AQUANEWS

Sustainable Aquaculture for a Secure Future

AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM NEWSLETTER

Volume 20, Number 4/Fall 2005 pdacrsp.oregonstate.edu ISSN 1062-4996

HCPIs Initiate Project with Thailand Study Tour

By Chris Bridger
Oregon State University

This year the Aquaculture CRSP funded a project entitled "Training and Information Exchange on Cichlids among Aquaculture CRSP Host Country Institutions." This project is compelling from many angles, and the premise is simple. The Aquaculture CRSP has funded research, in large part focused on some aspect of cichlid aquaculture, throughout the globe since 1982. However, there has been little opportunity for intensive information exchange between long-term Aquaculture CRSP Host Country PIs, with the exception of conference and workshop networking. The HCPI Exchange Project was conceived to bridge this gap and "facilitate the sharing and effective dissemination of information, methodologies, and technologies on cichlid biology and culture between sites. The knowledge gained through these visits will be applied towards accelerating aquaculture growth when the participants return to their home countries." A second goal of the project was to compare the adoption of Aquaculture CRSP technologies by cichlid producers in the five participating ACRSP host countries.

On 18 July 2005, Host Country Principal Investigators Amrit Bart (Thailand), Remedios Bolivar (Philippines), Dan Meyer (Honduras), Wilfrido Contreras-Sánchez (Mexico),

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Livelihood Diversification in the Cojimies Estuary of Northern Ecuador Through the Cultivation of Chame (*Dormitatus latifrons*)

By Ludgarda Rehfisch and Derek Simmonds, Fundación Ecocostas, Guayaquil, Ecuador

The SUCCESS (Sustainable Coastal Communities and Ecosystems) project is a global initiative for coastal zone management, aquaculture, and fisheries funded by USAID and implemented by the Coastal Resources Center (CRC) at the University of Rhode Island and the Pacific Aquaculture and Coastal Resources Center (PACRC) at University of Hawaii Hilo. This project is currently working in Ecuador, Nicaragua, Tanzania, and Thailand.

Farmers of the Cojimies Estuary find it increasingly hard to support themselves with traditional livelihoods.

In Ecuador, the SUCCESS project works in communities located on the Cojimies Estuary with several women´s groups to diversify the livelihoods of group members and local residents. The Cojimies Estuary is located just north of the equator on the border between the provinces of Manabi and Esmeraldas in northern Ecuador. This estuary was previously surrounded by mangrove forests, which were cut down first to supply tannin to the leather processing industry and later (and more thoroughly) to make way for shrimp farms. Mangroves remain in a few places around the estuary, but have largely been replaced by the shrimp farms.

Since the arrival of White Spot disease in the late 1990´s, shrimp farming has required more intensive management and has thus become more expensive. This, combined with declining world shrimp prices, made shrimp farming much less profitable, and as a result, there are many abandoned shrimp ponds in the area. Additionally, the decline in harvests of fish and mollusks in the estuary and rapidly increasing local populations have strained the ability of local residents to support themselves with traditional livelihoods.

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Photos by Nancy Gitonga

Pond construction at the Sagana Fish Farm.

Some of the fancy fishes grown at the farm are imported from Thailand.

Sagana Fish Farm Gives an Insight into Kenyan Aquaculture

By Chris Flemming

The Aquaculture CRSP developed its Ambassador program as a means to foster closer ties with USAID field missions and engage them in advanced understanding of the CRSP and the aquatic resources sector, provide qualified on-the-ground professionals to act as resources to the Missions, and help link Mission needs with CRSP capabilities.

In the first of a series of networking events, ACRSP Kenya ambassador (and Director of Fisheries for the Government of Kenya) Nancy Gitonga invited USAID mission personnel, Kenyan government officials, and representatives off Moi University to visit Sagana Fish Farm and neighboring independent fish farms. There they found that Aquaculture CRSP research and extension efforts have been instrumental in the growth of aquaculture in the area.

Members from USAID, Sagana Station, and Aquaculture CRSP Principal Investigators visited the Sagana Fish Farm, Kenya, on 30 June 2005. Charles Ngugi of Moi University took the visitors through an overview presentation of the ACRSP program. Topics from the presentation included a history of the program, projects undertaken by the program, achievements of the program, problems encountered, and future projections for the program.

The visitors were then given a tour of Sagana to see the ongoing research, various facilities, and construction of new ponds. Along the tour, the group visited an ornamental fish farm that neighbors Sagana Fish Farm whose owner, Mr. Kiama, has learned and used innovative pond construction techniques and water harvesting methods to start a small business. The group learned that Mr. Kiama has profited USD $12,500 since starting his business one year ago.

