Aquaculture extension: Overview and a framework of options

A case study of aquaculture extension planning by a DFID research project in Eastern India

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Acronyms:

AFO	Assistant Fisheries Officer
AFPRO	Action for Food Production
AICRP	All India Co-ordinated Research Projects
CAPART	Council for Advancement of People's Action and Rural Technology
CIFA	Central Institute for Freshwater Aquaculture
DBT	Department of Biotechnology
DFID	Department for International Development
DFO	District Fisheries Officer
DoF	Department of Fisheries
EIRFP	East India Rainfed Farming Project
FEO	Fisheries Extension Officer
FFDA	Fish Farmers' Development Agencies
FPR	Farmer Participatory Research
ICAR	Indian Council of Agricultural Research
IDS	Institute of Development Studies
IIED	International Institute for Environment and Development
IVLP	Institution-Village Linkage programme
KVK	Krishi Vigyan Kendra (Farm Science Centres)
LLP	Lab to Land Programme
MASC	Matsya Anusandhan Sahayak (Farmer Research Support) Committee
NDP	National Demonstration Programme
NGO	Non-Governmental Organisation
NR	Natural Resources
OBC	Other Backward Classes
ODA	Overseas Development Agency
ORP	Operational Research Project
RNRRS	Renewable Natural Resources Research Strategy (DFID)
RTAB	Research for Tribal and Backward Areas
SC	Scheduled Caste
SRI	Society for Rural Industrialisation
ST	Scheduled Tribe
TTC	Trainers' Training Centres
YMCA	Young Men's Christian Association

Abstract

Recommendations have long been made that uptake pathways should be clearly identified and planned from the outset when projects are designed, and uptake actively promoted. This paper presents a costed needs-assessment for the development and testing of dissemination materials related to outputs from the project 'Integration of aquaculture into the farming systems in the eastern plateau of India'.

Nearly 40% of the world's absolute poor live in India. The Eastern Plateau region is characterised by poverty and inequality, land alienation and seasonal migration. Isolated communities of scheduled castes and tribes have limited livelihood options, and are amongst the poorest and most vulnerable groups in India. Aquaculture integrated into existing farming systems has the potential to diversify and enhance livelihoods in the region.

A number of aquaculture extension agencies operate. However, since the early 1990s it has been widely recognised that the development and dissemination of aquaculture technologies in India provides little incentive or support for aquaculture initiatives appropriate to resource poor farmers. Poor farmers rarely achieve expected yields and there is little consideration given to their circumstances, socio-economic context, and resource-use priorities.

The project produces two major research findings; namely technical recommendations based on the on-farm trials carried out, as well as information relating to the farmer participatory research methodology.
The accessibility of extension media differs between different target groups. Farmers have low literacy levels, and limited knowledge of the technical language commonly used in manuals. However they generally have access to radio and some have access to TV and video. Aquaculture extension agency workers can generally access TV, video and radio, and some have access to computers, email and the internet as well.

Literature recommends the tailoring of material to specific target audiences, the promotion of a range of flexible technology options or practices, and extensive farmer participation in the development of extension materials. Collaboration between different research bodies, extension agencies and technology development centres is encouraged to increase the efficiency of extension. It is recommended that a variety of media are used for information dissemination, as different media will be accessible to different target groups, and for reaching farmers, farmer-to-farmer extension is known to be highly effective.

Extension recommendations with approximate costings were grouped into three steps: awareness creation, skills training and spreading the project approach.

For awareness creation amongst the scientific community information about the project approach and research findings should be published in national and international journals (Rs 9000 / £132), and the Indian Council of Agricultural Research (ICAR) should be oriented about project activities (Rs 3000 / £44). For orientation of farmers, we recommend the production and performance of a traditional street play about aquaculture (Rs 105,000 /£1544), the translation of the play to other dialects and the production and distribution of a video of the play in four different languages (Rs 143,500 / £2110). We also recommend the production and distribution of cassettes with traditional folksongs about aquaculture (Rs 13,500 / £199), and the arrangement of fairs and markets for farmers to share information about the project (Rs 45,000 / £662). This comes to a total of Rs 319,000 / £4691.

For skills training it is recommended that local aquaculture extension agents be trained in specific techniques recommended by the project (Rs 18,600 / £274), and that farmers in the project area be trained in specific skills recommended by the project (using pre-tested posters and video) (Rs 364,500 / £5360).Total cost Rs 383,100 / £5634.

For spreading the project approach we recommend exposure visits of extension personnel to project clusters (Rs 9000 / £132),farmer exposure visits to KRIBP(E) project villages (Rs 22,500 / £331), and a forum for local governmental and non-governmental aquaculture extension agents to meet and share experiences (Rs 30,000 / £441). We also recommend the production and distribution of a leaflet handbook in participatory research (Rs 16800 /£247). Total cost Rs 383,100 / £5634.

1 Introduction

1 In 1994 the ODA's Research Task Group concluded that the research products of too many projects were never made available to the wider community, and recommended that uptake pathways should be clearly identified and planned from the outset when projects are designed, and uptake actively promoted (Research Task Group, 1994).Even so in 1997 most dissemination outputs were still primarily targeted at the scientific community (Henderson and Martin, 1997, quoted in Myers *et al*., 1998).

2 To ensure that relevant project outputs are adequately disseminated to the project target group, in this project the planning of dissemination of the project outputs was included in the activities defined in the project logframe. The key objective of this report is to establish how the outputs of the project 'Integration of aquaculture into the farming systems in the eastern plateau of India' can be most efficiently and best disseminated to the project's target group.

3 A literature review of approaches to information dissemination for rural development was carried out and followed up by a field trip to Eastern India in November-December, 1998. Visits were made to key aquaculture research and extension institutes to determine what approaches are used in the project area, by whom, and with what success. Semi-structured interviews were carried out with key informants in institutions active in aquaculture extension. These include the Departments of Fisheries (DoF) in Bihar and West Bengal, Fish Farmers' Development Agencies (FFDAs), NGOs actively extending aquaculture in the area (the Society for Rural Industrialisation, SRI, and Ramakrishna missions), and other institutes active in aquaculture research in Bihar and Orissa (Ranchi Veterinary College and the Central Institute for Freshwater Aquaculture (CIFA)). The costs of different types of extension were obtained from interviews with extension agents, visits to local television and radio stations, publishers, and theatre groups in the area.

4 This report presents a costed needs-assessment for the development and testing of dissemination materials related to the project outputs. The background of the project approach is outlined, followed by an overview of the present aquaculture extension services of the area and the current guidelines for information dissemination. The requirements for reaching the target audience are evaluated, and acosted time schedule for how to most effectively do this presented.

2 Approaches to development

5 The development paradigms of the 1960 and 1970s derived from the legacy of colonial rule, especially the planning systems of the late 1930s and the period after 1945. The methods were bureaucratic and target driven, the conception top-down, development was something that governments did for people (Rennie and Singh, 1996). The apparent failure of development to improve the lives of poor people is now believed to be related to the absence of stakeholder involvement of those" undergoing" development. In the early 1980s Robert Chambers argued for anew professionalism to reverse the top-down approach (Chambers, 1983).

2.1 Participation

6 Many of the practitioners developing new approaches and methods at the end of the 1980s came together at a workshop on "Farmers and agricultural research: complementary methods (1987)" at the Institute of Development Studies (IDS), University of Sussex. The proceedings were developed into a book entitled *Farmer First* (Chambers *et al*., 1989) which distinguished the approach from the conventional paradigm of" transfer of technology". It presented evidence that new research methods and approaches could serve as a powerful tool for meeting farmers needs and could serve especially well those who manage complex, diverse and risk prone agriculture. After five years the Sustainable Agriculture Programme of the International Institute for Environment and Development (IIED) and IDS examined how

far the concept of participation had developed and evolved. With regard to participatory approaches to development, Scoones and Thompson (1994) defined three sets of insights that remain relevant today. These are discussed in Box 1.

Box 1: Insights from participatory approaches to development

1 Power and the pluralism of knowledge

Systems of knowledge are many, though modern science is especially powerful and widespread. Some types of knowledge (and research agendas) are monopolised whilst the weaker, more dispersed and isolated are marginalised. Scientific establishments link together most easily with the local elite (male, less poor, *progressive*) within rural communities. Thus we must take special care to:

- Hear and act upon the knowledge and needs of diverse groups varying in gender, age, socio-economic status and capability.
- To find ways in which the poor, vulnerable, female, excluded can be strengthened in their endeavours to enhance their own knowledge (and influence the research agendas of formal support services).

2 Changes in behaviour, interaction and methods

Evolving from the process of transfer of technology to farmers to one based on participation requires behavioural changes from all the key social actors, the development and application of new methods, and types of interaction (reflecting changed power relations). New methods (to model, map, rank, estimate, experiment) and new roles must be established:

- Farmers (from recipients) to observers, analysts, experimenters, monitors and evaluators.
- Extension workers (from conveyers) to convenors, facilitators, catalysts and consultants.
- Formal researchers (from definer of problem and solution)to recipient, facilitator, consultant and co-researcher.

3 Procedures style and culture of organisations

Development organisations (farmers' organisations, local government, government departments, NGOs, research departments) have lines of authority, communication, personal attitudes and behaviour which can facilitate or hinder participation. To change institutions from hindrance to facilitation requires reversals from top-down hierarchies with supply-driven orders, targets and supervision, to bottom-up articulation of needs with demand drawn research and supply with lateral sharing. Such sharing may involve networks alliances, lateral links, interactive learning environments and organisational strategies which permit scaling up and spread.

2.2 Sustainable livelihoods

7 An appreciation of the importance of participation in development, along with increased understanding of the role of the environment and an emphasis on sustainability, has led people to consider a new framework. The1997 UK White Paper on International Development commits the Department for International Development to promoting "sustainable livelihoods" and to protecting and improving the management of the natural and physical environment. These objectives are expected to contribute to the overall poverty eradication goal (Carney, 1998). Livelihoods can be said to comprise capabilities, assets (material and social) and activities required for a means of living. They are sustainable when they can withstand stresses and shocks and maintain or enhance capabilities and assets, both now and in the future, whilst not undermining the natural resource base.

