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IMPACT REPORT Q2

SECOND QUARTER



People,
Place,
Promise



**College of Tropical Agriculture
and Human Resources**
University of Hawai'i at Mānoa

*The founding college of the
University of Hawai'i, established 1907*

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College of Tropical Agriculture and Human Resources
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“This quarter’s Impact Report focuses on our stakeholders: on the ways we are committed to their success and the amazing things they accomplish—with a little help from their friends.”

Links in the Chain. It is often said that of all the university’s colleges, CTAHR is the one that interacts most closely with the community. For many in the Islands, our college is their connection to UH—aside from some Rainbow Wahine volleyball, of course. This quarter’s Impact Report focuses on our stakeholders: on the ways we are committed to their success and the amazing things they accomplish—with a little help from their friends.

Reading over these stories, what strikes me is not only the variety of stakeholders that we serve but also the breadth of ways in which we serve them. One story is about local farmers who are important components of our economy and the backbone of our push toward food self-sufficiency. With research, funding, and hands-on instruction, we have helped them retain and expand their roles. Another story describes the Polynesian Voyaging Society’s newest canoe, the *Hikianalia*, and its most ambitious voyage, a circumnavigation of the globe that will serve as inspiration and education for those whom it meets at its ports of call. CTAHR is helping to feed the voyagers and showcase efficient, small-scale growing systems that can be adapted for land- and water-poor areas. And lastly, there is an explanation of the ways the marine cone snail’s powerful venom can be harnessed to create molluscicides against agricultural pests that are also threats to human health. CTAHR scholars are at the forefront of this important research.

From forage production to using cutting-edge equipment to identify peptides in the laboratory, CTAHR helps its stakeholders find solutions to create a safer, more fruitful, more unified Hawai‘i—and, from there, a better world.

Aloha,

A handwritten signature in gold ink that reads "Maria Gallo". The signature is fluid and cursive.

Maria Gallo
Dean and Director of CTAHR

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Providing for the Voyage

The Polynesian Voyaging Society, which made history and captured the hearts and imagination of so many throughout the Islands with their construction and sailing of the iconic *Hōkūle'i'a*, is setting forth on a new journey, with a new voyaging canoe, and CTAHR is going along for the ride. Growing systems created by researchers and extension agents in the College have been installed in the hull of the newly launched *Hikianalia*, which crewmembers will tend and use to supplement their diets throughout the vessel's year-long interisland "test cruise" and then on its three-year circumnavigation of the globe.

On long ocean voyages, fresh food is always an issue. Sailors used to succumb to scurvy; nowadays they resort to canned or dehydrated foods that may keep nutrient-deficiency diseases at bay but lack taste and optimal nutrition. Clyde Tamaru and Bradley "Kai" Fox (both MBBE), Jari Sugano (PEPS), and Jensen Uyeda (TPSS) each contributed to creating, refining, and installing the sustainable and efficient alternative sources of fresh greens this crew will benefit from, including a hanging soil bag for growing sweet potato, which provides tasty and nutritious shoots and leaves as well as the slower-growing tubers. A specialized hydroponic system for growing microgreens will be installed as well when the vessel is in dry dock in mid-August.

But the project is concerned with the nutritional needs not only of the crew but also of a much larger segment of society. As access to available growing space, fresh water, and fertile soil lessens worldwide, the *Hikianalia's* space-efficient and water- and energy-saving systems provide a powerful illustration of how much can be done in a small space with a very limited amount of fresh water. Hydroponic systems such as these will therefore also serve as a prototype for growers at the *Hikianalia's* ports of call, allowing people to gain the inspiration and technical knowledge to create similar systems themselves. For if, as master navigator Nainoa Thompson says, we are all members of the crew on the tiny, self-contained canoe called the Earth, we must learn to conserve and use our limited resources with care and respect.



Photo: Bradley "Kai" Fox

CTAHR alumna Miki Tomita (BA Biosystems Engineering) and extension agent Jensen Uyeda install a sweet potato soil bag planter in tight quarters aboard the Hikianalia.

Hikianalia anchored in Honokanai'a Bay, Kaho'olawe.



Fighting Snails With Snails

Hawaiian mollusks and CTAHR scientists are unlikely allies in the battle against an invader that threatens agriculture and human health worldwide.

Prolific breeders and voracious eaters (known to feed on at least 500 types of plants), African land snails are listed among the Global Invasive Species Database's top 100 invasive species and ranked 10th on the U.S. Department of Agriculture's list of priority quarantine gastropods.

But these snails not only wreck havoc on Hawai'i crops; they also harbor the "rat lungworm" parasite *Angiostrongylus cantonensis*. When accidentally consumed, this parasitic nematode can trigger meningitis, swelling of the brain and spinal cord. Once active in the central nervous system, the parasite can cause permanent brain damage and retardation.

Unfortunately, the pesticides developed to combat the land snails, such as malathion, are also toxic to humans and pets. And importing predator snails may introduce new threats to already endangered native snail species. So molecular bioscientists are looking at endemic Hawaiian cone snails, whose venom is capable of incapacitating human beings and potentially causing death, for clues to a natural, biodegradable molluscicide.

Molecular Biosciences and Bioengineering (MBBE) doctoral candidate Zachary Bergeron screens the venom of the *Conus textile* marine snail to identify prospective compounds. Cone snail venom is an ideal candidate, he says, because it has been evolutionarily tailored to incapacitate the other marine mollusks *C. textile* preys on.