The trip gave members the chance to see an overview of opportunities and challenges facing fish farmers in Kenya and the contributions the ACRSP has provided in the development of aquaculture.

Representatives tour the Sagana Fish Farm hatchery.

CLSU-Aquaculture CRSP Project Funds Nine Undergraduate Students

By Remedios Bolivar, Central Luzon State University, Philippines

Over the past five years, the Aquaculture CRSP has been supporting undergraduate students from Central Luzon State University, Philippines, particularly at the College of Fisheries.

The support comes in the form of tuition fee reimbursement and a monthly stipend. This school year (2005–2006), the Aquaculture CRSP has supported nine undergraduate fisheries students:Emma M. Vera Cruz, Jayson P. Angeles, Reginor Lyzza B. Argueza, Mark Brian P. Dy, Andie John D. Tadeo, Roberto Miguel V. Sayco, Jamaica B. Mendoza, Apple Joy M. Balbin, and Rayzon John M. Espinosa. The students come from various years in their degree programs, and they were each introduced to the fisheries program through an orientation and interview with Aquaculture CRSP Host Country Principal Investigator Remedios B. Bolivar. The students then earned assistantships by showing continued interest and offering their services to the program whenever needed.

Remedios Bolivar

Aquaculture CRSP funds these undergraduate students in the Philippines.

Host Country PI Exchange Project Enjoys Mexican Hospitality

By Jeff Burright

For a week in the beginning of October, Host Country Principal Investigators from Aquaculture CRSP projects around the world gathered in Villahermosa, Mexico, for the third in a series of visits that constitute the HCPI Exchange Project (for a description of the project's goals, see our article on Thailand, page 1). The researchers—Amrit Bart, Thailand; Remedios Bolivar, Philippines; Charles Ngugi, Kenya; Suyapa Meyer, Honduras—and their host, CRSP researcher Wilfrido Contreras-Sánchez of the Universidad Juárez Autónoma de Tabasco (UJAT), dedicated a week to observe aquaculture research and outreach efforts in southern Mexico. Additionally, the researchers shared their own experiences and expertise with the students, researchers, governmental and NGO workers, and rural farmers who joined in this international event.

The group began their visit with a tour of UJAT's laboratory and research facilities to gain an initial perspective on Mexican aquaculture and see the source of much of its advancement in the region. An overview presentation from Wilfrido followed, which described the Department of Biological Sciences' structure and current research. In addition to its research, the lab produces and sells over 500,000 tilapia and gar fry to surrounding small-scale and commercial farms. Demand from farmers so exceeds their production that they achieve great success at this venture, and their earnings offset most of the costs of running the lab. As a result, the program can afford to build upon itself. The Department utilizes Aquaculture CRSP support to fund approximately 45 student scholarships that build a larger human infrastructure that can in turn perform more ambitious experiments and ensure that this growing number of trained professionals will continue to build Mexico's capacity for research and extension.

Jim Bowman

Host Country Principal Investigators and researchers from UJAT view gar at the Granja Acuícola Miraflores-Zapotal farm, which uses UJAT-CRSP methods.

UJAT also provides extension to the surrounding community, which includes no-cost pond planning and seed fry to starting farmers, and free technical assistance. Once these new farms begin to turn a profit, they become new clients for the Department's hatchery and technical services. This system enacts a symbiotic spread of production and ensures the responsible growth of aquaculture in the region. [*For more, read the graduate student profile of Rafael Martínez García on page 10.*] UJAT's ability to simultaneously enrich livelihoods through aquaculture and create new clients for its own growth creates an operational structure that is a model of sustainability.

After the introduction to UJAT and its methods, it was time for the HCPIs to visit local farms and hatcheries and see how aquaculture has developed throughout the region.

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Goings On

Congratulations to Chris Kohler, CRSP US Lead Principal Investigator on the Amazon Project, who has been elected President of the American Fisheries Society for the 2005–2006 year.

Kudos to CRSP researcher Bill Tollner, who was named Georgia Engineer-of-the-Year by the American Society of Agricultural and Biological Engineers Georgia Section.

CRSP researcher Kwamena Quagrainie recently moved from the University of Arkansas at Pine Bluff to Cornell University. Quagrainie joined the Department of Agricultural Economics at Cornell in September 2005, where he holds a joint appointment in Agricultural Economics and Forestry and Natural Resources. He plans to continue his CRSP research in his new location.

