

1. FISHERIES ECONOMICS RESEARCH AND EDUCATION IN INDIA : AN OVERVIEW

R. S. Biradar, Shyam S. Salim, Mukunda Goswami and S. Ayyappan

Central Institute of Fisheries Education
(Deemed University, ICAR)
Fisheries University Road
Versova, Mumbai - 400 061

1. Introduction

The food security problem in India has been alarming due to the rapid growth of population and the reduction of the per capita land. The current scientific, economic, environment and social trends are forcing farmers and policy makers to look for alternatives to fulfill the nutritional requirement for the growing population. Fish with an average of 18-21 percent protein can be the best alternative in this context. Fisheries sector have been playing an important role in the national economy through improved food supply, employment and income. During 1998-99, fisheries sector contributed Rs.22,223 crores to the total Gross Domestic product (GDP), forming 1.4% of the total. The seafood exported from India in terms of volume is 3.4 lakh tonnes and Rs.6200 crores in terms of value (Ayyappan and Biradar, 2001). The exploitation of marine fishery at sustainable level is very essential in view of the sluggish growth of the sector in recent years. The cost effective and environment friendly fishing technology is to be worked out. Fish farming practices hold promise for many small farmers and potential significant benefits for strengthening the rural economy. How fast farmers adopt fish farming practice depends on economic opportunities and incentives. These incentives are influenced by available resources, technical information, market forces, environment society, research priorities and government policies.

Not much research work has been done in respect of fisheries economics in India. There is no separate department for fisheries economics in any fisheries college in India except at College of Fisheries, Tuticorin. The discipline of fisheries economics – comprising both aquaculture and capture fisheries economics has much scope to play a catalytic role in fisheries development in the country. In this context it is highly essential to review the status of research in this field and to suggest possible areas in research and education in fisheries economics.

2. Fisheries Economics Research

Research related to fisheries economics mainly covered marine capture fisheries. Most of the research works were carried out on different areas on specific problems relating to economics of different fishing methods, impact of mechanization, marketing

problems, etc. Some micro level studies on the costs and earnings of different craft-gear combinations indicated that the introduction of mechanized fishing boats such as trawlers, gill netters and purseiners along the Indian coast have shown positive economic impact (Sathiadhas, 1997). Investigations related to these aspects are skeptical and pointed out various conservation problems and negative effects of mechanization on traditional sector.

Lot of work has been carried out in socio-economic aspects of marine fisheries. Socio-economics have been brought into existence by the demands of the planners attempting to combine coverage of the social sphere into one role with in the project or planning team. Several micro and micro-level socio-economic surveys had been conducted by various agencies and research workers in different regions of our country to study the socio-economic problems of the fishermen community (Desai and Baichawal, 1960, Selvaraj, 1975, Panikkar, 1980, Subbarao, 1986, Sathidhas and Panikkar, 1988 and Korakandy Ramakrishnana, 1994). These researches over all covered the aspects like characteristic features of the target groups of species developmental programmes, impact of introduction of new technologies and practices on income and employment, economic impact of detonative fishing and mariculture practices, economic growth of particular region in comparison to national development.

Research conducted at various part of the country attempted to cover costs and earnings of fishing practices of marine sector, economics of the operation of various crafts and their feasibility of operation. Varghese (1996) evaluated the economics of industrial fishing vessels and worked out trends and cycles in fishery returns from motorised and traditional crafts. Extent of swing in the annual revenue was also observed. Techno-economic assessment of marine fish production carried out by Devraj, *et al.*, 1998 assessed the economic performances of trawlers and motorised gill netters and analyzed the distribution pattern of marine fish on the terminal market.

Socio-economic study of smallscale marine fishermen was carried out where emphasis was given on costs and earnings of traditional fishing units (Sathiadhas and Panikkar, 1988). Economic performance of mechanised trawlers was also worked out with economically optimum level of fishing effort (Devraj and Smita, 1988). Rajan, 1995 studied socio-economic conflicts and their resolution in the state of Kerala.

