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A concept for the transfer of aquaculture technology in Asia

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The Technology Continuum

A concept for the transfer of aquaculture technology in Asia

There is always a great disparity between yields attained at the experimental level and those obtained at the farm. This is plainly evident in agriculture where, as in the Philippines, rice yields have remained generally low (1.2 to 1.7 tons per ha) despite IRRI having developed the technology to harvest 8 to 10 tons. With corn, it is the same story where, at the experimental level, yield is as high as 5 tons per hectare per crop but reduced to 2.64 tons at the field testing level and 1.4 tons at the farm level on optimum areas and 0.5 tons in marginal lands. Similar examples abound in animal husbandry, forest production and, obviously, aquaculture, a fairly recent field of concerted scientific concern compared to crop and livestock culture.

Case of the Late Corn

In fairness to the generators of technology, it is not an established fact that results of their scientific efforts are that inappropriate although every now and then we see a good example as in the case of a top-notch Filipino plant breeder, Dr. Virgilio G. Carangal, who during the recently concluded Asian Workshop on Technology Generation, Verification and Dissemination candidly told this story.

It appears that he was given a Presidential award for developing a high-yielding maize variety which was vigorously promoted among farmers in Mindanao who eagerly tried, and promptly rejected, it. The new variety, it turned out, matures 10 days later than the old corns the farmers had been using, which of course upset their entire cropping system.

"It was nice to receive a citation," Carangal remarked, "but hardly satisfying to think that what I had been acclaimed for was not entirely useful."

It was an attempt at understatement but the point is clear: technology must be tested in the actual production setting, taking into consideration the specific location and the specific situation, before it can be recommended with confidence.

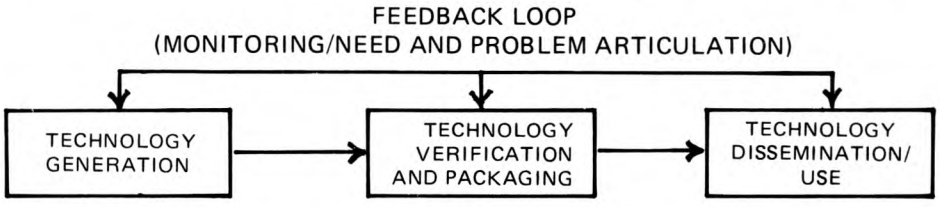
The Concept

Actually, verification of technology, according to former PCARR director general Joseph C. Madamba, presently director of the Asian Institute of Aquaculture, is only one of the processes in the so-called technology transfer continuum. At one end is technology generation, at the other is technology dissemination and use. Being a continuum, it is clear that a breakdown somewhere along it affects the efficiency of the entire technology transfer system.

In the transfer of technology, two things are moved, Madamba says, the *component technology* (i.e. everything about milkfish culture) and the *appropriate production system.* These are to be applied in the context of the producer's setting, capabilities and limitations, resources, and probably aspirations, Madamba says.

The target is to effect complete and high-fidelity transfer from source to end user; the main requisite is to have a reliable and strong mechanism for forward and backward linkages to monitor and provide feedback of needs and problems of both technology source and ultimate user.

The scheme may be illustrated as follows:



Application to Aquaculture

Generation

Research and development programs could be conducted along various aquaculture commodities such as milkfish, carp, mussels and oysters, crab, prawn, and other important food species. These programs may range from the basic to the applied and problem-oriented researches depending on the technology gaps.

The commodity programs should be conducted in a network of research stations with a main station (i.e. the Aquaculture Department of SEAFDEC) handling the needed research on the component technology and the cooperating stations to be located, in other countries, doing the studies to cover differences in environments, socio-economic conditions and production systems. The research team in a cooperating station will be working with the research system of the country where it is located.

For *borrowed* aquaculture technology, the second component of the technology generation stage, the network's research teams and the local scientists will have to challenge and test it for in-country adoption. Technology proven successful elsewhere is not automatically and without question applicable to another country or, if it comes from another world region, to Asia.

Verification and Packaging

Technology developed by local scientists, international research centers, and other national research systems can only be said to be viable if adapted and made responsive to end-user actualities, says Madamba. To avoid let-downs generally caused by the enthusiastic dissemination of a breakthrough or a miracle product without benefit of verification, it is imperative to test these results on both a location-specific and situation-specific basis before they are fed into the extension and media pipeline, he explains.