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HCPI Project in Thailand

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Nancy Gitonga (Kenya), and Benson Thiga (Kenya) met in Bangkok, Thailand for the first leg of this exchange. These researchers were selected based on their long-term and ongoing involvement with the Aquaculture CRSP and tilapia research. Representatives of the Program Management Office, including myself and Jim Bowman, accompanied the team to observe their achievements in their home countries and to help facilitate the workshops and information sharing.

Participants who arrived the day before had the unique chance to explore Bangkok and its rich culture and history, as the aquaculture information exchange was set to begin Monday morning. From this point, the PIs' business agenda in Thailand began in earnest. We started the day with a group tour of the Asian Institute of Technology's aquaculture-related facilities. AIT hosts the Aquaculture and Aquatic Resource Management Program. Through this program, AIT serves as a research hub for Southeast Asia; AIT also serves as the hub for Aquaculture CRSP research in the region, but this wasn't always the case.

Following the tour of the AIT facilities, CRSP researcher C. Kwei Lin gave a presentation that covered the history of the Aquaculture CRSP in Asia. Three distinct periods were described for Aquaculture CRSP involvement. The first period, known as the Tripartite Period, occurred between 1983–1986. This period coincided with the Global Experiment and involved Asian research sites in Indonesia, the Philippines, and Thailand. The second period, the Consolidating Period, existed from 1987–1992 in response to funding cuts. During this period, Aquaculture CRSP research was conducted in Thailand, and 20 ponds were built at AIT to accommodate this research. The third period, from 1992 to the present, is the Pan-Asian period. This period is defined by regional expansion of the Aquaculture CRSP network, with AIT serving as the research hub, and collaborative partnerships formulated with institutions in Bangladesh (2000–present), Cambodia (2001–2003), China (2005), Laos (2001–2003), Nepal (2001–present), and Vietnam (1998–present).

One could sit in an office anywhere in the world, thumb through old Aquaculture CRSP Reports, and read about the long-term involvement of the program in these countries. However, a perspective of the program cannot be complete without standing pond-side to directly observe the research in progress, conversing with students in their home labs to witness first-hand the opportunities afforded to them through their involvement with the Aquaculture CRSP, or touring fish farms where the farmers describe in their own words how Aquaculture CRSP research has had an impact on their farms' efficiency and subsequently, their quality of life. The shared knowledge gained through the HCPI project widens the possibilities for global efforts in aquaculture research in the future, and Wilfrido reflected this sentiment during his summary comments that, "The trip to Thailand was very enlightening and it has given perspective on the long-term tradition here of aquaculture."

Now it's off to the Philippines, Mexico, and Honduras for the next HCPI Exchange visits. Keep looking in the next few issues of *Aquanews* for details of those wonderful visits!

Photos by Jim Bowman

Left: PhD student D.R. Yuan (second from right) led the visiting PIs on an informative tour of the Asian Institute of Technology (AIT) hatchery facility. Here he describes the egg collection, incubation, and hatching system developed at AIT.
Right: Host-Country Principal Investigators (from left) Dan Meyer (Honduras), Remedios Bolivar (Philippines), Amrit Bart (Thailand), Nancy Gitonga (Kenya), and Wilfrido Contreras-Sanchez (Mexico) gather for a farewell photo near the end of their Thailand workshop.

Livelihood Diversification

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With financial assistance from USAID/Ecuador, La Fundación Centro Regional para el Manejo de Ecosistemas Costeros (EcoCostas) is implementing a Project for the production of chame with the local group "El Carmen." This group has approximately 120 members and has been operating in the area since 1999. Their hacienda is located close to the community of Mache, about 30 minutes from Pedernales by bus and about 35 minutes from San José de Chamanga, one of the three communities currently targeted by the SUCCESS Project. El Carmen manages several shrimp ponds on their hacienda. Among the livelihood diversification activities planned for the project is the development and promotion of improved methods of cultivating chame.

Chame (*Dormitatus latifrons*) is naturally found in brackish coastal waters from Southern California to Southern Peru. It is resistant to diseases, grows very fast, and reproduces easily in captivity. Chame is also resistant to environmental changes, thriving in a wide range of salinities and also able to breathe air. They are able to eat a wide variety of foods and are common in the Cojimies Estuary. With the abundance of shrimp farms in the Cojimies area, chame often find their way into shrimp ponds naturally. Local shrimp farmers began taking advantage of this as an additional source of income. Although chame is not the most visually appealing fish to some eyes, it is highly valued for its mild, white flesh. Chame has also been sold to a limited degree as an aquarium fish.

