

**AQUACULTURE & FISHERIES  
COLLABORATIVE RESEARCH SUPPORT PROGRAM**  

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**STRATEGIC INVESTMENT IN RAPID TECHNOLOGY DISSEMINATION  
(SIRTD) ASSOCIATE AWARD**

**FEED THE FUTURE:  
ENHANCING THE PROFITABILITY OF SMALL AQUACULTURE  
OPERATIONS IN GHANA, KENYA, AND TANZANIA**

**FIRST ANNUAL REPORT  
October 1, 2010 – September 30, 2011**



**Associate Award Number AID-OAA-LA-10-00006  
Leader with Associates Award EPP-A-00-06-00012-00**



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COLLABORATIVE RESEARCH  
SUPPORT PROGRAM



## **SIRTD: ENHANCING THE PROFITABILITY OF SMALL AQUACULTURE OPERATIONS IN GHANA, KENYA, AND TANZANIA FIRST ANNUAL REPORT**

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### **Disclaimers**

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This report covers the period from 1 October 2010 to 30 September 2011, which we refer to interchangeably as FY11 and reporting year (1 Oct 2010 to 30 Sep 2011), with the understanding that there is a one-day divergence between this reporting period and the Federal Fiscal Year, and that this work does not use FY11 federal funding.

A draft of this document was submitted to USAID on 29 September 2011 and feedback was provided by USAID on 11 and 12 October 2011. All comments have been addressed.

### **Acknowledgments**

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### **Cover Photo**

Photo courtesy of Kwamena Quagrainie, Ghana, 2011.

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## EXECUTIVE SUMMARY

The First Annual Report for the AquaFish CRSP Strategic Investment in Rapid Technology Dissemination (SIRTD) Program Associate Award “Enhancing the profitability of small aquaculture farm operations in Ghana, Kenya, and Tanzania” covers activities and accomplishments from October 1 2010, through September 30, 2011. During this reporting period, US and Host Country investigators conducted collaborative activities focused on SIRTD and FtF development goals, including scaling up innovations from previous CRSP project successes and accelerating best management practice (BMP) adoption rates.

The origins of this Associate Award date back to March 2010, when USAID/EGAT contacted the ten CRSP Directors requesting short concept notes to move existing CRSP research towards adaptation and dissemination at a scale that will result in greater impact and visibility. The Director of AquaFish CRSP, Dr. Hillary Egna, in consultation with partnering US Project PIs, submitted two concept notes for consideration. On April 9, 2010, USAID informed Dr. Egna that the concept note for “Enhancing profitability of small aquaculture farm operations in Ghana, Kenya, and Tanzania” was highly ranked and to submit a more detailed pre-proposal addressing reviewer comments. On April 19, 2010, Dr. Egna submitted the pre-proposal and through July, she then revised the pre-proposal several times in response to changing instructions from USAID to address reviewer comments. On August 12, 2010, Dr. Egna received a formal Request for Associate Award Application (RFAAA) under the Aquaculture & Fisheries CRSP Leader Award from USAID through the EGAT/AG Strategic Investment in Rapid Technology Dissemination (SIRTD) Program. AquaFish was one of only three CRSPs to receive a RFAAA. On September 6, 2010, Dr. Egna submitted a full proposal in response to the RFAAA, including expanded sections on environmental impacts and gender inclusivity. Anticipating the need to expedite work under this Associate Award, and in furtherance of research and development discussions among select and previously interested colleagues, Dr. Egna sent an Invitation to Participate to Dr. Kwamena Quagrainie (Purdue University), and Dr. Emmanuel Frimpong (Virginia Polytechnic Institute and State University), inviting them to submit proposals for work under the Associate Award. On September 28, 2010, the AquaFish CRSP ME at OSU was awarded a 3-year, \$1.1 million from USAID for the Associate Award “Enhancing the profitability of small aquaculture farm operations in Ghana, Kenya, and Tanzania.” Proposals submitted to AquaFish from Drs. Quagrainie and Frimpong were externally peer-reviewed that fall 2010 and subcontracts put in place with Purdue University and Virginia Polytechnic Institute and State University in spring 2011.

The focus of this Associate Award is technology adoption involving best management of inputs for fish production to provide economic, environmental, and agronomic efficiency of aquaculture in sub-Saharan Africa. Target technologies being focused on include *effluent management practices* and *nutrient management practices*, using the lens of *profitability analysis*. This project focuses on Ghana for initial scale-up but with the sub-Saharan African region as a whole in mind. As a further step in scaling up innovations from previous ACRSP and AquaFish project successes and accelerating BMP adoption rates in Ghana, Kenya, and Tanzania, three innovation diffusion techniques are being simultaneously deployed: 1) Central Media (series of workshops at the regional level and extension follow-ups), 2) Demonstrations (BMPs at work on farms of selected farmers), and 3) Lateral Diffusion (farmer-to-farmer extension of BMPs).