Testing involves research stations with a multi-disciplinary team of researchers; it is done in the local setting. A scheme of pilot program packaging and testing would further fine-tune the verification stage. Here, a pilot test area is selected from several producers' sites in a given ecological or agro-climatic zone. Results of the pilot program could then be packaged for dissemination to and application by producers with similar product-

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ion situation in or out of the agro-climatic zone where the pilot program was done.

It is necessary to incorporate whatever technology is developed in a farming system and then packaged and tested.

The advantages of conducting such controlled experiments in farmers' field are:

1. It will considerably increase production and productivity and will provide immediately visible satisfactory results.
2. It is economically favorable to the farmer.
3. It is manageable by the farmer, and compatible with his farming system.
4. The product is acceptable to the farmer.
5. The product is easily marketed.
6. The inputs are readily available and accessible to the farmer.
7. The risk to the farmer is low.

Subject Matter Experts

Experiments in this phase are designed by researchers and subject matter specialists (SMSs) with the close collaboration of extension workers. Under the present Philippine research system, the SMSs are "commodity experts" who will provide the vital link between research and other technology users by working in the different experiment centers and stations.

At present the SMSs are turning out the *"Philippines Recommends* Series." The series is a "one-story" package of alternative recommendations designed to simplify technology to be used by extension specialists in helping farmers improve their production.

In summary, the objectives of the field trials are:

- To validate technology results.
- To obtain feedback information to guide research programs.
- To better understand traditional farming practices and possibly improve on them.
- To evaluate practices and technologies both technically and economically.
- To learn how the farmer receives, evaluates and eventually uses the technology.
- To modify technologies for specific areas.
- To introduce new technologies to extension workers and to farmers.
- To train professionals working in farmer level experimentation, the researchers and farmers
- To serve as an interphase or planned linkage between Research and Extension

Technology Dissemination/Utilization

Three aspects are worth considering in technology dissemination. These are: (a) farm demonstrations, (b) extension, and (c) acceptance of the technology by farmers in the form of its application to actual production. But unlike in technology verification and packaging where the researchers take the lead responsibility, with the extension workers closely collaborating, this time it is the extension worker who plays the lead role in technology dissemination and utilization.

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search agencies in a concerted effort of solving the myriad problems of aquaculture development. Hopefully, this cooperation will not only strengthen efforts in producing desired high-quality graduates at both the M.S. and Ph.D. levels, but will also successfully integrate and interchange faculty, researchers, students, and course areas in the field of aquaculture.

The AIA is also envisioned to serve as a forum through which the best minds in fisheries can work together to map out solutions to problems, strategies, plans and policies for hastening aquaculture development. This way, the drafting of inter-agency or inter-country plans, the undertaking of problem-oriented research projects, the laying out of policies to service Asian universities and other institutions, among others, will be facilitated and implemented sooner.

R & D Notes

Floating fishpens... *from p. 4*

Production and Yield

The floating fishpen system is among the most productive means of fish production through aquaculture. The present grouper farm produced 8 tons of fish in a total area of 619 sq m, including the area between two cages, or approximately 12.2 kg/sg m. The yield per hectare (122 tons) is many times higher than that of pond culture of Chinese carps (3-5 tons/ha), milkfish culture (0.45-1 ton/ha) or mullet culture (150-300 kg/ha). The yield of bighead carps from productive reservoir is also extremely high. The production is estimated to be 296 tons per hectare if only the net area is considered under culture.

Technical Considerations

Floating Cages

Both fingerlings and adults can be reared in floating cages. The size and shape of the rearing cage depends on the types of fish cultured and the physical condition of the site.

The floating fishpen consists of a floating platform and net cages suspended from the platform.

It is important to ensure that the cage and the platform are strong enough to resist strong currents, winds or waves during a heavy storm. Size of the net-cages used ranges from 1 to 100 sq m but not to exceed 100 sq m as periodic change of the nets and maintenance is difficult. Cage depth is about 2 meters.

The netting used for making the net-cage should be of sufficient thickness and able to resist seawater and heat. Nets made of 21 to 24 ply polythene thread is suitable as it is sufficiently strong to resist tearing by crabs or cutting by the edges by oyster shells. Unlike nylon, polythene netting appears to be able to stand the strong heat of the sun for a considerable period of time.

Culture Site

In selecting a site for cages, consider the following: