Seminar on the role of

SMALL-SCALE FISHERIES AND COASTAL AQUACULTURE IN INTEGRATED RURAL DEVELOPMENT

SEMINAR ON

The Role of Small-scale Fisheries and Coastal Aquaculture in Integrated Rural Development

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ABSTRACTS

1. PRESENT STATUS AND ROLE OF SMALL-SCALE FISHERIES OF INDIA

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The exploitation by small-scale fisheries is primarily rural-based and contributes to nearly 65% of the total marine fish landings of India. The contribution by this sector is estimated at 8,74,832 tonnes. About 0.32 million people are self employed to produce this national wealth The landed value is estimated at Rs. 171.2 crores and contributes to the extent of 0.5% of the GNP. The fishing crafts owned and employed by the small-scale fishermen are estimated at 1,06,519 which include the catamarans, dug-out canoes and small plank-built boats. The traditional gears operated by them are drag nets, gill and drift nets, shore seines including 'Rampan', boat seines, cast nets, hooks and lines, traps etc. The total number of gears employed in the fishing operations is estimated at 8,29,894. The total capital investment by the small-scale fisheries sector is estimated at Rs. 114.16 crores. The net profit after meeting expenses towards wages, maintenance of crafts and gears and on their depreciation charges at 10% and at 33% respectively is estimated at Rs. 17.84 crores. This gives an average income of Rs. 558 per fisherman per year which is insignificant in view of the huge capital investment, hazardous nature of the profession and the effort expended.

The artisanal fishermen are heavily indebted to the middlemen and money lenders. They are exploited by high rates of interest on borrowings or pledging their catch at fixed rates decided by the middlemen. The Fisheries Co-operatives have a very important role to play in this context, but the co-operative movement has not penetrated to the desirable extent during the last two decades. There are in all about 5000 fisheries co-operatives with a membership of 5.3 lakhs and a total paid-up share capital of Rs. 3.6 crores, the Government's share being Rs. 2.24 crores. However, of these 5000 societies nearly two thirds are either defunct or dormant, due to improper management. The existing fisheries co-operatives at different levels need strengthening by proper managerial support, and the defunct societies should be revived to fulfil the needs and requirements of this vulnerable sector.

For improving the socio-economic conditions of the small-scale fishermen, it is essential that he is weaned of the influence of the middleman and introduced to new or modern technologies of fishing. This could be achieved only by improving his economic condition and literacy and by massive extension service. In this connection an integrated approach involving financial assistance through soft loans, and subsidies for procuring production means, price support for his produce, storage and warehousing facilities, effective marketing system and transfer of technology are suggested. With such an effort, there is considerable scope for the uplift of the small-scale fisheries which is vitally important for the overall development of the fisheries of the country.

2. OPERATIONAL CONSTRAINTS OF ARTISANAL FISHERMEN

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Fishing is one of the oldest professions of man. Even today, the traditional methods of fishing have stood the test of time. In the coastal sector of Karnataka, age-old practices such as the use of shore seines, boat seines, gill nets, cast nets, hooks and lines etc. have been in vogue over the years. The giant shore seine, 'Rampan' accounts for the bulk of the landings of mackerel and oil sardine along the coasts of North and South Kanara. The operation of this important gear sustains the economy of a large segment of the fishing community. Other traditional methods of fishing, while accounting for a good proportion of the catch, support the economy of the fisherfolk to a fair extent.

Lately, the impact of mechanisation on the traditional methods of fishing has been felt all along the Indian Coast, especially so along the Karnataka Coast. The use of trawl nets and purse seines has caused serious damage to the economy of fishermen, particularly of those dependent on shore-based operations for their livelihood.

The paper attempts a portrayal of the operational constraints of the artisanal fishermen, suggests improvements in the traditional gear, indicates ways for overcoming the operational difficulties and discusses the prospects for concurrent development of small-scale fisheries.

3. THE TRADITIONAL PRACTICES OF COASTAL AQUACULTURE AND SUSTENANCE FISHERIES OF INDIA

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India is bestowed with an extensive system of bays, backwaters and estuaries. Yet, so far, no tangible programmes have been evolved to use these areas for productive purposes. Age old traditions in rearing fish and prawns are being practised in West Bengal and Kerala which require to be scientifically reoriented for better yields.

The sustenance fisheries of India, largely represented by the diverse species of shellfish, are generally a neglected resource. Apart from proper assessment of these fisheries, they require to be harnessed for development of shellfish farming and thereby the rural economy. Indigenously developed techniques could be transferred to the culturist for the proper utilisation of the different eco-systems in our country.

4. SOCIO-ECONOMIC CONDITIONS OF THE COASTAL RURAL POPULATION WITH SPECIAL REFERENCE TO THE FISHERIES SECTOR

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Recognising the role and potentials of small-scale fisheries carried out by artisanal fishermen, considerable interest has been evinced in recent years, both at the national and international levels, for the development of these fisheries. While the problems confronting the small-scale fisheries in the developed countries relate to technological and economic criteria, in the developing countries like India, they are mainly related to the improvement of the fisheries and the socio-economic conditions of the communities that depend on this sector for survival.

In India, a great majority of the coastal fishermen are engaged in the traditional small-scale fisheries employing indigenous crafts and gears. They contribute to about 65% of the total marine fish production of the country and supply to the main source of fish consumed internally and that exported from the country. Nevertheless, a review of the changes that have taken place over the years in respect of production means and socio-economic status of this sector would reveal that there has been only marginal improvement.

The paper presents the past and the present status of the fishing communities and the structural barriers which force them to remain an economically and socially backward segment in our society. Highlighting some of the cultural and social dimensions which are referred to as "superstructural dimensions", the paper stresses the economic dimensions denoted as "infrastructural dimensions", which form

the base of the life and economy of traditional fishermen. An attempt is made to study the interrelations between the factors that determine and encourage various traditional techniques and the social relations that emerge between the users and the owners of these techniques. Besides, the nature of the linkages between the fishermen and the market through the associated interests that stand as big barrier to the socio-economic development of traditional fishermen is discussed.

Planning for fisheries development with special reference to the traditional sector is examined to highlight some of the reasons for the growing divergence between what is fisheries development and fishermen's development. This dichotomy is, to a very great extent, responsible for the continued miserable plight of traditional fishermen. In conclusion, the paper identifies some of the areas where steps must be taken to improve the small-scale fisheries and the artisanal fishermen.

