TRAINING TRAINERS FOR LONG TERM AND SUSTAINED IMPACT OF POND AQUACULTURE IN AFRICA

Technology Adoption and Policy Development/Activity/09TAP08AU

FINAL INVESTIGATION REPORT

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ABSTRACT

This report summarizes a train-the-trainers program of activity and experiences that combined hands-on field experience with independent computer-based study. The program focused on six individuals who took on-line training and produced practical fact sheets for use in training programs in their home countries. Auburn University's distance learning program is called Certification of Aquaculture Professionals (CAP). The program of lectures from Auburn's Aquaculture Training Program was delivered to fish farming professional selected for the program and was accompanied by a practical training program in the field.

INTRODUCTION

Research, extension and education can contribute greatly to enhancing aquacultural production in a sustainable way and to reducing poverty, but achievements have generally fallen short of expectations in Africa (Sanginga et al. 2008). Farmers trust the experience and knowledge of others who are in situations similar to their own. Their desire to meet and talk with each other has spurred the formation of groups and networks to foster informal gatherings and more formal mechanisms of association to facilitate peer-to-peer learning. Such learning groups are most effective when they have a targeted membership like fish farmers. If member perspectives are too diverse, then participants tend to become disenchanted because the results do not apply to their situations (Barrett and Ewert 1998).

The sustained growth and development of pond aquaculture in Africa depends on a well-prepared cadre of researchers and consultants who are conversant with technical fundamentals and best practices (Machena and Moehl 2001; Molnar et al. 1996). Ensuring and renewing the skills of aquaculture professionals will advance productivity and protect the investment made by private landowners, governments, and donors in fish farm development. Most nations in which aquaculture plays a significant role in poverty alleviation recognize that human resource capacity renewal is a key to sustained development of the sector. The types and levels of training required must focus on basic principles. Yet the need to increase specialized training in the aquaculture sector will grow as the sector develops (De Silva et al. 2001).

In the past, extension workers were expected to have specialized knowledge in technological aspects, such as the artificial propagation of an aquatic species. The training for this, however, tended to be relatively short term, lacking a holistic approach. Such training was frequently driven more by technology interests than by development needs or the needs of the farmers. A holistic approach to

aquaculture training is, and will continue to be, an essential ingredient of sustainable aquaculture development (De Silva et al. 2001; Veverica and Molnar 1997).

Auburn University's distance learning program is called Certification of Aquaculture Professionals (CAP). The program of lectures from Auburn's Aquaculture Training Program was delivered to fish farming professional selected for the program and was accompanied by a practical training program in the field.

Several subjects covering the fundamentals of aquaculture are presented in modules. The complete certification consists of ten modules and a total of 136 segments with an average duration of 30 minutes each (see Appendix for detailed content).

Module	**Instructor**	**Segments**
Principles of Aquaculture	Leonard Lovshin	10
Water Quality	Claude E. Boyd	16
Physiology	Imad P. Saoud	9
Hatchery Management	Ronald Phelps	20
Aquatic Animal Nutrition	D. Allen Davis	12
Genetics and Breeding	Rex Dunham	17
Aquatic Health	Jeff Terhune / Karl Hayden	17
Aquaculture Production	Masser / Daniels / Veverica	21
Extension Methods	John Jensen	5
Aquaculture Economics	Terril R. Hanson	9
TOTAL		**136**

Aside from a computer and internet connection, no special technology is required to gain access to the CAP modules. The participant is assigned a user name and selects a password. The student can access the learning modules at any time. Users with slower internet connections are able to view the slides, listen to the lectures in English and view the translated lecture transcripts. Those with faster internet connections are able to view the lecturer as well.

Objectives:

1. Develop a team of 6 highly-qualified trainers who have a wide range of field experience.
2. Make CRSP research results more accessible and applicable to the African context through the production of fact sheets based upon CRSP technologies.
3. Conduct basic principles and practical applications training programs in selected African countries for technical advisors, prospective fish farm managers and advanced farmers (total 60 individuals)

METHODS AND MATERIALS

This activity provided a selected group of current trainers (termed Master Trainers), 1) a complete online course that provides the fundamentals of aquaculture for their further use in developing their own courses, as well as a Certificate of Aquaculture Professional, and 2) hands-on field experience in pond-based fish production to accompany the CAP and to allow the Master Trainers (MT) to experience all of the techniques they are teaching others.

As the CAP program is completed by the prospective MT, a 1 month field exercise was conducted in the US. The hands-on field experience was conducted at Auburn, EW Shell North Auburn Fisheries Research Station, of 800 hectares, with more than 300 ponds, totalling 100 ha of water surface. Karen Veverica led the activities. A set of 400 sq meter ponds were allocated to set up a small feed trial, a tilapia spawning pond for production of uniform-age fry, and fry grow-out. In addition, the trainees received fish marketing experience, fish harvesting experience for small (<1 ton) and medium scale (>1 ton per harvest), fish transport experience, hatchery experience, including hormonal sex reversal of tilapia, hatchery design and air blower maintenance experience and general pond management practice.

The In-Country Training Schedule

Week One: Basic Principles of Pond Aquaculture

- 2 Days prior: Trainers arrive, planning meeting, review of local arrangements, course management and strategy discussions
- Day 1: Travel and assembly at training site, participant arrival day.
- Day 2: Principles of pond construction and renovation Pond Design and construction. Pond management –carrying capacity.
- Day 3: How to select the fish production system (ponds or tanks, liners or no, aeration or not). Tilapia biology and cage culture.
- Day 4: Carrying capacity at different production levels.
- Day 5: How to sample and harvest fish. Pond record keeping.
- Day 6: Basics of fish handling and transport.
- Day 7: Basic principles of fish marketing, Assessment by training team; participants depart.

In-Country Training Week Two: Basic Principles of Pond Aquaculture

- Day 0: Trainers arrive, planning meeting, review of local arrangements
- Day 1: Travel and assembly at training site
- Day 2: Water quality and fish production
- Day 3: Pond fertilization for zooplankton and for tilapia production
- Day 4: Feeding and feed management, Catfish Hatchery Management
- Day 5: Economics of feeding, and a comparison of fertilizer-based and feed-based fish production options.
- Day 6: Preparation of farm management plans. Revisit fish marketing and production planning.
- Day 7: Assessment by training team; participants depart.

The MT were "visiting scientists" and allocated the "Aquaculture training room" where they had computer access. Time was provided for the review of CRSP research publications and the production of fact sheets. Each MT was expected to produce 2 or more fact sheets that were reviewed and printed. Auburn Professors Boyd, Phelps, Terhune and others conducted one-hour question and answer sessions with the visiting scientists.

Following this Master Trainer program, the trainers held one-week sessions in their own country, at various locations and were given a budget to finance the training. They were assisted in the training by K. Veverica for all but one training, which was assisted by Dr Nelly Isyagi and another MT: Ben Kiddu. Following the training program, a summary report, including the course evaluations was sent to the Aquafish CRSP PIs .

An announcement of the Master Trainer opportunity for training was distributed ANAF and SARNISSA and to Aquafish CRSP collaborators. Selection of the MT candidates was based upon recommendations from: CRSP collaborators; department heads at Legon University, the Kwame Nkrumah University of Science and Technology, and the Ministry of Fisheries in Ghana; Sokoine University. Tanzania Fisheries Research Institute and the Ministry of Fisheries in Tanzania; and from Makerere University, the Fisheries Training Institute, and Gulu University in Uganda.

Two candidates from each country were selected based on the long-term training potential of the individual, either through their appointment as instructor in aquaculture or their continued training of fish famers and managers and their previous work with the Aquafish CRSP. Two Master Trainer candidates from Ghana, two from Tanzania, two from Kenya and two from Uganda and two from Kenya were identified. Private consultants acting as fish farmer advisors, were allowed to compete for the scholarships. The in-country trainees were selected by the Master Trainers, with owner-operators and those currently employed in fish farm management being given priority.

RESULTS

The project sought gender balance in the selection of Master Trainers by requesting one male and one

female candidate from each office (universities, fisheries training institutes and fish farmer societies. From this pool, two candidates from each country were selected, based upon the resume, cover letter and recommendations provided by the candidate.

The in-country training program venues were selected to accommodate women in regard to housing and the Master Trainers are encouraged to keep gender balance in their selection of trainees.

The project sought but did not achieve gender balance in the selection of Master Trainers by requesting one male and one female candidate from each office (universities, fisheries training institutes and fish farmer societies. From this pool, two candidates from each country were selected based upon the resume, cover letter and recommendations provided by the candidate. The CRSP Management Entity had final choice on candidates. In addition, for the in-country training programs, the training venue was selected to accommodate women in regard to housing and the Master Trainers were encouraged to keep a fair gender balance in their selection of trainees. Women are an integral part of the training effort**.**

The one-week training sessions held in-country and organized by the Master trainers covered a variety of subjects but pond construction, the concept of carrying capacity and making of management plans were included in every training. In Tanzania (the Arusha training), trainees staked out and constructed a 400 square meter pond in one week. In Uganda, the two MT's combined their training program and renovated a pond on a private farm. Weather hampered the work in Uganda because it rained every day. In Ghana, one of the MT's did a substantial amount of re-pegging of a pond that was previously poorly constructed and began the renovations. Evaluations very extremely positive except for the time -length of the training, which most participants believed to be too short.

CONCLUSION

There were many lessons learned during this activity. The CAP distance learning program was completed by 5 of the 8 participants (but at least one per country). Both Uganda participants (both from the private sector) completed the CAP. Although the lesson plan was overly ambitious for the one-week in-country trainings, it provided the MT the opportunity to collect the training presentations by Ms. Veverica on a wide variety of subject areas so that they can modify them as needed and use them for future training programs. The Master Trainers maintain communications with their new-found colleagues and this has helped them in their own professional development.

Gender issues in aquaculture can be seen from two perspectives: instrumental and empowerment (Derun 2000). From an instrumental perspective, women are a vital force in aquaculture development, and interventions focus on the need to assist women so that they can be more involved and more effective in aquaculture activities. From this viewpoint, augmenting women's primary capabilities and access to credit, training and extension services are important, so they are able to improve yields. Thus the project enables women by enhancing their knowledge, skills, and abilities to lead fish farming enterprises.

Change in gender power relations in the household and in the society are more difficult to achieve solely by training. Changing existing gender relations through aquaculture activities to achieve more equal relationships between genders is the broader objective, whether their choices regarding the management of the activity and the household have increased, and whether women's self-esteem and self-confidence have improved so that they can be in charge of their own lives. Training may enable women able to access knowledge and information, to make decisions on household investment and expenditure, as well as having decision making power in the community, are some of the indicators to judge advances in their empowerment.

Women enabled to participate in aquaculture activities are in a better position to take part in decision making processes. Women who can make decisions can be in a better position to be in charge of aquaculture activities, and thus be more effective in managing their aquaculture activities. On the other hand, if women work on aquaculture activities more and consequently increase their income, but if there is not questioning nor challenging of existing gender relations, women's empowerment processes are hampered. Exclusion of women from management functions has a double effect. First it

does not allow the strengthening of a community's capabilities. Second, it ignores an important portion of social knowledge and thus leads to inefficiency in resource use and retards the overall development of the community's social capital.

Our trainees have moved into important leadership roles in their home countries. They are consultants to the private sector. Some lead government agencies in aquacultural development. The help farmers organize and empower women to realize the promise of fish farming on their own farms and in their own nations.

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Appendix 1 Detailed Topics for the Auburn University Certification of Aquaculture Professionals (CAP)

PRINCIPLES OF AQUACULTURE	WATER QUALITY MANAGEMENT	AQUACULTURE PRODUCTION	PHYSIOLOGY	HATCHERY MANAGEMENT	NUTRITION AND FEEDING	AQUATIC HEALTH	GENETICS AND BREEDING	EXTENSION METHODS
Fisheries and Aquaculture Statistics	Physical Properties of Water	Concept of Commercial Fish Production	Introduction	Introduction	Introduction	Disease Dynamics I Knowing the Fish and the Culture System	Goals Plans and environmental variations	Introduction
Aquaculture Definitions	Hydrology	Facilities/Types of Production Systems	Environmental Stressors	Gonad Development	Digestive Morphology	Disease Dynamics II Knowing the Diseases	Qualitative and Basic Genetics	Goals
Primary productivity in water	Dissolved Oxygen and Redox Potential	Site/Species/System Evaluation	Homeostatic control	Brood Stock Management	Digestive Process	Non-infectious diseases (Water Quality)	Strain Evaluation and Selection	Adoption/Diffusion
Carrying capacity in water: nutrient inputs	pH, Carbon Dioxide and Alkalinity	Production Planning-I	Receptor mechanisms	Environmental Control of Reproduction	Energy	Non-infectious diseases (Nutrition Deficiencies)	Inbreeding and Random Genetic Drift	Program Development
Carrying capacity in water: water quality	Microorganisms and Water Quality	Water Budgets	Gas exchange	Hormone Induced Spawning	Protein	Sample Collection and Preservation	Intraspecific Crossbreeding	Demonstration of how to do a Demonstration
Carrying capacity	Oxygen Production and Demand	Pond Preparation-Liming	Metabolism	Ovulation and Spawning	Lipids	Diagnostic techniques-I	Interspecific Hybridization	
Carrying capacity in water: species and polyculture	Nitrogen and Phosphorus	Pond Preparation-Fertilizing	Osmoregulation	Sex Manipulation	Minerals	Diagnostic techniques-II Video	Selection and Heritability	**AQUACULTURE ECONOMICS**
Growth rate	Sulfur and Trace Elements	Pond Preparation-Insect & Unwanted Fish Control	Excretion	Egg Development	Vitamins	Treatment theory	Correlated Response, Indirect Selection and Multiple trait selection	Budget Analysis
Yield and economics	Pond Liming	Aquatic Weed Management	Measures Stress.	Egg Handling	Dietary components	Vaccines	Polyploidy	Cost Return Analysis
Classification systems for aquaculture	Pond Fertilization	Water Quality Monitoring/Maintenance-DO,		Egg Incubation	Grow-out diets	Warm Water Bacterial Pathogens	Sex reversal and breeding	Economic Analysis
	Mechanical Aeration	Water Quality - pH, ammonia, etc.		Larval Management	Maturation and Larval Diets	Cold Water Bacterial Pathogens	Genetic Markers	Cash Flow Analysis
	Feed BOD and Aeration Requirements	Feeds and Feed Management		Intensive Larval Feeding - Rotifers	Feed processing and Feeding programs	Finfish Viral Pathogens	Marker Assisted Selection	How to Price your Product
	Off Flavor and Toxic Algae	Handling/Grading/Transportation/Harvesting		Intensive Larval Feeding - Algae		Invertebrate Pathogens	Conservation and Population Genetics	Record Keeping
	Miscellaneous Treatments	Flow-Through System -Tanks & In-Pond Raceways		Intensive Larval Feeding - Artemia		External Parasites	Genetic Engineering	Partial Enterprise Budgeting
	Aquaculture and the Environment	Cage Culture-Types of Cages & Construction		Intensive Larval Feeding - Daphnia		Internal Parasite	Environmental Risk, Fitness and transgenic sterilization of GE fish	Project Analysis
	Best Management Practices for Aquaculture	Cage Culture-Cage Placement & Management		Intensive Larval Feeding - Artificial Diets		Biosecurity Summary	Public Education and Concerns in Biotechnology	Marketing
		Recirculation System Production Considerations		Pond Management			Combining Genetic Enhancement Programs	
		Production Planning-II		Nursery Ponds				
		AMR's-Aerated Microbial reuse systems		Practical Example				
		Record Keeping		Practical Example II				
		Project start up						