This project will convert one of the El Carmen ponds into a chame farm in order to better refine the techniques for managing chame farms, create a more reliable local source for chame fry, train local chame farmers, and promote the conversion of some abandoned shrimp ponds into chame ponds. We hope that by the second year of the project, local women´s groups and other small local producers begin this conversion of abandoned shrimp ponds.

Cultured chame (*Dormitatus latifrons*).

Chame cultivation in Ecuador is at a fairly undeveloped stage; few studies have been conducted on the species, and fish farmers are not yet able to buy chame fry from laboratories, as they do for shrimp. Chame cultivators typically use fry they collect in the wild or from shrimp ponds, as was formerly practiced with shrimp. The average time to harvest for chame is six to seven months, at which time the fish weigh between one and two pounds. They are relatively easy to cultivate and the major market is local, though recently some Ecuadorian chame has been sold on the international market. In the local market, local shrimp farmers are able to sell chame for around USD $0.50 per pound.

Local community members who directly benefit from this activity include the members of the women's groups and their families in the three communities (San Jóse de Chamanga, Daule, and Bolivar), who are the focus of the SUCCESS project (about 600 people). Indirect beneficiaries will include local shrimp farmers and their families (about 800 people) and the members of the Asociación Agro Artesanal El Carmen (about 120 people).

EcoCostas is the implementing partner of the Ecuador portion of the project. EcoCostas is a non-profit, nongovernmental organization based in Ecuador and is associated with the CRC of the University of Rhode Island. Since its formation in 1999, it has worked throughout Latin America in the design, implementation, and evaluation of Integrated Coastal Manangement (ICM) projects and training programs, as well as in the development of participative systems to promote the exchange of knowledge of Integrated Coastal Management projects among both public and private entities.

www.ecocostas.org | luga@espoltel.net | dereksimmonds@espoltel.net

Aquaculture CRSP Lead Principal Investigator Maria Haws and previous Co-Principal Investigator James Tobey are currently engaged in collaboration with the SUCCESS program as extension specialists. The SUCCESS program's activities operate in cooperation with the USAID/EGAT Water Team, with whom the CRSP is also a partner.

East Africa Mariculture Extension Workshop Builds Capacities Through Shared Experience and Planning

By Chris Flemming

The Aquaculture CRSP management entity sponsored Aloyce Kaliba, a research associate with the CRSP Tanzania project at the University of Arkansas at Pine Bluff, to attend a Mariculture Extension Workshop in East Africa from 27 June to 2 July 2005. The workshop was organized by the Sustainable Coastal Communities and Ecosystems Program (SUCCESS) with advertising assistance from the ACRSP and presented by the Western Indian Ocean Marine Science Association (WIOMSA). The objective of the workshop was to introduce participants to different methods of mariculture and aquaculture extension methods and associated limitations. At the end of the workshop, participants were expected to be able to understand how extension fits within the framework of integrated coastal management governance, design different extension strategies and methods for use in aquaculture and mariculture, and identify the priority areas, limits, and constraints of extension in aquaculture and mariculture in East Africa. The participants were also expected to identify opportunities for alliances and strategies for institutional cooperation on extension in aquaculture in East Africa and identify applications of extension tools and strategies to aquaculture and mariculture projects.

The workshop was divided into three themes:
1) Extension methods;
2) Evaluation of extension effectiveness; and
3) Experience in different extension application methods.

Kaliba presented on economic and marketing aspects of extension and examples of economic tools used to evaluate new technical innovations. He introduced two concepts: enterprise budgets as tools to assess economic needs and potential success for a farm; and partial budgets as a tool to assess the economic profitability of innovations.

During the workshop, the theory and practice of mariculture extension in the context of integrated coastal management was offered. The objective was to strengthen the ability of individuals and institutions to plan and implement mariculture extension programs. In both courses, technical topics focus on the culture technology of low-input native species and on marketing, economics, and business management for sustainable mariculture and aquaculture. Environmental management of mariculture and aquaculture was also a key topic. The workshop covered the following:

- Identifying the key clients for your extension efforts;
- Understanding the knowledge, skills, and attitudes of a good extension agent;
- Developing an extension strategy and plan;
- Using the right tools and techniques for extension;
- Evaluating the effectiveness of your extension interventions;
- Sharing personal experiences and case studies of extension efforts in East Africa; and
- Training in the basics and methods for culture species: milkfish, bivalve, and seaweed.

The course also introduced the concept of governance base lining as a tool for bridging the gap between program planning and program implementation. It was targeted to individuals working on a day-to-day basis to provide technical assistance in mariculture or aquaculture to coastal inhabitants, or to individuals managing mariculture or aquaculture. The second course will address the application of the theories to real world situations.

