CTAHR Research News

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Special focus on aquaculture, hydroponics and aquaponics

Clyde Tamaru stands behind a WCC modified “barrel-ponics” system growing taro.

Water-based agriculture in CTAHR

NIFA / AFRI funding is announced

Student, Kristen Domingcil, wins education support

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From the Associate Dean and Associate Director for Research

With the Health Care Initiative passed out of the House, the focus is now back on how to control federal spending. The Democrats have challenged the Republicans to do away with special grants to private companies and the Republicans countered by proposing to get rid of all special grants completely! This line of discussion makes me very nervous. Representative Young (R, FL) has been the sponsor of the TSTAR special grant program from the House side, while Senator Inouye does the same from the Senate side. Rep. Young will no longer sponsor TSTAR for the next fiscal year! The reality of not having special grants for our research programs is getting closer each day. We have substantially changed the way we manage our special grants to soften the potential disruption of our programs. However, it is also critical for us to increase our efforts to secure competitive grants from now on.

Speaking of competitive grants, the USDA released six RFA's during the spring break. It is quite clear the USDA is pushing through a major effort to re-direct the national research agenda. We touched on this topic last month, and are following up with another piece to give more details on the AFRI competitive programs. I encourage our faculty to read the specific RFA which matches your research program. It is clear that we need to be active in writing and submitting proposals to these programs. If your research does not fall under one of the five priorities areas, it will have to fit under the "Foundational Science" program. Note that each program is required to spend at least 30% on integrated projects, which is a code word for research projects with an extension or educational component. Dr. Linda Cox and I will work together to organize our research and extension programs into teams so that we can respond to these national priorities in future years.

Linda and I are working on our annual accomplishment report and the new Plan of Work. We went through a major transition several years ago in submitting our annual report and where just starting to feel comfortable with the format, when all of a sudden a set of new directives reached us earlier this year. We are now required to add the five new national priorities under the Agriculture and Food Research Initiative into our existing report and our Plan of Work. USDA is serious with these new changes, and we need to adjust our programs to stay in the game.

We have chosen "aquaculture/ aquaponics/hydroponics" as our theme for this month. We have tried the theme format once before (Sustainability, January, 2009), and would like to do more themes in coming months. Thanks to Dr. Clyde Tamaru of Molecular Biosciences and Bioengineering, for providing us the lead story. Samir Khanal, PingSun Leung, Harry Ako, Spencer Malecha, and Bernie Kratky also contributed to this issue.

As USDA moves to fund larger team-oriented grants it is critical that we have various academic teams in place so we hope that this theme format will help our faculty members form collaborative teams. *See you next month!*

C.Y. Hu
Associate Dean and Associate Director for Research

Expanding and diversifying CTAHR's aquaculture extension and outreach capacity

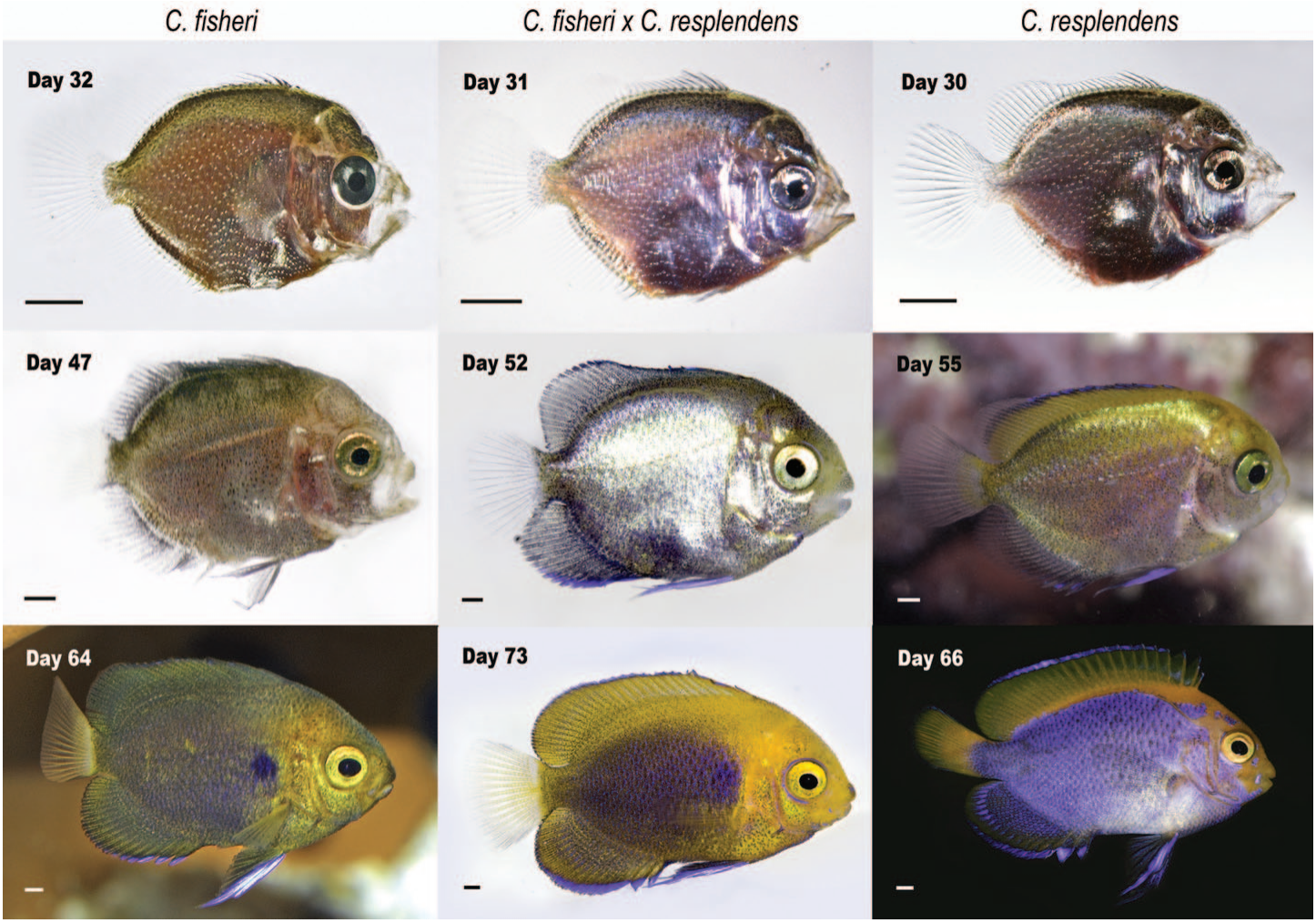
By Clyde Tamaru
Aquaculture Specialist
Department of Molecular Biosciences and Biological Engineering

Gorilla ogo removal from Waikalua Fishpond.

Becoming a member of CTAHR's faculty has been one of the most positive career moves that I have experienced and cannot thank my new family enough for all of their support during these challenging times. Aquaculture extension in CTAHR was just a breath away of being extinguished in the beginning of 2009 due to budget shortfalls. Working with **Wayne Nishijima** (now retired), MBBE Department Chair **Harry Ako**, and support from **C.Y. Hu** and Dean **Andy Hashimoto**, an academic home in MBBE and a small amount of Smith Lever funding formed a cornerstone to build from. What a difference a year would make and like the mythical phoenix rising from the ashes, our team currently includes two half time junior extension agents (**Kathleen McGovern-Hopkins** MBBE and **RuthEllen Klinger-Bowen** MBBE), two research associates (**Karen Brittain** and **Benjamin "Bo" Alexander** HIMB) and a post doctoral scholar (**Bradley "Kai" Fox** MBBE) engaged in a variety of aquaculture research and extension activities both locally, nationally and internationally. Aquaculture extension is alive and well in CTAHR and continues to make a positive impact on the aquaculture industry, the fastest growing segment in diversified agriculture in Hawaii that posted a record $34.7 million in sales for 2008.

Hawaiian Fishponds Loko I'a

It should be no surprise that some of our extension efforts focus around Hawaiian fishponds. Hawaii's long standing history in aquaculture practices date back to ancient times with the creation and operation of walled Hawaiian Fishponds found throughout our islands. Today these ponds are icons to the concept of "sustainability" and is particularly true when included as part of the ancient ahupua'a system, the basic self-sustaining unit that is shaped by the island's geography. MBBE Junior Extension agent, **Kathleen McGovern-Hopkins** along with myself and a dedicated group of volunteers assists in the implementation of a State DOE



Comparison of various larval fish stages of *C. fisheri, C. resplendens* and their hybrid.

standards based fishpond curriculum (Kahea Loko:The Call of The Pond). The lessons are designed around the use of Hawaiian fishponds as an educational tool that empowers Hawaii's students to learn about the host culture, science and values such as stewardship (Malama I Ka 'Aina). Each year some 3,500 students and other visitors participate in educational programs that take place at Waikalua loko located in Kaneohe Bay. These programs, however, remain threatened largely because the fishpond is privately owned by local developers. With support from the U.S. Department of Housing and Urban Development (HUD) our partners, Windward Community College, Hawaii Institute of Marine Biology, and the Pacific American Foundation are working towards acquiring Waikalua fishpond. The impact of the acquisition would be for the fishpond to remain in perpetuity as an educational and cultural resource for all of the people of these islands and for generations to come.

