# The Role of Extension in Effecting On-Farm Practice Change for Controlling Shrimp Disease

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## ABSTRACT

The history of participatory extension methods throughout Asia and the Pacific illustrates the effectiveness of these methodologies in creating sustainable changes to farming practices. By involving farmers in research on farms it is possible to construct appropriate technologies to improve farming practice. This paper describes theories that underpin processes that lead to on-farm adoption of technologies. The paper sits the theories within the context of ACIAR project FIS/2000/061 'Development and Delivery of Disease Control Programs to Small Scale Shrimp Farmers in Indonesia, Thailand and Australia'. This project is designed to create effective processes for controlling shrimp diseases such as white spot syndrome virus and yellow head virus. The contextual relevance for specific extension approaches and resulting technologies means that there is a fusion between the scientific and social systems that are in play. This paper describes the extension design process for the overall project, processes used to analyse social systems, and outlines extension strategies adopted for each country. The paper contends that without effective social research and extension program design there will be little adoption of appropriate technologies. No matter how good the scientific research there will be little change if people participating in the aquaculture industry do not contextually apply technologies. Extension is one key factor for successful control of shrimp disease in the Asia/Pacific region.

## INTRODUCTION

The common use of the word 'extension' emerged in Britain in the 1840s, where it was associated with the growth of adult education by universities for women's associations and working men's clubs in the industrial north of England. It was thus a movement in which the universities extended their work beyond the campus. This was taken up in the United States where 'extension education' was used to indicate that the target group for university teaching should not be restricted to students on campus, but should be *extended* to people living anywhere in the particular state served by the university. Thus, in its origins, *extension may be seen as a form of adult education* (Van den Ban and Hawkins, 1996).

Foster, D. and H. Demaine. 2005. The role of extension in effecting on-farm practice change for controlling shrimp disease. *In* P. Walker, R. Lester and M.G. Bondad-Reantaso (eds). Diseases in Asian Aquaculture V, pp. 589-601. Fish Health Section, Asian Fisheries Society, Manila.



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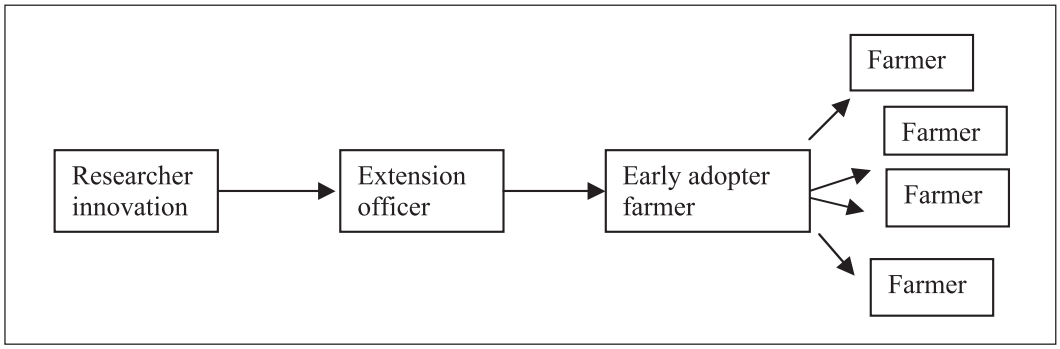


**Fig 1.** Transfer of technology diffusion extension process.

In the United States, extension education was mainly an activity of Colleges of Agriculture, which employed extension agents widely across the state. Land Grant Colleges provided advisory services to farmers (Hawkins *et al*., 1982). It was in the 1960s that the notion of group learning began to emerge with the initial writings of Rogers (1983) on diffusion of innovation. This genre of diffusion saw the development of groups of farmers coming together to learn about the latest science and technology that researchers and innovators had developed (Fig. 1). This process was called the 'technology transfer' (ToT) model. This model has a 'top down' approach and an emphasis on improving the rate of adoption. It is based on the principle that extension officers could influence the adoption of research innovations by *persuading* farmers to adopt technologies developed in universities or research facilities.

Farmers who were enthusiastic and willing to try new ideas promulgated through the ToT approach were known as 'early adopters' (Rogers and Shoemaker, 1971). It was presumed that if these early adopters were targeted first then the example set by their adoption of technologies would diffuse to less willing farmers and thus encourage broader adoption of the technologies. This extension process became known as the 'diffusion' model and was used extensively in the 1970s.

The World Bank (1996) identified significant issues associated with the ToT approach.

