

AQUAFISH COLLABORATIVE RESEARCH SUPPORT PROGRAM

ANNUAL WORK PLAN

for the transition period

1 JANUARY 2012 TO 29 SEPTEMBER 2012

AquaFish CRSP
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AQUAFISH
COLLABORATIVE RESEARCH
SUPPORT PROGRAM

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INTRODUCTION

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 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. The AquaFish CRSP is focusing 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

The following activities will be undertaken during the transitional 6th year extension ending 29 September 2012. Activities encompass work under Addendum 3 of the AquaFish CRSP *Implementation Plan 2009–2011*. For pre-authorized travel during this period, see Appendix 1.

In September 2011, AquaFish CRSP was granted a no-cost extension on its current program of research through 29 September 2012. In May 2012, \$1,900,000 was awarded from USAID with no additional time extension¹.



I. RESEARCH PROJECT INVESTIGATIONS

This Annual Work Plan includes the continuation of investigations for each of the seven core research projects in areas that include experimental pond unit assessment and value chain analysis. Projects are also continuing on air breathing fish species as candidates for aquaculture and capacity building through training-of-trainers in Africa.

VALUE CHAIN ANALYSIS

CRSP researchers in each project are evaluating the value chain for one aquatic species in a partner Host Country. As part of this research component, CRSP Project PI, Dr. Robert Pomeroy, an international expert in value chain analyses, will lead a workshop for fellow CRSP researchers. This program-related workshop will focus on mapping techniques and approaches for uniform data collection and value chain analysis across the seven core research projects. Dr. Pomeroy has scheduled the workshop in July 2012 to take advantage of CRSP attendance at the International Institute of Fisheries Economics & Trade (IIFET) conference in Tanzania.

EXPERIMENTAL POND UNIT ASSESSMENT (EPUA)

This set of investigations is designed to develop a baseline set of physical, chemical, and biological characteristics of aquaculture ponds and build capacity at each research site to complete all of these measures. The experimental framework draws upon methods formulated under the former Pond Dynamics/Aquaculture CRSP. The overall goal of this experimental approach is to establish a uniform research direction for basic work needed to develop small-scale aquaculture. Future AquaFish CRSP programs would be able to draw upon the EPUA results to further develop methodology for customizing management practices for any given aquaculture system.

AIR BREATHING FISHES

¹ USAID letter to OSU indicating intent to increase award amount dated 28 Dec 2011; USAID RFA/OAA letter dated 8 Feb 2012; ME application submitted 12 March 2012; USAID funds received 1 May 2012 (OSU signed Mod#6), 3 May 2012 (USAID signed Mod#6); budget backdated to 1 Jan 2012.

Researchers associated with the Auburn University, University of Hawai'i at Hilo, and University of Michigan projects plan to continue work on three air-breathing fish species groups with high potential as aquaculture species. In Uganda, Auburn University investigators are characterizing African lungfish. Since this freshwater fish can survive in low oxygen conditions, its aquaculture potential is promising for smallholders in drought-stricken areas of Africa. A Latin American species native to the Pacific coast, the Pacific fat sleeper (or chame) is already a traditional fish of the poor. University of Hawai'i researchers will be focusing on developing spawning and rearing methods for this species under hatchery conditions. The University of Michigan project is working with gars, another species group in Latin America. These species are excellent aquaculture candidates due to their rapid growth potential, adaptability to high densities, tolerance of low water quality, and the ability to adapt to changing environmental conditions. CRSP researchers will be experimenting with feeding strategies, stocking density, water quality, and salinity tolerance trials.

REGIONAL RESEARCH

The continued work is encompassed within four of the AquaFish CRSP Topic Areas, including:

Topic Area: Marketing, Economic Risk Assessment & Trade

- Value Chain Analysis in Uganda
- Value Chain Analysis of Seaweed in Aceh, Indonesia
- Assessment of Tilapia Value Chain in Ghana
- Value Chain Analysis of Tilapia in Southern Mexico
- Value Chain Analysis of Freshwater Small-Sized Fish in Cambodia
- Value Chain Analysis for Black Cockles (*Anadara tuberculosa* and *A. similis*)
- Value Chain Analysis of Carp Polyculture Systems in Southern Nepal

Topic Area: Production System Design & Best Management Alternatives

- Experimental Pond Unit Assessment in Uganda
- Experimental Pond Unit Assessment in Bangladesh
- Experimental Pond Unit Assessment in Ghana
- Experimental Pond Unit Assessment in Kenya
- Experimental Pond Unit Assessment in Cambodia
- Experimental Pond Unit Assessment in Nicaragua
- Experimental Pond Unit Assessment in Southern Nepal