Photos by Aloyce Kaliba

Left: A tilapia pond being constructed at Mfuru-mwambao village, Mkuranga District, in the Coastal Area of Tanzania using manual laborer with help from a small compact machine. Center: After nine days of blood and sweat, the pond is ready.

Aquaculture CRSP Photo Contest!

Dear CRSP participants,

The Aquaculture CRSP uses archived photos for products such as posters, training manual covers, *Aquanews*, the ACRSP DVD, and promotional material for USAID. The difficulty here is that the photos we have are starting to show their age, and our best images risk overuse.

Therefore, we are hoping that you, our readers, can help us replenish our supply of excellent pictures. Just a few photos from any of your CRSP-related activities from the past few years will allow us to showcase the best of your current activities.

Furthermore, we are offering **prizes** for your submissions! The top 5 photo entries will receive Aquaculture CRSP t-shirts.

Hillary Egna

What we're looking for includes:

- You!—We like pictures of our CRSP participants, on-site, meeting collaborators, or in the lab or classroom.
- Host Country Sites—Physical locations are apt to change over the course of 10–20 years, and we'd like both to stay current and to see how things have improved/changed over our time there.
- Extension Work—If people from the public visit you, we'd like to see it. If you visit a Host Country, we'd like to see that too.
- Ways in which the CRSP has made an impact—Markets, backyard ponds, farmers using safer practices, any situations or examples where the CRSP can help or is helping already.

Along with a photo, will you please include:

- What the picture is showing;
- Where and when the picture was taken;
- Provide background on the news, event or story and describe why the photo is significant; and
- Photographer and affiliation for photo credit.

Here are the ways you can send photos:

- If you have hard copy pictures or film and can make duplicates, please send them to our physical address (located on the back page of *Aquanews*).
- If you have hard copy pictures and you **cannot** make duplicates, send them with an attached note indicating that you would like your photos back and we will scan them here and return them immediately.
- If you have electronic files of your photos, you can either email them to burrighj@onid.orst.edu or put the files on CD and mail it to our physical address.

Thanks, and good luck!
Jeff Burright
Publications and Communications Manager

Announcing the Aquaculture CRSP Book Donation Program

The Aquaculture CRSP receives a continuous donation of journals and books on topics spanning agriculture research, natural resources, economics, aquaculture, and more. In order to share these resources with our host countries, we would like to announce the opening of our Library Donation Program to all HCPIs.

ACRSP host country participants are encouraged to visit the website at http://pdacrsp.orst.edu/pubs/books_available.htm, where the available literature has been compiled into eight listings by subject. The categories are: Aquaculture, Agriculture, Economics/Finance, Food, General Science, Horticulture, and Law.

If interested, please email Thuy Le, Aquaculture CRSP Library Donation Coordinator, at lethu@onid.orst.edu. There is no limit to the amount you may request, and all shipping costs will be covered by the Aquaculture CRSP. We fill requests on a first come, first served basis.

Please Note: The Library Donation Program is designed so that the Aquaculture CRSP can provide assistance **only** to ACRSP participants located in host countries. Further, any books provided to host countries through the Library Donation Program **must** be placed in a common library or resource room widely accessible throughout an institution and **not** placed within a personal book collection.

HCPI in Mexico

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The first stop was the Kab-Ja Fish Farm outside Villahermosa. This semi-intensive farm has been in operation since 2003 as a private investment, with technical assistance from UJAT. The farm contains a fry production laboratory, a juvenile grow-out area, and a final grow-out area, and it produces 12 tons of fish with 5,000,000 fry per year. Wilfrido challenged the group before they arrived, "This farm is a kind of test. See if you can find places where it should be running better." The PIs offered feeding and rearing advice to the farm manager to help the operation run more efficiently and observed their nearly completed fish harvesting plant, a service which the owner hopes will add value to fish harvests throughout the area.

Jeff Burright

Tilapia harvest at the state hatchery "Jose. N. Rovirosa."

Finally, the Mexican hosts showed the HCPIs a representative example of UJAT's symbiotic extension methodology that was initiated by a group of over 20 rural families that came to the university looking for help to start a cooperative aquaculture venture. With the aid of the researchers and a grant from a Government of Mexico social development program, the group carved five earthen ponds from banana plantation land, seeded them with UJAT tilapia and robalo fry, and at the time of the HCPI visit were two months away from their first harvest. Ulises Hernandez-Vidal, one of the Aquaculture CRSP/UJAT researchers who visits the farm on a regular basis to assist the new farmers, related that most of these people have no homes and thus no capital to spare for feeds and fertilizers and are more open to conducting on-farm trials and experimental methods that promote sustainability. When they heard the results of CRSP Philippines project research that delayed the onset of feeding by 90 days and received comparable fish yields, they decided it was worth a try. The results so far are successful, and as their first profit nears, the UJAT extension group is helping the cooperative decide how to best reinvest their revenues for continued growth in their new business.

