CMFRI Special Publication
Number 6


# coastal aquaculture

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Lab

to

Land

coastal aquaculture

# Proceedings of the first workshop

on Technology Transfer

Cochin * Mandapam

23-24 July 27-28 July

1979

Central Marine Fisheries Research Institute
(ICAR)
P. B. 1912, COCHIN - 682018, INDIA

# Proceedings of the first workshop

on Technology Transfer in Coastal Aquaculture

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P. B. 1912, COCHIN - 682 018, INDIA

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# PREFACE

"Give a man a fish and he will have food for a day; teach him to grow fish and he will have food for the rest of his life", an old Chinese saying, is a previsional statement on what has, in the recent years, developed into the art of aquaculture. The saying has also emphasised teaching, that is the transfer of technology. Mariculture which is the branch of aquaculture relating to the realm of the sea and its contiguous coastal saline waters is a field which is fast developing the world over. Mariculture has immense potentials for increasing food production but its significance is greater as a technology which is capable of aiding the development of the coastal rural sector. It admirably fits into the small-is-beautiful concept which Mahatma Gandhi had commended as the most appropriate mechanism for the uplift of the rural India.

The major highlight of the programmes for the Golden Jubilee (1929-1979) of the Indian Council of Agricultural Research is the transfer of proven technologies in agriculture, animal husbandry and fisheries to the marginal and small farmers and the landless labour households. The programme has been styled "Lab-to-Land" to ruralise the terminology itself. The Central Marine Fisheries Research Institute (CM FRI) readily responded to avail this new opportunity. In the marine fisheries sector, coastal aquaculture is one of the most appropriate technologies for assisting the above target-groups. The Institute has developed the techniques for marine prawn and fish culture, pearl culture, open-sea mussel farming, oyster culture and seaweed culture and these, except pearl culture, form the technology package for the 'Lab-to-Land' programme.

Implementation of the programmes commenced at CMF RI in January 1979. About 350 families have been selected in

Cochin, Quilon, Calicut, Tuticorin, Mandapam and Madras as recipients of the technologies. In the selection of families, village/group approach has been given due importance. Benchmark surveys have been completed and the farmers have been trained. Actual farming operations have been commenced (except for mussel culture) and harvests have been taken in some cases. There have been both successes and failures. The scientific teams engaged in the implementation of the programme have had varied experiences in the field operations and also with the human aspect as they have come in direct contact with the farmers for the transfer of technology. The fish farmers themselves have been exposed to scientific culture practices for the first time.

A Workshop on 'Lab-to-Land' programmes was organised by the CMFRI in July 1979 to review the progress made, discuss the experiences of the farmers and the scientists, identify the constraints and, based on the above, to chart an action plan. The Workshop was conducted in two area sessions, the first one at Cochin during 23-24 July to deal with the programmes at Cochin, Quilon and Calicut, and the second at Mandapam during 27-28 July to discuss the programmes at Madras, Mandapam and Tuticorin. The Workshop, in effect, was a mid-term appraisal.

The present report contains the proceedings of the workshop. The fish farmers proved themselves to be an enlightened lot and they have identified the areas for additional technical inputs. The scientists have indicated the progress and constraints, and the successful and not-yet successful results. The district and block-level development officers have advised the scientists on the financial assistance available for these programmes. The discussions among the three participating groups — technology, finance and production groups — have resulted in evolving new strategies and action plans for the implementation of the 'Lab-to-Land' programmes.

The Workshop has, as anticipated, fulfilled its objectives. There have been forthright discussions among the groups of fishermen/fish farmers, scientists and development officials. Besides serving the purpose for which it

was organised, the Workshop's discussions have relevance to the overall efforts aimed at integrated rural development of the coastal rural sector. Technology as such apart, the mechanism of transfer of any technology will have common problems and constraints as have been expressed at the Workshop. In view of this wider implication and usefulness, it has been decided to bring out the proceedings of the Workshop in a printed form.

The farmers and the development officers deserve our gratitude for their contributions to the success of the Workshop. My deep appreciation is due to my colleagues Dr. P. S. B. R. James, Shri T. Tholasilingam, Dr. P. V. R. Nair, Shri K. Nagappan Nayar, Dr. P. V. Rao and Shri M. M Kunju and their teams (names appearing elsewhere in the report) for the active implementation of the programmes at different centres. Dr. K. Alagarswami is the coordinator of the 'Lab-to-Land' programme at this Institute and he edited this report.

E. G. SILAS

Abbreviation: *Proc. Workshop Trans. Tech. coast, Aquacult CMFRI Spl Publ., No. 6, 1979.*

## CONTENTS

# Lab-to-Land programmes at Central Marine Fisheries Research Institute

## MARINE PRAWN CULTURE

Demonstration of techniques of prawn seed collection from the natural environment; identification of prawn seed; selection of farm sites; construction of ponds; design, construction and fixing of sluices; productivity of water areas; fertilisation of ponds; monitoring of soil and water conditions; pest and predator control; selective stocking; collection and transport of spawners; breeding of prawns and rearing of larvae to the stage suitable for stocking; culture of live food organisms, preparation of compounded feed and feeding; pond management; harvesting technology.

The above technologies which have already been developed and tested at the Institute will be demonstrated to the fishermen and fish farmers. The programme has been taken up in Ernakulam and Quilon Districts in Kerala. The farmers who possess small holdings of areas which are seasonally inundated by brackish water and those who possess perennial fields are encouraged to adopt scientific methods of prawn farming for increasing production of selected, fast-growing and high priced species of prawns. A major thrust has been laid in demonstrating the culture of the prawns *Penaeus indicus* and *P. monodon*. Tamilnadu is witnessing a great awakening among the fishermen of the potentials of prawn culture. The programme on prawn culture will be extended to Chinglepet District.

The agricultural and fisher women who are assisting in their family avocations are trained in the simple techniques of

seed collection, feeding and maintenance of ponds so that they can also play a vital role in earning additional income.

### PRAWN AND FISH FARMING (POLYCULTURE)

Demonstrations of polyculture of prawns and fishes in the backwater areas; selection of prawns and fishes based on compatibility for mixed farming; large-scale collection of prawn and fish seed; feeding; monitoring; pond management; phasing of harvests for different species; harvesting technology.

The demonstrations on polyculture are linked up with the programmes on prawn culture.

### MUSSEL FARMING

Demonstrations on collection of mussel spat from the wild and transportation; open-sea farming of mussels; raft construction, floating and mooring; seeding of ropes with mussel spat; thinning and re-distribution of mussels; spatfall in the farm and spat collection; growth of mussels; harvesting technology; purification of mussels.

The above techniques of open-sea mussel culture have been developed by the Institute. The demonstrations are carried out at Calicut and it will be extended to Tellicherry. The beneficiaries are the people engaged in the collection of mussels from the natural beds. Farming of mussels results in several-fold increase in production and also yields quick harvests of quality mussels. Introduction of purification techniques ensures destruction of pathogenic organisms. Mussel farming is also demonstrated at Karikattukuppam, a village in Chinglepet District of Tamilnadu. The technology is ideally suited for landless labour households.

### OYSTER CULTURE

Demonstrations of techniques of spat collection; preparation and laying of tiles for spat collection; scraping of spat and farming; rack construction; rack culture and rope culture techniques; environmental parameters and their influence on gro-

wth of oysters; identification of predators and their control; methods of fattening; pollution problems; harvest technology; purification of oysters; food value of oysters.

Demonstration of oyster culture is carried out in a village near Tuticorin bordering the bay. The beneficiaries are small fishermen whose fortunes have been affected in the recent years by the intensification of mechanised fishing in the inshore waters. The fishermen, in their leisure time and off-season, and their womenfolk and children look after the oyster farm after appropriate training. Marketing avenues will be explored and the oyster farmers will be assisted in purification and marketing of the product.

### SEAWEED CULTURE

Demonstrations on identification of cultivable and commercial seaweeds; methods of collection; preparation of coir network; seeding of ropes with vegetative fragments of seaweeds; growth of seaweeds; maintenance of farm; control of browsing fishes; harvest technology; post-harvest technology for the cottage-level preparation of agar-agar.

The programme is implemented at Mandapam in Tamilnadu. The inshore areas of the Gulf of Mannar around Mandapam is the most important seaweed collection centre for the agar-agar industry. Due to increasing pressure on the natural beds, the yield is becoming reduced. Culture of seaweeds of commercial importance by appropriate techniques would enhance production. The beneficiaries of the programme are small fishermen and landless labour of the coastal villages around Mandapam.

### INTEGRATED FARMING

The programme envisages economic uplift of the selected families through integrated farming practices. Fish/prawns-livestock-agriculture integration is encouraged. Under the existing paddy-cum-prawn culture system of Kerala improvements are effected through appropriate technical inputs for taking two harvests of prawns and one harvest of paddy.

Prawn culture is encouraged in the canals of the coconut groves as an additional farming system. The CMFRI seeks the assistance of other ICAR Institutes, Agricultural Universities and Departments of State Governments for technical advice on livestock rearing and agriculture.

### TRAINING OF FARMERS

All the Lab-to-Land programmes of the Institute are closely linked up with organising appropriate training programmes for the small fishermen, fish farmers, landless labour and womenflok. The training is phased out so that it is given at the required time taking the convenience of the farmers into consideration. The training programmes are organised by the implementation groups and the Krishi Vigyan Kendra for Mariculture in local languages both n the Institute's farms and in the farmers' fields.

### COLLECTION OF FEED-BACK DATA

Collection of feed-back scientific information is considered as one of the important aspects of the transfer of technology programme. Demonstrations of mariculture technology in the farmers' fields are new and hence the feed-back data are vital for expansion of culture operations. The farmers have been instructed to cooperate with the scientists in this aspect. Due to this arrangement new problems and lacunae in the technology are identified. The scientists conduct further investigations wherever necessary and the farmers are advised on the solutions to the technical problems.

### INFORMATION TRANSFER

The Institute has taken up an active publication programme to spread the message of science through popular literature. Pamphlets on the technologies are printed and distributed to the farming communities at different centres. Pamphlets on prawn culture, oyster culture, mussel culture, seaweed culture, Operational Research Project and Krishi Vigyan Kendra (a series of leaflets) have already been issued and a few others will follow.

# Inauguration

**Prawn and fish culture in Cochin**

Villages: Valappu, Puthuvypu, Ezhikara and Kedamangalam

No. of families: 122 Harijan families at Valappu
3 Families from other villages

*Dr. M. S. Swaminathan F.R.S., former Director General, ICAR, inaugurating the Lab-to-Land Programme at the AMSF Harijan Colony at Valappu, Cochin on 13 March 1979 by introducing prawn seed in the farm. Shri Philipose Thomas I.A.S., District Collector, Ernakulam presided over the function.*

**Prawn and fish culture in Quilon**

Villages: Thekkumbhagom and Ayiramthengu

No. of families: Three agricultural families

*Shri Baby John, Hon'ble Minister for Revenue, Govt. of Kerala inaugurating the programme at Velithuruthu, Thekkumbhagom village on* 12 *April* 1979 *by introducing prawn seed in the farmer's pond. Shri C. Ramachandran I.A.S., District Collector, Quilon presided over the function. Dr. J.A. Gulland, Chief, Fisheries Resources Division, FAO, Rome participated.*

**Mussel and prawn culture at Madras**

Villages: Karikattukuppam and Muttukad

No. of families: 141 Fishermen families at Karikattukuppam
65 Harijan families at Muttukad

*Shri G. R. Edmund, Hon'ble Minister for Food and Fisheries, Govt. of Tamil Nadu inaugurated the programme at Karikattukuppam on 7 April 1979. Dr. B. K. Soni, Deputy Director General (Animal Sciences), ICAR presided over the function. Shri G. Thirumal I.A.S., Commissioner — Secretary, Department of Forests & Fisheries, Govt. of Tamil Nadu felicitated. The Minister inspected the windmill erected for pumping sea water into the prawn culture pond.*

**Oyster culture at Tuticorin**

Villages: Panimayanagar and Sahayapuram

No. of families: Eleven fishermen families

*Shri R. Shanmugham I.A.S., District Collector, Tirunelveli inaugurated the programme on* 10 *May* 1979 *at Tuticorin. Shri N. Dhanasekaran and Shri Sadhu Selvaraj, Members of Legislative Assembly, Tamil Nadu felicitated.*

**Seaweed culture at Mandapam**

Villages: Vedalai, Marakayarpatnam and Seeniappa Darga

No. of families: Eight fishermen families

*Shri S. Subramaniam I.A.S., District Collector, Ramanathapuram inaugurated the programme at Marakayârpatnam on 28 February 1979. Kumari Thangam Ananthakrishnan I.A.S., General Manager, District Industries Centre, Ramanathapuram felicitated.*

**Mussel culture at Calicut**

Village: Elathur

No. of families: Ten musselmen families

*Shri K. M. Balakrishnan I.A.S., District Collector, Calicut inaugurated the programme at Elathur on 8 April 1979. In the picture he is seen examining a mussel culture rope. Shri P.K. Sankarankutty, Member of Legislative Assembly, Kerala presided over the function.*

# Scientific groups engaged in the Lab-to-Land programmes

*DIRECTOR*

Dr. E. G. Silas

*Inter-disciplinary Team*

Dr. K. Alagarswami, S-3 — *Coordinator*
Dr. P .V. Ramachandran Nair, S-3
Dr. P. Vedavyasa Rao, S-3
Shri K. V. Narayana Rao, S-3
Dr. K. Alagaraja, S-2

*Implementation Groups*

*Cochin programme*

Dr. P. V. Rao, S-3 — *Leader*
Dr. V. Balakrishnan, S-2
Shri M. Kathirvel, S-1
Shri P. Karunakaran Nair, T-6

*Calicut programme*

Shri M. M. Kunju, S-2 — *Leader*
Dr. P. S. Kuriakose, S-1
Shri C. V. Mathew, S

*Quilon programme*

Dr. P. V. R. Nair, S-3 — *Leader*
Shri K. J. Mathew, S-1
Dr. P. Parameswaran Pillai, S-1
Shri K. Rengarajan, S-1

*Madras programme*

Shri T. Tholasilingam, S-3 — *Leader*
Shri K. Rangarajan, S-2
Shri K. G. Girijavallabhan, S-1
Shri A. C. Sekar, T-II-3

*Mandapam programme*

Dr. P. S. B. R. James, Jt. Director — *Leader*
Shri V. S. K. Chennubotla, S-2
Shri S. Kalimuthu, T-II-3

*Tuticorin programme*

Shri K. Nagappan Nayar, S-3 — *Leader*
Shri P. Muthiah, S-1
Shri M. E. Rajapandian, S

Besides the above teams responsible for the implementation of the programmes, a number of scientists and technical staff are engaged in providing assistance to and collection of feed-back scientific data from the programmes at the different centres. All the scientists and technical staff involved are working part-time in the programmes in addition to their responsibilities to the Research Projects of the Institute.

# Workshop on Lab-to-Land

## PROGRAMME

*Area Session I: COCHIN*

Dates: 23 — 24 July 1979

Venue: CMFRI Annexe, Cochin.

*Chairman*

Dr. E. G. Silas
Director, CMFRI.

