

# AQUAFISH COLLABORATIVE RESEARCH SUPPORT PROGRAM

## ANNUAL WORK PLAN: 2009–2010

for the period

30 SEPTEMBER 2009 TO 29 SEPTEMBER 2010

SEPTEMBER 2009

APPENDIX ON TRAVEL ADDED 2010

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# AQUAFISH CRSP ANNUAL WORK PLAN: 2009–2010

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## INTRODUCTION

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Stopping the unsustainable exploitation of water resources by developing water management strategies at regional, local, and national levels and promoting equitable access is part of the Millennium Declaration. It is also a guiding principal of the Aquaculture & Fisheries (AquaFish) CRSP, led by Oregon State University. Giving the poor better access to well managed water resources can help eradicate poverty. USAID's EGAT Bureau recognizes the impact poverty has on livelihoods, health, and ecosystems in their strategies and goals. Oregon State University is responding with a program that addresses USAID's goals and helps reduce gnawing development problems that keep the poor poor. Oregon State University's overall management vision for AquaFish CRSP is to create global partnerships that develop sustainable solutions in aquaculture and fisheries for improving health, building wealth, conserving natural environments for future generations, and strengthening poorer societies' ability to self-govern in a way that respects the sanctity of all.

Great progress has been made over the past twenty years in increasing fish production through aquaculture, yet challenges still face the sector in terms of pressures from global trade, environmental impacts, water use conflicts, and distribution of and access to benefits. The capture fisheries sector, which supplies the major share of the world's fishery products, is also experiencing great challenges that must be overcome for the sustainable management of fish stocks and livelihood security of fishing communities. OSU will focus its resources from the Leader Award on aquaculture and the nexus between aquaculture and fisheries by targeting high priority constraints facing poorer countries. The proposed global portfolio is framed around ten topic areas that each target one or more of USAID's focal areas for development results: Improved Health and Nutrition, Food Quality, and Food Safety of Fishery Products; Income Generation for Small-Scale Fishers and Farmers; Environmental Management for Sustainable Aquatic Resource Use; and Enhanced Trade Opportunities for Global Fishery Markets. Proposed areas of inquiry address critical constraints and emerging issues, for which AquaFish CRSP can build synergies and avoid duplication with other development efforts.



### *GOAL & PURPOSE*

The USAID (May 2006, RFA) goal for the AquaFish CRSP is:

*to develop more comprehensive, sustainable, ecological and socially compatible, and economically viable aquaculture systems and innovative fisheries management systems in developing countries that contribute to poverty alleviation and food security.*

The overall research context for the projects described in this *Work Plan* is poverty alleviation and food security improvement through sustainable aquaculture development and aquatic resources management.



## ANNUAL WORK PLAN OBJECTIVES

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All of the following objectives and activities will be undertaken during the period 30 September 2009 to 29 September 2011. They encompass work under the AquaFish CRSP *Implementation Plan 2009–2011*, which will begin 1 January 2010. For approved travel, see Appendix 1.



### I. INTEGRATED PRODUCTION SYSTEMS

#### I-A. Production System Design & Best Management Alternatives (BMA)

##### *Problem Statement:*

Aquaculture is an agricultural activity with specific input demands. Systems should be designed to improve efficiency and/or integrate aquaculture inputs and outputs with other agricultural and non-agricultural production systems. The best design criteria will limit negative environmental impacts. CRSP research should benefit smallholder or low- to semi-intensive producers, and focus on low-trophic species for aquaculture development. Research continues to be needed on soil-water dynamics and natural productivity to lessen feed needs. Interventions for disease and predation prevention must adopt an integrated pest management (IPM) approach and be careful to consider consumer acceptance and environmental risk of selected treatments.

##### *Development Tasks:*

1. Incorporation of tilapia (*Oreochromis niloticus*) and Sahar (*Tor putitora*) into the existing carp polyculture system in Nepal.

University of Michigan (USA)  
Institute of Agriculture and Animal Sciences (Nepal)  
Shanghai Ocean University (China)

2. Study of the effectiveness of a pond-based recirculating system for shrimp culture.

University of Michigan (USA)  
Hainan University (China)  
Shanghai Ocean University (China)  
Network of Aquaculture Centres in Asia-Pacific (Thailand)

3. Development of indoor recirculating culture systems for intensive shrimp production in China.

University of Michigan (USA)  
Shanghai Ocean University (China)

4. Identifying best practices to improve the giant river prawn industry in Thailand.

University of Michigan (USA)  
Network of Aquaculture Centres in Asia-Pacific (Thailand)  
Shanghai Ocean University (China)

5. Evaluation and improvement of production technology in Uganda: Case studies of small-holder cage culture in watershed reservoirs and as an alternative livelihood for fishers.

Auburn University (USA)  
Uganda National Fisheries Resources Research Institute (Uganda)  
Makerere University (Uganda)  
Gulu University (Uganda)

6. Aquaculture training and outreach in Uganda and surrounding nations.

Auburn University (USA)  
Gulu University (Uganda)  
Makerere University (Uganda)

## **I-B. Sustainable Feed Technology (SFT)**

### ***Problem Statement:***

Methods of increasing the range of available ingredients and improving the technology available to manufacture and deliver feeds are a critical research need. Better information about fish nutrition can lead to the development of less expensive and more efficient feeds. Investigations on successful adoption, extension, and best practices for efficient feed strategies that reduce the “ecological footprint” of a species under cultivation are encouraged. Feed research that lessens reliance on fish meals/proteins/oils and lowers feed conversion ratios is desired, as is research on feeds (ingredients, sources, regimes, formulations) that result in high quality and safe aquaculture products with healthy nutrition profiles.

### ***Development Tasks:***

1. Feeding and feed formulation strategies to reduce production costs of tilapia culture.

North Carolina State University (USA)  
Central Luzon State University (Philippines)

2. Develop feeding strategies for *Moringa oleifera* and *Leucaena leucocephala* as protein sources in tilapia diets.

Purdue University (USA)  
University of Arkansas at Pine Bluff (USA)  
Sokoine University of Agriculture (Tanzania)

3. Expansion of tilapia and indigenous fish aquaculture in Guyana.

University of Arizona (USA)  
Mon Repos Aquaculture Center (Guyana)

4. Alternatives feeds for freshwater aquaculture species.

University of Connecticut – Avery Point (USA)  
University of Rhode Island (USA)  
Cantho University (Vietnam)

5. Assessment of integrated pond-cage system for the production of Nile Tilapia for improved livelihood of small-scale fish farmers in Kenya.

Purdue University (USA)  
Moi University (Kenya)  
Ministry of Fisheries Development (Kenya)

6. Impact Assessment of CRSP Activities in the Philippines and Indonesia

North Carolina State University (USA)  
Central Luzon State University (Philippines)  
Ujong Batee Research Center (Indonesia)  
University of Arizona (USA)

### I-C. Indigenous Species Development (IND)

#### *Problem Statement:*

Domestication of indigenous species may contribute positively to the development of local communities as well as protect ecosystems. At the same time, the development of new native species for aquaculture must be approached in a responsible manner that diminishes the chance for negative environmental, technical, and social impacts. Research that investigates relevant policies and practices is encouraged while exotic species development and transfer of non-native fishes are not encouraged. A focus on biodiversity conservation, and biodiversity hotspots, as related to the development of new native species for aquaculture is of great interest. Aquaculture can be a means to enhance and restock small-scale capture and wild fisheries resources (Aquaculture-Fisheries Nexus Topic Area). Augmentation of bait fisheries through aquaculture to support capture fisheries is an area of interest, provided there are no net negative environmental effects.

#### *Development Tasks:*

1. Development and diversification of species for aquaculture in Ghana.

Purdue University (USA)  
Virginia Polytechnic Institute & State University (USA)  
Kwame Nkrumah University of Science and Technology – KNUST (Ghana)

2. Consolidation of native species aquaculture in Southeastern Mexico: Continuation of a selective breeding program for native cichlids and snook reproduction in captivity.