Jim Bowman

Ponds at the farm cooperative "La Tenhuayaca" were designed and overseen by UJAT and used CRSP Philippines research.

The HCPI Exchange Project offered instances throughout the visit where the participants found they had much to share with one another. For instance, Remedios Bolivar was pleased to see her research on delayed feeding adopted outside the Philippines. Also, when Contreras revealed that a major constraint in their extension efforts to local farmers has been the inadequate amount of literature that translates university-level research and benefits into layman's language that can be easily understood and applied in the pond setting, Suyapa Meyer from Honduras offered the use of the Spanish language manuals that her institution, Zamorano University, recently developed for just such an audience. The open channel of the HCPI project was designed to facilitate these kinds of solutions and develop new independent relationships between our CRSP Host Countries.

The Principal Investigators saw a Mexico where its aquaculture practice is still young, the constraints are many, and the need is significant. Despite its growing pains, they also witnessed active progress and enthusiasm in all levels of the science, from the top where policy is made to the land that the rural poor utilize to build their economies and feed their families.

Graduate Student Profile: Rafael Martínez García

Rafael Martínez García has been a student of aquaculture at UJAT, Mexico, for the past four years working with other researchers to study the endemic garfish in the belief that this fish will diversify the market and strengthen aquaculture's ability to improve the lives of the rural poor. Rafael began his studies at UJAT in biology, but after his second year he was drawn to aquaculture. "I began with cleaning the tanks, but the more I studied, the more I got involved in the research."

Gar nets almost three times the profit of tilapia in Mexico because it fills a niche in a marketplace saturated with tilapia. Native species research can face challenges in its early stages, however, as the dedication of a new, regionally specific culture species entails years of research on limited global support in order to grow efficiently in a pond setting. Rafael and others at UJAT strive to make gar accessible in a small-scale farm setting.

Rafael's senior project focused on antibodies and reproduction in the female gar. With most species, hatchery workers determine fish maturity through a biopsy of the eggs, which in turn lets them know when to induce spawning. Gar, however, possess a uniquely sticky egg that is nearly impossible to biopsy and presents a barrier to reproduction. Rafael's research developed a system to measure proteins in reproductive antibodies and determine gar maturity. This is the first indirect sign of spawn readiness for this new culture species, and it provides technicians with a new tool to save time and increase production levels.

In addition to his student research, Rafael plays a large role in UJAT's efforts to extend aquaculture to the surrounding population. This work allows the students to present tilapia to members of rural communities, introducing fish farming as a means of providing food and income. If a party is interested, they develop a detailed farm plan with the help of Rafael and other students and staff in order to petition government social programs to assist with the startup capital.

Once a plan has been approved, the students participate in on-site visits to supervise construction, fertilization and feeding, and the harvest. "You make an agreement, man to man. You can't just give them fry and say 'good luck.' You have to stay and make sure they make it." These visits occur once per month at each of the six current projects and will continue through the first successful harvests. Rafael and the other UJAT representatives then advise the farm cooperatives on the best way to reinvest their profits for further growth with their next crop.

In January Rafael will begin his masters degree at the University of Arizona with CRSP researcher Kevin Fitzsimmons studying shrimp-tilapia polyculture. Afterward, he plans to earn a Ph.D. and ultimately return to Tabasco and continue his work with gar research and aquaculture extension to new farmers. "There's so much to do. Production and extension is hard, but we need it, and the harvest for the poor is the prize at the end."

Wararat Wudtisin

25 November 1978–15 July 2005

By Claude Boyd

Courtesy of Global Water Watch, Auburn University, Department of Fisheries and Allied Aquacultures

Wararat Wudtisin, known as Bird by all her friends, died in an automobile accident near Macon, Georgia, on 15 July 2005. Bird was from Thailand and graduated from Kasetsart University in March 2001. She came to Auburn University as a graduate student in the spring of 2002, received a masters degree in Fisheries Science in December 2003, and was continuing her studies in the doctoral program. Bird's studies at Auburn University, as well as those of her sister, Idsariya, were partially supported by the ACRSP. They met a number of other ACRSP participants while at World Aquaculture Society meetings in Honolulu and New Orleans.