8 Actions in support of poverty eradication can be conceived within a conceptual framework for sustainable livelihoods. Such a framework has been developed by the Institute for Development Studies (Scoones, 1998).Livelihoods are described as built upon *Natural, Social, Human, Physical* and *Financial* capital assets vulnerable to trends, shocks and local cultural practices. Livelihoods are defined by *transforming structures* (e.g. institutions, government) and *processes* (e.g. laws/incentives) which determine who gains access to which type of asset, its effective value and thus which strategies and activities are attractive to whom. Access to aquaculture as a livelihood option may contribute to the robustness of and increase the opportunities available to individuals/groups/communities by building up their *asset* base.

3 Paradigm shifts in development and the dissemination of information

9 A summary of how innovation paradigms in development strategy have evolved is shown in Table 1. As strategies evolve so the roles of different actors in the process begin to change.

Table 1: An evolution of innovation paradigms in development strategy

Approach	Farmers role	Outsiders role	Premise	Methodology	Assumptions
Technology transfer	Passive partner	Innovator	The technology would be adopted if it were available	Transfer to 'progressive farmers', trickle down of technology through interpersonal network and emulation of success	The innovator presumes the receivers needs. Technology fits intended situation. Interpersonal networks exist between progressive farmers and others. The technology responds equally well to different socio-economic groups
Farming systems research	Active participant in the innovators understanding of the farmers situation	Innovator	Indigenous knowledge systems can be used by innovators to generate more holistically oriented technologies.	Questionnaire, Rapid rural appraisal, development of technologies for transfer to farmers.	Comprehensive understanding of farming situation can be gathered rapidly, outsiders must be innovators of new technologies. Technologies can be transferred to farmers who participate in outsiders understanding of farming systems
Towards more comprehensive participatory methods.	Active participant in planning, management, stakeholder selection and deselection, active research, monitoring and evaluation.	Active participant in planning, management, stakeholder selection and deselection, active research, monitoring and evaluation.	Participatory approaches can be used to enable local people to share, enhance and analyse their knowledge of life and conditions to plan and to act.	Relaxed participatory learning. Addressing the needs of vulnerable groups, challenging asymmetrical relationships	The context of a commitment to value equally the contribution of all partners can be established. A long-term commitment can be envisaged. A self-critical approach can be engendered. Reciprocal accountability can be built in.

10 Rural development whereby technology is transferred to farmers tends to involve extension as a unidirectional flow of information from researchers to extension workers to farmers within the traditional roles outlined below:

Researcher	The traditional role for formal researchers in the development sector has been the production a finished non-adjustable package of recommendations to field level teachers (extension workers) who it is hoped can interpret and then teach these to farmers. Often research and extension organisations centralise and standardise information in order to provide simple all-inclusive solutions or technical recommendations.
Extension worker	The role of the extension worker has been to demonstrate acceptable improvements and seek ways of bringing their adoption within the grasp of farmers.
Farmers	There is commonly little role for farmers in the development of the research agenda, or the adaptation of innovations. They have been traditionally viewed as passive recipients of packaged solutions; something they clearly are not. The role of farmers– to adopt.

11 Such traditional roles do not lend themselves well to the development of recommendations in support of families who manage diverse, risk prone agro-ecosystems. The variety of flexible management strategies which are employed by farmers dealing with risk in such situation, are difficult for outsiders to understand and to research. Pre-packaged complete solutions developed by outsiders stand little chance of being adopted. And the success of technology transfer depends on the relevance of the content of the extension programme and the popular interest it generates.

4 Working with natural resources in India

12 The poor of the world depend predominantly directly on natural resources, through cultivation, herding, collecting or hunting for their livelihoods (Rennie and Singh, 1996). India has nearly 30%of the population of the world's low-income countries and 40% of the world's absolute poor. The Eastern Plateau region is characterised by poverty and inequality, land alienation and seasonal migration. Isolated communities of scheduled castes and tribes are amongst the poorest and most vulnerable groups in India. Their livelihood options are limited. Most families have limited access to land for cultivation, but common property resources play a vital role. Environmental degradation can be severe. Rainfed farming projects developed by DFID are working with communities to better manage common property resources to the benefit of all. Participatory approaches to technology development and transfer have led to increases in productivity on family land holdings. A large expansion of the DFID portfolio of NR projects is currently underway. DFID is now working with communities to explore other livelihood options both NR and non-NR based. Communities have established savings schemes and the projects are exploring options for providing credit.

4.1 Livelihoods framework in relation to aquaculture amongst tribal groups in India

13 One area where options and choices are being considered is aquaculture. In many rain fed parts of the states of Bihar, Orissa and West Bengal fish, though limited in availability to isolated tribal communities, form an important part of the diet.

14 *Natural capital*, such as perennial watercourses, springs and/or small-scale surface water storage(e.g. *dobas* and *gorias*) or groundwater (shallow tube-well) irrigation represent an opportunity for enhancing local fish production. *Social capital*, in relation to aquaculture, such as networks, membership of groups, relationships of trust, access to wider institutions is however almost totally absent amongst isolated tribal communities. *Human capital*, such as aquaculture skills and knowledge is currently limited, and ability to labour and to pursue livelihood strategies involving aquaculture is unknown. *Physical capital*, the basic infrastructure for aquaculture such as water, energy, transport, communications and the production equipment to enable people to pursue aquaculture is restricted. *Financial capital*, the financial resources, which can provide the opportunity to take up aquaculture as a livelihood option is currently limited and dependent upon the accumulation of social and physical capital.

15 The vulnerability context of livelihood strategies involving aquaculture are subject to *Trends*, such as decreasing availability of wild fish stocks, as well as increasing activities aimed at improving water storage (tank excavation and outlet renovations, and the construction of farm dams in watershed development). The Indian population is growing at around 2%. Financially capital-intensive aquaculture technologies are being developed. People in the area have been excluded from the mainstream political processes but constitutional amendments in 1992 and 1996 provide a basis for elected village representatives (*Gram Panchayats*) and give additional powers to the combined assembly of all voters in a village including executive rights over natural resources. Financial capital is limited, few goods are traded, though group formation and group savings are developing and some credit or groups is available. *Shocks* to livelihoods come principally as the result of disease and death, calamities such as fire, and climate. Rainfall is erratic and drought is commonplace. Tribal *culture* affects livelihoods especially via the management of assets. Village development tends to fall under the formal leadership of elected Panchayat leaders whereas the settlement of disputes (marriages, religion and culture) come under the guidance of unelected traditional leadership. Women play a key role in managing the household economy and are considered as co-decision makers often taking a dominant role. Men tend to control livestock resources and ponds whilst women control income from waged labour and household articles. Men and women take on different farming tasks (Dutta *et al*., 1998).

16 Currently, many of the *Transforming structures* and *processes* acting on isolated tribal communities result in livelihood options involving aquaculture, which are unavailable or unattractive to farmers. Some key formal structures are national and local line agencies; the Departments of Fisheries (DoF)[1]; NGOs, the Indian Council for Agriculture Research (ICAR) fisheries institutes; and a number of academic departments. The Fish Farmers' Development Agencies (FFDAs) under the Department of Fisheries (DoF) train farmers in, and provide financial assistance for, the standard techniques of composite semi-intensive carp culture recommended by research institutions such as the Central Institute for Freshwater Aquaculture (CIFA). Training is also carried out by the Farm Science Centres (KVKs) under the Indian Council of Agricultural Research(ICAR) and by various NGOs such as the Society for Rural Industrialisation SRI. The main activities of the major organisations involved are outlined in Appendix 1.

17 Processes include aquaculture support schemes[2]; research and training of the Indian Council for Agricultural Research(ICAR) institutes, university departments and the DoF. The institutional context currently provides little incentive or support for aquaculture initiatives appropriate to resource poor farmers. Problems with the process of developing and disseminating aquaculture technological innovation in India[3]have been widely recognised since the early 1990s, poor farmers rarely achieve expected yields and there is little consideration given to their circumstances, socio-economic context, and resource-use priorities. DoF initiatives such as preferential leasing of *Panchayat* water bodies to tribal and the provision of 50 - 100% subsidies for prescribed aquaculture and fisheries interventions respectively are attempts to support aquaculture development for poor groups. However,

[1] The DoF has Block Extension Officers in all districts where they consider there is aquaculture development potential. The extension effort is therefore geographically very variable, though specifically targeted. The potential for DoF extension support is likely to be limited because funding is very constrained.

[2] The Federal Government, in line with its policy of positive discrimination toward Scheduled Castes and its interest in the potential for aquaculture development, has set up across the country a series of Fish Farmers' Development Agencies (FFDAs). The process began in selected districts in1970 the FFDA remit being the intensive development of inland fish farming.

[3] Appaji, C. (1991). Reasons for non-adoption or partial adoption of certain recommended packages of practices of freshwater aquaculture technologies. *In* "National Symposium on new horizons in freshwater aquaculture", pp. 231-233. ICAR, CIFA, India.; Sivasankar, N., Hugar, L. B., and Umesh,K. B. (1991). An analysis of yield gap and its constraints in inland fish culture of Karnataka State. *In* "National Symposium on new horizons in freshwater aquaculture", pp. 222-224. ICAR, CIFA, India.; Suresh, R., and Selvaraj, P. (1991).Adoption behaviour of fish farmers in relation to credit availability in freshwater aquaculture - A case study. *In* "National Symposium on new horizons in freshwater aquaculture", pp. 220-221. ICAR, CIFA, India.

farmers can find they have little choice in the aquaculture system they employ[4] little control over: the supply of inputs, the date of harvest, the nature of loan or repayment schedule, many have no previous experience of fish production, negligible extension support and no disease diagnosis capacity.

18 DFID departments working together(in this case RNRRS with DFID India) directly with rural people as well as aquaculture institutions, have the opportunity to make a valuable contribution by:

- Researching and promoting livelihood options involving aquaculture, which are available and attractive to isolated tribal groups[5]. By devising then testing *livelihood strategies* (based on local knowledge, traditional knowledge, with appropriate elements from contemporary knowledge) against *livelihood outcomes* using indicators categories such as more income, increased well being, reduced vulnerability, and improved food security and more sustainable use of the NR base.
- Researching and promoting new methods, involving working directly with rural people, to devise and test livelihood strategies involving aquaculture which attempt to influence transforming structures and processes in favour of poor people.

19 Table 2 outlines the current division between research and development initiatives being undertaken to enhance people's overall asset status in relation to livelihoods involving aquaculture. The table illustrates potential synergies where a development initiative provides a research opportunity, such as social capital development leading to the opportunity to research directly with rural people (and a forum where expectations raised by research might be satisfied by development). Or where research leads directly to new avenues for development. These may be products such as preliminary identification of livelihood strategies, available and attractive to isolated tribal groups, utilising a broader range of natural capital. Or, as is the case with research to enhanced social capital, researching a process which attempts to influence transforming structures and processes in favour of poor people. The table also illustrates the links between capital assets, such as the dependence of financial capital upon the accumulation of social and physical capital.