23—7—1979

| | |
|---|---|
| 0930-1000 | Welcome and Opening Remarks — by Chairman |
| 1000-1015 | Salient features of the guidelines on the Experimental Transfer of Technology — by K. Alagarswami |
| 1015-1115 | Presentation of Experience Papers — by Implementatiton Group for the Cochin programme (prawn culture and polyculture) |
| 1115-1215 | Presentation of Experience Papers — by Implementation Group for the Quilon programme (prawn culture) |
| 1215-1300 | Discussion |
| 1300-1400 | *Lunch Break* |
| 1400-1430 | Presentation of Experience Papers — by Implementation Group for the Calicut programme (mussel culture) |
| 1430-1500 | Discussion |

1500-1600 Discussion on new guidelines — technical and financial

1600-1700 Discussion on improvements in technical programme and their implementation

24—7—1979

1000-1015 Welcome — by Chairman

1015-1115 Presentation of farmers' experiences and viewpoints on Lab-to-Land programmes — by prawn farmers of the Cochin programme

1115-1200 Presentation of farmers' experiences and viewpoints on Lab-to-Land programmes — by prawn farmers of the Quilon programme

1200-1210 Transfer of technology through Krishi Vigyan Kendra for Mariculture — by V. Balakrishnan

1210-1245 Financial assistance under the Integrated Rural Development Programmes
— by Assistant Development Commissioner, Ernakulam
— by Block Development Officer, Vypeen
— by Block Development Officer, Chavara

1245-1330 Discussion

1330-1430 *Lunch Break*

1430-1700 Concluding Session
Discussion on:
Improvements in technology to meet farmers' needs
Bench-mark survey evaluation
Preparation of Farm Family Plans
Budget for the programmes
Programmes for National Extension Fortnight
Feed-back data collection
Strategies and action plans
Concluding Remarks — by Chairman
Vote of thanks.

*Area Session II: MANDAPAM CAMP*

Dates: 27 — 28 July 1979

Venue: CMFRI Regional Centre, Mandapam Camp

*Chairman*

Dr. E. G. Silas
Director, CMFRI.

27—7—1979

| | |
|---|---|
| 0930-1000 | Welcome and Opening Remarks — by Chairman |
| 1000-1100 | Presentation of Experience Papers — by Implementation Group for the Madras programme (mussel culture and prawn culture) |
| 1100-1200 | Discussion |
| 1200-1300 | Presentation of Experience Papers — by Implementation Group for the Mandapam programme (seaweed culture) |
| 1300-1400 | *Lunch Break* |
| 1400-1500 | Discussion |
| 1500-1600 | Presentation of Experience Papers — by Implementation Group for the Tuticorin programme (oyster culture) |
| 1600-1700 | Discussion |

28—7—1979

| | |
|---|---|
| 0900-0915 | Welcome — by Chairman |
| 0915-1000 | Presentation of farmers' experiences and viewpoints on the Lab-to-Land programmes — by oyster farmers of the Tuticorin Programme |
| 1000-1045 | Presentation of farmers' experiences and viewpoints on the Lab-to-Land programmes — by seaweed farmers of the Mandapam programme |

1045-1130 Presentation of experiences and viewpoints on the Lab-to-Land programmes
— by farmers of the Madras programme

1130-1200 Financial assistance under the Integrated Rural Development Programmes
— by P.A. to District Collector, Ramanathapuram
— by Commissioner, Mandapam Panchayat Union
— by Deputy Agricultural Officer
— by Extension Officer (Animal Husbandry)

1200-1300 Discussion

1300-1400 *Lunch Break*

1400-1700 Concluding Session
Discussion on:
Improvements in technology to meet farmers' needs
Bench-mark survey evaluation
Preparation of Farm Family Plans
Budget for the programme
Programmes for the National Extension Fortnight
Feed-back data collection
Strategies and action plans
Concluding Remarks — by Chairman
Vote of thanks.

## PARTICIPANTS

WORKSHOP AREA SESSION I: COCHIN

### CMFRI

Dr. E.G. Silas
Dr. S.V. Bapat
Dr. K. Alagarswami
Dr. M.J. George
Dr. A.V.S. Murty
Dr. P.V.R. Nair
Shri K.V.N. Rao
Shri K.N. Krishna Kartha
Dr. P.V. Rao
Dr. K. Alagaraja
Dr. V. Balakrishnan
Shri M.M. Kunju
Shri M.S. Muthu
Dr. K. Radhakrishnan
Shri Syed Ahmed Ali
Shri K.K. Appukuttan
Shri M. Kathirvel
Dr. S. Kulasekarapandian
Dr. P.S. Kuriakose
Shri A. Laxminarayana
Dr. R.S. Lal Mohan
Dr. P. Parameswaran Pillai
Shri M. Rajamani
Shri A. Regunathan
Shri K. Rengarajan
Shri C.V. Mathew

Shri A.N. Mohanan
Shri P. Karunakaran Nair
Shri P. Radhakrishnan
Shri K.A. Unnithan
Shri D. Vincent

### State Officials

Shri G.R. Kurup,
Asst. Development Commissioner,
Ernakulam
Shri N. Bhageerathan,
Block Development Officer,
Chavara
Shri C.K. Kumaran,
Block Development Officer,
Vypeen

### Fish Farmers

*Cochin Group*

Shri R.V. Ajayakumar
Shri K.K. Bahuleyan
Shri P.K. Divakaran
Shri K.K. Karthikeyan
Shri P.A. Manmadhan
Shri P.K. Mony
Shri K.K. Prakasam
Shri T.A. Raghavan
Shri T.K. Sasidharan
Shri V.K. Sugathan
Shri P.A. Sukumaran
Shri A. Uthaman

*Quilon Group*

Shri V. Soman Pillai
Shri Tripuran Pillai
Shri K.P. Sukumaran

## WORKSHOP AREA SESSION II: MANDAPAM CAMP

### CMFRI

Dr. E.G. Silas
Dr. P.S.B.R. James
Shri K. Nagappan Nayar
Shri T. Thokasilingam
Shri V.S.K. Chennubhotla
Shri S. Mahadevan
Shri K. Rangarajan
Shri K.G. Girijavallabhan
Shri P. Muthiah
Shri M.E. Rajapandian
Shri S.J. Rajan
Shri S. Kalimuthu
Shri N. Najmudeen
Shri J.R. Ramalingam
Shri M. Selvaraj

### State Officials

Shri S. Palaniswamy,
P.A. to District Collector,
Ramanathapuram
Shri M. Vedamuthu,
Block Development Officer,
Mandapam
Shri S. Sevugaperumal,
Dy. Agricultural Officer,
Mandapam
Shri M.V. Alagirisamy,
Extension Officer (Poultry),
Mandapam
Shri G. Ahmed Hussain,
Extension Officer,
(Animal Husbandry),
Mandapam

## Fishermen/Fish Farmers

*Madras Group*

Shri Gopal
Shri T. Mohan
Shri B.S. Sanjeevi
Shri M. Sarangan
Shri S. Venu

*Mandapam Group*

Shri S.M. Ahmed
Shri K.A. Jaffar
Shri S.M. Mustaffa Kamal
Shri M. Seeni Mohamed
Shri K. Mohamed Mohideen
Shri K. Ponniah
Shri S. Abdul Rasak
Shri A. Seeni

*Tuticorin Group*

Shri A. Antoniappa
Shri A. Siluvai Arokiam
Shri P. Celestine
Shri J. Guber Raj
Shri R. Joseph

# Proceedings of the workshop

## OBJECTIVES AND PLANS

The Workshop on Lab-to-Land Programmes in Coastal Aquaculture was organised by the Central Marine Fisheries Research Institute in July 1979 in two Area Sessions. The Area Session at Cochin was conducted during 23-24 July 1979 and at Mandapam Camp during 27-28 July 1979. Clear objectives set for the Workshop were

a) to make a critical review of the progress made in the implementation of the Institute's Lab-to-Land Programmes at different centres since January 1979,

b) to discuss in detail the experiences of both the scientists and the fish farmers with a view to identifying technical and physical constraints of the programmes,

c) to create an interaction among the farmers, scientists and development officers responsible for providing financial assistance under the Integrated Rural Development Programmes, and

d) to develop strategies and action plans for the successful implementation of the programmes.

The Area Session at Cochin was devoted for discussing the programmes taken up at Cochin, Quilon and Calicut and the Area Session at Mandapam Camp for discussing the programmes implemented at Madras, Mandapam and Tuticorin. The two-day programme at each Area Session included i) presentation of experience papers and discussion by the scientists on the first day, ii) discussion on the farmers' experiences and viewpoints and financial assistance among the farmers, scientists and development officers of the State Government on the forenoon of the second day, and iii) discussion among the

scientists for developing strategies and action plans at the concluding session on the afternoon of the second day. The proceedings of the forenoon session of the second day were conducted in the local language of the respective areas. Representative fishermen and fish farmers from each centre (except Calicut) were invited to participate in the Workshop.

## OPENING REMARKS BY CHAIRMAN

Dr. E. G. Silas, Director, Central Marine Fisheries Research Institute presided over the Workshop. Welcoming the participants, he said that the CMFRI is one of the few Institutes under the ICAR which initiated the Lab-to-Land programme from the very beginning of the Golden Jubilee Year, from January 1979, although the Council's programmes have commenced with effect from 1 June 1979. He elaborated on the objectives of the Workshop and invited the scientists to have frank discussions and a critical review of the Institute's Lab-to-Land programme. He pointed out that the scientists are involved for the first time in the transfer of technology to a large section of the coastal fishermen and fish farmers and the technology of mariculture itself was relatively new. We have had both successes and failures. The weak links in the technologies have to be identified and strengthened. He emphasised that the scientists must have a good understanding of the human aspects — the ideals and aspirations of the fishermen, fish farmers and their families — for implementing the programmes successfully. He expected the participating farmers to speak openly of their experiences and viewpoints which would help the scientists in reorienting the programmes.

The Chairman briefly touched upon the highlights of the Golden Jubilee programmes of the Indian Council of Agricultural Research. The Experimental Transfer of Technology is a National programme of the ICAR and the scientists of the organisation are expected to take up the challenges of transforming their laboratory and field results into positive action in the farmers' fields. He said that although certain groups have been identified or implementing the programmes, it is the collective responsibility of all the staff of the Institute to co-

operate and contribute in one way or the other to the success of the programmes. He cautioned the scientists to never lose sight of the economic aspects of the farming systems while assisting the fish farmers with the demonstrations.

## EXPERIENCE PAPERS

The scientific groups engaged in the implementation of the Lab-to-Land programmes at different centres presented experience papers dealing with the evaluation of the bench-mark surveys, socio-economic conditions, progress of the programmes and constraints. Abridged versions, highlighting the salient features and important findings, of the experience papers are given here.

### PRAWN CULTURE IN COCHIN

By S.A. Ali, V. Balakrishnan, M. Kathirvel, L. Krishnan, S. Kulasekarapandian, A. Laxminarayana P. Karunakaran Nair, M. Rajamani, P.V. Rao and A.R. Thirunavukkarasu

#### Evaluation of Bench-mark Survey

*Area and families*

A total number of 125 families belonging to the marginal farming group have been selected for the transfer of technology of prawn culture and polyculture. Of them, 122 Harijan families belong to a society called Ajanta Marananthara Sahaya Fund (AMSF) and live in the village Vallappu, near Malippuram in Vypeen Island; and one family each comes from Ezhikkara, Kedamangalam and Puthuvypu. The bench-mark survey was carried out on 100 families of AMSF and the three individual families. Valappu and Puthuvypu come under the Vypeen Development Block and Ezhikkara and Kedamangalam come under Parur Development Block, both in Ernakulam District. Information on population, households, educational institutions, medical facilities, commercial banks and other public services in the two blocks have been collected. Paddy and coconuts are the main agricultural crops in the

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area. Traditional prawn filtration is practised in perennial and seasonal fields.

*Family particulars*

In AMSF Valappu, of the 505 members belonging to the 100 families, 246 are males and 259 are females. Thirty-seven per cent of the sampled population are married. Persons above 30 years old form the maximum (35%) and those in the age-group 14-18 years form the minimum (8.32%). Among the 103 families surveyed, the average family size is 5, the maximum being 9. In Valappu, about 151 persons are students; 49.67% of them are in primary schools, 43.05% in the upper primary and high schools and the rest in colleges.

*Employment and income*

In AMSF, 52% of the families are daily-wage earners; 13% are self-employed. The three individual families from Puthuvypu, Ezhikkara and Kedamangalam are also self-employed. In AMSF, male earners form 72.51% and female earners 6.45%. Table 1 gives employment and income status of the families. The average daily income is very low (Rs. 7.60) per family in AMSF.

*Expenditure*

In AMSF the average annual expenditure of the households on different items is as given below:

| | |
|---|---|
| Food | Rs. 1613.00 |
| Fuel | Rs. 424.50 |
| Clothing | Rs. 394.80 |
| Household articles | Rs. 274.30 |
| Education | Rs. 192.70 |
| Miscellaneous | Rs. 333.80 |

*Loans and Savings*

Data on loans and savings are given in Table 2. In AMSF more than 50% of the families avail loans mainly for meeting the demands in family affairs, occupation and education. The habit of saving is very low. In AMSF, the saving range is from Rs. 250-500 in 30.77% of the families.

TABLE 1. *Employment and income status of the families selected for the transfer of prawn culture technology at Cochin.*

| | No. of persons | | | |
|---|---|---|---|---|
| | *Vala-ppu,* | *Puduv-ypu,* | *Ezhik-kara* | *Kedam-angalam* |
| *Employment* | | | | |
| Earners | 124 | 1 | 1 | 1 |
| Males | 90 | 1 | 1 | 1 |
| Females | 8 | — | — | — |
| Earning dependents | 26 | — | — | — |
| Males | 17 | — | — | — |
| Females | 9 | — | — | — |
| Non-earners | 381 | 5 | 4 | 3 |
| Non-earning dependents | 379 | 5 | 4 | 3 |
| Males | 137 | 1 | 1 | 1 |
| Females | 242 | 4 | 3 | 2 |
| Members who are non-earners | 2 | — | — | — |
| *Source of income* | | | | |
| Government source | 29 | — | — | — |
| Private source | 1 | — | — | — |
| Self employment | 13 | 1 | 1 | 1 |
| Wages | 52 | — | — | — |
| Household | 3 | — | — | — |
| Dependent | 2 | — | — | — |
| *Income* | | | | |
| Average annual income per family. Rs. | 2,735\|- | 5,060\|- | 1,800\|- | 7,040\|- |

*Assets*

Details regarding assets are given in Table 3. Of the 103 families surveyed, 85 possess land. In AMSF, of those who possess land, 62.65% have land below 10 cents each and 26.5% have land above 30 cents each. Of the 98 houses, 50 are tiled and the rest thatched.

Poultry is the predominant animal asset. However, 97.95% of the birds are of 'desi' variety. The maximum number of birds owned is 21 in one family. Two birds each are owned by 22 families. Only 7 families possess ducks.