During this first annual reporting period CRSP BMPs have been extended through both on-site demonstration ponds and short-term training workshops. In Ghana, six farms are currently demonstrating the use of CRSP BMPs. Two short-term training events were held at Kwame Nkrumah University of Science and Technology, Ghana, and included a training-of-trainers targeting extension personnel and a BMP workshop targeting farmers. A total of 168 FtF focus country nationals have received training.

During this reporting period efforts were made to coordinate activities conducted under this Associate Award and existing core AquaFish CRSP projects. A face-to-face meeting occurred immediately prior to the 2011 AquaFish CRSP Annual Meeting in April 2011, allowing project researchers from Oregon State University, Virginia Polytechnic Institute and State University, Purdue University, Kwame Nkrumah University of Science and Technology, Kenya Ministry of Fisheries Development, and Sokoine University of Agriculture, to discuss and coordinate SIRTD Project activities with other activities planned under CRSP core projects in Africa.

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**INTRODUCTION**

Feed the Future (FtF) is a new US Government initiative to reduce poverty and hunger around the globe. Recognizing that agriculture and rural development have long been neglected in international aid programs, FtF renews a commitment towards sustainable global food security through reinvestment in these areas. USAID has recognized the severe impact poverty has on livelihoods, health, and ecosystems and has endeavored to align its strategies and goals within the FtF initiative.

Oregon State University's AquaFish CRSP has responded with a project that addresses FtF goals and helps reduce gnawing development problems that contribute to keeping the poor poor. This project, *Enhancing the Profitability of Small Aquaculture Operations in Ghana, Kenya, and Tanzania*, is framed around USAID and FtF objectives by investing in strong, evidence-based efforts. The project shares the FtF aim of accelerating progress toward meeting the poverty and hunger Millennium Development Goals, as measured by reducing the prevalence of poverty and reducing the incidence of underweight children. Our project is working towards these goals by accelerating inclusive agriculture sector growth through improved agricultural productivity, expanded markets and trade, and increased economic resilience in vulnerable rural communities. Improvements in nutritional status are expected to result from increased access to diverse and high quality foods. The ability to access and utilize food must remain stable and sustained over time. Paying attention to cross cutting themes such as gender, environment (climate change), and natural resources management can result in improved nutrition for all family members.

The AquaFish CRSP FtF project works in three of the focus countries identified by FtF: Ghana, Kenya, and Tanzania. Feed the Future's overarching goal is "to sustainably reduce global hunger and poverty by tackling their root causes and employing proven strategies for achieving large scale and lasting impact." We are focusing on small-scale agricultural producers, high quality seed, and best management practices, working with private sector partners to expand commercially sustainable agro-input industries and dealer networks, including small enterprises and seed production training to improve quality management. Increased access to inputs will be coupled with strategies to help ensure their safe and sustainable use. Our technologies will be refined and tailored to local conditions by supporting national research institutes and building local research capacities, including training local researchers and technicians. If gender inequalities inhibit demand, then these inequalities will be addressed. Our aim is to provide women with equal access to affordable inputs and improved techniques and technology.

The project additionally supports FtF objectives in the area of *Expanding Markets and Trade*, through the development and dissemination of market information for producers and enterprise owners, including activities that focus on equitable access for women. Greater access to market information can increase the ability of small-scale agricultural producers to participate in formal and higher-value markets. By improving post-harvest market infrastructure, our project aims to make markets work better for women and men agricultural producers and to extend the availability of nutritious foods. Through the reach of the project, our results will also aid FtF's objective of *Improving Nutritional Status* (FtF GUIDE, section 3.3.2), by improving diet quality and diversity through the addition of animal source protein and micronutrients commonly found in fish.

This project has primary focus locations in Ghana and Kenya to leverage work done by the AquaFish CRSP, and to consolidate adoption of the technology and ensure measurable impact. In addition to the intensive efforts in Ghana and Kenya, a pilot workshop will be held in Tanzania. The project began on 1 October, 2010, and will continue through 30 September, 2013.

### ***Resource Management Practice***

Working regionally across Africa with Best Management Practices (BMPs) holds the promise of strengthening regional coordination and can add value to activities at the country level. This includes harmonization of laws and regulations governing the release of varieties and trade in fish inputs (e.g., seed), developing more efficient supply chains for feeds, fertilizers, and other inputs, facilitating efficient dissemination of best practices and knowledge for similar agro-ecological conditions, and encouraging shared approaches to help producers adapt to the effects of global climate change.

