Economic Evaluation of Paddy-Prawn Integrated Farming in Kerala

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INTRODUCTION

Coastal aquaculture has been receiving much importance during the last two decades due to the tremendous potential it has in augmenting prawn and fish production and increasing employment opportunities to the rural coastal fisherfolk. Farming in brackish waters and backwaters has been in vogue for ages in several areas in the country especially in Kerala, Karnataka, Goa and West Bengal (Alikunhi 1978, Silas 1978). An area extending to about 6,000 hactares of low lying coastal region in Kerala is utilised for paddy-cum-prawn culture. The 'Gazani' farms of Karnataka have an area of 2,300 hactares mainly in North Canara district. Here in the brackish waters near to the coast, prawn/fish culture is carried out along with salt production while in the interior areas paddy-cum-fish culture is practiced. In Goa, prawn culture is done in the 'Khazan' lands extending over an area of 1,800 hectares. Khariff crop of paddy is grown in the fields and after the harvest the fields are used for culturing prawns. In West Bengal the 'Bheris' extending over an area of 40,000 hactares in Hooghly-Matlah estuarine system is used for culturing fish and prawns (Alagarswami 1978).

Keeping in view the importance of Kerala in the production of culture prawns, the C. M. F. R. I took up a research project for economic evaluation of traditional paddy-cum-prawn culture practice in that state. The present paper deals with the results of the research investigation carried out during 1981-84 based on data collected through a sample survey, covering Ernakulam district of the state where the practice is mostly confined to. Attempts have been made earlier to study the economics of the practices by George (1974, 1978) and Gopalan (1978) by taking up case studies in Vypeen island which brought out interesting results. The figures may not be directly comparable with those obtained in the present study because of the time gap and the difference in the method of selection of observational units.

THE PRACTICE IN BRIEF

In the traditional paddy-cum-prawn culture practice, paddy is cultivated in the fields adjoining the backwaters during

June-September, when the water is of low salinity. The variety of paddy used for this type cultivation is locally known as 'Pokkali' which is a saline tolerant strain. After the harvesting of paddy during October, prawn and fish seeds are let into the field during high tides. Bamboo screens are used as barricade to prevent the escape of fish and prawns during low tides. Sluice gates made up of wood are fixed to regulate the in and outflows. Prawn filtration (harvesting, by use of filter net, prawns which flow out through the sluice gate during low tides) starts in November middle and is carried out for a week around every full and new-moon. periods till the middle of April.

NATURE AND EXTENT OF DATA

A preliminary enquiry was conducted in Vypeen, parur and Varapuzha areas in the district to identify the farms to be observed continuously for a period of one year covering both paddy and prawns. 70 farms representing different holding sizes as well as location, were selected for detailed investigation. The sample farms covered an area of 164 hectares for paddy cultivation and 177 hectares for prawn filtration. This difference has arisen due to the fact that some of the areas which are deeper are not used for paddy cultivation. Prawn filtration is mostly carried out by contractors who take the farms on lease. However, paddy cultivation is carried out by the owners of the farms themselves.

The data collected through the continuous survey in 1981 and 1982 and the follow-up surveys in 1983 and 1984 were critically analysed and the results are presented in the following sections.

PADDY PRODUCTION, COST AND REVENUE :

The cost of paddy cultivation worked out to about Rs. 2780,-per ha. for Vypeen, Rs. 2270/-for Parur and Rs. 2320/- for Varapuzha. Labour accounted for almost 81 per cent of the total cost, seed 10 per cent, sluice gate 7 per cent and miscellaneous expenditure 2 per cent. In Parur and Varapuzha about 12 per cent of the total cost was for seeds while in Vypeen only 7% was spent for seeds. This was mainly due to second sowing in Parur and Varapuzha as the first sowtng was damaged due to heavy rain and floods.

The yield per ha. worked out to about 20 quintals in Vypeen, 17 quintals in Parur, 15 quintals in Varapuzha and 19 quintals for the whole areas realising gross returns of Rs. 3900/-, Rs. 3270/-, Rs. 2870/-and Rs. 3670/- respectively. The total value includes the value of hay, which accounted 2 to 5 per cent of the gross returns. The net returns were Rs. 1120/- per ha for Vypeen, Rs. 1000/- for Parur and Rs. 550/- for Varapuzha and the average Rs. 1100/-.