With regard to marine fish marketing a few studies have been conducted in the national and regional levels (Saxena, 1983, Rao, 1983, Sathiadhas and Panikkar, 1988, Panikkar *et. al.* 1996). Studies related to the economics of fish retailing in Orissa highlighted issues related to marketing cost, market margin, seasonability of sale of fish and factors responsible for the success of fish trade in urban and rural areas (Mallick and Samuel, 1993). Studies have also been carried out to analyze the marketing share of fisherman and middlemen in consumer price (Sathiadhas and Panikkar, 1992). Trade related aspects of fish and fishery products were also studied to see opportunities of these products in international trade. Few studies have been made to observe marketing structure and price behaviour of marine fish.

Study conducted by Sathiarajan (1988) pointed out that infrastructure need for domestic fish marketing in India is not adequate. Possible impact of WTO agreements on fish trade was also studied. Shassi and Ramachandran (1998) found out changing market demand for marine products and identified the trend of increasing market demand for marine products. Some studies worked out the economics of using containers (ice box) over the conventional fish basket for fish trading. Srivastava (1992) identified different market intermediaries and fishermen farmers share in the consumers rupee. Remunerative price for the producer and reasonable price for the consumer can be assured only by strengthening the fish marketing structure. Marketing practices in different parts of the world, various impediments that are affecting the fish trade throughout South and Southeast Asia were studied by Rao (1991).

Study has also been made to find out the availability of finance for modernization, product diversification revisable of sick units of marine products manufactures for exports (Joy, 1991). Financial institutes can play a significant role for planning of both physical and financial resources besides playing important role in transferring technology. Role of financial institutes in fisheries development was reviewed by Palanisamy and Ghos (1998). Their studies also brought out various non-credit functions performed by the financial institutes in promoting new technology and development of the sector.

Datta and Das (1989) carried out input output relationship in capture fishery and worked out relationship between capital intensity and labour productivity and capital intensity and production. The Cobb-Douglas production function was used to find out the functional relationship of input and output for selected types of craft-gear combinations (Panikkar and Srinath, 1991).

Fisheries economics research related to inland fishery is very meagre. Some of the studies covered riverine fisheries with regard to income of fishermen and fishermen's share in consumer's rupee. Chaudhury (1989) analysed econometrically the socio-economic conditions of fishermen community adjacent to beel in lower Assam. Social status and socio-economic problems of fishermen living along the Ganga and the Yamuna river at Allahabad were studied by Singh *et al.* 1995.

Paul (1997) reviewed infrastructural base and policy support for inland fisheries. Lack of pre-harvest and post harvest infrastructural support in terms of efficient marketing mechanism, institutional funding arrangement and prevalence of revenue biased exploitation policies are prevalent in this sector. Some important aspects of riverine fishery, conservation and fishery management, income generation and productivity, input supply and remunerative prices to fishermen needs immediate infrastructure and policy support measures.

Few studies have been conducted on aquaculture economics. Ranadhir (1986) first reported the costs & earnings of traditional fish culture operations. Studies related to

cost of production, cost of operation, various cost factors and profit composite in fish culture were carried out by several researchers (Sinha, 1976, Rao, 1996, Ranadhir and Tripathi, 1991, Suresh *et al.* 1992, Dalai and Das, 1992, Singh *et al.* 1995, Rao and Raju, 1998 etc.). Ghosh (1990) studied investment pattern in organized system of coastal fish culture system with distinct brackishwater and freshwater aquaculture phases. Sathiadhas *et al.* (1996) worked out economic evaluation of composite culture practices of crab fattening and fish-shrimp farming in Kerala.

Some studies on costs and earnings of integrated fish farming were carried out in different parts of the country (Ghosh, 1979, Sharma *et al.* 1979, Ghosh *et al.* 1985 and Shingare and Shirgur, 2000). Cobb-Douglas production function has also been applied in fisheries in some studies. (Rout, 1991, Randhir and Tripathi, 1992, and Rao and Raju 1998).

3. Profile of Fisheries Economics Education

Graduate level fisheries economics education in India is restricted to one or two courses in economics and three or four courses in management. The courses are offered either by department of economics or department of management studies in various state agricultural universities. There is no post graduate level programme in fisheries economics except the one offered by Tamil Nadu Veterinary and Animal Science University at College of Fisheries Science and Research Institute, Tuticorin.