Marine Ornamentals

The ornamental trade in freshwater and marine organisms relies on a combination of cultured and collected specimens and spans the whole gambit of plants, invertebrates and vertebrates. Advances in the artificial propagation of the various species has led to the belief that culturing marine organisms can alleviate some of the fishing pressure on wild stocks and also create small or large-scale industries. Latest estimates are that 90 – 95% of the freshwater species and only 5% of the marine species are farmed. Propagating ornamentals has an added value that is often overlooked. It is an opportunity to expand the basic knowledge of many biological aspects of a species that would otherwise be difficult if not impossible to obtain. Nowhere is this more evident than with the work being done by Frank Baensch at his home in Kaimuki. Founder of Reef Culture Technologies he has successfully propagated 10 species of marine angelfishes that were once thought

Bradley Fox (right) provides training for the State Hospital staff at Windward Community College Aquaculture Complex.

to be impossible to produce in captivity (see: http://www.rcthawaii.com/). Because of his pioneering work aspects of their reproductive and early life histories have now been documented. In turn, he supports his efforts by marketing his outputs, some of which command exceptionally high prices (e.g., $5,000 for a single individual). Frank's association with CTAHR began with obtaining his Master's degree with advisor **Doug Vincent** of HNFAS. I serve as his advisor as he works through MBBE and an MOU with Nagasaki University where he plans to attain his doctorate via their *Ronpaku* program. This is the same degree program I obtained my Ph.D. through the University of Tokyo. The major requirement is publication of his work in peer reviewed journals that must be listed in the Citation Index. His most recent accomplishment is the hybridization of two pygmy angelfishes, *Centropyge fisheri* and *C. resplendens*. Academically, the results show a much closer biological relationship than what you expect for two separate species. The results are of practical value because he has shown that a cultured product is still obtainable by substituting the rare and valuable individual with a more easily obtainable species.

Extension and Outreach

In addition to our usual responses to technical assistance by the aquaculture community, our working group has been bombarded with requests for technical assistance in utilizing aquaponic technologies in backyard or commercial settings. Fortunately our team, which has a substantial amount of aquaculture expertise, can also draw on the considerable amount of plant expertise present in CTAHR's research and extension faculty (e.g., **Bernard Kratky** TPSS, **Theodore Radovich** TPSS, **Jari Sugano** CES, **Jim Hollyer** ADAP) and the hard work of graduate and undergraduate students (**Adam Baker** MBBE, **Jensen Uyeda** TPSS, and **Marissa Lee** MBBE). Based on the research outputs of **Harry Ako**, **Adam Baker** MBBE and personal experiences of **Bradley Fox** MBBE since November 2009 we have been able to provide two informational workshops on Oahu and one on Maui with our Sea Grant counterpart Robert Howerton that in total drew over 300 participants. Outcomes of the workshops have been an ever increasing number of individuals establishing aquaponic and hydroponic systems both in their backyards and also in commercial settings (e.g.

Fred Lau) on Oahu. Anticipated impacts will be the realization of a decreased dependence of imported food items improving our ability to be self sustainable.

One of our more interesting projects is a work in progress with Tiffany Kawaguchi and staff from the State Hospital who plan to use a combination of static hydroponic and aquaponic systems as 'Horticultural Therapy' for patients. The therapeutic benefits of gardening have been recognized since humans first cultivated plants, but there is now a growing professional practice linking gardening to numerous, wide-ranging health benefits. In order to meet the needs of Hawaii's unique culture, hospital staff have developed a Hawaiian Garden class which helps their clients recover from the effects of substance use and mental illness through creating individualized, meaningful activities that fosters physical, cognitive, social, and emotional growth and the learning of Hawaiian values. The challenges of transferring technology is being accomplished by our working group but fiscal constraints are being overcome in the true spirit of Aloha and Kokua from a variety of groups and individuals that include **C.N. Lee** HNFAS, Joe Blanco (former UH Board of Regents Chair), Jimmy Yamada Jr., (CEO of A-l A-Lectrician and leader of GS Foundation) and Stan Kodama (Waimanalo Feeds). Production units have recently been completed and anticipated production outputs are to be used to sustain the operation by having patients, working with staff, producing fresh fish and vegetables to supply their cafeteria and opening micro-enterprises within the hospital. If all goes well marketing outside of the hospital is also a possibility.

A real challenge for Hawaii's aquaponic systems is that tilapia is the preferred species for culture because of its tolerance to water quality conditions that normally occur in these types of systems. Local acceptance of tilapia as a valued farmed product has been painfully slow in coming as it has the dubious reputation of being the "Ala Wai" fish and one of the more serious invasive species that are now established in Hawaii. Our working group has been collaborating with Ilima Ho and members of the Waimanalo Homestead Association along with Sam Moku (DHHL) by providing assistance in establishing aquaponic systems with a focus on growing taro in these systems. It is easy to get folks excited about growing taro in these units as the concept of having your own source of fresh fish and poi in your own backyard is very attractive. However, it is a bit of a challenge getting folks past the stigma that the fish component is going to be tilapia even if you grew it yourself. Work being done to improve the image of home grown tilapia by our aquaculture partners, Todd Low (Department of Agriculture's Aquaculture Development Program) and Ron Weidenbach (Hawaii

Additions of aquaponic growout beds at Fred Lau's nursery operation in Mililani.

Deep fried tilapia that you can eat bones and all.

Baked tilapia.

Fresh Fish Company), include featuring farmed tilapia as a main course by well known chefs such as Alan Wong. At the aquaponics workshop held for the Waimanalo Homestead Association we provided farmed tilapia that was prepared by the organizers of the workshop to participants. The expression "broke da mouth" kind of sums up the response that we got for the tilapia dishes such as tilapia crab cakes, Chinese style steamed tilapia, beer batter tilapia tempura, baked tilapia in mayonnaise stuffed with lopchong, tilapia in miso soup and deep fried tilapia (my personal favorite) were creations that were enjoyed by all. Increase in aquaponic producers may have a farther reaching impact if tilapia becomes an accepted fresh fish for the local community as it will be cause for further expansion of Hawaii's aquaculture industry. All of these efforts should lead to an increase in the ability to locally produce our own food and the realization of CTAHR's commitment to creating a sustainable future for our island communities.

Clyde S. Tamaru

Hometown: Kailua, Hawaii
Joined CTAHR: 2009

Educational History: B.S., Biology, University of Hawaii at Manoa, 1976; M.S., Zoology, University of Hawaii at Manoa, 1981; Ph.D., Faculty of Agriculture, Department of Fisheries, University of Tokyo, 1988.

Specialization: Aquaculture

Current Work: Developing hatchery and growout technologies for a variety of freshwater and marine fish species. Providing technical assistance to aquaculture stakeholders statewide.

Language Spoken: English

Recent Publications

Campora, C.E., C. S. Tamaru, Y. Hokama, B. Anderson and D. Vincent. 2010. Evaluating the Risk of Ciguatera Fish Poisoning from Reef Fish Grown at Marine Aquaculture Facilities in Hawai'i. *World Aquaculture Society*. Vol: 41(1):1-10.

Baensch, F. and C.S. Tamaru. 2009. Spawning and development of eggs, larvae and juveniles of the rare Pomacanthid, Centropyge debelius (1988), in the hatchery. *J. World Aquaculture Society*, Vol.40(4):425-439.

Hollyer, J., C.S., Tamaru, A. Riggs, R. Klinger-Bowen, R. Howerton, D. Okimoto, L. Castro, T. Ron, B. K. Fox, V. Troegner and G. Martinez. 2009. On-Farm food safety: Aquaponics. College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. *Food Safety Technology,* July 2009 FST-37. 8 pp.

Recent Grants

Collaborative Effort for Utilizing Biofuel Byproducts. Agreement No. 58-5320-8-392 (Amendment 01) with USDA-ARS. $200,000

Purchase of Waikalua Loko Fishpond (Acquisition of Real Property) U.S. Department of Housing and Urban Development. $799,000

Sustainable Aquaculture for Food Security in Hawaii: Survey and Improvement of Farm Production and Post Harvest Practices for Biosecurity and Food Safety. Department of Commerce, National Oceanographic Atmospheric Administration. $153,146

Aquaponics in the Pacific: studies using a Nutrient Flux approach

By Harry Ako, Researcher, and Adam Baker, Graduate Student
Department of Molecular Biosciences and Bioengineering

Experimental trays of lettuce displayed at the Governor's Aquaculture Week Proclamation held at Magoon Agricultural Research Station. Adam Baker (left) is speaking to Governor Linda Lingle (in lei) and Harry Ako (green shirt) is chatting with UHM Chancellor Virginia Hinshaw (in pink).

