
## Letter from the Director

Aloha!

As you may be aware, the Obama Administration has recently directed government agencies to prepare FY13 budget requests that are least 10% below their current appropriation levels. According to a letter from Dr. Gary Jensen, "agencies are directed to identify programs that are cost-effective and 'provide the best opportunity for economic growth."

In my opinion, CTSA and the other four centers that make up the RAC program are an asset to securing the US seafood supply and boosting the economy. However, these recent budgetary developments will signify tighter scrutiny of the program, as well as the research projects supported by each center. As we move forward, projects that promise significant, immediate economic impacts in CTSA's region will be the ones most likely to receive support. I hope this will encourage researchers to think creatively about the most effective ways aquaculture can provide new revenue streams and enhance existing operations in Hawaii and the Western Pacific. Although we typically hold one funding cycle per calendar year, we at CTSA are always on the lookout for any projects that have the potential to fulfill our mission.

In this month's issue of e-notes, you will find a link to CTSA's annual "Progress Report to the Public" presentations. Also in this issue is information from the recently released 2010 Hawaii Aquaculture statistics, and the Pacific Island Spotlight features a report from the CTSA aquaponics project in American Samoa. Enjoy!

Mahalo,

Cheng-Sheng Lee
Executive Director, CTSA

## In This Issue



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## 2010-2011 CTSA Progress Reports to the Public

Each summer for the past few years, CTSA has held a Progress Report to the Public meeting on the island of Oahu. At this annual event, Principle Investigators present findings from their recently completed CTSA projects to other researchers, farmers, and industry stakeholders.

In an effort to increase accessibility to the valuable information contained in these presentations, we have decided to post them on the CTSA website in lieu of an in-person meeting. We hope that this format will allow us to reach more of our constituents across the Pacific.

Click here to visit the 'Videos' page of our website, where you can access the presentations for projects completed between June 2010 and May 2011. Some of the narrated presentations have been converted to YouTube videos for your viewing pleasure; the remainder are in a simple streaming format on the authorSTREAM website (all presentations are also available for download in PPT format on the authorSTREAM site).

We hope you find the information contained in these presentations useful. If you have any questions about a specific project, or comments and suggestions for our information dissemination efforts, please contact mbrooks@oceanicinstitute.org

## Pacific Island Spotlight: Transferring Aquaponics Knowledge to American Samoa

*by Harry Ako, Ph.D., and Kiara Sakamoto*

An aquaponics system was designed for use in the Pacific Islands (Ako and Baker, 2009). The systems are especially suited for the Pacific Islands or urban environments because they are able to produce large quantities of produce on a relatively small area of land, use negligible amounts of freshwater, and release no effluent into the environment. Our systems grew fish and vegetables symbiotically; the fish provide nutrients in the form of metabolites and the plants use these metabolites for growth, providing clean water for the fish.

The original system designed by Rakocy was not optimized and after many years there was not a single commercial entity doing aquaponics (Rakocy, 1989; Rakocy et al., 2004). Our first work was adaptation of a cost effective hydroponics system (Kratky, 2005) which then led to the elucidation of a nutrient flux hypothesis (Ako, 2010). This work matched nutrient production by fish to crop needs. We prepared a workshop and manual (Ako and Baker, 2009) and this led to some establishment of aquaponics businesses and many backyard and urban applications.

Manoa lettuce and kai choy about a week or two from harvest at Apela Afoa's property in Taputimu.

American Samoa is a group of Pacific Islands where resources such as fertilizer, water, and land are scarce. The population consists mainly of indigenous farmers who work the land in accordance to tradition to produce fruits and vegetables. However, land is at a premium, costing over $40,000 per ¼ acre if available at all. In addition, specialty products are often hard to find and are very expensive in comparison to the prices of the same products in Hawai'i or the United States proper. It would be ideal for farmers to adapt aquaponics for use in American Samoa in order to produce food for themselves and create some income from their production. The present work summarizes the data and knowledge gained from extension work in American Samoa and evaluates the work done to determine the practical use of an aquaponics system there.