The accelerating pace of growth of aquaculture in sub-Saharan Africa has received much positive appraisal because of the potential of the industry to contribute to development and food security by providing jobs and supplementing wild fish protein. Questions, however, are being raised about how long it will be before the industry comes under scrutiny for its environmental practices and the need for regulations. BMPs in aquaculture are now widely recognized as a more viable alternative to conventional industrial waste treatment methods, and their widespread adoption will help forestall imposition of prohibitive regulations on smallholder fish farms.

The adoption of BMPs in fish production requires strategies that integrate profitability and efficiency in the fish farming enterprise. Production options that consider both profitability and other efficiency issues were studied by Purdue University under the previous ACRSP where decision support tools were developed for assessing farm profitability. The tools involved financial spreadsheets that incorporated enterprise budgeting. Methods for farm-level reporting led to improved record keeping—important documentation for securing loans from banks. This is mainstream CRSP "soft" technology that can incorporate farm costs associated with adoption of BMPs and evaluation of profitability.

In November 2009, CRSP held a two-day national workshop in Ghana attended by 60 participants including fish farmers, fisheries commission officials, extension officers, regulators, and researchers. The workshop was held in the local language and also served as a "test drive" of one of several methods that could be used together to disseminate BMP guidelines and facilitate adoption. There was great enthusiasm among farmers with many interested in setting aside demonstration ponds for AquaFish-funded studies. These workshops thus accomplished: 1) training of extension officers who could follow up with farmers implementing BMPs in a sustained outreach program; 2) reaching a core group of farmers who may continue to spread the BMP ideas to other farmers; and 3) convincing regulators that the aquaculture industry has an active program of examining its environmental practices and continually working on improving these practices, thereby reducing costs of creating a formal regulatory process. A formal regulatory process for fish farms in Ghana does not currently exist in any standardized form. Establishing such a process is time consuming and faces challenges due to the difficulty of monitoring, corruption, and creating unintended costs to small farmers.

### ***Target Technologies***

The focus of this project is technology adoption involving best management of inputs for fish production to provide economic, environmental, and agronomic efficiency in aquaculture in sub-Saharan Africa. Target technologies being focused on in this work include *effluent management practices*, *nutrient management practices*, and *profitability analysis*.

#### **Effluent Management Practices**

Effluent management practices include guidelines on pond operation, settling ponds and vegetation ditches, draining to wetlands, top-releases for partial drainage, and water re-use (by holding or re-circulating to other ponds). Specifically, issues to be addressed include frequency of drainage, installation of drain outlets, and water level maintenance. Of these practices, emphasis will be placed on water re-use to provide the most environmental benefit because intentional drainage, which accounts for most effluent output, can be avoided

altogether for many years. In areas facing water scarcity, such as baitfish farming in Arkansas, USA, farmers have successfully adapted harvesting methods that involve little or no draining. A new crop is then stocked in the “old water.” This technology is clearly viable for most tilapia and catfish farms in Africa. Even where water is not in short supply, the technology produces environmental benefits because of reduced effluents. Problems anticipated for those adopting water reuse is that some existing ponds are too deep or have non-uniform bottoms. Some of these could be retrofitted with variable-depth overflow standpipes that keep water at desired and safe depths. Size of fingerlings at stocking in old water usually needs to be adjusted upward to account for the fact that old water is a more hostile environment for fingerlings initially because predators may remain in the water. Some benefits to farmers of reusing water include retaining nutrients from previous production that can still be incorporated into the biomass of the new crop. New and expanding farms that anticipate adopting water reuse would need to construct ponds with relatively shallow and uniform bottoms.

#### Nutrient Management Practices

Nutrient management practices include guidelines relating to fertilizing and feeding regimes that avoid wastes or, in worse cases, result in deteriorated water that threaten the health or condition of the fish. Avoidance of feed wastes is input cost-saving and translates directly into farm profitability. It is a better practice to regulate fertilization by packing fertilizer into ponds in slow-release sacs that can be removed from the pond when water attains the desired level of plankton bloom. Remaining fertilizer can be dried and saved for future use. Feeding is best regulated by observing how much the fish are eating and then adjusting the amount of feed accordingly. This is possible only when extruded (floating) feeds are used as opposed to pelleted (sinking) feed. Feed that is not eaten functions very much like fertilizer and can cause highly eutrophic water conditions that both reduce yields and escalate the cost of operations. Thus, pelleted feeds often result in high waste loads and lower feed conversion ratios ( $FCR = \text{weight of feed fed} / \text{fish weight gain}$ ). Pelleted feeds are however more common and relatively cheap in Ghana wherever any formulated feed is available at all. Farmers who cannot afford formulated feed use a variety of local agro-industrial wastes, all of which are expected to produce even poorer feed conversion ratios than pelleted feeds. The BMP recommendation for feeding is to use floating feeds.