Table 2: Current aquaculture research and development initiatives in Eastern India

	Development	Research	Leading to:
Natural capital	Development strategies based on high-input high-output commercial exploitation of perennial water resources (which tend to be unavailable or unattractive to poor farmers) are currently promoted by GOs, NGOs, etc.	Identify natural capital (e.g. water resources, local production enhancing inputs) assets together with isolated tribal groups and assess their capacity to benefit through aquaculture. Disaggregate the complete aquaculture process into stages and service components to enable investigation of potential entry points for different groups.	Data set as a foundation for preliminary identification of livelihood strategies[6]. The benefits (and comparative benefits) of aquaculture options assessed via the analysis by input – labour and output income and via participatory evaluation.
Social capital	Women and men and mixed aquaculture groups have formed with the support of EIRFP[7]Community Organisers. Group savings schemes operate.	Stakeholder analysis of support institutions. Research into (iterative) methods to enhance networking and secure more appropriate support services.	Better access to support service provision. Strategies for: institutional support to isolated tribal groups; problem identification; participatory trial planning frameworks
Human capital	Training is provided in high-input, high output	Identify key constraints to aquaculture for isolated tribal groups by researchers and	Evolution of increasingly relevant research agenda

[4] This is determined by research that supports high input aquaculture aimed at maximising production carried out at ICAR institutes and extended via the DoF, the adoption of which is a pre-requisite to receiving grant aid and bank loans.

[5] Isolated tribal groups are representative of many poor and vulnerable groups.

[6] Data demonstrating the contribution of aquaculture to the livelihoods of the poor is very scarce.

[7] EIRFP: East India Rainfed Farming Project

	aquaculture systems via EIRFP support by CIFA.	farmers	(identified first by stakeholder workshop and farmers groups but with increasing levels of input from farmers' networks as social capital is enhanced).
Physical capital	Enhancement of basic infrastructure, e.g. pond excavation, development & repair of water control structures, provision of pumping capacity is promoted by EIRFP, NGOs	Design production/transportation equipment appropriate for and accessible to groups and their level of financial capital	The development of prototype equipment from local resources.
s *Financial capital*	Accumulation of group savings and the provision of small-scale credit.	Assess capital requirements, returns and margins from a broad range of appropriate aquaculture options.	The development of costed protocols and equipment

4.2 The project approach

Participatory Needs Assessment

20 Participatory needs assessment enables the quick collection of information on new areas and identification of issues of which there was little prior outside knowledge. It offers scope to explore issues, which emerge as particularly important and to pay particular attention to avoiding certain biases. The process helps farmers and researchers to quantify and analyse the use of resources in farm households and assist in the identification of researchable constraints and opportunities. In addition researchers can discuss with farmers the likely resource-use implications at the farm level of implementing possible solutions and thus improve the impact of the research. Research planning can be facilitated, especially the design and evaluation of experiments with farmers.

Participatory Research Management

21 Participatory research management provides the opportunity for a productive interface between local and scientific knowledge. The approach attempts to empower farmers in their relationships with outside agencies and to encourage outsiders to understand and respond to local knowledge. The early, sustained and (as far as possible) equal involvement of farmers, extension agents(Community Organisers) and outside researchers provides a forum to develop and (where possible) unite context sensitive priorities for innovation and the more broadly relevant aspects of the research. Participatory Research Management can be viewed as an extension of the needs assessment process and a vital component of the FPR process.

Farmer Participatory Research (FPR)

22 It has long been recognised that farmer participation is vital for agricultural research directed towards producing strategies for farmers in marginal areas. Low-income farmers most often operate in complex, diverse, risk-prone environments where farming strategies are unusually flexible and complex and therefore difficult to replicate in on-station trials (Marsh and Appendini,1998). Where experiments on research stations have optimal levels of all inputs other than the experimental variable, the situation is quite different in the complex farming systems of poorer, more marginalised farmers (Shah *et al*., 1991; Okapi *et al*., 1994a; Farrington, 1989). Furthermore on-station research does not take into account the interdependent social and economic activities of the farm, variables which are equally if not more important than pure production figures for the viability of farming activities (Delince, 1998; Hodge *et al*., 1998; Veach, 1996). Better suited for the special conditions of marginal areas is farmer participatory research, where on-farm trials are used in an attempt to develop technology in the environment in which it is to be used(Collinson, 1998; Farrington, 1996a; Jones, 1998; Lightfoot, 1987; Loevinsohn and Simpson, 1998; Tripp,1991). The failure to elicit farmers' views in the technology development process is now widely regarded as a major reason for the low adoption by farmers of technologies generated on research stations

(Farrington, 1989). Research should therefore not only take place in farmers' fields but farmers need to actively participate in the planning and management of experiments (Leelapatra *et al*., 1992). FPR thus permits a better technological fit with the farming system and farmers' constraints, can better adjust technology to particular environmental conditions, allows for more rapid testing, evaluation and adoption of technology and builds on local knowledge and farmers capacity for experimentation. The FPR approach offers scope to link on-station trials conducted in conjunction with ICAR Institutes with farmer designed and managed investigations.

23 Most aquaculture research in India currently takes place on-station, with some on-farm testing and little modification of broad technologies.

5 Guidelines for information dissemination

24 A number of studies have been conducted on the efficiency of different extension approaches, methods and media. Section 5.1 outlines general recommendations for information dissemination and section 5.2details recommendations for different types of extension media.

5.1 General recommendations

25 In order to facilitate uptake by farmers in complex, diverse, and risk-prone environments, it is important that a range of options, tailored to individual target groups, is offered. To ensure efficient dissemination of relevant information, extension should involve the collaboration of all institutions involved as well as the target farmers. Information disseminated should facilitate decision making, encourage the adaptation of technology to local circumstances, and give information on the economic and financial implications of any suggested technologies, including the uncertainties and known risks involved (Garforth *et al*., 1998).

Providing options

26 Because the information developed by on-farm research often yields recommendations that represent 'best-bet' compromises rather than rigid packages, traditional extension programmes used to promoting 'technological packages' may have trouble accepting such recommendations (Tripp, 1991). However, experience shows that to present farmers with a new piece of technology, or a 'package', designate it as *the* recommendation for their area and expect them to adopt it wholeheartedly is unrealistic. According to Farrington (1989) adoption rates will increase if a range or 'basket' of technology options, developed with end-users, are offered so that farmers can choose and adapt as they wish.

27 The importance of offering a choice of options to the farmer is also highlighted by Okali *et al*. (1994a), who states that experience of the last twenty years of extension programmes shows that restricting the farmers' choice will have little if any positive impact. Because much on-farm research is very location-specific, it is a recognised problem that even when useful technologies or practices are developed on-farm, very few national programmes maintain a mechanism that allows the lessons learned from on-farm research to be transferred to similar research being done elsewhere (Tripp, 1991).Recent aquaculture research in Laos with farmers, women's groups and government extension services however, has led to the adoption by the extension service of a process to allow lessons to be learnt and recommendations to be iteratively upgraded (Haylor *et al*., 1999).

Target groups

28 Garforth and Usher (1997)recognise two main user groups of NR research findings:

- The end users: farmers and others engaged in productive activities.
- The intermediate users: researchers in international agricultural research centres and within national agricultural research systems, technology transfer or extension agencies, communicators, educators and policy makers.

29 In order to effectively extend farming practices, it is necessary to understand the social dimensions of the society, which can facilitate or constrain adoption (e.g. Kumar and Karim,1990; Hodge *et al*., 1998). Thus the format and content of extension material should be tailored to the needs and characteristics of the target audiences. Because there are often several target groups, increased diversity of extension services can lead to greater overall coverage, with different sectors or approaches complementing one another by meeting different needs or covering different groups of the population (Garforth and Lawrence, 1997a).

Institutional collaboration

30 As outlined in section 4 many different institutions are currently involved in aquaculture research and extension in India. Given the complexity of the physical, social and economic environments in which many rural people live and farm, Okali *et al*. (1994b) identified the challenge of integrating the many diverse sources of knowledge existing. The collaboration between different research bodies, extension agencies and technology development centres is helpful for fast dissemination of aquaculture options. Unfortunately institutional barriers often limit the possibility of collaboration and integration (Garforth and Usher, 1997), but there is increasing awareness of the need to integrate extension efforts amongst governments of developing countries. For example, in Bangladesh partnership of all agencies involved in agricultural extension has been established in order to ensure that technical recommendations reach all farmers in a cost-effective manner (Sarkar *et al*., 1995). And Garforth *et al*. (1998) recommend co-ordination and co-operation between extension providers at the local level. This can include agreements between agencies to work in different geographical areas or with different categories of clients, to provide specialist services within each other's programme and to share information about locally adapted or developed technologies.

Farmer participation

31 Although perhaps intuitively obvious it is often forgotten that farmers will only take up technology or practices, which they consider useful. Experience shows that the main factor, influencing uptake by users is the relevance to them of the research output itself (Garforth and Usher, 1997). Thus in a review of a number of renewable natural resource projects funded by the Overseas Development Agency (ODA), Farrington *et al*. (1993) found that the most commonly cited factor influencing uptake of research outputs was the relevance or appropriateness of the information and / or the technology itself. These findings are supported by research in Nepal by Subedi *et al*. (1998). Because the end-users themselves will know best what is relevant to them, there is a strong case for involving farmers in the production of extension materials. This will furthermore ensure that any material produced can be easily understood by the target audience – which is not always the case when materials are produced by project staff(Byram and Garforth, 1980).

32 Farrington (1996b) and Garforth and Usher(1997) highlight the importance of involving marginal farmers at the research dissemination stage in order to obtain sustainable results in development projects. Garforth *et al*. (1998) recommends that extension efforts, which incorporate bottom-up and interactive processes in their planning are supported. According to Leelapatra *et al*. (1992) and Leeuwis*et al*. (1998) on-farm research and extension are not separable because when a farmer participates fully in on-farm research, extension will always result. Because farmers can learn first-hand from trials (discovery learning), a practical example is often the single most effective extension tool. A useful approach may be the farmer-based curriculum approach, which has successfully been initiated in Kenya, where farmers are actively involved in choosing the person training them, the topics taught and eventually become farmer trainers themselves (Maina and Oloo, 1998).

