

Aquaculture Extension : the Neglected Aspect in Aquaculture Development

M. Kumaran, V. S. Chandrasekaran and N. Kalaimani

Central Institute of Brackishwater Aquaculture (CIBA)

75, Santhome High Road

Chennai-600 028

Aquaculture, which contributes half of India's fish production utilizing only 16% of its brackishwater and half of freshwater culture fishery potential, is emerging as the focus for future fisheries development. This surmise is based on the present situation of the production from capture fisheries becoming almost stagnant. Information, particularly on the huge potential of aquaculture for fish production, is not properly disseminated among the concerned in India. Public awareness has to be created that the nutritional security of India depends heavily on how the country develops aquaculture with expediency. Since the population is expected to touch 1.5 billion in another 25 years, the quantity of nutritious food required to eliminate malnutrition will be very high. Considering the fast rate of urbanization of agricultural lands, the only reliable source that will remain at our disposal is the huge hidden potential of aquatic resources that can be judiciously harnessed through aquaculture. Hence, awareness creation programmes are to be taken up to educate public/consumers on one side and the politicians, administrators and officials who are involved in decision-making process for fisheries/ aquaculture development in India on the other. The prevailing wide communication gap has to be bridged and the realities understood with the cooperation of development agencies, a challenge which has to be met immediately (Sakthivel, 2001).

Importance of Aquaculture Extension

An Increase in fish production depends upon many factors namely, the expansion of the area under aquaculture, diversification of culture technologies and cultivable fish species and a system of information transfer from the research and development centres to the farming households. The prime objective of aquaculture/fisheries extension is to persuade and help aqua farmers and fishing communities to improve

upgradation of socio-economic condition and quality of life through their farming practices for increased fish production and income (Kumar, 1999). Education and training of rural communities to develop/improve their aquaculture skills and capabilities is the core function of aquaculture extension system which is expected to perform five major tasks. These are : (i) dissemination of appropriate technology (Education), (ii) convincing the farming community to adopt such technologies (Motivation), (iii) collect the farmers response (Feedback), (iv) refinement of technology to suit the farming situation (Assessment and Refinement) and (v) act as a link between the research and user system (Liaison).

Extension and developmental efforts in the fisheries sector could improve the socio-economic conditions of fish farmers particularly the shrimp farmers through gain in knowledge, increased production and favourable attitudes (Krishna, 1986). Though a great deal of technology development and transfer has taken place in aquaculture, a broad network of extension system to reach the clientele at large is yet to be established (Krishna 1995). A national seminar on fisheries extension organised in 1980 identified extension as one of the weakest entities in fisheries development and quoted the observations of the National Commission on Agriculture, thus: "Absence of adequate work in fisheries extension has been one of the principal reasons for slow pace of inland fisheries development". Efficient extension services are required to support the existing farmers and the new entrants for effectively promoting equitable and sustainable development of aquaculture that will contribute to overall rural socio-economic life. Quick and large-scale motivation of fish farming communities is essential to learn and use the technologies and mobilise essential materials and technical inputs at their doorsteps. No system has been devel-

oped to facilitate two-way flow of information between the top officials of the departments (who frequently get exposed to research and development information) and the grass root level extension and field personnel. This emphasizes the need for a well-organised and dedicated Aquaculture Extension Service. Similar views have also been expressed time and again by many workers in India (Radheshyam and Kumar, 1982; Singh and Sampath, 1981, 1982, 1983 & 1990; Tripathy *et al.* 1982). Several expert panels and committees have also highlighted the importance of extension in fisheries sector (Anon, 1976 & 1989).

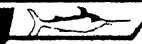
Present Scenario

The Organizations providing fisheries extension services in India are categorized and presented in Table 1. Fisheries Division in the Department of Agriculture and Cooperation under the Union Ministry of Agriculture is the nodal agency for coordinating fisheries development programmes in the country and in formulating major policy guidelines for the States. Fisheries extension programmes are planned both at Central and State levels and implemented mainly through State Departments of Fisheries. Fisheries extension programmes, including aquaculture extension, are executed at field level exclusively by the respective State Fisheries Departments. However, unlike agriculture where the agriculture department has the primary role of extension and mobilizing support services for the farmers, fisheries sector is yet to start a dedicated and organised extension service. Aquaculture extension services are provided mainly through the BFDA/FFDA programmes and these have been found to be too inadequate to disseminate the improved aquaculture technology packages throughout the country (Kumar, 1996).