Topic Area: Indigenous Species Development

- Prospects and Potential of African Lungfish (*Protopterus* spp.) for Aquaculture in Uganda
- Developing Feeds for Larval *Dormitator latifrons* (Chame) Larvae
- Development of Sustainable Feeds, Improved Stocking Densities, and Salinity Management in Closed Recirculating Systems for Gar (*Atracosteus* spp.) Culture
- Effects of environmental conditions on gills and gas bladder development in bimodal-breathers, gar (*Lepisosteus* sp.), pirarucu (*Arapaima gigas*) and bowfin (*Amia calva*)

Topic Area: Technology Adoption & Policy Development (TAP)

- Training Trainers for Long Term and Sustained Impact of Pond Aquaculture in Africa



II. COMMUNICATING IMPACT AND RESULTS

CRSPs generate important technologies and information that could be better consolidated and used to improve outreach of these effective programs to various stakeholders. During this Fiscal Year, AquaFish CRSP will further analyze research results and make them available for wider access by the general public, end users, and the scientific community as well as extend ready CRSP technologies through new communication formats. Further, AquaFish has extended the subaward to Cultural Practices LLC to continue their initial work on the “The CRSP Council Knowledge Management and Communication Project,” a CRSP-wide effort to combine the wealth of information accumulated by all CRSPs into a single information clearinghouse/database.

During this Work Plan Period, AquaFish CRSP researchers will also continue to submit scientific manuscripts for publication. A partial list of anticipated publications for this work period is included in Appendix 2.



III. CAPACITY BUILDING AND OUTREACH

Long Term Training and Student Support.

AquaFish CRSP goals will be accomplished by managing an integrated, multidisciplinary, cross-cutting research and outreach program that will increase aquaculture productivity, enhance environmental stewardship, address gender integration, prevent further degradation of aquatic ecosystems, and increase domestic and export market opportunities, thereby increasing food security, economic well-being, and standards of living for citizens in participating Host Countries. AquaFish CRSP objectives address the need for world-class research, capacity building, and information dissemination. During this period, students enrolled in long-term training programs will continue to be supported towards degree completion.

Library Donation Project.

The AquaFish CRSP will continue to actively lead the Library Donation Project during this Work Plan period. Library donations, including books and journals from Oregon State University faculty and the OSU Valley Library, will be shipped to our Host Country PIs. Each PI determines the need for individual items that will be held in a publicly accessible library within their home institution. The Library Donation Project began in 1999 to help strengthen Host Country libraries in Africa, Asia, and Latin America.



APPENDIX 1: APPROVED TRAVEL

Table A-1 lists trips for program or project travel to various destinations that were pre-authorized under Implementation Plan 09-11 for 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 travel is presented as per ADS 303.I.18.a. Each entry represents one trip, and builds on previous pre-authorized travel. Travel is tracked by the ME with an online system.

Table A-1. Approved AquaFish CRSP international travel.

Departure Country	Destination Country	Approximate Travel Date	Trip ID
USA	China	FY2012	676
USA	Mexico	FY2012	677
Mexico	USA	FY2012	678
Kenya	USA	FY2012	679
Kenya	USA	FY2012	680
USA	Uganda	FY2012	681
USA	Kenya	06-2012	682
USA	Tanzania	07-2012	683
USA	Czech Republic (WAS)	09-2012	684
Mexico	Czech Republic (WAS)	09-2012	685
Kenya	Tanzania	07-2012	686
Kenya	Czech Republic (WAS)	09-2012	687
USA	Mexico	06-2012	688
Nepal	Tanzania	06-2012	689
USA	Nepal	06-2012	690
Nepal	Tanzania	06-2012	691
Nepal	Tanzania	06-2012	692
Mexico	LAC, Africa, Asia regions	06-2012	693
USA	Bangladesh	06-2012	694
USA	Indonesia	FY2012	695
USA	Argentina	09-2012	696
Philippines	Indonesia	FY2012	697
Philippines	Indonesia	FY2012	698
Philippines	Tanzania	07-2012	699
Philippines	USA	FY2012	700
Bangladesh	USA	FY2012	701

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Table A-1. Approved AquaFish CRSP international travel.