5. COMMUNITY DEVELOPMENT AND INFRASTRUCTURE FACILITIES FOR IMPROVING THE SOCIO-ECONOMIC CONDITIONS OF FISHERMEN

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The seas around India and the extensive estuaries, backwaters, brackishwater lakes and swamps, fresh water rivers, reservoirs, tanks and ponds abound in fishery resource. Yet the development of the fisheries of the country during its long history before and after Independence has not been appreciable. This is mainly due to the immobility of labour

in fishing industry from one to the other, lack of communication and proper exchange of knowledge and experience in respect of different kinds of trades and occupations; neglect of fishery sector in the national development programmes; inadequate facilities for fisheries education and training; and absence of any risk-bearing social schemes such as Employees State Insurance Scheme, Provident Fund Scheme and Workmen's Compensation Scheme available for industrial workers or Crop Insurance Scheme in the agricultural sector.

Certain suggestions are made to develop the fisheries sector and to improve the socio-economic conditions of fishermen. Both marine and inland fisheries are to be developed simultaneously and the fishing industry is given high priority in par with agriculture. The existing indigenous crafts may be mechanised with suitable inboard and outboard engines and adequate landing and berthing facilities may be provided at all minor ports. An extension unit should be organised to inform the fishermen about the modern techniques and their benefits. The existing training facilities at the Fishermen Training Centres may be strengthened and additional courses beneficial to fishermen are introduced. Infrastructural facilities such as processing units, cold storage, fish curing yards and roads may be provided at every fishing village. Social and community amenities such as house, medical facilities, sanitation, potable water should also be provided at every fishing village. Steps should be taken to provide adequate facilities for distribution, transport and marketing of fish. Adequate opportunities may be ensured to fishermen to obtain higher education. Alternate jobs to fishermen during the lean fishing season may be created. Distress relief for fishermen and their families may be provided by all the states. Fishermen Cooperative Societies may be given fishing rights in tanks, ponds and reservoirs.

6. A CASE-STUDY OF THE SOCIO-ECONOMIC CONDITIONS OF THE FISHING VILLAGE POONTHURA IN KERALA AND SCOPE FOR IMPROVEMENT

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Poonthura, a fishing village near Trivandrum along the Kerala coast, harbours a population of about 10,000 people in about 2000 families in an area of about 0.8 sq. km. Almost 86% of the families depend directly or indirectly on fishing for their livelihood. A sample survey carried out by social workers and students in 1976 covering over 1000 families has indicated the deplorable conditions under which most of the people live in the fishing village.

Only 31.9% of the families own fishing implements and the rest, except for a small percentage engaged in fish vending and other jobs, forms the fishing labour force exploited by the boat owners and middlemen. Bonded labour and child labour are common features. Almost 60% of the actual fishermen are bound to work under money lenders. 79.2% of the families are in debt. Bank credit facilities are unavailable for the lack of necessary credentials. Almost 50% of the people live on a rupee a day for all requirements and 42.1% have two meals a day during the fishing season. Many go hungry during the lean season. Fish and tapioca form the staple food and an overwhelming majority does not have any vegetables in their diet. Balanced diet is something unheard of and children suffer ill effects and also die of malnutrition. Infant mortality accounted for 47.9% of deaths during 1972–75. Only

12% of the families own any land and others have settled on church property. 65.5% of families have houses of some sort and huts account for 71.8% of the accommodation. Sea erosion has periodically rendered many homeless and housing schemes of the Government of Kerala have helped to rehabilitate some of them. Sanitary facilities are conspicuous by their absence even in the houses built under these schemes. For long periods of 3–6 months during the non-fishing season, 90% of the working population idle away their time. More than 75% of the women have no occupation other than housekeeping throughout the year and for most of them it is a question of prestige to remain in-doors. Literacy is only 22.7% and more than 60% among the literates have only the primary education.

Poonthura is one of the important fishing centres along the coast and the annual turn over is in the order of Rs. 50 lakhs. It is a typical traditional fishing village with a society stagnant and stoically silent about its woes. Development of such a village poses both challenges and opportunities. The paper deals with the existing operational and socio-economic conditions in the village and indicates the possibilities and problems of development. The major areas for immediate attention are non-formal education, creative use of idling time of men and women through introduction of land-based and essentially sea-based technologies including sea farming, improvement of the operational conditions of the fishermen, finding ways and means of providing credit facilities for acquiring craft and gear and getting rid of bondage of labour and middlemen problem.

7. SOCIO-ECONOMIC SURVEY OF FISHERMEN ENGAGED IN THE LIME-SHELL FISHERIES – A CASE STUDY

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Fishermen exploit about a dozen species of molluscan shellfish in a 100 sq. km area in the Kakinada Bay for burning them into lime. Among the molluscs fished the window-pane oyster ranks first with an annual production of 5000 tonnes, followed by the blood clam *Anadara granosa* with 1000 tonnes. As sustenance fisheries, these shellfish play an important role in augmenting the usual earnings of the fishermen.

Out of a total of 706 families in the 15 villages, 165 are employed full time in the lime-shell fisheries; the rest are engaged part time during January–May and they pursue prawn fishing during June–December. A total of 302 country crafts are deployed in these fisheries. As a case study, Balusutippa, a major fishing village situated 48 km from Kakinada was taken up in March 1978 and the results are presented in this paper. Among the full-time workers, the average per capita income per year worked out to Rs. 349/– and the income per family is Rs. 1850. Country crafts are owned by 43.8% of the families. Majority of the houses are thatched (93.7%) and 84.4% of the families own houses. Literacy is poor and only 14.7% of the population can read and write. In the case of the families engaged is part-time shell fishing the average per capita income per annum is Rs. 434 and the income per family is Rs. 2602. The economic condition of the part-time fishers is relatively better than the full-time fishers since they have traditional

rights to fish in the creeks for prawns and finfish where others are forbidden by age-old social custom.

At present, the shellfish landings are generally stagnant and there is scope to step up production several times by deploying more fishermen, since the recent studies estimated the window-pane oyster resource at 51,000 tonnes in the Kakinada Bay. The meats of the shellfish, presently discarded, are a valuable source of cheap protein food. The scope to augment production by the culture of the window-pane oyster and the blood clam is highlighted.

8. DIET AND NUTRIENT INTAKE AND NUTRITIONAL STATUS OF FISHERMEN COMMUNITY

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An attempt has been made in this paper to present the dietary intake, nutritional status and nutritional problems of the vulnerable groups among the fishermen families of the coastal areas of Kerala and Tamil Nadu. Cereals, roots, tubers and fish are the commonly used food items among these families, while other foods are rarely used. The diets are found to be deficient in all the nutrients, especially in the case of pre-school children and expectant and nursing mothers. Home production of foods is negligible.

The nutritional uplift of the fishermen can come about only as a part and parcel of an overall programme of socio-economic development. The nutritional status of the poor populations can be improved only through development

efforts rather than through expensive supplementary feeding programmes, which, at best can only mitigate malnutrition for the time being, but cannot be self-generating. One of the most neglected aspects of life in this sector is nutrition and health education. Therefore, 'Balwadies', Primary Schools and High Schools must be established, at least one for two or three adjacent 'Kuppams'.