Initial interest was to develop an aquaponics system for the Pacific Islands. Such systems would grow a cash crop such as lettuce for sale to restaurants and would also grow fish which are prized by local residents as food. Fish would be fed and would release metabolites in the water. These metabolites would be converted to non-toxic nutrients by bacteria in the water and would be transferred to plants where they would nourish the plants. A demonstration of this system was displayed at the Governor's Aquaculture Week Proclamation in May of 2009 (photo). When enough preliminary data was generated, we initially planned a small workshop for interested fellow aquaculturists. However, we were surprised when 205 people reserved seats for our workshop held in November of 2009. Attendees included folks interested in a more sustainable living that included a group of Hawaiian Homesteaders seeking a greener, more sustainable lifestyle and some dirt and hydroponics farmers interested in expanding into aquaponics.

We reviewed the literature before we started our research and found that after 15 years of research there were no commercial aquaponics producers. This was taken to indicate that something was lacking in the research and this lack had to be remedied. However, we also found much of the lettuce we eat are produced by hydroponics or growing plants in fertilized water. When we began our research, we leaned heavily on colleagues

realizing that multidisciplinary research saves time and effort. We began by consulting Tropical Plant and Soil Science colleagues Professors **Bernie Kratky** and **Kent Kobayashi.** We also leaned heavily on **Ray Uchida's** Agricultural Diagnostic Service Center for Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES).

Lettuce plants *Lactuca sativa* were provided a fertilizer whose composition reflected a consensus among hydroponics scientists. The nutrients taken up over time were quantified by ICP–AES. An accurate assessment of nutrient needs was obtained and was tested by modifying concentrations in hydroponic solutions and observing whether lettuce plants grew as predicted or whether the hypothesized nutrient needs were inaccurate. The model was to provide fish water, 20 L at a time, one time a day to trays growing 48 lettuce plants.

Next, tilapia *Oreochromis sp.* were stocked in 200 L shaded tanks that were vigorously aerated and provided with a biofilter. Shading was intended to prevent microalgae from growing and using up plant nutrients. Vigorous aeration was intended to provide oxygen to the fish which, on hindsight, would be grown at high density (e.g., 20 kg/m^3). The biofilter would convert toxic nitrogen metabolites to non-toxic nitrate plant fertilizer. In the experiments, fish biomass and feed inputs were increased and fish water chemical profiles were determined, again by ICP–AES. Fish water suitable for 48 lettuce plants harvested once every 5-6 weeks was obtained when 2.3–2.5 kg of tilapia were fed 40–59 g of feed/day. This water contained benchmark levels of 44–49 mg/L nitrate nitrogen. The critical result was defining the lower density of fish that is needed to produce lettuce that greatly simplifies the design of an aquaponic system. Several growth trials verified that lettuce plants grew as well aquaponically as hydroponically when fish water met these nutritional specifications. Lettuce plants were harvested at weights (minus roots) of between 175-325 g per plant. Larger lettuce plants were obtained in the summer when measured light levels were higher and smaller plants were obtained in the winter when sunlight was less.

Thus, we were able to report on the development of an inexpensive, maintenance-free aquaponics system and shared our results at the Governor's Aquaculture Week Proclamation held at Magoon Agriculture Research Station in May of 2009. It is suited for transfer to remote Pacific Islands and also for Hawaii among aquaponics farmers and backyarders interested in a more sustainable lifestyle. Schools are using it to teach the science involved with the nitrogen cycle to children. One challenge has been to provide CTAHR-quality extension assistance to stakeholders in a timely manner because of the large number of requests. The assistance must be clear and concise, but most important, based on very sound research. There are similar systems other members of the team developed and our iteration has only one electrical component, an air pump to oxygenate the water for fish and minimize denitrification (loss of nitrate fertilizer as nitrogen gas) in the fish tank. Preliminary experiments by **Bradley Fox** MBBE and **Clyde Tamaru** MBBE are yielding revolutionary results for the cultivation of kalo *Colocasia esculenta*. Aquaponics growth of this species seems to be occurring faster than when using traditional wet and dry methods and an area that is in need of much future research.

Large scale lettuce experiments in Manoa.

Converting biofuel residues into protein-rich fish feed

By Samir Kumar Khanal
Assistant Professor
Department of Molecular Biosciences and Bioengineering

Hawaii is a highly energy dependent state in the United States. There is a significant effort towards increasing Hawaii's local production of energy and food for the islands' sustainability. The major challenge of producing renewable energy, especially biofuel (bioethanol and biodiesel), in Hawaii is the cost of production. The biofuel plants also produce a significant amount of low-value by-products (such as stillage/vinasse from bioethanol plants and glycerine from biodiesel plants). It is important to realize that the days of cheap oil import to Hawaii is going to come to an end within the foreseeable future. We must become less dependent on import of energy as well as food. Our research focus is to convert low-value biofuel residues into high-value products, like protein-rich fish feed ingredients, which could provide additional revenue to the biofuel plants. The project aims at providing locally produced ingredients to aquaculture enterprises in the Pacific islands.

Freeze-dried biomass cultivated on vinasse.

The cost of commercial feed accounts for 40 to 60% of the total fish production costs. The high feed cost is impacting the aquaculture enterprises in our islands. Thus, producing an alternative protein substitute for imported fish feed from locally available feedstocks could reduce the fish production cost greatly. Hawaii's largest producer of biodiesel, Pacific Biodiesel, uses waste cooking oil to produce biodiesel. Glycerine produced by the plant is a major residue to deal with. Hawaiian Commercial & Sugar Company has to address a byproduct called vinasse that results from bioethanol production process. Both sources are rich in organic carbon and nutrients. Our research looks at growing a protein-rich edible fungus, *Rhizopus microsporus*, on these residues. The fungal biomass contains 45 to 50% crude protein with significantly high amounts of amino acids such as arginine and threonine. With the establishment of a protein stream, the fungal biomass can be readily processed into a product that could substitute fish or shrimp feed. We envision that the process may eventually be used to produce high-grade edible fungus, as a dietary protein supplement for humans. Research collaborators are **Clyde Tamaru**, **Harry Ako** and **Jon-Paul Bingham** (MBBE), and Warren Dominy (Oceanic Institute).

Samir Khanal (right) and Saoharit Nitayavardhana (Ph.D. student) discussing the fungal project in the lab.

Shrimp partial harvesting decision support system

By PingSun Leung, Economist
Department of Natural Resources and Environmental Management

Lotus Kam, Post-doc
Department of Molecular Biosciences and Bioengineering

Run Yu, Assistant Researcher
Department of Molecular Biosciences and Bioengineering

Paul Bienfang, Researcher
UHM Oceanography

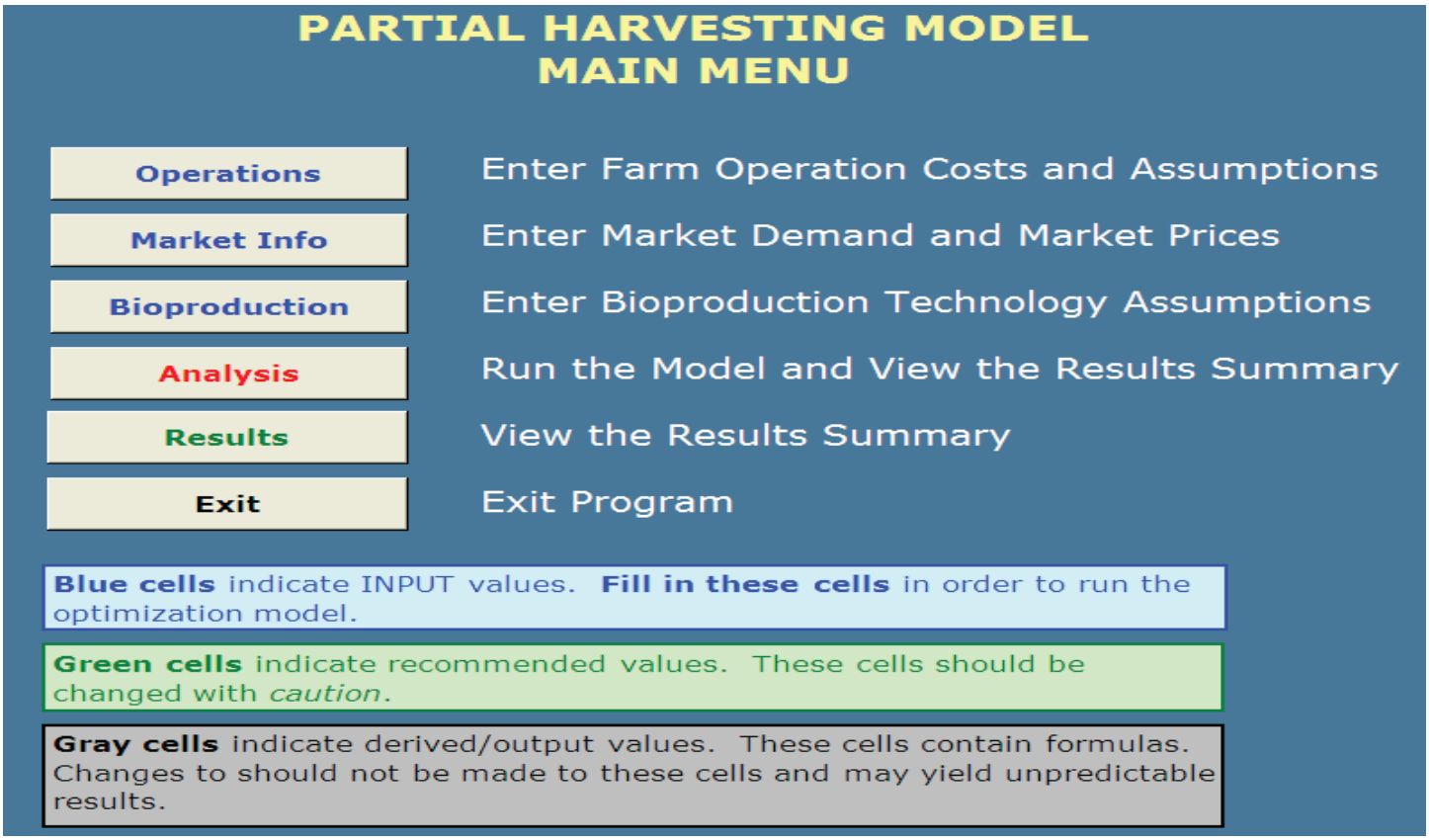
In shrimp culture and many other aquaculture systems, an entire crop is usually harvested at one time, i.e., single batch harvesting. However, since growth and survival are density-dependent, single-batch harvesting can lead to competitive pressures that lower individual growth and increase mortalities. In comparison to single batch harvesting, a partial harvesting approach can enhance growth rates and total yield since the reduction in total biomass reduces competitive pressure. In partial harvesting, a crop can be partially-harvested so that only a portion of the crop is extracted. A number of pilot experiments and analytical studies have demonstrated the promising potential of partial harvesting in enhancing the productivity and profitability of growout facilities in intensive shrimp culture. However, the implementation of partial harvesting in practical operation is not easy, due to its complex nature. To assist aquafarmers, especially the shrimp producers to explore the potential of partial harvesting for their farming system, a decision support system has been developed with funding support from the Center for Tropical and Subtropical Aquaculture (CTSA), USDA.

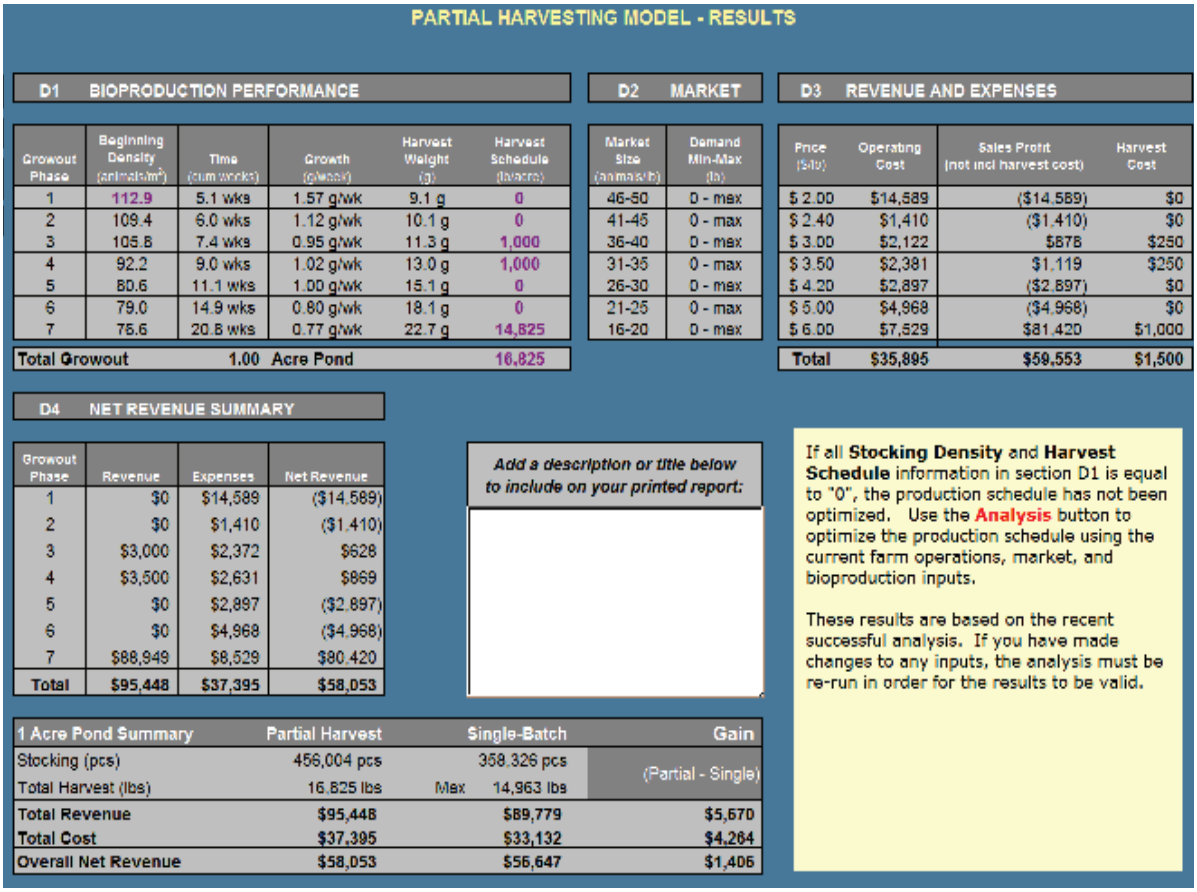
The partial harvesting decision support system (PHDSS) is designed to provide the aqua-farmers with the ability to determine the most efficient partial harvesting scheme that maximizes the returns from farming operations, subject to market and demand conditions. The concept behind this model views the entire production cycle as a series of growout phases. At the end of each phase, the crop can be either partially or completely extracted. Hence, the optimization procedure needs to compare many possible combinations of the harvest schemes for each growout phase within the production cycle. This is exactly the formidable challenge that is faced by any farm production manager considering partial harvesting. With the aid of a PC and readily available computational program (MS Excel with Solver), the PHDSS identifies the best partial harvesting strategy that meets the managerial objective of the aqua-farm in a matter of a few minutes.

The robustness of the PHDSS has been successfully validated through several case studies. The PHDSS is flexible enough to handle a variety of managerial conditions and objectives. It is a useful management tool for determining the harvesting strategy for aquaculture operations. Additional expert opinions might be necessary in the practical use of the PHDSS. Nevertheless, the system adds a new facet to the aqua-

managers' toolkit that assists them with complex management decisions relating to partial harvesting.

The PHDSS is available to anyone upon request and its user's manual can be retrieved from the CTSA's web-site at http://www.ctsa.org/PublicationList.aspx.





Non-circulating hydroponic methods for growing vegetables

By Bernie Kratky
Horticulturist
Department of Tropical Plant and Soil Sciences

How would you grow high quality vegetables if you don't have soil or if your soil is infested with diseases or nematodes or if you don't want to spend time and effort for weed control?

Consider growing with a simple hydroponic method. Hydroponics generally refers to growing plants using nutrient solution (fertilizer + water) in situations where a sterile growing medium is employed instead of soil as a substrate for roots. Non-circulating or passive hydroponic methods may be designed to utilize water and fertilizer very efficiently. These systems avoid the additional production costs and complexities associated with mechanical aeration and circulation including the need for electrical power and pumps which are required in many conventional hydroponic systems. The most common non-circulating hydroponic techniques involve suspended pot, floating topcover and sub-irrigation methods.

The suspended pot method is a powerful technique for growing short-term vegetables such as lettuce because the entire crop can be grown with only an initial application of water and nutrients. After planting or transplanting, no additional labor is required until harvesting. The most basic system consists of a 2-liter plastic bottle which is nearly filled with water after 3 grams of a complete hydroponic granular fertilizer are added. Lettuce is seeded or transplanted into a tapered growing medium plug which is supported by the neck of the bottle. The lower 2 cm of the plug is immersed in the nutrient solution. This moistens the entire medium in the plug by capillary action, thus automatically watering the young plant. Plant growth causes the nutrient solution level to decrease and creates an expanding moist air space. The extending root system is capable of absorbing nutrient solution from the bottle even after the liquid level drops below the growing medium. Roots occupying the moist air space above the solution have been described as oxygen roots whose main function is aeration; these roots experience vigorous lateral and branching growth. Roots extending into the nutrient solution are considered to be water and nutrient roots that have limited elongation capabilities, because the oxygen content of the nutrient solution becomes progressively lower with depth. The nutrient solution level should not be raised, because submerging the oxygen roots will cause the plants to 'drown'. Lettuce may be harvested at about 5 to 7 weeks from seeding. Other small-scale embodiments of this method include growing 3 lettuce plants on a 20-liter plastic bucket with a lid or 6 lettuce plants on a plastic storage container or an ice chest.

Growing lettuce in a 2-liter plastic bottle with a suspended pot, non-circulating hydroponic method.

Big Island grower Hank Schultz demonstrates his commercial-scale, non-circulating hydroponic lettuce growing operation.

CTAHR Research Technician Eric Magno harvests hydroponically-grown watercress.

Growing tomatoes by a sub-irrigation hydroponic method.

Commercial lettuce growers emulate this method by lining lumber tanks with polyethylene and covering them with a polystyrene sheet or similar material. The tank is nearly filled with water prior to transplanting. Two fertilizer stock solutions are added to prepare a nutrient solution. No additional watering and fertilization are needed for the crop. Lettuce seedlings are transplanted into 5 cm net pots which are then supported by the tank cover. The lower portion of the net pots is immersed in the nutrient solution. By harvest time, the nutrient solution level may drop 6 to 12 cm. A 200 gram lettuce plant typically consumes only about 3-6 liters of nutrient solution. Leafy or semi-head lettuce is ready for harvest in about 5 weeks from transplanting depending upon the season and cultivar. Growers usually harvest and replant on the same day, thus maintaining full capacity of the tanks.

Watercress may be grown by a floating topcover method. Growing tanks are filled with nutrient solution. Holes for 5-cm net pots are cut in a 1.2 cm-thick extruded polystyrene board which is placed in the tank and floats on the nutrient solution. Net pots are filled with a peat-perlite growing medium. They are supported by the floating polystyrene boards. The bottoms of the net pots are immersed in the nutrient solution. This moistens the growing medium in the containers by capillary action, thus automatically watering and fertilizing the plants. Approximately 10-20 watercress seeds are sown on the surface of the growing medium in the net pot with a shaker-type tube seeder. Seeds usually germinate within 3 days and watercress continues to grow for 4 to 6 weeks without any attention at which time it is harvested. A ratoon crop of watercress may be harvested after about one month. Then, the tank is drained and the whole growing process is repeated.

Crops requiring large amounts of water such as tomatoes (usually more than 100 liters per plant) and other long-term vegetables are often grown with some version of a sub-irrigation method. Fertilizers may be injected into the irrigation water or nutrient solution stored in elevated tanks may flow to growing tanks by gravity feed. In a typical production tank, growing containers are immersed in or suspended slightly above a constant level (5 cm) of nutrient solution throughout the life of the crop. Remarkably, even root crops like edible ginger and taro have been successfully grown by various sub-irrigation methods.

Mosquitoes may breed and multiply in non-circulated nutrient solution and become a health menace as well as a nuisance to workers, so mosquito control must often be practiced when growing with non-circulating hydroponic systems.

Educators may use these inexpensive methods to teach students about plant growing concepts and will be happy to learn that there is no need for weekend watering! Gardeners may use these methods to grow vegetables in rainshelters, on lanais and under the overhangs of buildings. Researchers may conduct nutritional studies, test pesticides and produce seed with these methods. Farmers may grow high quality crops with non-circulating hydroponic methods.

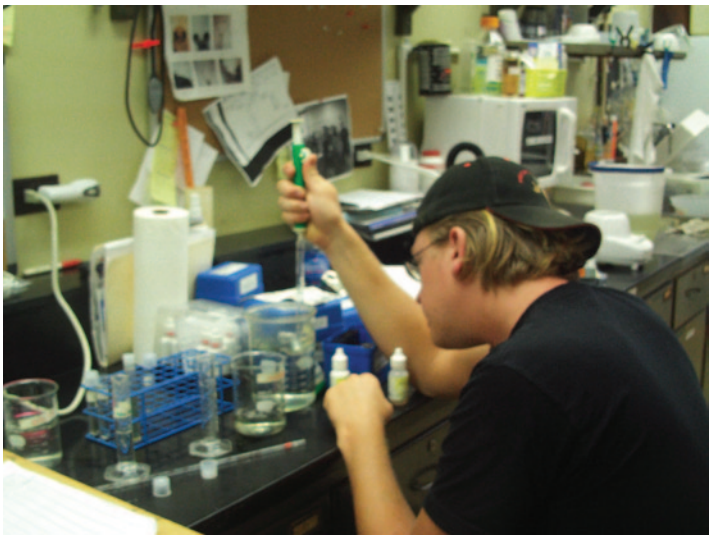
Undergraduate aquaculture education

By Spencer Malecha
Professor
Department of Human Nutrition, Food and Animal Sciences

An active undergraduate aquaculture curriculum is conducted in the Department of HNFAS which includes the only aquaculture courses offered at UH Manoa. An aquaculture certificate program is planned so that undergraduate students will have a "major" to focus on. The lecture formatted course, ***Aquaculture Production*** (AnSci/Ocn 450), is popular throughout the campus with students in CTAHR, Environmental Sciences, Marine Biology and other disciplines because it provides a comprehensive coverage of the basic theory and practice of all the major aquaculture animal groups. In AnSci/Ocn 450 we "go around the world" with Google Earth to study examples of aquaculture systems, many from my travel, consulting, and business experience. All courses are "paperless": all class material is posted on the class Laulima web sites. I welcome readers to visit these sites by contacting me (SMal1113@aol.com) with their email address and I will give you a visitor password.

Student Aquaponics Project in Aquaculture Production Laboratory (AnSci 465L). Tank contains Asian catfish that support lettuce, strawberries, herbs, tomatoes, duckweed, and other plants.

AnSci/Ocn 450 is taught in the Fall and is a prerequisite to the follow-on courses taught in the Spring. ***The Biology and Culture of Freshwater Prawns and Marine Shrimp*** course (AnSci 460) is designed as a follow-up to AnSci/Ocn 450 for students interested in a more in-depth study of certain aspects of freshwater prawn and shrimp culture. In the ***Aquaculture Business and Entrpeneurship*** course (AnSci 490), I use the actual business documents from my commercial experience to teach students to write a commercial business plan for an aquaculture business which includes assessments of markets and competition, sales strategy, mission statements and objectives, financial analysis, staffing, intellectual property and technology development, leases, land acquisition, and production plans.



Aquaculture Laboratory (AnSci 465L) student, Austin Stankus, determines Ammonia, Nitrite, Nitrate, and pH levels in aquaponics and closed recirculation system water as part of class activities on materials balance.

In the ***Aquaculture Laboratory*** course (AnSci 465L) students do all hands-on work using commercial methods on a variety of live animals. Both full strength seawater and freshwater systems have been set up in the St. John teaching laboratory and outdoor tanks. AnSci 465L is intensive and is not a dry lab! Students must tend to their animals in shifts every day, seven days a week. They culture the larvae and juveniles stages of the freshwater prawn, marine shrimp, rainbow trout, and Asian catfish which come from females they spawn with hormonal methods. Students learn how to make and apply the food for these life forms. AnSci 465L students also set-up and operate a closed recirculation and aquaponics system and conduct water quality testing. Here they learn the nutrient material flow basis for biological filtration and successful plant aquaponics

Left: Aquaculture Laboratory (AnSc 465L) students (left to right) Jason Chow, Koi Lorence, Lori Nitahara, and Melanie Iwaishi set-up a commercial trout hatchery module for rearing trout eggs to the "swim-up" stage. Right: "sac fry" (larval fish with egg sac attached) being raised by AnSc 465L students.

production. Outdoor shrimp and fish tanks are used to study critical standing crop theory and practice and animal growth.

As an example of student research in ***AnSci 499: Undergraduate Research,*** which flows from the other HNFAS aquaculture courses, Jenilee Dowda, a recent HNFAS undergraduate (Dec. 2009) presented her research work on low temperature tolerance in the freshwater prawn at annual meetings of the U.S. Freshwater Prawn and Shrimp Growers Association (North Carolina, 2008; Mississippi, 2009). Her research was so well received by the industry that she was invited to work with producers and extension agents to further develop low temperature live warehouse technology.