TABLE 2. *Particulars regarding loans and annual savings of the families selected for the transfer of prawn culture technology at Cochin.*

| *Particulars* | *No. of families* | | | |
|---|---|---|---|---|
| | *Valappu* | *Puduvypu* | *Ezhikkara* | *Kedamangalam* |
| *Loans* | | | | |
| Not availed any loan | 51 | 1 | — | 1 |
| Availed loan | 49 | — | 1 | — |
| " for occupation | 3 | 1 | — | — |
| " for family affairs | 47 | — | — | 1 |
| " for education | 1 | — | — | — |
| Had loan but not outstanding | 4 | — | — | — |
| Having loan Rs. 100 and below | 5 | — | — | — |
| " Rs. 101 - 250 | 7 | — | — | — |
| " Rs. 251 - 500 | 8 | — | — | — |
| " Rs. 501 - 1000 | 6 | — | — | 1 |
| " above Rs. 1000 | 21 | 1 | — | — |
| *Annual savings* | | | | |
| Not saving | 74 | 1 | 1 | — |
| Saving | 26 | — | — | 1 |
| " Rs. 100 and below | 4 | — | — | — |
| " Rs. 101 - 250 | 7 | — | — | 1 |
| " Rs. 251 - 500 | 8 | — | — | — |
| " Rs. 501 - 1000 | 5 | — | — | — |
| " Rs. 1001 and above | 2 | — | — | — |

Among the implements, hand tools — mainly sickles — predominate. Eighty-eight families possess hand tools and 22 possess spades. Fourteen families have fishing implements such as wooden boats, cast nets, stake nets and "vattavala". Eighty-seven families have furniture and 22 families have assets such as cycle, sewing machine and electrical goods.

*Production*

Paddy and coconut are generally produced by the families; coconut is more important. Of the 37 families producing coconuts, 27% produce each below 100 numbers, 35% from 100-200 numbers, 19% from 200-300 numbers, and the rest above 300 numbers. Of the 17 families producing paddy, 14

TABLE 3. *Assets of the families selected for the transfer of prawn culture technology at Cochin.*

| | *Valappu* | | *Puduvypu* | | *Ezhikkara* | | *Kedamangalam* | |
|---|---|---|---|---|---|---|---|---|
| | *No. of families* | *No. of the item* | *No. of families* | *No. of the item* | *No. of families* | *No. of the item* | *No. of families* | *No. of the item* |
| *Land* | 83 | — | 1 | — | — | — | 1 | — |
| Below 10 cents | 52 | — | — | — | — | — | — | — |
| 11 - 20 cents | 6 | — | — | — | — | — | — | — |
| 21 - 30 cents | 3 | — | — | — | — | — | — | — |
| Above 30 cents | 22 | — | 1 | — | — | — | 1 | — |
| *House* | 95 | 95 | 1 | 1 | 1 | 1 | 1 | 1 |
| Thatched | 47 | 47 | — | — | 1 | 1 | — | — |
| Tiled | 48 | 48 | 1 | 1 | — | — | 1 | 1 |
| *Animal assets* | | | | | | | | |
| Cow | 4 | — | 1 | — | — | — | 1 | — |
| Calf | 1 | — | — | — | — | — | 1 | — |
| Poultry | 74 | 244 | 1 | 8 | 1 | 15 | 1 | 10 |
| Desi variety | 72 | 239 | 1 | 8 | 1 | 15 | 1 | 10 |
| Leghorn variety | 3 | 4 | — | — | — | — | — | — |
| Duck | 7 | 42 | — | — | — | — | — | — |
| Goat | 2 | 3 | — | — | — | — | — | — |
| Sheep | 1 | 1 | — | — | — | — | — | — |
| *Implements* | | | | | | | | |
| Hand tools | 86 | 204 | 1 | 7 | 1 | 4 | — | — |
| Agricultural implements | 21 | 23 | — | — | 1 | 1 | — | — |
| Fishing implements | 12 | 12 | 1 | 3 | — | — | 1 | 1 |
| *Household articles* | | | | | | | | |
| Electrical goods | 16 | — | — | — | — | — | — | — |
| Cycle | 1 | — | — | — | — | — | 1 | — |
| Sewing machine | 3 | — | 1 | — | — | — | — | — |
| Furniture | 85 | — | 1 | — | — | — | 1 | — |
| Almirah and box | 69 | — | 1 | — | 1 | — | 1 | — |
| Miscellaneous | 16 | — | — | — | 1 | — | — | — |

produce more than 10 'paras'. Vegetables and banana are grown by 5 and 2 families respectively. Among the animal products, egg is produced by 45 families, 37 of them producing below 250 eggs annually. Fish and prawn production

is undertaken by 9 and 7 families respectively. Milk is produced only in 2 families.

*Nutrition and diseases*

Rice and tapioca form the staple food. A few take wheat also. Almost all families eat non-vegetarian diet. "Flu" is the common disease noticed. Twenty families each have been affected by rheumatism and asthma.

*General considerations*

The above evaluation of the base-line survey has shown that majority of the families have only the basic needs as assets. The AMSF has about 8.5 acres of waterlogged land as the common property of all its members which they want to utilise for prawn, paddy and coconut cultivation. Among the other three families, two possess some water area and the other works in a leased field. The families mostly belong to very low marginal farmers group and some are landless labour. The people are interested in appropriate technologies to improve their lot, but expect subsidies and easy loans. The Lab-to-Land programme on prawn culture has aroused general interest in the whole area. The present effort of the CMFRI in introducing intensive prawn culture practices in the area would form the base for expansion of prawn culture in the Cochin region by private interests.

## Progress of Prawn Culture

*Selection of families*

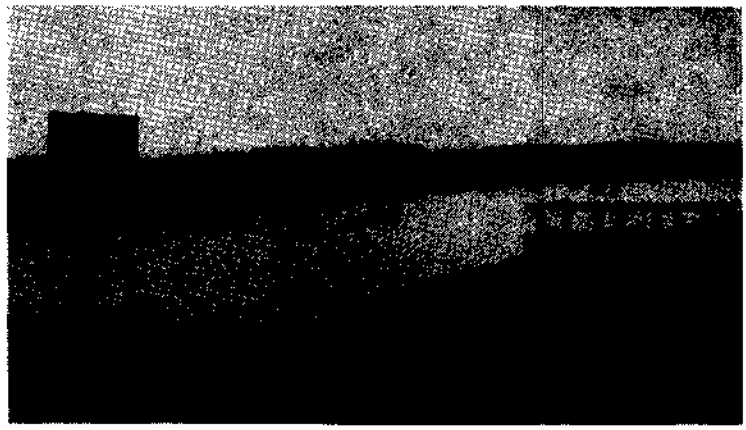
The following families were selected under the Lab-to-Land programme keeping the guidelines for the selection of families in view:

1. Ajantha Marananthara Sahaya Fund (AMSF) Valappu, Vypeen (122 Harijan families)
2. Shri K. K. Karthikeyan, Puthuvypu, Vypeen
3. Shri A. Uthaman, Ezhikara, N. Parur
4. Shri P. A. Sukumaran, Kedamangalam, N. Parur.

Bench-mark survey of the families was completed.

*Training*

The individuals at serial numbers 2 to 4 above were former trainees of the Krishi Vigyan Kendra (KVK) of the Institute and hence initial training was not necessary. One of the members of the AMSF had also received training at the KVK. In view of the large area of the AMSF to be brought under prawn culture, four male and five female members of the AMSF were later trained in prawn culture at the Krishi Vigyan Kendra. Wherever necessary, on-the-spot refresher training was given by the scientists to the farmers.



*Prawn culture farm of Valappu, Cochin.*

*Improvement of farms*

A preliminary survey of the farm sites belonging to the farmers was undertaken. Plans were formulated for development of the farms. The AMSF society had a partially developed pond of 0.36 ha area. The society was advised to convert an adjoining 0.48 ha plot into a prawn field. Required supervision and assistance were provided and the society developed a total area of 0.84 ha for prawn culture. The ponds were so constructed as to facilitate 'pokkali' paddy cultivation during the monsoon.

The farm site of Shri Karthikeyan was a shallow area and rectangular ponds of 0.19 ha and 0.05 ha making a total area

of 0.24 ha were made by deepening, construction of bunds and providing sluice gates. These were made into a perennial prawn culture farm. Shri Uthaman's leased field measuring 0.44 ha was a fairly well-developed seasonal field and only a little attention was necessary. Shri Sukumaran's was a perennial field of 0.21 ha in extent and only minor improvements were needed. The farmers were provided with technical assistance and critical inputs. The water quality, productivity and soil conditions were tested in all the farms.

*Prawn culture farm of Shri Karthikeyan, Puthuvypu.*

*Stocking*

Eradication of undesirable species was done by repeated netting before stocking the ponds. The farmers themselves collected *Penaeus indicus* seed and this was supplemented by the laboratory-reared seed and those collected from the wild by the scientists. The numbers of prawn seed stocked in the ponds were 56,665 (0.84 ha), 18,800 (0.24 ha), 30,171 (0.44 ha). and 23,569 (0.21 ha). The size range of the seed was 20-40 mm.

*Monitoring*

Regular monitoring of the farms was done by the scientists. Factors such as growth of prawns, tidal flush, hydrographic conditions and plankton were recorded. In the farm of Shri Karthikeyan the growth of prawns was not as much as in other fields; during April-May, water conditions were unfavourable for some days. Further monitoring showed progressive reduction in the modes, entry of large numbers of *Metapenaeus dobsoni,* mullets and milk-fish into the field. These clearly indicated that the farmer had interfered with the system on his own. In the farm of AMSF, dinoflagellates were observed to affect the prawns by middle of May.

*Harvest*

Immediate harvest was advised in the Valappu field on observing the dinoflagellate bloom. The harvest was done on May 18, only 78 days from stocking, which yielded 315.8 kg of *Penaeus indicus* and 3.1 kg of *P. monodon.* The survival

*Part of prawn Harvest from the farm of AMSF, Valappu.*

rate was 74.1%. The sale-proceeds from the harvest amounted to Rs. 4,680.75. In the field of Shri Uthaman, the harvest was done on May 15 which gave an yield of 98.2 kg of *P. indicus*, 1.1 kg of *P. monodon* and 7.3 kg of *M. dobsoni* totally valued at Rs. 2,033.86.

In the field of Shri Sukumaran an unfortunate incidence of unlawful fishing and destruction of the sluice took place on April 17/18 and hence the farmer could not take the harvest. In the field of Shri Karthikeyan, the results were impaired, presumably by the farmer's own independent action.

## Impact of Intensive Prawn Culture on the Traditional Practices

### *Traditional system*

The age-old traditional system of prawn culture is extensively practised in the Central Kerala and it has been estimated that about 4500 ha of water area come under this system. A local variety of paddy called "pokkali" is cultivated in these fields during the monsoon period from June-September. Subsequently the field is used for the growth of prawns and fishes. During high tide the brackish water is allowed to enter the fields. Fishes and prawns are carried into the fields by the tide. During low tide a closely tied bamboo screen is kept near the sluice gate so that the juvenile prawns and fishes are retained in the field. This process continues for a few days. The retained prawns and fishes are allowed to grow in the field. Harvest usually commences in December and is done around full moon and new moon phases. During the low tide, a long conical bag is fixed in the sluice gate and the wooden planks are removed. The prawns and fishes carried in the outflow of water are caught in the net. Since the system depends on natural stocking, an assemblage of prawns and fishes, including predatory fishes, grow in the fields. As a result the yield and value are low.

### *Intensive prawn culture*

The intensive culture of selected species of prawns which is being extended to the farmers through the demonstration

programmes and Lab-to-Land programmes of the Central Marine Fisheries Research Institute has several advantages over the traditional system. Under this system, the fields are prepared, predators and other organisms are eradicated and pre-determined quantities of seed of fast growing and high priced species of prawns, particularly *Penaeus indicus* and *P. monodon* are stocked. The prawns grow fast and are ready for harvest in about 3 months. Thus two harvests can be taken in the non-paddy season. The production is high and more so in terms of value.

*Transformation*

The traditional prawn farmers have realised these advantages and there is a slow transformation to intensive culture practices. There is a distinct growth of seed trade to meet the seed requirements for the farms. The CMFRI, having developed the techniques of intensive prawn culture, is aiding the process of transformation through research, training and extension programmes, of which the Lab-to-Land programme is the most significant.

## Constraints Faced by Scientists and Farmers

*Constraints encountered by the scientists*

1. As the scientists involved in this programme are engaged in the Institute's regular research activities, full justification in terms of full-time participation could not be given by them for this purpose.

2. Considerable delay occurred in the transportation of seeds to the stocking site and subsequent monitoring of the fields due to inadequate transport facilities.

3. As the availability of the prawn seeds of desirable species from the backwaters is widely fluctuating, a steady supply of the same could not be procured in time, resulting in the prolonged period of stocking as well as in the reduction of the rearing period.

4. Since the farmers do not follow the instructions given by the scientists in respect of the management of the culture

pond, the monitoring of the stocked prawns could not be carried out in certain fields.

*Constraints encountered by farmers*

1. Most of the farmers belong to the low income group and as such they do not have enough finance to take up prawn culture by themselves. Financial assistance in the form of loans from the banks could not be availed of by them as they are not in a position to produce the necessary guarantee.

2. The farmers want a quick return of income so that they can meet their day-to-day expenses. This is not possible in the present programme because the income comes only after the harvest of prawns, i.e. 3 months later.

3. The required quantity of prawn seeds are not available from the backwaters at appropriate time and this has forced the farmers to spend more time and energy till they procure the same.

4. Though the farmers have been given the essential training in intensive prawn culture methods, they have not become so skilled as to do the same effectively.

*General*

1. The collection of seeds from the backwaters poses a problem because the local fishermen are raising objections for catching the prawns at their early juvenile stage, for fear that it will ultimately affect their backwater prawn catch.

2. The local custom is that the lease on the seasonal prawn culture fields expires by the middle of April and the lessee has to fish out all the stock within that period. Beyond that date, the fish/prawn will be fished out by the local people. This hampers intensive prawn culture which extends up to the end of May. In one of the fields under this programme, fishing was done by the public after 15th April, which has resulted in financial loss to the farmer. To prevent such unpleasant incidences, suitable legal protection/measures have to be implemented.

3. At present there is no practice of giving a culture field on a long-term lease. If it is given, the fishing by public can be avoided.

4. Co-operation in implementing this venture successfully was lacking among some of the farmers.

## PRAWN CULTURE IN QUILON

By P. V. Ramachandran Nair, K. J. Mathew,
P. Parameswaran Pillai, D. Vincent
and K. Rengarajan.

The Lab-to-Land programme in Quilon District for the culture of prawns is at present implemented in two villages, namely Thekkumbhagom and Perunad of the Karunagappally Taluk. Through these programmes prawn culture has been extended to two major lakes south of Cochin namely Kayamkulam Lake and Ashtamudi Lake. The Thekkumbhagom village lies on the banks of the estuary formed by the lower extremities of the Ashtamudi Lake. Similarly the bar mouth and a good water area of the Kayamkulam Lake lie in the Perunad Village. Preliminary investigations have revealed that there is great potential for introducing aquaculture, especially prawn culture, over a vast area adjoining these lakes. It is worthwhile to note that prawn culture is not practised in any form in these areas. Hence anything done in the field of aquaculture will be a pioneering work for the area. Both the villages have the SFDA facility under which small and marginal farmers can avail loans for developing their farms.