Departure Country	Destination Country	Approximate Travel Date	Trip ID
USA	Ghana, Kenya, and Tanzania	06-2012	702
USA	Ghana	06-2012	703
Ghana	Tanzania	07-2012	704
Cambodia	Vietnam	03-2012	705
Cambodia	Vietnam	03-2012	706
Cambodia	Vietnam	03-2012	707
Cambodia	Vietnam	06-2012	708
Cambodia	Vietnam	06-2012	709
Cambodia	Vietnam	06-2012	710
Cambodia	Vietnam	06-2012	711
USA	Tanzania	07-2012	712
USA	Tanzania	07-2012	713
Vietnam	Tanzania	07-2012	714
Cambodia	Vietnam	07-2012	715
Mexico or USA	USA or Mexico	06-2012	716
USA	Tanzania	07-2012	717
USA	Nicaragua	07-2012	718
Tanzania	Nicaragua	07-2012	719
USA	Uganda	FY2012	720
USA	Uganda	FY2012	721
USA	Czech Republic (WAS)	09-2012	722
USA	Tanzania	07-2012	723
USA	Tanzania	07-2012	724
Uganda	Tanzania	07-2012	725
Uganda	Tanzania	07-2012	726
Mexico	Tanzania	07-2012	727
Mexico	Czech Republic (WAS)	09-2012	728
USA	Czech Republic (WAS)	09-2012	729
USA	Ghana, Kenya, Tanzania	07-2012	730
USA	Australia (WAS)	FY2012	731
USA	Honduras, LAC Region	FY2012	732
USA	Asia	FY2012	733
USA	Asia	FY2012	734
USA	Ghana, Mali, South Africa (West/South Africa Region)	FY2012	735
USA	Nepal, India, Thailand, Bangladesh	FY2012	736
USA	Cambodia, Vietnam, Indonesia, Philippines	FY2012	737

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Table A-1. Approved AquaFish CRSP international travel.

Departure Country	Destination Country	Approximate Travel Date	Trip ID
USA	Nicaragua, Guyana, LAC Region	FY2012	738
USA	Tanzania	07-2012	739
USA	Tanzania	07-2012	740
USA	Vietnam	07-2012	741



APPENDIX 2: PUBLICATIONS IN PROCESS

Appendix 2 lists articles by current AquaFish CRSP participants on their recent CRSP-sponsored research, which are either planned for submission or have been recently submitted for peer review in 2012.

North Carolina State University

- Ayoola, A.A., P. R. Ferket, R. D. Malheiros, E. Won, C. Stark, R. Borski. Replacement of fishmeal by alternative protein ingredients in feeds for Nile tilapia (*Oreochromis niloticus*). [in preparation]
- Ayoola, A.A., P. R. Ferket, R. D. Malheiros, E. Won, C. Stark, R. Borski. Replacement of fishmeal by fermented mechanically deboned poultry meat in feeds for Hybrid striped bass (*Morone chrysops* X *M. saxatilis*). [in preparation]
- Borski, R., R. Bolivar, E.B. Jimenez, R. Sayco, P. R. Ferket, and C. Stark. The effectiveness of fishmeal-free and reduced protein diets on tilapia (*Oreochromis niloticus* L.) growout in ponds. [in process]
- De Jesus-Ayson, E.G. and R.J. Borski. Alternate day feeding reduces growout of milkfish in brackishwater ponds and seacages. [in process]
- Hu, P.R. Ferket, R. Borski, R. Bolivar and C. Stark. Effect of binders on pellet stability of tilapia feeds. [in process]
- Vera Cruz, E., R.B. Bolivar, R.J. Borski. Effect of broodstock social condition on tilapia (*Oreochromis niloticus*) seed production and growout. [in process]

Purdue University

- Agbo, N.W., E. Tetey, E. A. Frimpong, and S. Amisah. Growth performance of juvenile *Chrysichthys* sp. on manufactured diets in Ghana. [in process]
- Agbo, P. K. Akpaglo, E. A. Frimpong, and S. Amisah. Growth performance of juvenile *Heterotis niloticus* on manufactured diets in Ghana. Ansah Y. B., E. A. Frimpong, and S. Amisah. [in process]
- Anane-Taabeah, G., E. A. Frimpong, and S. Amisah. Factors affecting the cage aquaculture adoption-decision process in Ghana. [in process]
- Anane-Taabeah G, E. A. Frimpong, N. W. Agbo, and S. Amisah. Distribution and market potential of snakehead *Parachanna obscura* in Ghana. [in process]
- Ansah Y. B., E. A. Frimpong, and S. Amisah. Characterization of potential pond effluents and physico-chemical assessment of effluent-receiving streams in Ghana [submitted]
- Chenyambuga, S. et al. Evaluation of *Moringa oleifera* and *Leucaena leucocephala* leaf meals as protein sources in Nile Tilapia (*Oreochromis niloticus*) diets. [in process]
- Chenyambuga, S. et al. Effects of substituting soybean meal with *Moringa oleifera* leaf meal and sunflower seed cake as a sources of protein in Nile tilapia (*Oreochromis niloticus*) diets. [in process]
- Chenyambuga, S. et al. Effects of feeding levels and alternate day feeding of Nile tilapia (*Oreochromis niloticus*) using a diet containing mixture of *Moringa oleifera* leaf meal and sunflower seed cake as source of protein. [in process]
- Chenyambuga, S. et al. Comparative evaluation of growth performance of different tilapia species under on-station and on-farm culture conditions Lochmann, R. et al. Nutrient digestibility of *Leucaena leucocephala* and *Moringa oleifera* in Nile tilapia. [in process]
- Lochmann, R. et al. Growth, health, body composition, and proteolytic enzyme activity in juvenile tilapia fed diets with *Leucaena* or *Moringa* leaf meals in place of soybean meal. [in process]