These are:

- being unresponsiveness to variation in farmer needs;
- leading to a lack of ownership by intended beneficiaries;
- having failed to reach poor and women farmers;
- having limitations in the quality of field and technical staff; and
- having high and unsustainable public costs.

In an attempt to explain this failure of adoption, extensionists began thinking about the relationships between rural extension and the broader sociological dimensions of rural communities (Roberts and Cloonan, 1997). The importance of understanding rural social systems as a basis for effective extension work began to be considered worldwide. The 1980s emerged as the era of systems. Checkland (1981) laid the foundation for a significant worldwide shift in thinking with his publication 'Systems Thinking, Systems Practice'.

This soft systems approach to thinking about complex social, natural and organisational issues led to the development of new extension models. Throughout the 1960s and 1970s, Freire (1973) espoused the importance of adult education as a foundation for social reconstruction and poverty alleviation in South America. R_ling (1988) reinforced the importance of learning as a basis for social reform when he proposed the Agricultural Knowledge and Information Systems (AKIS) approach. This work emphasised participant learning within complex farming systems. The involvement of participants in experiential learning (Lewin, 1964; Knowles, 1975) was seen as fundamental to sustainable on- farm changes. In developed and developing countries, participatory processes were emerging as significant strategies for effective extension practices. Farming Systems Research (FSR) initiated a process that involved close collaboration between farmers, extension staff and researchers (Röling, 1988; Scoones and Thompson, 1993). Techniques such as Rapid Rural Appraisal (RRA) and Participatory Rural Appraisal (PRA) began to provide processes for understanding rural systems in a way that involved all actors in the system (Pretty and Chambers, 1993).

In the late 1980s Chambers *et al*. (1989) published Farmer First (FF), which built adult learning and participation theories into behavioural change processes. This approach laid the foundation for more rigorous sets of guidelines for 'participatory' approaches. Subsequently there was a growing international acceptance and application of these concepts (Chambers, 1989; Drijver and van den Breemer, 1995).

In Asia, the use of participatory extension techniques was promoted through the World Bank, Food and Agriculture Organisation (FAO), Australian Agency for International Development (AusAID) and Australian Centre for International Agricultural Research (ACIAR).

*'Putting responsibility in the hands of farmers to determine agricultural extension programs can make services more responsive to local conditions, more accountable, more effective and more sustainable. To realise these benefits, the role of the public sector has to be redefined to permit multiple approaches that account for user diversity and to develop partnerships with farmer organizations, NGOs, and the private sector' (World Bank, 1996).*

The above statement illustrates the growing complexity of applications that extension was being asked to address. Social, environmental and economic issues were now being seen as interrelated and even more systemic approaches to problem identification and solution generation were being tried, using highly participative extension approaches. The discipline of extension now included not only the persuasive prescriptive domain of the technology transfer paradigm but also the facilitation and adult learning parameters of participatory community development.

Phillips *et al*. (2001) identified the importance of understanding the complexities of systems interaction in producing sustainable aquaculture. They referred to a 'wide range of factors and issues' that are relevant to modern aquaculture development and identified in particular three dominant systems that are currently recognized:

- natural systems;
- social systems; and
- economic systems.

'The "systems approach" recognises this diversity of influences on aquaculture development, and is a multifactorial and multidisciplinary approach. It uses an understanding of how aquaculture systems operate to analyse how different factors affect aquaculture and develop solutions to problems that are identified' (Phillips *et al*., 2001).

