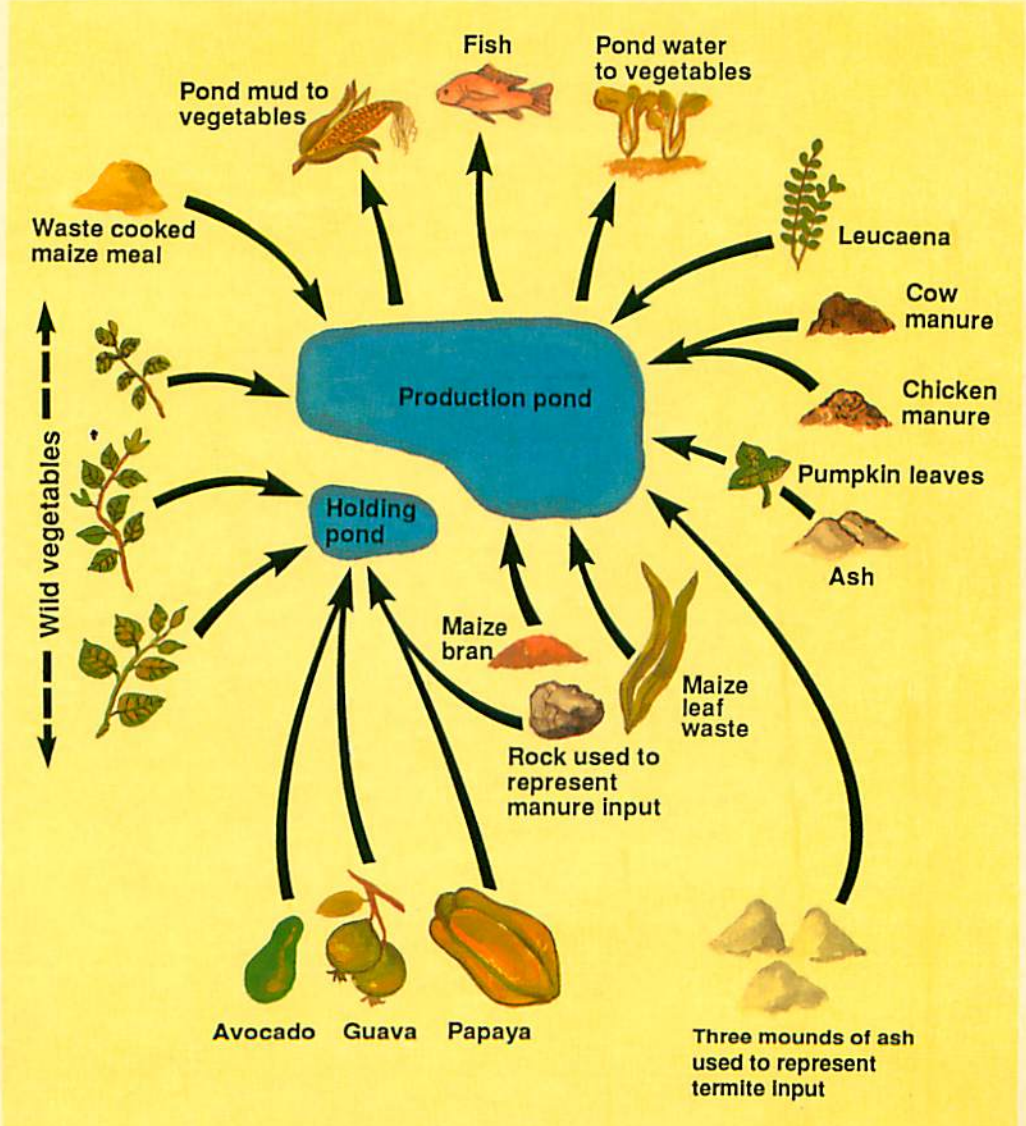
Training Resource Book on a Participatory Method for Modelling Bioresource Flows



Training Resource Book on a Participatory Method for Modelling Bioresource Flows

Clive Lightfoot
Reg Noble
Regina Morales

1991

INTERNATIONAL CENTER FOR LIVING AQUATIC RESOURCES MANAGEMENT
MANILA, PHILIPPINES

Training Resource Book on a Participatory Method for Modelling Bioresource Flows

Clive Lightfoot
Reg Noble
Regina Morales

1991

Published by the International Center for Living Aquatic Resources Management, MCPO Box 2631, 0718 Makati City, Philippines.

Printed in Manila, Philippines.

Lightfoot, C., R. Noble and R. Morales. 1991. Reprinted 1995. Training resource book on a participatory method for modelling bioresource flows. ICLARM Educ. Ser. 14, 30 p.

Artwork and layout by Ovidio F. Espiritu, Jr.
Photographs by C. Lightfoot and R. Noble

ISSN 0116-5720
ISBN 971-8709-12-6

ICLARM Education Series 14
ICLARM Contribution No. 743

CONTENTS

VIDEO CREDITS

VIDEO 1: Aquaculture and the Rural African Farmer

Produced by the Audio Visual Center, Chancellor College, University of Malawi, with the Malawi Fisheries Department
Narrator: Edge Kanyongolo[a]
Video script: Reg Noble[a],[d]
Videographer: Reg Noble
Videographer and editor: James R. Bage[c]
Domasi Experimental Station trials: Sloans Chimatiro[d], Fredson Chikafumbwa[d], Daniel Jamu[d], Amos Chikhadze[d], Emmanuel Kaunda[d] and Orton Msiska[e]

VIDEO 2: Pictorial Modelling: A Farmer-Participatory Method for Modelling Bioresource Flows in Farming Systems.