The cost of production per quintal of paddy worked out to Rs. 138/- in Vypeen, Rs. 137/-in Parur, Rs. 153/- in Varapuzha and the overall average worked out to Rs. 140/-. The average price realised per quintal was Rs. 192/- in Vypeen, Rs. 191/-in Parur, Rs. 188/- Varapuzha and overall Rs. 191/-

The analysis of cost and returns of paddy cultivation by size of holdings indicates that the net income increased as the holding size increased for all the three areas. This may be due to the better management of labour in the production process and economics of scale in the case of larger holdings.

PRAWN FILTRATION

All the farms observed under paddy cultivation were also considered for prawn filtration. The usual practice is to give the paddy fields to contractors by auction after paddy harvesting and the contractors operate the holdings for prwan farming from middle of October to middle of April when the prawn filtration is completed. Out of the 70 farms, in 9, farm owners directly carried out the prawn filtration operations while the remaining 61 farms were leased out to the contractors. In the case of contract system the highest bidder who pays the whole lease amount before the commencement of the operations is given the farm. Generally the contractor takes charge of the farm with the sluice gate and he has to make only minor repairs and maintain the same. More than 85 per cent of the farms in these areas are leased out for prawn filtration. 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. The lessee has to take a licence on a nominal fee of Rs. 35/-per hectare which is levied by the State Department of fisheries.

The lessee carries out preparatory work before starting the operations. The outer bunds are strengthened and all breaches and holes closed so that the water flow is fully regulated through the sluice gate. The area adjacent to the main sluice is deepened and channels (with a width of about 1.5 metre and depth one metre) are cut through the fields connecting the deepened area giving a slope towards the sluice gate.

The wooden sluice gate which is locally known as 'Thoombu' is fixed in the outer bund (Kartha and Karunakaran Nair, 1980). The size and number of sluice gates required for a farm depends on the extent of the operational field and direction of the water flow. A bottom plank is set firmly on the ground under the water. The side planks provided with foot-rests are then fitted. These foot rests are meant for drawing the coir rope operating the shutter planks. The top frame is fixed over the side planks and the gate is made as a single unit. Strong poles are erected very close to both sides of the sluice gate and this inter-connected structure is firmly tied to the sluice gate to form a stabilized unit. Shutter planks are then introduced into the grooves provided for this purpose. The sluice gate is generally made of local timber having an average size of 3 metre length, 1.75 metre height and 0.90 metre width. The construction of such a sluice gate costs about Rs. 4000/-

Prawn filtration process consists of letting in the incoming tidal waters from the adjoining backwaters into the fields during the high tides by removing the shutter planks of the sluice gate and allowing the impounded water to flow out during low tides. while letting the water out, a screen made of nylon net or bamboo/ arecanut stripe closely tied together called 'adichil' is placed vertically inside the sluice mouth so as to prevent the impounded tiny prawns from escaping out of the ponds when there is no fishing. During the high tide in order to lead the prawns to the field and to prevent the impounded prawns from escaping a conical net (locally known as 'ettavala') is fixed inside the sluice gate with cod end open.

The harvesting of prawns starts in November but becomes intensive from January. The filtration is carried out for about a week around every full moon

and new moon, the period being locally called as 'thakkam'. The net made up of strong cotton or nylon thread with fine meshed cod-end and conical in shape with its mouth tied to a rectangular wooden frame is fixed in the outer mouth of the sluice gate during favourable tides. To attract prawns a hurricane lamp| petromax is hung at the mouth of the sluice gate. The code end of the net is lifted out of water at intervals to empty the catch. The process of filtration is continued for a period of 2 to 3 hours, depending on the force of the outflow, the bulk of the prawns being caught during the initial one hour. When the filtration is over, the shutter planks are replaced. The process of trapping during the high tide and harvesting during the low lide is repeated. The catches are sorted out according to species and size. The catches mainly consist of *M. dobsoni*, *P. indicus* *M. monocerus*, *P. monodon*, crabs and fishes like *Etroplus*, *Tilapia* and *Mugil*.