"Tropical" freshwater prawns being held at 17^0 C in a stupor for three months with no feeding, filtration, aggression and movement in a prototype "live warehousing" system designed and operated by AnSci 499 research undergraduate HNFAS student Jenilee Dowda.

FCS APDM undergrad, Kristen Domingcil, receives a UHM summer research award - congrats!!

Office of the Vice Chancellor
for Research and Graduate Education

UNIVERSITY of HAWAI'I® MĀNOA

February 26, 2010

Ms. Kristen Domingcil

Dear Kristen,

I am pleased to be able to inform you that following a rigorous evaluation by a panel of six faculty reviewers, your proposal entitled, "Natural Dyes from Invasive Species for Hawai'i's Sustainable Environment" was ranked among the best out of a total of 31 applications that were recommended to me for support. I therefore would like to offer you an undergraduate summer research award in the amount of **$3,000.**

As a condition of the award you will be expected to make all possible efforts to achieve your stated objectives. You will also be required to present your research findings in a poster presentation at a public forum that will be organized during the 2011 academic year. It is your responsibility to inform us of any other support you receive that may duplicate items listed in your award budget. If you accept these conditions, please sign and return the enclosed Memorandum of Agreement and WH-1 Statement of Citizenship and Federal Tax Status.

I have high expectations for you and the other awardees and look forward to meeting you personally before the end of the program.

Congratulations and best wishes on your research.

If you have any questions, you can contact June Imamura at the Office of Research Relations in Spalding 357, or by calling her at 956-4053, or by email at jimamura@hawaii.edu

Sincerely,

Gary K. Ostrander
Vice Chancellor for Research
and Graduate Education

Enclosures
c: Dr. Shu Hwa Lin
Ms. Tracie Nakagawa
Research Relations File

2500 Campus Road, Hawai'i Hall 211
Honolulu, Hawai'i 96822
Telephone: (808) 956-7837 Fax: (808) 956-2751
An Equal Opportunity/Affirmative Action Institution

Update on 2010 T-STAR program

By Po-Yung Lai
Special Program Director for Grants and Contracts

The RFP guidelines for the 2010 TSTAR grant were sent to faculty of the Pacific Basin institutions on September 4, 2009. The deadline for submission of Letters of Intent was on Friday, October 2, 2009 and the deadline for submission of proposals was on Friday, October 30, 2009. A total of 50 proposals with a total requested budget of $8,678,135 were submitted, of which, 43 were from Hawaii, 5 from Guam, 1 from American Samoa and 1 from Palau. Based on the categories identified by the PDs in their respective Letters of Intent, the 51 submitted proposals were grouped into four categories as follows: 18 proposals in Category I (Plant Protection), 9 in Category II (Plant Biotechnology), 9 in Category III (Soil, Water & Environment), and 14 in Category IV (Others).

Among the four categories, Categories I and II focused more on specific disciplinary areas; the former on Plant Protection related subjects including plant pathology, nematology and entomology and the latter on Plant Biotechnology. Setting up scientific review panels for these two categories was easier. However, Categories III and IV are different, focusing on diverse subject areas; the former on Soil, Water and Environment and the latter on Others, including aquaculture, livestock, nutrition, food technology and marketing or economically related subjects. Inviting qualified scientists to serve on the review panels for these two categories was difficult. To illustrate the diversity of Categories III and IV, the 9 proposals submitted under Category III were further broken down into 6 subcategories with the number of proposals in parenthesis, including soil (2), water (1), environment (2), green roof technology (1), waste management (2), and biofuel (1). Similarly, the 14 proposals submitted under Category IV were coincidently further broken down into 6 subcategories including economic analysis (3), modeling agricultural land (1), marketing (1), aquaculture (2), livestock (3), and value-added production (4).

The comments and scores provided by the reviewers were submitted to the TSTAR Pacific Basin Administrative Group (PBAG) for reference in making its decisions on the final selections of proposals for funding. After much discussion and consideration at the PBAG meeting held on February 25-26, 2010, a total of 17 (34%) proposals, out of the 50 eligible proposals submitted, were selected for funding; of which, 13 (77%) proposals were from Hawaii, 3 (18%) from Guam and 1 (6%) from American Samoa. These proposals were further broken down on the basis of the four categories as follows: 5 (30%) proposals in Category I (Plant Protection), 3 (18%) in Category II (Plant Biotechnology), 4 (24%) in Category III (Soil/Water/Environment), and 5 (30%) in Category IV (Others). Of the $3,107,035 available in FY2010, a total of $2,986,817 was allocated to fund the 17 proposals for two years in FY2010 and FY2011.

In anticipation of Congressional appropriation for the continued funding of the TSTAR program in FY2011, the PBAG has decided to move up the decision making schedule to mid-November 2010. As such, the RFP for TSTAR proposals for FY2011 will also have to be moved up accordingly. Tentatively, the RFP is scheduled to be sent out in August or September 2010. Since the TSTAR review process is quite competitive, faculty are urged to start early when preparing their proposals for submission to meet the relatively short turnaround time in FY2011.

USDA/NIFA releases new RFAs

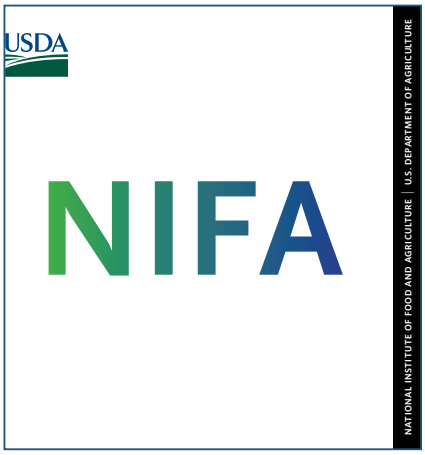
By CY Hu
Associate Dean and Director for Research

National Institute of Food and Agriculture (NIFA, formerly CSREES) released its Agriculture and Food Research Initiative (AFRI) Competitive Programs RFA on March 22. Starting this year, NIFA will have only seven RFA's for its AFRI competitive programs. Six were released last week, and the NIFA fellowship program will be released in April. USDA has increased substantially the size of the AFRI competitive grant programs. AFRI has received a total of $262 million for this year's programs. After taking 4% as NIFA's overhead, the balance is distributed among the following seven programs:

1. Foundational Science - $64 million
2. Childhood Obesity Prevention - $25 million
3. Climate Change - $55 million
4. Global Food Security - $19 million
5. Food Safety - $20 million
6. Sustainable Bioenergy - $40 million
7. NIFA Fellowship - $6 million, to be announced in April

Many of the awards designated as targeting societal challenges will be larger in size and longer in duration than awards in previous years (with funding up to $45 million over a five-year award period) and some grants will be eligible for renewal upon achieving specific goals. NIFA expects that such grants will establish collaborations among multiple institutions and organizations and will integrate basic and applied research with deliberate education or extension programs. NIFA will post a series of webinars focused on the individual RFAs to provide an overview of the program areas. Visit www.nifa.usda.gov/afri for more information.

Since these are brand new RFA's, I strongly recommend that you carefully read those that are most closely related to your research program. Many RFAs also require a Letter of Intent, the majority of which are due in April or early May. Please note the stakeholder input announcement, which allows you to provide feedback directly to NIFA. The link to read the RFA's is here: http://www.nifa.usda.gov/funding/rfas/afri_rfa.html. As I mentioned last month, Dr. Roger Beachy, NIFA Director, has issued a statement that NIFA will focus its research and resources on a limited number of initiatives, and they are now formally established in the five RFA's. All other subjects will be covered under the "Foundational Science" RFA. Individual faculty members with research appointments should concentrate their research effort in one of these areas. As Dr. Beachy indicated, we cannot afford to spread our research effort too thin and we need to concentrate on a smaller number of projects and show some concrete impacts in a short period of time. Dr. Beachy has also mandated that we submit our annual Plan of Work and annual accomplishment reports to include these five priory areas starting this year. Dr. Linda Cox and I have already re-aligned our research and extension efforts to meet this new requirement in our report. It is clear that we need to shift our research focus to be more in alignment with the national priorities so that we increase our chance of getting more competitive grant money. Dr. Beachy also strongly suggested that we consider shifting our formula fund research to match national priorities. Therefore, it is critical that we begin the conversation to respond to these changes at the national level.



The new book published by the NAS titled "A New Biology for the 21st Century" is a must read for all of us, as this is the book Dr. Roger Beachy is using as the road map to direct the NIFA programs. You can download a free copy at the National Academy of Sciences website at: http://www.nap.edu/catalog.php?record_id=12764.

NIFA grants are now available!

By Sharee Pepper
Grant coach

The following list includes some current funding opportunities that may be of interest to CTAHR faculty. If the deadline is too short for this year, it is still a good indication of the likely due date for next year. Let us know if we can be of any assistance with developing and editing your grant application.