Gender aspects

33 No meaningful developmental progress can be achieved without the active participation of women. Often in rural settings agriculture is largely in the hands of women because men tend to migrate to towns and cities for off-farm work. In India about 75% of all women

belong to rural areas, and about 60-70% of agricultural labour input is provided by women (Hirevenkanagoudar and Bheemappa, 1998). Goldey *et al*. (1997) suggest that efforts should be made to increase the active participation of women in technology development and dissemination, and recommend that extension efforts directed at women should aim to use training methods adjusted to the level of literacy and domestic obligations of the women. A number of authors (e.g.Hirevenkanagoudar and Bheemappa, 1998; Deppert *et al*.,1990; Subedi *et al*., 1998) recommend the use of female extension workers and the use of mechanisms such as group formation and mass media deliberately to direct extension efforts at women.

34 However some studies show that male farmers are much more likely to obtain information or advice from public extension services, farmers' groups and radio than women. The majority of female farmers depend on other farmers and male family members for information (Norrish and Lawrence, 1997; Subedi *et al*., 1998).

Pre-testing of materials

35 In order to ensure that extension materials are appropriate and relevant it is essential to pre-test them with the target group(s) before they are widely disseminated. A number of authors provide examples of how inappropriately tested materials can cause at the best widespread confusion, and at the worst lead to directly misunderstood messages (e.g. Byram and Garforth, 1980; Linney, 1985).Pre-testing is carried out by exposing a sample of the intended audience the draft medium and then questioning them about how the draft design can be improved so that it gets the message across more effectively. The pre-testing process should investigate all levels of interpretation of the media in order to help the identification of specific reasons why the medium may be unclear or ineffective. On the basis of audience suggestions the draft should be changed and the new version pre-tested until it is ensured that the media communicates the message intended effectively. Pre-testing poster material in India, Linney (1985) interviewed audience using a questionnaire, with questions designed to determine how well the message was understood as well as establishing the attractiveness of the media.

5.2 Extension tools

36 A study on the efficiency of extension in selected areas of India, Bangladesh and the Philippines revealed that farmers draw on a wide range of information sources (Norrish and Lawrence, 1997). In some areas, friends and relatives are the most important source of information, in others radio and television are the dominant modes of information. In most areas wealthy farmers have more contact with extension workers than poorer categories.

Radio, TV, video and computers

37 Because the approaches identified in farmer participatory research are likely to be very situation and site-specific, they may not be suitable for resource-intensive dissemination. In an report evaluating the current dissemination of natural research results, Myers *et al*. (1998) state that whilst it is recognised that 'the use of mass-media to influence local opinion in-country is often strategically important', 'examples of mass-media being used specifically for educational purposes and aiming at end-users is rare'. Farrington (1996b) recommends the use of video in group settings, and radio and television to provide interaction between farmers. Studies from e.g. Mali and Nepal suggest that radio is a major source of farmer information in rural areas (Myers *et al*., 1998; Subedi *et al*., 1998). But often the ownership of radio or TV, and the access to information from published materials, reflects a relatively high wealth status, thus favouring better-off parts of the community.

38 The mass media can be a powerful tool for exchange of views and sharing of information within a rural population, but according to Garforth *et al*. (1998) and Norrish (1998) it is seldom used in a participatory fashion. In both print and broadcast media the target group(s) are rarely involved in the design and production of the extension material, which means that information is unlikely to be relevant, useful and accessible to farmers. Shaw (1998) and

Braden (1998) recommend the use of video as a participatory tool for group development, where participants are trained to use video equipment, thus empowering and increasing awareness in the local community.

39 Electronic information and communication technologies have opened new channels for aquaculture information delivery(Woods, 1993). Databases or web-sites can be used to store large amounts of information, which can be accessed by scientists and extension workers. However many of the intermediate users of research findings have only sporadic access to the internet, email and fax.

Printed extension materials

40 Extension booklets or manuals presenting options to farmers are increasingly being used around the world. Thus Dierolf *et al*. (1998) describe the use of extension manuals in a Training & Visit (T&V)programme in Indonesia, and Okali *et al*. (1994a) detail a similar system used in Niger. Material used consists of single page sub-topics printed on heavy (or laminated) paper and kept in a folder for easy updating. A number of farming options /strategies or solutions to common problems are included in the folder, and extension workers and farmers can update information together at individual or group meetings. In the Indonesian project the information included was chosen by scientists and extension workers, but there is no reason why farmers themselves cannot select the topics they think should be included in an extension folder.

41 Research results can also be published in scientific journals, but because of the delays of publication world-wide and distribution problems in many developing countries, these cannot be considered an effective way of communicating new findings to intermediate users in the target country (Myers *et al.*, 1998).Furthermore, because of the technical language often used in scientific journals, extension workers often prefer extension bulletins or manuals Garforth and Usher (1997), and Deppert *et al*. (1990) recommend the distribution of simple technical information bulletins in the rural areas to rural farming families.

42 Leaflets and other printed materials are commonly used as extension materials. These are often produced in the local language and distributed to all farmers, but unless the end-users are involved in the design of brochures, they are often not very successful in reaching the target audience. A recent case study of the success of leaflets on vermiculture techniques in a village in Karnataka revealed a number of problems, including badly narrated information, use of too complicated words for farmers to understand, no illustrations, plus the fact that leaflets were only available in the main dialect, and not in all local languages (Norrish and Lawrence, 1997). In the case study an astonishing49% of men and 73% of women had difficulties understanding the leaflets, and it is recommend that literature is targeted at specific groups of farmers to increase the uptake. For guidelines on how to produce written materials, see (Wright, ?).

43 Because the most resource-poor farmers (and women) often cannot read, pictorial materials such as posters and cartoons are commonly used mediator extension of information. With regards to the production of visual extension material, Linney (1985 and 1995) recommends that the end-users are involved in the planning, making and use of their own visual aids, because this will ensure a high degree of local relevance and promote empowerment. He highlights the widespread failure of visual communication activities in developing countries because of badly designed visual extension material, misunderstood by the target community, because people from different cultures have different visual literacy skills. For example Linney found that the symbolic conventions used by Westerners, or by better-educated people in third world countries, are often not understood by people rarely exposed to visual material. Similarly in Botswana Byram and Garforth (1980) found that caricature or cartoons were confusing most respondents, and that many farmers had difficulties following a sequence of pictures. If participatory planning and design of visual

material is not possible, Linney recommends that thorough pre-testing of material is carried out at times convenient for villagers, by skilled interviewers sampling the opinions of a large number of villagers.

Folk / community /live media

44 Extension messages are more efficient if they are disseminated in an interesting format. Drama, dance and folk songs can be used to create mass awareness, as well as to teach specific skills or practices. (Harding, 1999)distinguishes between five main trends in the use of theatre in development:

- Professional theatre, where foreign theatre experts enter a local theatre company and locals and outsiders share ideas.
- Campaign theatre, where a local theatre company goes out to communities to perform a show for them which has been commissioned on a pre-determined topic as part of an aspect of development by an outside agency.
- Project theatre. Here a problem-solving message is presented.
- Commercial theatre, where a local commercial company incorporates a development message into their repertoire, often funded by outside agencies.
- Theatre for development. This is a collaboration between local communities, development agencies and theatre workers, thereby providing locals with a technique which they can use for themselves as a means of collating and analysing whatever issues arise for them in the future.

45 Despite the fact that it is probably the most culturally sensitive way of disseminating output, folk media are not much used to disseminate information generated in research projects (Myers *et al*., 1998). Of the options above the theatre for development approach is no doubt the most participatory and empowering means of using theatre in extension, since it passes over the tools for analysis and resolution of crises or inequalities to members of the community. However when the other categories are used to disseminate conclusions from a farmer-led agenda of participatory research, participation is again ensured.

46 It is important to use local forms of performance which already exist in a community (Harding, 1999), such as local folk songs, drama styles and story-telling traditions. In India there are strong traditions for storytelling, which is often a great part of festivals, where the storyteller delivers messages about appropriate social behaviour and right living. Story telling can be incorporated into radio or television programmes, or recorded on video. In the State Department of Agriculture, Tamil Nadu, extension professionals who have flair and skill in story telling are trained to deliver development messages. First, technical information is identified and formed into messages in collaboration with extension scientists of Tamil Nadu Agricultural University (Ganesan,1998).

47 Puppetry is widely used by e.g. the Health Department in Himachal Pradesh, and by the DFID in Tamil Nadu, but is not customary in Eastern India (Smith, 1999; Mantrana Group, pers.comm.). Folk dance using mask and drums is extremely popular in West Bengal(where it is known as *Chow* Dance), Andhra Pradesh and Karnataka, but not traditionally used much in Bihar. Chow dance has successfully been used to convey extension messages by KVKs in West Bengal. Using dance alone it may be difficult to convey an extension message, but dance-drama or dance with songs could be used.

48 Drama is widespread in West Bengal (where it is known as *Jadra*), and is presently used by various government departments (including the Forestry Department and the Literacy Department) to spread extension messages. In many villages there is an *'Akhara'*, a local stage where folk dance and drama is performed. Any drama or dance produced should be in the local language following the local customs for dance or drama.

49 Folk songs sung in local dialects are very popular in West Bengal, where they are known as *Jhumurs*. These have been used to disseminate information on specific technology such as afforestation or integrated pest management by KVKs in West Bengal. Tapes can be produced and broadcast on local radio stations or sold in small village shops.

50 In order to increase the audience, drama can be broadcast on television or radio in the local area. In Kenya a locally written and produced drama production in the local dialect was shown to provide a great opportunity for reaching rural women (Lloyd Morgan and Mukarebe, 1998).

Extension personnel

51 The extent to which information is disseminated in an efficient manner is often highly dependent on the efforts and dedication of extension staff. People as a communication medium are confined by what they know; their individual communication skills; their mobility, whom they like; who likes them; whom they meet; their age; their health; their gender; and cultural obstacles (Woods, 1993). Roy and Talukdar (1990), in their recommendations to the Bangladeshi Government, suggest that incentives are offered to encourage extension personnel to increase extension efforts. If such a system is implemented, however, care should be taken to avoid performance-based incentives, situations where extensionists are merely trying to 'get their quota' as this may lead to mis-directed and inappropriate targeting of extension efforts.