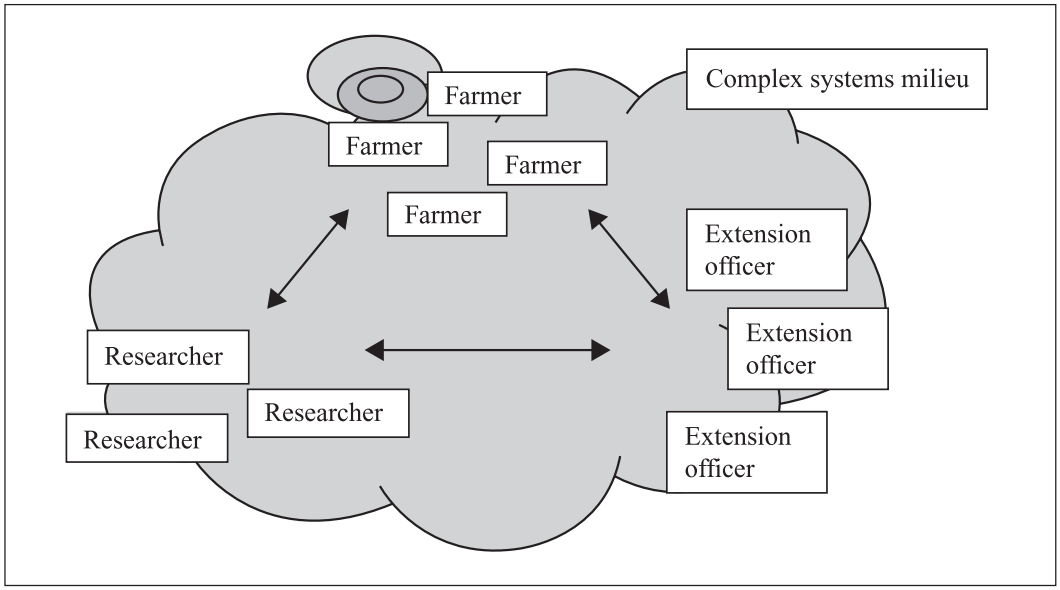


**Figure 2.** Relationships in participatory extension.

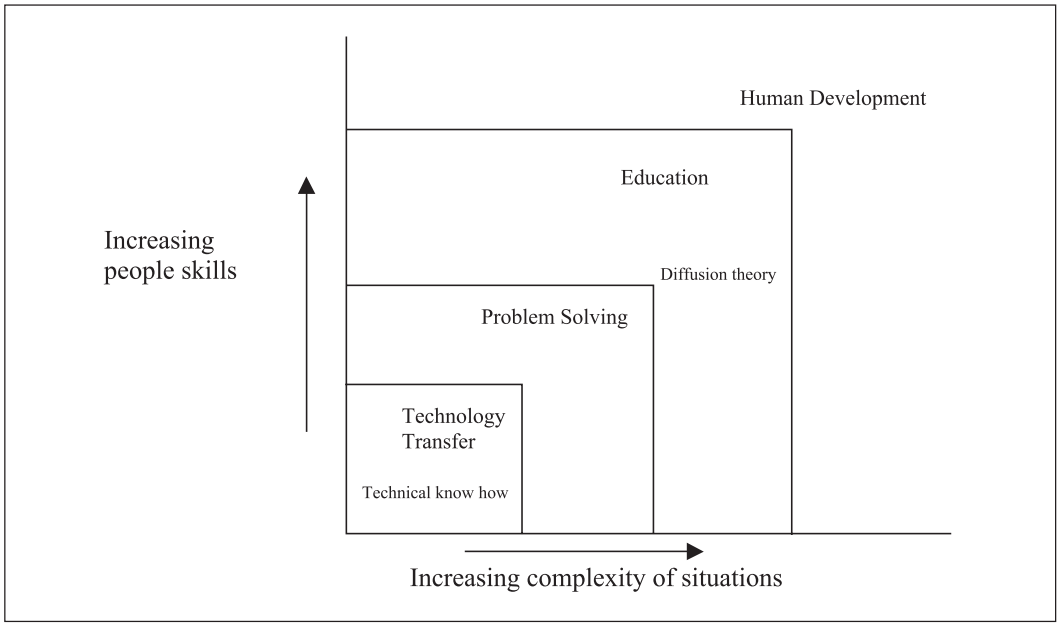


**Figure 3.** Paradigms of extension (modified from Coutts, 1994).

Extension officers now had a new dimension to add to their operations, one that embraced participative research and development between farmers, researchers and extensionists set in a milieu of complex systems (Fig. 2). Participatory extension programs are now well established throughout the world and are used in addition to the traditional transfer of technology and other extension approaches.

Despite these differences in emphasis, a common definition of the term proposed by Van den Ban and Hawkins (1996), which stresses education and advice, is *'the conscious use of communication of information to help people sound opinions and make good decisions'.*

Coutts and van Beek (1994) summarised these different approaches and identified four paradigms of extension and described them in terms of complexity of situations and demands on people skills. By adding the diffusion concepts of Rogers (1983) we can provide a schematic of the paradigmatic styles of extension (Fig. 3).

## SETTING THE CONTEXT OF THIS PAPER – ACIAR PROJECT FIS/2000/061

This paper uses the experiences gained through the establishment of ACIAR project FIS/2000/061 'Development and Delivery of Disease Control Programs to Small Scale Shrimp Farmers in Indonesia, Thailand and Australia' (Callinan, 2000). The project is set across three countries and is using eight sites; two in Thailand (Chachengsao, Kungkraben), three in Indonesia (East Java, South Sulawesi, Central Java); and three in Australia (North Queensland, South East Queensland, Northern New South Wales).