Aquaculture extension personnel are to support and render all possible technical service/advice to the farmers.

Table 1. Aquaculture Extension Services in India

Sl.NO	Stream/ Organization	Extension Programme/ Scheme	Activities
1	Fisheries Division, Ministry of Agriculture & Cooperation, Govt. of India	Aquaculture Authority, FFDAs & BFDAs	<ul style="list-style-type: none"> * Issuing license * Information transfer * Helping the farmers from Project preparation to marketing * Distribution of literature * Providing technical advise * Mobilizing water area on lease * Providing Training * Organising demonstrations * Organisation of seminars, workshops etc
2	State/UTs Departments of Fisheries	FFDA & BFDA	<ul style="list-style-type: none"> * Helping in getting license * Helping the farmers from Project preparation to marketing * Distribution of literature * Technical advice * Mobilising water area on lease * Providing training * Seed supply on cost basis * Extending subsidy assistance * Organising demonstrations * Conducting farmers meet, field days
3	Indian Council of Agricultural Research (ICAR)	KVKs, TTCs & other TOT Programmes of Fisheries Research Institutes (CIFA & CIBA)	<ul style="list-style-type: none"> * Conducting vocational trainings * Providing Seed supply on cost basis * Conducting demonstrations * Conducting farmers meet, Field days * Providing technical advice * Distribution of literature * Awareness programmes, Exhibitions * Instituting Village Linkage Programme * Organisation of seminars, workshops etc.
4	State Agricultural Universities (SAUs) - College of Fisheries (11+1+1)	TOT Programmes as part of Education	<ul style="list-style-type: none"> * Providing training * Conducting awareness programmes * Disseminating printed extension materials * Conducting exhibitions * Organisation of seminars, workshops etc
5	MPEDA, Ministry of Commerce, Govt. of India	Export promotion through Fresh and Brackishwater Aquaculture	<ul style="list-style-type: none"> * Helping the farmers from Project preparation to marketing * Providing technical service * Providing subsidy assistance * Imparting training * Assistance in project preparation * Assistance in obtaining credit * Distribution of literature * Assistance in marketing, exports, duty reduction, quarantine
6	Other Development Departments in the Centre and States (Ministry of Rural Development, DBT, DST, DAE etc.,	R & D efforts to improve the technology package and pilot scale demonstration, Rural Development Programmes to Improve the living standard of rural people	<ul style="list-style-type: none"> * Welfare measures * Demonstration in pilot scale * Training * Financial support for extension projects, printing literature



7	NGOs and Private Agencies (Feed & other input companies)	Integrated Rural Development	<ul style="list-style-type: none"> * Campaigns for eco friendly aquaculture * Technical Advice * Supply of inputs on credit basis * Farmers meets * Farm trips * Organising rural poor * Mobilizing water bodies on lease * Input assistance * Group savings * Balanced Development of Coastal areas.
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They are expected to help them in soil and water analysis, and accordingly advice on manuring and feeding schedules, environmental monitoring, disease diagnosis and health care etc. But no such services are extended due to inadequate facilities and lack of trained manpower. In most of the State fisheries organizations there are no exclusive fisheries extension services as such.

Extension and technology transfer per se has been the responsibility of the State Fisheries Departments. The Fish Farmers Development Agency (FFDAs) and Brackishwater Fish Farmers Development Agency (BFDAs) with district level jurisdiction have been the important machinery for promotion of aquaculture. However, the FFDA/BFDA mechanism could not be supported with technology innovations and improvements. Its access to subject matter specialists is very limited. Basic infrastructure for problem-solving at local level is wanting. Further, the administrative and organizational systems for extension at the State/District/field levels need strengthening for playing an effective role. Although many agencies (ICAR institutes, SAUs, MPEDA, Banks, NGOs etc.) have substantially contributed for the development and transfer of technology at field level, their activities are constrained by limited manpower, lack of coordination and duplication of efforts. Suitable extension models for brackishwater aquaculture need to be developed considering the status and scope of the major TOT components (technology development, extension and utilization). Like the Training and Visit system, which has been successful in agriculture, there is no proven extension model for aquaculture. The available media for group or mass communication have hardly been used for the development of aquaculture. All these lacunae clearly indicate the necessity to develop a

mechanism for an effective Transfer of Technology. The SAUs (Colleges /Faculties of Fisheries) should closely work with the Department of Fisheries and its extension programmes in the related State.