52 Informal systems of knowledge dissemination can be encouraged in an extension programme. In areas where large number of pond owners all buy seed from a small number of small fingerling suppliers, traders are often useful agents for spreading information. A study in Nepal confirm that providers of inputs and buyers of produce constituted major means of communication, and that farmers prefer these means because access to information is strongly linked with obtaining material inputs (Subedi *et al*., 1998). Gregory and Golder (1990) recommend the training of local seed traders in basic fish culture management and fish seed transportation skills. In their experience most traders already offer advice to pond owners on fish culture as a way of promoting sales but this information is often of a poor standard. Traders therefore see additional knowledge as a way of improving their businesses and in trials carried out all traders reported significant improvements in business opportunities as a direct result of project training. The experiment showed pond owners to be receptive to the advice offered. When considering the use of input suppliers as extension agents, it is important to bear in mind that better-off farmers will have relatively higher access to this means of communication than their poorer counterparts (Subedi *et al*., 1998). However, the use of fish traders in West Bengal tribal areas (and other remote areas in Bihar, Orissa and Madhya Pradesh) would be unlikely to succeed. Tribal farmers in Eastern India see fish traders as a major constraint to aquaculture development, offering very poor quality seed, which often do not survive (Dutta*et al*., 1998). Fish seed is a major cost component of fingerling rearing for these groups and survival a more important determinant of financial success than growth rate (work in prep. IBRFP).

Farmer-to-farmer extension

53 Research shows that people communicate most frequently and effectively with those who are most similar to themselves (Roling *et al*., 1998). Thus farmers are more likely to obtain information from and be influenced in their farming practices and management decisions by, other farmers than by extension professionals (Deppert *et al*.,1990). This has been used on a systematic basis in the Training and Visit (T&V) system, where information is facilitated to 'contact farmers'(commonly 10% of farmers) from where it is expected to diffuse to 'follower farmers'. However many studies suggest that the 'trickle down' of information from innovative farmers to other parts of the farming community is not as efficient as hoped (Maina and Oloo, 1998; Roling *et al*., 1998). In India, where society is highly socially

stratified, (Garforth and Lawrence, 1997b) found that informal communication networks do not cross socio-economic boundaries.

54 With regards to the use of natural information networks, it is recognised that farmers exchange information regarding new farming practices or technology amongst themselves. However very little is known about the extent to which the outputs of formal research can be effectively promoted and diffused through these naturally occurring social processes (Garforth and Usher, 1997). Findings from the Indian State Tamil Nadu suggest that despite declining access to extension, most farmers receive information on recommended varieties and chemical treatments through mass media and informal contact with other farmers. And in Nepal it was found that formal and informal farmers' networks are the major sources of information for farmers (Subedi *et al*., 1998).

55 Workshops, meetings and conferences for stakeholders can be used to provide a forum for direct interaction and encourage information spreading. If workshops are held for farmers, care should be taken not to dominate the proceedings with formal presentations, and back-up documentation should be produced so that participants are aware where they can access further information (Myers *et al*., 1998). Warburton (1997), quoted in Myers *et al*. (1998) recommends that in order to allow freedom for participants to express their opinions, separate workshops be held for farmers and researchers rather than inviting a range of stakeholders,. Farmers' groups have been successfully used to mobilise and encourage other farmers to take up improved agricultural production practices in a number of countries, including Nepal (Mathema, 1998; Subedi *et al*., 1998), Kenya (Maina and Oloo, 1998), and Indonesia and Zanzibar (Leeuwis*et al*., 1998). Groups can be successfully used for the mobilisation of marginal groups such as women and landless, and Narasimha *et al*. (1998) cite examples where Self Help Groups have successfully been used as a forum for dissemination of technical know-how.

6 East India Rainfed Farming Integrated Aquaculture project

56 The East India Rainfed Farming Integrated Aquaculture project aims to select, test and develop integrated aquaculture innovations relevant to local needs and conditions in participation with farmers' groups in farm-based trials integrated with on-station research and contextual information collection. Research activities include the on-station development of a solar-powered portable hatchery suitable for individual farmers, and a solar-powered fry transport system. On-farm trials for farmers' groups have been initiated, with research into rearing of advanced fingerlings, fish to table size, and the production of stunted carps.

57 The KRIBP(E) project area covers areas of Bihar, West Bengal and Orissa. The majority of farmers grow paddy, commonly only one crop a year because of limited irrigation facilities. Most water bodies in the area are seasonal, and some of these (e.g. seasonal ponds, doba/gorias, water harvesting tanks, and check dams) are suitable for aquaculture activities as are the perennial ponds. However because of the short duration of the rainfall and common intermittent dry spells, there is a high demand on existing water bodies for irrigation and other uses (e.g. domestic use)(Dutta *et al*., 1998).

6.1 Project outputs

58 Research project outputs commonly include not only recommendations based on knowledge generated but also methodologies used (Warburton, 1997, quoted in Myers *et al*., 1998). This project produces two major research findings, namely technical recommendations based on the on-farm trials, as well as information relating to the farmer participatory research methodology. Part of the project aim is to disseminate both these types of information to relevant organisations as well as to farmers.

59 Research findings include *recommendations on technologies and practices* suitable for aquaculture integrated into rain fed farming systems. This maybe in the form of a systems

suitable for the transport of fry to farmers living in remote rural areas, advice on pond construction or modification, or in recommendations for stocking densities, feeding and fertilisation levels realistic and attainable for poor, marginal farmers.

60 The project aims to involve farmers in all stages of the research. This approach is rarely followed in India, where most research is carried out on research stations under ideal conditions. In order to increase the relevance of the research findings for marginal farmers, it is essential that they have a say in the planning and management of experiments. But whilst this is being increasingly recognised by research institutions, there is a distinct lack of recommendations for how-to carry out farmer participatory research. The project therefore aims to make *guidelines for the research process* available to research and extension organisations.

6.2 Extension target groups and access to media

61 The information dissemination is targeted toward a number of different groups. Appendix 3 shows an outline of their information needs as voiced during interviews. A more detailed description of the key characteristics of project farmers can be found in Dutta *et al*. (1998).

62 Most of the project farmers belong to the deficit class (see Box below). Seasonal migration in the Rabi and summer season is common.

63 In Bihar there are a total of 9 tribal dialects, but Hindi is widely spoken throughout the state. In West Bengal there are two dialects, Bengali and Santali. Various local areas speak modified versions of Bengali, but in all these areas Bengali is understood. In Orissa only Oriya is spoken, and this is understood in all villages. However along the Andhra border and on the coast Telegu is spoken (not in KRIBP (E) area) (J. Purti, Programme Executive, All India Radio Station, Ranchi, pers. comm.).

64 The literacy levels amongst farmers in the project villages inn West Bengal range between 20.9% to 89% for men (average 50.5%) and between 1.4% to 51.7% for women (average 25%) (KRIBP(E) project files, 1998).

65 Every day the All India Radio Station broadcasts an agriculture programme from 19.00 - 19.30. The topics of the programme vary, depending on the season. For most of these agricultural programmes, a specialist comes to the station, e.g. from the KVKs, the Agricultural Universities, KRIBP(E), etc. The programme is broadcast in the major language of the region (i.e. Hindi in Bihar, Oriya in Orissa, Bangla in West Bengal), which most people within the 100km radius that the programme reaches understand. The Ranchi Radio Station estimates that 75% of all farmers listen to this programme almost every day. Another agriculture programme is broadcast from 6:05-6:10 AM, giving brief notes for farmers before they go into the field, with information specific to the season. (J.Purti, Programme Executive, All India Radio Station, Ranchi, pers. comm.). The All India Radio Station is not the only radio station in the area. In villages very small radio stations are present, broadcasting only at the village level.

66 In all project villages there are about 10-15radios, and both men and women listen to the radio. Men listen mainly to news and cricket, whereas women listen to songs. The project area is mainly tribal, and villagers listen to a programme in their own language between 6and 7 PM (news and drama). Mainly young men and educated people listen to the radio, the poorest people(deficits) do not have any spare time. Young people also listen to Hindi songs.

67 The Ranchi TV station broadcasts agricultural programmes daily from 18:30-19:00 Monday to Friday. All programmes are in Hindi except for on Wednesdays, when the programme is broadcast in Nagpuri, a local dialect. The Agriculture programme covers issues such as livestock, fisheries, poultry, dairy etc. The *Gramenokelje* - programme for rural

people is produced by the Prasar Bharati Broadcasting Corporation Ranchi TV station, and watched by most villagers. It has two components, a part aimed at farmers (talks by scientists, other experts, and farmers) and a part aimed for development agencies. Viewer figures for the project states can be seen in Table 3.

68 Only rich villagers own televisions. In some villages the village Panchayat(local governing body) has supplied a TV, which is kept in the Panchayat Office, and often used in social clubs for men only. Women can however access the television if they want to see something in particular. In Bihar in general there are very few TV sets per village, and although all villages have electricity, the supply is not regular. In some districts some villages have no TV sets. In 1998 35% of viewers watched agriculture programmes in Ranchi District (S.N. Sinha, Ranchi TV Station, pers. comm.).

Table 3: Total and rural viewers in the project states. Source: data survey, Ranchi TV station (1997).

State	Total viewers	Rural proportion (%)
West Bengal	7,712,0000	14.2
Bihar	8,335,00	10.1
Orissa	3,650,000	12.1

69 Table 4 below shows the accessibility of different types of extension media for the different stakeholders.

Table 4: Matrix of accessibility of media to the key stakeholder groups for information dissemination. Information based on interviews with the sources listed below.

Accessibility of:	Farmers		CIFA	NGOs	KVKs	FFDAs
	Male	Female				
Computers / internet	Low	Low	Moderately high	Medium	Medium	Low
TV	Medium	Low	High	High	High	High
Radio	Medium	Low	High	High	High	High
Newspapers	Moderately high	Low	High	High	High	High
Textbooks	Low	Low	High	Moderately high	Moderately high	Moderately high
Leaflets	Medium	Low	High	High	High	High
Video	Medium	Low	High	High	High	Moderately high
Cassette player	Medium	Medium	High	High	High	High
Drama performances	High	High	Low	Low	Low	Low
Fairs / exhibitions / forums	High	Low	Medium	High	High	High

Sources: Dr. K. Kumar, CIFA; Dr. Moharty, Principal Scientist, CIFA; Dr. S.K. Sarkar, Senior Scientist, In Charge of KVK & TTC, CIFA; Mr. B.N. Baskey, DFO, DoF, Purulia; Mr. A. Kumar, DFO & CEO, FFDA, Ranchi; Mr. S.P.Singh, FEO, Ranchi; Mr. R. Nishad, fish farmer under FFDA project, Karra block; Mr. Maharaji Dibyan KVK Ranchi; Mr. Madan, SRI, Ranchi; Mr. D. Masih, Secretary YMCA, Ranchi; . KRIBP(E) staff: Pinki, CO; Shyam Lal Yadav, CO; Subudra, CO; Gautam Dutta, Aquaculture Research Team; Natrajan, Aquaculture team.