Bird was a delightful person and a diligent worker. She particularly enjoyed being involved in outdoor activities. Bird also was an excellent student and had the highest grade point average among the current group of doctoral students at Auburn. She was posthumously awarded the Swingle Award in the Department of Fisheries and Allied Aquacultures in recognition of her scholarship. Wararat will be greatly missed by all who knew her.

Aquaculture CRSP at World Aquaculture 2005

Tilapia and Aquaculture CRSP Session
12 May 2005 8:30–17:30
Bali, Indonesia
Chair: Kevin Fitzsimmons

Kevin Fitzsimmons*
Overview of Global Trade and Markets for Tilapia–2005

Kim Thai Yong
Experiences in the Tilapia Culture and Marketing in Malaysia

Isaac Fandika
Growth and Reproduction of *Oreochromis shiranus* Stocked at Different Densities at Bunda College of Agriculture in Malawi

Yang Yi*
Mitigating the Effects of High Temperature and Turbidity on Seed Production of Nile Tilapia from Hapa-in-Pond Systems

Graham C. Mair
The Status and Impact of Genetics Research in Tilapia Aquaculture

Harrison Charo-Karisa
Estimates of Phenotypic and Genetic Parameters for Carcass Traits in Nile Tilapia Selected for Fast Growth in Low-Input Conditions

Jose C. Mota-Velasco
Genetic Sex Determination in Nile Tilapia: Comparison of a Sex-Linked Marker and Progeny Testing

Yonas Fessehaye
Microsatellite-Based Parentage Analysis and Male Reproductive Success in Nile Tilapia *Oreochromis niloticus*

M.A. Wahab*
Evaluation of Production Performance of Gift Strain of Tilapia *Oreochromis niloticus* in Polyculture with Common Carp *Cyprinus carpio* and with Two Major Carps *Catla catla* and *Labeo rohita*

Nahrowi Ramli
Effects of Formiò Inclusion Rate on Growth Performance of Infected Tilapia by *Vibrio anguillarum*

Hambali Supriyadi
The Incidence of *Streptococcosis* in Nile Tilapia *Oreochromis niloticus* Farm in Indonesia

Wing-Keong Ng
An Overview of the Nutrient Requirements and Feeding of Tilapia

Frank Liebert
Threonine Requirement of *Oreochromis niloticus* Depending on Dietary Threonine Efficieny and Protein Deposition

Frank Liebert
Optimal Lysine : Threonine Ratio of *Oreochromis niloticus* Depending on the Amino Acid Efficieny in the Feed

Zhigang Zhou
Yeast Culture Supplementation in the Feed of Hybrid Tilapia *Oreochromis niloticus x O. aureus* in Cages: Replacement of Antibiotic

Lourens F. de Wet*
Quantifying the Nutritional Contribution of Natural Productivity in the Pond Culture of Mozambique Tilapia *Oreochromis mossambicus*

Yoram Avnimelech
Feeding of Tilapia on Microbial Flocs: Quantitative Evaluation Using Material Balances

M. Sharif Uddin
Effects of Periphyton Substrates and Addition of Freshwater Prawn *Macrobrachium rosenbergii* on Pond Ecology and Tilapia *Oreochromis niloticus* Production

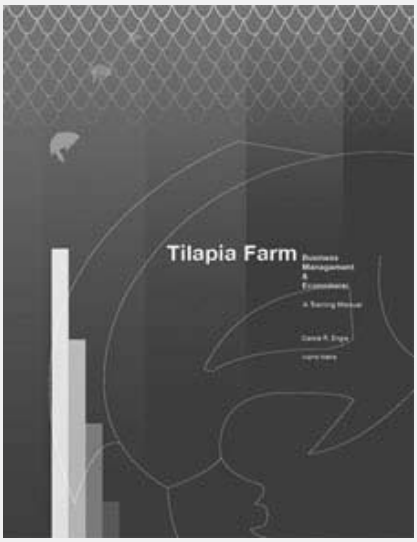
*** CRSP participant**

New Manual on Farm Business Management and Economics

The Aquaculture CRSP has produced a new manual, titled *Tilapia Farm Business Management and Economics: A Training Manual*, as a supplementary management guide for tilapia farmers, extension officers, commercial producers, and students worldwide. It was developed by CRSP researchers Carole Engle and Ivano Neira.

