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Part Three

FEBRUARY 1991



NATIONAL SYMPOSIUM ON RESEARCH AND DEVELOPMENT IN MARINE FISHERIES

MANDAPAM CAMP

16-18 September 1987

Papers Presented
Sessions V, VI & VII

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
(Indian Council of Agricultural Research)
P. B. No. 2704, E. R. G. Road, Cochin-682 031, India

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POST-GRADUATE EDUCATION, TRAINING AND EXTENSION AT CENTRAL MARINE FISHERIES RESEARCH INSTITUTE, COCHIN

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ABSTRACT

In view of the increasing demand for trained personnel to meet the requirements of mariculture and brackishwater culture activities in the country, the Central Marine Fisheries Research Institute took steps to institute a post-graduate education programme in mariculture at the Institute, leading to the M.Sc. and Ph.D. degrees awarded by the Cochin University of Science and Technology. Through this programme a number of post-graduates have been turned out in the subject during the past seven years. The students were given both theoretical and practical instructions in different aspects of mariculture including basic subjects like physiology, nutrition, genetics and pathology. The Scientists of the Institute constitute the faculty for the programme and a number of members of the faculty have also been trained abroad in different specialisations. The Programme also had the advantage of consultants from other countries who have contributed greatly to its improvement and also in the development of infrastructural facilities at the Institute. As a result of the consultancy, a number of manuals on special subjects have also been published. The Krishi Vigyan Kendra and the Trainers' Training Centre handle a number of courses at the farmers level and at the trainers level based on the technologies developed at the Institute. In addition, an integrated programme of training including subjects in agriculture, animal husbandry and home management is also conducted.

INTRODUCTION

Fish production in the marine sector in India has been dependent, almost fully, on capture fisheries and it seems to have stagnated around 1.5 million tonnes in recent years. Demand for fish, nevertheless, is steadily on the increase. Increasing fish production by adopting aquaculture practices may prove to be one of the effective alternatives to meet the increasing demand for fish. There is good scope for development of coastal aquaculture in the country as we have vast brackishwater areas and salt water lagoons, left mostly fallow, all along the coast. However, successful management and execution of coastal aquaculture requires a cadre of trained personnel and competent expertise. It was with this intention that a "Centre of Advanced Studies for Post-graduate Education and Research in Mariculture", was started at the Central Marine Fisheries Research Institute, Cochin in July, 1979 with financial assistance from the UNDP and the ICAR. Several ad-hoc programmes also have been organised by the Institute under various projects at different levels, in an attempt to take the technologies developed at the Institute to the farmers and entrepreneurs.

A. POST-GRADUATE EDUCATION AND RESEARCH PROGRAMME IN MARICULTURE

Objectives

1. Institution of post-graduate degree courses such as M.Sc. and Ph.D. in mariculture

for creating a cadre of professionally qualified personnel to meet the requirement of research, managerial and executive level manpower.

2. Strengthen research programmes in mariculture and related subjects utilizing investigations by research fellows.

3. Develop infrastructure for teaching and advanced research.

4. Arrange advanced overseas training in identified priority areas under the faculty improvement programme for scientists involved in teaching and research activities.

5. Draw services of expert consultants from developed countries in areas where Indian expertise is lacking.

6. Organise seminars, workshops and special lectures on topics relevant to mariculture.

7. Establish linkages with other organisations both in India and abroad for exchange of views and ideas and extension activities.

ACTIVITIES AND ACHIEVEMENTS

1. Teaching programme

The Centre, in collaboration with the Cochin University of Science and Technology, offers a two year M.Sc. and a three year Ph.D. degree course since 1980.

The course programme for M.Sc. comprises of four semesters with subjects of basic sciences, marine biology, coastal hydrography, and physiology, endocrinology and cytogenetics of marine animals in the 1st semester; fisheries, fish and

fishery biology, finfish culture and fish farm engineering technology in the 2nd semester; culture of crustacea, culture of seaweeds and research methodology in the 3rd semester; and management of marine culture farms and extension and dissertation in the 4th semester.