Medical and sanitation facilities must be augmented in the fishing 'Kuppams', with more health centres, and necessary medical and para-medical staff, to provide a healthy climate and reduce birth and death rates. Appropriate, inexpensive nourishing diets must be demonstrated for the fishermen families. Recipes of weaning foods based on low cost, local foods suitable for infants and children should be formulated. Augmenting vegetable and fruit production through raising home gardens is also needed.

There is a conspicuous gap in the vital data about fishermen community. The author could not locate any published scientific information on the dietary intake and nutritional status of the fishermen community *per se*. State-wise and District-wise averages do not help in locating the dietary deficiencies. There is an urgent need to commission and finance community nutrition surveys, action research and its surveillance among fishermen community.

9. NUTRITIONAL STATUS OF THE FISHERMEN POPULATION OF CALICUT AND MALAPPURAM

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Assessment of nutritional status of the fishermen population of Calicut and Malappuram Districts was done using the method described by D. B. Jellaffe. Special emphasis was given to the nutritional deficiency signs of infants and children and also pregnant women and lactating mothers.

Severe forms of various deficiencies were observed. Vitamin A deficiency signs were comparatively less. A very severe degree of stunting of growth was also seen in the infants and pre-school children. The paper presents the details of the study.

10. EXPLOITED AND POTENTIAL CAPTURE FISHERY RESOURCES IN THE INSHORE WATERS OF INDIA

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The paper deals with the present status of exploited capture fishery resources and the potential stocks in the inshore waters of India. Although the exploitation of the inshore region extends to a depth of 75 m, most of the fishing is confined to depths within 50 m. The exploited

resources of this region essentially consist of the traditional fisheries of oil sardine, mackerel, Bombay duck, prawns and others which contribute to about 65 per cent of the total marine fish production of the country. A few dominant single-species fisheries are characteristic of the west coast unlike the multiple-species fisheries of the east coast. While the pelagic stocks along greater part of the west coast are exploited to a fairly high degree, those of the east coast are known to be underexploited. Due to concentration of trawling for prawns, some of the inshore demersal fisheries, especially along the west coast, remained underexploited or unexploited.

The nature and distribution, production trends, species composition and seasonal abundance of these resources are analysed for the period 1961 to 1976 in the background of the physico-chemical and biological characteristics of the coastal environment, delineating the productive areas and the promising fisheries. Certain highly productive areas (average annual catch of 50,000 to 1,00,000 tonnes) have been found off the coasts of Kerala, Maharashtra and Gujarat. Recent catch trends indicate that promising fisheries may be those of elasmobranchs, anchovies, catfishes, silver bellies, ribbon fishes and perches. Attention is also drawn to the existence of underexploited and potential fisheries resources which include white baits, horse mackerels, ribbon fishes, catfishes, silver bellies, pomfrets, seer fishes, tunas and related fishes and molluscs. Mention has been made of non-conventional resources like those of cuttle fishes, squids and some fishes which could be exploited for stepping up production.

Exploitation of ancillary marine resources like those of sea cucumbers, sea urchins, sponges, corals and seaweeds from the inshore waters also offer scope for further development.

The need for diversification of fishing in the coastal waters to release pressure on shrimp trawling has been stressed so that the identified potential stocks and the underexploited

and non-conventional resources can be harvested utilizing the existing small mechanised vessels employing pelagic and midwater trawls and purse-seines for this purpose. The prospects for actual development of the unexploited resources and management of the principal stocks along with guidelines for future studies in the coastal region are outlined.

11. PROSPECTS FOR COASTAL AQUACULTURE IN INDIA

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India has a traditional coastal aquaculture system that has been developed through ages by the ingenuity of the common man. The 'pokkali' fields of Kerala, 'bheries' of West Bengal, 'gazani' farms of Karnataka and 'khazan' lands of Goa represent this system. Non-selective stocking and unscientific management of these fields have put a low ceiling on production. Aquaculture which has been practised as an art, if carried out on sound scientific principles, has a tremendous potential for an employment base, increase in production, improvement of economy and accelerated development of the coastal sector. The scientific base for coastal aquaculture has already been laid in India.

The country has the basic requisites for taking up aquaculture enterprises. Along the 6100-km long coastline there are areas suitable for year-round sea farming. The estuaries at the numerous river mouths, backwaters, brackishwater lakes, mangrove fields, derelict saltwater areas and the paddy fields seasonally inundated by brackish water form a valuable water resource for coastal aquaculture.

A rich variety of fishes, crustaceans, molluscs and marine algae constitute the cultivable species resources. The milk fish (*Chanos chanos*) and mullets (*Mugil* spp) form the two major conventional species of culture, and the pearl spot and 'bhekti' are too of importance. Prawns enjoy an economic advantage over other groups and the "Naran chemmeen" (*Penaeus indicus*) and "Kara chemmeen" (*P. monodon*) are the prize species. Other prawns (*Penaeus* spp and *Metapenaeus* spp), lobsters (*Panulirus* spp) and crabs (*Scylla serrata*) have a great potential for culture. Among the molluscan shellfishes, the green mussel (*Perna viridis*), the backwater oyster (*Crassostrea madrasensis*) and clams of four genera (*Meretrix, Katelysia, Villorita* and *Paphia*), all of which at present support only sustenance fisheries at different centres, would contribute most to the quantum of production through culture. Pearl culture has become a reality in India with a modest potential for production of cultured pearls. The agar-yielding (*Gracilaria* and *Gelidiella* spp) and algin-yielding (*Sargassum* and *Turbinaria* spp) seaweeds have prospects for culture. Mixed farming (*polyculture*) using compatible and mutually advantageous species of finfishes and shellfishes can help in the rational use of the synergy of the ecosystems. Although most of the species of the coastal and brackishwater areas have the potential for increased production through culture, our immediate attention will be on the foregoing species for which culture technologies have been developed and the economic aspects are understood.

Coastal aquaculture follows the principles of animal husbandry and involves seeding, feeding, disease control and harvest, and aims at production rates higher than in nature. Application of the basic technologies of culture has given encouraging production rates. The paper discusses the resource potential for coastal aquaculture in India and indicates the prospects that it offers for an overall development of the coastal sector.