The project is a four-year project and follows a previous ACIAR project that identified protocols for effective control of major shrimp diseases such as white spot syndrome virus, yellow head virus. The main thrust of the project is to validate disease diagnostic protocols and technologies in each of the locations over the first two years; and from years two to four, to develop an extension program specific for each of the countries.

### *Processes for Providing an Extension Program*

In an abbreviated form, the objectives of ACIAR project FIS/2000/061 are:

- completion of training, in practical disease control issues;
- description of disease pathology and epidemiology on Australian shrimp farms;
- development of appropriate, country-specific extension processes;
- validation of farm-level disease control programs;
- demonstration of validated disease control programs on selected farms; and
- extension of validated disease control programs to shrimp farmers.

These objectives illustrate the emphasis on designing and providing an extension capacity within each country to progress the adoption of disease control technologies and farming practices. To assist in the provision of extension services for ACIAR project FIS/2000/061 within the complex social, technological and governmental systems in each country, a framework for designing extension programs (Fig. 4) was used. This framework has three cornerstone activities, namely: Understanding, Designing and Implementing (Foster, 2002).



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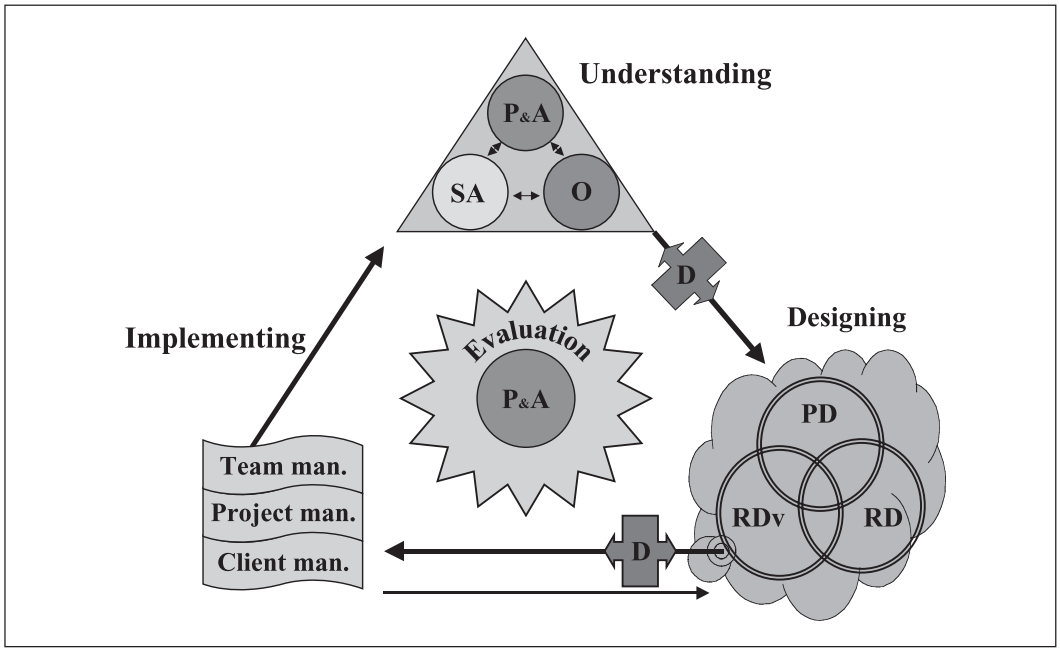