#### Profitability Analysis

Appropriate stocking and feeding regimes can reduce the cost of production through reduced aeration, better water quality, higher survival, reduced use of medication and chemicals, and improved feed conversions. These parameters account for over 75% of the cost of fish production and consequently profitability. Previous ACRSP work in Ghana that measured performance indicators and profitability in Nile Tilapia, *Oreochromis niloticus*, using measures of variable costs, fixed costs, owned inputs, yield and revenues showed that the economic profitability of integrating economic, social, and environmental objectives in the Ashanti Region achieved a break-even production of 904 kg/acre and a break-even price of \$0.99/kg. The Brong-Ahafo region had a break-even production of 877 kg and a break-even price (\$1.25/kg), indicating better performance for farmers in the Ashanti region. Incorporating BMPs into this analysis could increase profitability by at least 20%. The decision tool to be used enhances and delivers a financial decision support system that can assist prospective, new, and existing fish farmers who want to adopt BMPs to assess and select production scenarios and profitability relationships for their farm enterprises. The tool provides financial spreadsheet templates for fish farmers to develop their own financial profiles and determine benchmarks that serve as bases for investment decisions, comparisons, and/or improvements to the farm enterprise.

#### ***Outreach and Diffusion Techniques***

This project focuses on Ghana for initial scale-up but with the sub-Saharan African region as a whole in mind. Targeted regions for deploying BMPs are Ghana, Kenya and Tanzania. As a further step in scaling up innovations from previous ACRSP and AquaFish project successes and accelerating BMP adoption rates in Ghana, Kenya, and Tanzania, three innovation diffusion techniques will be simultaneously deployed: 1) Central Media (series of workshops at the regional level and extension follow-ups), 2) Demonstrations (BMPs at work on farms of selected farmers), and 3) Lateral Diffusion (farmer-to-farmer extension of BMPs).



Central Media (workshops)

This is a series of workshops at the national or regional level that targets as many farmers as possible to expand first exposure to BMPs. These workshops include regional extension officers (i.e., a train-the-trainer model) who are expected to follow up adopters and liaise between these adopters and researchers to provide advice and sustain adoptions. Communications media are being developed in local languages. In Ghana, the Western, Ashanti, and Brong-Ahafo regions are being targeted, where there are 2,869 fish farmers and about 4,500 farm ponds. In Kenya, we are targeting about 600 fish farmers, and in Tanzania, the target is about 100 fish farmers. We will hold three regional workshops in Ghana, each of which will target 100 farmers. We will also hold three national workshops for Kenya and Tanzania, each of which will target 50-100 farmers.

BMP Demonstrations (BMPs at work on farms of selected farmers)

Demonstrations are used both to take advantage of their positive effects in the diffusion process and also to provide the data needed to estimate the economic benefits of selected components of BMPs for monitoring and evaluation of the intervention. The demonstration effect has been identified as one of the principal variables that explain diffusion of innovations. We envisage BMPs at work on farms to be a crucial ingredient to show skeptical farmers what benefits can be achieved with BMPs. In the Ashanti and Brong-Ahafo regions of Ghana, AquaFish CRSP projects have already established working relationships with many farmers. We have identified farmers whose farms are accessible to researchers and who have the highest potential to reach out with new ideas to other farmers. In Kenya and Tanzania, we will leverage existing work with lead farmers to demonstrate focal BMP schemes. Through agreement with farmers, we will select two ponds each from ten farms and put these ponds under each of the two focal BMP management schemes (i.e., water re-use and nutrient management). Accurate data will be collected on these ponds, including stocking densities, fertilization rates, feeding rates, monthly water quality, yields, and FCRs. These ponds will be managed by AquaFish-supported graduate students and fisheries extension officers with the cooperation of the farmers. Ponds will be visited during workshops to show farmers the benefits of BMPs. In addition, data collected from these ponds will be contrasted with data from similar ponds under “regular” management from the same farms. These data will be used for *with-versus-without* analysis of the benefits and cost of BMP implementation.

Lateral Diffusion (farmer-to-farmer extension of BMPs)

Through regional workshops and demonstrations we will be establishing a business enterprise network in each country. One vital function of these networks is farmer-to-farmer extension of BMPs. Under the innovation diffusion model, farmers exposed and trained in workshops constitute nodes in a network. These farmers can spread information to other farmers who, in their estimation, are likely to be interested in their new ideas. These new farmers also become nodes and propagate their own networks, thereby laterally transmitting knowledge without the direct involvement of the central media.