Produced by the Audio Visual Center, Chancellor College, University of Malawi
Narrators: Edge Kanyongolo and Sloans Chimatiro
Video script: Reg Noble, Clive Lightfoot[b] and James Bage
Farmer exercise: Clive Lightfoot and Sloans Chimatiro
Videographer: Reg Noble
Video editor: James Bage
Illustrations by: Ovidio F. Espiritu, Jr.[b]

[a]Biology Department, Chancellor College, University of Malawi, Zomba, Malawi.
[b]International Center for Living Aquatic Resources Management, MC P.O. Box 1501, Makati, Manila, Philippines.
[c]Audio Visual Center, Chancellor College, University of Malawi, Zomba, Malawi.
[d]ICLARM/GTZ Africa Aquaculture Project. P.O.Box 229, Zomba, Malawi.
[e]Department of Research and Environmental Affairs, P.O. Box 30745, Capital City, Lilongwe 3, Malawi

Special thanks to: ICLARM staff at Domasi; fish farmers of Zomba District; Chancellor College, University of Malawi; Malawi Fisheries Department.

This research and development work is funded by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, Eschborn, Federal Republic of Germany.

PREFACE

This training resource book was developed for people working with farmers in farming systems research and extension. It deals specifically with a farmer-participatory method for constructing pictorial models. The model, in this case, concerns bioresource flows between aquaculture and agriculture enterprises; but it could just as well be flows between forestry and livestock enterprises, or labor flows between on-farm and off-farm enterprises. However, if the model tries to cover all flows, it breaks down under a mass of linkages that confuse rather than clarify.

Pictorial models of bioresource flows are particularly useful for introducing diverse enterprises and determining how they might be added or futher integrated into existing farming systems. Many technologies do not get adopted because they are not integrated.

The knowledge generated through such modelling has many uses. Primarily, it provides an entry point for on-farm experimentation in farm system integration. It suggests topics for on-station research and affords a link with extension through farmer-to-farmer technology exchanges.

Indeed, it is these attributes that our first video exemplifies in the context of aquaculture and the rural African farmer. We see farmer-participatory modelling incorporated into a research project that spans on-station research, on-farm research and extension linkages. A perception of the place and influence of such models in a wider development setting emerges from the first video.

The second video takes the viewer step-by-step through the process of farmer-participatory pictorial modelling. These training guidelines support the video's training style.

We suggest that you read the introduction, then watch both videos. This book includes descriptions of the videos, so that it can be used alone, if the videos are not available. After viewing both videos, read the training guidelines and view the second video again. Our purpose is to give you enough "if-they-can-do-it-so-can-I" confidence to go out and make it work for your purposes. This book is more of a training resource to inspire rather than a methodology handbook.

INTRODUCTION

In recent years, sustainability has become a watchword for people concerned with developing better farming systems. This is particularly true for Third World government and non-government research and development institutions undertaking Farming Systems Research and Extension (FSRE). While many strive to make farming systems more sustainable, there are few tools for the task.

So far, we know that farmer participation, biodiversity, and enterprise integration are necessary conditions for sustainable farming systems. Farmers must participate, for they are the ultimate constructors of farming systems. And they have much traditional knowledge to contribute. Farms must be diverse in the organisms grown, the ecosystems cultivated and resources used. Enterprises must be integrated, with the wastes of one serving as input for another.

With such a difficult set of conditions, many FSRE practioners are confused about where and how to start. The method described here is designed to help. It is an easy-to-use, rapid appraisal technique that enables farmers to draw conceptual models of farm systems. The pictorial models show how a diverse set of crops, livestock and forestry enterprises are integrated with aquaculture. As with any rapid qualitative method, it is mainly a guide for research. Models show the diversity of organisms, ecosystems and resources and help identify important interactions. This knowledge is sufficient for researchers, not only to decide how and where to start intervening, but also to be able to identify parameters for quantitative assessment. Most importantly, the modelling process brings farmers into the research activity right from the start.

VIDEO DESCRIPTIONS

The videos accompanying this book introduce farmer-participatory modelling as an aid to researchers or extensionists attempting to modify and improve the integration of existing farming systems with aquaculture, or other new enterprises such as forestry.

Video 1, ***Aquaculture and the Rural African Farmer,*** presents a case study of small farmers working with researchers to improve their local farming systems through the integration of aquaculture. The story of this project sets the context in which farmer-participatory modelling is particularly useful.

Video 2, ***Pictorial Modelling: A Farmer-Participatory Method for Modelling Bioresource Flows in Farming Systems,*** demonstrates the technique of pictorial modelling as a qualitative participatory method that enables researchers and extensionists to quickly understand local agricultural practices and identify points of departure for future integration.

Video 1 *AQUACULTURE AND THE RURAL AFRICAN FARMER*

(about 30 minutes)