**Figure 4.** Framework for designing extension programs.

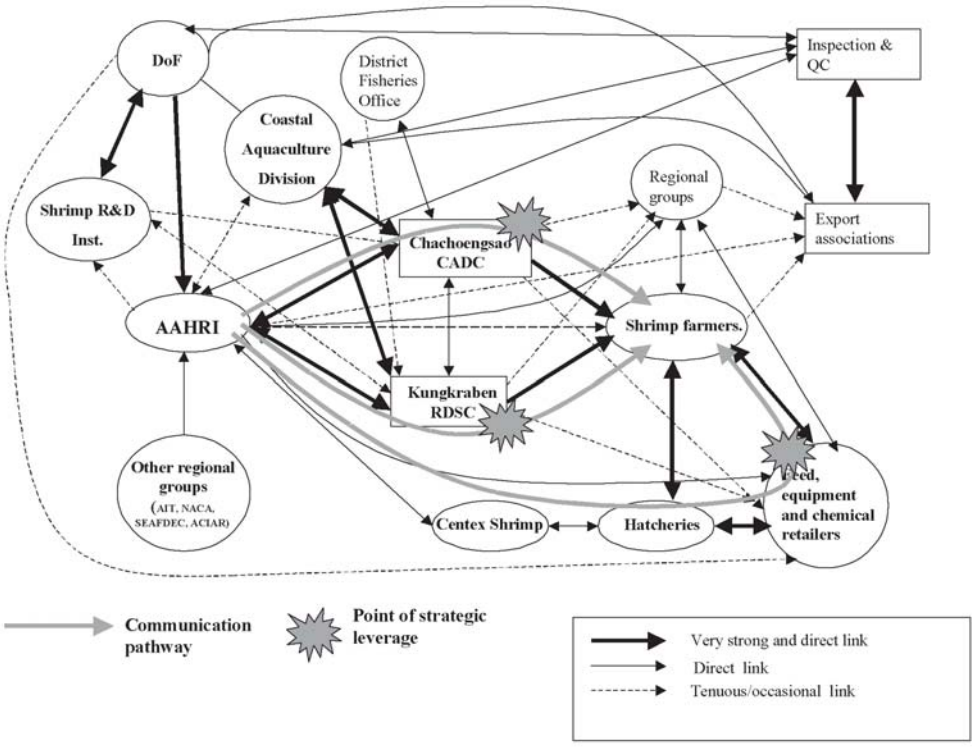


**Figure 5.** Sociogram analysing of shrimp farming extension system for disease control project in Thailand.

In the 'Understanding' section of this framework, many techniques can be used to appreciate the complex systems in which the extension program will sit. In this instance, there were two trips to participating countries by the project leader and extension coordinator. During these trips, extensive interviews were undertaken with participants to gather information about such issues as working and personal relationships between potential participants, cultural demands, technical and knowledge capacities, perspectives and expectations for the project and physical data with respect to participating aquaculture sites and research facilities. This information was then synthesised into a sociogram (Fig. 5) for each of the countries. These sociograms allowed for a clearer picture of the systems operating in each country. It also allowed identification of effective communication pathways and points of strategic leverage for the project.

These activities and associated literature reviews allowed for the identification of the strategic approach to be used within the ACIAR project. In this case it was decided that, due to existing technologies that emanated from a previous ACIAR project (FIS/1997/125 'Disease control programs for prawn farms in Indonesia and Australia: a pilot study) and recognition that there was significant diversity of natural, social and economic systems amongst the participant countries participating in the current project, a combination of diffusion theory and participatory approaches was to be used. The diffusion theory would allow the existing technology for shrimp disease management to be offered to project participants and the participatory approaches would allow for the situational adjustment of these technologies for specific project locations.

The sociogram provided a basis for designing an extension approach (Fig. 6). The overall extension design undertaken as part of the 'Designing' component of the framework identified three separate sections:

- continuous improvement processes;
- communications strategy; and
- building extension capacity.

This extension program design illustrates the '*multifactorial*' and '*multidisciplinary*' (Phillips *et al*., 2001) nature of extension needed to effect change in complex system environments. The first of these sections of the extension program is associated with participative processes for farm-based trials and research. The second and third sections are associated with developing sustainability of the project interventions.

With respect to the communications strategy, an array of strategies is employed to ensure that communications occur between the project and stakeholders and all interested parties. An important principle used in this component is that of linking to existing information and communication conduits rather than inventing new ones. To this end links will be established to information bases and extension material in organizations such as the Network of Aquaculture Centres in Asia (NACA), Centex Shrimp and the Asian Fisheries Society (AFS). This linking will be provided through the website, published materials and through promotional activities and materials.