Uniform syllabus has been recommended at undergraduate level (UG) for all the fisheries college in the country. According to revised syllabus the subjects under fisheries economics include Fisheries Economics (2+1), Co-operative, Banking and Management (2+2) and Project Formulation, Monitoring and Implementation (1+1). There is still a lot to be improved before implementing it as a unified syllabus for different fisheries colleges. Adoption at national level is expected soon. The subjects related to fisheries economics included in the B. F. Sc. programme in different fisheries college of the country are given in Table - 1.

The master's level programme in fisheries economics is a replica of Agricultural curricula followed in other State Agricultural Universities. We can compare Aquaculture economics with agricultural economics while capture fisheries to forestry studies. But fisheries require unique economic tools and course. The syllabi of post graduate programme offered in fisheries economics by TNVASU is given in Table - 2.

Table-1 : Institution-wise coverage of major areas in Fisheries Economics (Graduate Level)credits

Major Areas	Institutions									
	AAU	KAU	OAU	KKV	TNVASU	GBP	UAS	ANG-AU	WBAU	RAU
1. Principle of Economics				1+0		2+0			2+1	
2. Fisheries Economics	1+0	3+1		1+0	2+1	2+1	2+1	2+0	2+1	
3. Co-operative, Banking & Management							1+1			
4. Business organization & personal management/Business Management	2+0	2+0		1+0						
5. Project Formulation, Implementation and Evaluation	1+1									
6. Fishery administration and Finance/ Legislation, Planning and Finance				2+2				2+0	2+1	
7. Fish Marketing and co-operation Business Organization and Personnel Management										2+1
8. Fisheries managerial Economics		3+1								
9. Aquaculture economics					2+1					
10. Fish Marketing and Co-operatives			2+1		2+1			2+0		
11. Fishery Planning, Finance and Management			2+0							
12. Fishery Project/ Project Formulation and Finance			1+1				2+2			

Table-2 : M.F.Sc. (Fisheries Economics) course structure

1	RMC	601	Research methodology	1+1
2	FST	621	Statistical methods	3+1
I Optional : Any two)				
1	FEC	612	Fisheries finance	1+1
2	FEC	613	International trade in fish and fishery products	1+1
3	FEC	614	Fisheries price analysis	1+1
4	FST	611	Statistics for social sciences	1+1
II Major Courses				
1	FEC	601	Microeconomics	2+1
2	FEC	602	Econometrics	2+1
3	FEC	603	Marine resource economics	2+1
4	FEC	604	Aquaculture production economics and management	2+1
5	FEC	605	Macro economics	2+1
6	FEC	606	Fisheries marketing management	2+1
7	FEC	607	Fisheries project analysis	2+1
8	FEC	608	Fisheries development policy and planning	2+1
III			Seminar	0+1
IV			Research	0+20

Abstract

I Minor courses	:	10 credits
II Major courses	:	24 credits
III Seminar	:	1 credits
iv Research	:	20 credits

55 credits

The Central Institute of Fisheries Education, conducts postgraduate programmes (M. F. Sc.) in five disciplines viz. Inland Aquaculture, Fisheries Resources Management, Mariculture, Freshwater Aquaculture and Post Harvest Technology. Courses related to fisheries economics which are taught under these programmes are Inland Fish Marketing Management and Cooperatives (2+0), Management Accounting as applied to Fisheries (1+0), Manpower Planning and Human Resources Development (1+0), Principles of Business Management as Applied to Fisheries (1+0), Plan and Project Formulation, Implementation and Evaluation (1+0), Mariculture Economics, and Extension (2+1),

Aquaculture Economics and Marketing (1+1), Economics and Marketing (1+1), Project Planning and management (1+1). At Ph. D. level also courses related to fishery economics like Principles and Practices of Fisheries Management (2+1), Fishery Socio-economics (2+1), Capture Fisheries Economics (2+1), Aquaculture Economics (2+1) and Fish Marketing and Trade (2+1) are being taught.