6.3 Production of extension material

70 Costings for the development of educational material using the different media listed in section 6.1 are outlined in Appendix 4.

7 Recommended strategy

71 The extension strategy recommended can be summarised:

- Format and content of extension material should be tailored to the needs and characteristics of the target audiences, i.e. the male and female farmers belonging to different social groups, and the aquaculture extension agencies of the region (KVKs, FFDAs, CIFA, SRI, YMCA).

- In order to ensure maximum and efficient spread of information, collaboration between aquaculture research bodies (CIFA, agricultural universities), extension agencies (NGOs, KVKs, FFDAs) and technology development centres (SRI, CIFA) should be established by arranging meetings and common forums. Co-ordination and co-operation between extension providers at local level should be facilitated by exposure visits for extension staff to the KRIBP(E) project.
- Rather than a rigid 'technology package' a range of flexible technology options or practices (including information on the economic implications, risks and uncertainties of any suggested strategies) should be presented to farmers for them to adapt and modify as appropriate.
- To increase the uptake of information, end-users should be involved in the production of extension materials so that information is as relevant to their needs as possible. All material developed should be pre-tested on a representative sample of the target audience prior to mass production.
- To ensure efficient extension to women, the extension material should be adjusted to their level of literacy and domestic obligations. Female extension workers and mechanisms such as group formation and mass media should be used deliberately to direct extension efforts at women.
- To ensure as broad coverage as possible, it is recommended that a variety of media be used for information dissemination. TV, video, radio and bulletins are useful for broad orientation of farmers and extension workers. Databases, email networks and journal articles are useful for communicating findings to other research institutions or scientists. On-farm research functions as an extension tool in itself because the farmer learns by doing and the pond serves as a demonstration of techniques to other farmers. Farmers are often some of the best extension agents, and farmer-to-farmer extension should be facilitated by arranging meetings between farmers of different areas e.g. in the form of village fairs, produce exhibitions etc. Extension agents used should take an active part in the research to ensure they possess the expertise needed for effective extension.
- Impacts of extension materials should be evaluated by follow-up studies (questionnaires?).

Step 1:awareness creation

72 The first project output is the message that aquaculture does not have to be high-input, multi-species systems in perennial water bodies but is quite feasible in seasonal water bodies for poorer farmers. This message is not intended to teach farmers how to carryout aquaculture, but simply to create awareness that aquaculture could present a strategy for diversifying livelihoods, an extra income or an extra food source, and to point those interested in the right direction for seeking further advice. Target groups for this information include both farmers (end-users) and all aquaculture research institutions / aquaculture extension agencies (intermediate users). Recommendations are shown in Table5.

Table 5: Costed recommendations for awareness creation for farmers and aquaculture extension agencies. Costings based on estimates outlined in Appendix 4.

Recommendation	**Cost**	**Total**	
		(Rs)	**£**
Project findings (research methodology and specific recommendations)published in both international and in-country scientific journals by the end of the project	1.5 months * one full time project staff @ Rs 6000 per month	9000	132
Meetings between project staff and ICAR institutes to ensure that local research institutes are aware of approaches taken by the project (the project is already co-operating elaborately with CIFA).	1 trip to CIFA HQ Bhubaneswar @ Rs 600 * 5 KRIBP(E) Aquaculture staff = Rs3000	3000	44
A local drama group with tribal actors commissioned to write a play on aquaculture as an option.	Rs 15,000 for play	105,000	1544
Performance in 20 villages in project area.	Rs 1500 per performance*20 = Rs 30,000 plus transport and accommodation for actors @ Rs 200 p.p. * 15 actors * 20nights = Rs 60,000		
Performance of the play for recording on video in Hindi and English	Rs 5000 * 2 languages =10,000	143,500	2110
Video taping of play	Rs 100,000		
Translation of video into Bangla, Oriya, and Hindi	Dubbing studio at Rs 200 *10 hours * 3 languages = Rs 6000		
100 copies of video	Rs 200 * 100 copies = Rs 20,000		
Demonstration of video to farmers in Bihar, Orissa and West Bengal on the communal TVs present in most villages.	4 full-time staff @ Rs 300 per day * 5 days each = Rs 6000.		
The video should be made available to CIFA, the FFDAs and the KVKs and NGOs of the region.	1 full-time staff @ Rs 300 per day * 5 days = Rs 1500.		
Folksongs in Nagpuri and Hindi with aquaculture message recorded	Rs 3500 * 2 languages = Rs 7000	13,500	199
250 copies of tape made	Rs 20 * 250 copies = Rs 5000		
Songs played on radio stations and at market fairs and sold on cassettes to farmers in village stores			
Copies distributed to the FFDAs, the KVKs and the NGOs of the project area.	1 full-time staff @ Rs 300 per day * 5 days = Rs 1500		
Fairs and markets arranged to increase the opportunities for farmer communication and thereby the dissemination of information.	Rs 5000 * 9 fairs (3 in each project state) = Rs45,000	45,000	662
Total		**319,000**	**4691**

Step 2: skills training

73 The teaching of specific skills (e.g. how to stock, harvest, feed, breed or transport fish) will be required both for farmers and also for staff from collaborating research or extension institutes. This requires more attention to details and personal contact.

Table 6: Costed recommendations for skill training of farmers and aquaculture extension agencies. Costings based on estimates outlined in Appendix 4.

brdrs **Recommendation**	**Cost**	**Total**	
		(Rs)	**£**
Staff from the FFDAs, SRI, the KVKs and YMCA trained in specific techniques(e.g. hatchery operation, fry transport) by KRIBP(E) project staff.	2-day training courses * 5 full-time staff @ Rs 300 per day =Rs 3000. Rs 200 for food and accommodation * 2 days * 5 participants * 6organisations = Rs 12,000	18,600	274
Development of slides for teaching and illustrated training manuals by current staff Testing of teaching materials with target organisations	2 * full-time staff @ Rs 300 * 2 days * 6 organisations = Rs 3600		
Task-oriented colour posters targeted at farmers developed in co-operation with project farmers	Rs 6000 printing charge 500 copies + 1 full-time project staff @ Rs300 * 3 days = Rs 6900 + Rs 500 composing fee * 10 posters = Rs 5000	364,500	5360
3 task-oriented video-films targeted at farmers featuring and developed with project farmers	Rs 100,000 * 3 films = Rs 300,000		
Translation of videos into Hindi, Bangla and Oriya	Dubbing studio Rs 200 * 10 hours * 3 languages = Rs 6000		
200 copies of each film	Rs 200 * 3 languages = Rs 600		
Pre-testing of materials on target farmers	Rs 200 * 200 copies = Rs 40,000		
	1-day workshop at Rs 2000 * 3 states = Rs 6000		
Total		**383,100**	**5634**

Step 3:spreading the project approach

74 Aquaculture research stations and NGOs interested in extending aquaculture should be familiarised with the on-farm research approach used in the project.

Table 7: Costed recommendations for extension of Farmer Participatory Research framework to farmers and aquaculture extension agencies. Costing based on estimates outlined in Appendix 4.

Recommendation	**Cost**	**Total**	
		(Rs)	**£**
Exposure visits of Fisheries Extension Officers and NGO staff to project clusters	Rs 2 full-time staff @ Rs 300 * 2 days visit * 3 countries =3600 + jeep hire @ Rs 900 * 2 days * 3 countries = Rs 5400	9000	132
Production of 300 copies of 3languages 20-A4-page colour leaflet handbook in Farmer Participatory Research theory and practice	Composing fee Rs 100 * 20 pages =Rs 2000 + art paper front & back pages Rs 900 (all languages) + Maplito paper 200copies (2 A4 pages) * 3 languages = Rs 3300 + printing charges Rs 800 (4 A4 pages) * 5 (to 20 pages) = Rs 4000 + Rs 1000 printing charge front pages block colour * 3 languages = Rs 3000	16,800	247
Distribution of printed materials	3 full-time staff @ Rs 300 * 5 days each = Rs 4500		
Farmer exposure visits to KRIBP(E)project villages	Rs 150 food & transport * 100 farmers * 3 states = Rs22,500	22,500	331
Forum for NGOs, KVKs, ICAR, DoF and others to meet and share experiences	Rs 5000 * 2 forums * 3 states = Rs 30,000	30,000	441
Total		**78,300**	**1151**

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Appendix I: Organisations involved in aquaculture research and extension in Eastern India.