- Lochmann, R. et al. Nutrient digestibility of *Leucaena leucocephala* and *Moringa oleifera* in Nile tilapia. [in process]
- Quagraine, K. et al. Consumer Preference for Farmed Tilapia in Ghana and Kenya: A Stated Preference Approach. [in peer review]
- Quagraine, K. et al. The Importance of Brant Test in Analysis Involving Ordinal Dependent Variables: Evidence from Consumer Preference Data. [in peer review]
- Quagraine, K. et al. Consumer Preference for Farmed Tilapia in Tanzania: A Choice Experiment Analysis [in process]
- Quagraine, K. et al. Economically Feasible Options for Increased Participation of Women in Kenyan Aquaculture Value Chain [in process]
- Quagraine, K. et al. Constraints and Opportunities for Increased Participation of Women in Kenyan Tilapia and Catfish Aquaculture Chain [in process]

University of Arizona

- Contreras-García, M. de J., W. M. Contreras-Sánchez, A. Mcdonal-Vera, U. Hernández-Vidal, C. A. Álvarez-González, S. Páramo-Delgadillo, and J.M.Vidal López. 2010. Variación reproductiva en hembras silvestres de chucumite *Centropomus parallelus* mediante el empleo del diámetro de ovocitos como indicador de maduración. Universidad y Ciencia. [submitted 2010]

University of Connecticut — Avery Point

- Le Xuan, S., R. Pomeroy. Aquaculture Economics and Management on Value Chain of Snakehead Fish in the Lower Mekong Basin of Cambodia and Vietnam. [planned]
- Pomeroy, R. The social and economic impacts of semi-intensive aquaculture on biodiversity. Reviews in Aquaculture. [accepted]
- So, N, S. L. X., N. Hap and R. Pomeroy. Value Chain of Small Sized Fish in the Lower Mekong Basin of Cambodia and Vietnam. [planned]

University of Hawai'i at Hilo

- Haws, M.C., N. Hernandez, R. Lazarich Gener, J. Bravo, E. Sandoval, C. Rivas and Q.S.W. Fong. Market channels and attitudes on product attributes for black cockles (*Anadara similis* and *A. tuberculosa*) in Nicaragua to support improved fisheries management and shellfish sanitation. Journal of Food Product Marketing. [submitted]
- Haws, M.C., E. Sandoval, N. Hernandez, L. Arias, E. Balladares, J. Bravo, C. Rivas, M. Montserrat and G. Laeiva. Depuration of black cockles (*Anadara similis* and *A. tuberculosa*) in the field and laboratory to reduce the incidence of shellfish-borne diseases in Latin America. Journal of the National Shellfisheries Association. [submitted]
- Rodriguez-Montes de Oca, G.A., E.A. Medina Hernandez, J. Velasquez Sandoval, V.V. Lopez Lopez, K. Dabrowski and M.C. Haws. Advances on Chame (*Dormitator latifrons*) larvae production for aquaculture. Revista Colombiana de Ciencia Pecuaria. [submitted]

University of Michigan

- Cao Ling. 2012. "Cradle to Grave" Applying life cycle thinking towards sustainability in aquaculture. Reviews in Aquaculture. [submitted]
- Cao Ling, J.S. Diana, and G. Keoleian. 2012. Applying life cycle thinking towards sustainability in aquaculture. North American Journal of Aquaculture. [in preparation]
- Cao Ling and J.S. Diana. 2012. Modeling the effects of management strategies on nutrient dynamics in intensive shrimp ponds in China. Aquaculture. [in preparation]
- Cao Ling and J.S. Diana. 2012. Characterization of Chinese shrimp farming systems towards typology, economic and social sustainability. Aquaculture. [in preparation]
- Diana, J.S. 2012. Is semi-intensive aquaculture a valuable means of producing food? An evaluation of its effects of on biodiversity in near shore and inland waters. North American Journal of Aquaculture. [in preparation]

Diana, J.S., H. S. Egna, T. Chopin, M. S. Peterson, L. Cao, R. Pomeroy, M. Verdegem, W. T. Slack, M. G. Bondad-Reantaso, and K. Dabrowski. 2012. Responsible Aquaculture by 2050: Valuing Local Conditions and Human Innovations Will Be Key. [in process]