University of Arizona (USA)  
Texas Tech University (USA)  
Universidad Juarez Autonoma de Tabasco (Mexico)

3. Sustainable snakehead aquaculture development in the Lower Mekong River Basin of Cambodia and Vietnam.

University of Connecticut – Avery Point (USA)  
Inland Fisheries Research and Development Institute (Cambodia)  
Cantho University (Vietnam)

4. Developing hatchery methods for the mangrove oyster *Crassostrea corteziensis* for the Pacific Coast of Mexico.

University of Hawaii-Hilo (USA)

Louisiana State University (USA)  
Universidad Autónoma de Sinaloa/Mazatlan Campus (Mexico)  
Universidad Autónoma de Sinaloa/Culiacan Campus (Mexico)

5. Induced spawning and larval rearing of the 'chame' *Dormitator latifrons* in laboratory conditions.

University of Hawaii-Hilo (USA)  
Ohio State University (USA)  
Universidad Autónoma de Sinaloa/Mazatlan Campus (Mexico)

6. Stock assessment of 'chame' *Dormitator latifrons* in Nayarit and south of Sinaloa Mexico.

University of Hawaii-Hilo (USA)  
Ohio State University (USA)  
Universidad Autónoma de Sinaloa/Mazatlan Campus (Mexico)  
Universidad Autónoma de Sinaloa/Culiacan Campus (Mexico)

#### **I-D. Quality Seedstock Development (QSD)**

##### ***Problem Statement:***

Procuring reliable supplies of high quality seed for stocking local and remote sites is critical to continued development of the industry, and especially of smallholder private farms. A better understanding of the factors that contribute to stable seedstock quality, availability, and quantity for aquaculture enterprises is essential. Genetic improvement (e.g., selective breeding) that does not involve GMOs may be needed for certain species that are internationally traded. All genetic improvement strategies need to be cognizant of marketplace pressures and trends, including consumer acceptance and environmental impacts.

##### ***Development Tasks:***

1. Evaluation of performance of different tilapia species.

Purdue University (USA)  
University of Arkansas at Pine Bluff (USA)  
Sokoine University of Agriculture (Tanzania)

2. Broodstock and seed quality for Nile Tilapia in the Philippines.

North Carolina State University (USA)  
Central Luzon State University (Philippines)

3. Sustainable integrated tilapia aquaculture: aquaponics and evaluation of fingerling quality in Tabasco, Mexico.

University of Arizona (USA)  
Universidad Juarez Autonoma de Tabasco (Mexico)

4. Development of polyculture technology for giant freshwater prawns (*Marcobrachium rosenbergii*) and mola (*Amblypharyngodon mola*).

University of Michigan (USA)  
Bangladesh Agricultural University (Bangladesh)  
Shanghai Ocean University (China)



## II. PEOPLE, LIVELIHOODS, & ECOSYSTEM INTERRELATIONSHIPS

### II-A. Human Health Impacts of Aquaculture (HHI)

#### *Problem Statement:*

Aquaculture can be a crucial source of protein and micronutrients for improved human health, growth, and development. Research on the intrinsic food quality of various farmed fish for human consumption is needed—this might include science-based studies of positive and negative effects of consuming certain farmed fishes. Patterns of fish consumption are not well understood for many subpopulations. Human health can be negatively impacted by aquaculture if it serves as a direct or indirect vector for human diseases. There is interest in better understanding the interconnectedness of aquaculture production and water/vector-borne illnesses such as malaria, schistosomiasis, and Buruli ulcer and human health crises such as HIV/AIDS and avian flu.

#### *Development Tasks:*

1. Co-management and bivalve sanitation for black cockles (*Anadara* spp.) in Nicaragua.

University of Hawaii-Hilo (USA)  
Louisiana State University (USA)  
Central American University (Nicaragua)

2. Extending Best Management Practices for Human Health Aspects of Coastal Aquaculture in Mexico and Central America

University of Hawaii Hilo (USA)  
Autonomous University of Sinaloa (Mexico)  
Central American University (Nicaragua)  
CESASIN (Mexico); Ajoya (Mexico); CIAD (Mexico)

### II-B. Food Safety & Value-Added Product Development (FSV)

#### *Problem Statement:*

Ensuring high quality, safe, and nutritious fish products for local consumers and the competitive international marketplace is a primary research goal. Efforts that focus on reducing microbial contamination, HACCP controls and hazards associated with seafood processing, value-added processing, post-processing, and byproduct/waste development are of interest. Consumers and producers alike will benefit from research that contributes to the development of standards and practices that protect fish products from spoilage, adulteration, mishandling, and off-flavors. Certification, traceability, product integrity and other efforts to improve fish products for consumer acceptance and international markets are desired. Gender integration is important to consider as women are strongly represented in the processing and marketing sectors. (Aquaculture-Fisheries Nexus Topic Area)

#### *Development Tasks:*

1. Maximizing the utilization of low value or small size fish for human consumption through improving quality standard and safety with appropriate value added product development: case study on fermented fish paste in Cambodia.

University of Connecticut – Avery Point (USA)  
Inland Fisheries Research and Development Institute (Cambodia)

2. Demonstration of sustainable seaweed culture and processing in Aceh, Indonesia and the Philippines.

North Carolina State University (USA)  
University of Arizona (USA)  
Ujung Batee Aquaculture Center (Indonesia)  
Southeast Asian Fisheries Development Center (Philippines)

3. Assessing the Impacts of Sustainable Freshwater Aquaculture Development and Small-sized/Low-value Fisheries Management in the Lower Mekong Basin Region of Cambodia and Vietnam

University of Connecticut-Avery Point (USA)  
Inland Fisheries Research and Development Institute (Cambodia)  
Cantho University (Vietnam)  
Department of International Cooperation (Cambodia)

## II-C. Technology Adoption & Policy Development (TAP)

### *Problem Statement:*

Developing appropriate technology and providing technology-related information to end-users is a high priority. The program encourages research that results in a better understanding of factors and practices that set the stage for near-term technology implementation and that contribute to the development of successful extension tools and methods. Areas of inquiry can include institutional efforts to improve extension related to aquaculture and aquatic resources management; science-based policy recommendations targeting poor subpopulations within a project area, or more broadly (for example, national aquaculture strategies); methods of improving access to fish of vulnerable populations including children (e.g., school-based aquaculture programs); science-based strategies for integrating aquaculture with other water uses to improve wellbeing, such as linkages with clean drinking water and improved sanitation. Policy initiatives that link aquaculture to various water uses to improve human health are needed. Additionally, social and cultural analyses regarding the impacts of fish farming may yield critical information for informing policy development.

### *Development Tasks:*

1. Harnessing the opportunities and overcoming constraints to widespread adoption of cage aquaculture in Ghana.

Purdue University (USA)  
Virginia Polytechnic Institute & State University (USA)  
Kwame Nkrumah University of Science and Technology (Ghana)

2. Internet-based podcasting: Extension modules for farming tilapia in the Philippines.

North Carolina State University (USA)  
Department of Commerce (USA)  
Central Luzon State University (Philippines)

3. Development of alternatives to the use of freshwater low value fish for aquaculture in the Lower Mekong Basin of Cambodia and Vietnam: Implications for livelihoods, production and market.

University of Connecticut – Avery Point (USA)  
Inland Fisheries Research and Development Institute (Cambodia)

4. Aquaculture & Fisheries CRSP sponsorship of the Ninth International Symposium in Tilapia in Aquaculture

University of Arizona (USA)  
Universidad Autonoma de Tamaulipas (Mexico)  
Shanghai Ocean University (China)

5. Accredited Training Program for Commercial Small- and Medium- Scale Aquaculture in Ghana

Purdue University (USA)  
Moi University, Kenya (Kenya)  
KNUST (Ghana)  
FAO/ Accra (Ghana)  
Water Research Institute (Ghana)  
Fisheries Directorate (Ghana)  
Aquaculture Association of Ghana  
Agricultural Development Bank (Ghana)

6. Effects of ACRSP Intervention Strategies on Aquaculture Development in Kenya

Purdue University (USA)  
Moi University, Eldoret (Kenya)

7. Assessing the Impacts of CRSP Research: Human Capital, Research Discovery, and Technology Adoption

Montana State University (USA)  
Oregon State University (USA)  
All AquaFish CRSP lead US & HC participating subcontracting universities and institutions

## II-D. Marketing, Economic Risk Assessment & Trade (MER)

### *Problem Statement:*

Aquaculture is a rapidly growing industry and its risks and impacts on livelihoods need to be assessed. Significant researchable issues in this arena include cost, price, and risk relationships; domestic market and distribution needs and trends; the relationships between aquaculture and women/underrepresented groups; the availability of financial resources for small farms; and the effects of subsidies, taxes, and other regulations. Understanding constraints across value chains in local, regional, and international markets is of interest, especially as constraints affect competitiveness, market demand, and how to link producers to specific markets. (Aquaculture-Fisheries Nexus Topic Area)

### *Development Tasks:*

1. Improving supply chain opportunities for tilapia in the Philippines.

North Carolina State University (USA)  
Virginia State University (USA)  
Auburn University (USA)  
Central Luzon State University (Philippines)