The technology transfer and extension education were given further thrust by the ICAR by opening Krishi Vigyan Kendras (Farm Science Centres) and Trainer's Training Centres (TTC). In KVKs, fish farmers are trained on available technologies according to their needs. In fisheries sector, three important KVKs are functioning, one at Bhubaneswar, Orissa (CIFA) for Inland Aquaculture, and the other at Narakkal, Kerala (CMFRI) for Mariculture and at Kakdwip (CICFRI) West Bengal for Brackishwater Aquaculture. There are only two TTCs, one each at CIFA, Bhubaneswar and CMFRI, Kochi, where trainers from State Departments of Fisheries, NGOs and others are trained for 3 to 6 months. Need-based short term training programmes are also organised for the benefit of fishers, fish farmers, entrepreneurs and NGOs by the ICAR Fisheries Research Institutes and Fisheries Colleges as part of their extension programmes. Short-term training programmes are also conducted by private institutes like MAC School of Aquaculture at Thoothukudi in Tamil Nadu and Raman Academy at Kakinada in Andhra Pradesh (Ayyappan and Biradar, 2002).

At the global level also, many studies have highlighted the weak aspects of the Research-Development-Diffusion model and proposed a new model linking research scientists, extension agents and farmers to work together as equal partners. It is increasingly recognized that conventional approaches to agricultural extension have failed to respond adequately to the needs of poor

farming households (Cox *et al.*, 1998) and it is high time to devise alternative approaches. Transfer of Technology model is not a generalizable model amenable to all circumstances, clients and policy goals. Client-driven systems and participatory approaches build partnerships among researchers, extensionists, producers and other users and can be more effective and efficient (Monu 1995). Two factors were found to be common for successful technology development and transfer. One is integration of research, extension and farmers' participation and the other is strong farmers' organization at the grassroot level. Small benefits in wide areas and quick adoption of innovations are recognized as important elements in the technology transfer mechanism (Sharif *et al.* 1980; Halim, 1991). As most of the coastal States in India were new to commercial scale shrimp farming, lack of awareness of good farming practices and lack of suitable extension services had led to a host of problems. Motivating the farmers on the use of good management practices and awareness building continues to be a Herculean task, for which, the present facilities in the States/UTs continue to be inadequate.

At present, there is a general lack of support for shrimp farmers. Most of the problems encountered by the farmers are because of the wrong practices adapted by them due to ignorance and the lure of making more money. BFDAs and State departments are ill-equipped to cover the vast area that has been developed for shrimp farming. Most of the farmers are illiterate and are entirely dependent on private 'consultants' or the technicians from feed companies for technical support. The so-called 'consultants' in most cases are persons without sufficient practical knowledge and experience in shrimp farming and

they take advantage of the situation. A strong technical support is necessary to enable the shrimp farmers to adopt the best management practices. The shrimp farming technology should be continuously reviewed and improved. Such improvements should be communicated to the farmers through established extension methods and on-farm trials, trainings etc., (Aquaculture Authority, 2001).

It is quite evident that when support from extension service is not adequate, the small-scale operator has to depend on external sources for information. In the case of higher input based culture of high valued species, like shrimp, it has been experienced that in the absence of effective extension services, most information is volunteered by groups associated with manufacturers and dealers of feed, drugs, chemicals, appliances and equipment. Aggressive marketing by these interest groups often push the farmers towards over intensification by luring them to short term profitability at the expense of environmental and social sustainability (Aquaculture Authority 2001; Kumar, 1999; Kumaran *et al.* 2001). Lack of proper extension machinery, extension orientation and extension skills in the State fisheries departments could be the cause of this malady. Further, the fisheries officers and staff are basically tuned to function as fisheries administrators, and as such, hardly any inclination exists in providing extension services.

Research - Extension - Farmer Linkage

Aquaculture contributes significantly for the country's fish production. Various technological interventions led to area expansion, species diversification and productivity improvement. Effective technology transfer is greatly influenced by the extent of functional linkages between and among the sub-systems involved in the process. The success of any extension programme and adopted approach is highly influenced by the appropriateness of the package of practices introduced. The approach and the technology package should be complementary to each other. Effective technology transfer requires firm linkages between research and extension. Technology is developed through research, and extensionists must have access to re-

searchers to know and understand the latest technology to ensure its successful transmission to farmers. At the same time, a good feedback from the farming community obtained through extension personnel would be of great help to the researchers in planning relevant research programmes or in modifying the existing programmes in tune with the farmers' needs. At present, the linkage between and among the stakeholders (research, extension, input agencies, public and farming community) is quite weak. There is a very limited interaction that exists between the fisheries colleges of SAUs and the fisheries research institutes of the ICAR even when they are located in the same place or a nearby place. This is one of the reasons why the technologies already developed at these institutes remain unknown to each other. As the colleges of fisheries have to lay more emphasis on tackling problems of local nature, linkages with the institutes located in the respective States or neighbouring States are suggested (Abidi and Biradar, 2001).