### EVALUATION OF BENCH-MARK SURVEY

The following farming families were selected for the transfer of prawn culture technology:

1. Shri K. P. Sukumaran, Perunad
2. Shri V. Soman, Thekkumbhagom
3. Shri Tripuran Pillai, Thekkumbhagom

Shri Sukumaran, 63 years old, belongs to the Ezhava community. He has a wife and two dependent children. He

owns 1.5 acres of land which consists of a fish farm and coconut grove. The fish farm was not productive, yielding only *Tilapia*. His only other assets are a two-room tiled house, a Chinese dip-net and a small canoe. His animal asset is a cow. There is no electricity in his house and he draws water from a distant tap. The family's annual income is about Rs. 2,750|-.

Shri Soman, 27 years old, is a bachelor. He lives with his two sisters and his elder brother who is married. The whole family is engaged in coir making. They have a three-room thatched house and 48 cents of land with a few coconut trees. There is no electricity in the house. Tap water is available. The family's annual income is about Rs. 2,100|-.

Shri Tripuran Pillai, 45 years old, has a wife and three dependent children. He works as a night watchman in a dairy farm. He has 2.42 acres of land and a four-room thatched house. He too has a few coconut trees. There is no electricity in the house. The family uses well water. The family's annual income through wages and coconut cultivation is about Rs. 2,500|-.

## Progress in prawn culture

The lab-to-land programme on prawn culture at Thekkumbhagom village is implemented in the plots owned by Shri Tripuran Pillai (0.1 ha) and Soman (0.08 ha). Technical and critical inputs were made available for the development of the ponds, eradication of unwanted organisms and fixing up of sluice gates and culture activities were started during April-May, 1979 by introducing seed of *Penaeus indicus*. The environmental parameters such as temperature, salinity, dissolved oxygen and PH were regularly monitored. Relatively good growth rate was observed in the pond of Shri Pillai. During June, due to the monsoon rains the salinity of the ponds dropped considerably and this had an adverse effect on the growth of prawns. Advice was given on the feeding of the prawns which has been adhered to.

In Shri Soman's pond stocking was conducted during the second week of May and subsequent monitoring showed satis-

factory growth of prawns. On the 15th June, mass mortality of the prawns occurred in his pond, and this was due either to the sudden lowering of salinity or the decay of the grass roots used in the construction of the bunds. The farmer also suspected that the death of prawns could have been due to poisoning.

In the pond (0.8 ha) owned by Shri Sukumaran at Perunad village, stocking was done during April. But the culture operations were temporarily hampered by the monsoon rains during June. However, precautionary measures have been taken by way of improving the bunds and re-setting sluice gates. Relatively good growth rate was observed in the pond during the subsequent periods.

## OPERATIONAL DIFFICULTIES AND CONSTRAINTS

1 .One of the major constraints felt by the scientists was the problem of finance for the farmer. Details of financial assistance available under SFDA have been provided to the farmers. Small farmers possessing only the bare minimum of land have difficulties in obtaining the necessary loans.

2. Another difficulty felt by the scientists is the inability to conduct regular monitoring of the water quality and other culture operations in Quilon District due mainly to the distance from the Institute.

3. Many of the technical advices and instructions given to the farmers with regard to the maintenance of the farms and checking up the growth of prawns have sometimes been not followed. It is evident from the data collected on the growth rate that, apart from the occurrence of small size groups due to stunted growth, occasional fishing is also conducted by the farmers without informing the scientists concerned.

4. All the above facts make it difficult to collect reliable research feed-back information which would help in understanding the problems and finding proper solutions.

# MUSSEL CULTURE IN CALICUT

By M.M. Kunju, P.S. Kuriakose and C.V. Mathew

## Evaluation of bench-mark survey

Elathur, a coastal village which is 8 km from Calicut has about 1200 families, of which 320 are engaged in mussel fishing and marketing. Among them about 220 families are engaged in mussel fishing and the rest in marketing. Ten families whose only source of income is through mussel fishing were selected from the village for the transfer of technology of mussel culture.

The bench-mark survey on the ten families was completed in February 1979. Among the 10 families, there are 13 adult males, 14 adult females and 30 children. The head of the family is the only earning member in each family and others are non-earning dependents. All are literate. They have their own houses, 4 of them thatched and the rest with tiled roof. Eight families have small pieces of land, the extent varying from 4.75 - 20 cents. The land is the house-site itself. Eight families have poultry, the number of birds ranging from 1 to 6 numbers. Seven have canoes, 7 m long costing about Rs. 2000 each, used for reaching the mussel-bearing rocks. All have cast nets which they operate when they do not go for mussel picking.

The annual income ranges from Rs. 900 to Rs. 1800 per family, the average being Rs. 1299. About 75% of the income goes for expenditure on food and the rest is spent towards maintenance of boat, education, clothing etc.

Based on the revised proforma, the bench-mark survey has recently been done on all the families engaged in mussel fishing and the data are being evaluated.

## Progress of lab-to-land programme

Ten families of mussel pickers in Elathur near Calicut were selected for the transfer of mussel culture technology. The bench-mark survey was completed. The objectives of the programme were explained to the families at the first farmers' meeting. Subsequently orientation and training in the methods

of open-sea raft culture of mussels were given to the members. Being men engaged in picking of mussels as their occupation, they were able to understand and practise the different techniques of mussel culture easily. Since the season for mussel culture would start only by October, after the south-west monsoon, the implementation was staggered after training.

There is a general demand from the mussel pickers of the village to include more numbers of families for the transfer of technology. However, Elathur where the programme has been started is not covered under IRDP schemes and the families would not get any subsidy. Tellicherry is also an important centre for mussel fishing and it comes under the IRDP Block. Hence there is a proposal to take up the Lab-to-Land programme at Tellicherry. Enquiries with fishermen and consultations with the revenue officials are being held for finalising the expansion of Lab-to-Land programme on mussel culture.

## MUSSEL AND PRAWN CULTURE IN MADRAS

By T. Tholasilingam, K. Rangarajan, K.G. Girijavallabhan and A.C. Sekar

### EVALUATION OF BENCH-MARK SURVEY

### 1. Karikattukuppam

Karikattukuppam is a compact, small, fishermen hamlet in the Muttukadu village about 30 km south of Madras on the east coast road to Mahabalipuram. The total population of the hamlet is 594 including children. There are 141 houses, out of which 119 have been constructed by the Government at a cost of Rs. 3000 - 4000 each. Twenty fishermen have taken loans for improving and enlarging the houses under the Rural Housing Scheme. Only two fishermen have their own houses in the hamlet. They use kerosene lamps for lighting, except one who enjoys electricity supply.

*Household belongings*

Utensils for cooking and a few boxes were common in all the houses. Nearly 95% of the fishermen do not own any

furniture. About 10% of the fishermen have transistor radios. Nearly 75% of the families maintain a few fowls, about 4-5 birds, for their domestic consumption.

*Family size and education*

The number of persons in a family on an average is 5 which includes one adult male, two adult females and two children. The maximum number of persons observed in a family was eleven. Upto the primary level most of the children attend the school in the hamlet itself. Generally boys discontinue their studies at the age of 13-14 and help their parents in their occupation.

*Occupational status*

Fifty-six percent of the male population (males 291) are in the age group 13-55 and are engaged in active fishing. On an average they make 25 fishing trips a month. During the monsoon season they fish in the backwaters. The fisherwomen take no part in mending the nets. Six families have no earning male member and they eke out their livelihood by selling eatables in the Kuppam.

*Fishing implements*

There are 151 catamarans in the village. Most of the fiishermen have one catamaran each measuring 13-15 ft costing about Rs. 2000. Some have, in addition to the long one, a small catamaran measuring 9-12 ft costing about Rs. 300-500. There are 134 gill nets. Gill nets and "Thuri valai" are the valuable possession of fishermen. There are 78 "Konda valai" used to fish in the backwaters. Thirty-eight fishermen possess hooks and lines. About 9 fishermen have no catamaran. They share the catamaran of other fishermen and pay 10% of the catch value as hire charges. The cost of a gill net weighing about 5 kg is Rs. 600. A "Thuri valai" costs about Rs. 250-300. There are only 5 shore seine units in the village under joint ownership, each unit costing Rs. 8000 (boat and net inclusive).

*Nutrition, health and hygiene*

The general health of the fishermen is good. Respiratory infection and scabies are common in the fishing hamlet. Night blindness is common among children and few adults. This condition appears very strange since fish forms part of the diet of all the fishermen. Anaemia is prevalent among women in the village. A doctor from Madras city visits the village once a week and the fishermen pay 50 paise for consultation as well as medicine. The common items in their food are rice and fish. Cheap vegetables like brinjals, tomato and drumstick are occasionally used.

*Icome and indebtedness*

The average monthly income of a fisherman family ranges from Rs. 150 to Rs. 450. The owners of shore seine are generally better off with high income. Eight fishermen families possess dry land varying from 1-2.5 acres where casuarina is grown, and paddy lands varying from 25 cents to 4 acres. They form the higher income group, the income going up to Rs. 700 per month.

No evidence of saving was noticed among the fishermen. Nearly 82% of the fishermen are indebted to a couple of middlemen to the tune of Rs. 300 to 1200. The middleman, often financed by prawn exporters, advances Rs. 300 - 350 per gill net to the fishermen before the prawn season and thereby purchases the right to buy prawns. In consideration of this, a sum of Rs. 100 per net per year is written off from the amount advanced as loan.

*Marketing and transport*

The fishes landed at Karikattukuppam are collected by small traders and disposed off in the fish markets at Saidapet, Chintadripet and Tambaram. The right to purchase fish at Karikattukuppam is auctioned every year and the auction value for 1979 is Rs. 3,700. The merchants who are allowed to buy fish at the shore has to pay to the successful bidder 50 paise per basket of fish, 10 paise for every big seer fish and 2% of the value of prawns.

## 2. Muttukadu

Muttukadu lies opposite Karikattukuppam fishing hamlet, the coastal road separating the two hamlets. The hamlet has 145 families, of which 65 families are Harijans. The population of the Harijan colony is 330. The houses, each of about 40 sq. m area are constructed with mud and coconut leaves overlaid with hay. The residents draw their water requirements from 2 wells and 5 hand pumps. Only 3 houses are electrified in the hamlet. There are 6 street lights in the colony. Education is provided upto 5th Standard. Fifteen boys and 9 girls in the colony have studied upto S.S.L.C. A primary health centre, a post office and a church are located in the hamlet. A few people from the colony go to the Meston Rural Activity Field to read Tamil newspapers.

*Household belongings*

Apart from the mud pots and kitchen utensils, most of the families have common items of furniture like cot, box, small almirahs etc. the total value amounting to Rs. 1000. Number of families have transistors and bicycles.

*Occupational status*

Nearly 90% of the residents in the hamlet are marginal farmers engaged in cultivating paddy in their own lands or on lease hold lands. Nearly 50% work as farm labourers, men earning Rs. 5 and two meals per day and the women Rs. 2 and one meal a day. During the non-agricultural season many of them are engaged in subsistence fishing in the backwaters behind their hamlet. Nearly 12% of the population is engaged in catching crabs using 25-30 circular nets, called "Nandukatcha", from a small catamaran measuring 9-10 ft. Each earns daily Rs. 2 from this occupation. About 3% of the population regularly go out for clam fishing in the backwaters. Women are engaged in hand picking of prawns from the backwaters.

Among the Harijans nearly 50% are engaged in casuarina nursery. Each family has nursery beds varying from 10-40 in number. A family earns about Rs. 500 in a season.

*Farm implements, livestock, poultry etc.*

Farm implements like spade, crowbar and knife are common in most of the houses. Four farmers possess bullock carts drawn by two bullocks, each unit costing Rs. 4,000. The goat population in the hamlet is quite high; 20 farmers keep about 122 goats and the children take them out for grazing. Some farmers have as many as 15 goats each. There are about 100 cows owned by 14 farmers. The cows are country-bred and costs about Rs. 200-300 each. The milk yield is very poor, being 1.5 litres per day per cow. A farmer earns Rs. 3 per day by selling the milk locally. Most of the farmers maintain about 4-10 country poultry in their house. There are three diesel pump sets of 5 h.p. in the hamlet, one being shared by 4 persons. The pump sets are hired to other farmers at Rs. 5 per hour.

*Farming*

Most of them are marginal farmers holding 0.1 to 1.5 acres of wet lands on lease. Few have their own lands. The production per acre is poor being 25 bags of paddy. Total profit per acre per year is about Rs. 2000 if the land is a lease hold and Rs. 3000 if free hold. Many farmers have dry lands ranging from 1 to 2 acres in which casuarina is grown. One acre of casuarina plantation after 5 years gives an income of Rs. 5000, the total expenses for cultivation being Rs. 1000.

*Income and indebtedness*

The average monthly income of a farmer's family varies from Rs. 100-350. Majority of farmers are free from indebtedness. Few have taken loans ranging from Rs. 3000-5000 from banks for the purchase of pump sets or building houses. Land owners occasionally give small loans ranging from Rs. 50-200 to the farmer to meet urgent family expenses. No interest is charged on this loan which is returned at the end of the year.

*Remarks*

Although the residents of this Harijan colony are predominantly agriculturists earning their major income from

lands, many of them, during non-agricultural season, are engaged in fishing crabs, prawns and clams from the backwater. A happy blend of agricultural farming and fishing is noticed here. Some farmers possess small catamarans also to fish in backwaters. Our contacts and discussions with the people in the colony have revealed that they are intensely interested in fish/prawn farming. The areas adjoining the backwaters behind their hamlet is well suited for locating ponds. Nearness of the area to the backwater is an advantage. The residents have come forward to form a Co-operative Society for fish farming and efforts are being made to channelise their enthusiasm.

## Progress in mussel and prawn culture

The fishermen families of Karikattukuppam and the Harijan families of Muttukadu have been selected for the transfer of technology of mussel culture and prawn culture.

### *Mussel culture*

The sea opposite Karikattukuppam hamlet was surveyed and suitable area was located for anchoring the rafts. The first raft was anchored at a depth of 4 fathoms in April 1979. The second raft was fabricated at Karikattukuppam by the local fishrmen and anchored by them in the sea in the first week of May. Parent stock of mussels was collected from Ennore and suspended from the raft for spawning. Tiles were suspended to collect spat. Sparse spatfall was noticed during May on ropes and tiles.

Ten ropes were seeded with juvenile mussels of the size range 15-20 mm in April/May and suspended from the raft for further growth. The work on mussel culture was disrupted by the cyclonic storm during the second week of May and both the rafts were washed ashore. The work was recommenced by the end of May with one raft. Seeded ropes have again been suspended from the raft in June and further work is in progress.

*Prawn culture*

A derelict tidal pool about 2500 sq. m in area adjacent to the hamlet has been cleaned and deepened with the voluntary help of the fishermen and stocked with mixed species of prawns after removing the predators. In April, 2000 juveniles of *P. indicus* and 500 *P. monodon* in the size range of 15-20 mm were stocked in the pool. During the unusual cyclonic storm which passed very near Madras on 10th May, 1979, sea water splashed into the pool bringing in plenty of post-larvae of *P. indicus, P. monodon, M. dobsoni* and *M. monoceros*. The total number of prawns in the pool is estimated to be about 10,000.