12. RECENT TECHNOLOGICAL ADVANCES IN COASTAL AQUACULTURE IN INDIA

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Concerted efforts are being made to develop coastal aquaculture through scientific investigations in the recent years. As a result, valuable information on the techniques of culture of several finfishes, prawns, mussels, oysters and seaweeds that could be farmed, is now available to the farmers. In the field of prawn culture, technological advances recently made relate to breeding nine species of commercial penaeid prawns and three species of palaemonid prawns and rearing their larvae through different stages under controlled conditions. These are possible due to the knowledge accumulated over the years on the biology of these species and their environmental requirements, and to the successful techniques evolved for the culture of phytoplankton, brine shrimp and other zooplankters on which the different larval stages feed. Intensive culture of prawns by improved operational method involving selective stocking of fast growing and high priced prawns such as *P. indicus* and *P. monodon*, and growing them for 3½ to 4 months when they attain marketable size is suggested in the place of the traditional culture practice with relatively low production due mainly to uncontrolled stocking and premature harvesting. Several potential seed grounds have been located along the Tamil Nadu and Kerala Coasts so as to help the farmers in procurement of seed. Studies on induced breeding, mass-rearing of larvae, large-scale culture of live-food organisms and development of compounded feed necessary for commercial hatchery production of seed are progressing. Considering the variability of factors such as stocking rates, ecology and productivity

of the fields, and growth and survival of the stocked prawns, suitable culture techniques for different ecosystems are being evolved. The pueruli of spiny lobster, *Panulirus homarus* collected from the wild have, under controlled conditions, been grown to marketable size within 18 months. The green crab, *Scylla serrata* cultured in baskets and cages has shown relatively fast rate of growth (12-15 mm carapace width per month) in the field experiments.

Fish culture in the coastal waters forms at present only a part of the traditional brackishwater fish-culture Industry. Experiments carried out recently on the culture of milkfish have shown that their fry (45 mm) collected from the wild grow in the ponds to marketable size of 450 mm during a period of 4½ to 5 months without any artificial feeding. Techniques of collection of elvers of the eel, *Anguilla bicolor*, and their culture in running water have been developed. Potential seed grounds of *Sillago sihama* in the estuaries of the rivers of Karnataka have been located. Investigations on induced breeding and pond culture of *S. sihama*, milkfish, mullets and eels, and on poly-culture of prawns and fishes are progressing.

Culture of edible molluscs received little attention prior to 1971. As a result of a series of investigations conducted since then, techniques have been developed to culture mussels by seeding ropes with their spat collected from nature and growing them on ropes suspended from a floating raft, or on poles erected in the inshore waters. Open sea farming experiments have shown an annual production rate of 150 tonnes per hectare for the brown mussel and 235 tonnes per hectare in 5 months for the green mussel. Techniques of edible oyster culture evolved at present in the country include collection of spat and raising them further by rack, pole or tray culture methods.

A major breakthrough achieved in the field of molluscan culture is the development of an indigenous technique in 1973 for the production of cultured pearls and culture of

pearl oysters. Techno-economic studies on commercial scale culture of mussels and pearls are being undertaken from different centres. Pre-farming studies on feeding, spawning biology and environmental requirements of the backwater clam, *Meretrix casta* and the cockle, *Anadara granosa* are in progress.

Studies carried out on the culture of seaweeds have given encouraging results. The experimental culture of *Sargassum* on coir ropes have shown a growth rate from 10 cm to 15 cm within 40 days. In the case of *Gracilaria edulis*, an yield of 4.5 kg per metre has been obtained from a seed of 1 kg during 80 days, while *Gelidiella acerosa* produced 3 kg from an initial 1 kg seed material within 77 days. Spore production in these algae have also been studied with a view to rearing spores to adult plants.

While the technical know-how gained so far in respect of the culture of the above organisms could greatly help the development of the coastal aquaculture, it is essential that the researeh results are taken to the field for adoption by the fish farmers. Pointing out to the endeavours made in this direction through the operational research projects and demonstration programmes, the need for an integrated approach involving research, technological and economic assessment, transfer of technology and establishment of viable culture fisheries for accelerated rural development is stressed.

13. SMALL-SCALE FISHERIES DEVELOPMENT PROJECTS AT MUTTOM, KANYAKUMARI DISTRICT - A CASE STUDY

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The paper briefly reviews the programmes and results of the Indo-Belgian Fisheries Project (1968-1973) at Muttom in Kanyakumari District for the development of the traditional fisheries. Under the Project, a pioneering effort was made towards mechanisation of the catamaran and tests were conducted on beach-landing crafts. Nylon net webbing centres were also started.

On the conclusion of the above Project, the development activities were taken up by the Kottar Social Service Society in 1974. Marketing Associations ('Sangams') have been started. A Boat Buildng Training Centre functions for the benefit of the local youth. Pilot experiments are conducted for improving the operational aspects of the traditional fisheries. The progress of the Society's Fisheries Development projects is presented in the paper. The problems of the small-scale fishermen are discussed. The question of treating mechanisation of the indigenous crafts as a local problem or as a problem of national and global significance is considered.

14. OPERATIONAL RESEARCH PROJECTS — A CASE STUDY OF THE ECONOMICS OF INTEGRATED CAPTURE AND CULTURE FISHERIES

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An Operational Research Project on 'Blending sea farming with traditional capture fisheries' has been in operation at Kovalam, a fishing village 35 km south of Madras from April 1978. This is the first of its kind for the marine fisheries sector. The paper deals with the socio-economic conditions of the fisherfolk of Kovalam, based on data collected prior to the introduction of the scheme. The present status of capture fisheries and the proposed scheme for culturing mussels have been presented. The objectives of the scheme, planned on the guidelines for operational projects, *viz.*, people's participation, feasible development strategies in conjunction with specific need of the locality, increasing the per capita income of the rural folk and improving the social standards of the people to obtain social and equity goals, and the line of approach adopted towards this end have been explained. The scheme has been drawn up to benefit one hundred families initially. One youth from each family will participate in the scheme and give free labour during his leisure time, that is time outside of his regular fishing hours. This spare time job is expected to increase the income of each family by 23.3% in the first year, 46.6% in the second year and 93.2% from the third year onwards. The experience gained during the first six months and future plans have also been discussed.

The constraints for the development of aquaculture by the rural fisherfolk like ownership of backwater farm areas large financial inputs necessary for such scheme and management problems are presented in the paper.

There has been three-fold increase in marine fisheries production as a result of developmental plans since Independence. But this has been more on the export sector and has not benefited the small fishermen who still continue to live below the poverty line. The possible reason for this and plans for integrating aquaculture with capture fisheries, involving the rural fisherfolk as the only method of increasing their socio-economic conditions is discussed.

15. RURAL AQUACULTURE PROJECT AND ITS IMPACT ON DEVELOPMENT OF RURAL AREAS

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The CIFRI/IDRC Project on Rural Aquaculture was initiated by the Central Inland Fisheries Research Institute to bring about an over-all development of rural areas through transfer of the new technologies of seed production and culture of carps and air-breathing catfishes. Demonstrations on new technologies were organised in 38 villages.