There is a definite lack of good interchange between researchers and extension agents because the responsibilities for these functions are vested in different departments and rarely any effort is made to provide formal coordination between them. Aquaculture departments have either a research or an extension function. There should be workshops, discussion meetings and interactions before and after completion of one cropping cycle. These sessions provide a common platform for the extension agents, senior fisheries officers, fish farmers and scientists of research institutions to meet and discuss various emerging issues. Workshops also provide opportunity for the participants to get first hand information about the performance of particular technology packages at farm level. In such workshops, operational and administrative problems can also be discussed. Frank discussions and exchange of ideas help scientists to get an insight into field problems and plan cost-effective field research. The scientists will also get an opportunity to brief the group about some of the recent findings and technologies developed by the research institutions and provide ready-made solutions to some of the emerging technical problems.

At present, research and extension linking mechanism is established mainly through training of extension personnel at research institutes and interaction among senior officials of the State fisheries departments, Fisheries Division of the Government of India and research managers of fisheries research institutions through formal meetings. The grass root level workers and junior officers do not get opportunity to interact with the scientists working in the field. Moreover, the senior officers who frequently attend meetings, seminars, and workshops on behalf of their organizations hardly make any effort to share their experience or exposure with junior officers and field level workers of their own organization. No system has been developed to facilitate two-way flow of information between the top officials of the departments who frequently get exposed to research and development information and the grass root level extension and field personnel (Kumar, 1996). Many experts have suggested that a Transfer Of Technology (TOT) mechanism has to be evolved inclusive of all stakeholders - Research & Development institutions, State Department of Fisheries, Inputs producers and agencies, Mass media, Farmers, Corporate bodies, NGOs, Coastal community etc., for better interaction among them and regular transfer of technological information in order to have a sustainable and responsible shrimp farming. Better co-ordination and linkage need to be established among the concerned fisheries institutions so that they all could integrate their efforts in helping the farmers to increase their production through effective Transfer of Technology (Singh and Sampath, 1981, 1982, 1983 & 1990; Radheshyam and Kumar, 1982; Tripathy *et al.* 1982; Rahiman *et al.*, 1991, Alagarswami, 1995; Srinath 1995 & 2000; and Kumaran *et al.*, 1999 & 2001).

What is to be done?

A review of the past activities of the Central and State governments reveals that adequate attention has not been paid towards transfer of technology and that the recommended aquaculture technologies have been disseminated at a very slow pace. With this in view the following aspects are to be immediately looked in to.

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Tilt towards Vannamei

Farmers of Andhra Pradesh State are stated to be replacing their black tiger shrimp (*Penaeus monodon*) with the Pacific white shrimp, *Penaeus vannamei*, which it is stated, they are finding much easier and cheaper to cultivate.

The white shrimp is native to Latin America and a major export item from those areas to the US and EU.

Andhra Pradesh Seafood Exporters Association president Raghunath Reddy is reported to have said that the new variety has already been introduced to a number of farms in the state.

Nekkanti Seafoods' ED Sriram said *vannamei* can be stocked at far higher density compared to the black tiger shrimp, and hence has a higher yield.

Sriram said that while wastewater released from black tiger shrimp farms contained salt, which harms land and water sources around farms, the water released from *vannamei* would contain no salt.

In addition and unlike black tiger shrimp, *vannamei* is a more efficient food converter, so ponds contain less waste and bottom sludge, he said.

"The *vannamei* is also resistant to melanosis and keeps very good appearance even three to four days after defrosting at refrigerated temperatures," Sriram said. He is not however supportive of the introduction of *Vannamei*. He feels that there should be conclusive evidence established by the concerned research institute that culture of this shrimp is environmentally safe.

"The new variety does have some disadvantages that cannot be overlooked. It does not grow as large as black tiger shrimp and fetches less price in the international market, at least a dollar less per kilo, he added."