The Ph.D. programme consists of two semesters of course work in the 1st year followed by research on selected topics. The course work in the 1st semester is on mariculture and it is common for all Ph.D. candidates. Syllabus for this includes an overview on mariculture, current concepts on the biology of cultivable finfishes and shellfishes, finfish culture, prawn culture, lobster culture, crab culture, mussel culture, oyster culture, pearl culture, clam culture, seaweed culture, site selection and grow-out structures, production economics and extension, biostatistics and research techniques. The 2nd semester, however, is specific to the topic of work selected in the Ph.D. programme. The areas identified as priorities for Ph.D. specialisation fall under the broad heading of ecology, physiology, nutrition, endocrinology, pathology, biology of cultivable species and different culture systems.

Ten candidates are admitted for each course every year. Seven batches were taken for each course so far as per details given in Tables 1 and 2.

The topics of research for which Ph.D. degrees have already been awarded are:

1. Culture and growth kinetics of selected nanoplankters.
2. Reproductive physiology of Indian species of the genus *Perna* (Family Mytilidae).

3. Studies on sporulation and propagation of selected Agarophytes.

4. Studies on the ecology and productivity of saline lagoons.

5. Pathological investigations in penaeid prawns.

6. Nutritional studies in juvenile *Penaeus indicus* with reference to protein and vitamin requirements.

2. Faculty improvement programme

A total of 28 scientists have been trained under this programme in countries like USA, France, U.K., Japan, Philippines, Belgium, Spain, Malaysia, China, Australia, Netherlands and Canada for periods ranging from two to six months on specialised subjects such as Integrated fish farming, Oyster hatchery, Fish seed production, Mullet culture, Milk fish culture, Cage and pen culture of *Tilapia*, Mussel culture, Lobster culture, Invertebrate tissue culture, *Macrobrachium* culture and Crustacean genetics, Seaweed culture and genetics, Marine fish genetics, Molluscan genetics, *Eucheuma* culture, Culture of live feed organisms, Fish and shellfish nutrition, Bioenergetics, Biochemistry of steroids, Crustacean physiology, Reproductive physiology of fish and shellfish, Reproductive physiology of marine prawns, Endocrinology of fish and shellfish, Bioassay procedure and experimental design on toxicity studies, Aquaculture and water quality management, Aquatic pathobiology, Fish diseases, Applied ecology of mangrooves, and Aquaculture economics.

Table 1 M.Sc..Degree Course

Batch No.	Year	No. of candidates			
		Admitted	Completed	Discontinued	Continuing
1.	1980-82	10	9	1	-
2.	1981-83	15	12	3	-
3.	1982-84	10	10	-	-
4.	1983-85	10	10	-	-
5.	1984-86	9	8	1	-
6.	1985-87	9	-	-	9
7.	1986-88	9	-	-	9
Total		72	49	5	18

Table 2 Ph.D.Degree Course

Batch No.	Year	Admitted	Completed	Discontinued	Continuing	Synopsis submitted	Thesis submitted	
							Result awaited	Degree awarded
1.	1980-83	4	4	-	-	-	-	3
2.	1981-84	9	9	-	-	-	4	3
3.	1982-85	10	8	2	-	-	1	-
4.	1983-86	11	1	4	6	2	-	-
5.	1984-87	10	-	5	5	-	-	-
6.	1985-88	10	-	2	8	-	-	-
7.	1986-89	10	-	2	8	-	-	-
Total		64	22	15	27	2	5	6

3. Expert consultancy

Fifteen scientists from abroad were invited to give training and guidance for improving teaching and research programmes. The subjects on which consultancy was made available were Environmental physiology, Reproductive Physiology of finfish and shellfish, Crustacean physiology and nutrition, Fish and shellfish nutrition in India, Fish/shrimp nutrition, Culture of live food organisms, Oyster biology and culture, Tissue culture of marine invertebrates, Fish and shellfish genetics, Fish and shellfish endocrinology, Microbial ecology in grow-out ponds, Fish and shellfish pathology in India, Fish and shellfish diseases, Water quality management in Aquaculture and Aquaculture Engineering.