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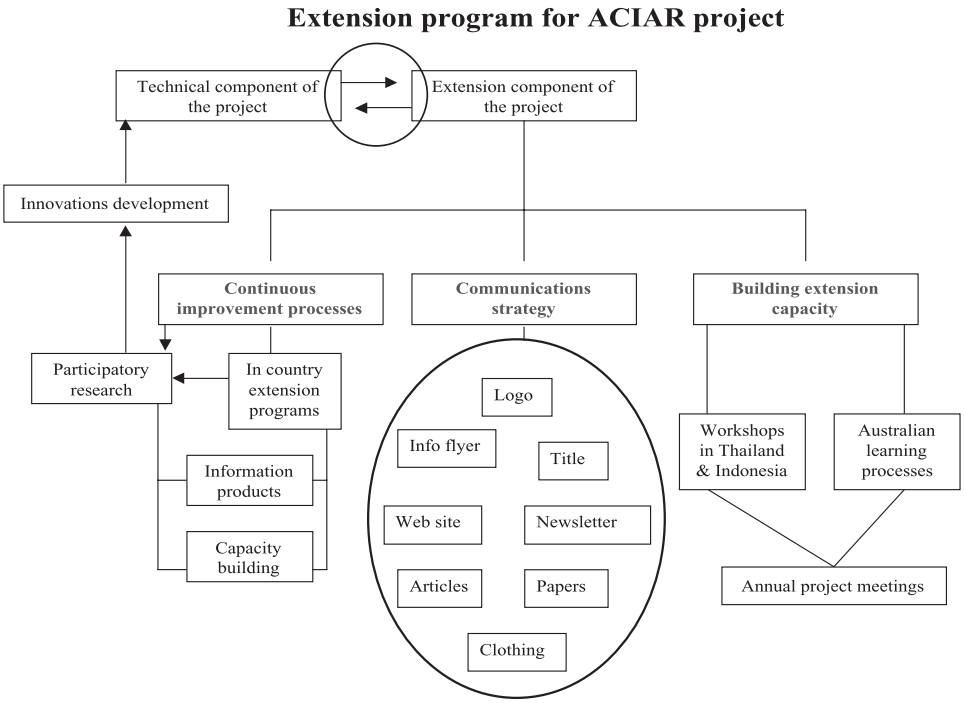


**Figure 6.** Extension program for ACIAR Project FIS/2000/061 'Development and Delivery of Disease Control Programs to Small Scale Shrimp Farmers in Indonesia, Thailand and Australia'.

The 'Building Extension Capacity' section uses high-level participative processes to allow extension officers in all countries the capacity to design appropriate extension programs for their country. In August 2002, workshops were run in Thailand and Indonesia to provide the opportunity for extension and research staff to develop both an understanding of extension theory (where appropriate) and develop a research/extension program for the first year of the project. Through this approach staff were able to apply concepts specifically to the research sites in each of the five locations in Thailand and Indonesia. These objectives were met using techniques such 'rich picturing' (i.e., participants use drawing and cartooning to describe the context of their extension work), group discussion, peer-situation assessment, timelines and post-it/grouping techniques (used to prioritise and group activities). The processes also allowed for activities such as the review and reconstruction of the countrywide sociograms. In both countries, this analysis lead to significant changes to these sociograms. Through the process, participants were also able to construct a sociogram specifically for their site. These site-specific sociograms were extremely significant because of the specificity to project implementation and they had high contextual relevance to participants. This often contributes to what is loosely termed 'ownership'.

The importance of facilitating change to sociograms was that:

- it allowed the participants the opportunity to understand the operational and social systems in their area at a much deeper level;
- it allowed the participants the opportunity to add their local knowledge and wisdom to the picture;
- it created a focus for dialogue and discussion that surfaced differences and commonalities amongst the group;
- it allowed for a commonly agreed approach to activating the project within the context; and
- it created high levels of contextual relevance.

All of the strategies used within the workshop were designed to create deep understanding about the objectives of the project and how the project will benefit farmers in specific locations. By using these processes, strong relationships between the project and the participants was created. The project was effectively recreated by the participants into language and context specific processes and technologies that are relevant to the social, natural and economic systems operating around the research sites.

The 'Continuous Improvement Processes' (Fig. 7) section focuses on the participatory extension approaches to be used (during and post- project) with farmers and farmer groups. In the diagram, there is a loop that exists between the on-farm experiences, the researchers working on the technical aspects of the project and the extension program. In addition, there is an implied diffusion aspect as each country has opted for working with farmer groups who are able to observe and analyse key farmer activities.