19 each in West Bengal and Orissa, covering 149 ponds comprising a total water area of about 60 ha. While demonstrating the recently developed scientific techniques of fish breeding and spawn/fry rearing, 10.58, 0.78 and 0.38 million spawn, fry and fingerlings respectively were produced, of which 8.48, 0.2 and 0.04 million spawn, fry and fingerlings were distributed to the farmers for rearing in ponds other than those covered by the project. A total of over 200 t of table size carps, 1.5 t magur and 0.2 t of singhi were also produced as a result of the demonstrations on carp and air-breathing fish culture systems involving sale proceeds of over Rs. 1.5 million by the farmers.

As a result of the seed distributed amongst fish farmers, an estimated 250 ha of additional water area was brought under fish culture in the rural sector yielding a production of over 200 t of table-fish valued at Rs. 1 million. Almost all the individual farmers, institutions and Gram Panchayats associated directly with the Rural Aquaculture Project have adopted the technologies demonstrated to them, though in a varying measure. The impact has also been recorded in the neighbouring areas where fish farmers have adopted the new technologies following the primary beneficiaries. Participation of voluntary agencies such as Rural Development Consortium, Socio-economic Development Programme and Bratachari Society in West Bengal has further helped in disseminating the technology and widening the area of impact. The importance of *stocking an adequate number of fingerlings in well-prepared predator-free ponds*, use of fertilisers and/or feed seems to have been well realised. A great demand for the seed of exotic carps and air-breathing catfishes has been generated in these areas. Magur and singhi culture is becoming popular with small farmers in West Bengal. While individuals or a group of farmers or institutions have been benefited in West Bengal, the impact of such demonstrations in the panchayat ponds of Orissa has benefited the entire community as the income from the sale proceeds of fish has been utilised for the construction and/or repairs of schools,

ponds and roads and electrifications in villages. Besides creating a direct employment for 96 man-years, the Project has generated considerable self-employment by initiating a number of uneducated and educated unemployed youth in fish breeding and fish culture activities thus creating a class of neo-fish farmers.

16. MIXED PLANTING OF COCONUT, CASUARINA AND CASHEW ALONG THE COASTLINE OF INDIA

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India has a long coastline and fishing is carried out all along the coastline. However, because of the traditional methods of fishing, the fishermen are able to live at subsistence level only. In recent years, it has also been observed that several points along the coastline are subject to varying degrees of sea erosion. The various public works programmes to control this have met with only limited success.

In the present paper, it is proposed that mixed plantations of coconut, cashew and casuarina all along the sea coast will, to a great extent, help to solve these two problems. Stands of these tree crop plants, both pure as well as mixed, can be seen in several parts of India. However, only limited studies have been carried out on an organised and systematic basis. The results obtained from such studies have been presented in the paper. The data show that such plantings will help control soil erosion along the coastline and also to improve the economy of the fishermen along the coastline of India.

17. UTILIZATION OF CONVENTIONAL AND NON-CONVENTIONAL MARINE PRODUCTS AND SCOPE FOR EXPANDING THE CONSUMER SECTOR

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There is plenty of scope for expanding the consumer sector in conventional and non-conventional marine products of our country both in the home markets and outside. An estimated 66.7% of our total fish landings are at present utilised in the unprocessed condition which can be further expanded by prompt and proper propagation of the 'technicracy' of modern, hygienic and efficient methods of handling, preservation and transportation. Similar is the case with our cured and dried fish products whose external markets, though dwindling at present, can very well be revived by a little amount of sophistication, besides meeting the requirements of our protein-starved rural and tribal population to a great extent. Among the non-conventional methods of preservation, both freezing and canning of our fishes, other than prawns, which constitute about 85% of our total marine fish landings, can expand the area of their utilization inside the country, besides capturing even quality conscious external markets. Recently methods have been worked out in our country for turning out several non-conventional speciality products like fish protein concentrate, edible fish powder, fish soup powder, fish wafers, fish jam etc. from less popular/under-utilized varieties of fishes, besides finding out industrial uses for sardine oil, prawn shell waste etc. Miscellaneous trash fishes and fish offal discarded from processing establishments can also be converted into fish meal and fish ensilage for poultry, cattle/livestock feed.

18. DEVELOPMENT OF LOW-COST PROCESSING TECHNOLOGY FOR FISHES AND SHELLFISHES

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The present-day Indian fish processing industry is an export-oriented one making use of the high-cost technology of freezing and canning which cannot be adopted to the conditions, economic and infrastructural, obtaining in the fishing villages in our country. Fisheries have to play a pivotal role in the integrated rural development programmes envisaged. Fish processing techniques adaptable to the rural conditions should have low-cost technology with minimum involvement of sophistication at its disposal. Improvements in the techniques of curing and sundrying of fish, drying of light smoked cured mussel and clam, conversion of prawn head and shell waste to chitosan which is a potential industrial chemical, production of shark fin rays etc. are some of the techniques which are easily adaptable to the rural conditions. An account of the innovations made in the above fields is covered in this paper.

19. CERTAIN ASPECTS OF PRESERVATION OF FISH SUITABLE FOR SMALL-SCALE FISHERIES

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The stress in the utilisation and development of aquatic resources of vast stretches of coastal backwaters, lagoons and similar water spreads has been towards the culture of fishes such as *Chanos*, mullets and eels, crustaceans like prawns and lobsters, and molluscs like mussels, oysters and clams. Seaweeds are also assuming importance and their culture for certain phytochemicals, if not for food, is a commercial possibility. The technical know-how of culturing suitable organisms in our waters has been established and the different maritime states are paying attention to bring such water spreads under fish cultivation.

Increase in fish production must necessarily be linked with proper preservation techniques easily adaptable by the small-scale fishermen and a sound marketing strategy, so as to improve the socio-economic conditions of the producer. The preservation of prawns and its marketing has undergone a revolutionary change during the past two decades from the traditional drying, semi-drying, pickling etc. to the highly sophisticated methods of freezing and canning. Traditional methods with technological improvements in practices can still be adopted with advantage. The different aspects of preservation of fish are outlined and discussed.

20. AQUACULTURE AND POLLUTION

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The relation between aquaculture and pollution is a complex one. Some factors which are considered harmful in a natural ecosystem can be made beneficial in aquaculture. This paper analyses the beneficial changes that can be brought about in water quality by domestic and animal wastes, industrial and organic wastes and thermal effluents to advantage in aquaculture. The general harmful effects of the pollutants which affect aquaculture operations are discussed. It is suggested that the existing marine pollution in coastal waters will have to be carefully surveyed, baseline data gathered and any new pollution viewed in the light of possible effects on the aquaculture in potential areas. The permissible levels of pollutants in estuarine and coastal areas together with the stress they produce on the cultivable organisms when tolerance levels exceed are also discussed.