***Gender Integration and Analysis***

The AquaFish CRSP is dedicated to improving gender inclusiveness in the aquaculture and fisheries sectors across the spectrum of CRSP projects and activities. FtF requires that we develop approaches to target both men and women with agricultural interventions. This includes investments in sustainable labor-saving technologies so that shifts in the gender division of labor and products do not systematically disadvantage one sex over the other. Where water, fuel, and labor constraints increase the domestic chore burden on women and girls and prevent women from expanding agricultural production, labor-saving technologies might be introduced to mitigate this effect. Involving and recognizing both the men and women producers within the household in agricultural programs can be more sustainable than focusing only on the head-of-household (FtF Guide, May 2010).

Following guidance from USAID, we considered the following for our Strategic Investment in Rapid Technology Dissemination (SIRTD) project:

- “a. How will the different roles and status of women and men within the community, political sphere, workplace, and household (for example, roles in decision-making and different access to and control over resources and services) affect the work to be undertaken?
- “b. How will the anticipated results of the work affect women and men differently?”

The purpose of the first question is to ensure that: 1) the differences in the roles and status of women and men are examined; and 2) any inequalities or differences that will impede achieving program or project goals are addressed in the planned work design. The second question calls for another level of analysis in which:

- 1) The anticipated programming results are examined regarding the possible different effects on women and men; and
- 2) The design is adjusted as necessary to ensure equitable and sustainable program or project impact. For example, programming for women's income generation may have the unintended consequence of domestic violence as access to resources shifts between men and women. This potential negative effect could be mitigated by engaging men to anticipate change and be more supportive of their partners.

This project recognizes that providing for equal opportunities for women's involvement is necessary because such a directed involvement of women is one of the keys to advancing economic and social development not only in aquaculture but for a holistic household and family economy. Women play a major role in the production, processing and marketing of agricultural products in Ghana, Kenya and Tanzania, but agricultural information and production resources are not reaching and benefiting them in the food value chain. The project's intent is therefore to ensure that no one is excluded from participating in the training or educational activities and opportunities conducted on the basis of gender. Further, where women are members of the larger populations under consideration (i.e., Fisheries Officers who serve as aquaculture extension officers, fish farmers, fish traders, consumers, program personnel, students, etc), we are actively recruiting women to participate in these activities. Qualified women graduate students from host countries have been selected for long-term training, and efforts are being made, when selecting workshop and short-term training participants, to seek a 50:50 gender ratio or to design women-only workshops should we find low enrollment of women due to logistical, cultural, or subject matter concerns.

#### ***Initiation of Subawards to Partner Institutions***

In preparation for the Associate Award in support of this SIRTD project, the ME sent an Invitation to Participate to eligible partners at Purdue University and at Virginia Polytechnic Institute and State University. Proposals containing a scope of work and budget were received from both institutions on 30 September 2010. In order to maintain quality standards associated with all CRSP-affiliated work, the investigations underwent peer review in accordance with the established NSF-style process adopted by AquaFish CRSP. Reviewer critiques and programmatic comments from the ME were returned to both proponents by November 2010. Requests were submitted to OSU's Office of Sponsored Programs in mid-February 2011 to initiate subcontracts. Subcontracts were fully executed by mid-June 2011.



### COLLABORATING INSTITUTIONS AND PERSONNEL

**AquaFish CRSP, Oregon State University, USA**  
Hillary Egna, Principal Investigator

**Purdue University, USA**  
Kwamena Quagrainie, US Co-PI

**Virginia Polytechnic Institute and State University, USA**  
Emmanuel Frimpong, US Co-PI

**Kwame Nkrumah University of Science and Technology, Ghana**  
Steve Amisah, HC Co-PI

**Ministry of Fisheries Development, Kenya**  
Sammy Macharia, HC Co-PI (from July 2011)  
Charles Ngugi, HC Investigator (was HC Co-PI thru July 2011)  
Judith Amadiva, HC Investigator

**Ministry of Natural Resources and Tourism, Tanzania**  
Kajitanus Osewe, HC Co-PI

**Sokoine University of Agriculture, Tanzania**  
Sebastian Chenyambuga, HC Co-PI

### PROJECT OBJECTIVES

The two projects funded under this Associate Award have the broad objectives of (1) scaling up innovations from previous ACRSP and AquaFish project successes and (2) accelerating BMP adoption rates in Ghana, Kenya, and Tanzania. Specific objectives for each 3-year project are listed below.