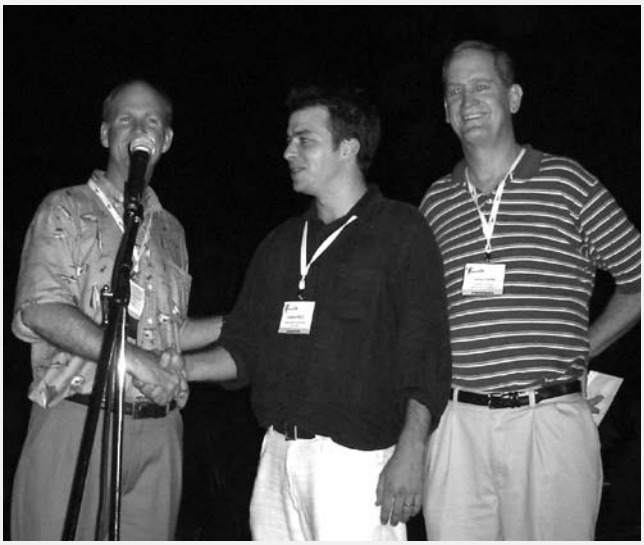
Efficient management of a tilapia farm can make the difference between profits and losses even in years with unfavorable prices and costs. Farm management involves more than just taking care of the biological processes involved; it includes paying close attention to economic and financial measures of the farm business also.

This manual provides a practical overview of economic and financial indicators and analyses to use to better understand the performance of the tilapia farm business, and it is designed to assist farm owners and managers in making informed management decisions on tilapia farms. The booklet presents pro forma financial statements accompanied by instructions for tailoring these statements to specific farm situations. The examples used in the training manual are all based on data obtained from different tilapia farms in Kenya over the previous five years. The sample budgets and analyses are based on prices and cost conditions in the country at that time, with some assumptions.



The manual is the product of an activity to develop pro forma financial statements for use as components of business plans. The manual can be used as a self-guided tutorial to build feasible business plans, and while developed in the context of Kenya, the *Tilapia Farm Business Management and Economics* training manual is useful worldwide.

WAS 2005, Bali, Indonesia Best Student Poster Award Winners



WAS past President Kevin Fitzsimmons (left) and CRSP TC Co-Chair Jim Diana (right) present the first place award to Charlie Price.

First Place:
Effects of Pesticide Residues on Vegetables Grown in Ditch Dyke Systems and Implementation of Pesticide Minimisations Experiments in Central Thailand
Charlie Price, Dave Little, and Paul Van den Brink
Institute of Aquaculture
University of Stirling
Stirling, Scotland

Second Place:
The Water Quality of Aquaculture Sites by Using Lactobacillus *sp. as a Probiotic Microbial Species*
Shanti Dwita Lestari
Fisheries Product Technology Department of Fisheries and Marine Science Faculty
Bogor Agricultural Institute, Indonesia

Third Place:
Karyotype Analysis and Chromosomal Localization by Fish rDNA, Telomeric (TAAGGG)n, and (GATA)n Repeats in Haliotis fulgens *(Archeogastropoda: Haliotidae)*
Cristian Gallardo-Escárate*, Josué Álvarez-Borrego, Miguel Ángel del Río-Portilla, Ismael Cross, Alejandro Merlo and Laureana Rebordinos
Centro de Investigación Científica y de Educación Superior de Ensenada
Km 107 Carretera Tijuana
Ensenada, Código Postal 22860
Ensenada, B.C., México

Upcoming Events

International Symposium on Lepisostid Biology and Culture
5–7 December 2005
Villahermosa, Tabasco, Mexico

Aquaculture America 2006
13–16 February 2006
Las Vegas, Nevada, USA

Aquaculture CRSP Annual Meeting
7–9 May 2006
Florence Italy

World Aquaculture Society 2006
9–13 May 2006
Florence Italy

2nd International Symposium on Cage Aquaculture in Asia (CAA2)
3rd ~ 8th July 2006
HangZhou, Zhejiang Province, China

IIFET 2006
11–14 July 2006
Portsmouth, United Kingdom

5th International Aquaculture Extension Training Course in the Amazon Region and First Amazon Aquaculture Meeting
11–14 April 2006
Macas, Ecuador

Goings On

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This summer marked a farewell for Aquaculture CRSP Associate Director Danielle Clair. Danielle was a part of the CRSP for over ten years, and she was an integral part of our team through a great deal of growth and change. She has gone on to bigger and better things, and we wish her all the best.

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Aquanews is published by the Aquaculture Collaborative Research Support Program, Oregon State University, 418 Snell Hall, Corvallis OR 97331-1643. <pdacrsp.orst.edu>

The Aquaculture Collaborative Research Support Program is funded in part by the United States Agency for International Development under CRSP Grant No. LAG-G-00-96-90015-00 and by participating US and host country institutions.