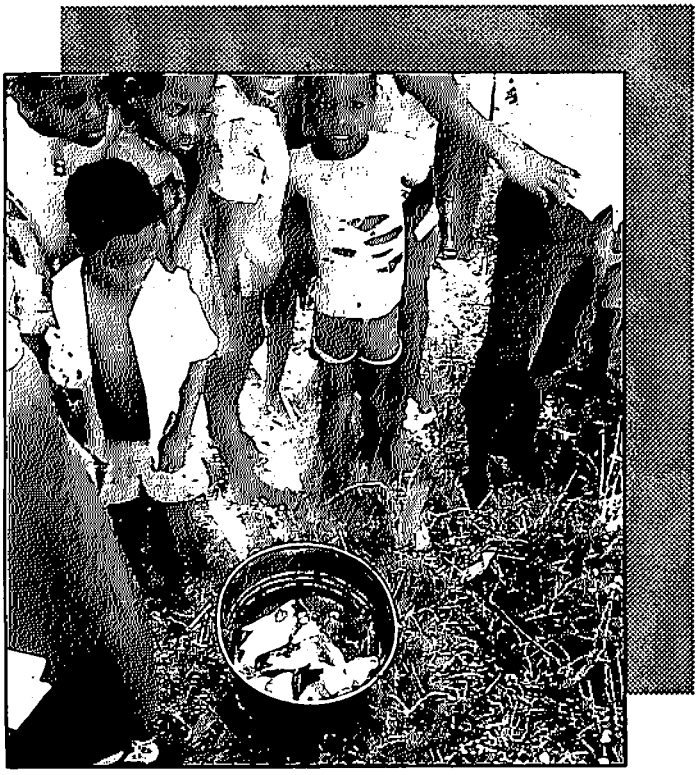
This video is about Malawi's small farmers who are trying to integrate fishponds into their farms. When the film opens, vibrant African music transports you to Domasi, a

rural area near Zomba, Malawi. The people are dancing and chanting songs to celebrate their fish harvest. The women sway gracefully, their hands gesture to tell a story - before, fish was scarce in their village and fish harvests were poor; today, they grow fish in their own backyard ponds, and this time, harvests have been better.

The farmers are partners in an ICLARM-GTZ research and training project started in 1986, a project in tune with a government campaign to help alleviate the poverty and malnutrition widespread among the country's eight million people. If the project succeeds, aquaculture could provide the farmers with a source of high-quality protein and much-needed income.

The film introduces some of the farmers who are harvesting tilapia and carp in their backyard ponds. One complains about a poor catch: only 8 kilos after 6 months! Another, a woman fish farmer, has water supply problems and is also disappointed with her harvest. Another farmer has been more successful. He used to buy fish from the lake to sell in the village market. When fish became scarce, he decided to dig his own pond and raise his own fish. Since then, he has added four more fishponds and has made aquaculture his main farm enterprise.

He is one of over 500 smallholder farmers participating in the project and now actively engaged in aquaculture. In a way, he is a pioneer. Aquaculture has been a minor activity in Malawi due to persistent problems such as low yields, poor water quality and the lack of suitable feeds and fertilizers.



Fish harvests have been poor due to water quality and feed problems.

From the farms, the film takes you to an experimental fish farm where researchers are working with the farmers to find innovative ways to overcome these local problems and improve fish production.

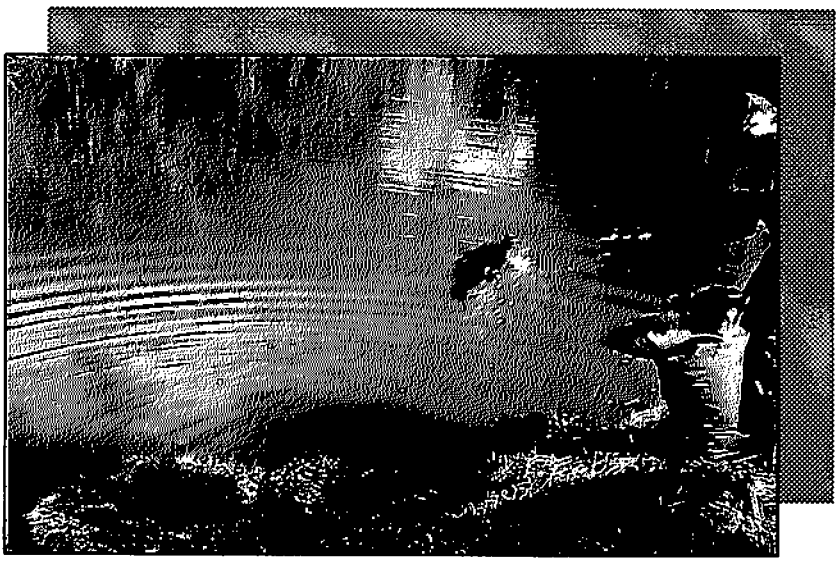
For example, to address lack of suitable fertilizers, they have been experimenting with techniques to use compost. Usually, farmers throw plant wastes into the corner of a pond where these decompose very slowly, providing

little fertilizer. The experiments could help the farmers by devising better ways of turning plant wastes into compost.

Another potential pond fertilizer and fish feed is Napier grass, which grows wild and is plentiful in Malaŵi. Experiments at the station show that Napier grass may be just as effective as maize bran, the traditional, but seasonally scarce, fish feed.

In addition, the researchers have found that applying cooking-fire ash helps improves the quality of pond water, which, in the area, is often too acidic. They also learned that farmers usually keep fish in their ponds too long because they cannot catch them! Nylon seine nets are too

Composting farm wastes to fertilize the pond.



Feeding* madeya *(maize bran) to the fish.

expensive. The researchers are therefore investigating the use of alternative harvesting methods, such as traps and fences made from local materials.

The film stresses that if aquaculture is to become widely adopted in Africa, it needs to be fully integrated with other farm enterprises. Fishponds should increase the productivity of other crops on the farm and vice versa.

However, before researchers or extensionists introduce a new technology, such as fish farming, or attempt to improve the local farming system, their first task is to identify the farmers' needs and understand the local farming system.