4. Equipments

Under the financial assistance of UNDP, the Institute has acquired a number of sophisticated equipments necessary for advanced research in mariculture. These include a transmission-cum-scanning Hitachi-H-600 Electron Microscope, LBK-400 Amino Acid Analyser, Tecator Fibretec, Soxtec, Kjeltex and Ds.40 Digestive systems, Sorval Rc-5B Centrifuge, Polarographic Analyser, Hewlett Packard Gas Chromatograph, Pharmacia Column chromatographic systems, LKB Ultra Microtome, Mettler Electronic Balance, Olympus Vanox Research Microscope, A.O. Cryostat Microtome, Sartorius Microbalance, Chemlab SB-5 Freeze Drier, Spectronic 2100 Clinical Analyser,

A.O. Phase Star Microscope and Potentiometric Recorder.

5. Seminars, workshops, group discussions and special lectures

A total of 69 seminars and 158 group discussions were organised under the programme in Expert Consultancy on topics related to fields of consultancy.

The Institute organised five National Workshops on aspects related to mariculture in the country. Of these, two workshops were organised in collaboration with the University of Madras and one with the Marathwada University. At the Institute level, 12 workshops were conducted by the Expert Consultants. The themes of the above workshops were Mussel farming, Crustacean biochemistry, Fish and shellfish nutrition, Marine invertebrate reproduction, Invertebrate endocrinology, Methodology and techniques of induced breeding of finfish, Approaches of finfish and shellfish pathology investigations, Application of genetics in aquaculture, Physiology and moulting in crustacea, Culture of live food organisms with special reference to *Artemia*, Marine toxins, Water quality management in mariculture, Methods and design of experiments in environmental biochemistry, Nutritional quality of live food organisms and their enrichment, Hormone isolation and assay, and Techniques for estimation of bacterial growth ratio and productivity in aquaculture pond system.

The Centre also arranged 45 special lectures by National and International Scientists/professors as part of its educational programme in mariculture.

6. Research programmes

Fortynine short-term and 22 long-term projects were handled by the M.Sc. and Ph.D. students respectively. Presently nine short-term and 27 long-term topics are being worked out. Topics of research under this programme are related to ecological studies on culture systems, soil and water, its microbiology, mangroves, benthos, primary production and pollution; seaweeds and seagrass; seed resources, seed transportation and hatchery production; general biology of cultivable organisms; ecophysiology, reproductive physiology and endocrinology; nutrition, nutritional requirements and feed development, digestion and metabolism, live food culture and their nutritive values; pathology and genetics. While Ph.D. degrees were awarded to six candidates, results of theses submitted on the following subjects to the Cochin University of Science and Technology are awaited.

1. Studies on ecophysiology of *Penaeus indicus* in the grow-out systems.

2. Studies on histological and biochemical changes during spermatogenesis in *Mugil cephalus* and related species.

3. Studies on larval nutrition in the pearl oyster *Pinctada fucata*.

4. Studies on Indian Cichlids.

5. Larval biology of the spiny lobsters of the genus *Panulirus*.

Two other topics on which synopses have been submitted to the University are:

1. Role of trace elements on the growth and physiology of selected microalgae.

2. Biochemical genetics of selected commercially important penaeid prawns.

Work on 9 other topics was completed and on 5 others is nearing completion.

7. Publications

The programme under mariculture has brought out a series of manuals in research methodologies as CMFRI Special Publications. They are, Manual of research methods for crustacean biochemistry and physiology, Manual of research methods for fish and shellfish nutrition, Manual of research methods for marine invertebrate reproduction, Approaches to finfish and shellfish pathology investigations, Application of

genetics in aquaculture, Manual of research methods for invertebrate endocrinology, Production and use of *Artemia* in aquaculture, Manual of marine toxins in bivalve molluscs and general consideration of shellfish sanitation, Handbook on diagnosis and control of bacterial diseases in finfish and shellfish culture, Mariculture research under the Centre of Advanced Studies in Mariculture, Water quality management in aquaculture, A practical manual for studies on environmental physiology and biochemistry of cultivable marine organisms, and Theorems of environmental adaptations. Nutritive value of live food organisms and their enrichment, Neuroendocrine research and techniques, Techniques for estimation of bilateral growth rates and productivity in aquaculture pond system and Approaches to physiological studies on moult cycle in crustacea are under publication.

About 32 papers/articles have been published in various periodicals on the basis of work done under the programme on mariculture.

8. Utilisation of manpower

The teaching and education programme in mariculture was started in the country to build up a cadre of trained personnel. The candidates who have successfully come out are suitably employed. A number of them are engaged in conducting further research or teaching at university levels. Some have joined as managers or executives of non-government organisations dealing with mariculture, farming and export. MPEDA, TATA, Hindustan Lever, Vorion Chemicals, Commercial Banks, Insurance Companies, Research organisations, Universities and State Fisheries Departments have absorbed most of the candidates.

B. FISHERIES TRAINING AND EXTENSION

The various research programmes of the Central Marine Fisheries Research Institute have resulted in the development of new technologies in the field of marine fisheries relating to both capture and culture. Concerted efforts have been made since 1978 to impart training to the end-users through programmes organised under various projects at different levels. The regular training programmes organised under various projects of the Institute during 1979 included training in marine prawn culture, pearl culture, edible oyster culture, underwater investigations using SCUBA diving, fishery resources assessment and population dynamics. Subsequently all

these training programmes have been brought under the Trainers' Training Centre of CMFRI.

1. Training in marine prawn culture

Considering the importance of prawn culture in increasing production, the Crustacean Fisheries Division of CMFRI conducted a training course in the year 1978 for 12 inservice personnel belonging to the Marine Product Export Development Authority and Fisheries Departments of Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu and Andhra Pradesh, on the various aspects of marine prawn culture. In 1979, 22 Research Scholars recruited under the sponsored project 'Assessment of Fry Resources of Culturable Penaeid Prawns at Selected Centres in Kerala and Karnataka were trained for two weeks in prawn and fish seed collection, identification and quantitative and qualitative analysis of seed samples. Besides, training was also imparted to 10 quality control supervisors of the MPEDA in identification of commercially important prawns, lobsters and crabs. Two officers, one from Indonesia and the other from Bahrain, underwent training in prawn filtration/culture and biology of shrimps, respectively, for two months.

2. Training in pearl culture

In order to update knowledge in the latest techniques of pearl culture, nine officials working on related aspects and belonging to Gujarat, Tamil Nadu, Andaman and Nicobar, Lakshadweep, CMFRI and also the Philippines, were given training on the various aspects of pearl oyster culture and production of cultured pearl.

3. Training in edible oyster culture

The objective of the training programme in edible oyster culture was to transfer the technology to small and marginal farmers/fishermen to form a source of additional income to them and also to generate self-employment for the unemployed. Fifteen fishermen were trained under this project. Besides, a batch of students from the University of Madras undergoing the Post-graduate Diploma Course in Mariculture were also trained in these culture techniques.

4. Training in underwater investigation by SCUBA diving

SCUBA diving is one of the most reliable methods for underwater investigations on marine resources. A training programme was conducted at the Institute for a period of eight weeks in order to train scientists and technicians in the principles and methodology of SCUBA diving. Five persons from various Departments and CMFRI participated in the training.

5. Training in fishery resources assessment and population dynamics

It is very essential that the research and technical personnel engaged in marine fisheries research, education and development programmes in the country be trained in fishery resources assessment and population dynamics. Twentytwo officials from various State Fisheries and other Departments, Fisheries Colleges and CMFRI have been trained under this programme.

6. Training in sampling techniques for assessment of exploited marine fisheries resources

The Institute has developed a stratified multistage random sampling design which is widely used for the collection of marine fisheries catch statistics. It is necessary that the field staff of the Fisheries Departments of Maritime States also follow the same method to facilitate easy comparison of the data. To ensure this the Institute has been training State Fisheries officials in the sampling methodology. So far, 35 inservice personnel from various States have been trained under this project.

7. Training programmes of Trainers' Training Centre

A Trainers' Training Centre for 'Marine Fisheries' was sanctioned by the ICAR in October, 1983. It functions under CMFRI as a complementary scheme along with the Krishi Vigyan Kendra at Narakkal. The TTC started training programmes in 1984 with the help of scientists of CMFRI who have actually developed the various technologies of the Institute on mariculture and marine resources assessment were brought under the TTC scheme. Inservice personnel are given training in prawn farming and hatchery production of marine prawn seed at the KVK/TTC and MPH, Narakkal; in seaweed culture at the Regional Centre of CMFRI, Mandapam Camp and in edible oyster culture and hatchery production of oyster seed at the Tuticorin Research Centre of CMFRI, Tuticorin.