#### *Enhancing the Profitability of Small Aquaculture Operations in Kenya and Tanzania*

- A. Provide information on BMP adoption in Kenya and Tanzania
- B. Quantify adoption of BMPs in Kenya
- C. Quantify production and financial efficiencies for BMPs Adopters versus non-adopters in Kenya
- D. Assess economic benefits of adopting BMPs in Kenya

#### *Enhancing the Profitability of Small Aquaculture Operations in Ghana*

- A. Widely disseminate information on readily adaptable BMPs in Ghana, Kenya, and Tanzania
- B. Quantify adoption of selected BMPs in Ghana over a two-year period
- C. Quantify production and financial efficiencies for adoption of selected BMPs in Ghana
- D. Assess economic benefits of adopting the Selected BMPs in Ghana

### PROGRESS MADE AND RESULTS ACHIEVED

#### *Enhancing the Profitability of Small Aquaculture Operations in Kenya and Tanzania*

Demonstration farm sites have been identified and selected in Kenya and farmers are currently being recruited for participation in the workshops. The manager of Mwea Aqua Fish Farm, one of the key demonstration farms in Kenya, was sent to Ghana in July 2011 to visit a demonstration farm that is in operation there and to participate in the first farmers' BMP training workshop held in Ghana. Workshop materials are being developed and discussions have been held between the Kenya and Ghana project teams regarding the sharing of workshop materials for use in the three countries involved in the overall FtF project.

Due to recent personnel movements in Kenya, it became necessary to negotiate a new Kenya lead institution and transfer HC PI responsibilities accordingly. The Ministry of Fisheries Development is replacing Kenyatta University as the lead HC institution for this project, with Sammy Macharia, Aquaculture Scientist in the Ministry, taking up HC PI duties. Charles Ngugi, who has taken a new position as Fisheries Secretary advisor in the Ministry, will continue to assist in the role of HC Co-PI. A new subcontract between Purdue University and the Kenya Ministry of Fisheries Development was signed and put into place in late August 2011.

***Enhancing the Profitability of Small Aquaculture Operations in Ghana***

Six on-farm demonstrations of the use of BMPs in production ponds are underway. The first production cycle on three farms (1 in Ashanti, 1 in Brong Ahafo, and 1 in Western Region) is about 75% completed and the other 3 (2 in Ashanti, and 1 in Western) were started in August 2011. None of the farms examined in the Central Region met the criteria for inclusion in demonstrations. However, the Western Region demonstrations will also serve the Central Region.

In addition to the six demonstrations begun, two workshops have been conducted. The first was a training-of-trainers workshop, needed to prepare extension personnel for their roles in the farmer training sessions to follow, and the second was the first BMP workshop for farmers. The training-of-trainers workshop was conducted at Kwame Nkrumah University of Science and Technology (KNUST) on 11 January 2011, and covered topics such as the criteria for selecting farms for the BMP demonstrations, experimental design for on-farm demonstrations, expectations from participants, and water quality kit demonstrations. The first farmers' workshop on BMPs was conducted at Kumasi, on 12-15 July 2011. The concept of BMPs was introduced to the farmers and was followed by a discussion of the pros and cons of using them in pond aquaculture. A BMP survey questionnaire was introduced and the participants were guided through the completion of its baseline section. Attendance at this first BMP workshop, with 155 trainees, exceeded the target by 50%. The first workshop put to test the utility of the on-farm demonstrations as an integral part of outreach activities. The demonstration component of the workshop proved vital for communicating the differences that the choice of feeds can make on fish growth. As the demonstrations advance over time, it is expected that noticeable differences will also be observed between ponds operated under the water reuse BMP and ponds not operated under this BMP.

Approximately 150 baseline BMP knowledge and adoption surveys have been completed. This is also in excess of the original target, which was 100. A subsample of the respondents will be surveyed by phone in December 2011 to begin to monitor evolving attitudes about BMPs and estimate the initial rate of self-reported adoptions of BMPs.

***Short-Term Training under the FtF Project***

In this first year of the SIRTD (FtF) Associate Award, two short-term training events were held, with a total of 168 FtF-country nationals receiving training. Of these, 25 were women (14.9%) and 143 were men (85.1%). Future trainings will be designed to increase access of women to information. These first two events were held at KNUST, Kumasi, Ghana.

***Project-Level Coordination Meeting at the 2011 AquaFish CRSP Annual Meeting***

Prior to the 2011 AquaFish CRSP Annual Meeting in April 2011, the project's principal investigators from OSU, VT, Purdue, KNUST, Kenya Fisheries, and Sokoine met to discuss and coordinate FtF Project activities with other CRSP activities planned under CRSP core projects in Africa. It was agreed that, where possible, short-term training events and other activities would be conducted "back-to-back" for efficiency and so that trainees would have opportunities for participation in more than one event.

***Peer-review of BMP fact sheets***

In November 2010, the Management Team (MT) conducted a technical review of three BMP handouts (Virginia Tech University) and one husbandry manual (Purdue University) that were prepared for use in project activities. The BMP handouts encompass a range of topics including effluent management, nutrient management, biodiversity conservation, and manual sexing of fish. Critiques from two technical reviewers were returned to the authors in December 2010 for revision.

