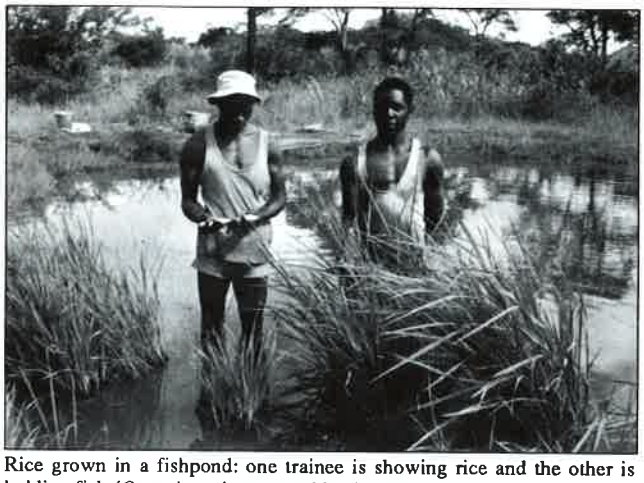

Rice grown in a fishpond: one trainee is showing rice and the other is holding fish (*Oreochromis mossambicus*) caught from the pond.
Riz poussant dans un étang: un stagiaire montre le riz et un autre exhibe un poisson (*Oreochromis mossambicus*) pris dans l'étang.

Realizing the potential of aquaculture, the Ministry of State introduced an aquaculture training program at the Chaminuka Training Centre in 1987, associated with a two-year aquaculture training course. The objectives are:

1. To train rural youth in practical approaches to aquaculture;
2. To apply agricultural skills and knowledge to integrated agriculture-aquaculture for broader based approaches to farming systems;
3. To motivate trainees for self-employment or cooperative ventures; and
4. To develop personnel trained in aquaculture appropriate to rural Zimbabwe.

Integrated farming, particularly chicken-fish, duck-fish and vegetable-fish systems, is emphasized in pursuing these training objectives.

In Zimbabwe, aquaculture has had little attention yet from the public and private sectors but could play a vital role in rural development. A sound research, training and extension program in integrated aquaculture could help the expansion of aquaculture to benefit the rural poor, who are badly in need of such an approach.

Editor's Note: It is very encouraging to see moves towards effective training and extension for the development of integrated farming in Zimbabwe. Since it always pays to learn from others' mistakes, readers should be aware that ICLARM's and its Philippine collaborators' first few years of research in training in livestock-fish integrated farming systems suffered a lot from concentrating on research activities on-campus instead of involving farmers from the outset. Consequently, extension and development efforts failed. The Farmer First principle is essential from the outset in all such efforts. Without it, research, training and extension will all fall into the trap of the outdated 'top-down', 'technology package transfer' approach - which will fail. The following reading list is suggested for those interested in farmer participation in research and training:

Reading List

Amanor, K. 1989. 340 Abstracts on farmer participatory research. Agricultural Administration Unit, Overseas Development Institute, London.

Bunch, R. 1985. Two ears of corn: a guide to people-centered agricultural improvement. Second edition, World Neighbors, Oklahoma.

Chambers, R., A. Pacey and L.A. Thrupp. 1989. Farmer first: farmer innovation and agricultural research. Intermediate Technology Publications, London.

Farrington, J. and A. Martin. 1988. Farmer participation in agricultural research: a review of concepts and practices. Overseas Development Institute, London.

van der Kamp, J. and P. Schuthof. 1989. Methods of participatory technology development: theoretical and practical implications. ILEIA, Leusden, The Netherlands.

Khon Kaen University. 1987. Proceedings of the 1985 International Conference on Rapid Rural Appraisal: Rural Systems Research and Farming Systems Research Projects, Khon Kaen, Thailand.

Lightfoot, C., N. Axinn, P. Singh, A. Bottrall and G. Conway. 1989. Training resource book for agro-ecosystem mapping. International Rice Research Institute, Los Baños, Laguna and Ford Foundation, India.

Lightfoot, C., V.P. Singh, T. Paris, P. Mishra and A. Salman. 1990. Training resource book for farming systems diagnosis. International Rice Research Institute, Los Baños, Laguna and International Center for Living Aquatic Resources Management, Makati, Metro Manila.

Smallholder Farmers in Malawi Adopt and Improve Technologies from Collaborative Research

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Open Days for Farmers

An ICLARM-GTZ project has been pursuing collaborative research with the Fisheries Department (FD), the University of Malawi (UM) and farmers in Malawi since 1986. The research has been directed towards developing aquaculture technology applicable to rural smallholder farmers in Africa. In May 1990, some research results obtained on-station at the FD's Domasi Experimental Fish Farm near Zomba, were presented to farmers during Open Days. ICLARM and FD researchers felt it was very important that farmers should lead the participatory research process and freely modify the technologies they adopt to suit their circumstances.

The technologies demonstrated by the FD and ICLARM and the farmers' reactions were as follows:

- *Use of* Pennisetum purpureum *(napier grass) as an alternative/supplement to maize bran, the most common fish feed.*

The farmers saw that fish (*Tilapia rendalli* and *Oreochromis shiranus*) in a pond that received only grass achieved similar growth rates to those fed on maize bran. They were initially surprised, then excited. They felt that grass could be particularly useful as a pond input as maize bran is often in short supply at certain times of the year.

