



PD/A CRSP SEVENTEENTH ANNUAL TECHNICAL REPORT

AQUACULTURE TRAINING FOR KENYAN FISHERIES OFFICERS AND UNIVERSITY STUDENTS

*Ninth Work Plan, Adoption and Diffusion Research 3 (9ADR3)
Progress Report*

Karen L. Veverica
Department of Fisheries and Allied Aquacultures
Auburn University, Alabama, USA

Bethuel Omolo and Judith Amadiva
Sagana Fish Farm
Sagana, Kenya

James R. Bowman
Department of Fisheries and Wildlife
Oregon State University
Corvallis, Oregon, USA

ABSTRACT

A lack of technical training was cited as a major reason for the low output of fish ponds in Kenya. The need for training was observed at all levels, from the lowest level extension agent through university levels. The training program undertaken by PD/A CRSP researchers in Kenya seeks to improve training and to provide a cadre of trainers who have extensive practical fish production experience. Stipends for student research have allowed undergraduate university students to remain longer at Sagana Fish Farm and gain valuable field experience. A small research projects program has allowed the station staff to further their professional development and carry out their own research, which can have a positive impact on station management. Following requests from farmers, a program of farmer education days was developed. During the first half of 1999, five farmer education days were held, in which 107 farmers and 40 extensionists participated. All districts in the Central Province were covered and one district each from the Eastern and Rift Valley Provinces was included. The farmer education days are being continually improved, following feedback from farmers. Programs for more specialized training are planned, as well as demonstration visits held at farmers' ponds.

INTRODUCTION

A lack of technical training was cited as a major reason for the low output of fish ponds in Kenya. The need for technical training was observed at all levels, from the lowest level extension agent through university levels. The training program undertaken by PD/A CRSP researchers in Kenya seeks to improve training and to provide a cadre of trainers who have extensive practical fish production experience. This activity was originally planned to include training only for university students and fisheries officers at all levels, but has been expanded to include farmer training as well.

The following were the objectives for the training program:

- 1) To increase the pond management skills of fisheries personnel currently involved in aquaculture extension activities in Kenya, and
- 2) To enhance the research and extension capabilities of Kenyan university students likely to be employed in the aquaculture sector.

UNIVERSITY STUDENT TRAINING

Three MS students from the University of Nairobi conducted their thesis research at Sagana with supervision by the CRSP US Principal Investigator, Ms. Karen Veverica. They were Mr. Paul Izaru, Mr. Wilson Gichuri, and Ms. Patricia Mwau. All three handed in the final drafts of their theses in November

and December 1998. These are sent to outside readers, after which a defense is scheduled. To date, none of the three theses have been scheduled for defense. Students have no choice but to wait for a reaction from their department. Mr. Paul Izaru elected to stay on at Sagana to write a proposal for Ph.D. research. Mr. Wilson Gichuri returned to his job as a Fisheries Officer and is awaiting assignment to Sagana. In the meantime, he has submitted a proposal for further research to the International Foundation for Science. The third, Patricia Mwau, is seeking employment. Graduate-level training conducted in 1998–1999 is shown in Table 1.

Undergraduates at Kenyan universities are required to do a six-week "attachment" in which they learn the practical aspects of station work and often take on a special subject for their Attachment Report. If the student can stay longer, they often conduct their Senior Project research, for which a report is due at the end of their senior year. Student stipends from the CRSP have made it possible for some students to remain at Sagana for the whole break between their junior and senior years, thus allowing them to complete a senior project. Names and senior project subjects for these students are presented in Table 1.

FISHERIES OFFICER TRAINING

A key part of the overall training activity has been the selection of the candidate for training to fill the Fisheries Department's

Research/Extension Liaison position. The selected candidate would be eligible to receive an MS scholarship sponsored at least in part by the PD/A CRSP. This training thus relates to both university student training and fisheries officer training. Mr. B. Omolo was selected from a short list of seven candidates for the scholarship. His maturity and experience were the major factors in the selection, which was conducted by a training committee made up of seven people. Mr. Omolo has applied to two graduate programs and is currently arranging to take the necessary entrance exams. His MS program will be at least partially supported by the CRSP.

Fisheries officers assigned to Sagana Fish Farm have asked for assistance in conducting small research projects. Assistance in experimental design and in materials is provided by the CRSP (Table 2). These projects further the professional development of the officers and provide background information and experience for writing proposals for more detailed research. Some of the projects, such as those looking at *Clarias* fingerling production techniques, have immediate impact on station management. One of the fisheries officers, Mr. Felix Lagat, has

won a scholarship to Belgium for an MS program in aquaculture at University of Ghent. He will be leaving in September 1999.

Two staff members at Sagana Fish Farm were selected for further professional training, fully financed by the PD/A CRSP. John Maina Kamau followed an intensive computer course at Kenyatta University. He has completed his exams and is awaiting certificates for the units completed. Mr. James Karuri has received a scholarship for a three-year diploma program in Applied Biology at the Murang'a College of Technology. He began his first year in January 1999.

FARMER AND EXTENSION AGENT TRAINING

A planning meeting was conducted for district fisheries officers, in which the latest PD/A CRSP research results were presented and during which farmer and extension agent training sessions were planned. Quarterly meetings such as this with district fisheries officers are needed, but budgetary constraints often mean that meetings occur only once a year. PD/A CRSP funds can help increase the frequency of fishery officer meetings.

Table 1. Participants, university affiliation, and project of students who attend the university-level training conducted in 1998-1999. Mr. Meso's stipend was paid under the PD/A CRSP Effluents and Pollution Research project.

Name	University / Department	Project	Date Started
ATTACHMENTS			
Paul Wamwea Wabitah	Kenyatta University/ Zoology	Senior project in comparison of tanks and hapas for sex reversal of tilapia	Intermittent, as of May 1998
David Mirera	Moi University/Fisheries	Senior project on primary productivity indicators	May 1999
William Nyaga	Moi University/Fisheries	Senior project on treatments to enhance survival of goldfish larvae	May 1999
Cosmas Munga	Moi University/Fisheries	Senior project on <i>Clarias</i> larvae feeding strategies	May 1999
GRADUATE STUDENTS			
Daniel Oenga Nyanchiri	Moi University/Fisheries	Largemouth bass introductions and fingerling production	July 1998
Bernard Meso	University of Nairobi/ Soil Sciences	Irrigation of horticulture crops with pond water effluents	September 1998
Paul Bilal Izaru	University of Nairobi/ Zoology	Phytoplankton dynamics at different nitrogen and phosphorus input levels	October 1998
Patricia Nduku Mwau	University of Nairobi	Nitrogen and phosphorus budgets in tilapia/ <i>Clarias</i> polyculture ponds receiving different combinations of rice bran and chemical fertilizer	
Wilson Maina Gichuri	University of Nairobi	Comparison of chemical fertilizer and rice bran in different combinations as inputs for tilapia/ <i>Clarias</i> polyculture	

Table 2. Fisheries officers assigned to Sagana who have worked on their own research projects, with advice and materials provided by the PD/A CRSP.

Name	Project Title	Status
Charles Gatune	Production of ornamental fish	Report in progress.
Felix Lagat and Stephen Njao	Feed electivity indices for <i>Clarias</i> and tilapia in fertilized ponds	Data collected; now in analysis.
Raphael Mbaluka	Construction and testing of fish graders <i>Clarias</i> fingerling production technologies	Data collected. Data collected on first experiment; second experiment to begin August 1999.

With reduced government spending, the extension service cannot be expected to disseminate information to all farmers. Therefore a program of farmer training, in which as many farmers as possible receive some information, seems to be the best option. To assist the extension service a program of farmer education days was developed by Mr. Omolo, K. Veverica, and the Social Development Officer, Judith Amadiva. Short (one-day) training sessions were planned because it is difficult for farmers (especially women) to leave their homes for long periods. The first farmers' education day was requested by the newly formed Mt. Kenya Fish Farmers' Association. Education day packages consisting of binders containing fact sheets are

Table 3. Subjects covered in the farmers' education day package. Fact sheets were printed for each of the subjects and presented to farmers in a binder. Two fact sheets have not yet been prepared: fish harvesting methods and fish preservation. Translation into Kiswahili is being considered but the fact sheets still need some editing. Students on assignment at Sagana accompany the trainees and help with translations into Kikuyu.

Subject	Instructor
Pond Management—Especially Water Flow Control and Weed Control	Veverica
Feeds and Feeding	Lagat or Gichuri
Fertilizing Options and Rates	Lagat
Predator Control	Oenga or Veverica
Parasites and their Prevention	Njau
Requirements and Biology of Tilapia, Catfish, and Carp	Omolo
Stocking Rates as They Relate to Carrying Capacity and Desired Size	Mbaluka
Tips on Pond Construction and Pond Maintenance	Veverica
Integration of Farm Practices with Fish Ponds	Meso or Njau
Fish Drying and Smoking	Wasane
Fish Harvesting Techniques	Kibe or Makau

Table 4. Farmer/Extension Agent training programs in 1999. The term fisheries officer is used loosely; it indicates Fisheries Department staff—mostly fisheries officers, assistant fisheries officers, or fisheries assistants. Except as noted, education days were held at Sagana Fish Farm.

Date	Farmers		Fisheries Officers		Origin	Subjects
	Women	Men	Women	Men		
11 March	5	13	1	1	Kiambu	Introduction to fish farming
18 May	5	25	1	9	Nyeri, 7 divisions	Farmers education package
24–25 June	0	0	0	5	Central Province	Research results of CRSP on-farm trials
11 June*	7	28	0	0	Kerugoya	Training programming Fish harvesting and processing
8 July	0	10	0	5	Kirinyaga District	Farmers education package
	0	5	0	0	Muranga DST	Farmers education package
20–21 July	2	13	1	3	Thika and Kiambu Districts	Farmers education package
	1	5	0	6	Nyandarua District	Farmers education package
29 July	2	9	2	6	Nyeri District	Farmers education package
	2	6	1	1	Nyanyuki District	Farmers education package
	0	6	1	1	Embu District	Farmers education package
	0	0	0	1	Murang'a District	Farmers education package

* Held at a reservoir site in Kerugoya.

prepared for the trainees at each education day; subjects covered in these packages are described in Table 3. As the field days continue, new subjects are added and new handouts are developed. More specialized programs will be offered in the future. Feedback from farmers has been very positive and encouraging. A few simple ideas such as water inflow control and pond fertilization were totally new to the majority of farmers. Although meetings can be held elsewhere, most are held at Sagana, which is an ideal place because farmers accept information on pond management more readily when they actually see a pond with static water in which fish are feeding actively. One on-site demonstration on fish harvesting and preservation was held at a large, seven-acre dam in Kerugoya. Farmer training/education programs that have been held in 1999 are summarized in Table 4. More of these programs are foreseen, because they seem to be more easily attended by women and they allow for additional involvement of onlookers and school teachers.

Observations on Farmer and Extension Agent Training

Extensionists were selected by their superiors based on the likelihood that they would use their new information to the benefit of the farmers. The selection process seems to have worked fairly well. Most extensionists were very eager to learn more and complained about never having received training. Only a few showed little interest in the subjects. Extensionists who were the most eager to learn will be invited to a longer session later in 1999. They will receive a certificate after the one-week training.

The farmers were asked what kinds of new things they learned at the education days. The following is a list of their answers with the more frequent appearing first:

- 1) Flowing cool water through the pond is not a good thing for tilapia and *Clarias* production.
- 2) Inputs do not have to be purchased but many things available on the farm can be used as feeds or fertilizer.
- 3) Chemical fertilizers can be used in ponds.
- 4) *Clarias* catfish is a good second species to grow with

tilapia and it consumes those tadpoles and frogs that are such a bother.

- 5) Just about anybody can smoke and dry fish for their own use; it is not so difficult.
- 6) Some of the algae growing on the pond surface, like *Euglena*, are not a problem for tilapia and are consumed by them.
- 7) Fish can taste really good (even catfish) if prepared correctly.
- 8) For optimal water regulation, it is better to capture a spring and divert its water to the pond when needed instead of growing fish right in the cool, flowing spring.

The water flow question appears to be the single most important issue in improving fish growth and production. Most extensionists were previously taught to continually flow water through ponds. Unfortunately, most surface waters in the Central Province are very cold and have very low total alkalinity and hardness. This is a recipe for disaster in low-input warm water fish culture ponds. But simply *telling* farmers that static water is better was not enough—the farmers needed to *see* ponds in which no new water had been added during the previous five months, except for topping off to replace water lost to evaporation. At Sagana the farmers saw such ponds and the fish produced in them. They also saw evidence that Sagana Fish Farm's leakiest ponds are consistently the poorest producers.

As the education days start to include farmers from greater distances, the program will have to be lengthened to allow farmers transport time and to make the relatively high transport costs pay off. Alternatively, other training centers can be established. However, it is imperative that good pond management techniques be observed and not just talked about, so any other sites considered for training will need to have appropriate examples in the vicinity.

ANTICIPATED BENEFITS

This activity is providing university students, fisheries officers (including those involved in extension efforts), and farmers with improved fish handling and pond management skills. Short training courses are improving technical confidence and morale among extensionists. Linkages between research and extension activities in Kenya are being strengthened. Ultimately, better pond management by farmers will lead to increased fish production, increased farm income, increased amounts of fish available to communities and markets, and increased employment opportunities. Support and hands-on guidance of graduate students in aquaculture will strengthen their degree programs and ultimately help promote productive and sustainable aquaculture growth in Kenya and in the region.