By middle April, just before the contract period terminates, a complete harvesting of entire stock of prawns and fishes is made by operating cast nets, drag nets and even hand picking after draining out the water to the extent possible. The process is called 'Kettukalakkal'.

PRAWN PRODUCTION, COST AND REVENUE (Overall)

The cost and returns structure of prawn filtration pooled over the sample data from paddy fields operated by contractors as well as by owners themselves is given in Table 1. The land lease, labour and expenditures on sluice gate, canoe and net are the major cost components. The lease amount per ha ranged from about Rs. 3240/- (Parur) to 4620/- (Vypeen). In the case of fields operated by owners themselves for prawn filtration, the average lease value in the area concerned is taken as the opportunity cost of the land. Almost 80 per cent of the total cost was accounted by the lease value. The labour cost varied from about Rs. 410/- per ha in Varapuzha to Rs. 640/-in Parur accounting for about 10 per cent of the total cost. Expenditure for maintenance of sluice gate, hiring charges of canoe and cost of net accounted for about 5 per cent of the total cost. The operational cost per ha ranged from Rs. 810/-in Varapuzha to Rs. 1050/- in Parur accounting for about 18 per cent of the total cost. The total prawn catches (per ha) during the five months period were 620 Kg in Vypeen, 410 Kg in Parur and 260 Kg in Varapuzha. *M. dobsoni* accounted for the bulk of the prawn catches (63%) followed by *P. indicus* (27%) *M. monocerus* (9%) and *P. monodon* (1%). About 100 Kg of fishes and crabs per ha were also caught during the season. The total value of the catches worked out to Rs. 7670/-in Vypeen, Rs. 5180/-in Parur and Rs. 2830/-in Varapuzha. *P. indicus* dominatdd in value accounting for about 60 per cent followed by *M. dobsoni* 23%, *M. monocerus* 9%, *P. monodon* 4% and fishes 4%.

The net returns per ha over all the three areas worked out to about Rs. 1200/-. However, there was wide variation in net returns among the areas namely Rs. 2080 in Vypeen, Rs. 830/- in Parur and a loss of Rs. 1400/- in Varapuzha. The loss is mainly because of the low productivity and absence of *P. indicus* in most of the fields. These to some extent, may be due to the effect of pollution emanating from the nearby Eloor industrial belt.

PRAWN PRODUCTION, COST AND REVENUE (Contractor operated fields)

The cost and revenue of prawn filtration in the paddy fields leased out to contractors are given in Table 2. The

lease amount is the major component of cost (82%) followed by labour (10%) and expenditure for maintenance of sluice gate and other operational costs (7%). The prawn production per ha in Vypeen was 590 Kg while it was as low as 260 Kg in Varapuzha. *M. dobsoni* accounted for 64% of prawn production, *P. indicus* 27%, *M. monoceros* 8% and *P. monodon* 1%. The total revenue per ha was Rs. 5850/-. *P. indicus* dominate in total value. The net returns worked out to Rs. 912/-.

PRAWN PRODUCTION, COST AND REVENUE (owner operated fields)

The cost and revenue of prawn filtration in paddy fields operated by owners themselves in Vypeen and Parur area are given in Table 3. In Varapuzha there was no owner-operation for prawn filtration in the sample. The cost of prawn filtration per ha worked out to about Rs 1520/-. Of the operational costs, labour contributed to about 55 per cent, followed by expenditure on sluice gate (16 per cent) and net and canoe hire charges (12 per cent). The total catch of prawns was about 790 Kg in Vypeen and 500 in Parur. The prawn catches were dominated by *M. dobsoni* (61%) followed by *P. indicus* (29%). About 100 Kg of fishes and crab per ha were caught during the period. In terms of value *P. indicus* realised the higehst amount accounting for 62 per cent of the gross returns. The net returns worked out to Rs. 7280 in Vypeen and Rs. 6680 in Parur. Here the opportunity cost of land has not been considered for computing the net returns.