2. A study of consumer fish preferences: Opportunities for strategic supply of tilapia and catfish products.

Purdue University (USA)  
Moi University (Kenya)  
Ministry of Fisheries Development (Kenya)

3. Value chain analysis of snakehead fish in the Lower Mekong Basin of Cambodia and Vietnam.

University of Connecticut – Avery Point (USA)  
Cantho University (Vietnam)  
Inland Fisheries Research and Development Institute (Cambodia)

4. Market assessment and profitability analysis of aquaculture enterprises in Uganda.

Auburn University (USA)  
Alabama A&M University (USA)  
Makerere University (Uganda)  
Gulu University (Uganda)

## II-E. Watershed & Integrated Coastal Zone Management (WIZ)

### *Problem Statement:*

Aquaculture development that makes wise use of natural resources is at the core of the CRSP. Research that yields a better understanding of aquaculture as one competing part of an integrated water use system is of great interest. The range of research possibilities is broad—from investigations that quantify water availability and quality to those that look into the social context of water and aquaculture, including land and water rights, national and regional policies (or the lack thereof), traditional versus industrial uses, and the like. Water quality issues are of increasing concern as multiple resource use conflicts increase under trends toward scarcity or uneven supply and access, especially for freshwater. Ecoregional analysis is also of interest to explore spatial differences in the capacities and potentials of ecosystems in response to disturbances. Innovative research on maximizing water and soil quality and productivity of overall watersheds is of interest. Pollution is a huge concern, as over 50% of people in developing countries are exposed to polluted water sources. Additionally, aquatic organisms cannot adequately grow and reproduce in polluted waters, and aquaculture may not only be receiving polluted waters, but adding to the burden. Rapid urbanization has further harmed coastal ecosystems, and with small-scale fisheries and aquaculture operations in the nearshore, integrated management strategies for coastal areas are also important. (Aquaculture-Fisheries Nexus Topic Area)

### *Development Tasks:*

1. Effects of watershed-water quality-aquaculture interactions on quantity and quality of water from small catchments in South Africa and Uganda.

Auburn University (USA)  
Stellenbosch University (South Africa)  
Makerere University (Uganda)

2. Surface catchment development and sustainability evaluation for multipurpose water supply for meeting aquaculture and other water needs.

Auburn University (USA)  
Makerere University (Uganda)  
Gulu University (Uganda)

### 3. Improved Cages for Fish Culture Commercialization in Deep Lake Waters

University of Michigan (USA)  
Shanghai Ocean University (China)  
Huazhong Agricultural University (China)  
Tongwei Group Ltd. (China)

## II-F. Mitigating Negative Environmental Impacts (MNE)

### *Problem Statement:*

With the rapid growth in aquaculture production, environmental externalities are of increasing concern. Determining the scope and mitigating or eliminating negative environmental impacts of aquaculture—such as poor management practices and the effects of industrial aquaculture—is a primary research goal of this program. A focus on biodiversity conservation, especially in biodiversity “hotspot” areas, as related to emerging or existing fish farms is of great interest. Therefore, research on the impacts of farmed fish on wild fish populations, and research on other potential negative impacts of farmed fish or aquaculture operations is needed, along with scenarios and options for mitigation. (Aquaculture-Fisheries Nexus Topic Area)

### *Development Tasks:*

1. Ration reduction and integrated multi-trophic aquaculture (milkfish-seaweed- sea cucumber) to improve incomes and reduce the ecological footprint of milkfish culture in the Philippines.

Southeast Asian Fisheries Development Center (Philippines)  
North Carolina State University (USA)

2. Invasion of the red swamp crayfish (*Procambarus clarkii*) in China: genetic analysis of the invasion and the impacts evaluation.

University of Michigan (USA)  
Huazhong Agricultural University (China)  
Shanghai Ocean University (China)

3. Integrating environmental impacts, productivity, and profitability of shrimp aquaculture at the farm-scale as means to support good aquaculture practices and eco-certification.

University of Michigan (USA)  
Huazhong Agricultural University (China)  
Shanghai Ocean University (China)

4. The impact of fish stocking on wild fish populations, fish production and the ecosystem of irrigation reservoirs in South Vietnam.

University of Michigan (USA)  
Nong Lam University (Vietnam)  
Shanghai Ocean University (China)

5. Evaluating the relationship between semi-intensive aquaculture and natural biodiversity.

University of Michigan (USA)  
Shanghai Ocean University (China)



### *III. COMMUNICATING IMPACT*

***Problem Statement:***

CRSPs generate important technologies and information that could be better consolidated and used to improve outreach of these effective programs to various stakeholders.

***Caveat:*** This objective is primarily management-driven, and was created in response to the 2009 extension request. For the extension, USAID requested non-research activities that, while not inconsistent with the overall CRSP mission, did not reinforce the usual arrangement of research, education, and engagement typifying most other CRSP activities. Consequently, the CRSP's topic area hierarchy does not apply to this objective.

***Development Tasks:***

1. Telling a Compelling Story about ACRSP and AQUAFISH CRSP Impacts

Oregon State University

2. The CRSP Council Knowledge Management and Communication Project

Peanut CRSP, University of Georgia  
Oregon State University



## MONITORING & EVALUATION PLAN AND PROGRAM INDICATORS

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The CRSP works towards achieving its development impacts by meeting key targets, measured as indicators and benchmarks of progress. In addition to the benchmarks and indicators for USAID's key targets (research, capacity building, information dissemination, and IEHA), thematically-driven indicators were developed internally for the four themes adhered to under the AquaFish CRSP.

The benchmarks provide a means to explore different measures of performance than either the more quantitative thematic impact indicators, or the metrics designed by USAID for reporting under EGAT 5.1 Enabling Environment, EGAT 5.2 Sector Productivity, and IEHA Intermediate Results (IR) indicators. Tables 1 to 5 (see Part 3) cross-reference the CRSP M&E indicators with the applicable USAID indicators.

Note that the M&E Plan was developed as a 5-year strategy for program and project-level indicators. AquaFish CRSP internal reporting methodology allows us to drill down to the tiniest metrics of investigation-level indicators. Soon after all the investigations (referred to here as objectives) are peer-reviewed and revised, we will issue Implementation Plan 2009-2011, which will contain investigation-level metrics. The USAID AOTR presently has access to detailed metrics for work in Implementation Plan 2007-2009. Further, an on-line tracking system is used by the Management Entity to ensure progress toward investigation-level stated metrics and deliverables.



### *PART 1. IMPACT INDICATORS BY DEVELOPMENT THEME*

#### **DTAP A: Improved Health and Nutrition, Food Quality, and Food Safety of Fishery Products**

- *Number of aquaculture products developed to improve food safety or quality*

#### **DTAP B: Income Generation for Small-Scale Fishers and Farmers**

- *Number of new biotechnologies developed*
- *Number of institutions with access to technological practices*
- *Number of (people) trained in use of technological practices*

#### **DTAP C: Environmental Management for Sustainable Aquatic Resources Use**

- *Number of management practices developed or adopted to improve natural resource management*
- *Number of hectares under improved natural resource management*
- *Number of management practices developed to support biodiversity*
- *Number of people trained in practices that promote soil conservation and/or improved water quality*

#### **DTAP D: Enhanced Trade Opportunities for Global Fishery Markets**

- *Number of new markets for aquatic products*
- *Number of aquatic products available for human food consumption*



## ***PART 2. DEVELOPMENT TARGETS, IMPACTS AND BENCHMARKS FOR THE AQUAFISH CRSP***

This conceptual framework helps ensure that targets and benchmarks are adequately addressed across its global portfolio, for facilitating feedback and continuous learning in order to improve processes and outcomes. A gender strategy shows plans for ensuring strong programmatic commitment toward gender inclusion. Gender is both integrated into the four targets and also highlighted independently.

### **A. Research Target**

Produce sustainable end-user aquaculture and fisheries research results that increase productivity, enhance international trade opportunities, and contribute to responsible aquatic resource management.

#### **Program-wide Research Indicators:**

- (1) Developed and adopted innovative technologies that increase profitability and environmental stewardship in aquaculture and fisheries.
- (2) Addressed biodiversity conservation issues to ameliorate threats to biodiversity and developed technologies and strategies to protect biodiversity habitat and populations.
- (3) Continuously funded research projects that meet the expectations of external peer-review panels.
- (4) Conducted appropriate biotechnology research to develop technologies that increase farm productivity.
- (5) Engaged local stakeholders in research design, implementation, and results reporting through active participation in stakeholder meetings.
- (6) Published AquaFish CRSP research published in regional, national, and international peer-reviewed journals.