The growth rate of the prawns in the pool is being monitored. Since the growth was retarded supplementary feeding with backwater clams has been commenced from middle of July. The stock will be harvested by the end of September.

The Harijan families at Muttukadu village have come forward to take up prawn culture in the backwaters behind their colony. The proposed area which lies between the Buckingham Canal and the backwater has been surveyed and found suitable for prawn culture. The Collector of Chinglepet who has been approached for the allotment of this 'peramboke' area to the residents of the colony has suggested the formation of a registered society for aquaculture. Transfer of prawn culture technology to the Harijan families will be taken up as soon as they form a Society and get the land.

*Introduction of low-cost technology*

The windmill pump designed and fabricated by A.M.M. Murugappa Chettiar Research Centre, Taramani, has been installed by the side of the pool to pump in clear sea water drawn from a well sunk at the edge of the sea. The windmill pumps in about 50 litres of sea water per minute. This is the first time that a windmill pump has been introduced for prawn culture.

In an effort to improve the quality of dried fish produced by the fishermen, a cheap (costing less than Rs. 50) solar

drier was introduced in Karikattukuppam. Fish that takes two or three days to dry in the open sun can be dried in the drier in 4 or 5 hours. The quality of the product is also good and is free from sand and other contaminants.

## CONSTRAINTS FACED BY SCIENTISTS AND FARMERS

*Constraints of fish farmers*

1. The fishermen are not very enthusiastic to undertake mussel culture. Mussel culture by raft method requires time for collecting spat from natural beds, seeding the ropes and maintenance of the rafts. Fishermen have very little spare time at their disposal.

2. Mussels are low priced and there is only limited demand in the local market. In order to get over their hesitation to take up mussel culture, a few fishermen were taken to Calicut to see large scale mussel culture operations which impressed them. After their return, a change in their attitude has been noticed. It is hoped that in course of time the fishermen will show greater interest in mussel culture.

3. Unlike agriculturists the mental attitude of fishermen is basically different. They are accustomed to immediate disposal of the catch and realisation of money. The idea of waiting for 3-4 months for the harvest is very strange to them.

*Constraints of scientists*

1. Non-availability of sufficient quantity of mussel seed at the proper time for seeding the ropes is a handicap. Extensive mussel beds are not found along the east coast. Hatchery production of seed is the only solution.

2. The sea along the east coast is never calm except for brief spells. After the north-east monsoon the sea becomes fairly calm only in March/April. When the south-west monsoon sets in along the west coast, strong westerly winds are encountered in the east coast. Improvements in raft designs suitable for the sea conditions are necessary.

3. Suitable areas are not available to demonstrate prawn culture to the fishermen. The tidal pool at Karikattukuppam

where the scientists have taken up prawn culture is not an ideal place. When the fishermen and Harijans get the land and water area for prawn culture the programme could be taken up more intensively.

## SEAWEED CULTURE IN MANDAPAM

### PRELIMINARY EVALUATION OF BENCH-MARK SURVEY DATA

By S. Kalimuthu and M. Najmuddin

*Village survey on Vedalai*

Two fishermen from Marakayarpatnam, five from Vedalai and one from Seeniappa Darga were selected for the transfer of technology of seaweed culture. Vedalai has in all 275 households. Out of these 116 families depend mainly on fishing in and around Vedalai. The fishermen, mainly the divers, go to Tuticorin in the south and Cuddalore in the north for chank fishing. This is also an important centre for seaweed landings. Seaweeds of economic importance, namely *Sargassum, Turbinaria, Gelidiella acerosa* and *Gracilaria edulis* are landed here. Apart from these fishery activities, coral stones are collected in huge quantities from the dead coral reefs around the nearby islands of Gulf of Mannar. The local fishermen own only about 60 small country boats. But during favourable seasons for fishing, seaweed collection and coral stone collection many boats from distant places like Tuticorin, Kilakarai etc. come here.

The total population of Vedalai is 1,555. The number of children below 14 years is 657. There is a middle school with classes up to 8th standard. Seventy-eight people have studied upto 10th standard and 59 have studied upto 5th standard and nobody is a graduate. The illiterates constitute about 31%. Nearly 105 acres of land is used for coconut plantation by the local population. Only 20% of houses are electrified and firewood is the fuel used for cooking.

From sample survey conducted among 10 fishermen families, it is found that average annual income per family is Rs. 3984 and the range of income is from Rs. 2620 to Rs.

6200. Only 20% of the fishermen are indebted, the amounts varying from Rs. 250 to Rs. 1200, mainly to the Fisheries Co-operative Society.

The cattle wealth at Vedalai is small compared to the needs of the village. The village depends upon distant places like Ramnad and Uchipuli for the supply of milk, cereals, pulses, oils and all other essential items. The area is not industrially developed and the people depend mainly on fishing. Women mend the fishing nets during the leisure hours and supplement their income.

*Village survey on Marakayarpatnam*

Marakayarpatnam has 81 families and out of them 41 depend upon fishing. There is not even a single boat operated from this village. All fishermen are employed in fishing boats at Mandapam and they also move to distant places like Tiruchendur, Ervadi and Jagathapatnam for fishing. The total population is 518. The number of children below 14 years is 211. There is one primary school with classes up to 5th standard. Seventy-four persons have studied upto 5th standard and 21 persons upto 10th standard. Five persons have graduated and one is a post-graduate. A total land of 22.5 acres with coconut plantation and *Acacia* trees are owned by the local population. Only 10% of the houses are electrified.

A sample survey among ten fishermen families indicate that they are not indebted and the average annual income per family is Rs. 2,362 and the range of income is from Rs. 1,200 to Rs. 4,040. Marakayarpatnam has the advantage of being very near to Mandapam Camp where the hospital, railway station, high school, and other facilities are available. Similar to Vedalai, Marakayarpatnam also depends on distant places for the supply of all essential items.

Marakayarpatnam has only muslim population except 3 families. Vedalai has mixed population of Hindus and Muslims. No cultivation of cereals or pulses is undertaken in both the villages due to the sandy nature of soil and poor rainfall. Most of the fishermen are labourers without land or fishing craft.

The data obtained by the bench-mark survey of both the villages are useful for preparing a blueprint for the development of each family selected under the Lab-to-Land programme with an emphasis on improvement in the employment potential and living conditions in the village.

## PROGRESS OF SEAWEED CULTURE

By V. S. K. Chennubhotla

*Selection of families*

A total number of 8 fishermen from the coastal villages around Mandapam were selected for the transfer of technology of seaweed culture under the Lab-to-Land programme. Two fishermen are from Marakayarpatnam, five are from Vedalai and one is from Seeniappa Darga. The bench-mark survey on the villages and selected families was completed.

*Training*

Initial orientation to the programme was given to the fishermen on February 2, 1979. Subsequently several training sessions were conducted in the Institute's seaweed culture farm to teach them the techniques of collection, seeding, maintenance, harvest and cottage-level preparation of agar-agar.

*Farming*

The farmers were assisted by providing the required simple inputs such as poles and coir nets to prepare the farm. Seed material was collected by them and the fragments were introduced into the twists of the coir ropes. The seeding work was completed at the different villages during February-March 1979. A total number of 204 coir nets, of which 54 were at Marakayarpatnam, 125 at Vedalai and 25 at Seeniappa Darga were introduced.

*Harvest*

Harvest was done at all the centres in May at the end of about 2 months. The yield was 560 kg of wet seaweed from 54 nets at Marakayarpatnam, 800 kg from 31 nets at Vedalai

and 50 kg from 8 nets at Seeniappa Darga. The remaining frames were not productive. The yield was not upto the expectations because of (a) grazing of the cultured seaweed by fishes and (b) wind and wave action during May-June which broke the seaweed from the ropes.

*Post-harvest techniques*

The harvested seaweeds were washed and sundried The dried product was approximately one-tenth of the wet weight. Agar-agar was extracted by the cottage-industry method. The crude product needed further refining.

*Extension*

At the time of the first harvest, a 'Krishi Mela' was conducted to demonstrate to the public, fishermen, industrialists, bankers and others the feasibility of seaweed culture. The culinary uses of seaweeds, apart from its use in the preparation of agar-agar, were demonstrated to the participants at the fair.

## Impact of seaweed culture on the socio-economics of farmers

By J. R. Ramalingam and M. Selvaraj

Since we are in the initial stage of the Lab-to-Land programme when the farmers have taken only one harvest on a low scale, it is too early to judge the impact of seaweed culture on the socio-economic conditions of the farmers. But certain projections could be made of the possible impact. The bench-mark survey has shown that the average monthly income of a fisherman family at Marakayarpatnam is Rs. 197 and at Vedalai Rs. 332.

Seaweed culture can be done at the domestic-level where the adult members and the grown-up children may be engaged. This is a spare-time avocation and does not need full-time attention. Each coir net of 5 m x 2 m size gives an average yield of 30 kg of wet seaweed in about 60 days time. One tonne of wet seaweed (*Gracilaria edulis*) yields 20 kg of agar-agar which sells at present at Rs. 100 per kg. But one tonne

of wet seaweed fetches, at current prices, Rs. 100 only. The big difference in the price of wet seaweed and its final product goes to the middleman, merchant and industrialist. By producing seaweed adopting simple culture methods and converting it to agar-agar, the fishermen could be assured of a steady additional income.

## CONSTRAINTS FACED BY THE SEAWEED FARMERS AND SCIENTISTS

By P. S. B. R. James

*Constraints of farmers*

1. Basically the fishermen are not enthusiastic to undertake seaweed culture since they are engaged in other activities like fishing, chank diving, collection of naturally occurring seaweeds. By all these avocations, they feel that they are earning sufficiently and they are indifferent to new technologies. Motivation is totally lacking.

2. Fishermen want day-to-day returns for their effort and do not want to wait for 2 months for the harvest.

3. Even those who have come forward exhibit lot of inconsistency in their attitude to culture work.

*Constraints of scientists*

1. Fishermen have to be constantly persuaded; otherwise they do not themselves turn up for work willingly. So also constant supervision is required on the fishermen at farm work.

2. There is lack of co-operation from other fishermen who feel that the culture sites are a hindrance for their normal activities of anchoring boats and operation of various types of nets.

3. Fishermen do not keep sincere watch and ward of materials.

4. Since the fishermen population of the selected villages are mostly muslims, there is no participation of women

and children in the culture programme when men are occupied in fishing activities.

*Environmental constraints*

1. Seed material is not available at times when all other factors are suitable. Compared to other seaweeds like *Sargassum* and *Turbinaria, Gracilaria edulis* is less abundant.

2. Grazing by fishes, which is generally said to be a major cause for loss of production, needs a thorough study.

3. Epiphytic growth of a number of species of algae on the seaweed curbs the growth of *G. edulis*. Periodic cleaning of such algae is therefore necessitated.

4. Strong wave action and sedimentation in coastal areas appears to be unfavourable for culture of seaweeds.

5. Presence of crabs in large numbers also seems to cause damage to the growing tips of the seaweed since they can easily clip off the weed by their chelipeds.

*Suggestions for improvement*

1. Proper selection of fishermen is necessary to include only unoccupied and willing fishermen. The programme on seaweed culture in this area may be extended to unemployed persons who may or may not be fishermen but are otherwise willing to do the work. The question of involving repatriates could also be examined.

2. Seaweed culture work has not been attempted in other areas to know the local problems. This is necessary to ascertain and fix up other suitable areas for culture so that if fishermen of such areas are more enthusiastic and willing, the programme may work better.

3. Research input into various aspects of seaweed culture needs strengthening, particularly on the environmental and topographical conditions, reducing production cost, culture of other higher priced species and simple post-harvest technology.

# OYSTER CULTURE IN TUTICORIN

By K. Nagappan Nayar, P. Muthiah
and M. E. Rajapandian

## EVALUATION OF BENCH-MARK SURVEY

A preliminary survey of different fishermen colonies at Tuticorin was made before selecting the team of fishermen for the transfer of technology in 'Oyster farming'. A large number of small-scale fishermen were interviewed and they were told about the scope and function of the programme. Eleven families, who were interested in the programme, were selected from two locations of Tuticorin, namely Sahayapuram and Panimayanagar and the bench-mark survey was conducted on these families.

*Category of household*

In general, the fishermen families fall under landless labour group. They live in thatched huts with the dwelling space ranging from 40-80 sq.m. Of the families selected, six of them live in rented houses and the rest own houses built on three-cent plots. The value of the self-owned houses ranged from Rs. 500-1000. All the fishermen families draw protected water from street taps. They use kerosene lamps for lighting, except two families who enjoy electricity supply.

*Household belongings*

Essential utensils and a few boxes, either wooden or steel, were the common household items, with their value ranging from Rs. 300-500. Three farmers possess a bicycle or a radio with a total value of Rs. 500. Fifty per cent of the families maintain a few fowls in their houses for domestic use.

*Particulars of family and literacy*

The number of persons in a family on an average is 7 which includes 2 adult males, 2 females and 3 children. Education up to secondary level is common among them. By and large girls continue their education upto S.S.L.C., but the boys invariably discontinue their studies at the age of 13 or 14 in favour of traditional fishing.

*Occupational status*

All adult males are sea-going fishermen, fishing with gill nets like sardine gill-net (kolavalai) or drift net (valavalai) using indigenous crafts. On an average they make 22 fishing trips a month. Out of the eleven families, four own fishing units and the rest work as labourers in other crafts. Fishing apart, the labourers spend considerable time in the maintenance of the craft and gear during their stay on land. The fisherwomen to a large extent are responsible for the fabrication of new net pieces and mending nets.

*Income and indebtedness*

The fishermen (labourers) earn a monthly income of Rs. 300 whereas the owners of the fishing units get a net income of Rs. 450 after meeting the expenses on the maintenance of the craft and gear. No evidence of savings as such was noticed in both categories. The seasonal fluctuations in the fish catches and the inconsistency in their earnings affect their economy driving them into the hands of private money lenders. The private money lenders who are either merchants or middlemen, have a hold on the fishermen by acquiring the right of marketing their catches.

All the fishermen are indebted to some extent as they regularly borrow money for domestic expenses during festivals or for the maintenance of the craft and gear. The labourers usually borrow money from the headman of the fishing units, who in turn borrows money from the marketing agents. The survey revealed that the labourers have personal loans ranging from Rs. 1000 to Rs. 2000 and the owner of the fishing units from Rs. 3000 to Rs. 5000.

*Fishing implements*

The craft utilised for fishing is plank-built, Tuticorin type of boat. The cost of the boat is around Rs. 5000. As stated already four of the eleven fishermen own crafts. An average of 12 sardine gill nets are employed from each boat. Each net is fabricated out of nylon yarn and costs about Rs. 400.

*Nutrition, health and hygiene*

The general health of the fishermen is sound except in a few cases wherein symptoms of vitamin deficiencies such as dermatitis and scurvy were observed. Some of the fisherwomen and children appear emaciated and suffer from malnutrition. Diseases such as cold, influenza and hepatitis are prevalent.