In the first phase of planning for extension work, housing was considered too expensive for the six week stay there. A farmer, Apela Afoa, volunteered a room of his Western style concrete house for Kiara to live in. His house is located in the village of Taputimu on the Southwestern, flat portion of the island of Tutuila, the largest island in American Samoa. We didn't encounter any traditional one room fale and the traditional hardwood-post guest houses called fale talimalo where family convene for meetings are now made of more modern materials such as concrete and tin. The Afoa house is situated on a small portion of the total property, just over 30 acres of relatively flat, cleared land. Our work plan in extending the aquaponics technology was to build and operate a system for one crop cycle alongside motivated Samoans. We would like to extend special thanks to Apela and Mina Afoa and the entire Afoa family for offering their home and hospitality to us.

Most of the materials were bought in Hawai'i and the larger items had to be shipped over to American Samoa. Different services were investigated prior to departure including surface and air

freight methods. However, in the course of that research, we found that shipping items to American Samoa using surface freight methods would entail first shipping the items to mainland America, typically to San Francisco, and then shipping from there to American Samoa. This would not save a significant amount of money and we shipped everything by air freight. Thanks to Ian Gurr and Francis Leiato for helping with the purchase of the rest of the building materials in Samoa.

Figure 1. A Land Grant intern drilling holes in the polystyrene for the net pots. Figure 2. Apela's grandson drilling screws into the tray bottom to secure the 2x4's to it, making a box.

Contrary to our original plans, the entire system was built and running by the time the first workshops were given and the participants simply viewed the finished system. This was not a problem since many of the people in American Samoa have practical experiences in carpentry and construction. But the people who helped us build the systems learned a lot. There is nothing like hands on experience. The stacks of bricks that support the 8 x 16 ft grow trays were first leveled. Holes for the net pots were drilled in the polystyrene panels at 12 holes per 2 x 4 ft panel (Fig. 1). In the future as shipping costs for polystyrene panels will be very high, perhaps ¼" painted plywood would be used to support net pots.

The grow trays were then assembled by clamping the 2x4's to 3 of the edges of a ¾ inch, 8x4 foot plywood. Sides were then screwed to the bottom of the tray (Fig. 2). The two trays were constructed separately at first, then pieced together after they were flipped upright. A continuous, two layer sheet of 6mm polyethylene plastic was then laid into the trays and stapled to the tray with a staple gun (Fig. 3). Helpers who volunteered to build the systems felt competent enough to allow them to build much larger systems, such as 12 tray raceways, should they decide to build commercial units.

The fish were acquired from a local tilapia farmer named Sefulu Laulu and another farmer named Kamal Singh. Sea Grant agent Ephraim Temple arranged the purchase. Sefulu had been feeding his slow growing, red O. mosambicus hybrid tilapia grated coconut, pig food pellets, bread, and laupele (edible hibiscus) leaves which is why the fish took so long to adapt to the pelleted fish food we use. Kamal's fast growing, black O. niloticus hybrid tilapia adapted immediately to the fish food because he had been feeding them dry dog food and laupele leaves. The CTSA project on locally produced fish food in American Samoa is critical for the future otherwise the whole effort to introduce successful aquaponics there will collapse. Many thanks go to Larry Hirata for filling in rough spots for our systems.

Outside of the workshops, most of my time was spent teaching Apela and his family how to feed the fish appropriately and how to test and interpret water chemistry (Fig. 4). He and his family are all eager to learn as much as they can about running the system and troubleshooting when necessary. We know that fish feeding drives the success of fish and vegetable growth and suggests water quality issues. The fish feeding and behavior tells us when the system is running efficiently and when maintenance needs to be done.

The difference in the successes of Apela's system and Land Grant's two systems (ours and a previously built Rakocy system) illustrated the importance of system management relating to the care of the fish. The system at Land Grant proved to be a challenge since the buildings are closed and inaccessible on the weekends, leaving the fish unfed for two or three days at a time. In

Figure 3. Francis Leiato helping to staple the polyethylene plastic sheet to the tray. Figure 4. Apela Afoa learning to test and analyze the water quality for ammonia, nitrite, nitrate, and oxygen using liquid testing kits.

contrast, Apela's system could be managed daily as recommended. Even expensive, complex systems such as Land Grant's version of the Rakocy style system falters without proper daily care.