#### **Research Benchmarks:**

##### Year 1:

- a. Request for Proposals approved by USAID and widely advertised, and submitted proposals externally peer-reviewed; and
- b. Favorably reviewed proposals have activities initiated.

##### Years 2-5:

- a. 1 innovative aquaculture and fisheries technology or strategy developed and disseminated throughout each region;
- b. AquaFish CRSP activities remain locally appropriate by receiving regular input through the Regional Centers of Excellence and Development Theme Advisory Panels;
- c. measured increases in farm productivity, farmer incomes, market access, and export value achieved following adoption of AquaFish CRSP recommendations and technologies;
- d. threats to biodiversity resulting from aquaculture activities ameliorated and biologically significant areas positively impacted;
- e. cost-effective biotechnology appropriate for use in developing countries developed; and
- f. continuous academic output of AquaFish CRSP data as publications within recognized journals and presentations provided at regional, national, and international forums.

## **B. Capacity Building Target**

Focus AquaFish CRSP investments on building local capacity in aquaculture and aquatic resource management and ensuring long-term program impacts at local and national levels through strategic informal and formal training opportunities. Integrate items related to gender.

### **Capacity Building Indicators (Regional):**

- (1) Forged professional and managerial relationships between US and Host Country researchers and institutions.
- (2) Established track record of successful formal long-term training of Host Country and US students and researchers.
- (3) Delivered relevant short-term training opportunities that provide positive Host Country societal benefits beyond the life of the AquaFish CRSP.
- (4) Identified gender issues in aquaculture and fisheries and adopted gender program-wide integration policies.

### **Capacity Building Benchmarks:**

#### Year 1:

- a. An additional year of the highly successful Host Country Principal Investigator Exchange Project continued to exchange information on cichlid aquaculture to additional countries including two IEHA countries.
- b. The jointly funded NOAA Sea Grant Technical Assistance program continued.
- c. Gender integration strategies adopted within all sub-awards.
- d. Regional Centers of Excellence established to reflect the AquaFish CRSP regions for research activities (i.e., Asia, Africa, and Latin America and the Caribbean).
- e. Formal Memoranda of Understanding adopted between all US and Host Country partners.

#### Years 2-5:

- a. Partnerships strengthened among US and Host Country universities, NGOs, NARS, and USAID Missions through Associate Awards;
- b. At least 100 degree students enrolled through formal long-term training opportunities in US, Host Country, and Regional universities;
- c. Equal numbers of women and men trained through short- and long-term training opportunities;
- d. Numerous train-the-trainer workshops convened to provide Host Countries with highly skilled extension specialists; and
- e. Biotechnology and biodiversity training activities conducted as identified.

## **C. Information Dissemination Target:**

Disseminate AquaFish CRSP research results to foster broad application of results among local stakeholders within governmental and non-governmental organizations, as well as for end-users.

### **Information Dissemination Indicators (Regional):**

- (1) Successful diffusion of AquaFish CRSP research results and technologies between countries within a region having comparable social and environmental conditions;
- (2) Increased awareness of local stakeholder constraints and opportunities related to responsible aquaculture and fisheries management;
- (3) Applicable extension activities associated with each research project conducted to ensure wide dissemination of research results;
- (4) AquaFish CRSP results and technologies for farm operations adopted and policies for responsible aquatic resource management created;
- (5) Applicable technologies developed and adopted by the US and other countries' aquaculture and fisheries sectors.

**Information Dissemination Benchmarks:**

Year 1:

- a. Dissemination efforts have continued through Aquanews, EdopNet, and a new searchable online publication database.
- b. The importance of extension evident through integration of at least one outreach activity within each funded project.
- c. Research adoption encouraged by prioritizing the use of on- and off-farm trials to conduct research.

Years 2-5:

- a. Intra- and inter-regional diffusion of AquaFish CRSP results and technologies accomplished;
- b. Training manuals with local and regional scopes published following completion of AquaFish CRSP research projects; and
- c. At least 30 workshops convened over the course of the 5-year AquaFish CRSP.

**D. IEHA Country Involvement Target:**

Expand AquaFish CRSP science and technology efforts in IEHA Host Countries to increase local capacity and productivity thereby contributing to national food security, income generation, and market access.

**IEHA Indicators (Within each participating IEHA Host Country):**

- (1) Development and adoption of innovative technologies that increase profitability and environmental stewardship in the context of aquaculture and fisheries;
- (2) Students enrolled in formal long-term training programs within Host Country, Regional, and US universities;
- (3) Increased awareness of stakeholder constraints and opportunities related to responsible aquaculture and fisheries management;
- (4) Applicable extension activities associated with each research project conducted to ensure wide dissemination of research results;
- (5) AquaFish CRSP results and technologies adopted for farm operations and policies for responsible aquatic resource management created; and
- (6) Increased farm income and local economic growth through enhanced market access in project areas.

**IEHA Benchmarks:**

Year 1:

- a. Formal strategy initiated to maximize locally appropriate results in participating IEHA Host Countries.
- b. Sites selected and formal connections established with suitable research institutions and government departments within each IEHA Host Country.
- c. The Africa Regional Center of Excellence has representation from IEHA countries to design research and outreach activities.

Years 2-5:

- a. Formal linkages, collaborative research, and outreach activities fostered between US universities and IEHA site institutions;
- b. Long-term research projects addressed specific needs of each IEHA Host Country;
- c. Diffusion of knowledge facilitated between separate research projects ongoing within each IEHA Host Country; and
- d. A measured increase in farm productivity, farmer incomes, market access, and export value has followed adoption of AquaFish CRSP recommendations and technologies in project areas.

## E. Gender Integration Strategy

The AquaFish CRSP is dedicated to improving gender inclusiveness in the Aquaculture and Fisheries sectors, and in the CRSP arena. Gender Integration is implicit and interwoven into in the above “target” benchmarks and indicators requested by USAID in its RFA. Additional explicit guidance, in the form of an improvement plan, was established for CRSP operations.

### Gender Integration Initiatives:

#### Year 1:

- Require that all funded projects address gender inclusiveness within their planned scope-of-work.
- Seek out USAID review of projects’ gender inclusiveness plans and respond by improving plans prior to project implementation.
- Promote the participation of women in formal and informal education and training opportunities provided through the CRSP. The CRSP has set a 50% benchmark for training women in formal and informal education. In addition, the 50% benchmark applies to attracting and retaining women scientists and administrators in all CRSP activities, as project researchers, advisory group members, and managers. (continue all years)

#### Years 2-5:

- Collect disaggregated gender data from individual research and outreach projects funded by the CRSP.
- Analyze disaggregated data on an annual basis to gauge gender inclusiveness success and take appropriate action as indicated through data analysis.
- Involve field projects in monitoring and evaluating gender integration as the program progresses with time. Evaluate the effects of specific projects on gender and ensure that any possible negative effects due to gender bias are mitigated.
- Focus one component of a lessons learned and synthesis assessment specifically on the social context and impact of CRSP research and outreach activities on the lives of women.
- Tailor specific extension and technical services related to sustainable aquaculture and aquatic resource management to women producers.
- Engage extension specialists sensitive to diversity issues and access to resources of underrepresented groups and women will be included as an integral part of their delivery team to ensure women farmers and fishers feel welcome in CRSP training opportunities.



## ***PART 3. PMP-USAID INDICATORS CROSS-REFERENCING***

The AquaFish CRSP Program Indicators (PMP Indicators) are specifically tailored for assessing program-specific achievements, impacts, targets, and benchmarks. Tables V-5 to V-9 cross-reference these PMP Indicators with the broader, more general USAID-EGAT Indicators:

### **Agriculture Program Element Indicators**

- EG 5.1 (Enabling Environment): 5 indicators numbered 5.1-9 to 5.1-13 and three Custom Indicators
- EG 5.2 (Sector Productivity): 15 indicators numbered 5.2-14 to 5.2-28 and one Custom Indicators.

**IEHA Performance (Outcome) Indicators<sup>1</sup>**

- IR 1.1 (Adoption of Targeted Technologies)
- IR 1.2 (Enhanced Human and Institutional Capacity for Technology Development...)
- IR 2 (Improved Policy Environment for Smallholder-Based Agriculture)

CRSP and USAID-EGAT indicators do not have a one-to-one correspondence. In most cases, the USAID-EGAT indicators apply only in part and usually form a mixed combination for a given CRSP PMP indicator. In other cases, there is no correspondence between the two indicator sets, which is noted as "NA" (Not Applicable) in the USAID-EGAT indicator column.

Tables 1 to 5 illustrate (1) how the CRSP indicators are an extension of the USAID-EGAT and IR indicator sets and (2) how general features of the USAID set can be encompassed within a specific AquaFish CRSP indicator.

