

## Extension in Riverine and Reservoir Fisheries

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Inland fisheries in India are noted for rich varieties and production potential. It involves a variety of activities undertaken by people from a wide spectrum of socio-economic background, high level of artisanal and informal activity and high degree of participation including women and children. The extension programmes in inland fisheries need further strengthening in order to reach the full potential. The paper discusses some extension strategies for capture and culture fisheries for reservoirs, riverine and brackishwater bodies. These include integrated watershed management, TOT model for aquaculture, group farming and precision farming and cyber extension.

**Key words:** Fisheries extension, integrated watershed management, group farming, precision farming, cyber extension.

Inland fisheries involve a variety of activities undertaken by people from a wide spectrum of socio-economic background. The main fishing areas are rivers in major basins often associated with extensive food plain areas, lakes, reservoirs, canals and a variety of small seasonal and perennial water bodies. A large proportion of inland capture fisheries is for subsistence and the catches are mainly consumed locally. The high level of artisanal and informal activity leads to a high degree of participation including women and children. The fishermen usually use non-mechanized country crafts, their capacity ranging from 1-3 t of fish per year (Rahim & Padhy, 1994). The level of participation, particularly amongst low income, resource poor groups makes inland capture fisheries important to local food security. In most geographical areas the biological potential may not be a

constraint for enhancing production, but the socio-economic constraints may be significant where fish stocks are common property and fisheries have open access. The distinction between inland capture fisheries and culture fisheries is slowly fading away (Jensen, 1997).

Inland capture fisheries in India are much noted for their variety and rich production potential. They comprise 45,000 km rivers 1,26,334 km canals, 2.7 m ha of estuaries, 3.15 m ha of reservoirs, 0.24 m ha of flood plain wet lands and 0.19 ha of lagoons. The present day riverine fisheries is below subsistence level with an average yield of 0.3 t. km<sup>-1</sup> which is only 15% of the actual potential. Biologically and economically desirable species have started showing a declining trend as in the case of major carps in Ganga which declined from

26.62 t.ha<sup>-1</sup>.yr<sup>-1</sup> in 1958-61 to 2.55 t.ha<sup>-1</sup>.yr<sup>-1</sup> during 1989-95 (Sinha, 2000). Similarly average fish production in Brahmaputra declined from 196.93 kg.day<sup>-1</sup> in 1973-79 to 137.4 kg.day<sup>-1</sup> in 1996-98 (Sinha, 2000).

### **Inland fisheries extension - present status**

Inland fisheries development in India is centrally administered with state level programme planning and implementation. The Fisheries Division of Ministry of Agriculture and Co-operation, Govt. of India is the planning and policy making body for fisheries development in the country. Training is mainly dealt with by the Fish Farmers' Development Agency (FFDA) and Brackishwater Fish Farmers' Development Agency (BFDA). They also provide package of assistance for popularising aquaculture technologies. The fisheries faculty of State Agricultural Universities and fisheries colleges as well as aquaculture departments of other universities have also taken up training and extension work as a part of the curriculum. Extension forms a major link in the organisational set up and programmes of state fisheries departments. Extension was born in India in 1952 as the method for implementing community development programme, which later evolved into Integrated Rural Development Programme. Provision of finance and subsidy for procurement of fishing implements to the marine fishermen formed a major component of IRDP. Private and commercial extension initiatives in the country are rare. Promotion

of fish culture under the *Janakeeya-sutranam* programme of Kerala state government helped in enhancing inland fish production in small water bodies.

The green revolution brought in significant increase in production in the field of agriculture with the introduction of new varieties of crop. The training and visit (T&V) system introduced by Daniel Banor enabled increased production. The limitation of T&V was that it could address only a largely uniform production system with favourable conditions. In fisheries, concepts such as 'grow more fish' and 'blue revolution' paid greater attention to fish production by exploitation of marine and inland resources. However, T&V approach as such found little application in fisheries extension.

The first line extension system of ICAR consisting of demonstration programmes, lab-to-land programmes, operational research projects, Krishi Vigyan Kendra (KVK) and Trainer's Training Centre (TTC) play a very major role in training and extension for fisheries development. Technology assessment and refinement with Institution - Village Linkage Programmes (IVLP) under NATP is a technology integration process fitting into the requirements of the farmer in a given farming situation.

An assessment of technologies transferred (CIFRI, 1999) indicated medium to high levels of adoption. Even when the content of extension programmes are appropriate, the adoption has been not of desirable levels in many cases. The lack of impact in many cases was attributed to the ignorance of target

groups, cultural resistance to development, fatalism and the like. Many such cases revealed that extension methods did not fit the farmers' situation. If new practices are to be accepted the content of extension programmes should relate to the situation experienced by the farmers. Participatory technology development and dialogue between researchers and farmers should be the approach where Indigenous Technology Knowledge (ITK) also forms a major component. (Bauer *et al.*, 1998). Transfer of technology model in extension focuses on national priorities such as productivity and food security. The conventional extension approaches promoted through finance and subsidy by the Government is expensive. Participatory technology transfer approach will be more effective in making such systems cost-effective.

The current trends in development, such as decentralization, privatization, natural resource management and major shifts in social, economic and environmental context call for flexible and responsive extension approach. In the Rio draft policy concept for sustainable development 1992, the principles and theme of Agenda 21 involve a social negotiation process for sustainable development.

### **Strategies for extension and technology transfer**

#### *Capture fisheries extension*

Inland capture fisheries is an area which has received only low priority in extension compared to marine capture and inland culture fisheries. In the case

of reservoir fisheries cooperative action is well established. Each reservoir, depending on its area, has varying number of cooperatives. The role of such cooperatives is mainly in supply of fishing implements and farming inputs. Only a few of these cooperatives support fish farming activities. The members of the cooperatives included tribal and scheduled caste communities. Cooperative action also takes place in brackishwater shrimp and fish farming.