One interesting segment of the film illustrates how a simple participatory exercise, called pictorial modelling, helped the researchers see how different farm enterprises and fish farming can be linked in a traditional farming system. (See Video 2 for more on pictorial modelling) They encouraged a group of farmers to show, by drawing pictures on the ground, ways of linking aquaculture with their farming systems. The farmers, being very experienced, needed little stimulus. They talked animatedly and their drawings presented many new ways of integrating ponds with farm crops on land. The indigenous knowledge generated from the farmers' drawings helped the researchers plan a more relevant and responsive research program.

Indeed, according to the project staff, the most important element in the project's success is the participation of the farmers themselves. They explain that technology developed through research is worthless unless farmers apply it and see that it improves their lives. This is why they work with extension officers who encourage more farmers to become "partners in research." They also invite farmers to the experimental station to observe and criticize their work, while they often visit the farmers' areas to discuss problems and encourage them to design their own arrangements of integrated crop-fish units. Through this interaction, farmers and researchers cooperate with each other to integrate fish farming into African farming systems and bring new hope to small farmers.

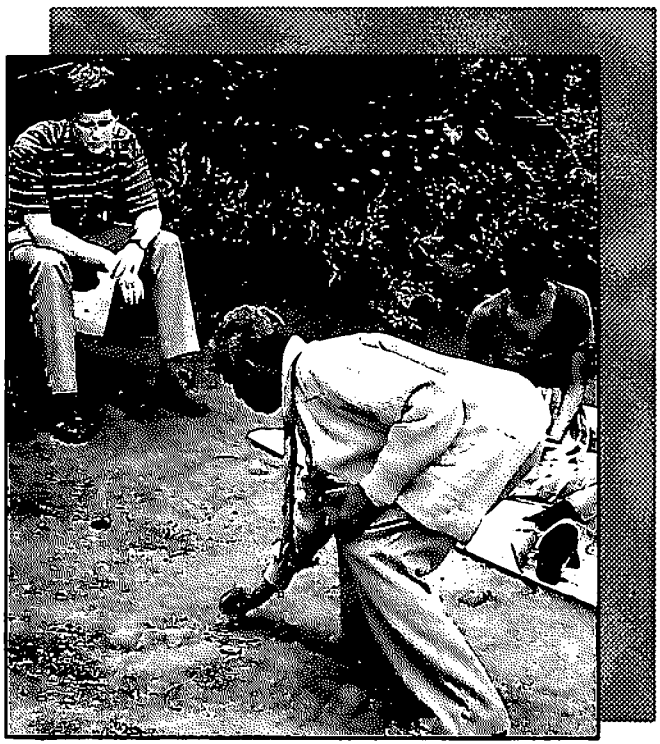
Video 2 *PICTORIAL MODELLING: A Farmer-Participatory Method for Modelling Bioresource Flows in Farming Systems (12 minutes)*

This video was designed to train researchers and extensionists in the use of the pictorial modelling method, specifically as an aid in integrating farming systems with aquaculture or other enterprises. It illustrates and explains each of the three phases of the pictorial modelling process.

After each phase, the film prompts the trainer to pause the video to enable viewers to discuss what they have just seen. Before proceeding to the next phase, it summarizes the previous phase, while diagrams further clarify what is going on. Finally, the advantages of using the pictorial modelling method are explained.

The film is set in a smallholder farm in Malawi, Central Africa, where researchers are encouraging farmers to integrate fishponds into their traditional farming system (For more information on this project, see Video 1). They use pictorial modelling as a participatory exercise wherein the farmers (in this case, fish-farming club members) show how the different enterprises in their farms are linked and how fish farming can be incorporated into their farming systems. The results of the exercise also help the researchers focus their program on the needs of the farmers.

In the first phase of the pictorial modelling process, an extension worker encourages a group of farmers to draw a model of their farm system using available materials (in this case, cooking-fire ash). He draws on the ground with ash. Once the farmers grasp the concept, they eagerly take



The farmer starts to draw a pictorial model of the farm system.

over the process without further help from the extension worker. They draw arrows and use symbols to show farm inputs; for example, a rock to represent manure which is used to fertilize the pond.

In the next phase, the farmers elaborate on their drawing, adding actual objects like fruits, leaves and wild herbs to show inputs to the farm. Excitement builds as interaction stimulates the exchange of ideas.

When the farmers have exhausted their inputs, they complete the drawing by showing outputs. To represent the fish harvest, one farmer uses a book with a picture of a fish on the cover; another puts down a maize cob to show pond mud that is added to crops on land; a leaf represents pond water used for watering vegetables.

The completed drawing shows the flow of inputs and outputs in an integrated farm. This provides a wealth of information on the indigenous farming system. It can also be used to show the farmers, in a way that is easy to understand, how a new enterprise like aquaculture, can fit into and improve their existing farm systems.

The exercise is a learning process for the researchers and extensionists, who learn from the farmers; and for the farmers, who learn from each other (since each operates his

The modelling team - farmers and researchers.

or her farm in a different way) and see new ways of improving their farming methods. Meanwhile, the new knowledge goes back into the research program to make it more responsive to local needs and conditions.

In pictorial modelling, the extension worker is the pupil, and the farmer is the teacher. The respect shown for the worth of their knowledge wins the confidence of the farmers and helps build an open relationship between farmers and extension workers. This makes the farmers more receptive to new ideas.

TRAINING GUIDELINES

Learning Objectives

After completing the activities shown in Video 2, trainees:

- will have improved skills in encouraging farmers to share their knowledge;
- will have developed the ability to elicit indigenous knowledge through pictures; and
- will be able to understand diagrams which show how aquaculture is integrated with the other enterprises in the farming system.

Definitions

Integrated agriculture-aquaculture farming systems

Systems wherein the outputs from the aquaculture subsystem become an input to the agricultural subsystems (including livestock and trees) and vice versa resulting in a greater total effect than the sum of the individual subsystems.