**Indicator Cross-Referencing Table Notes**

The EG 5.1<sup>2</sup> and 5.2 indicator series has two components: **FACT** (numbered) and **Custom** (not numbered). For purposes of cross referencing, the USAID-EGAT system is clarified or modified as follows:

**FACT Indicators:**

- EG 5.1-11 (short-term enabling training) is expanded to encompass both short- and long-term training for both genders
- EG 5.2-26 and 5.2-27 are tallied by the numbers of males or females attending a training.

**Custom Indicators:** AquaFish CRSP created a numerical coding system to differentiate among the custom indicators:

*Enabling Environment Custom Indicators*

- 5.1-C1: Policy Studies Undertaken
- 5.1-C2 Policy Studies Disseminated
- 5.1-C3 Partner Organizations Benefiting

*Sector Productivity Custom Indicators*

- 5.2-C1: Partner Organizations Benefiting

Table 1. AquaFish CRSP Development Themes

| USAID-EGAT Indicators <sup>3</sup>   | AquaFish CRSP Impact Indicators  |
|--------------------------------------|--|
| 5.1-12<br>5.2-14<br>5.2-15<br>5.2-16 | <p><b>DTAP A: Improved Health and Nutrition, Food Quality, and Food Safety of Fishery Products</b></p> <ul style="list-style-type: none"> <li>• <i>Number of aquaculture products developed to improve food safety or quality</i></li> </ul>                   |
| 5.1-11<br>5.1-C1<br>5.2-14           | <p><b>DTAP B: Income Generation for Small-Scale Fishers and Farmers</b></p> <ul style="list-style-type: none"> <li>• <i>Number of new biotechnologies developed</i></li> <li>• <i>Number of institutions with access to technological practices</i></li> </ul> |

<sup>1</sup> IEHA Output Indicators are not included here given their direct correspondence with the EGAT 5.2 indicators.

<sup>2</sup> EG 5.1 Indicators applied through 30 September 2008.

<sup>3</sup> Cross referencing for the CRSP DTAP indicators is at the thematic level.

Table 1. AquaFish CRSP Development Themes

| USAID-EGAT Indicators <sup>3</sup>   | AquaFish CRSP Impact Indicators  |
|--|--|
| 5.2-15<br>5.2-16<br>5.2-19<br>5.2-20<br>5.2-21<br>5.2-22<br>5.2-26<br>5.2-27<br>5.2-28<br>5.2-C1           | <ul style="list-style-type: none"> <li>• <i>Number of (people) trained in use of technological practices</i></li> </ul>  |
| 5.1-11<br>5.1-12<br>5.1-C1<br>5.2-14<br>5.2-15<br>5.2-16<br>5.2-17<br>5.2-18<br>5.2-21<br>5.2-26<br>5.2-27 | <p><b>DTAP C: Environmental Management for Sustainable Aquatic Resources Use</b></p> <ul style="list-style-type: none"> <li>• <i>Number of management practices developed or adopted to improve natural resource management</i></li> <li>• <i>Number of hectares under improved natural resource management</i></li> <li>• <i>Number of management practices developed to support biodiversity</i></li> <li>• <i>Number of people trained in practices that promote soil conservation and/or improved water quality</i></li> </ul> |
| 5.1-12<br>5.2-16<br>5.2-21   | <p><b>DTAP D: Enhanced Trade Opportunities for Global Fishery Markets</b></p> <ul style="list-style-type: none"> <li>• <i>Number of new markets for aquatic products</i></li> <li>• <i>Number of aquatic products available for human food consumption</i></li> </ul>  |

Table 2. AquaFish CRSP Development Targets, Impacts and Benchmarks

| USAID-EGAT Indicators  | AquaFish CRSP Research Indicators   |
|--|---|
| 5.1-11<br>5.1-12<br>5.1-C1<br>5.2-14<br>5.2-15<br>5.2-16<br>5.2-19<br>5.2-21<br>5.2-26<br>5.2-27 | (1) Developed and adopted innovative technologies that increase profitability and environmental stewardship in aquaculture and fisheries.                                       |
| NA   | (2) Addressed biodiversity conservation issues to ameliorate threats to biodiversity and developed technologies and strategies to protect biodiversity habitat and populations. |

Table 2. AquaFish CRSP Development Targets, Impacts and Benchmarks

| <b>USAID-EGAT Indicators</b>                                       | <b>AquaFish CRSP Research Indicators</b>   |
|--|--|
| NA   | (3) Continuously funded research projects that meet the expectations of external peer-review panels.   |
| 5.1-14   | (4) Conducted appropriate biotechnology research to develop technologies that increase farm productivity.  |
| 5.2-18<br>5.2-19<br>5.2-20<br>5.2-21<br>5.2-22<br>5.2-28<br>5.2-C1 | (5) Engaged local stakeholders in research design, implementation, and results reporting through their active participation in stakeholder meetings. |
| NA   | (6) Published AquaFish CRSP research in regional, national, and international peer-reviewed journals.  |

Table 3. AquaFish Capacity Building Target

| <b>USAID-EGAT Indicators</b>         | <b>AquaFish CRSP Indicators</b>   |
|--------------------------------------|---|
| 5.2-14<br>5.2-15<br>5.2-C1           | (1) Forged professional and managerial relationships between US and Host Country researchers and institutions                                       |
| 5.1-11<br>5.2-27                     | (2) Established track record of successful formal long-term training of Host Country and US students and researchers.                               |
| 5.1-11<br>5.2-19<br>5.2-21<br>5.2-26 | (3) Delivered relevant short-term training opportunities that provide positive Host Country societal benefits beyond the life of the AquaFish CRSP. |
| 5.1-12<br>5.1-C1<br>5.2-28           | (4) Identified gender issues in aquaculture and fisheries and adopted program-wide, gender-integration policies.                                    |

Table 4. AquaFish CRSP Information Dissemination Target

| USAID-EGAT Indicators  | AquaFish CRSP Indicators   |
|--|--|
| NA   | (1) Successful diffusion of AquaFish CRSP research results and technologies between countries within a region having comparable social and environmental conditions. |
| NA   | (2) Increased awareness of local stakeholder constraints and opportunities related to responsible aquaculture and fisheries management.                              |
| 5.1-11<br>5.2-16<br>5.2-26   | (3) Applicable extension activities within each research project conducted to ensure wide dissemination of research results.   |
| 5.1-12<br>5.1-C1<br>5.2-16   | (4) Adoption of AquaFish CRSP results and technologies for farm operations and policies created for responsible aquatic resource management.                         |
| 5.1-11<br>5.2-14<br>5.2-15<br>5.2-16<br>5.2-19<br>5.2-21<br>5.2-26<br>5.2-28 | (5) Applicable technologies developed and adopted by the US and other countries' aquaculture and fisheries sectors.  |

Table 5. IEHA Country Involvement Target

| USAID-EGAT Indicators                                    | AquaFish CRSP Indicators   |
|--|--|
| 5.1-11<br>5.1-C1<br>5.2-14<br>5.2-15<br>5.2-16<br>5.2-26 | (1) Development and adoption of innovative technologies that increase profitability and environmental stewardship in the context of aquaculture and fisheries. |
| 5.1-11<br>5.2-27   | (2) Students enrolled in formal long-term training programs within Host Country, regional, and US universities.  |
| NA   | (3) Increased awareness of stakeholder constraints and opportunities related to responsible aquaculture and fisheries management.                              |

Table 5. IEHA Country Involvement Target

| <b>USAID-EGAT Indicators</b> | <b>AquaFish CRSP Indicators</b>  |
|------------------------------|--|
| 5.2-26<br>5.2-28             | (4) Applicable extension activities associated with each research project conducted to ensure wide dissemination of research results.    |
| 5.1-C1<br>5.2-16             | (5) AquaFish CRSP results and technologies adopted for farm operations and policies for responsible aquatic resource management created. |
| IR 1.2                       | (6) Increased farm income and local economic growth through enhanced market access in project areas.                                     |



## BUDGET: 2009–2011

The proposed objectives and activities presented in this Work Plan will be carried out over a two-year period from 2009-2011. Proposed two-year investigation budgets were halved for the purpose of providing annual estimates for this report, and management costs were added proportionally to provide a complete estimate of costs per objective. OSU's understanding is that this estimated budget will not to be used to follow a single Fiscal Year's funding flow. Rather it will be used as an estimate of the cost of the work to be performed in 2009 to 2010. A complication in pulling together numbers for this budget is that AquaFish CRSP received advance funding in its FY08 budget (in Sept 2008), which would have carried the existing program through most of this upcoming fiscal year. The advance funding from last year, along with this year's extension funds, will be used to carry out objectives listed in this report, along with activities supporting management and outreach. Please refer to the approved budget on file with OAA for additional details.