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• *Creation of high-quality compost from poor quality plant wastes as a fish food and fertilizer.*

Composting of plant wastes for aquaculture in Africa is usually done in a small 'crib' in one corner of a pond, but such ponds usually remain nutrient-poor. Here, terrestrial composting of maize stover was demonstrated to farmers, using the Chinese high-temperature technique. The farmers thought that such compost could be an excellent input for ponds: relatively easy to make, though labor-intensive initially. They offered ideas about utilizing other plant wastes and incorporating worms.

• *Vegetable-pond integration using pond sediments and water for adjacent vegetable beds.*

The fertilizing effect of pond muds on adjacent vegetable plots (here growing head cabbages) came as a surprise to many farmers. They were particularly excited that production of two valuable cash crops, vegetables and fish, could be integrated. At first, they thought that the cabbages had been planted in some special way but when assured otherwise became eager to experiment with their own vegetables.

• *Integration of chicken and fish enterprises.*

The possibility of integrating chicken and fish production appealed to many farmers, but there were reservations because of the expense of buying chickens and the difficulty of preventing theft from ponds sited far from households. The value of poultry manure as a pond input is widely appreciated.

• *Pond stirring with a bamboo rake for lifting nutrients from the pond bottom into the water column.*

The idea of pond stirring was a novelty and farmers were intrigued that it might improve fertility. Some were concerned that it could adversely affect fish or damage the pond bottom. However, the general feeling was that, if done carefully, stirring could help recycle food from the pond bottom back into the water.

• *Use of a reed fence for harvesting fish.*

The reed fence generated much discussion as farmers rely on the FD's seine net for batch harvesting. The reed fence, made of cheap, locally-available materials can work just as efficiently as a seine. Several farmers felt the fence would be useful only for small occasional harvests. A few farmers were cautious and wanted to remain dependent on the FD. The majority of farmers, however, found the reed fence a suitable alternative to seine nets and for avoiding the need to drain ponds.

• *A smoking kiln for fish.*

The FD's smoking kiln was a great attraction, considered to be a very useful tool for preserving fish for household consumption or for sale.

Testing of Technologies by Farmers

A rapid survey was carried out to see to what extent farmers then tested these technologies. The survey covered all the twenty-nine farmers (OP) that had been to the Open Days and a random group of twenty-five (C) who had not. Twenty-five OP farmers were testing out some of the technologies and using a wider range and number of technologies than C farmers (Table 1).

Table 1. Aquaculture technologies being tested by 54 smallholder farmers in Zomba, Malawi, after Open Days to demonstrate these and the ongoing research from which they are being developed. OP = farmers who attended the open days (total=29); C = control group who did not (total=25).

Technology	Number (%) of farmers testing a particular technology OP		C	
Napier grass as a pond input	20	(37)	3	(6)
Terrestrial compost as a pond input	6	(11)	0	
Vegetable-fish integration	13	(24)	11	(20)
Chicken-fish integration	17	(31)	16	(30)
Pond stirring	5	(9)	0	
Reed fence for harvesting	7	(13)	1	(2)
Smoking kiln	1	(2)	0	

Except for the use of poultry manure, all the technologies were new to farmers. From this small survey the farmers appear keen to try new ideas. Demonstration of a range of technologies on Open Days at a research station seems to have been successful, probably due as much to the method of presentation and the approach to the farmers, encouraging their critical appraisal as to the technologies shown.

Acknowledgements

Thanks go to the FD and to the German Agency for Technical Cooperation (GTZ) who provided the financial support.

Editor's Note: A more comprehensive account of this aquaculture technology adoption and improvement by smallholder farmers in Malawi is being prepared for publication in Naga, The ICLARM Quarterly. This includes rice-fish culture adoption. NTAS readers who do not receive Naga, and who wish to receive this issue should write to the NTAS Secretary. A video describing these technologies is also being prepared. The price for this is not yet available, but please write if you wish to receive details of its availability.

REQUEST FOR INFORMATION

Mr. Edosa Omoregie, Assistant Lecturer, Department of Zoology, Faculty of Natural Sciences, University of Jos, P.M.B. 2084, Jos, Nigeria.

I am a NTAS member currently carrying out a research on the toxicity of agrochemicals on the growth rate and haematological parameters of *Oreochromis niloticus*. Information from other NTAS members will be highly appreciated. Thank you.

Dr. Daniel O. Okeyo, Senior Lecturer Aquatics, Department of Zoology, Kenyatta University, P.O. Box 43844, Nairobi, Kenya.

Women in Aquaculture

May I inform all NTAS members interested in collaborative work on women in aquaculture about net-making activities around Lake Victoria. This can be a main occupation and can generate a lot of income for women. Please will other NTAS members also share with me information on the role of women in aquaculture cooperatives, career opportunities for women in aquaculture research and development, and the whole area of problems and prospects for women working in aquaculture.

I would like to collaborate with NTAS members in this field of work since very little has been published on this area.

Thank you for your cooperation.