Bioresource flows

The physical transfers of biological materials, especially wastes and byproducts, from one subsystem or enterprise to another.

Key points

- One of the simplest ways to obtain information about farm operations is to ask the farmer to draw what is going on. The advantage of using pictures to represent the farm system is that it does not require the farmer to be able to write. Everyone can, to some extent, draw; and pictures are often easier to understand than writing, particularly when one is trying to grasp the complex interconnections between enterprises in a farming system.

- When drawing is done with a group of farmers, each can contribute to the picture, thus leading to exchange of ideas between farmers. They can also draw pictures separately so the researcher can see how levels of integration differ between farms.

- If the farmer is incorporating a new enterprise, such as forestry or aquaculture, into the farming system, drawing the possible links between the new enterprise and others, helps the farmer understand how it fits into the system. Certainly, such pictorial representations of farming systems are easier for everyone - farmers, researchers or extensionists - to understand.

Content overview

- This drawing method, which uses pictorial representations of farm systems, requires a simple approach to the farmer.

- Firstly, the drawing should include basic information, such as:

    a) the types of enterprises operating on the farm and
    b) the links and bioresource flows between current farm enterprises, and the possible links with any new enterprise being introduced.

- In the video, the example shown is the integration of a pond into the farming system. However, pictorial modelling may be used when integrating any new enterprise or crop into an established farming system.

- The farmers are encouraged in this video, to make their drawing with ash. The extensionist explains that they can draw arrows to indicate the flow of bioresource links between enterprises. Once the farmers understand how to do this, they are ready to draw the complete farm model.

- The video shows three main phases to the process. A pause between each phase allows the trainer using the video to discuss each one with the trainees. The trainer should encourage the trainees to recollect the important stages in each phase. When the trainer feels confident that the trainees understand the methodology shown in a phase, then the next phase in the video can be shown.

Field exercise

This field exercise can be done with one or more farmers, as shown in the video. Managing a group of more than 10 however, is difficult. Who you decide to include depends on your target clients. In the video, they are the office bearers of a fish club, but they could be women, or any other special group. The method allows you to target individuals or groups of your choice.

Begin with cordial introductions and short walks around the farm. Convey respect and confidence in the household by telling them who you are and that you are there to learn from them. Do not appear with paper and pens and instruct them to draw a picture of their farming system. This will not work. The picture must emerge as a natural way to express all that is going on and need not be mentioned at all the beginning. So, continue the exercise with a walk to see the farm enterprises, ecosystems and resources. The walk serves other purposes as well. Treading over familiar ground and telling familiar stories puts farmers at ease. As they explain while your hands are in the dirt, social distance and communication barriers are reduced. Do not take notes, just listen for half an hour or so. On your way back to the homestead, you will have so much information that a drawing on the ground will suggest itself as a means of documenting what you have seen. The video starts at this point and completes the exercise in three phases.

Phase 1 Showing the farmer how to begin drawing, using materials available on the farm

- The researchers or extensionists introduce themselves to the farmers and explain that they want the farmers to show them how the farm works.

- It is important to make the farmers realize that they are the teachers, and the researchers, the pupils. This respect for the farmers' knowledge encourages self-confidence and provides for an equitable working relationship between the researchers and the farmers.

The farmer traces arrows to show inputs to the pond.

- The researcher must verbally explain to the farmers how to draw the farm system. If the farmers are comfortable with pen and paper, then the researcher should provide these materials. It is usually easier for most farmers to draw on the ground using materials near-to-hand, such as a stick or wood ash from cooking fires.

- Farmers can also be encouraged to use plant and animal materials to represent different enterprises or resources on the farm. For example, in the video, a farmer uses a rock to represent manure as an input to a pond. This is obviously easier for the farmer than trying to draw the manure. Farmers have been known to actually go off to find some manure to put in their picture.

- It is important to get the farmers to actively start drawing and using their own methods and materials to represent their farm enterprises. The researcher or extensionist should avoid doing any drawing, otherwise the farmers may be intimidated and so withdraw.

- When the farmers have grasped the drawing technique and are confident enough to continue on their own and complete the picture of the farming system, it is the end of phase 1. The farmers' picture at the end of phase 1 in the video is shown in Figure 1.