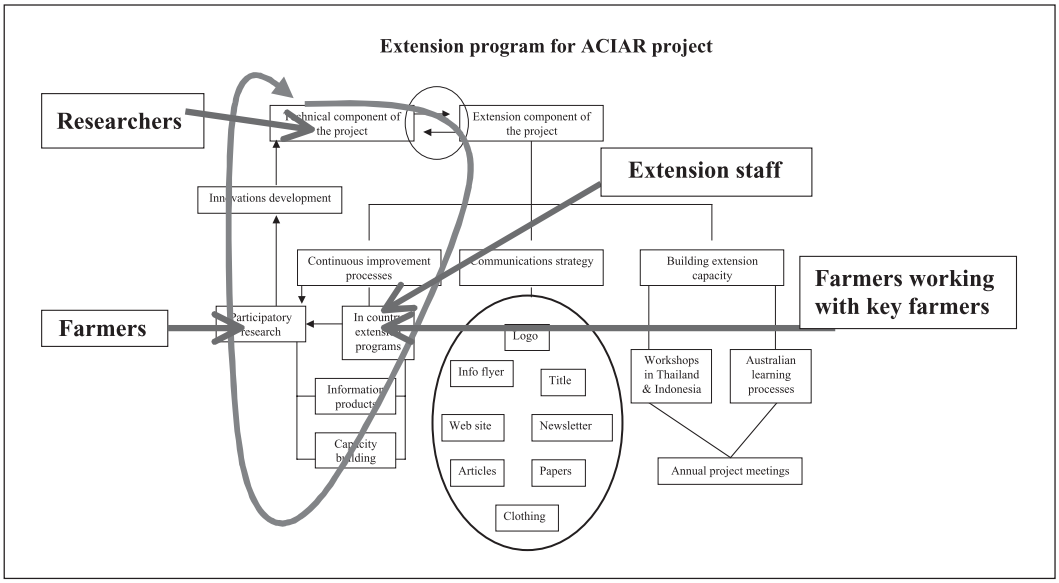


**Figure 7.** Continuous improvement loop.

In this case the existing technology will be tested in the various locations and extension staff, farmers and scientists will come together during and after each crop to discuss how things are progressing. The insights gained by farmers and consideration to the broader systems such as the social systems, economic systems and local natural systems will all play an important role in establishing the best practice for farms in a particular area.

## AN ASIAN CASE STUDY

Participatory research, as described above, is identifiable in programs for a wide range of primary industry activities throughout Asia, Africa, Central America and the Pacific (includes Australia). One example of this type of work is being carried on through the 'AIT Aqua Outreach Extension Experiment' at the Asian Institute of Technology (Demaine, 1994).

In this initiative, the development of an appropriate extension system becomes part of the experimentation process in the farming systems research and extension methodology (Fig. 8). Stages 1 and 2 in this framework are typical of farming systems research, i.e., situation analysis and the process of development of appropriate technology, particularly through on-farm trials. What is quite unusual in such frameworks is the emphasis in Stage 3, which illustrates an interactive process in the development of an appropriate extension system and extension materials.

After due consideration, bearing in mind the limitations of other approaches, a 'distance extension approach', based upon the concepts of innovation theory (Rogers, 1983), was selected for testing in Thailand. At the heart of this approach was the assumption that farmers were interested in improving their aquaculture sub-system and would respond to information on the appropriate means to do this, without active promotion by extension agents. Since the project's technical recommendations were relatively simple, farmers would be able to adopt these without 'back-up'. The experimental strategy involved a two-stage approach: firstly, raising the awareness of farmers of the technical recommendations through broadcast media (TV and radio) and the use of posters; secondly, making the extension materials available in large numbers though existing institutions at the district and *tambol* (sub-district) levels. These institutions included the *tambol* Agricultural Extension worker, the *tambol* health centre, the primary school group centre and the district office of the Bank for Agriculture and Agricultural Co-operatives (BAAC). Project field staff were responsible for distribution of the posters which were stuck in village shops and meeting halls with the permission of the owners and village committees, respectively. For the main part of the experiment, seven tambols in the two districts which had not been part of the project's original field area were chosen. The BAAC experiment covered offices in seven additional districts of the province. At each of the local institutions record books were provided so that local officials could note down the names of those farmers who came to collect the materials.

Early in 1992, the AIT Aqua Outreach Programme (AOP) began an assessment of the results of the experiment. The follow-up was carried out through surveys at two levels, with members of the institutions involved in the experiment and with farmers who had received the extension materials.

Detailed results of these surveys are given in Demaine (1994) and Demaine et al. (1994). In summary it may be concluded that:



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a) as many as 38.4% of farmers confirmed as having received the extension package had adopted one or more elements in it at the time of the first follow-up survey;
b) a small number of other farmers who did not follow recommendations had adopted their principle by 1992;
c) not all farmers fertilized their ponds using the standard project recommendations; and
d) although no detailed quantification of impact in the form of production figures were obtained from the surveys, most farmers claimed to have achieved a moderate to large increase using project recommendations and to have stopped or reduced a lot their purchases of fish from outside.