Encouraged by his success with our system in his village, Apela plans to provide vegetables for the Sodexo school lunch program and has started developing a co-op he and Larry plan on establishing for his village. He is actively teaching family members and visitors to his system all about it and its care and maintenance. He also plans to expand to the small grocery stores in addition to producing enough to provide for his large family. The New Zealand grown produce that is presently sold in the markets have a very short shelf life and Apela's goal is to expand his farm to about 5 raceways to provide fresh vegetables to the stores in place of the imported ones. Leadership and economic development fit well with his office of high talking chief for his district. We feel that we should work with the local culture rather than opposing or ignoring it. Albert Seliga another local farmer also had a system installed in his backyard. Using the knowledge he gained from the workshops, he plans on providing a nearby restaurant with vegetables from his system. Upon our departure we made it clear that no matter how educated any given farmer is, his success or failure depends on being a professional; dedicated to the care and maintenance of his system.

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## Announcements: Hawaii Aquaculture Stats, NIFA logo, Aquaponics Article

***Hawaii Aquaculture Statistics Released***

Hawaii grown aquaculture totaled $30.0 million in 2010, dropping 7 percent from the previous year and falling for the second year. Algae sales accounted for 56 percent of the value and amounted to $16.7 million. The 'other' category which includes seed stock, brood stock, fingerlings, and other items counted by number, accounted for 33 percent of the total or $9.8 million and increasing 26

percent from a year ago. The ornamental category was pegged at $1.8 million or 6 percent of the total. Finfish sales by weight totaled $1.0 million contributing 3 percent to the total. Shellfish sales by weight was valued at $575 thousand, making up the remaining 2 percent of the total.

Click here to view the PDF (produced by the National Agricultural Statistics Service, USDA) on the CTSA website.

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***NIFA Has a New Logo!***


The National Institute of Food & Agriculture (NIFA) is the USDA entity responsible for oversight of the RAC program and CTSA.

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***Researcher Dr. Clyde Tamaru and Oahu Aquaculture Farmer Fred Lau Featured in Hawaii Business Aquaponics Article***

Click here to check out the August 2011 article featuring CTSA-sponsored researcher Dr. Clyde Tamaru (CTAHR) and aquaculture farmer Fred Lau. The article highlights aquaponics, specifically the system setup at Mr. Lau's farm, Mari's Gardens.

## AquaClip: Study Assesses Nations' Vulnerabilities to Reduced Mollusk Harvests from Ocean Acidification

*Originally published on http://esciencenews.com, August 2, 2011.*

Changes in ocean chemistry due to increased carbon dioxide ($CO_2$) emissions are expected to damage shellfish populations around the world, but some nations will feel the impacts much sooner and more intensely than others, according to a study by scientists at Woods Hole Oceanographic Institution (WHOI). As $CO_2$ levels driven by fossil fuel use have increased in the atmosphere since the Industrial Revolution, so has the amount of $CO_2$ absorbed by the world's oceans, leading to changes in the chemical make-up of seawater. Known as ocean acidification, this decrease in pH creates a corrosive environment for some marine organisms such as corals, marine plankton, and shellfish that build carbonate shells or skeletons.

Mollusks-including mussels and oysters that support valuable marine fisheries-are particularly sensitive to these changes. The new study, which was published online July 7, 2011, by the journal Fish and Fisheries, assesses nations' vulnerabilities to decreases in mollusk harvests caused by ocean acidification.

"Some of the most important functions that marine ecosystems provide are food and income from harvests," said lead author Sarah Cooley, a marine geochemist at WHOI. "Nations around the world have different patterns of dependence on these marine resources, and those that depend heavily on mollusks will have to make some changes if they want to continue to have that resource readily available in the future."

Among the nations expected to be most heavily impacted are Senegal, Madagascar, Gambia, Mozambique and Haiti. In addition to a high dependence on shellfish, they also currently lack mollusk aquaculture and are already struggling with protein deficiencies.

Click here to read the full article.

The Center for Tropical and Subtropical Aquaculture (CTSA) is one of five regional aquaculture centers in the United States established and funded by the U.S. Department of Agriculture's National Institute of Food and Agriculture (NIFA) under grants 2006-38500-16901, 2007-38500-18471, 2008-38500-19435, and 2010-38500-20948. The regional aquaculture centers integrate individual and institutional expertise and resources in support of commercial aquaculture development. CTSA was established in 1986 and is jointly administered by the Oceanic Institute and the University of Hawaii.