Organisations	Activities
Fish Farmers' Development Agencies (FFDAs)	Launched in 1975 as district level organisations for promoting intensification of freshwater aquaculture (Kumar 1996). Rs 600 million earmarked for FFDA programme during 8th five-year plan (1992-97). Have initiated scientific fish farming in > 36,000ha water area and trained 400,000 fish farmers. Presently over 200 FFDAs functioning in 22 States. Extension and other support services to fish farmers, primarily weaker sections of society and fishermen's co-operatives. Government ponds and tanks leased to selected beneficiaries who are trained in fish farming on 14 day courses at the FFDA. Farmers given daily training allowance of Rs 25/day and Rs 40/coursefor travel costs. Activities include technical advice, assistance for project preparation plus help to obtain credit, as well as subsidies. Pond and home visits and farmers' pond demonstrations, printed booklets on improved aquaculture practices. Group extension via organised meetings, screenings of film and video shows, and celebration of the annual Fish Farmers Dayat district headquarters to provide a forum for farmers to share experiences. Mainly transfer composite fish culture, integrated fish farming and *Macro brachium* culture, by the use of 1) Mass awareness (publicity from State Fisheries Departments, radio and TV programmes and innovative farmers demonstrations) 2) Motivation of individual or group of farmers (individual and group contact by FFDA extension officers) and 3) Updating technology (Total Aquaculture Technology Centres ensuring that all recommended practices are followed, and that records of farmers' information are recorded and kept by FEOs). The **DoF**[8] **Purulia**, West Bengal conducts a training programme at block level for fish farmers selected by Panchayat from villages within a 15km radius. Only literate farmers can attend, and as no children are allowed very few women participate (in the 18 years of the programme, about 7-8000 farmers were trained in Purulia, 50 of these women). After training the DoF help individual farmers owning ponds suitable for fish production (holding water > 6 months, min. size 0.14ha) to obtain loans from national banks. Government provides 20% of loan value in materials as subsidy. Loan amounts vary with the state of the pond, if no modifications are needed Rs 12,000 is considered adequate, whereas if the pond needs modifications, more money are borrowed. Loans repaid in yearly instalments over 5 years. Project is monitored by FEOs[9] who go to villages once a month to assess progress and help farmers solve specific problems. In Ranchi there are 21 blocks and 3 FEOs, so each have responsibility for 7 blocks. In one week each FEO spends about 4-5 days in the field. The activities carried out by the **DoF in Ranchi**, are similar to those in West Bengal. Ranchi FFDA 1997 trained: 49farmers with stipend from the FDs[10], 50 farmers referred from the YMCA and 20 farmers and staff from an NGO called VEBSS. Of all these only two were women. Ranchi FFDA uses films covering cover specific activities (e.g. harvest) produced by the National Institute of Education in Bombay, for which they have a 16mm film projector.
State Fisheries Departments	Responsibilities include extension, training, development of fisheries co-operatives plus lots of other activities. Extension service still not organised. In some States, block level organisations manned by FEOs or AFOs[11]. However in most states, there are no exclusive fisheries extension services, and the development staff perform extension. Some FEOs responsible for all regulatory and developmental activities, including extension services.

[8] DoF: Department of Fisheries
[9] FEO: Fisheries Extension Officers
[10] FD: Fishery Department

Department of Agriculture: Fisheries Division	The Fisheries Division carry out some extension activities, including the production of film on different aspects of aquaculture technologies, shown regularly on national network and local TV channels, and also screened in the field to farmers by FEOs of the State DoF. The Extension Directorate prepares fisheries and aquaculture extension booklets.
Agricultural Universities	The Agricultural Universities and the State Fisheries Departments carry out the majority of aquaculture extension in India. The **Veterinary College** in Ranchi produces booklets in Hindi (e.g. integrated aquaculture, composite fish farming, nursery management). which are distributed to interested farmers? The College gives 7 days training courses in integrated or composite fish farming. However composite fish farming generally requires higher inputs of manure and feed than what poor have available. Training activities in 1997:30-40 courses for NGOs and about 20 for individual farmers (70-80 farmers in total). Of these 4-5 were women. Extension activities are mainly at village-level at local village markets.
ICAR (Indian Council of Agricultural Research) **KVKs** **TTCs** **NDP**	Responsible for promoting, conducting and co-ordinating research, education and primary extension education in agriculture including aquaculture and fisheries. Extension activities: mainly Transfer of Technology (ToT)developed on-station by research institutes to farmers and extension agencies. Institutions under the ICAR include the Krishi Vigyan Kendra (KVK) (Farm Science Centre), the TTC(Trainers' Training Centres), the National Demonstration Programme(NDP), the Operational Research Project (ORP), the Lab to Land Programme (LLP), the Research for Tribal and Backward Areas (RTAB), the Department of Biotechnology (DBT), and the Institution-Village Linkage Programme (IVLP). Started in 1974 by the ICAR Research Institutes, Agricultural Universities and Voluntary Organisations. Presently 261 KVKs in India, of which 3primarily dedicated to aquaculture (many have aquaculture as one of the major areas of activity). Primarily rural institutions doing vocational training for farmers, farm women, educated youth, school drop-outs and field level extension functionaries. Also disseminate and on-farm test technologies developed on-station. Emphasise the development of vocational skills through learning by doing. **Kalyan KVK (Ramakrishna Mission), Purulia** provides training for farmers educated up to 8th standard (for shorter training courses in the village (demonstrations etc.) literacy is not required). For aquaculture extension they use charts, posters, figures, photos, cartoons, slides, collages; folk dance, folk songs and video. Less than 10% of all trainees in aquaculture are women. Village ponds are mainly community run, and group (8-10 men)aquaculture is promoted. Technologies developed on-station are tested on-farm and modified to suit specific conditions and demands. **Dibyan KVK, Ranchi** only recently started aquaculture activities, in1998 10 village youths were trained in composite fish culture, fish breeding, and pond management in a one month long course. For the training leaflets, cassettes, audio visual material, and practical demonstrations are used. After the training trainees return to villages, and support for feed and marketing is provided by the KVK. Only bigger water bodies (big and medium tanks) used for aquaculture. Small demonstrations are carried out at the centre in Ranchi, whereas larger scale demonstrations are arranged at the central Ramakrishna Mission farm. So far aquaculture has been started in two tanks of the project's 30tanks. 8 specialised TTCs provide training to the KVK teachers and field extension workers on latest knowledge in farming technology and training pedagogy, one **TTC for freshwater aquaculture under CIFA, Bhubaneswar.** Here Subject Matter Specialists (SMS) from KVKs are trained in courses held24 times/yr, (about 25 participants in each). Courses 7-10 days, on different aquaculture topics (pearl farming, integrated aquaculture, women in aquaculture, etc.). Trainees given full literature prepared by CIFA, and blackboard, OHP, slides and videos, field visits, and practical classes in laboratories and on farms are used. Programme for scientists to extend new technologies by on-farm demonstrations. Initiated in 1965 to demonstrate potential of new production technologies

[11] AFO: Assistant Fisheries Officer

	in the farmers' fields and for scientists to test validity, relevance and limitations of findings
ORP	Launched in 1974-75 on basis of experience gained from NDP. Promote integrated approach to rural community problems through co-operation and involvement of local development agencies, financial institutions, rural development departments, voluntary organisations, agricultural universities etc. 152 ORPs in India, many with fish culture as a major component, including an ORP on composite fish culture in West Bengal, and an ORP at Sultanpur working on productive use of wastelands through aquaculture development.
LLP	Launched in 1979, implemented through 104 collaborating centres throughout India. Aims to bring farmers, scientists and extension workers in close contact and to introduce low-cost farming technologies including aquaculture with a view to generating employment and income among the participating farm families. Has covered 24,000 small and marginal farm families, mainly SCs[12], STs[13] and OBCs[14]. Each farm family given limited input assistance worth up to Rs 500 as incentive. Farmers and pondless farm labourers or rural poor are selected and adopted, and a survey of the available aquaculture resources in area is carried out. Based on survey suitable aquaculture activities are developed and implemented involving the members of the adopted farm families, scientists of the research institutes, extension officers of the State Fisheries Departments, faculty members of Agricultural Universities, local administrators etc. Demonstrates technology in farmers' ponds, train members of participating families and other progressive farmers, educate unemployed youth and women of the area. Also on-farm testing of technologies in order to obtain feed-back from farmers on technology.
RTAB	45 project centres work for the benefit of 267 economically and socially weaker sections of the Indian society. Main emphasis on identification of appropriate technology packages (including aquaculture options) and their implementations.
DBT	Initiated the perfection of several aquaculture technologies and the demonstration of these (including further intensification of the composite fish culture technology package with CIFA).
IVLP	Launched to ensure that research agenda and technology transfer is needs-based. Mainly deals with agriculture, but includes some aquaculture activities. Currently the programme is at a pilot stage, covering 42centres and 42,000 families all over India
NGOs	Several NGOs are active in aquaculture extension in India, including the Ramakrishna Mission, the World Luteran Service, the Don Bosco Society, the Tagore Rural Development Society, the Kamala Nehru Trust, the Nehru YuvaKendra and others. The Society for Rural Industrialisation (SRI), the Action for Food Production (AFPRO), and the Council for Advancement of People's Action and Rural Technology(CAPART) are described below:
SRI	Pioneer organisation transferring fish culture technology to grass root level in tribal belt of Bihar. Also runs programme on transfer of aquaculture technology to support other NGOs of area with assistance from the CAPART. SRI with assistance from CAPART has supported several NGOs to establish fish hatcheries to meet growing demand for fish seed. Interested pond owners are surveyed and trainees selected on the basis of water body characteristics (preference given to larger, groundwater fed perennial ponds owned by individuals. Farmers are expected to provide manure(400kg/acre/month) and feed (rice bran, mustard oil cake, beer production by-products) but are given fry and other inputs(e.g. lime (20kg/acre/month), bleaching powder, inorganic fertiliser (urea:20kg/acre/month and SSV: 60kg/acre/month) etc.) free of cost. If machines are used for the digging of ponds etc., farmers meet the costs of these. Train about 100 farmers per year, i.e. are actively involved in the arrangements of harvesting and marketing and providing inputs (fry, lime, inorganic fertiliser) for one year, and which they pull out and offer advice only. Also training of other NGOs (10in 1997) and other grass root level organisations (10 in 1997) in training approaches used. Teach KRIBP(E)staff and farmers' group representatives, *jankars* (latter trained for 7-10 days for which KRIBP(E)

[12]SC: Scheduled Caste
[13] ST: Scheduled Tribe
[14] OBC: Other Backward Castes

	pays Rs 100/day/jankar).
AFPRO	Delhi based operating in several states. Promotes network of NGOs working with socio-economically weaker sections of rural societies. Network partners meet at least once a year specifically for identifying problems of fisheries/aquaculture development vis-à-vis rural development and sharing of success / failures encountered. NGO network members helped by AFPRO for preparation of viable and appropriate projects and mobilise funding. Networking of NGOs for aquaculture extension initiated in several states, including Andhra Pradesh, Orissa, Bihar, Uttar Pradesh, Haryana and more. Main functions of AFPROL: organising rural poor and training in appropriate fisheries and aquaculture technologies, through arranging of lease of public water bodies, introducing group saving schemes, mobilising group loans, assisting groups to initiate aquaculture and helping them with the marketing of their products.
YMCA	The **YMCA in Ranchi** run a Village Reconstruction Programme involving 68 tribal villages in the Khunti block. Mainly agriculture training but 30-40 villages have ponds, and with the help from FFDA individual perennial pond owners from area trained in composite fish culture. Farmers select which people from which villages should be trained, after which they contact the YMCA who then contact the Deputy Fisheries Officer (DFO). YMCA supply fry and lime, farmers supply feed and fertiliser. Courses at FFDAR anchi, for 5-10 days, mainly for men (women stay home to look after children). Ranchi YMCA has 121 staff. There is also **YMCA** offices in **Calcutta** and **Orissa**. For extension material the YMCA uses leaflets, posters and video.