NET FARM INCOME

Figures of net annual returns to the owners of holdings from paddy cultivation and prawn filtration by self or through contract are given in Table 4.

The farm owners who operate both paddy cultivation and prawn filtration receive an annual net returns of about Rs. 8200/- per ha while those who cultivate paddy and lease out the farms for prawn filtration receive a net return of about Rs. 5130/- per ha. For those farm owners who engage themselves in prawn filtration, the net returns from prawn filtration alone worked out to about Rs. 7080 which is Rs. 3050 more than the opportunity cost of the land. This indicates that the farms where filtration is managed by owners themselves are much more profitable than which are given on lease. This may be partly due to the higher productivity of such farms and their independent access to the backwaters. However, most of the owners prefer to give their land on lease due to reasons such as the various constraints in the execution and management and often the unfavourable location of the farm.

YIELD IN RELATION TO DISTANCE FROM BAR-MOUTH

The sample holdings were divided into three groups depending upon their distances from the bar mouths of Cochin and Munambam. The fields which are less than 5 Kms distance from the bar-mouth form the first group, 5 to 10 Kms second group and above 10 Kms, the third group. Major parts of Vypeen and Parur come under first and second groups, whereas all the selected farms in Varapuzha area come under the 3rd group. *P. indicus* as well as total prawn production decreased as the distance of farms from the bar-mouth increased. The net returns (per ha) was also maximum in the first group (Rs. 2300/-) followed by second and third group (Rs. 1290/- and

Rs. 520/- respectively). It may be interesting to note that productivity studies made in the estuarine system of Cochin showed that the fields located near the bar-mouths of Cochin and Munambam are comparatively more productive and as distance increases the productivity gradually decreases (Gopinath et al 1980).

ESTIMATION OF TOTAL PRAWN PRODUCTION IN PADDY FIELDS

The bulk of the total area under paddy-cum-prawn culture in Kerala is in Ernakulam district covering an area of 4920 hectares. On the basis of the study conducted, the annual prawn production in paddy fields of Ernakulam district during 1981-82 worked out to 2500 tonnes. Out of this the estimated yields of *M. dobsoni* was about 1590 tonnes and *P. indicus* 680 tonnes. The area considered here does not include perennial fields used for prawn culture.

The value of total prawn produced from the paddy fields in Ernakulam district worked out, on the basis of the farm prices prevailing during the season, at Rs. 29.3 million.

ESTIMATED MAN-POWER REQUIREMENTS

The labour employed per hectare in the production process of paddy-cum-prawn culture in Ernakulam district of Kerala is detailed in Table 5. It is seen from the table that on an average 53 mandays and 56 womandays were employed per ha for paddy cultivation and 81 mandays per ha for prawn filtration. Ploughing and harvesting are the major components of labour requirement in paddy cultivation and filtration (harvesting) in prawn culture. It may be also seen that the variation among Vypeen, Parur and Varapuzha in the labour requirement for both paddy cultivation and prawn filtration was not of a high order.

The estimated labour requirement for paddy cultivation in Ernakulam district was about 0.26 million mandays and 0.28 million womandays. For prawn culture the requirement was about 0.40 million mandays. The total number of labour days worked out to 0.94 million.

PRODUCTION TREND

From the various published papers on paddy-cum-prawn culture in Kerala (Menon, 1954, Gopinath 1956, George et al 1968, George, 1974 & 1978, Gopalan, 1978 & 1981) it has been observed that the prawn production from the 'pokkali' fields in Vypeen area was of the order of 1000 kg per ha during the fifties and sixties while it reduced to about 700 kg per ha during the seventies. The current investigation indicated an average yield of 620 kgs per ha in Vypeen area and much less in other areas. It may be mentioned here that the above referred papers deal with case studies based on few farms in Vypeen area where the productivity is generally better than other areas in the district. The present investigation on the other hand is a sample survey based on a large number of farms for estimating the average and total production of prawns from paddy fields and the economics of operations in the district as a whole as well as its important segments. In any case from the available information it is evident that there has been a declining trend in prawn productivity in the past with stagnancy in recent years.