For information on submitting grants electronically on grants.gov the following publication may be useful. USDA, NIFA Grants.gov Application Guide – A guide for the preparation and submission of NIFA applications via grants.gov.
http://www.nifa.usda.gov/funding/grant_forms/electronic_app_guide.pdf

Agriculture, Rural and Community Development Grants

See appendix table at end for new AFRI deadline dates or URL: http://www.nifa.usda.gov/funding/afri/afri_program_deadline_dates.html

$ - Western SARE - Sustainable Ag Tours Grant (TRG)
Deadline: April 01, 2010
https://wsare.usu.edu/grants/RFA/TRG_ed_10.pdf

$ - USDA, NIFA, – Arthropod and Nematode Biology and Management: Tools, Resources, and Genomics
Deadline: April 1, 2010
http://www.nifa.usda.gov/fo/arthropodnematodetoolsresourcesgenomicsafri.cfm

$ - USDA, NIFA - Beginning Farmer and Rancher Development Program
Deadline: April 6, 2010
http://www.nifa.usda.gov/funding/rfas/bfrdp.html

$ - DHHS, Administration for Children and Families (ACF) - Social and Economic Development Strategies - Special Initiative
Deadline: April 9, 2010
http://www.anapacificbasin.org

$ - USDA, FIFA - New Era Rural Technology Competitive Grants Program (RTP)
Deadline: April 14, 2010
http://www.nifa.usda.gov/funding/rfas/new_era.html

$- USDA - Farmers Market Promotion Program (FMPP)
Deadline: April 15, 2010
http://www.ams.usda.gov/AMSv1.0/FMPP

$ - USDA, NIFA - The Center for Tropical and Subtropical Aquaculture (CTSA)
Deadline April 16, 2010 (pre-proposal)
http://www.ctsa.org/EventDetail.aspx?eID=1210

$ - Western SARE - Farmer Rancher Grant (FRG) and Professional + Producer Grant (PPG)
Application Window: April 14, 2009 to December 04, 2009
https://wsare.usu.edu/grants/?ok=Vw_RFAs

$ - Farm Foundation
Deadlines: April 30 and October 31
http://www.farmfoundation.org/webcontent/Farm-Foundation-NFP-Small-Grants-Program-357.aspx?z=85&a=357

$ -USDA, NIFA - Western Sustainable Agriculture Research and Education Program
Sustainable Agriculture Tours
Deadline: Open until funding is exhausted
http://wsare.usu.edu/grants/docs/RFA_SAT.pdf

$ - USDA, Rural Development
Community Facilities Loan and Grant Program
Deadline: Applications accepted on an ongoing basis
http://www.rurdev.usda.gov/rhs/cf/cp.htm
http://www.rurdev.usda.gov/rhs/cf/brief_cp_grant.htm

Education

$ - NOAA - Environmental Literacy Grants (ELG) for Informal/Nonformal Science Education
Deadlines - Letters of Intent (Required): February 16, 2010.
Deadline for full applications: April 6, 2010.
An informational teleconference: January 21, 2010.
http://www.oesd.noaa.gov/funding_opps.html

$ - Western SARE - Graduate Student Grant (GSG)
Deadline: May 31, 2010
https://wsare.usu.edu/grants/?ok=Vw_RFAs

$ - Human Frontier Science Program – Short Term Fellowship Program
Deadline: rolling – applications accepted year round
http://www.hfsp.org/how/appl_forms_STF.php

$ - NSF – Active Funding Opportunities
Deadline: Multiple
http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=date

Environment, Water, Energy, Invasive Species Grants

$ - National Fish and Wildlife (NFWF) Foundation Accepting Pre-proposals for Acres for America Conservation Program
Deadline: April 1, 2010 annually (Pre-proposals)
http://www.nfwf.org/AM/Template.cfm?Section=Charter_Programs_List&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=60&ContentID=15055

$ - National Science Foundation (NSF) - Climate Change Education Partnership (CCEP) Program, Phase I (CCEP-I) (program solicitation NSF 10-542)
Deadline: Letter of Intent due April 23, 2010 (required)
Full Proposal Deadline(s): May 24, 2010 Phase I Partnership Proposals
http://www.nsf.gov/pubs/2010/nsf10542/nsf10542.pdf

$ - National Forest Foundation: Community Assistance Program
Local Forest Partnerships Fund
Deadline: proposals accepted on a rolling basis throughout year
http://www.natlforests.org/consp_05_cap.html

$ - National Geographic Conservation Trust Offers Funding to Preserve Earth's Resources
Deadline: Open
http://www.nationalgeographic.com/field/grants-programs/conservation-trust-application.html

Families, Youth and Children Grants

$ - CHS Foundation
Rural Youth and Leadership Development
Deadline: rolling – applications accepted year round
http://www.chsfoundation.org/programs/ryld.htm

Financial Grants

$ - Money Management International Financial Education Foundation,
Financial Education Grants
Deadline: rolling – applications accepted year round
http://www.mmifoundation.org/GrantSeekers.asp

$ - Hitachi Foundation: Business and Communities Grants Program
Grants Address Economically Isolated Communities
Interested organizations may submit an online inquiry to provide information about project ideas **at any time** and the Foundation's will determine if it fits their priorities.
http://www.hitachifoundation.org/grants/guidelines/index.html

Health, Nutrition, Food & Biomedical Grants

$ - Robert Wood Johnson Foundation (RWJF) - Active Living Research and New Connections Grant Opportunities
Proposal Deadline: April 14, 2010
http://www.rwjf.org/applications/solicited/cfp.jsp?ID=21041

$ - Robert Wood Johnson (RWJ) Foundation - Healthy Eating Research Announces 2010 Call for Proposals
Deadline: Healthy Eating and New Connections – May 13, 2010
Rapid-Response Grants due any time until September 1, 2010
http://www.healthyeatingresearch.org/component/content/article/230

$ - Aetna Foundation Announces 2010 Grant Program Funding Priorities
Deadlines: Quarterly - February 15, May 15, August 15, & November 15, 2010
http://foundationcenter.org/pnd/rfp/rfp_item.jhtml?id=288000014

$ - Robert Wood Johnson Foundation and Pew Charitable Trusts Announce Health Impact Project
Deadline: Open
http://www.rwjf.org/applications/solicited/cfp.jsp?ID=20921

Science Grants

$ - DOE, Advanced Research Projects Agency (ARPA) - Grid-Scale Rampable Intermittent Dispatchable Storage (GRIDS)
Concept Paper Deadline: 4/2/2010
https://arpa-e-foa.energy.gov/

NSF – Active Funding Opportunities
Deadline: Multiple
http://www.nsf.gov/funding/pgm_list.jsp?org=NSF&ord=date

$ - National Geographic Society – Waitt Grants Program
Deadline: Rolling
http://www.nationalgeographic.com/field/grants-programs/waitt-grants-application.html

UH, Hawaii and Regional Grants

$ - UH, University Research Council - Faculty Travel Funds
Proposal Deadline: rolling – applications must be in >4 weeks before travel.
http://www.hawaii.edu/urc/pdf/factravel_g.pdf
http://www.hawaii.edu/urc/pdf/factravel_f.pdf

NIFA / AFRI deadlines

The Agriculture and Food Research Initiative (AFRI) encompasses several different Request for Applications (RFA) that contain many Program Areas. These Program Areas cover a broad array of issues and topic important to US agriculture. Important deadlines are summarized in the table below. Refer to the following RFAs for related detailed information on Program Area Priorities for FY2010:

AFRI Foundational Program RFA
AFRI Childhood Obesity Prevention Challenge Area RFA
AFRI Climate Change Challenge Area RFA
AFRI Food Safety Challenge Area RFA
AFRI Global Food Security Challenge Area RF
AFRI Sustainable Bioenergy Challenge Area RFA

URLs: http://www.nifa.usda.gov/funding/rfas/afri_rfa.html or http://www.nifa.usda.gov/funding/afri/afri_program_deadline_dates.html

Foundational Program within AFRI ($64 million)	Funds Available (Millions)	Letter of Intent Deadline	Application Deadline
Plant Health and Production and Plant Products (A1101)	$7.5	Tuesday, April 20, 2010	Wednesday, July 07, 2010
Pest and Beneficial Insects in Plant Systems (A111)	$6.0	Thursday, April 22, 2010	Thursday, June 10, 2010
Animal Health and Reproduction: Animal Bioinformatics and Development of Tools for Livestock, Poultry, and Aquaculture (A1201)	$5.0	Wednesday, April 21, 2010	Wednesday, July 14, 2010
Animal Health and Reproduction: Animal Reproduction (A1211)	$4.0	Not Required	Tuesday, May 04, 2010
Animal Health (1221)	$5.0	Not Required	Wednesday, May 05, 2010
Food-borne Pathogen-Plant Interactions (1301)	$3.5	Wednesday, April 14, 2010	Wednesday, May 26, 2010
Practical Approaches to Food Safety (1311)	$2.0	Wednesday, May 12, 2010	Wednesday, August 04, 2010
Reducing Food Allergies by Improving Food Quality (A1321)	$4.5	Wednesday, April 14, 2010	Monday, June 14, 2010