4. Suggested Areas in Fisheries Economics Research / Education

- Establishment of a network of fisheries economics research is very much essential to exchange information.
- Policy instruments to overcome the following problems
 - Sluggish growth rate in production
 - Inadequate marketing infrastructure
 - Demand and supply imbalance
 - Inter sectoral conflicts
 - Insignificant contribution of deep sea fishing
 - Lack of diversification in export trade
- Reliable data base relating to resources, their utilization, present production and potentiality is important for policy implications for fisheries development.
- Use of remote sensing and GIS technology for management of open water fishery and aquaculture.
- Development of suitable fish yield models for different types of resources is essential studies pertaining to multi-species population dynamics and resource economics are essential in this.
- Socio-economic status of fisheries / fish farmers is not conducive enough to attract credit and infrastructure support for required fish farming inputs as well as modern craft and gear from traditional banking and financial institutes. Research to evolve a new set of criteria for assessing credit-worthiness and repaying capacity of fish farmers / fishers as lack of credit worthiness adversely affects investment appraisal and assessment of funding possibilities.
- Comparative economic efficiency of location specific fishing crafts and gears related to inland and marine capture fisheries. It is also important to work out the best economically efficient craft –gear combinations as it differs considerably between regions.
- Economic effectiveness of Deep sea fishing at different level.

- Insurance policy for fishers/ farmers to guard them to fight against natural disasters.
- Assessment of role of co-operatives in strengthening poor fishermen / farmers. Fisheries co-operative have miserably failed to intervene in fish marketing and ensure a better consumer price to fishermen. The failure is considered to be one of the main reasons for the low incomes of fishers. Possibilities for strengthening the co-operative societies to ensure fishermen's benefit.
- Importance of upgrading technology, integrated project covering production, processing and marketing of value added consumer products.
- Emphasis on participatory programme for women in marine fish marketing. Fish marketing and management of co-operative society with special reference to women is necessary. Scope of utilization of women power for transportation and retailing sale is essential.
- Study of fish marketing to explore the possibilities of product development, cold-chain grade in the domestic market and development of transit and terminal markets at whole sale and retail levels. Fish marketing net work – Development of market linkages between various production groups. Marketing systems prevailing in different parts of India. Market structure and structural changes in fish marketing to cope-up with modern marketing. Aggressive market promotion to build up an improved image of India as a reliable supply of supplier of quality sea food.
- Induction of technology for value addition.
- Impact of Quantitative restrictions on fisheries trade.
- Species diversification for export .
- Assessment of ornamental fish trading opportunities at international level
- Settling trade related disputes over the protection of marine living resources.
- Financing institutes and their schemes for fisheries development and their impact on fisheries development .
- Subsidy scheme for fishing as well as fish culture – upgradation of the subsidy.
- Economic appraisal of riverine fishery. Riverine fishery being significant contributor to inland fish production (88%), aspects like technological inputs supply of fishery requisites, finance and post-harvest infrastructure assuring remunerative prices to fishermen, should be taken care of.

- Location specific / species specific economic evaluation of fish farming practices.
- Economic viability of integrated fish-farming practices (paddy-cum-fish culture, pig-cum-fish culture etc.) especially in North-eastern states of India and their comparative economic efficiency
- Application of different models in fisheries-Frontier production model, Economics management tools. The importance should be given for the use of computer-aided tools for planning, budgeting, record keeping, accounting and assessment of techno-economic aspects of fish farming / fishing and input use pattern for profitability and sustainability.

References:

- Ayyappan, S. and R. S. Biradar, 2001. Learn to Fish – Fish to Earn. In: National Symposium on Fishery Technologies and Their Commercialization, 11-12 Jan, 2001, pp 80-89.
- Chaudhury, M., 1989. An econometric study on the socio-economic status of the fishermen community in lower Assam, *J. Inland Fish. Soc. of India*, **2(1)** : 7-13.
- Dalai, S.K. and Das, S.K. (1992) Economic analysis of fish production under extensive aquaculture practice in Ganjam district of Orissa. *Sea Food Export Journal*, **XXIV(8)**: 21-23.
- Datta, K.K. and S. S. Dan, 1989. Input-output relationship in capture fishery : A case study in Orissa coast. *J. Mar, Biol. Assoc. India*. **31(1-2)** : 228-233.
- Desai, M. B. and P.R. Baichwal 1960. Economic Survey fo Fishing Industry in Thana District. Bombay, India. In : E.F. Srerepanic (ed.). The Economic Role of Middlemen and Cooperatives in Indo pacific Fisheries, FAO, Rome.
- Devaraj, M. and P. Smita, 1988. Economic performance of mechanised trawlers in the state of Kerala, India. *Fish. Res.* **6(3)** : 271–286.
- Devaraj, M., R., Sathiadhas, R. and R. Reghu, 1998. Technoeconomic assessment of marine fish production, marketing and capacity utilization of processing plants in Gujarat. *Mar. Fish. Inf. Serv. Tech. Ext. Ser.* **155** : 1-9.
- Ghosh, A., 1979. Use of domestic sewage in fish culture. In: Souvenir in commemoration of the ICAR golden jubilee year, 1979, Central Inland Capture Fisheries Research Institute, Barrackpore, Part I : 90-95.