Even though unit value of the product has increased the production of prawns in the paddy fields has not shown any increase. The reasons are not far to seek. The

practices followed in the farms remained more or less stationary over the years. Strictly speaking even now no culture is practised. Prawns are merely let into the fields during the high tide and are caught while letting them out during the low tide. However the prawns which get into the field may not necessarily move out during the subsequent outgoing tide. It is generally believed that recruits especially of *P. indicus* remain in the deeper areas of the farm for some time. The paddy fields may not be merely a part of the trapping mechanism but that they also provide an active and suitable biological environment for the growth of prawns (George, et al, 1968). It was observed during the enquiry that in some cases seeds collected from the adjoining back-water area are dispersed in the fields. Enquiries during the follow-up surveys in 1983 and 1984 revealed that more and more farmers are resorting to purchasnig seeds of *P indicus* from hatcheries and deposit them in the paddy fields. But as the harvesting is done frequently the effect of introducing high yielding seeds is not reflected in the production pattern. Use of artificial feed is a rare phenomenon. Unless the prevailing practices are improved there is no chance for a break-through in production.

The decline or stagnency in production may also be related to the heavy exploitation of prawns in the inshore areas during the last over one decade. Such exploitation can have an adverse impact on the flow of juvenile prawns from the sea into the back-waters. Environmental constraints may be another reason for the declining productivity.

COMMENTS & SUGGESTIONS

Information collected during the period of actual observation of prawn filtration operation and subsequent visits in 1983 and 1984 brought out some of the views reported by the farmers regarding ways and means for increasing production.

.There was an opinion among the farmers in favour of prawn culture for the whole year instead of the current practice of crop production for six months and prawn production for the other six months. But perhaps this may not be quite viable. The farms will have to be deepened to maintain sufficient level of water through out the year. During the monsoon period the salinity becomes low which also may not be conducive for prawn production. It is also believed that there is a favourable residual effect of paddy cultivation on the subsequent prawn production. In addition there is the land utilisation policy of the Government restricting the conversion of paddy fields for raising other crops. Considering these aspects it would appear that prawn culture round the year under the existing frame work may not be a practical proposal.

Another view expressed by a number of farmers is the desirability of extending the present termination date of mid-April. A study of the month-wise production rate showed that generally propuction increased upto the middle of March and thereafter a sharp declining trend is observed. In the middle of April the owners make an all-out effort to capture the entire prawn and fish stock left in the field. Even with this there has been an overall decline in production. One reason could be the increase in temperature of water in the field associated with summer season, which would make the habitat unfavourable for prawns. The yield trend indicates that prolonging the period beyond April middle may not result in economic returns.

It may not be easy to develop a complete technology to increase production which will fit into the broad frame work existing today. The farmers are used to make periodic harvestings (around full and new moon days) which provides them regular inflow of income. Use of high yielding seeds like that of *P. indicus* would help in enhanching the prawn production and its value (Vedavyasa Rao 1978 and Muthu 1978). The Governmen and Co-operative societies can establisht hatchery plants so as to provide assured supply of seeds of *P. indicus* for which a viable technology has been developed by Central Marine Fisheries Research Institute, Cochin. It may be desirable to evolve cheap feed mixtures suiting to the present set up which can promote better growth and consequently better weight and value for the prawns.

It may be stressed that some modifications would be required in the present harvesting technique if high yielding species are to be recommended for use and at the same time frequent harvesting as exists today is to be continued. The added seeds should be allowed to remain in the field for a longer time to facilitate growth. Few farmers put the smaller prawns back into the field after sorting the harvested produce. An effective and workable procedure may have to be formulated after experimentation so as to reap reasonably good benefits accruing from the use of high yielding species.

So far, there has been no large scale use of improved paddy seeds in the area. Use of better strains of salinity-resistant paddy and adoption of scientific agricultural practices may be helpful in increasing paddy production and thereby improving the overall economy. The outer bunds which are common to many small farms may be strengthened or constructed by the local Government agencies which will reduce the risk involved in cultivation and check the expenses on maintenance of bunds.