The common items included in their food are rice, tapioca and fish. Occasionally cheap vegetables such as drumstick, brinjal, tomato and fruits of cheaper varieties are consumed. Milk, mutton and chicken are luxury to them, taken only during festivals, weddings etc.

*Remarks*

All the families, irrespective of their occupational status, obviously belong to the economically backward segment of the society, living below the poverty line. The following factors may be attributed to the retarded economic status: a) Lack of organised local agency (co-operative) to support their operations and marketing of their products; b) Absence of self efforts needed for improving their saving habits, nutritional and hygienic standard; and c) Lack of guidance and assistance in communicating information on the improved and new technologies related to their profession.

There is considerable scope for improving the economic status of the fishermen adopted under Lab-to-Land programme. Under this scheme the fishermen are expected to utilise profitably about 100 hours of their spare time each month in oyster farming. Each family could easily earn an additional income. The demonstrations in oyster farming will certainly equip them with necessary experience and confidence to take up sea-farming in future as an additional avocation along with their traditional fishing.

## PROGRESS IN OYSTER CULTURE

*Selection of families*

The following 11 families were selected for the transfer of technology of oyster culture.

1. Shri R. Joseph, Panimayanagar, Tuticorin
2. Shri A. Siluvai Arokiyam, Panimayanagar, Tuticorin
3. Shri A. Anthoniappa, Panimayanagar, Tuticorin
4. Shri A. Antony Cruz, Panimayanagar, Tuticorin
5. Shri P. Celestine Fernando, Panimayanagar, Tuticorin
6. Shri V. Elias, Panimayanagar, Tuticorin
7. Shri Maclean Fernando, Panimayanagar, Tuticorin
8. Shri A. Lujus, Panimayanagar, Tuticorin
9. Shri S. Singarayan, Sahayapuram, Tuticorin
10. Shri J. Guber Raj, Sahayapuram, Tuticorin
11. Shri A. Siluvai, Sahayapuram, Tuticorin.

*Area of operation*

The Tuticorin Bay margin is shallow water area which is suitable for oyster culture. Occasionally cast net fishermen throw their nets for catching a few numbers of fishes and prawns. The Institute's oyster farm is located in the bay. The fishermen selected under the programme have set up their oyster culture racks in the Tuticorin Bay.

*Orientation training*

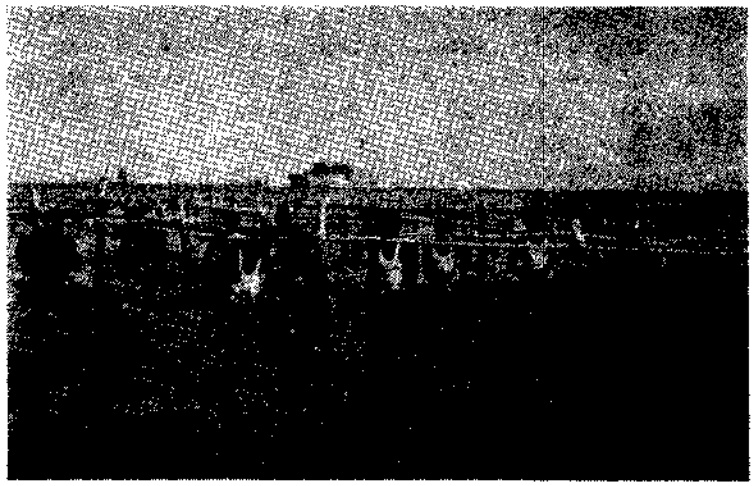
Soon after the families were selected, an orientation training programme was conducted wherein various aspects of the techniques of oyster culture were demonstrated and explained in detail to them. Practical training in spat collection, fabrication of oyster rearing cages, preparing materials for racks, etc. was given. Being professional fishermen learning these was not difficult for them. They showed a lot of enthusiasm and initiative.

*Inauguration*

After completing the bench-mark survey and training, the programme was formally inaugurated on 10th May 1979. The fishermen started growing the spat supplied, in cages which they had already fabricated and kept readily suspended in the racks in the bay. The fishermen followed this up and fabricated more than 500 oyster rearing trays and also erected sufficient number of racks in the open sea, using teak-wood poles. They were so enthusiastic that in no time they completed construction of 33 racks.

*Scale of operation*

Each fisherman adopted under this scheme is expected to erect 6 oyster growing racks so that he can grow a stock of about 25,000 oysters initially. For supplying spat for all the 11 families it was necessary to have at least a stock of over 4 lakhs of spat. It was then estimated that an approximate number of about 2.75 lakhs of oysters, weighing 35 tonnes, could be produced in an area of 0.25 hectares. As the spat settling was good it was possible to get a good stock of spat during April-May season. These seed oysters have been handed over to the fishermen's oyster farm. By the end of August most of the oysters would have grown to a size of about 55 mm when they will be transferred to rectangular trays for further growth till harvest.



*Fishermen working in their oyster culture farm.*

Because of their traditional fishing activities the fishermen are able to attend to the oyster farm only in the evenings, on two or three days per week. On Sundays, however they devote time from morning till noon.

*Extension service*

At the time of inauguration of the programme an exhibition was organised to highlight the various aspects of oyster farming and the utility of oyster as a source of food. In this respect a few oyster dishes were also prepared and served to the invitees. The concept of Lab-to-Land programme was explained to the public. The fact that oyster culture could be practised by small-scale fishermen as an additional avocation to improve their income was emphasised. The proceedings of the inaugural function were covered by the All India Radio and a resume of the same was broadcast under their 'Farmers programme'.

## CONSTRAINTS FACED BY THE SCIENTISTS AND FARMERS

*Constraints faced by the scientists*

1. It has been an uphill task to select the families for the programme. The difficulties encountered were (a) there is no tradition of eating oysters at Tuticorin; (b) markets had not yet been established; (c) fishermen generally demanded wages; and (d) oyster culture is totally a new venture for the fishermen. These were overcome by convincing the fishermen of constance technical assistance on all the matters connected with oyster culture.

2. After selection of families, ensuring their sustained interest and regular attendance to farm work was a problem. However, a considerable improvement has been brought about on this aspect.

3. Spatfall in nature is subject to fluctuations. The spat season of 1978 was a failure. However, it was very successful in April-May 1979 which made it possible to launch the programme in May. Development of technology for hatchery production of seed is the only solution. The scientists, fully aware of this, are giving the highest priority to the hatchery programme.

4. Taking the various inputs into account the cost of production is high with reference to the possible market price

that may be obtained at present. Efforts are being made to bring down the cost of operations, to explore markets and to ensure remunerative prices for the product.

*Constraints faced by the fishermen*

1. Steeped in traditional fishing practices, the fishermen have a psychological barrier to think of mariculture as an additional avocation.

2. The fishermen are not ready to sacrifice their leisure which they have been used to willingly.

3. Although the womenfolk assist in the fabrication of oyster cages from their houses, they have not yet come forward to look after the farm. Improvement on this aspect would help proper maintenance of the farm.

4. Finance is the major constraint. Something like a Sea Farming Promotion Credit Society, if set up, would enhance the chances of promoting oyster culture.

# Farmers' experiences and viewpoints

## Prawn Farmers from Cochin

*Need for technologies and assistance for integrated development*

Shri K. K. Bahuleyan, President of Ajantha Marananthara Sahaya Fund (AMSF) at Valappu, speaking at the Workshop at Cochin, expressed his gratitude to the CMFRI for selecting their Harijan Society for the transfer of technology. He was happy with the programme on prawn culture being carried out in their field. He wanted that technology and assistance may be provided for developing some more prawn farms and for the cultivation of paddy, coconut and vegetables in their total farm area of 8.5 acres. The land is a marshy area thought unfit for any cultivation. The Institute has shown the way for prawn culture. He requested that similar assistance for the integrated development of the land may be provided. Shri T. A. Raghavan and Shri T. K. Sasidharan (both of AM SF) stressed similar points and also wanted help towards adult education. The former mentioned the assistance given by the Institute for coconut and paddy cultivation. Shri K. K. Prakasam stated that the strength of membership which was at 110 when CMFRI adopted the programme has since grown to 122. He gave an account of the Society's schemes for the welfare of the members.

*Harvest was below expectations*

Shri V. K. Sugathan (AMSF) narrated his experiences as one devoted to prawn farming after receiving training at the Krishi Vigyan Kendra (KVK) for Mariculture. He described step by step the farming activities undertaken by the society under the technical advice, direction and supervision of the CMFRI scientists. Mentioning the results of the harvest,

he felt that the yield was below their expectations. This he attributed to the operations being carried out for the first time in the ponds and to the harvest having been taken early. He is hopeful of getting a higher yield in the next season.

*Timely advice saved the harvest*

Shri P. K. Mony (AMSF) said that they noticed the change of colour of the water in the farm and they felt something was going wrong. They lost no time in contacting the scientists who immediately rushed to the farm. On examining, they found a bloom of dinoflagellates which had started affecting the prawns. They advised immediate harvest which saved the yield. But for the timely action taken by them and the scientists they would have lost the stock altogether.

*Unfavourable environmental conditions affected the prawns*

Shri K. K. Karthikeyan who had received training at the Krishi Vigyan Kendra stated that he had invested a small fortunate in digging two ponds for prawn culture. He gave details of his operations. After about 2 months, due to poor tidal effect, the water conditions became standstill and temperature and salinity rose to high levels. This resulted in the mortality of stocked prawns. He has also stocked the ponds rather late. Other species of fishes and prawns have entered the ponds and he has not done the harvest. However, convinced of the economic viability of prawn culture, he would like to go ahead, improving by the lessons learnt during the first operation in the new field. He expects assistance from the Institute for continuing his farming work.

*Seed collection from the wild is a problem*

According to Shri A. Uthaman, the CMFRI is ushering in a new revolution in the Cochin area for improving prawn production through culture. He stated that he has received training in prawn culture at the KVK. His main problem was availability of seed for stocking and the scientists helped him with 26,000 juveniles of *P. indicus*. He said that majority of the local people still prefer traditional practices. At times some resort to using of poisonous substances in the

field for harvesting purposes. This also poses a serious problem for seed collection.

*Urgent need for extension of licensing period for prawn culture from five to seven months*

Shri P. A. Sukumaran said that when the culture operations were progressing very well in the field and the prawns were showing good growth, an unfortunate incident of poaching and destruction of sluice gate by the public happened in his field. According to him, this had happened because, under the existing rules, the licensing period for prawn culture comes to an end by the middle of April after which date the public fish whatever available in the fields. He appealed that the lease period for prawn culture must be extended from the present limit of 5 months to 7 months so that the prawn farmer can take his crop. The remaining 5 months period is sufficient for 'pokkali' (paddy) cultivation.

## Prawn Farmers from Quilon

*Marshy land turned to prawn farms in Quilon area*

Shri Tripuran Pillai stated that he possesses 1.5 acres of marshy land on the shore of Ashtamudi Lake. The scientists of CMFRI have assisted in converting 60 cents of this land into a prawn culture farm by their sustained efforts. According to him, the scientists had undergone more suffering than himself. He was also given training in prawn culture by the KVK. The growth of prawns was good and he got 60-count prawns within 2½ months. He expects further assistance from the Institute for doing prawn culture in the remaining land also.

*Mass mortality of stocked prawns on a rainy day*

Shri V. Soman who has converted 40 cents of his land into prawn culture ponds had a distressing experience on a day of heavy rains. All the prawns were found floating dead. He said that retting of coconut husks is a very common practice in the backwater canals and hence the ponds are prone to pollution. The scientists should examine this problem in detail and suggest solutions.

*Flooding of ponds impaired prawn culture*

Shri K. P. Sukumaran who has started a prawn farm of 2.5 acres in extent said that the scientists are giving him all technical assistance. A total number of 41,000 juveniles were stocked in the ponds and the prawns were showing good growth. During the rainy season the adjoining low lying areas were flooded and water began overflowing in his ponds. By placing lights at strategic points he tried to lure the prawns so that they might not escape. The flood has brought in undesirable species and predatory fishes into the ponds. He would do the harvest and see the results in August. He wanted the scientists to find solutions for such problems. He desired improvement in sluice gate design of his farm. His another difficulty was collection of seed. Initially the neighbours objected to his collecting the juvenile prawns. But subsequently on seeing the farming operations they extended cooperation.

## Seaweed Farmers from Mandapam

*Grazing of seaweed by fishes needs a solution*

Shri K. A. Jaffar, narrating his experiences on seaweed culture at the Workshop at Mandapam Camp, said that he had harvested 750 kg of seaweed from 50 frames. But other fishermen had some problems. Grazing of the seaweed on the frames by fishes affects the yield. He wanted the scientists to suggest measures to solve the problem. Shri Mustaffa Kamal and Shri Abdul Razak also made similar points.

*Quarrying of coral stones affects natural production of seaweeds*

Both Shri Jaffar and Shri Kamal mentioned that quarrying of coral stones from the islands of Manauli, Pulli, Krusadai and Hare has adversely affected the natural production of seaweeds in the region. The quantity has come down. They pleaded that coral quarrying in the islands should be stopped.

*All fishermen could do seaweed culture if financial assistance is provided*

Shri Jaffar expressed that all the fishermen could do seaweed culture enthusiastically if arrangements are made for get-

ting loans. They need loans for procuring fibreglass boats for the farm work. May-July is the leanest season for fishing and he suggested that some wages may be given to them for the above period to do seaweed culture.

### Oyster Farmers from Tuticorin

*All is well now with oysters*

Expressing the common view of the fishermen engaged in oyster culture at Tuticorin, Shri R. Joseph stated that they have been given adequate training in the farming of oysters. They have stocked the oyster seed in the farm and expect to do the harvest in March-April. The women and grown-up boys in the families are also assisting them in the culture work. All the fishermen want to continue oyster culture on a large scale. He pointed out that due to rough weather during May-July period, they are unable to go for fishing and they go through severe financial strain. He pleaded that they may be given wages for their farm work during this period.

### Fishermen from Madras

*Farm area needed for prawn culture*

Shri B. S. Sanjeevi stated that they have been introduced to prawn culture technology by the scientists. The scientists were also responsible for making cheap and effective solar driers for drying their surplus fish. They have also introduced the windmill for pumping sea water into the ponds. He said that the fishermen are badly in need of suitable areas for prawn culture and that they have represented to the Government. They want the CMFRI to extend assistance to develop prawn culture and improve their earnings.

Pursuing the same point, Shri T. Mohan stated that 90 acres of land which was used for prawn culture has been acquired by a private party and the fishermen are finding it difficult to do prawn culture there.

# Financial assistance under Integrated Rural Development Programmes

The Lab-to-Land programme is essentially an activity aimed at the transfer of technology from the laboratory to the farmers' fields. It has been suggested that selection of farm families under the scheme should be confined to the villages coming under the Community Development Blocks covered by the Integrated Rural Development Programme (IRDP). Since the IRDP is implemented through the State Governments, it was considered necessary to enlist the participation of the officers responsible for the implementation of the programmes of IRDP at the Workshop. The Workshop had the benefit of hearing about the financial assistance available for the Lab-to-Land programmes from these officers and of their active participation in the discussions. The summaries of their speeches follow.