In addition to the above courses, training is given in fisheries resources assessment with special reference to sampling techniques and population dynamics and in SCUBA diving, to officials sponsored by various government and autonomous agencies and private institutions.

The Training on the post-harvest technology in fisheries included theory and practical classes on principles of quality control in fish and shellfish processing, preservation by different methods, preparation of diversified products such as pickles, wafers, soup powder and cutlets using low cost fish and preparation of other products of commercial importance like sharkfin rays.

The number of persons trained in various technologies at the different centres are given below:-

1. Prawn farming	12
2. Hatchery production of marine prawn seed	21
3. Seaweed culture	7
4. Edible oyster culture	13
5. Hatchery production of oyster seed	11
6. Sampling techniques for assessment of exploited marine fisheries resources	19
7. Fishery Resources Assessment	16
8. Post-harvest technology in fisheries	5
Total	104

8. Summer Institutes

CMFRI has conducted five summer institutes to impart training in various fields of aquaculture. Fifteen persons participated in the Summer Institute on 'Coastal Aquaculture' conducted in 1974 at CMFRI, Cochin. In 1977 another Summer Institute was conducted by the Institute on 'Breeding and rearing of penaeid prawns' and 16 persons participated. At Tuticorin Research Centre of CMFRI a Summer Institute was conducted in 'Culture of edible molluscs' in 1980 in which 16 persons from different State and Central Government departments were trained. A Summer Institute on 'Hatchery Production of prawn seed and culture of marine prawns' was conducted in 1983 for 22 persons from various government and other agencies, at the Prawn Culture Laboratory, Narakkal. In May 1987 a Summer Institute on 'Recent Advances in Finfish and shellfish Nutrition' was conducted at Cochin and it was attended by 29 participants from all over the country.

9. KVK Training Programme

Training farmers is a critical input for the rapid transfer of latest technologies in the field of Agriculture, Animal Husbandry, etc. Therefore, the ICAR has established Krishi Vigyan Kendras at various places in the country as innovative institutions for vocational training in agriculture and allied subjects. A Krishi Vigyan Kendra was sanctioned to the Central Marine Fisheries Research Institute, Cochin at Narakkal, in December, 1976 and it started functioning in 1977 with some of the staff from the Institute. Training courses based on the principle of 'Learning by Doing' have been conducted for small and marginal farmers and fishermen in an attempt to urge them to adopt modern technologies. Young farmers and school dropouts are also selected for training to familiarise them with the scientific farming methods and for generating self-employment opportunities. These training courses are designed

according to their needs and the duration and venue decided.

The main theme of the training at Narakkal is scientific prawn/fish farming which is most suited to the Vypeen Island and other coastal areas of Ernakulam District of Kerala. The duration of the training courses varies from 5 to 30 days. In all, 174 courses have been conducted since the inception of the scheme and a total of 3016 persons, including 1523 women were trained. Of these 1160 persons belonged to Scheduled Castes and 5 to Scheduled Tribes.

In order to create an awareness on the various aspects of agricultural and animal production as well as health and home science, short-term courses have been arranged with the help of subject matter specialists from the various State Government Departments, Agricultural University and Financing Agencies through which most of the loans to farmers are channelised. Thus, 3 training courses on coconut cultivation, which is a part-time occupation of the people of the area were conducted benefitting 34 persons. Similarly, through nine courses on vegetable cultivation 269 women were trained, while 75 persons were trained in paddy-cum-fish culture. Lectures and demonstrations were also arranged on social forestry for the benefit of 208 persons.

Under the discipline of Animal Husbandry, 10 courses were conducted on poultry farming training 312 men and women. Two courses were conducted on duck farming with 64 women participating in them. Short-term training courses were arranged on the various aspects of Livestock Management such as clean milk production, food and fodder production, calf care and other management procedures on nine occasions, training 214 persons.

Training courses on Home Science and Hygiene were conducted for women and girls. Three courses on 'Nutrition' were attended by 110 women, while 266 girls were trained in the 'Preservation of fruits' during 10 courses. Three courses were conducted on 'Environmental sanitation' with special reference to epidemics, their occurrence and control in which 75 women participated.