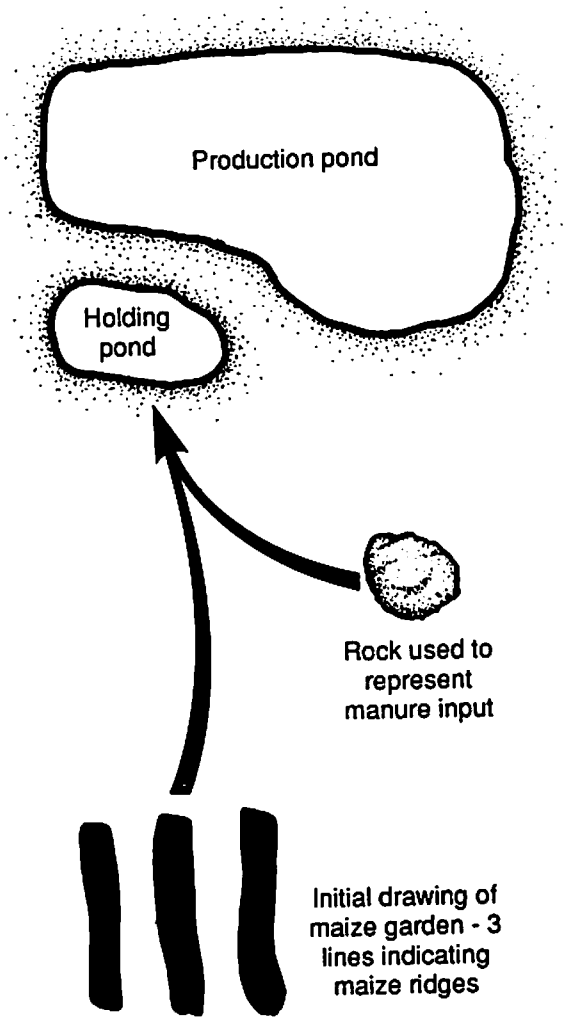


Figure 1
Farmers' picture at the end of Phase 1

Phase 2 Farmers draw inputs from other farm enterprises to their fish ponds

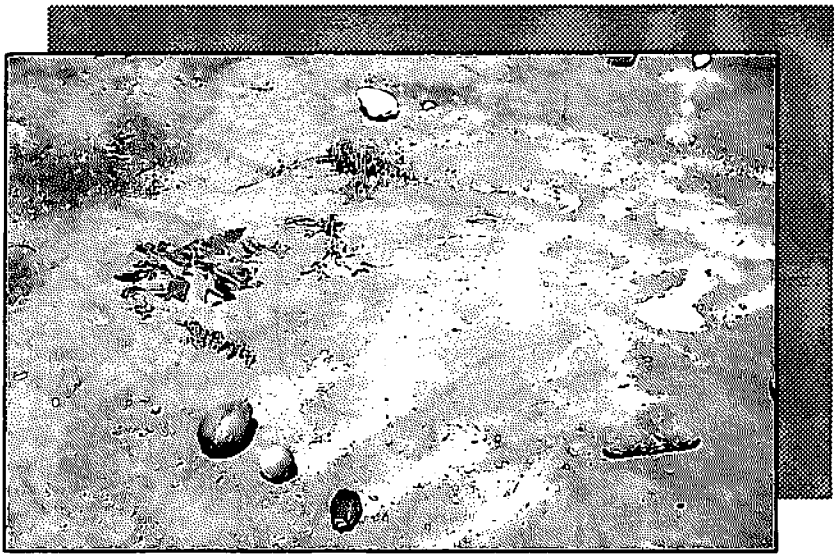
- The farmers are now left to make their drawings with as little prompting from the researcher as possible.

Farmers add plants to their drawing to show pond inputs.

- The researchers should let the farmers interact among themselves so they can exchange ideas and produce a picture through joint effort.

- Farmers often use real objects to represent inputs to the pond and may go off to search for the right plant or animal material to add to the picture. As the process of drawing the farm model is a group effort, farmers quickly learn from each other about different ways of linking ponds to other farm enterprises.

- The researchers should prompt the farmers to ensure that they have no more inputs to mark on their diagram.



Papaya , guava and avocado are also inputs to the pond.

It is the end of phase 2 when the farmers have exhausted all their ideas for inputs to the ponds. In phase 2 the farmers learn how to make their drawing and take over the process.

In the video, all the farmers are actively involved in drawing the picture. They become more enthusiastic as everyone makes a contribution.

The picture of pond inputs drawn in phase 2 of the video is shown in Figure 2.