21. EVALUATION OF PRESENT TECHNICAL TRAINING SYSTEMS IN FISHERIES AND SUGGESTIONS FOR MODERNISATION

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Existing facilities in India relating to the training of managerial, technical and operative personnel for different types of fisheries work have been analysed and their merits and demerits discussed. The inadequacy of the present

facilities to meet the demands of the growing fishing industry has been pointed out and the necessity for establishing specialised training facilities in coastal aquaculture and integrated rural development stressed. Suggestions have been made for modernisation of the existing facilities and creation of additional facilities to meet future demands.

22. TECHNICAL AND MANAGERIAL MANPOWER REQUIREMENTS FOR INTEGRATED COASTAL AQUACULTURE AND THEIR TRAINING NEEDS

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Since the total fish production in India is expected to be trebled or quadrupled by the year 2000, the manpower requirements for fisheries can also be expected to be 2-3 times the present, assuming a reasonable increase in the efficiency of fish production by then.

While attempts to set up a proper research base in the country was made in the late forties, central facilities for fisheries education and training were set up much later. Apart from the early fishery schools of certain provincial departments and the training schemes started in inland and marine fisheries in the Central Research Institutes, the first comprehensive fisheries educational programme in fisheries was started with the inception of the Central Institute of Fisheries Education at Bombay and the Central Institute of Fisheries Operatives at Cochin. The programmes of these institutions have spread now and, besides the lower level of training programmes given by the State Governments,

two Agricultural Universities have full-fledged degree programmes in fisheries with facilities for post-graduate programmes as well.

In general, the fisheries personnel required can be of three categories, namely, those for the primary sector consisting of operatives in marine and inland fishing and fish culture operatives who have to be qualified with the necessary certificates and diplomas; those for managerial operations in fisheries departments and industries, with undergraduate and post-graduate diploma or degree; and those for research and education, with post-graduate degrees and other accomplishments.

While the small-scale fisheries of the coast is nearing full exploitation by capture methods, integration of capture and culture fisheries of the coastal region, can increase the economy of the rural sector of the coast. With the awareness of the potentialities of the brackishwater prawn and fish culture and the new methods of exploiting resources of the coast by culture methods, the long coastline of 6100 km and 2 million hectares of brackishwater area of the country would ultimately be fully utilized. The manpower and training requirements for these developments in the next decade are discussed, with the perspective of integrated rural development of the coastal region.

23. ROLE OF INDUSTRIAL DEVELOPMENT BANK OF INDIA IN ASSISTING SMALL-SCALE FISHERIES AND COASTAL AQUACULTURE FOR INTEGRATED RURAL DEVELOPMENT

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IDBI, the apex public financial institution, extends financial assistance to industrial concerns in two ways - (i) direct and (ii) indirect. IDBI's direct assistance to industrial concerns takes the form of loan, subscription to and/or underwriting of issues of shares, bonds or debentures and guarantees for loans and deferred payments. Small scale industrial units get assistance from IDBI indirectly through its scheme of refinance and to a limited extent through its bills rediscounting scheme. IDBI provides refinance to commercial banks, regional rural banks, State co-operative banks. State Financial Corporations and State Industrial Development & Investment Corporations in respect of term loans granted to industrial concerns.

Since 1973, IDBI has been empowered to extend direct as well as refinance assistance to concerns engaged in fishing or providing shore facilities for fishing or maintenance thereof. All types of industrial concerns in the small scale and medium scale sectors such as sole proprietorships, partnerships, JHF concerns, co-operatives and private and public limited companies are eligible for assistance under the refinancing scheme. IDBI's financial assistance to fishing units, which are mostly in small and medium scale sectors (i.e., units whose project cost does not exceed Rs. 150 lakhs and net worth does not exceed Rs. 250 lakhs), is by way of refinance to SFCs; such refinance

facilities are available to banks from the Agricultural Refinance Development Corporation. The minimum amount in respect of loans to fishing units eligible for refinance was kept low at Rs. 10,000. Refinance is provided to the full extent for loans up to Rs. 5 lakhs to fishing units. Loans to concerns not located in specified backward districts exceeding Rs. 5 lakhs but up to Rs. 30 lakhs, are refinanced up to 80% of the loan amount.

As assistance by IDBI has generally been provided by way of refinance to SFCs and that also to concerns operating in the coastal States, the extent of IDBI's assistance to fishing units (including fish catching and processing) has so far been limited. In 1976-77 and 1977-78, IDBI sanctioned assistance to 315 and 352 units, amounting to Rs. 5.73 crores and Rs. 3.53 crores respectively. IDBI has recently made its refinancing scheme fully automatic in respect of loans up to Rs. 5 lakhs and also dispensed with the minimum limit of loans eligible for refinance. It is hoped that loans to the small fishermen for purchase of fishing boats would hereafter be made available in greater measure.

24. PLANNING STRATEGY FOR INTEGRATED DEVELOPMENT OF THE COASTAL ZONE

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Since the advent of the process of planning nearly three decades back, the principal Plan objectives have continued to be growth on a stable economic base, improvement of average levels of living standards, and removal of disparities in zonal development. The strategy followed has been, by and large, based on the 'Growth Model' in anticipation that investments in key areas would generate a centrifugal growth

pattern reaching remote parts of the country. Periodic evaluation indicated that this had happened only to a limited extent and the process of planning was gradually decentralized to the Community Development blocks. It has, however, yet to reach the grass root levels.

This has particularly affected adversely the development of traditional fishing which contributes even today to the bulk of fish production in the country. State investments directly in this traditional field has been negligible, the cooperative pattern of organization to enable flow of institutional finance has been generally ineffective, and schemes for housing, communications and infrastructure have not been linked with an integrated development programme in spite of the concept of development through community blocks.

Organized industries have been encroaching into the rights of the traditional fishermen without proper assessment of its effect on the ecosystem or environment, vital to the maintenance of fish production. Unregulated mechanized fishing has been leading to an increasing number of clashes between the indigenous and mechanised fishing sectors. Several resources like squids, mussels, clams etc. remain undeveloped. Areas suitable for mariculture are claimed by several other industries which usually get priority.

This imbalance can only be corrected by high level technical survey by disciplines concerned of coastal zones, stratified according to ecosystem, for identification of fields for specific industries without undue disturbance to the environmental conditions. This has to be followed by regulation and monitoring by a duly constituted authority. This authority will indicate priorities and control flow of finance to provide facilities of infrastructure and capital. This will automatically assist the local fishing industry in preserving its existence, developing new lines of exploitation of latent resources and securing a stable economic base for growth on both short and long term basis.