- Ghosh, A., Saha, S.K., Banerjee, R.K., Mukherjee, A.B. and Naskar, K.R., 1985. Package of practices for increased production in rice-cum-fish farming system, Aquaculture Extension Manual, 4, Central Inland capture Fisheries Research Institute, Barrackpore, West Bengal : 1-14.
- Ghosh, A., 1990. Rice-cum-fish culture and its economic feasibility. In: V. V. Sugunan and Utpal Bhaumik (Eds.). Technologies for Inland Fisheries Development, Central Inland Capture Fisheries Research Institute, Barrackpore, West Bengal : 69-84.
- Joy, C.P.H., 1991. Finance for modernisation, product diversification, revival of sick units of marine products manufactures for export. *Seafood Export J.* **23(10)** : 31-32.
- Korakandy Ramakrishnan, 1994. Technological change and the development of marine fishing industry in India – A case study of Kerala. Daya Publishing House, Delhi – 110 035 : 1-338.
- Mallick, S.C. and R.K. Samal, 1993. Economics of fish retailing in Angul District of Orissa. *Fish. Chimes*, **13(7)** : 50-54.
- Palanisamy, K and S. K. Ghosh, 1998. Technological advancements in Fisheries Proceedings of the National Symposium on Technological Advancement in Fisheries and its Impact on Rural Development held at Cochin by School of Industrial Fisheries, Cochin University of Science and Technology during December 5 to 7, 1995. Hameed, M. S. (ed.); Kurup, B.M. (ed.) Cochin India CUSAT 1998 : 495- 502.
- Panikkar, K.K. P., 1980. Coastal rural indebtedness – A case study. *Mar. Fish. Infor. Ser. T. & E. Ser.*, **18** : 8–12.
- Panikkar, K.K.P. and R. Sathiadhas, 1991. Rationality of the use of factors of production by small trawlers along Calicut Coast. *J. Mar. Biol. Ass. India*, **33 (1&2)** : 1994-1997.
- Paul, S. 1997. Fisheries enhancement of small reservoirs and floodplain lakes in India Sugunan, V.V. (ed.); Sinha, M. (ed.) Barrackpore India CIFRI, 75 : 237-240.
- Ranadhir, M. and Tripathi, S. D., 1991. Production options in carp culture. In: *Proceedings of National Symposium on Freshwater Aquaculture*, Central Institute of Freshwater Aquaculture : 213-216.
- Ranadhir, M. and Tripathi, S.D., 1992. Modeling in Aquaculture-Some Critical Issues. In: S.D. Tripathi, M. Ranadhir and C.S. Purushothaman, *Proceedings of the Workshop on Aquaculture Economics*, 20-22 November, 1991, Special Publication 7, Asian Fisheries Society, Indian Branch, Mangalore, India : 13-16.