In addition to the above, three training courses were arranged on "Finance and Financing Agencies in Prawn and Fish Farming" for the benefit of 104 farmers.

LAB-TO-LAND PROGRAMME

The Lab-to-Land programme of the ICAR, designed to transfer the technologies developed in the ICAR Institutes to the farmers' field, was implemented by CMFRI and KVK in three phases and now the fourth phase is in progress. In the

1st phase, the farmers were adopted for implementation of various technologies at the respective places where they seemed feasible. Thus, at Cochin 125 farm families were adopted for scientific prawn/fish farming. Three families were adopted for prawn/fish farming at Quilon. For mussel culture and prawn culture, 206 farm families were selected in Madras while 10 fishermen families were adopted for mussel culture at Elathur village in Kozhikode District. At Tuticorin, 11 fishermen families were adopted for edible oyster farming. Seaweed culture was taken up as technology for transfer at Mandapam adopting eight fishermen families. This phase of the programme was implemented with the active participation of the scientific and technical staff of the various research centres of the Institute.

During the 2nd phase of LLP, the programme was implemented at Valappu, Cochin only; with special permission of the ICAR to adopt the same families to make them confident in scientific farming of prawns and fishes to continue the enterprise by themselves. In this phase, 128 families were adopted and the programme was implemented by a team of scientists from CMFRI and staff of KVK.

The 3rd phase was implemented by KVK adopting 60 farm families for prawn farming integrated with coconut cultivation on the bunds. The families were selected from various villages of Ernakulam District.

During the 4th phase, 85 families were adopted for prawn/fish farming. The critical inputs included mini-sludge gates costing Rs. 200/- each made on a design by KVK with mango wood for use in small holding like canals in coconut groves and small ponds and also vegetable seeds and fertilizers for cultivation during the rainy season.

Demonstration projects

Scientific farming of prawns in hitherto unutilised canals in coconut groves was successfully demonstrated by KVK in the canals and fields of ex-trainees from different localities for convincing the prospective farmers on the advantages of the systems over the traditional method.

Application of mahua oil cake for eradication of predators from the culture fields was demonstrated in some canals at Narakkal and a perennial field at Kadamakkudi. Application of ammonia which is the latest and cheaper method for eradication of undesirable organisms was demonstrated in seasonal fields in Alleppey, Ernakulam and Trichur Districts. This resulted in a good number of enquiries from the prospective and active farmers and they are given necessary advice and assistance in the matter.

Radio talks

In order to create an awareness of the importance of scientific farming in prawns among the farming community, 21 programmes were broadcast over the Trichur Station of All India Radio. This included talks by the KVK. Besides, a lesson on 'Integrated Prawn Farming' by the Calicut Station of AIR.

Film shows

A number of film shows were arranged for the benefit of the trainees and visitors to the KVK. In all, about 165 film shows were arranged, of which 106 were on campus and 59 off the campus. In addition to the documentary film 'Mariculture' on the activities of the CMFRI, other films on topics such as Animal Science, Environment, Health and Nutrition were also screened.

Melas and Farmers' days

The KVK conducted 2 'Krishi melas', one 'Matsyamela' and one Farmer's celebration in collaboration with CMFRI at different places in Vypeen Island. Besides, a 'Karshaka Sammelanam' was organised by KVK for the benefit of farmers adopted under LLP.

Inauguration of a NES Block level 'Vanamahotsava' was conducted at the KVK campus.

The KVK participated in the World Food Day celebrations organised by the Canning Centre of Food and Nutrition Board, Government of India at Malipuram.

On 16th October, 1986, the CMFRI participated in the World Food Day celebrations in which the focal theme was 'Fishermen and Fishing Communities'. On this day, special training programmes were conducted at the KVK for girls on the preparation of nutritious recipes with cheap and readily available ingredients by the Canning Centre and "the preparations of diversified products from fish" by KVK/TTC.