Today there are too many gill nets, castnets, chinese dipnets and stakenets operating in the backwaters which prevent the free entry of recruits into the farms. It is essential that the Government put a limit to their numbers and strictly enforce the same. This will also help in reducing the catches of premature prawns. The reclamation of the backwaters is on the increase for various purposes which also needs to be regulated so as to allow free flow of water from the bar-mouth to the fields and thereby permitting good recruitment to the fishery. An important aspect which creates tension and uncertainties among the farm operators is the large scale poaching which usually takes place before the end of the contract period. It is essentiae that Government enforce strong protective measures against this unauthorised practice.

Another area where Government can come in a big way is to enforce law to prevent pollution resulting from the discharge of effluents from industrial units. In some of the areas especially in Varapuzha which is nearer to the Eloor-Alwaye industrial belt, proper polloulion control measures should be taken to reduce the adverse effect on paddy crop and large-scale mortality of prawns.

It is essential that production and associated environmental factors are regularly monitored for proper understanding of yield fluctuations which may facilitate the formulation of remedial measures if need be, at the right time. A good information base would also help in planning suitable programmes for the balanced development and management of the rich Cochin backwater region.

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TABLE-1

COST AND RETURNS (PER HA) IN PRAWN FILTRATION

(Pooled over oll sample farms)

Item	Area	Vypeen	Parur	Varappuzha	Overall
Coverage (ha)		101.32	48.33	27.09	176.74
Cost Rs.					
1. Lease value of land		4623	3226	3396	4056
2. Material cost					
i. Shed		22	33	18	24
ii. Lantern		15	20	18	17
iii. Bamboo screen		23	28	21	24
iv. Kerosene		57	75	41	59
v. Hiring charges of canoe and value of net		114	144	135	125
vi. Expenditure on slnice gate		130	104	168	129
Sub total		361	404	401	378
3. Labour cost					
i. Preparing the field tanning of net etc.		121	80	51	99
ii. Filtration labour		418	563	362	449
Snb total		539	643	413	548
4. Total operational cost (2+3)		900	1047	814	926
5. Other cost		64	70	51	64
6. Total cost including lease amount (1+4+5)		5587	4353	4261	5046
Yield					
7. Quantity (kg)					
i. *M. dobsoni*		392	266	160	322
ii. *P. indicus*		176	118	30	138
iii. *M. monocerus*		50	22	65	44
iv. *P. monodon*		5	2	2	4
Prawn total		623	408	257	508
v. Fishes and crabs		82	99	148	97
8. Value (Rs.)					
i. *M. dobsoni*		1703	1137	747	1402
ii. *P. indicus*		4787	3344	738	3772
iii. *M. monocerus*		598	301	914	565
iv. *P. monodon*		310	98	109	221
Prawn total		7398	4880	2508	5960
v. Fishes and crabs		269	301	321	285
9. *Gross returns* (Rs.)		7667	5181	2829	6245
10. *Net returns in* Rs. (9-6)		2080	828	-1432	1199

Table-2. COST AND RETURNS (PER HA) IN PRAWN FILTRATION
(Operated by contractors in leased out farms)

Item	Area			
	Vyppeen	Parur	Varapuzha	Overall
Coverage (ha)	84.21	40.09	27.09	151.39
Cost (Rs)				
1. Lease value of land	4623	3236	3396	4036
2. Material cost				
i. Shed	20	31	18	23
ii. Lantern	15	18	18	16
iii. Bamboo screen	21	26	21	22
iv. Kerosene	51	72	41	54
v. Hiring charges of canoe and velue of net	94	144	135	115
vi. Expenditure on sluice gate	107	75	168	110
Sub total	308	366	401	340
3. Labour cost				
i. Preparing the field, tanning of net etc.	124	73	51	98
ii. Filtration labour	341	559	362	402
Sub total	465	632	413	500
4. Total operational cost (2+3)	773	998	814	840
5. Other cost	65	67	51	63
6. Total cost including lease amount (1+4+5)	5461	4301	4261	4939
Yield				
7. Quantity (Rs)				
i. *M. dobsoni*	372	266	160	306
ii. *P. indicus*	172	100	30	127
iii. *M monocerus*	42	21	65	40
iv. *P. monodon*	5	2	2	4
Prawn total	591	389	257	477
v. Fishes and crabs	78	100	148	96
8. Value (Rs)				
i. *M. dobsoni*	1599	1110	747	1317
ii. *P. indicus*	4758	2791	738	3518
iii. *M. monocerus*	502	283	914	518
iv. *P. monodon*	297	98	109	211
Prawn total	7156	4282	2508	5564
v. Fishes and crabs	267	307	321	287
9. *Gross returns* (Rs)	7423	4589	2829	5851
10. *Net returns* in Rs. (9-6)	1962	288	-1432	912