***Monitoring and Evaluation***

Appendix 1 shows this project's indicator targets and results for FY11, along with revised targets for FY12.

### **PROBLEMS ENCOUNTERED**

Oregon State University recently restructured several of its administrative offices, including creating several Business Centers to decentralize financial and HR administrative duties. There has also been considerable personnel turnover in key positions both in the Business Centers and within central University offices such as the Office of Sponsored Programs. The AquaFish MT has experienced numerous administrative problems stemming from the restructuring and the new, inexperienced staff hired to perform essential OSU administrative support roles. One problem that we encountered during this fiscal year that pertains directly to this Associate Award was a 4-month delay in initiating subawards for Purdue University and Virginia Tech. The delay primarily resulted from uncertainty at OSU about donor authorization required to transfer a minor amount (\$73) among direct cost line items. After considerable back-and-forth between OSU's Office of Sponsored Programs and Office of Post Award Administration, an email was sent from OSU to USAID asking permission to make the budget change. USAID replied indicating that no donor permission was necessary to make the requested change. The experience highlighted communication and staffing shortfalls in OSU's newly restructured administrative offices. OSU has learned from this experience and we are hopeful that University support will be provided in a more efficient and timely manner on future subaward actions.

### **LESSONS LEARNED**

There is a visible benefit of AquaFish programs to KNUST, both in terms of growth in the aquaculture and fisheries programs (in areas such as student enrollment and student engagement in research and development activities) and development of the research skills and output of faculty. These benefits are not clearly captured in the current metrics being used in project impact assessment by USAID. This project has clearly benefitted from the cumulative effect of previous AquaFish-sponsored projects in Ghana.

The AquaFish-sponsored training programs are well patronized and playing a crucial role in extension and farmer-to-farmer networking in Ghana. Extension services for fish farming are weak to non-existent in many parts of the country. This is antithetical to the increasing interest in aquaculture marked by the influx of new farmers. Many workshop attendees come wanting to learn everything, even the most basic skills they should be learning through basic extension services. One remarkable experience during this year's BMP workshop was when Nana Siaw, an experienced farmer whose farm is being used as one of the demonstration farms in Ashanti, gave a demonstration of how to sex tilapia to sort males from females. The number of farmers who enthusiastically observed the demonstration and admitted they didn't know how to do this was staggering. Obviously, no farmer can truly raise tilapia profitably if they can't separate the sexes, since quality control for the production and supply of all-male tilapia fingerlings in Ghana is still questionable. The role of demonstrations is promising as a means of improving aquaculture extension in Ghana, if more of these can be established strategically in a coordinated national effort.

### **SUCCESS STORIES**

Yaw Ansah, a CRSP PhD student under PI Frimpong at VT, through his participation in this project, was awarded a 2011 Borlaug LEAP Fellowship in the amount of \$19,660, covering part of his international travels and field activities in Ghana. This fellowship has also leveraged significant in-kind support through collaboration with the International Water Management Institute (IWMI), represented by Dr. Regarssa Namara in Accra, Ghana. Dr. Namara provided valuable input in the development of the BMP

survey instrument and the IWMI provided office space and access to the rich CGIAR library in Ghana during Yaw Ansah's 6-week visit to Ghana this summer.

The first BMP training session in Ghana, held 12-15 July for 155 participants, drew public attention in Ghana, as evidenced by the appearance of an article entitled "Fish farmers recount prospects of aquaculture for job creation" in the on-line news service Myjoyonline.Com (<http://myjoyonline.com/>) on 7/22/2011. The article acknowledges the three-year AquaFish CRSP FtF project and Dr. Emmanuel Frimpong's role in the project and training course. Frimpong is quoted as saying "Our intervention is identifying the constraints that make aquaculture not so profitable. The lure of it that it is profitable obviously is out there because a lot of people get into it before they realize that it's hard to run fish farming for profit. So our interventions are targeted at helping farmers eliminate the sources of non-profitability and the threat to a sustained growth down the road."

## **PRESENTATIONS AND PUBLICATIONS**

### **Publications**

Ichien, S., C. Stephen, and H. Egna. 2011. Addressing the goals and objectives of the Feed the Future Initiative: Enhancing the profitability of small aquaculture operations in Ghana, Kenya, and Tanzania (poster). The Ninth International Symposium on Tilapia in Aquaculture, Shanghai, China, April 2011.

Frimpong, E., Y. Ansah, and S. Amisah. 2010. Effluent Best Management Practices. (Fact sheet).

Frimpong, E., Y. Ansah, and S. Amisah. 2010. Feeding and Nutrients Best Management Practices. (Fact sheet).

Frimpong, E., Yaw Ansah, and S. Amisah. 2010. Biodiversity Best Management Practices. (Fact sheet).