25. POLICIES AND PLANNING OF SMALL-SCALE COASTAL FISHERIES WITH PARTICULAR REFERENCE TO THEIR ROLE IN RURAL DEVELOPMENT IN KARNATAKA STATE

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Development of small-scale coastal fisheries in Karnataka is by far a success story. Till now an investment of about Rs. 22.00 crores has been made in the whole complex of coastal fishing industry consisting of about 1500 inshore mechanised boats, 100 purse seiners, 78 ice plants, 32 cold storages and 25 freezing plants, 3 modern fish meal plants, 12 canning plants and about 25 boat building yards and several fish transport trucks for marketing. This is besides the 8,000 indigenous fishing crafts operating along the coast.

The policies and planning of coastal fisheries development started with long term planning of primary education to fisher children and development of infrastructure facilities specially of providing fisheries roads to about 77 fishing villages. Modernisation in fishing craft was introduced initially on a loan-cum-subsidy basis, fully constructed boats being given to groups of trained fishermen. Side by said training centres were established to train fisher youths in the operation of mechanised boats. As the tempo picked up, instead of supplying fully constructed mechanised boats, the department started giving subsidies for procurement of mechanised boats through institutional finance by individuals and groups of fishermen. Side by side cooperative sector was also encouraged for the procurement and distribution of boats under the Agriculture Refinance Scheme which was also supported by subsidies from the department. About 340 small mechanised trawlers

were supplied through Cooperative Sector to groups of trained fishermen.

With the progress of mechanised fishing, infrastructure facilities like ice plants, cold storages and freezing plants were first provided in the Government Sector and later private agencies were given incentives to start ice plants by offering subsidies to these units. Cooperatives and the State Fisheries Corporation was also encouraged with such subsidies to put up the necessary infrastructures concerning processing plants.

Simultaneously, landing and berthing facilities were provided at important fish landing centres through assistance from Government of India.

A State Fisheries Development Corporation was also set up to provide additional infrastructure facilities which the private entrepreneurs could utilise for both processing and export with the result quite a number of entrepreneurs from the fishermen community itself have availed of these facilities and are substantially participating in the processing and export industry of Karnataka.

In such areas where it is difficult for small scale entrepreneurs in fisheries to venture, like deep sea fishing, the State Fisheries Corporation is taking the lead.

In order to diversify mechanised fishing so that a single resource is not over exploited, the department has encouraged purse seining by groups of fishermen availing of institutional finance with the support of subsidy given by the department and already about 100 purse seines (on which a total investment of eight crores of rupees has been made in the last two years) are operating in Karnataka substantially adding to the total catch.

In order to avoid possible clash of interest between the traditional Rampani units of Karnataka Coast and the modern purse seiners the Government has launched a special

scheme to assist Rampani operators to go in for purse seining with financial assistance from commercial banks suitably supported by soft loan and subsidy from Government. 20 such units were sanctioned last year and 20 more are being sanctioned this year. Ultimately Rampani operators who were interested to go in for purse seine will be assisted with preference.

To further diversify mechanised fishing and to put in additional fishing efforts on column fishing (mid-water fishing) which has not been exploited substantially so far, the department has proposed to offer subsidies for gillnet fishing also.

Among the 23,000 active fishermen of the Karnataka coast, already 8,000 are in mechanised inshore trawling with about 1,500 mechanised boats. Another 4,000 will be engaged in purse seining very shortly with 200 purse seines which are expected within the close of the present season. This means that 12,000 of the 23,000 will be covered by mechanisation (more than 50% of the total). In order to help the remaining fishermen as much as possible, out-board engines are being procured to motorise dug-out canoes and additional Rampanis will be assisted with purse seine units. However, it is anticipated that 25% of the active fishermen will ultimately continue to do traditional fishing and the proposed delimitation law will give them adequate protection against competition from the mechanised sector.

Encouragement of Cooperative Sector, Private Sector through individuals and groups of fishermen, as well as the Public Sector Corporation side by side has been the main policy of coastal fisheries development of Karnataka. Subsidy for viable investments in small-scale fisheries with financial assistance from commercial banks to groups of fishermen or individual fishermen has been the theme of development. The effective co-ordination and regulation for healthy growth of the industry through cooperation from financial agencies has been a contributing factor.

26. PUBLIC POLICIES AND PLANNING OF RURAL FISHERIES IN INDIA

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The aim of the paper is to focus attention on the public policies and planning of rural fisheries in Kerala State, restricting the term rural fisheries to cover only artisanal fishermen, both inland and marine, and thus excluding mechanised fishing and deep-sea fishing. The first part of the paper deals with the efforts made by the Department of Fisheries, Kerala for organising the traditional fishermen in the past in the marine sector and the future programmes for their uplift. The second part deals with the present status of inland fishermen and the current programmes of the Department in this area with particular reference to capture fisheries, licensing of nets and control of public waters. The last part of the paper discusses the planning of coastal aquaculture in Kerala, with emphasis on the public policies that will be required to make the programme a success.

27. PURSE SEINE OPERATION AND ITS FUTURE PROSPECTS IN GOA

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In this paper an attempt has been made to show that the purse-seine operations started by the Directorate of Fisheries in the year 1964 on an experimental basis have been accepted by the local enterprising fishermen for the commercial exploitation of the pelagic resources which abound

the offshore waters. In view of the exploitation of the single item of shrimps on a massive scale during the last three decades, the economics of the prawn fishing units are proving to be a burden. In case such units have to survive, they must diversify their mode of fishing and exploit the pelagic resources which till now were being exploited only by the traditional gears on a very limited scale in a limited area. The economics of such purse-seine cum trawlers have been highlighted in the paper. Unless more emphasis is given on diversification of fishing, the future of smaller units already introduced in our waters will be in danger.

28. MONSOON FISHERY AND MUD BANKS OF KERALA COAST

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The monsoon fishery constitutes a small-scale fishery along the southwest coast of India during the southwest monsoon months. The rough sea conditions during the monsoon months limit the fishing activities to a great extent. The mud banks formed at restricted places along the Kerala Coast play a vital role in the success of the monsoon fishery in view of the fact that they serve as safe launching and landing places for the country crafts. Studies on various problems including fishery were carried out at two areas, namely Purakkad-Thottappally in Zone K-4 and Valappad-Nattika in Zone K-6, where mud banks occur almost every year. The total catch as well as catch per unit effort in terms

of man hours for mud bank and non-mud bank centres in these zones were estimatad. Though the total landing is estimated to be high, the catch per unit effort for the mud bank area does not show much variation when compared to the non-mud bank area. The average catch per unit effort for 1973-'77 period was 5.34 and 4.94 kg respectively for the mud bank and non-mud bank areas of Zone K-4. Similarly, the average catch per unit effort for the mud bank and non-mud bank area of Zone K-6 was observed to be 5.5 and 2.4 kg respectively. The variation in the catch per unit effort in this zone is due to extended rough sea conditions during 1976 and 1977 when profitable fishing was not possible in the non-mud bank area.