Table 3: COST AND RETURNS (PER HA) IN PRAWN FILTRATION
(In owner-operated farms)

Item	Area		
	Vyppeen	Parur	Overall
Coverage (ha)	17.11	8 24	25.35
Cost (Rs)			
1. Material cost			
i. Shed	29	42	34
ii. Lantern	16	32	21
iii. Bamboo screen	34	37	35
iv. Kerosene	87	91	89
v. Hiring charges of canoe and value of net	211	143	189
vi. Expenditure on sluice gate	245	245	245
Sub total	622	590	613
2. Labour cost			
i. Preparing the field, tanning of net etc.	105	113	108
ii. Filtration labour	799	582	729
Sub total	904	695	837
3. Total operating cost	1526	1285	1450
4. Other costs	60	86	68
5. *Total costs*	1586	1371	1518
Yield			
6. Quantity (kg)			
i. *M. dobsoni*	494	263	413
ii. *P. indicus*	198	204	200
iii. *M. monocerus*	88	27	68
iv. *P. monodon*	7	2	5
Prawn total	787	496	692
v. Fishes and crabs	104	94	101
7. Value (Rs)			
i. *M. dobsoni*	2214	1269	1907
ii. *P. indicus*	4932	6033	5290
iii. *M. monocerus*	1070	388	848
iv. *P. monodon*	374	96	283
v. Prawn total	8590	7786	8328
vi. Fishes and crabs	276	266	273
8. *Gross returns* (Rs)	8866	8052	8601
9. *Net returns* (Rs) (8-5)	7280	6681	7083

TABLE-4.

ANNUAL NET RETURNS (Rs. PER HA) FROM PADDY-CUM-PRAWN

Culture fields

Area	Prawn filtratiod			Paddy culti-vation.	Annual net returns. Owners	
	Owners		Contractors			
	Owner-opear-tors	Leased out.			Owner operators.	Leased out.
Vypeen	7280	4623	1962	1117	8397	5740
Parur	6681	3236	288	997	7678	4233
Varapuzha	*	3396	-1432	552	-	3948
Overall	7083	4036	912	1096	8179	5132

*No owner operator In the sample.

TABLE 5.

LABOUR DAYS SPENT FOR DIFFERENT FARM OPERATIONS

of (per ha) paddy-cum-prawn culture

Item	Area	Vypeen		Parur		Varapuzha		Overall	
		M	F	M	F	M	F	M	F
1.	*Paddy cultivation*								
i.	Drying the field and repairing the bund	10	—	11	—	9	—	10	—
ii.	Sluice gate repairing	1	—	1	—	1	—	1	—
iii.	Ploughing	22	—	23	3	17	23	20	9
iv.	Sowing	2	5	2	7	3	7	2	6
v.	Transplanting	7	31	4	20	6	27	5	28
vi.	Weeding	1	10	1	2	—	2	1	7
vii.	Harvesting	17	4	10	8	12	7	14	6
	Total	60	50	52	40	48	66	53	56
2.	*Prawn filtration*								
i.	Filtration	75	—	72	—	70	—	73	—
ii.	Repairing and fixing sluice gate	4	—	3	—	2	—	3	—
iii.	Tanning of net	1	—	1	—	1	—	1	—
iv.	Transportation	3	—	2	—	1	—	1	—
v.	Miscellaneous	3	—	2	—	3	—	3	—
	Total	86	—	80	—	77	—	81	—

M-Male

F-Female