Sources: A.K. Singh, Assistant Professor of Fisheries, Ranchi Veterinary College, pers. comm.; B.N. Baskey, DFO, Purulia, pers. comm.; Ashish Kumar, DFO, FFDA Ranchi, pers. comm.; Ayyapan *et al*. (1998); Kumar(1996).

Appendix 2: Contact addresses

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Mr. S.N. Sinha, Investigator
Prasar Bharati Broadcasting Corporation of India
Doordar Shan Kenda, Ranchi

Mr. Madan of SRI

Mr. Maharaji of the Ramakrishna Mission (KVK Dibyan)
Ranchi

Mr. Durgapada Mandal (training organiser in charge) and Dr. Bikash Roy(training associate, fisheries), Kalyan KVK (Ramakrishna Mission), Purulia, West Bengal

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and
S.P. Singh
Fisheries Extension Officer
Ranchi
and
Rajendra Nishad and group of other progressive farmers at the FFDA from Karra block (ca. 42km from Ranchi).

Birendra Nath Baskey
District Fisheries Officer
Purulia, West Bengal

Appendix 3: Overview of the informationneeds of the institutions interviewed.

Organi-sation	Opinion	Suggestions
CIFA	Much need for research into options for small-scale farmers with seasonal water bodies. Not much need for on-farm research, since method of testing technology developed on-station works well.	Recommendations from KRIBP(E) project will be incorporated into existingextension message to farmers. Therefore training material for CIFA staff is needed (i.e. booklets, more detailed literature, video films etc.).
FFDA	Need for extension methods for reaching poor farmers. Recommendations regarding aquaculture options for poor farmers from the KRIBP (E) aquaculture project would be useful for the FFDA.	FEOs should be trained in on-farm research techniques via discussions and meetings with KRIBP(E) staff. The DoF would need printed materials (leaflets and books on techniques). Specific technology relevant to poor farmers developed in the KRIBP(E) aquaculture research would be easy to extend to the farmers that the DoF is working with. Farmer-to-farmer extension could also be used, with farmers groups interacting. FFDA could use videos, farmers' meetings where farmers could communicate techniques or research practices that work to each other - e.g. via visits of progressive farmers to other farmers practising different methods.
Farmers	Great need for framework for carrying out research with farmers.	Farmer-to-farmer extension via farmers' meetings should be arranged at block level (two meetings per block so that farmers from a radius of no more than 10km could attend, travelling to and from in the morning and evening). These meetings should be held after December. It would be difficult to get women to attend meetings because of their domestic duties.
KVK	Need for poverty focused technology derived from experimenting with farmers on their farms. Interest in the KRIBP(E) approach as research into aquaculture options for poor farmers without perennial water bodies would fill a gap. Demand for low-input technology and recommendations for producing fish for household consumption.	For the training of extension workers, government officials and NGOs, detailed literature would be required, e.g. descriptions of in-depth studies with site-specific details. For training farmers easy literature or posters, Chow dance and folk songs on cassettes would be useful. Suggested exposure visits for KVK farmers to KRIBP(E) farmers to discuss practices and options. Also suggested a forum for NGOs, KVKs, ICAR and other scientists and private companies, DoF and other governmental institutions to meet and share experiences.
SRI	Interest in the research carried out at KRIBP(E), identified need for options for marginal farmers with seasonal ponds.	SRI trainers would need booklets and a course from KRIBP(E) staff in the farmer-research methodology. For the dissemination of specific technologies or low-input aquaculture options for seasonal ponds, SRI would need written material for their extension personnel, and recommend that meetings between SRI and KRIBP(E) farmers be arranged for farmers to share information.
YMCA	Need for aquaculture options or technology for the poorest farmers as these are not currently addressed. Would welcome details of methodology for how to involve farmers more in the research process.	The YMCA would welcome both new aquaculture technologies and information relating to the research process. Most useful would be a training course for their staff in the methodologies used in the KRIBP(E) project, as well as in any technology or husbandry recommendations, which could also be recorded on video films they could show to farmers.

Sources: Dr. K. Kumar, CIFA; Dr. Moharty, Principal Scientist, CIFA; Dr.S.K. Sarkar, Senior Scientist, In Charge of KVK & TTC, CIFA; Mr. B.N.Baskey, DFO, DoF, Purulia; Mr. A. Kumar, DFO & CEO, FFDA, Ranchi; Mr. S.P.Singh, FEO, Ranchi; Mr. R. Nishad, fish farmer under FFDA project, Karra block; Mr. Maharaji Dibyan KVK Ranchi; Mr. Madan, SRI, Ranchi; Mr. D. Masih, Secretary YMCA, Ranchi.

Appendix 4: Extension material development costings

TV and radio

To orientate the rural population about aquaculture, video films about aquaculture options (species, practices etc.) could be produced, and shown in village Panchayat offices, at farmers' fairs, in local schools for children of the 8th standard (12-13 years),etc. Such videos should be produced in the local language. The video should be short enough to keep attention focused (max. 45 minutes) and if targeted at children should include e.g. cartoons and popular songs.

Item	Cost (Rs)	Source
20-30 minutebetacam*/u-matic video master copy	60-70,000	Mantrana Group
15-20 minute betacam/u-matic video master copy: Shot in studio (over 2-3 days) Shot in field (one visit)	 125,000 140,000	At a Glance
Eachsubsequent copy	200	Mantrana Group & At a Glance
VHF master copy Each subsequent copy	2500-3000 200	YMCA
VHF video documentation Daily charge for 6-hour day Rental of 4-wheel vehicle per day** VHF video reporting, per visit 15-30 minutes VHS video film (one visit) For every additional minute add VHF press release section, per month Audio-video library, per month***	 3500 350 5000 15,000 5000 7000 5000	M/S Multi Media

* Betacamvideo produces better quality master copies than VHF, which often cannot be played more than a couple of times before the tape disintegrates.

** For out-door shooting the project must provide accommodation, food and a4-wheel vehicle (alternatively the vehicle can be rented).

*** A room and other facilities for library must be provided by the project.

Photographs, picture library

At fairs and exhibitions, photographs can be used to show project approaches.

Item	Cost (Rs)	Source
Still photography, colour, 5"7", per photo* Photo feature, per album	60 1000	M/S Multi Media

* A minimum of 15 photographs per visit are required.

Cassette and radio

Item	Cost (Rs)	Source
Master copy folk song cassette	2-3000	Kalyan KVK, Purulia
Broadcast quality master cassette (2 songs) Each subsequent copy	3-4000 15-20	Mantrana Group
Small battery driven radio	150	All India Radio Station, Ranchi

The cost of broadcasting songs varies between radio stations. If the KRIBP (E) aquaculture extension material included folksongs, they could be broadcast from the Ranchi Radio Station free of cost. However they have to pass an auditory test to get on the air. Frequently hosted by the All India Radio Station in Ranchi are stage shows held at different locations within the broadcast zone, lately in the heartland of the tribal zone. Shows feature light Indian music, and are held late in the evening (when all villagers have completed the day's work) about 2-3 times per year. Shows are extremely popular, with women, men and children attending often until late at night. Folk song shows are also held about 4-5 times per year. The theme of most folk songs are development issues, seasons, ceremonies and farming activities, and the format and content of these songs varies from region to region (Joseph Purti, Ranchi All India Radio Station, pers. comm.).

Drama, dance and folk songs

Drama groups traditionally consist of youths from the villages. For the drama to be entertaining and relevant, it is important to consider the target group and the topic. Drama can be performed in selected small villages where villagers from neighbouring villages can come along to watch, about 2villages in a cluster should be sufficient to cover everybody. For the recording of folk songs, KRIBP (E) can either provide the singer and the lyrics and record in a studio (e.g. with the Mantrana Group in Ranchi), or provide ideas to a producer who can then help write the lyrics and the music. These are relatively cheap to produce because of the short time frame involved(see section on radio for price details).

Item	Cost (Rs)	Source
Chow Dance*	10-15,000	Kalyan KVK, Purulia
Drama** Each subsequent performance***	10,000 1-2000	Mantrana Drama Group & M/S MultiMedia****

*Time-frame approximately 30-45 days.
** Time frame approximately 10-30 days.
*** Depends on the number of actors (normally10-15).
**** The group would require transport and accommodation for performances.

Printed material

Item	Cost (Rs)	Source
1000 one pageA5 low quality paper leaflet printed one side only 1000 four page A5 (up to 18" by22" or one side print on A3)	350 750	Mantrana Group
1000 four page A5 low quality paper leaflet	400	Doranda Press
Four page A5 colour leaflet (up to 18" by 22" or one side print on A3) Composing fee per A4 page Black and white photos or sketches/line diagrams (each) Eight pages A4 Krim of paper (both side printing of 1 page A3) Folding charge (per 500 copies)	 750 100 80 500 100	Sumudran Publishers
Posters: for 500 black and white copies* Printing charges for multicolour (4 colours)	600-700 6000	Sumudran Publishers
Newsletter / bulletin: Front & back page 75% picture 50% picture Whole page picture 1 colour block (2 A4 pages) Art paper (New Scientist type glossy thin coated paper) for front and back pages for all four language editions Black and white photo processing charge per picture Maplito paper (white good quality paper) super printing 200 copies 2 A4pages Krim of low quality paper (greyish thin) per language Printing charge: same prices for 100-3000 copies Cover 4 colours (4 languages) 5th colour per language Black and white pages (per 4 A4 pages)	 750 600 1000 150 900 80 50 100 6000 1000 800	

* Does not include processing fees - which depend on the job.

Fairs, meetings, workshops and exhibitions

Fairs and aquaculture produce exhibitions can be held a number of times a year for farmers to exchange ideas and advice. Smaller meetings to direct the research (Matsya: Anusandhan Sahayak Committee (MASC) or Farmer Research Support Committee meetings) are already held regularly at village level, and in most areas there are regular village *harts* (markets). Larger fairs can be held at development block level, in block office common halls or the like. Here exhibitions or other aquaculture activities could be advertised beforehand, to attract farmers and research institutions, banks, government bodies, NGOs etc., for open discussions. In this forum farmers could raise their questions and give feedback directly to scientists, as well as discuss opportunities for institutional and financial support with the relevant organisations. The cost of a fair is likely to be about Rs 5000 (Dr. A.K. Singh, Ranchi Veterinary College, pers. comm.).