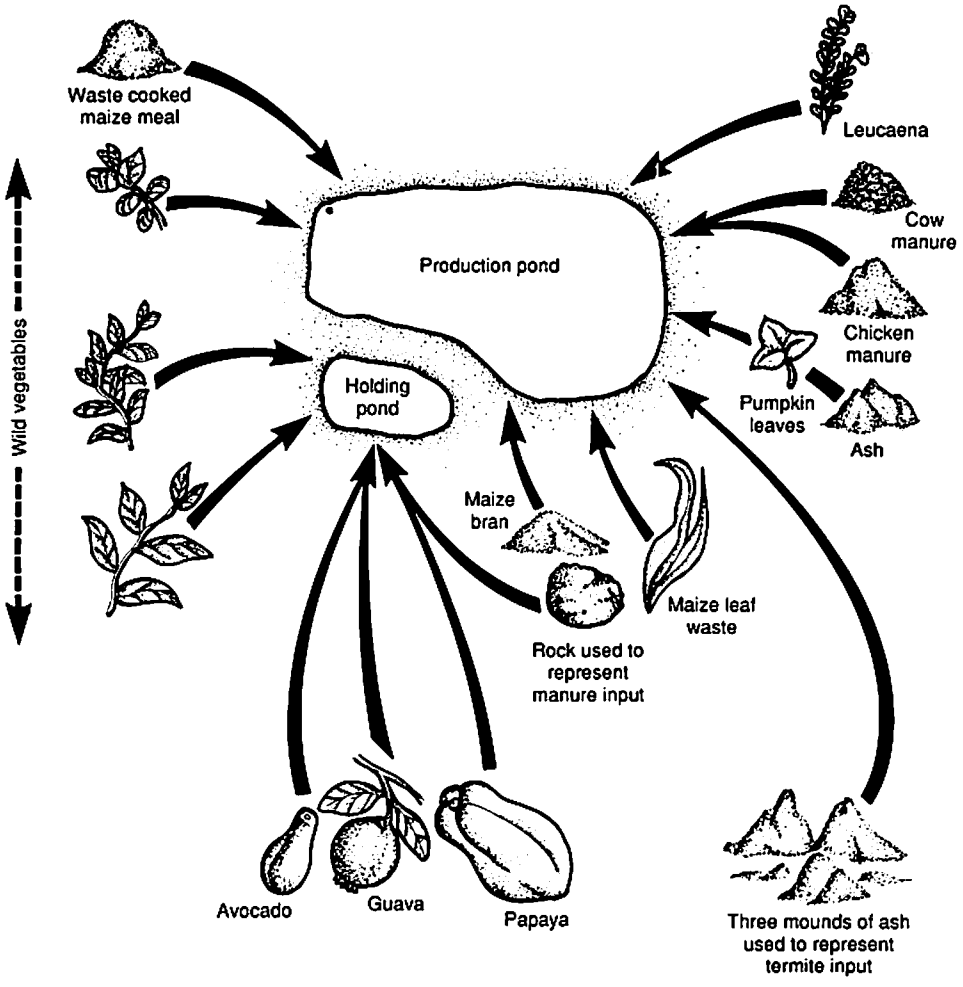
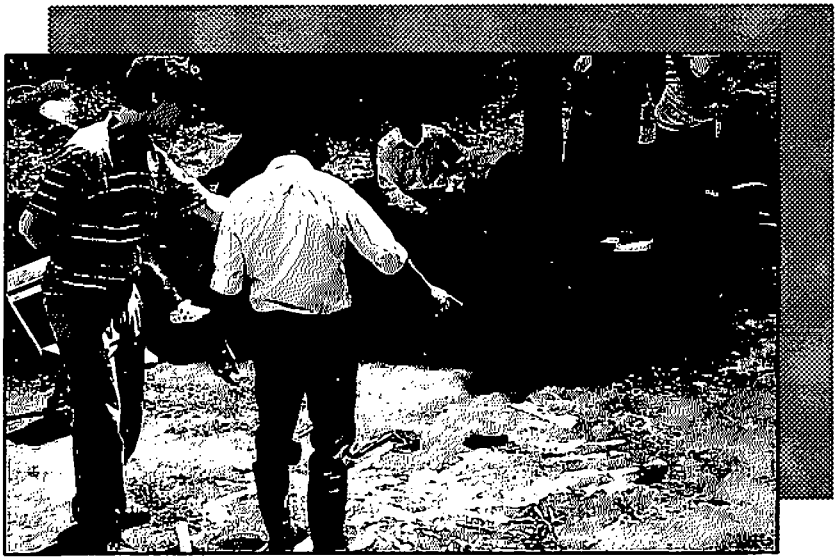


Figure 2
Farmers' picture at the end of Phase 2

Phase 3. Farmers draw outputs from their fish ponds to other farm enterprises

- In this phase, the researchers encourage the farmers to think about pond outputs to other enterprises on the farm. The procedure follows that of phase 2.



The farmer explains the model to the researcher.

- When farmers have finished marking their outputs on the diagram, the model is complete.

The completed picture in the video is shown in Figure 3. Note that the farmers used a book with a fish on the cover to represent fish harvests from the pond.