**Shri G. Ramachandra Kurup**
*Assistant Development Commissioner, Ernakulam*

Speaking at the Workshop at Cochin, Shri Kurup said that considerable importance has been given under the IRDP to fisheries schemes in Vypeen area. Financial assistance will be extended to prawn culture also. Nationalised Banks, Block Development Officers, Panchayat Presidents and other connected departments have been requested to prepare necessary programmes. The difficulties of prawn farmers are being studied.

'Marginal farmers' having land upto 2.5 acres would be entitled for a subsidy of 33.33% of the cost of the programme and 'small farmers' having land up to 5 acres will get a subsidy of 25% under the IRDP scheme, subject to the condition that the annual income of the farmer from assets other than

agriculture does not exceed Rs. 2400. During the previous year an assistance of about Rs. 2 lakhs was given to the fisheries sector alone in this area. Although the nationalised banks can insist upon guarantees or sureties for the loan part of the assistance, they are advancing loans against group guarantee and also against personal sureties by two persons. The scientists should help the farmers with proper project proposals individually for each farmer. At present societies, like the AMSF at Valappu, are not covered for assistance under the IRDP. Subsidies are available only for programmes in the notified Development Blocks. But in other areas the Block Development Officers can recommend cases to the nationalised banks to extend loans at 4% interest.

**Shri C. K. Kumaran**
*Block Development Officer, Vypeen Block*

Shri Kumaran mentioned that 199 fishermen were given subsidy and loans last year for the purchase of canoes, nets and other implements.

**Shri N. Bhageerathan**
*Block Development Officer, Chavara Block*

Shri Bhageerathan stated that there is a proposal to include small fish farmers for IRDP assistance. The State Bank of Travancore, Agricultural Development Bank and District Cooperative Bank are willing to provide credit facilities to prawn culture, provided they are satisfied with the economic viability of the programmes duly recommended by the scientists. The proposals should include information on different aspects such as capital investment required, expected production, income, repaying capacity of the farmer etc.

He suggested that prawn culture should be integrated with the cultivation of coconuts and vegetables on the bunds of the ponds. Financial assistance could be extended to the integrated programme as a whole.

**Shri S. Palanisamy**
*Personal Assistant to Collector,*
*Ramanathapuram District*

Shri Palanisamy, speaking at the Workshop at Mandapam Camp, said that as a result of his participation in the Workshop he was able to appreciate the needs of the fishermen for taking up the culture of fishes, prawns, seaweed etc. The fishermen in some places have formed cooperative societies. The Government have made arrangements to provide fibreglass boats. The Government offers 50% subsidy and the officers guide them to get the other 50% as loan from the nationalised banks. Under the IRDP, both the Drought Prone Area Programme (DPAP) and Small Farmers Development Agency (SFDA) are operating in the Ramanathapuram District. He advised the fishermen to approach their local Block Development Officers or Panchayat Commissioners for necessary guidance and assistance.

**Shri M. Vedamuthu**
*Commissioner, Panchayat Union, Mandapam*

Shri Vedamuthu advised the fishermen to get the assistance under the IRDP programmes through cooperative societies. They can get 50% subsidy through the societies. He stated that in Karangadu village, 100 acres of land has been taken up for prawn culture. In Devipatnam the fishermen have planned to take 600 acres of land for culture operations. He explained that small farmers will get 25%, marginal farmers 33% and farm labourers 50% of their requirements as subsidy. If they apply through cooperative societies, it would be easier for them to get the subsidy and other funds from the nationalised banks. The Panchayat Union and Block Development Officials would extend their full assistance to the fishermen taking up culture projects.

**Shri S. Sevugaperumal**
*Deputy Agricultural Officer, Mandapam*

Shri Sevugaperumal pointed out that firstly the local fishermen must register themselves with the Block Development

Office and get their identity cards as small fishermen, marginal fishermen etc. They can approach for subsidy only with their identity cards. The fishermen should be able to popularise their products for ensuring proper marketing.

**Shri G. Ahmed Hussain**
*Extension Officer (Animal Husbandry), Mandapam*

Shri Hussain advised the fishermen to make use of their spare time for poultry keeping and cattle rearing. There are many agencies to provide assistance.

For the current year, a sum of Rs. 10 lakhs has been allotted to this area as subsidy under the IRDP. It requires investment of another Rs. 30 lakhs as credit to be able to use the subsidy benefit.

# Summary of discussions and action plan

Chairman Dr. Silas emphasised that frank discussions on all aspects of implementation of the Lab-to-Land programmes are necessary to make an in-depth analysis of our achievements and failures. The discussions should contribute to evolving new strategies and action plans for future work. As we get more and more involved with the rural sector in taking the laboratory results to the farmers' fields, our responsibilities would become greater. Discussions in forums like the present workshop would help in understanding our own strengths and weaknesses and in taking appropriate action to strengthen the weak links in the chain of processes involved in the transfer of technology. The fishermen and fish farmers have been invited to the Workshop specifically to enable the scientists to understand the end-users' needs and problems.

As it turned out to be, a wide range of subjects, from human aspects to financial assistance, was discussed at the Workshop. The discussions were led and guided by the Chairman. A summary of the discussions held at the Cochin and Mandapam Camp Area Sessions is presented here. The Workshop desisted from making any recommendations in a formal manner, but has indicated action plans wherever required and these are indented in the following text.

## Prawn Culture

*Technology for fractional harvests*

One of the major constraints in intensive prawn culture was that the farmer has to wait for about three months before he can take the harvest of prawns, whereas in the traditional system some income accrues every fortnight. The farmer needs money periodically to meet his family needs. Therefore, the

techniques of intensive prawn culture must be adjusted in such a manner that the farmer's needs are met with. Such a system would relieve the farmers from the difficulties in collection of large quantities of prawn seed at one time for stocking.

The scientists should evolve appropriate methods for staggered stocking and periodic harvesting of selected size of prawns. Harvest technology has to be developed to fish selectively without disturbing the general stock. The methods should be developed first at the Institute's farm at Narakkal and later extended to the farmers' fields.

*Insufficient tidal flush, rainfall and flooding*

The prawn farmers from Cochin and Quilon had ascribed mortality of prawns due to near stagnant water conditions caused by insufficient tidal flush and heavy rainfall. One farmer stated that overflow of flood water has affected the ponds.

*A prawn farmer expressing his viewpoints at the Cochin Area Session of the Workshop.*

These are areas requiring immediate attention of the scientists. Monitoring systems must be improved so that such

*Farmers and scientists participating of the Cochin Session.*

*Prawn and fish farmers from Cochin and Quilon with the Director CMFRI.*

situations could be analysed immediately. While advising the farmers on construction of ponds all the factors must be considered. In seasonal fields the farmers's interest in paddy cultivation must be borne in mind while advising on the depth of pond and number of trenches.

*Red water and pollution*

The Valappu farmers had reported occurrence of red water which began to cause mortality of prawns. Another farmer had stated that water polltued by retting of coconut husks entered the farm.

Scientists should make a detailed study of the noxious blooms in the ponds and analyse the factors responsible for inducing the blooms and also evolve remedial measures. Investigations should be started immediately to study the problem of pollution due to coconut retting in Ashtamudi Lake and its effects on prawn farms. The farmers must be suitably advised, based on the findings, on the control of flow of water into the ponds.

*Entry of fishes and prawns into the ponds after stocking*

Some farmers had reported entry of predatory fishes and other species of prawns into the ponds after stocking had been completed. The scientists held that the farmers had not maintained their sluice gates properly as advised by them and in one case a farmer had replaced the velon screen shutter.

While the scientists should give proper advice on the number of sluices, quality of shutter materials and eradication procedures, the farmers should strictly follow the advice of the scientists.

*Use of fish poisons for harvest in the traditional fields*

A farmer had mentioned that poison is sometimes used in the traditional prawn fields for harvesting the stock. This is a very harmful practice. Already laws are there against such practices in the inland water areas.

The scientists may collect information on such practices, if any. The people must be educated on the matter and the fishermen must be dissuaded from indulging in such harmful practices.

*Extension of lease period for prawn culture*

There have been a few instances of poaching in prawn culture farms by the public after middle of April. This is a very great constraint in the development of prawn culture in the area. If prawn culture were to progress on a large scale, poaching by public as if by right after middle of April should be prevented. The farmers wanted the licence period for prawn farming to be extended from the present five months to seven months. They argued that it will not affect 'pokkali' paddy cultivation as the variety needs only 100 days.

The CMFRI may bring the above views to the attention of the Government of Kerala for their consideration and decision.

*Master Plan for prawn culture in Vypeen area needed*

As a result of the initiative taken by CMFRI to introduce scientific prawn culture, there is a great awakening among the people of Vypeen to develop the fallow lands into prawn farms. At present, for want of an overall development plan for prawn culture in Vypeen, ponds are coming up in a haphazard way without proper feeder canals. Considering the vast potential and scope for bringing in an improvement in the economy of the area, the Workshop suggested that a blueprint for the development of the marshy areas with feeder canals may be prepared. This would also facilitate proper flushing of the existing ponds.

This has to be done by the State authorities and CMFRI may send necessary proposals to the Govt. of Kerala.

*Provision for hiring of capital equipment*

The small and marginal farmers and labourers engaged in prawn culture find it impossible to individually invest on capital equipment such as pump sets required for pumping sea

water into the ponds when tidal flow is insufficient. In the case of agriculture, the Government assists by providing tractor facilities to the farmers on hire basis. Coastal aquaculture is developing fast and more fish and prawn farmers are coming into the field. These farmers would also like to have such assistance from the State Government.

> The CMFRI may convey to the Fisheries Department of the Govt. of Kerala the fish and prawn farmers' request that they be provided by the Government the facilities of capital equipment such as pump sets on hire basis, for consideration and action.

*Co-operative prawn farming*

Although the programme at Karikattukuppam was begun with the technology of mussel culture by the scientists from Madras Research Centre, based on popular demand, prawn culture has been included in the programme. The Harijan community in the adjoining hamlet Muttukadu has also shown keen interest to take up prawn culture with CMFRI assistance. The problem at both the places is one of getting suitable land for which they have approached the Government of Tamilnadu.

> The Workshop noted with great appreciation the recent decision and orders of the Government of Tamilnadu that the lands/areas suitable for prawn culture shall be exploited by the Government only or *allotted on lease basis to Fishermen Cooperative Societies consisting of actual working fishermen as members.* The team leader of the Madras programme may suitably advise and guide the fishermen of Karikattukuppam and the Harijan families of Muttukadu to take advantage of the Government Order and, upon their getting the areas, prawn culture technology may be extended to them.

## Mussel Culture

*Selection of a new centre*

Elathur near Calicut where the mussel culture programme has been initiated is not covered under the IRDP schemes

and hence the mussel-men will not be able to avail of the subsidy facilities. However, there is demand for the demonstrations on open-sea mussel culture.

> Since the ICAR guidelines on selection of families are specific, it is desirable to select a centre covered under IRDP. Tellicherry which is a very important centre for mussel fishery comes under IRDP. Hence the scientists may explore the possibilities of taking up the Lab-to-Land programme on mussel culture at Tellicherry. A decision on this could be taken by early August.

*Improvements in raft culture*

Rigid rafts are not able to withstand the rough sea conditions during monsoons and also occasional cyclonic storms hitting the coasts. This has been the experience both at Calicut and Madras. Also the poles at Karikattukuppam were washed away. It was considered necessary to improve upon the raft system so that year-round culture became possible. Several suggestions were made at the Workshop — collapsible rafts with ropes and floats; use of smaller unit rafts with shorter ropes; use of barrels quoted with fibreglass or barrels filled with polyethylene bubbles to imporve life of barrels and to increase buoyancy; use of old motor tyres as a ring around the rafts to act as a barrier against wave acttion; and submerged rafts.

> The scientists at Calicut and Madras should experiment on the above methods suggested at the Workshop and evolve viable techniques for year-round open-sea mussel culture.

*Problems of mussel culture at Karikattukuppam*

The scientists pointed out that the programme on mussel culture has not yet made an impact on the people of Karikattukuppam. The reasons ascribed were problems connected with rafts, non-availability of sufficient quantities of seed at the right time, pre-occupation of fishermen with fishing activities, low demand for mussels at present and, above all, lack of enthusiasm among fishermen. The Workshop identified that

there has been a lack of proper education to the fishermen on the merits of mussel culture. Both mussel culture and prawn culture will help improve their economic conditions.

> Efforts must be made to educate the fishermen through pamphlets and other means. Their interest and cooperation for prawn culture must be linked to mussel culture. Mussel, as food, should be popularised. The technical problems on rafts should be solved by pre-designed experiments as stated before. Hatchery techniques for production of mussel seed should be developed quickly.

## Oyster Culture

*Development of low-cost technology*

It was felt that the cost of racks, trays etc. used in the culture of edible oysters considerably adds to the cost of production.There is an urgent need to bring down the costs to make the technology economically more viable. Methods such as collecting the spat on shells and growing the oysters on ropes may be tried. Alternate cheap and durable materials may be tried to replace the trays.

> Steps must be taken to develop low-cost techniques for the production of oysters. The team may work on the above suggestions, besides others, concurrently with the present programme.

*Selection of more families*

The scientists have been able to create and sustain the interest in the eleven fishermen selected for the transfer of oyster culture technology. During the last six months the programme has made good progress. As the fishermen are impressed with the programme it should be possible to increase the number of families so that a slightly larger section of people could be benefitted.

> The team may consider the above point for selecting more number of families. The team was of the opinion that the strength could be increased from 11 to 15 families.

*Training for the womenfolk*

It was a very good sign that the women and children are actively assisting the fishermen in their oyster culture work. When the men are otherwise engaged in fishing, their families must be able to look after the farm.

Necessary field training programmes may be arranged for the womenfolk and their participation should be encouraged.

*Raising of oyster seed*

The scientists pointed out the uncertainty in the collection of seed oysters for supply to the farms. They quoted the failure of 1978 season and the success of 1979 season. It is imperative that dependence on natural seed should be reduced.

The work on oyster hatchery which is already in progress should be accelerated to achieve an early breakthrough in hatchery production of seed.

*A fisherman giving his experiences at the Mandapam Area Sesson of the Workshop.*

*Attention to marketing*

The most critical factor for the success of oyster culture programme is marketing. The scientists, in a small way, have

*The Block Development Officer, Mandapam explaining the assistance available under IRDP.*

*Section of the audience at the Mandapam Session.*

*Fishermen and farmers from Mandapam, Tuticorin and Madras with Director CMFRI.*

demonstrated the palatability of oysters and their nutritional value. However, efforts must be taken to locally popularise oyster as food and to explore local and outside market needs, particularly in hotels. No time should be lost in this effort so that before the oysters become ready for harvest in the next few months, the marketing channels must be established.

Marketing is the most essential part for the success of the programme. Highest priority must be given to exploring and establishing markets for oysters and ensuring remunerative prices to the farmers.

*Purification of oysters*

The scientists have taken steps for purification of the farm oysters to kill the pathogenic organisms. A local processing industry has asked for samples of oysters to try export market. While sending out samples to local as well as export market, it must be ensured that the oysters are purified and are free from pathogens.