Exhibitions

The CMFRI has actively participated in 25 exhibitions organised by various government and voluntary agencies. This includes exhibitions at Cochin organised by the Corporation of Cochin, Rotary Club, Al-amin Trust, Congress Centenary Celebration Committee, Integrated Fisheries Project, Central Institute of Fisheries Technology, etc., from time to time. The Institute has also participated in exhibitions organised by other ICAR Institutes. In the AGRI EXPO '77 at New Delhi, the CMFRI participated along with DARE.

The Research Centres of CMFRI also have organised exhibitions at Mandapam, Tuticorin and Madras and participated in exhibitions organised by other agencies at Bombay, Goa, Mangalore, Calicut, Vizhinjam, Tuticorin, Madras, Mini-

coy and Waltair. These exhibitions have given the public an opportunity to get first hand information about the research and development activities of CMFRI in marine fisheries.

Seminars/Workshops/Symposia

The CMFRI has conducted a number of seminars to disseminate information gathered, transfer the technologies developed and assess the nature and extent of exploitation of the resources along the Indian coasts, from time to time, at Cochin, Tuticorin, Mandapam and Madras, in which the Scientists of the Institute have actively participated. Besides, the scientists of the Institute have participated in all the symposia organised by the Marine Biological Association of India, viz., Symposia on Scombroid fishes, Crustacea, Mollusca, Corals and Coral reefs, Coastal Aquaculture, Endangered species of marine animals and contributed papers.

The Institute's staff have participated in the several workshops and seminars organised by the Institute at different centres and also other agencies such as MPEDA, Universities and other Institutes. As part of the extension activities, the staff of the KVK have participated in a number of seminars/workshops such as 'Role of Small Scale Fisheries and Coastal Aquaculture in Integrated Rural Development'. 'Southern Regional Agricultural Information Communication Workshop', seminar on 'Brackishwater fish culture', workshop on 'Regional Development Programme' organised by the Kerala State Government and UNICEF; 'Development Week' celebrations organised by Vyttila NES Block at Fisheries College, Panangad; meetings organised by the Co-operative Land Mortgage Bank for discussion on 'Schemes for financing prawn farming' and 'Farmers' Meet' organised by MPEDA and State Bank of Travancore to discuss about the loan scheme to be launched by the bank with the technical assistance from government agencies. The Officer-in-Charge of KVK has attended the Rural Programme Advisory Committee meetings of All India Radio, Trichur Station, IRDP Advisory Committee of Vypeen NES Block and monthly workshops of the Kerala Agricultural Extension Programme.

CONCLUSIONS AND RECOMMENDATION

The programme of the Centre of Advanced Studies in Mariculture under UNDP/ICAR financial assistance was to be completed by 1986. After a phasing out period of six months it came to a close in September, 1986. UNDP has spent about 0.7 million US dollars on the programme. The ICAR likewise has spent about Rs. 3.8 million. According to official estimates the country needs a lot more trained hands in the field. Considering this, the ICAR has permitted to continue the project during the VII Five Year Plan period as a Post-graduate Education and Research Programme of CMFRI. The huge investment on the infrastructure and the expertise developed in the Institute through consultancy and faculty improvement programme are justifiably being utilised by continuing the programme. The expertise available in the Institute ranges widely in specialised subjects like Fishery Biology, Marine Biology, Oceanography, Statistics, Economics, Management, Electronics, Engineering, Physiology, Genetics, Nutrition, Pathology, Pollution, Soil Science, Animal Husbandry, Veterinary Science, Dairy Science, Poultry Science, Home Science, Library Science and Extension. The Institute has a well developed Krishi Vigyan Kendra (KVK) and Trainers' Training Centre (TTC) to take care of the transfer of technology to the farming community through programmes on learning by doing. The Institute arranges from time to time short-term training courses in a variety of subjects like culture of prawns, molluscs, fishes and seaweeds, stock assessment, population dynamics, collection and compilation of fish statistics and Nutrition which are attended by candidates from within the country and abroad. A number of candidates from the Afro-Asian countries have undergone training in the Institute on various aspects of fishery science. Further, a number of teachers from Agricultural Universities also have been admitted for higher studies under the Faculty Improvement Programmes. Under such circumstances it seems imperative to continue permanently the teaching and research programmes, and recognising the Institute as an international Centre for offering courses in Fishery Science and allied subjects.