Regional and program-wide activities will be undertaken for each of the above objectives, and will be centered on extension and impact of ACRSP and AquaFish CRSP technologies and knowledge. These activities will include, but not be limited to, monitoring and evaluation (M&E) efforts, research oversight, strategic initiatives, meetings, and analyzing and providing information to the various impact and synthesis activities. AquaFish CRSP Regional Centers of Excellence in Africa, Asia, and LAC will be supported in their creation of new partnerships. Partnerships can help with transferring technologies, expanding the reach and impact of CRSP work, and providing new opportunities to host countries. Linkages and partnerships will be advanced through: 1) enhanced use of information technologies; 2) symposia on hot topics such as biodiversity in aquaculture; and 3) participation at regional meetings.

### Estimated Cost per Objective and Topic Area

|  |     |   |   | Number<br>of Tasks | 2009               |
|--|-----|---|---|--------------------|--------------------|
| <b>Objective I. Integrated Production Systems</b>                            |     |   |   |                    | <b>\$1,318,492</b> |
| I-A  | BMA | Production System Design & Best Management Alternatives | 6 | 239,803            |                    |
| I-B  | SFT | Sustainable Feed Technology                             | 6 | 438,546            |                    |
| I-C  | IND | Indigenous Species Development                          | 6 | 435,099            |                    |
| I-D  | QSD | Quality Seedstock Development                           | 4 | 205,044            |                    |
| <b>Objective II. People, Livelihoods, &amp; Ecosystem Interrelationships</b> |     |   |   |                    | <b>\$1,915,758</b> |
| II-A   | HHI | Human Health Impacts of Aquaculture                     | 2 | 173,579            |                    |
| II-B   | FSV | Food Safety & Value-Added Product Development           | 3 | 213,175            |                    |

**Estimated Cost per Objective and Topic Area**

|   |     |  | Number<br>of Tasks | 2009               |
|---|-----|--|--------------------|--------------------|
| <b>Objective II. People, Livelihoods, &amp; Ecosystem Interrelationships (cont)</b> |     |  |                    |                    |
| II-C  | TAP | Technology Adoption & Policy Development       | 7                  | 750,163            |
| II-D  | MER | Marketing, Economic Risk Assessment & Trade    | 4                  | 231,222            |
| II-E  | WIZ | Watershed & Integrated Coastal Zone Management | 3                  | 308,267            |
| II-F  | MNE | Mitigating Negative Environmental Impacts      | 6                  | 239,352            |
| <b>Objective III. Communicating Impact</b>  |     |  |                    | <b>\$219,747</b>   |
| III   | n/a | Communicating Impact                           | 2                  | 219,747            |
| Regional Activities   |     |  |                    | <b>\$713,784</b>   |
| <b>TOTAL for 2009-2010</b>  |     |  | <b>49</b>          | <b>\$4,167,782</b> |

The total includes previous year funding, some of which has been already allocated prior to the new fiscal year. Please note that FY08 funding provided “advance” funding for AquaFish CRSP — enough to carry forward on original activities through much of Year 4. All activities in this WP are occurring in the coming fiscal year, regardless of the funding stream (FY08 or FY09). Thus, the total cost is greater than this year’s planned obligation of \$3,058,096.



## APPENDIX 1: APPROVED TRAVEL

Table A-1 lists trips for approved program or project travel to various destinations during the course of the AquaFish CRSP award CA/LWA No. EPP-A-00-06-00012-00. The Trip ID is an internal tracking code assigned to trips by the AquaFish CRSP Management Team. This approved travel is presented as per ADS 303.I.18.a. Each entry represents one trip.