	Microbial Communities in Soil (A1401)	$4.5	Monday, May 03, 2010	Monday, August 23, 2010
	Agriculture Water Science (A1411)	$4.5	Not Required	Wednesday, May 19, 2010
	Engineering Approaches for Improved or Alternative Management Systems to Safeguard Animal Welfare (A1501)	$4.0	Wednesday, April 14, 2010	Thursday, July 08, 2010
	Nanoscale Science and Nanotechnology to Ensure Safe Food (A1511)	$3.5	Not Required	Friday, May 14, 2010
	Prosperity of Small and Medium-Sized Farms and Rural Communities (A1601)	$7.0	Not Required	Wednesday, July 14, 2010
	Economics of Markets and Development (A1611)	$3.0	Not Required	Wednesday, July 07, 2010
Childhood Obesity Prevention ($25 million)		**Funds Available (Millions)**	**Letter of Intent Deadline**	**Application Deadline**
	Integrated Research, Education and Extension to Prevent Childhood Obesity (A2101)	As many as 15 awards up to $1.0 million per award per year	Not Required	Tuesday, June 29, 2010
	Extension Interventions to Prevent Childhood Obesity (A2111)	As many as 5 awards up to $0.2 million per award per year	Not Required	Tuesday, June 29, 2010
	Transdisciplinary Graduate Education and Training in Nutrition and Family Sciences or Child Development or Related Fields to Prevent Childhood Obesity (A2121)	As many as 2 awards up to $1.0 million per award per year	Not Required	Tuesday, August 03, 2010
	Methodological Research to Assess the Effectiveness of Obesity Prevention Strategies (A2131)	As many as 4 awards up to $0.5 million per award per year	Not Required	Tuesday, June 29, 2010
	Community-based Childhood Obesity Prevention (A2141)	As many as 1 award up to $5 million per award per year	Monday, May 03, 2010	Tuesday, August 03, 2010
Climate Change ($55 million)		**Funds Available (Millions)**	**Letter of Intent Deadline**	**Application Deadline**
	Regional Approaches to Climate Change (A3101)	As many as 5-8 awards up to $4.0 million per award per year	Friday, May 07, 2010	Friday, July 16, 2010
	Regional Approaches to Climate Change: Planning (A3111)	As many as 10 awards up to $0.05 million per award per year	Not Required	Friday, May 14, 2010
	National Cereal Germplasm Phenotyping (A3121)	As many as 2 awards up to $5.0 million per award per year	Friday, May 07, 2010	Friday, July 16, 2010

	Impacts of Climate Change on Animal Health and Production (A3131)	As many as 5 awards up to $0.5 million per award per year	Friday, April 30, 2010	Friday, July 02, 2010
	Climate Change Mitigation and Adaptation in Agriculture (A3141)	As many as 13 awards up to $1.0 million per award per year	Friday, April 30, 2010	Friday, July 02, 2010
Global Food Security ($19 million)		**Funds Available (Millions)**	**Letter of Intent Deadline**	**Application Deadline**
	Improving Sustainability by Improving Feed Efficiency of Animals (A5101)	As many as 3 awards up to $3.0 million per award per year	Wednesday, April 14, 2010	Wednesday, July 14, 2010
	Minimizing Losses from Dairy Diseases with Major Impact on Production, Marketing, and/or Trade (A5111)	As many as 1 award up to $2.0 million per award per year	Friday, April 23, 2010	Tuesday, July 13, 2010
	Oomycete Pathosystems in Crop Plants to Minimize Disease (A5121)	As many as 2 awards up to $1.9 million per award per year	Monday, April 26, 2010	Monday, August 02, 2010
	Program Delivery and Implementation of Wide-area Pest Monitoring (A5131)	As many as 1 award up to $1.2 million per award per year	Wednesday, May 19, 2010	Wednesday, August 11, 2010
	Improved Sustainable Food Systems to Reduce Hunger and Food Insecurity Domestically and Globally (A5141)	As many as 5 awards up to $1.0 million per award per year	Friday, April 30, 2010	Tuesday, June 29, 2010
Food Safety ($20 million)		**Funds Available (Millions)**	**Letter of Intent Deadline**	**Application Deadline**
	Prevention, Detection, and Control of Shiga toxin-producing Escherichia coli from Pre-Harvest through Consumption of Beef Products (A4101)	As many as 1-2 awards up to $5.0 million per award per year	Wednesday, May 05, 2010	Wednesday, September 22, 2010
	Microbial Ecology and Shiga toxin-producing Escherichia coli Shedding in Cattle (A4111)	As many as 7 awards up to $0.5 million per award per year	Wednesday, April 21, 2010	Tuesday, June 29, 2010
	Prevention, Detection, and Control of Food-borne Viruses in Food: A Focus on Noroviruses (A4121)	As many as 1-2 awards up to $5.0 million per award per year	Monday, April 26, 2010	Wednesday, September 01, 2010

	Food Processing Technologies to Destroy Food-borne Pathogens with an Emphasis on Viruses and Shiga toxin-producing Escherichia coli (A4231)	As many as 4 awards up to $1.0 million per award per year	Wednesday, April 21, 2010	Tuesday, June 29, 2010
	Addressing Critical and Emerging Food Safety Issues (A4141)	As many as 5 awards up to $0.3 million per award per year	Wednesday, April 28, 2010	Tuesday, June 29, 2010
	National Education Programs for Food Safety (A4151)	As many as 2 awards up to $0.5 million per award per year	Wednesday, April 28, 2010	Tuesday, June 29, 2010
Sustainable Bioenergy ($40 million)		**Funds Available (Millions)**	**Letter of Intent Deadline**	**Application Deadline**
	Regional Approaches to Sustainable Bioenergy (A6101)	As many as 3-5 awards up to $9.0 million per award per year	Friday, July 09, 2010	Wednesday, September 15, 2010
	Regional Approaches to Sustainable Bioenergy: Planning (A6111)	As many as 4 awards up to $0.05 million per award per year	Not Required	Friday, May 14, 2010
	Sustainable Bioenergy Research (A6121)	As many as 40 awards up to $0.2 million per award per year	Friday, April 30, 2010	Monday, June 14, 2010
	Investing in Americans Scientific Corps: Stimulating a New Era of Students and Faculty in Bioenergy (A6131)	As many as 2 awards up to $1.0 million per award per year	Friday, April 30, 2010	Monday, June 14, 2010
	National Loblolly Pine Genome Sequencing (A6141)	As many as 1 award up to $3.0 million per award per year	Friday, May 07, 2010	Friday, July 16, 2010

New grants won! (3-1 to 3-25, 2010)

Last Name	First Name	Proposal Title	Sponsor Name	Department	Description	Award Amount
Grace,	Kenneth	Biology and Control of the Formosan Subterranean Termite	Agriculture, Dept - FED	PEPS	Develop tools and assessment methods to support community-wide termite management; detect and establish research methods for new invasive termites in Hawaii.	$5,842
Leung,	PingSun	Comparative Advantage of Hawaii's Agricultural Exports to the Japan Markets	Agriculture, Dept - HI	NREM	To document and assess the competitive and comparative advantage of selected agricultural exports to Japan and summarize the results in a fact-sheet for public dissemination.	$38,295
Rubinoff,	Daniel Z	Evaluation of Oleander Sphinx Moth Daphnis nerii and the Giant Sphinx Moth, Cocytius antaeus, as Mod	Defense, Dept - Defense Threat Reduction Agcy	PEPS	Rearing and evaluation of two moth species, one in Hawaii and one in Florida for Hybrid MEMS technology	$108,916
					Award Count: 3	Total: $153,053

Faculty publications

Russell Messing (PEPS)

Kroder, S. & R. H. Messing. 2010. A new parasitoid from Kenya, Fopius ceratitivorus, complements the extant parasitoid guild attacking Mediterannean fruit fly in Hawaii. *Biological Control* 53: 223-229.

Dan Rubinoff (PEPS)

King, C. B. A, W. P. Haines and D. Rubinoff. 2010. Impacts of invasive parasitoids on declining endemic Hawaiian leafroller moths (Omiodes: Crambidae) vary among sites and species. *Journal of Applied Ecology*. 47:299-308.

Rubinoff, D. B.S. Holland, A. Shibata, R. H. Messing, and M. G. Wright. 2010. Rapid invasion despite extremely low genetic diversity in the invasive Erythrina Gall Wasp (*Quadrastichus erythrinae* Kim Delvare and La Salle 2004). *Pacific Science* 64:23-31.