Extreme care should be taken even at this stage to send samples which are fully treated against pathogenic orga-

nisms. Necessary equipment should be procured. The farmers must be given the facility for purification of their oysters in the Institute's purification tanks.

*Training programmes*

The progress made in oyster culture by the farmers should be taken advantage of for organising Training Courses for technical personnel of the State Fisheries Departments and to prospective farmers so that they could gain practical experience in large-scale operations.

The team leader may prepare suitable syllabus for two types of Training Courses, one for the technical officers and the other for the farmers. These must be timed to coincide with the harvest of oysters. Necessary proposals with details of the courses may be sent by the leader to the Director CMFRI.

## Seaweed Culture

*Selection of families*

It was noted that the number of families selected for the transfer of seaweed technology has decreased from the initial ten to eight now. It must be our aim to have at least 20 families under the programme. It was pointed out that certain amount of affluence has crept in along the coastal belt and the fishermen are generally busy. Only those who show interest and are willing to undergo training and devote some of their time to seaweed culture should be selected. Unemployed fishermen, repatriates and those who are already engaged in seaweed collection in the islands may be considered for increasing the number of families under seaweed culture.

The team leader may take steps to increase the number of families at least to twenty. Selection may be made based on the above criteria.

*Culture of high-priced species*

The fishermen wanted introduction of high-priced species such as *Gelidiella acerosa* as the product will give higher re-

turns. They even went to the extent of suggesting that some such high-priced species may be imported and cultured. While appreciating the interest of the farmers, the scientists stated that *G. acerosa* is a slow-growing species and it has to be propagated by the spore method. Our technology has not reached the stage of large-scale spore production.

> The scientists should take note of the farmers' suggestions and launch a crash programme for developing suitable techniques for the culture of *G. acerosa* and other high-priced species of seaweeds.

*Solution to problem of grazing*

While the farmers claim that grazing of seaweeds by fishes destroys the crop, the scientists are yet to have confirmation on it. Only one species of fish has been found to have seaweed inclusions in the stomach.

> The scientists should take immediate steps to identify the fishes responsible for grazing and take suitable measures for scaring, trapping or netting the fishes to save the crop from destruction.

*Increasing the scale of operation*

The fishermen expressed that each should have at least 200 frames for seaweed culture so that a sizable quantity of seaweeds could be harvested.

> The team may consider the request and assist the farmers in enlarging the scale of operations with financial assistance from sources such as IRDP.

*Post-harvest technology*

It was brought out that selling seaweed as such is not to the advantage of the farmer. Preparation of crude agar through cottage-industry techniques enhances the returns a little. But the farmers would get the greatest benefit if the seaweed is converted into refined agar-agar and sold. The farmers are aware of this fact and would like to start a cooperative agar producing unit in course of time.

The scientists must assist the farmers with proper post-harvest technology to give them the maximum advantage of returns. When the Institute procures its own agar production plant, the farmers must be given training. They may also be assisted in farming a cooperative to start a processing unit. This would also help them to avail the maximum subsidy benefit of 50% under IRDP scheme. Marketing could also be taken up by the cooperative society.

*Conservation of ecosystem of islands*

The farmers had voiced their concern about removal of coral stones from the neighbouring islands as it disturbs the substratum on which seaweeds grow resulting in reduction of yield. The scientists felt that in view of the fact that the chain of islands at the head of Gulf of Mannar may receive a protected status, human interference with the ecosystem of the islands should be discouraged.

If the problem of removal of corals exists, the scientists may make a time-bound study on its effect on the ecosystem. The fishermen must be encouraged to set up their seaweed farms in the coastal waters. The scientists should make a study of the topography and environmental conditions of the coastal areas in the region and advise the farmers on locations suitable for seaweed culture.

## General

*Bench-mark survey*

The teams had completed the bench-mark survey based on the proformae originally sent by the ICAR, supplemented by a proforma developed by the Institute specific for fisheries information. The revised proformae were received from the ICAR only recently. These contain some additional items on which information has to be collected.

The teams may take steps to complete collection of the additional information in about a fortnight's time. To enable uniform analysis of the data, a set of 28 standard

tables have been prepared and distributed to the team leaders and the data may be analysed based on these tables. An evaluation report on the bench-mark survey data may be prepared wherever it has not been done properly.

*Integrated farming system*

The prawn farmers from Cochin and Quilon had shown much interest in integrated farming. The scientists have helped coconut and paddy cultivation to some extent. The Madras team has encouraged poultry keeping with the assistance of Tamilnadu Poultry Corporation (TAPCO). The Operational Research Project at Kovalam is assisting the fishermen in laying a nutrition garden. The block-level officers had indicated at the Workshop that IRDP assistance is also available for such integrated projects.

The teams should assist the farmers in developing integrated prawn/fish — crop — livestock system. They should seek the help and assistance of the concerned Departments of the State Government, Agricultural Universities and other ICAR Institutes. Where necessary, honorarium can be paid to the experts for their services.

*Education and Training*

It was made amply clear at the Workshop that the success of the Lab-to-Land programme would heavily depend on education and training given to the farmers on the concept of transfer of technology and the technology itself. This would involve three processes. Firstly, the entire farming community of the area has to be educated of the significance of the programme so that we get their understanding and full cooperation. Secondly, the families selected should be made to understand and appreciate the programmes. This group is directly involved in the transfer of technology and hence they should know in unequivocal terms what benefits the technology would bring to them, what assistance they can expect from the scientists — technical and subsidy assistance, what would be their inputs — work and money, what financial assistance they

can expect from the financing agencies connected with rural development programmes and what are their responsibilities to the scientists and the programme. Thirdly, the training part which would include the initial orientation and subsequent training at the appropriate time for the different phases in operation; also refresher training.

> The scientists may take necessary steps to achieve the above understanding with the farming community, if it has not already been done. Mass contact programme may be organised. Periodic meetings may be arranged between the scientists and the farmers. Pamphlets in local languages may be printed and distributed. Since the training phase has been completed in the present programmes refresher courses may be conducted. A farmer had particularly requested for training in water and soil analysis. Such programmes must be arranged by the KVK.

*Cooperation of farmers*

The scientists had pointed out instances where the farmers were non-cooperative and showed lukewarm attitude. On some occasions the farmers were not available even after they had been informed of the visit of the scientists. At least one had deviated from the advices given by the team which might have contributed to the failure in that field. In many cases there was good cooperation. Educating the farmers as mentioned before could result in better cooperation.

> The farmers were advised to extend full cooperation to the scientists in the implementation of the programme. They should provide all the feed-back information required by the scientists for purposes of evaluation.

*Supervision and monitoring*

The scientists expressed that there had been some lapses in monitoring the fields due to several factors beyond their control. They are working part-time in the programme in addition to their responsibilities to their research projects. Some of the centres are away from their stations and getting transport facility at the required time has been a problem.

In spite of the above handicaps, the scientists may strive to monitor the fields at least once a week. They may visit the fields in turn. Also the farmers must take initiative to communicate with the scientists on their field problems. Emergency situations must be brought to the notice of the team expeditiously. Scientists may suitably advise the farmers on sending telegraphic messages etc.

*Feed-back data*

Collection of feed-back information is an essential part of the Lab-to-Land programme.

The teams should ensure that the data are periodically collected, analysed and evaluated. Wherever there is insufficiency of staff, participation of other scientists working in related projects could be requested. The concurrence of project leaders may be ascertained in such cases.

*Liaison with local authorities*

The team leaders have a great responsibility to develop a good rapport with the local authorities which will go a long way for the successful implementation of the programmes. Liaison may be built up with the local Panchayat, Panchayat Union, Block Development Office, Police Department, Departments of the State Government connected with the technologies of the programme, Agricultural Universities, IRDP implementation agencies including the Nationalised Banks, Co-operative Banks, Agricultural Credit Societies etc. so that these organisations become aware of our effort in assisting the farmers of that area with the technologies under the Lab-to-Land programmes and could extend their support and assistance. Since all such public organisations are committed to rural development programmes as a National policy and directive, mutual help and assistance will certainly accelerate the process of implementation of the programmes.

The teams may strive to establish such liaison as mentioned above and strengthen the contacts already developed.

*Crop insurance for mariculture*

The marginal farmers and landless labour will not be able to stand the loss in case of failure of the culture system due to unforeseen circumstances and natural calamities. The Workshop desired that the possibility of getting the farm stocks insured against such losses may be explored.

Since we do not have sufficient information to formulate any proposals on crop insurance for mariculture, the Institute, as the first step, may collect information from other countries where insurance facilities may be available to the fish farmers.

*Blueprint on farming plans*

The need for preparing development plans for each family or groups of families, depending on the unit adopted, was stressed. This would help in predetermining the inputs and their sources, phasing them out, planning operations in advance and coordinating. Physical targets must be fixed. Anticipated production must be estimated and the families must be made aware of this. The blueprint may be in the model of a PERT chart. This would enable easy monitoring of the programme and an objective evaluation.

The team leaders may prepare such blueprints on farming plans for each family or family groups as the case may be in about two weeks' time.

*Budget*

The Institute has to send the budget on Lab-to-Land programme to the ICAR for sanction of funds for implementation. The guidelines on financial assistance have been received and sent to the implementation groups. Based on the blueprints on farming plans, the financial assistance required must be worked out. As has been mentioned in the guidelines, the subsidy available from the ICAR is towards critical inputs. The major part of financial assistance should come from the sources of IRDP, and the teams should assist the farmers to avail this assistance.

It was pointed out that the norms for ICAR's subsidy to mariculture projects should be different from those adopted for land-based agriculture, even inland aquaculture. Being a new venture the farms themselves have to be developed. In the case of mariculture, rafts for mussel culture, racks and trays for oyster culture and coir frames for seaweed culture which have to be constructed/erected at a cost are the base of operations and are analogous to the land already available for cultivation of crops in agriculture for which no amount need be spent by the farmers.

The team leaders may prepare the budget for the programmes keeping the guidelines in view and send the same to the Director in about two weeks' time.

*National Extension Programme*

The Workshop on ICAR Golden Jubilee Transfer of Technology for Rural Development held at Hyderabad in January 1979 has recommended programmes for the National Extension Fortnight. The ICAR has suggested to have the programmes during the first fortnight of September 1979. Programmes of lectures, broadcasts and telecasts could be arranged during the above fortnight. The Institute has already made a detailed plan for the above programmes and the team leaders of Lab-to-Land programmes and the officers-in-charge of the Research Centres of the Institute have been informed of these for implementation.

Farm fairs (Krishi Melas) may be organised coinciding with the harvests in each of the Lab-to-Land programmes. There must be two such fairs in an year. In Cochin a floating fair may be organised. The KVK should organise lectures in village schools. 'Open House' may be organised at the Research Centres. The Workshop noted the programmes already initiated on the International Year of the Child and Nutrition Garden during the Golden Jubilee Year.

The Films Division of Govt. of India has already shot newsreels on the Lab-to-Land programmes. Wherever this has not been done action may be taken. The team leaders may also

obtain particulars of release of the newsreels from the Films Division.

The teams may take all steps to implement the National Extension Programme as per the programme already communicated and the guidelines of the Hyderabad Workshop and also those outlined above.

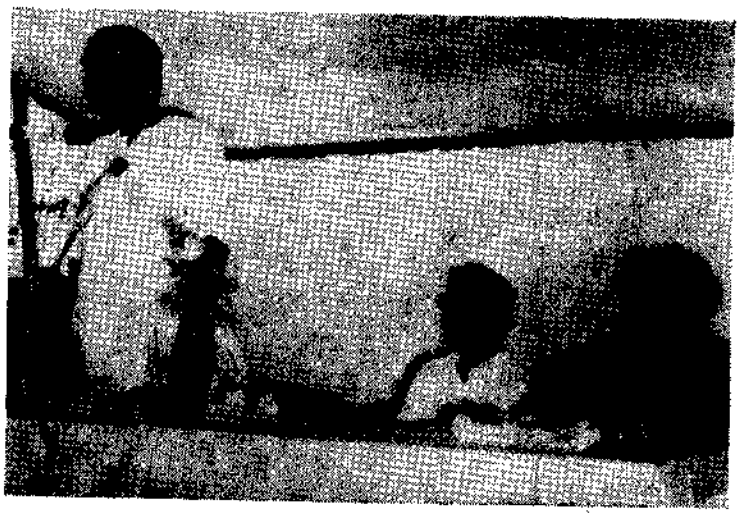
*National Seminar for Policy-makers*

One of the recommendations of the Hyderabad Workshop was 'Organisation of a National Seminar for Policy-makers on improving organisational efficiency and extension services'. The present Workshop on Lab-to-Land opined that it is timely to organise a National seminar of the above kind on fisheries to strengthen and streamline the extension services. This will be of special significance and use for the CM FRI. The Workshop recommended that the Institute may suggest to ICAR along with necessary proposals to consider organising a National Seminar on Fisheries Extension Service. The CMFRI can play an important role in organising and conducting the seminar. It will be very relevant as the Institute is actively implementing the transfer of technology programme. The Workshop identified a team to draft detailed proposals.

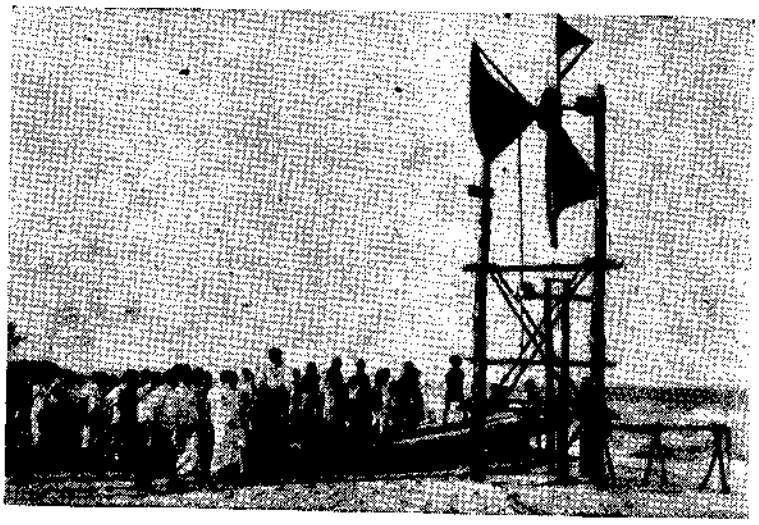
Proposals for National Seminar on Fisheries Extension Service may be prepared and sent to the ICAR for consideration and approval.

*Printing of Proceedings*

At the two Area Sessions lasting four days, the Workshop had covered a wide range of subjects relating to Transfer of Technology programmes. The discussions were frank and forthright. It was an occasion for introspection as well as prospection. The scientists were exposed to the ideals and aspirations of the farmers on the one hand and their problems and limitations on the other. In view of such importance, it was recommended that the proceedings of the "Workshop on Lab-to-Land" may be printed for circulation.



*Shri Baby John delivering the inaugural address.* *(See page 14)*



*The windmill erected for pumping sea water into the culture pond at Karikattukuppam.* *(See page 15)*

*Shri K. K. Bahuleyan, President, A M S F, Valappu, speaking at the Cochin Session of the Workshop.*