The present paper embodies a detailed account of this small-scale fishery connected with the mud banks along the Kerala Coast, the craft and gear, species composition and the relative abundance of major fishery components. An attempt is also made to project the socio-economic status of the fishing community of this area along with the infra-structure and the impact of the legislation on the fishing community and the monsoon fishery.

29. PROBLEMS AND PROSPECTS OF BRACKISHWATER FISHERIES AND COASTAL AQUACULTURE IN GUJARAT

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The paper deals with the present status of brackishwater fisheries activities in Gujarat. Problems, further scope and recommendations in relation to aquaculture are discussed.

30. UTILISATION OF SUPERNATANT MUNICIPAL WASTE-WATER IN BRACKISHWATER AQUACULTURE

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Preliminary investigations were conducted during 1977-78 for finding out the effect of regulated ingress of supernatant municipal waste-water diluted with tide water in increasing productivity of brackishwater fish farm in low salinity zone of an estuary. The salinity of the 15 ha farm ranges between 0.5 and 12 0 ppt and the temperature between 19.5° and 35.5°C. The D.O. of water varies from 3.0 to 12.0 ppm and the B.O.D. from 5 to 20 ppm. The pH ranges between 7.1 and 8.7. The fishes grown in the farm are acclimatized major carps, *Penaeus monodon* and other shrimps, the growth of which are remarkably good. Comparatively high soluble phosphate seems to be an important factor in maintaining the high productivity of the fish farm.

31. RECYCLING AND UTILIZATION OF FISH WASTE AND THE WASTE OF POULTRY AND LIVESTOCK

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India is one of the leading countries for the export of frozen shrimp. In the year 1976, frozen shrimp worth Rs. 160 crores and weighing about 47,952 tonnes was exported. While beheading and peeling of shrimp, waste material

forming nearly 40-45% of the original weight of the starting material is obtained. Also, along with shrimp, huge quantities of small varieties of fish and *Squilla* are obtained. Their disposal poses serious problem. Shrimp waste and *Squilla* could be processed into intermediate product 'chitin' for subsequent conversion into Chitosan which finds many industrial uses. The small varieties of fish being not tasty and with lot of bones could be converted into processed fish products with acceptable profiles, while the waste material such as head, viscera, scale etc. could be converted as a poultry feed.

During the raising of poultry, one-day old male birds (cockerels) are destroyed in thousands every day because their growth rate is not comparable with broilers. These birds could be reared on low cost feeds and the dressed poultry from such birds can find use for table purpose.

Huge quantities of blood and intestines are obtained daily by slaughtering thousands of sheep/goat, pigs and buffaloes. The blood could be converted into blood meal for poultry feeding or for fire extinguishing, while the intestines could be processed into casings for use in sausage making. The above few items suggest profitable use of some of the waste material from fish, meat and poultry.

32. IMPROVEMENTS IN TRADITIONAL HANDLING AND PROCESSING OF FISH — SOME OPTIONS

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Post-harvest technology is relevant to small-scale fisheries, only when the price realised per unit of catch improves as a consequence of adopting it. Techniques for improved

handling of catches and curing of surplus fish are available for adoption on even small scale. Although processing technologies like freezing, canning or reduction cannot be adequately scaled down to make them less capital intensive, they help to eventually raise the levels of price realised per unit catch. To achieve this, technology has to be integrated with all aspects of economics, handling, distribution and marketing.

33. OPERATIONAL FISHERIES TRAINING

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The paper deals with the specific requirements of qualified man-power needed for developing the sea fishing industry. Organised training to exploit the inshore potentialities with mechanised vessels was mooted out soon after Independence. Maritime State Governments, during the successive Plan periods, created training facilities to train suitable men for handling the modern fishing gear and small mechanised vessels capable of operating within the 10-mile belt. There was a lacuna with regard to the exploitation of resources beyond the range of the conventional fishing crafts and small mechanised crafts. Larger vessels were needed for exploiting the resources beyond the inshore limits. The Government of India created two training establishments to create suitable manpower to handle larger vessels with more sophisticated fishing gear. At the same time another Institute was created to

develop suitable man-power for district-level fishery administration.

In this paper an attempt is made to analyse the possibilities of linking the man-power already created under various training programmes with the development of small-scale fisheries.

34. ROLE OF KRISHI VIGYAN KENDRA AND TRAINERS' TRAINING CENTRE IN THE TRAINING OF OPERATIVES FOR COASTAL AQUACULTURE

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The Central Marine Fisheries Research Institute, in recent years, has developed indigenous techniques to rear and culture various marine and brackishwater animals. In order to transfer the technical know-how to the farm men and farm women, a Krishi Vigyan Kendra (KVK) for Mariculture was established at Narakkal. The KVK is the primary agency in the transfer of technology from the research laboratory to the field. As such, it plays a very significant role in the development of rural areas. The Krishi Vigyan Kendra concept differs from agricultural polytechnics in that it does not intend to impart training to produce certificate- or diploma-holders. It is designed to provide skill-orientated vocational training to the practising farmers, in-service field level extension workers and to those who intend to go for self employment.

The Kendra at Narakkal has been imparting training on prawn/fish culture since its inception in December 1976.

Courses are formulated to suit the particular needs of the farmer. The syllabus and the time schedule are kept so mobile as to facilitate this. Upto the end of 1978, 19 courses have been conducted, training 302 farmers including 66 farm women. The Kendra, through its trained farmers, introduced for the first time scientific culture of fast growing species of prawns in the hitherto unutilised canals in the coconut groves at Narakkal. Intensive training on the culture of other marine organisms such as oysters, mussels and seaweeds is also to be taken up. The KVK is a district-oriented institution catering to the immediate needs of the district and as such it is also to be developed as a training centre in other fields such as agriculture, piggery, home management and home craft.

The kind and quality of training envisaged in the Krishi Vigyan Kendra demands practical and experienced trainers. To meet such demands a Trainers' Training Centre is to be established at the Central Marine Fisheries Research Institute.

35. FINANCING SMALL FISHERMEN – A CHALLENGING TASK

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Outlines of paper: Introduction - importance of fishing industry - types of fisheries - inland and offshore - deep sea fishing - technical aspects for financing fisheries project - special reference to small fishermen engaged in traditional fishing - items of expenditure - estimation of fish catch and value - processing, marketing and transport - engagement of middleman - financing - recovery - problems faced by banks - role of Fish Farmers Development Agencies - suggestions.