The craft and gear used for inland fisheries are mainly of traditional designs. Craft protection methods and sustainable gears are not yet popular among the fishermen operating in inland waters. The use of small mesh drag nets for catching small prawns, used for smoking, by fishermen in Hirakud reservoir seems to capture juveniles of many fishes in large quantities. Innovations such as craft protection methods, alternative material for craft building, appropriate mesh size, post-harvest handling methods, etc., if promoted through the cooperatives can bring about sustainable changes in inland fish production. Strengthening market support by the cooperatives will help to reduce the exploitation by middlemen. To achieve this, the research institutes, fisheries development departments and the cooperatives should work hand-in-hand.

#### *Culture fisheries extension*

Review of aquaculture extension services in the Peoples Republic of China (FAO, 1997) observed that aquaculture extension services made remarkable

progress. The high yield pond fish culture technology, which included fish pond reforms, introduction of high quality species, high quality feed formulation, disease prevention and processing in a complete package was extended to 98 million ha ponds in 1989-93. The production obtained through the package was 5,91,000 t of fish of which about 30% was attributed to extension services.

### *Fisheries in integrated watershed management*

In the integrated watershed management, fisheries has received a rightful place. Fish farming is observed to be one of the potential sub-sectors to facilitate reclamation of problematic soils and low productive areas, water harvesting and recycling (Muruganandam & Sharma, 2000).

### *Cyber extension*

The technologies developed will have to be disseminated efficiently to the end users taking full advantage of the information technology systems. There is also need for an organized effort to handle the technological problems faced by the fishing industry. Extension can effectively act as a bridge to reduce the gap between the researcher and the clientele. Dr. M.S. Swaminathan Research Foundation has demonstrated cyber extension by setting up knowledge centres in three villages (Swaminathan, 1998). Information on schemes related to health and rural welfare, directory of crop insurance schemes, integrated pest management in crops, safety of fishermen at

sea, occurrence of fish shoals and techniques of post-harvest processing; and information on wave heights for next 24 h downloaded from the US navy website, were made available to the fishermen, through web sites. Women formed the major participants in cyber extension.

The two-way communication between the fishers and the researchers is important for this process to be effective. The speed with which the information exchange takes place is of crucial importance. It should be fast, timely and adaptive. Information technology is one of the latest and quickest methods through which this can be done. It can be integrated into the process of technology transfer for quick dissemination of information and also for assessing the felt needs of the fishers.

### *Precision farming in inland fisheries*

Precision farming is a management philosophy or an approach to farming. It identifies the critical factors and controllable factors and determines intrinsic spatial variability. It is essentially more precise farming management made possible by modern technologies. The variation occurring in the crop or soil is mapped and their management actions are taken as a consequence of continued assessment of special variability within that field. Techniques of remote sensing, Geographic Information System (GIS) and Global Positioning System (GPS) aid in the adoption of site-specific management system. Precision farming helps in maximising crop production with minimum environmental degradation,

leading to sustainable aquaculture. (Dawson, 1997; Mandal & Gosh, 2000). Sustainability of this approach will be worth testing in aquaculture.

### **Chellanam model for transfer of technology in aquaculture**

The Chellanam model of transfer of technology (TOT) in aquaculture aimed at empowering brackishwater fish farmers in the technologies for fish/shrimp culture (Srinath, 1999). The implementation of Chellanam model of TOT included the following steps.

- i. Identification of technologies
- ii. Identification of fish farmers/women
- iii. Preparation of project report
- iv. Securing funding
- v. Training of farmers in technologies
- vi. Procurement of inputs
- vii. Implementation of farming
- viii. Periodical assessment
- ix. Evaluation

The technologies identified included shrimp farming, shrimp/fish farming, feed production, fish/poultry farming, crab farming and aquaculture. The following criteria were followed in the selection of farmers/women for each technology :

- i. Possession of a water holding like pond or canal of minimum area of 2 cents up to 10 cents
- ii. Access to the water body
- iii. Proximity to the water supply canal

- iv. Good physical ability and mental attitude of the farmers/farmers' family and free from indebtedness to government sources
- v. Interest in undertaking recommended technology and the TOT activities
- vi. Readiness to cooperate with the society and terms and conditions of the financing agency

### **Group farming**

In transfer of aquaculture practices, group farming has been beneficial in overcoming many of the farming constraints. Group farming approach relies on synchronized farming operations and collective management by farmers of a locality and enables them to increase production by improving their access to required inputs and reducing the cost of cultivation. (Hali, 1993; Sobhana & Shylaja, 1994). Introduction of community management in 23 common property Oxbow lakes under Small-scale Fisheries Project with emphasis on environment and participation of women, has shown successful participation by women (Kibria *et al.*, 1999). Srinath *et al.*, (2000) conceived and implemented a project on group farming for sustainable aquaculture in a cluster of paddy-cum-prawn (*pokkali*) farms in Chellanam (Ernakulam Dist.) and reported that the intervention was effective in educating the farmers on sustainability while helping them to improve their farming practices. Women could also be involved in the farming activities.

The need for increasing fish production has necessitated the strengthening of technology transfer and extension to

various types of clientele engaged in capture and culture fisheries. Several approaches are developed and implemented to communicate the research results to the end users. But they remain as isolated experiments. In order to draw the benefits of the development programmes, a proper strategy integrating finance, subsidy and training schemes with field level extension activities, is required.

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