### **Presentations**

Egna, Hillary S. 2011. AquaFish CRSP Project-Level Coordination Meeting: Training Activities Planned in Africa. (Meeting) Shanghai, China.

**APPENDIX 1: INDICATOR TARGETS AND RESULTS FOR FY11, REVISED TARGETS FOR FY12**

**Agriculture Indicators**  
**Implementing Partner: AquaFish CRSP**

<b>4.5.2 Agriculture Sector Productivity</b>	<b>FY 2011 Targets</b>	<b>FY 2011 Actuals</b>	<b>Revised FY 2012 Targets</b>
Number of new technologies or management practices under research as a result of USG assistance.	0	0	0
Number of new technologies or management practices made available for transfer as a result of USG assistance.	3	3	3
Number of new technologies or management practices being field tested as a result of USG assistance.	3	2	3
Number of additional hectares under improved technologies or management practices as a result of USG assistance.	9	9	150
Number of farmers, processors, and others who have adopted new technologies or management practices as a result of USG assistance - <b>Female</b>	421	15 <sup>(1)</sup>	34
Number of farmers, processors, and others who have adopted new technologies or management practices as a result of USG assistance - <b>Male</b>	421	119 <sup>(1)</sup>	302
Number of rural households benefiting directly from USG interventions - <b>Female Headed Household</b>	0	17 <sup>(2)</sup>	17
Number of rural households benefiting directly from USG interventions - <b>Male Headed Household</b>	33	132 <sup>(2)</sup>	132
Number of producers organizations receiving USG assistance.	1	1	1
Number of water users associations receiving USG assistance.	0	0	1
Number of trade and business associations receiving USG assistance.	0	0	0
Number of community-based organizations (CBOs) receiving USG assistance.	0	0	1
Number of producers organizations who have adopted new technologies or management practices as a result of USG assistance.	1	1	1
Number of water user associations who have adopted new technologies or management practices as a result of USG assistance.	0	0	1
Number of trade and business associations who have adopted new technologies or management practices as a result of USG assistance.	0	0	0

## APPENDIX 1 CONTINUED:

<b>4.5.2 Agriculture Sector Productivity</b>	<b>FY 2011 Targets</b>	<b>FY 2011 Actuals</b>	<b>Revised FY 2012 Targets</b>
Number of community-based organizations (CBO) who have adopted new technologies or management practices as a result of USG assistance.	0	0	1
Number of agriculture-related firms benefiting directly from USG supported interventions.	0	2	2
Number of women's organizations/associations assisted as a result of USG interventions.	0	0	0
Number of public-private partnerships formed as a result of USG assistance.	0	0	0
Number of individuals who have received USG supported short-term agricultural sector productivity or <b>food security</b> training - <b>Female</b>	23	31 <sup>(3)</sup>	55
Number of individuals who have received USG supported short-term agricultural sector productivity or <b>food security</b> training - <b>Male</b>	127	160 <sup>(3)</sup>	135
Number of individuals who have received USG supported long-term agricultural sector productivity <b>food security</b> training - <b>Female</b>	1	2	2
Number of individuals who have received USG supported long-term agricultural sector productivity or <b>food security</b> training - <b>Male</b>	1	1	1
Value of new private sector investment in the agriculture sector or food chain leveraged by FTF implementation.**	NA	NA	NA
Number of jobs attributed to FTF implementation (disaggregated by gender, ag vs non-ag)	NA	NA	NA

## Footnotes:

(1) The original figures provided as FY11 targets were for *beneficiaries* and not for *farmers*. The corrected targets are shown here. The estimated targets for women and men should have been 17 and 151, respectively, for FY2011.

(2) Additional information from the field allowed for a more accurate estimate of the number of households benefiting.

(3) Interest in the training resulted in attendance exceeding projected targets.

NA = Not Applicable, not part of approved WP



**APPENDIX 2: ACRONYMS**

AA	Associate Award
ACRSP	Aquaculture Collaborative Research Support Program
BMP/BMPs	Best Management Practice(s)
CGIAR	Consultative Group on International Agricultural Research
FCR	Feed Conversion Ratio
FtF	Feed the Future
HC	Host Country
HC PI	Host Country Principal Investigator
IWMI	International Water Management Institute
KNUST	Kwame Nkrumah University of Science and Technology (Ghana)
LEAP	Leadership Enhancement in Agriculture Program (Borlaug LEAP)
LWA	Leader with Associates Award
ME	Management Entity
MT	Management Team
NSF	National Science Foundation
OSU	Oregon State University (USA)
SIRTD	Strategic Investment in Rapid Technology Dissemination
USAID	United States Agency for International Development
VT	Virginia Polytechnic Institute and State University (USA)