- Rao, D.V.S. and Raju, V.T., 1998. Economics of Fisheries Technologies, Ambica Book Agency, Jaipur : 35-55.
- Rao, P.S. 1991. Traditional trade of Fish and Aquaculture Products in South and Southeast Asia. *J. Fish. Eco. Dev.*, **1 (1)** : 1-26.
- Rao, P.S., 1996. Investment pattern for aquacultural farms, *J. Fish. Eco. Dev.*, **3(1)**: 31-40.
- Rao, S.N., 1983. Product development for export. Fisheries development in India some aspects of policy management. Concept Publishing Company, New Delhi :211-218.
- Rout, M., 1991. Computer modeling for fish production in freshwater aquaculture ponds. In: *Proceedings of National Symposium on Freshwater Aquaculture*, CIFA, Bhubaneswar : 146-148.
- Sathiadhas, R. and K.K.P Panikkar,. 1988. Socio-economics of small scale fishermen with emphasis on costs and earnings of traditional fishing units along Trivandrum coast, Kerala - A case study, *Seafood Export J.* **20(ii)** : 21-36I.
- Sathiadhas, R. and K.K.P Panikkar, 1991. Economics of catamaran fishing along the Madras coast. *J. Mar. Biol. Assoc. India*, **33(1-2)** :241-245.
- Sathiadhas, R. and K.K.P. Panikkar, 1992. Share of fishermen and middlemen in consumer price : A study at Madras region. *J. Mar. Biol. Assoc. India*, **34(1-2)** : 18-25.
- Sathiadhas, R., R. Reghu and V.K. Suresh, 1996. Economic Evaluation of Composite Culture Practices of Crab fattening and fish-shrimp farming in Kerala. *Fishing Chimes*, July 1996 : 31-34.
- Sathiarajan, 1988. Importance of domestic fish marketing in the development of fisheries in India. CMFRI – SPEC. PUBL. 1988. No. 40, : 87-88.
- Saxena, B.S. 1983. Uses of economic tools in formulation and executing Indian fishery policy. Fisheries development in India – some aspects of policy management. Concept Publishing Company, New Delhi : 1-220.
- Sehera, B.S., K.K.P. Panikkar and J. P. Karbhari, 1992. Monsoon fisheries of the east coast of India : prospects, problems and management. Rao, P.V.; Murty, V.S; Rengarajan, K. eds. Central Marine Fisheries Research Institute, Cochin, India, CMFRI 1992 no. 45 : 242-250.

- Selvaraj, C., 1975. Small fishermen in Tamil Nadu, Madras Institute of Development Studies, Publication No.9. Sangam Publisher, Madras.
- Sharma, B.K., Dilip Kumar, M.K., Das, S.R. and Chakraborty, D.P., 1979. Observations on swine-dung recycling in composite fish culture. In: Symposium on Inland Aquaculture (Abstracts), Feb- May 12-14, 1979, Central Inland Capture Fisheries Research Institute, Barackpore : 99.
- Shassi, S. and A. Ramachandran, 1998. Technological advancements in fisheries proceedings of the national symposium on technological advancements in fisheries and its impact on rural development held at Cochin by School of Industrial Fisheries, Cochin University of Science and Technology during December 5 to 7, 1998 : 417-425.
- Shingare , P.E. and Shirgur, G.A., 2000. Minimum input-oriented paddy-cum-fish culture in summer: case study, *Fishing Chimes*, **20(5)** : 45-46.
- Singh, R.K.P., Sing, L.N. and Prasad, K.K., 1995. Economics of fish Production in Hasanpur block, Samastipur District, Bihar, *Journal of Fisheries Economics and Development*, **2(2)** : 1-15.
- Sinha, V.R.P., 1976. FAO technical conference of aquaculture, Japan, 26 May-2 June 1976 : 1-7.
- Srivastava, U.K., 1992. Aquaculture Marketing and Economics in India. In : Aquaculture Research Needs for 2000, Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi : 311-325.
- Subba Rao, N., 1986. Poaching of fish by alien vessels : Needs for a National Strategy. *Seafood Export Journal*, **18 (9)** : 15-20.
- Suresh, R., Selvaraj, P. and Ramkumar, R.K., 1992. Costs and returns of composite fish culture in Madurai District, Tamil Nadu. In: S.D. Tripathi, M. Ranadhir, C.S. Purushothaman, Proceedings of the workshop on Aquaculture Economics, 20-22, Nov. 1991 : 33-38.
- Vergheese, C.P., 1996. Economic of Industrial fishing vessels operated in the Upper East Coast of India. Proceedings of the seminar on Fisheries a multibillion Dollar Industry held at Madras, India from August 17 to 19, 1995 :185-200.