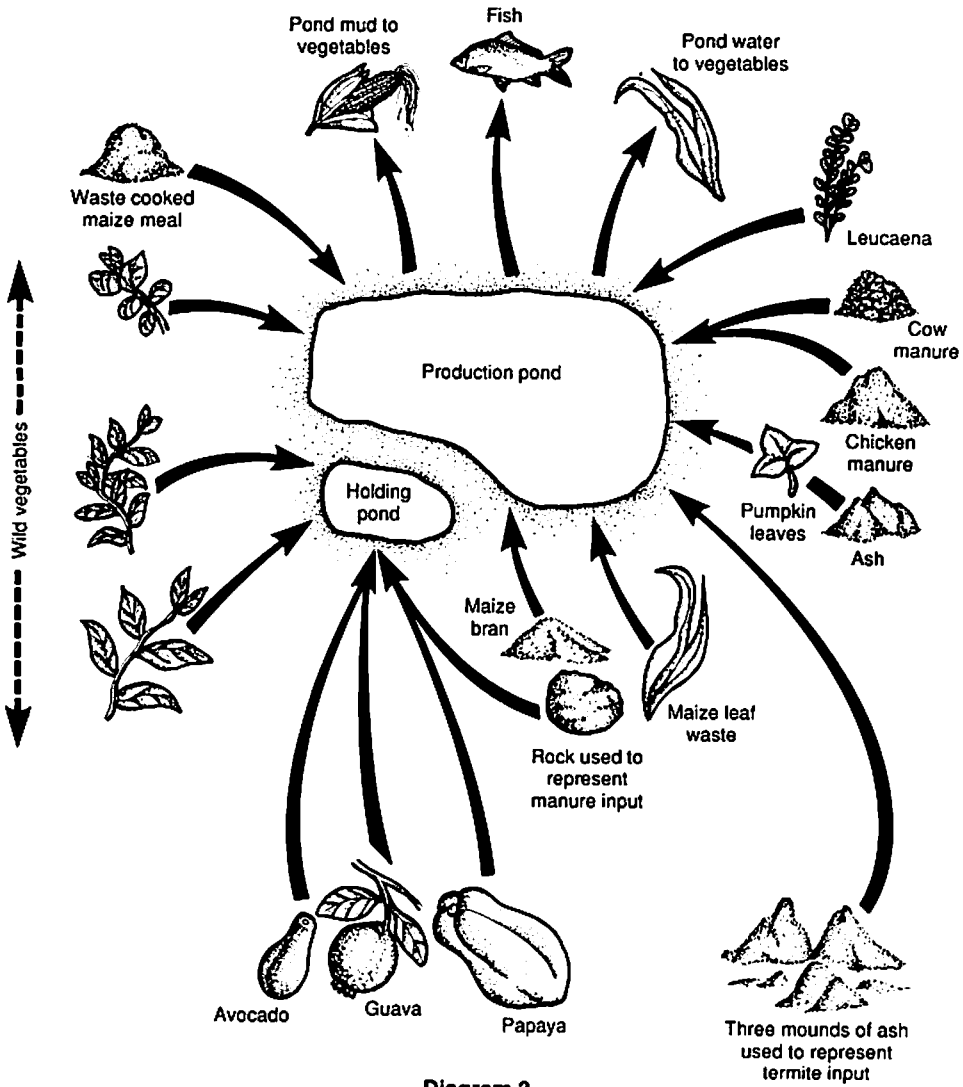


Diagram 3
Farmers' picture at the end of Phase 3

Figure 3
Farmers' picture at the end of Phase 3

Arrows point to the pond's main output: pond mud that is added to crops on land (represented by a maize cob), fish (represented by a book with a fish on the cover) and pond water used for watering vegetables (shown by a leaf).

There is a final pause at this point in the video for the class and the trainer to discuss the whole process and its value. After this discussion, the trainer restarts the video to view the concluding comments.

CONCLUSION

The pictorial approach to understanding farm systems and modelling their bioresource flows has many advantages:

- A picture showing the links between farm enterprises, conveys the message of farm integration more effectively than either the written or spoken word.

- A picture of the farm system helps farmers appreciate their own farm as an integrated unit of interlinked enterprises.

- Once a picture is drawn, it is easier for a researcher, extensionist or farmer to see the possibility of making new links.

The farmers and their pictorial model.

- If a new enterprise is being introduced to a farm, it can be added to the drawing, and the picture can be used as a medium through which to discuss its possible effects on farm operations.

- For the researcher, an initial drawing of the farm system acts as a basis for differentiating levels of integration on different farms.

- When asked to draw a picture, the farmer acts as the teacher. This shows respect for the farmer's knowledge of local farming conditions. Such an approach helps to win the confidence of the farmer and makes it easier to carry out research and extension work later on.

- The picture serves as a basis for further research. The researcher uses the picture to make suggestions about modifying farm operations. The farmers, in turn, can indicate on the drawings, areas they feel need change or more study. In this way, further research can be developed through mutual cooperation.

- When several farmers are involved, the drawing of farm systems linking new to existing enterprises, is a valuable teaching technique. The exchange of ideas takes place much more readily within such a peer group, than if an outsider conveys ideas to individual farmers. In such groups, the communal drawing of pictures, facilitates the generation of new ideas among farmers and can often lead to valuable suggestions for suitable research topics.

- Bioresource flows in a farmer's picture can be quantified by asking the farmer how much material passes between enterprises. This can be given a temporal dimension by

getting the farmer to draw the links which occur at different times of the year. In this case, the researcher must visit the farm several times during the year to obtain a complete, quantitative picture of farm operations.

- Pictorial modelling helps researchers determine the data needed to draw up bioeconomic and ecological models of the farm system. Farmer-generated pictures show inputs and outputs for various enterprises and outline the basic structure of the farm system. The researcher can assign standing crops and rate processes to these parts of the diagram by gathering relevant data on the farm. The farmers' drawing is therefore a valuable precursor to any qualitative modelling exercise.

The list above is not exhaustive and simply cites some benefits of using this method. Certainly, for anyone intending to take a farmer-participatory approach to agricultural research, the pictorial method provides a valuable first link with the farmer. This drawing tool is also useful for the researcher who is developing a dynamic model of farm systems in order to analyze the effects of changing farm practices on economies and environments.

Through pictorial modelling, farmers constantly surprise visitors. Their indigenous knowledge reveals a deep understanding of the ecological and economic bases of their farming practices. Drawing pictures lets farmers express this knowledge clearly and encourages them to use it for developing new integrated farming systems.

A farmer proudly shows off his drawing.

FURTHER READING

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

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

Lightfoot, C. 1990. Integration of aquaculture and agriculture: a route to sustainable farming systems. Naga, ICLARM Q. 13 (2): 9-12.

Lightfoot, C., N. Axinn, V.P. Singh, A. Botrall and G. Conway. 1989. Training resource book for agroecosystem mapping. International Rice Research Institute, Los Baños, Laguna, Philippines and Ford Foundation, New Delhi, India. 125 p.

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, Philippines and International Center for Living Aquatic Resources Management, Manila, Philippines.

Natpracha, P. and A. Stephens. 1990. Taking hold of rural life. Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand. RAPA Publ. 1990/20. 112 p.

Noble, R.P. and B. Rashidi. 1990. Aquaculture technology transfer to smallholder farmers in Malawi, Southern Africa. Naga, ICLARM Q. 13 (4):14-16.

Rhoades, R.E., V.N. Sandoval and C.P. Bagalanon, Editors. 1990. Asian training of trainors on farm household diagnostic skills. User's Perspective with Agricultural Research and Development, International Potato Center, Los Baños, Laguna, Philippines.

Stephen, A.. 1988. Participatory monitoring and evaluation. Handbook for training field workers. Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Bangkok, Thailand. RAPA Publ. 1988/2. 51 p.

HOW TO ORDER

Videos 1 and 2 and this book are supplied together. Video available in English in color in VHS and Beta formats. Price: VHS, US$40 including airmail delivery; Beta, ₱2,000. A superior VHS-NTSC edition is available at $90. This book is also available independently. Price $3 including airmail delivery. To order, write to: Director, Information Program, ICLARM, MC P.O. Box 1501, Makati, Metro Manila 1299, Philippines. Fax: (63-2) 816-3183.