Zachary uses a fluorescent assay, a novel tool developed in the laboratory of his advisor, Assistant Professor Jon-Paul Bingham. Biofluorescence serves as a sort of molecular light bulb for measuring the activity of peptides. Peptide toxins are short strings of amino acids that are chemically similar to proteins. They give snake, spider, scorpion, and snail venom its punch by targeting ion channels that regulate physical processes in the nervous system.

Zachary is looking for bioactive molecules that could be potential building blocks for safer, more targeted pesticides for agricultural pest control, but the process also has implications for pharmaceutical development.

In recognition of the caliber and potential community benefit of his work, Zachary recently received the 2013 CTAHR Research Symposium Best PhD Oral Presentation Award and the ARCS Foundation's Helen Jones Farrar and Honolulu Scholar of the Year Awards.



PhD candidate Zachary Bergeron and his advisor, Dr. Jon-Paul Bingham.

CTAHR molecular bioscientists are looking at endemic Hawaiian cone snails, whose venom is capable of incapacitating human beings and potentially causing death, for clues to a natural, biodegradable molluscicide.



Helping the Community to Grow

At the heart of CTAHR's history is the College's support of local agriculture, and this work continues to benefit the community of farmers, ranchers, and horticulturalists to this day. Here are three important ways CTAHR is making an impact:

When the papaya ringspot virus appeared in Hawai'i, it almost destroyed the Islands' papaya industry. It was so difficult, costly, and toxic to effectively control the virus with pesticides that production fell by nearly 40%, and farmers were going out of business. Growers looked to UH for help. In 1997, the Rainbow papaya, genetically engineered to be resistant to the virus, was released to a small group of farmers in Hawai'i for field-testing; it was commercialized in 1998 and today represents most of Hawai'i's papaya crop. CTAHR continues research to aid the local papaya industry, including working on a conventionally bred papaya resistant to ringspot.

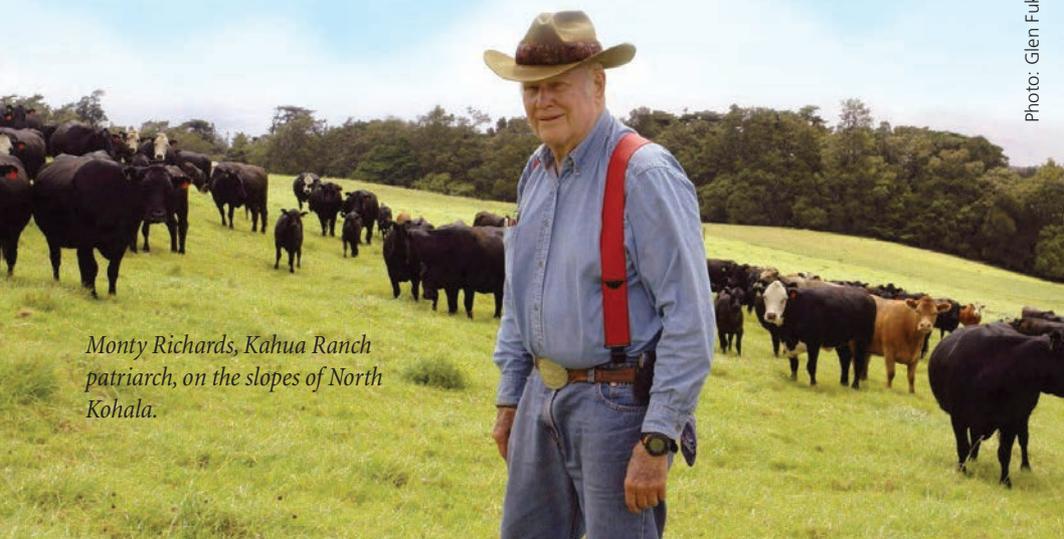
Hawai'i's tradition of cattle ranching and paniolo has its share of challenges. Ranchers used to be forced to ship most calves to be sold on the mainland, adding operational costs, so ranchers and UH sought solutions to improve Hawai'i's market for local beef. The CTAHR Beef Initiative provides research and outreach to support all aspects of Hawai'i's cattle industry: tenderness and carcass quality of grass-finished beef, best management practices for sustainable forage, improved breeding of cattle for grass-based production systems, and economic development and marketing tools for the ranchers. Now demand is high, with cattle ranked third highest among the state's commodities, and so is the quality of the beef!

Anthurium is the most important cut flower in Hawai'i's floriculture industry, consistently supplying local, national, and international markets. But when anthurium blight struck down the industry in 1985, Hawai'i production dropped by half, with many farms losing their entire harvest. UH scientists developed best management practices for growers to help mitigate the disease, but while Hawai'i's production was damaged, foreign competitors stepped in to meet worldwide demand. To maintain Hawai'i's prominence, new and unique varieties of anthurium were developed, including CTAHR's 'Tropic Fire', 'Maggie Inouye', and 'Centennial'. These new varieties, provided only to Hawai'i growers, give our farmers a competitive advantage in the world market again.

And these three areas alone account for almost \$60 million of the local economy, giving just a small idea of CTAHR's large-scale impact.



Harold Tanouye, owner of Greenpoint Nurseries, holds up 'Tropic Sunrise', one of many anthuriums bred by CTAHR that have been awarded ribbons by the Society of American Florists.



Monty Richards, Kahua Ranch patriarch, on the slopes of North Kohala.

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