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                                      | Destination                                   | Approximate Travel Date | Trip ID |
|---|---|-------------------------|---------|
| <b>MANAGEMENT TEAM</b>                                  |   |                         |         |
| TBD   | France  | 07-2010                 | 473     |
| TBD   | Kenya, Uganda, Tanzania                       | FY2010                  | 469     |
| TBD   | China and Korea                               | FY2010                  | 470     |
| TBD   | Thailand, Malaysia                            | FY2010                  | 474     |
| TBD   | Ghana, Mali, and South Africa                 | FY2010                  | 476     |
| TBD   | Cambodia and Vietnam                          | FY2010                  | 477     |
| TBD   | Netherlands, Turkey, or Israel                | FY2010                  | 479     |
| TBD   | Mexico, Honduras, Panama                      | FY2010                  | 481     |
| TBD   | Peru, Bolivia                                 | FY2010                  | 482     |
| TBD   | Peru, Bolivia                                 | FY2010                  | 483     |
| TBD   | Nicaragua, Guyana                             | FY2010                  | 484     |
| TBD   | Nicaragua, Guyana                             | FY2010                  | 485     |
| TBD   | Australia                                     | FY2010                  | 486     |
| TBD   | TBD   | FY2010                  | 487     |
| TBD   | China/Brazil*                                 | 04-2011                 | 471     |
| TBD   | China/Brazil*                                 | 04-2011                 | 472     |
| TBD   | Nepal, India, and Bangladesh                  | FY2011                  | 478     |
| TBD   | Philippines, Indonesia, Malaysia              | FY2011                  | 480     |
| TBD   | TBD   | FY2011                  | 488     |
| <b>HOST COUNTRY INSTITUTION &amp; CAPACITY BUILDING</b> |   |                         |         |
| TBD   | Kenya, Tanzania, Uganda                       | FY2010                  | 497     |
| TBD   | Vietnam and other SE Asia locations           | FY2010                  | 498     |
| TBD   | Thailand and other SE Asia locations          | FY2010                  | 503     |
| TBD   | Honduras and other Central American locations | FY2010                  | 507     |
| TBD   | China, Japan and other E. Asia locations      | FY2010                  | 508     |
| TBD   | China, Japan and other E. Asia                | FY2010                  | 509     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                    | Destination                    | Approximate Travel Date | Trip ID |
|---------------------------------------|--------------------------------|-------------------------|---------|
|                                       | locations                      |                         |         |
| TBD                                   | Nicaragua, Guyana or other LAC | FY2010                  | 511     |
| TBD                                   | China/Brazil*                  | 04-2011                 | 500     |
| TBD                                   | China/Brazil*                  | 04-2011                 | 501     |
| TBD                                   | China/Brazil*                  | 04-2011                 | 502     |
| TBD                                   | TBD                            | 06-2011                 | 513     |
| TBD                                   | TBD                            | 06-2011                 | 514     |
| TBD                                   | Ghana, Mali, South Africa      | FY2011                  | 510     |
| <b>UNIVERSITY OF ARIZONA PROJECT</b>  |                                |                         |         |
| Guyana                                | Arizona, USA                   | 03-2010                 | 343     |
| Guyana                                | Arizona, USA                   | 03-2010                 | 344     |
| Arizona, USA                          | Guyana                         | 05-2010                 | 334     |
| Guyana                                | Trinidad and Tobago            | 05-2010                 | 345     |
| Guyana                                | Trinidad and Tobago            | 06-2010                 | 346     |
| Mexico                                | Tucson, Arizona                | 08-2010                 | 515     |
| Mexico                                | China                          | 04-2011                 | 337     |
| TBD                                   | China                          | 04-2011                 | 338     |
| TBD                                   | China                          | 04-2011                 | 339     |
| TBD                                   | China                          | 04-2011                 | 340     |
| TBD                                   | China                          | 04-2011                 | 341     |
| TBD                                   | China                          | 04-2011                 | 342     |
| Guyana                                | China                          | 04-2011                 | 347     |
| Guyana                                | China                          | 04-2011                 | 348     |
| Mexico                                | China                          | 04-2011                 | 516     |
| Mexico                                | China/Brazil                   | 04-2011                 | 349     |
| TBD                                   | China/Brazil                   | 04-2011                 | 350     |
| Arizona                               | Guyana                         | 07-2011                 | 335     |
| Arizona                               | Mexico                         | 08-2011                 | 336     |
| <b>UNIVERSITY OF MICHIGAN PROJECT</b> |                                |                         |         |
| Nepal                                 | California, USA                | 03-2010                 | 360     |
| Bangladesh                            | California, USA                | 03-2010                 | 361     |
| China                                 | California, USA                | 03-2010                 | 362     |
| China                                 | California, USA                | 03-2010                 | 363     |
| China                                 | California, USA                | 03-2010                 | 364     |
| China                                 | California, USA                | 03-2010                 | 365     |
| Vietnam                               | California, USA                | 03-2010                 | 366     |
| Vietnam                               | California, USA                | 03-2010                 | 367     |
| Thailand                              | California, USA                | 03-2010                 | 368     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                             | Destination               | Approximate Travel Date | Trip ID |
|--|---------------------------|-------------------------|---------|
| Thailand                                       | China                     | 04-2010                 | 369     |
| China  | Hobart, Australia         | 05-2010                 | 517     |
| TBD  | Hawaii, USA               | 06-2010                 | 351     |
| TBD  | Hawaii, USA               | 06-2010                 | 352     |
| Michigan                                       | China                     | 06-2010                 | 353     |
| Michigan                                       | Thailand                  | 06-2010                 | 354     |
| Michigan                                       | Thailand                  | 06-2010                 | 355     |
| China  | Nepal                     | 08-2010                 | 518     |
| Michigan                                       | China/Brazil              | 04-2011                 | 356     |
| Nepal  | China/Brazil              | 04-2011                 | 519     |
| TBD  | China/Brazil              | 04-2011                 | 520     |
| TBD  | China/Brazil              | 04-2011                 | 521     |
| Bangladesh                                     | China/Brazil              | 04-2011                 | 522     |
| China  | China/Brazil              | 04-2011                 | 523     |
| Thailand                                       | China                     | 08-2011                 | 524     |
| Vietnam  | China                     | 08-2011                 | 525     |
| Vietnam  | China                     | 08-2011                 | 526     |
| Vietnam  | China                     | 08-2011                 | 527     |
| Vietnam  | China                     | 08-2011                 | 528     |
| Vietnam  | China                     | 08-2011                 | 529     |
| Vietnam  | China                     | 08-2011                 | 530     |
| China  | Vietnam                   | 08-2011                 | 531     |
| TBD  | Hawaii, USA               | 10-2011                 | 357     |
| TBD  | Hawaii, USA               | 10-2011                 | 358     |
| TBD  | Hawaii, USA               | 10-2011                 | 359     |
| <b>NORTH CAROLINA STATE UNIVERSITY PROJECT</b> |                           |                         |         |
| North Carolina, USA                            | Philippines and Indonesia | 02-2010                 | 370     |
| Philippines                                    | Indonesia                 | 02-2010                 | 379     |
| Arizona, USA                                   | Indonesia                 | 02-2010                 | 384     |
| Philippines                                    | California, USA           | 03-2010                 | 378     |
| Philippines                                    | China/Brazil              | 04-2011                 | 381     |
| Philippines                                    | California, USA           | 03-2010                 | 382     |
| Philippines                                    | California, USA           | 03-2010                 | 383     |
| Arizona, USA                                   | Philippines               | 04-2010                 | 371     |
| Philippines                                    | Indonesia                 | 06-2010                 | 380     |
| Indonesia                                      | China                     | 10-2010                 | 386     |
| Philippines                                    | North Carolina            | 12-2010                 | 532     |
| North Carolina, USA                            | Philippines               | 01-2011                 | 372     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location               | Destination      | Approximate Travel Date | Trip ID |
|----------------------------------|------------------|-------------------------|---------|
| North Carolina, USA              | China/Brazil     | 03-2011                 | 373     |
| North Carolina, USA              | Philippines      | 05-2011                 | 377     |
| Philippines                      | China/Brazil     | 04-2011                 | 533     |
| Philippines                      | China/Brazil     | 04-2011                 | 534     |
| Arizona, USA                     | Indonesia        | 06-2011                 | 385     |
| North Carolina, USA              | Philippines      | 07-2011                 | 374     |
| North Carolina, USA              | Philippines      | 07-2011                 | 375     |
| North Carolina, USA              | Philippines      | 07-2011                 | 376     |
| <b>PURDUE UNIVERSITY PROJECT</b> |                  |                         |         |
| TBA                              | Tanzania         | 11-2009                 | 391     |
| Indiana, USA                     | China/Brazil     | 04-2011                 | 389     |
| Kenya                            | California, USA  | 03-2010                 | 395     |
| Kenya                            | California, USA  | 03-2010                 | 396     |
| Kenya                            | China/Brazil     | 04-2011                 | 398     |
| Tanzania                         | California, USA  | 03-2010                 | 399     |
| TBD                              | California, USA  | 03-2010                 | 467     |
| Ghana                            | China/Brazil     | 04-2011                 | 401     |
| Kenya                            | Kenya and Uganda | 05-2010                 | 355     |
| Kenya                            | Kenya and Uganda | 05-2010                 | 356     |
| Kenya                            | Kenya and Uganda | 05-2010                 | 357     |
| Kenya                            | Kenya and Uganda | 05-2010                 | 538     |
| Indiana, USA                     | Ghana and Kenya  | 06-2010                 | 387     |
| Indiana, USA                     | Kenya            | 06-2010                 | 388     |
| Virginia, USA                    | Ghana            | 06-2010                 | 393     |
| Virginia, USA                    | Ghana            | 06-2010                 | 394     |
| Indiana, USA                     | Accra, Ghana     | 06-2010                 | 539     |
| Kenya                            | Accra, Ghana     | 06-2010                 | 540     |
| Virginia, USA                    | Accra, Ghana     | 06-2010                 | 541     |
| Indiana, USA                     | Accra, Ghana     | 06-2010                 | 542     |
| Kenya                            | China/Brazil     | 04-2011                 | 397     |
| TBD                              | China/Brazil     | 04-2011                 | 400     |
| TBD                              | China/Brazil     | 04-2011                 | 392     |
| TBD                              | China/Brazil     | 04-2011                 | 543     |
| Virginia, USA                    | Accra, Ghana     | 05-2011                 | 544     |
| Indiana, USA                     | China/Brazil     | 04-2011                 | 545     |
| Kenya                            | Kenya and Uganda | 05-2011                 | 546     |
| Kenya                            | Kenya and Uganda | 05-2011                 | 547     |
| Kenya                            | Kenya and Uganda | 05-2011                 | 548     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                                     | Destination          | Approximate Travel Date | Trip ID |
|--|----------------------|-------------------------|---------|
| Kenya  | Kenya and Uganda     | 05-2011                 | 549     |
| Indiana, USA   | Kenya                | 06-2011                 | 390     |
| Indiana, USA   | Nairobi, Kenya       | 09-2011                 | 550     |
| Indiana, USA   | Nairobi, Kenya       | 09-2011                 | 551     |
| <b>UNIVERSITY OF CONNECTICUT – AVERY POINT PROJECT</b> |                      |                         |         |
| Rhode Island, USA                                      | Vietnam and Cambodia | 01-2010                 | 421     |
| Vietnam  | California, USA      | 03-2010                 | 435     |
| Cambodia   | California, USA      | 03-2010                 | 437     |
| Cambodia   | Vietnam              | 03-2010                 | 438     |
| Cambodia   | Vietnam              | 03-2010                 | 439     |
| Cambodia   | Vietnam              | 03-2010                 | 440     |
| Cambodia   | Vietnam              | 03-2010                 | 441     |
| Cambodia   | Vietnam              | 03-2010                 | 445     |
| Cambodia   | Vietnam              | 03-2010                 | 446     |
| Cambodia   | California, USA      | 03-2010                 | 447     |
| Cambodia   | California, USA      | 03-2010                 | 451     |
| Cambodia   | California, USA      | 03-2010                 | 454     |
| Cambodia   | California, USA      | 03-2010                 | 455     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 05-2010                 | 431     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 06-2010                 | 422     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 06-2010                 | 423     |
| Vietnam  | Cambodia             | 06-2010                 | 442     |
| Vietnam  | Cambodia             | 06-2010                 | 443     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 09-2010                 | 424     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 09-2010                 | 425     |
| Cambodia   | China                | 09-2010                 | 452     |
| Cambodia   | China                | 09-2010                 | 552     |
| Cambodia   | Vietnam              | 01-2011                 | 444     |
| Cambodia   | Vietnam              | 01-2011                 | 457     |
| Connecticut, USA                                       | China/Brazil         | 04-2011                 | 426     |
| Rhode Island, USA                                      | China/Brazil         | 04-2011                 | 432     |
| Rhode Island, USA                                      | China/Brazil         | 04-2011                 | 433     |
| Vietnam  | China/Brazil         | 04-2011                 | 436     |
| Cambodia   | China/Brazil         | 04-2011                 | 448     |
| TBD  | China/Brazil         | 04-2011                 | 449     |
| Cambodia   | China/Brazil         | 04-2011                 | 453     |
| Rhode Island, USA                                      | Vietnam and Cambodia | 05-2011                 | 434     |
| Vietnam  | Cambodia             | 05-2011                 | 456     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                          | Destination          | Approximate Travel Date | Trip ID |
|---|----------------------|-------------------------|---------|
| Rhode Island, USA                           | Vietnam and Cambodia | 06-2011                 | 427     |
| Rhode Island, USA                           | Vietnam and Cambodia | 06-2011                 | 428     |
| Cambodia                                    | Vietnam              | 08-2011                 | 458     |
| Cambodia                                    | Vietnam              | 08-2011                 | 459     |
| Rhode Island, USA                           | Vietnam and Cambodia | 09-2011                 | 429     |
| Rhode Island, USA                           | Vietnam and Cambodia | 09-2011                 | 430     |
| Cambodia                                    | Vietnam              | 09-2011                 | 460     |
| Cambodia                                    | Vietnam              | 09-2011                 | 461     |
| Cambodia                                    | TBD                  | TBD                     | 450     |
| <b>UNIVERSITY OF HAWAII AT HILO PROJECT</b> |                      |                         |         |
| Mexico                                      | California, USA      | 03-2010                 | 413     |
| Mexico                                      | California, USA      | 03-2010                 | 414     |
| Mexico                                      | California, USA      | 03-2010                 | 415     |
| Nicaragua                                   | California, USA      | 03-2010                 | 419     |
| Nicaragua                                   | California, USA      | 03-2010                 | 420     |
| Hawaii, USA                                 | Mexico               | 05-2010                 | 402     |
| Hawaii, USA                                 | Mexico               | 05-2010                 | 403     |
| Louisiana, USA                              | Mexico               | 05-2010                 | 410     |
| Ohio, USA                                   | Mexico               | 06-2010                 | 406     |
| Ohio, USA                                   | Mexico               | 06-2010                 | 407     |
| Louisiana, USA                              | Nicaragua            | 06-2010                 | 411     |
| Louisiana, USA                              | China/Brazil         | 04-2011                 | 412     |
| Mexico                                      | China/Brazil         | 04-2011                 | 416     |
| Mexico                                      | China/Brazil         | 04-2011                 | 417     |
| Mexico                                      | China/Brazil         | 04-2011                 | 418     |
| Nicaragua                                   | China/Brazil         | 04-2011                 | 553     |
| Nicaragua                                   | China/Brazil         | 03-2011                 | 554     |
| Hawaii, USA                                 | Mexico               | 05-2011                 | 404     |
| Ohio, USA                                   | Mexico               | 05-2011                 | 408     |
| Hawaii, USA                                 | Mexico               | 06-2011                 | 405     |
| Ohio, USA                                   | Mexico               | 06-2011                 | 409     |
| <b>AUBURN UNIVERSITY PROJECT</b>            |                      |                         |         |
| Alabama, USA                                | South Africa         | 08-2009                 | 305     |
| Alabama, USA                                | Uganda               | 10-2009                 | 314     |
| Alabama, USA                                | Uganda               | 10-2009                 | 315     |
| Alabama, USA                                | South Africa         | 12-2009                 | 304     |
| Alabama, USA                                | Uganda               | 12-2009                 | 307     |
| Georgia, USA                                | Uganda               | 12-2009                 | 318     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                   | Destination     | Approximate Travel Date | Trip ID |
|--------------------------------------|-----------------|-------------------------|---------|
| South Africa                         | California, USA | 03-2010                 | 323     |
| Uganda                               | California, USA | 03-2010                 | 325     |
| Uganda                               | California, USA | 03-2010                 | 326     |
| Uganda                               | South Africa    | 03-2010                 | 327     |
| Uganda                               | South Africa    | 03-2010                 | 328     |
| Uganda                               | China/Brazil*   | 04-2011                 | 329     |
| Uganda                               | China/Brazil*   | 04-2011                 | 330     |
| Uganda                               | California, USA | 03-2010                 | 333     |
| South Africa                         | Uganda          | 08-2010                 | 306     |
| Alabama, USA                         | Uganda          | 08-2010                 | 308     |
| Uganda                               | South Africa    | 08-2010                 | 319     |
| Georgia, USA                         | Uganda          | 08-2010                 | 320     |
| South Africa                         | Uganda          | 08-2010                 | 322     |
| Uganda                               | South Africa    | 03-2011                 | 331     |
| Uganda                               | South Africa    | 03-2011                 | 332     |
| Alabama, USA                         | Uganda          | 04-2011                 | 309     |
| Alabama, USA                         | Uganda          | 05-2011                 | 310     |
| Alabama, USA                         | China/Brazil*   | 04-2011                 | 311     |
| Alabama, USA                         | China/Brazil*   | 04-2011                 | 313     |
| Alabama, USA                         | China/Brazil*   | 04-2011                 | 317     |
| South Africa                         | China/Brazil*   | 04-2011                 | 324     |
| Alabama, USA                         | South Africa    | 07-2011                 | 312     |
| Alabama, USA                         | Uganda          | 08-2011                 | 316     |
| Georgia, USA                         | China/Brazil*   | 04-2011                 | 321     |
| <b>IMPACT ASSESSMENT PROJECT–MSU</b> |                 |                         |         |
| Wuhan, China                         | Washington, USA | 10-2010                 | 555     |
| Phnim Pehn, Cambodia                 | Washington, USA | 10-2010                 | 556     |
| Ho Chi Minh City, Vietnam            | Washington, USA | 10-2010                 | 557     |
| Manila, Philippines                  | Washington, USA | 10-2010                 | 558     |
| Nairobi, Kenya                       | Washington, USA | 10-2010                 | 559     |
| Dar es Salaam, Tanzania              | Washington, USA | 10-2010                 | 560     |
| Kampala, Uganda                      | Washington, USA | 10-2010                 | 561     |
| Johannesburg, South Africa           | Washington, USA | 10-2010                 | 562     |
| Managua, Nicaragua                   | Washington, USA | 10-2010                 | 563     |
| Culiacan, Mexico                     | Washington, USA | 10-2010                 | 564     |
| Ciudad Victoria, Mexico              | Washington, USA | 10-2010                 | 565     |
| Villahermosa, Mexico                 | Washington, USA | 10-2010                 | 566     |
| Montana, USA                         | China/Brazil    | 04-2011                 | 567     |