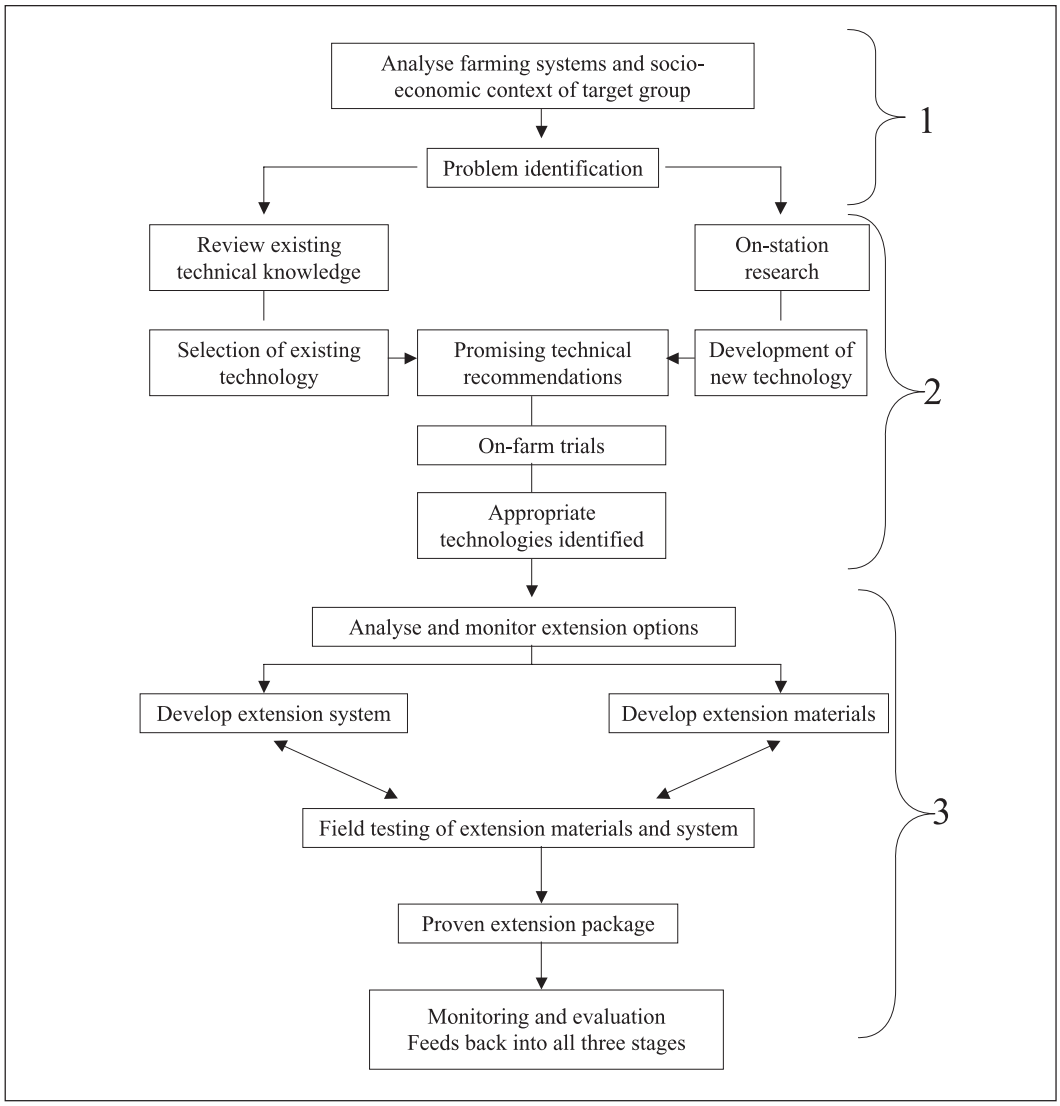


**Figure 8.** AIT Extension Strategy: AIT Aquaculture outreach process to develop proven extension packages consists of three sequential stages (indicated on right) linked together in a dynamic process.

We can see from this case study that the implementation of an extension program involves three major activities:

- managing the client group;
- managing the project; and
- managing the extension team/s.

This is reflected in the third cornerstone of the framework for developing an extension program. For the ACIAR project the implementation of the project has seen the following activities: technical workshops; extension workshops; formation of extension teams; validation trials; extension plans for each site; web site design; formation of farmers and farmer groups.

This is typical of an extension program set in a complex systems environment. There is great effort required to maintain these initiatives so dedicated resources should be allocated for this purpose.

## CONCLUSION

In conclusion it should be noted that:

- extension is a structured discipline consisting of a wide range of operant frameworks and protocols;
- extension is effective in developing sustainable practice change;
- a project extension program will typically have many different functions and clients within the project; and
- typically there are many different products and processes that make up a project extension program.

Because of the well-developed nature of the discipline of extension it is able to serve the discipline of research in many ways. As the science of controlling disease in Asian aquaculture continues to address emerging regional issues, 'extension' can offer research a structured discipline to assist in creating effective and sustainable best practice throughout the industry.

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