Table A-1. Approved AquaFish CRSP international and domestic travel.

| Departure Location                   | Destination              | Approximate Travel Date | Trip ID |
|--------------------------------------|--------------------------|-------------------------|---------|
| Montana, USA                         | Asia                     | 07-2011                 | 568     |
| <b>SYNTHESIS PROJECT–ME</b>          |                          |                         |         |
| Oregon, USA                          | China                    | 02-2010                 | 253     |
| Australia                            | Seattle, Washington      | 02-2009                 | 254     |
| Oregon, USA                          | Shanghai, China          | 02-2010                 | 255     |
| Oregon, USA                          | TBD                      | 02-2011                 | 256     |
| Oregon, USA                          | China                    | FY2010                  | 290     |
| Oregon, USA                          | China                    | FY2010                  | 291     |
| TBD                                  | China                    | FY2010                  | 292     |
| Oregon, USA                          | LAC - TBD                | FY2011                  | 293     |
| TBD                                  | LAC - TBD                | FY2011                  | 294     |
| Oregon, USA                          | LAC - TBD                | FY2011                  | 295     |
| <b>IMPACT ASSESSMENT PROJECT–OSU</b> |                          |                         |         |
| Oregon, USA                          | China                    | 06-2010                 | 569     |
| Oregon, USA                          | China                    | 01-2011                 | 570     |
| Oregon, USA                          | Kenya                    | 01-2011                 | 571     |
| Oregon, USA                          | China/Brazil             | 04-2011                 | 572     |
| Oregon, USA                          | China/Brazil             | 04-2011                 | 573     |
| <b>COMMUNICATIONS PROJECT</b>        |                          |                         |         |
| TBD                                  | China/Brazil*            | 04-2011                 | 493     |
| TBD                                  | Vietnam, Thailand, China | FY2010                  | 491     |
| TBD                                  | Mexico, Honduras         | FY2010                  | 494     |
| TBD                                  | Peru                     | FY2010                  | 495     |
| TBD                                  | Bangladesh               | FY2010                  | 496     |
| TBD                                  | Kenya                    | FY2011                  | 490     |
| TBD                                  | Philippines              | FY2011                  | 492     |
| TBD                                  | TBD                      | 06-2011                 | 574     |

\* Indicates trips originally proposed as “Brazil” for the 2011 AquaFish CRSP annual meeting to be held in either Brazil or China.