



CTAHR IN FOCUS

Highlights of recent impacts in teaching,
research, and extension



**College of Tropical Agriculture
and Human Resources**

University of Hawai'i at Mānoa

People, Place, Promise

**The number of individuals who had contact with CTAHR
in 2012 would fill Aloha Stadium 19 times.**

x19

CTAHR by the Numbers

People

- 303 CTAHR-certified Master Gardeners who assist schools and homeowners statewide
- 412 Employees, permanent and temporary, statewide (fall 2013 headcount)
- 560 Benefactors who contributed a collective \$1.1 million to CTAHR in FY2013
- 994 Students in CTAHR undergraduate majors and graduate programs (fall 2013 third-week enrollment)
- 11,697 Total graduates from CTAHR programs (as of spring 2013)
- 101,946 People who had direct contact with a CTAHR program or employee

Place

- 50 Peer-reviewed articles on protection and management of the state's natural resources and environment
- 66 Community agencies where Family Resources students serve semester-long internships
- 84 Varieties of kalo described in the seminal bulletin *Taro Varieties in Hawai'i*
- 923 Workshops or activities addressing family and community health and wellness held statewide
- 1,281 Hawai'i-focused publications (most of them free) at www.ctahr.hawaii.edu/site/Info.aspx
- 1,600 Acres of off-campus facilities serving the community at 29 locations statewide

Promise

- 41 Percent of CTAHR doctorates awarded to women
- 45 Endowed scholarship funds that support CTAHR students; see www.ctahr.hawaii.edu/Site/Scholarships.aspx
- 117 Percent return on investment (extramural funding generated for every State dollar allocated to CTAHR)
- 278 Degrees awarded in AY2012–13, a 12% increase over the previous year
- 27,555 People who adopted a practice or changed a behavior due to CTAHR outreach (75 people per day!)

Photo courtesy Gregory Yamamoto; Sources include UH Office of Research Support (FY2013), UH Institutional Research and Analysis Office, University of Hawai'i Foundation, University of Hawai'i Combined Research and Extension Annual Report of Accomplishments and Results.

Excellence Education Integrity Service

"These are the core values that emerged from the College of Tropical Agriculture and Human Resources' 2013 strategic planning retreat."



Dr. Maria Gallo
Dean and Director

www.ctahr.hawaii.edu

facebook.com/uhctahr

Recent discussions by faculty, staff, students, and community stakeholders have focused on how CTAHR will anticipate and serve the needs of our clientele, act both responsively and responsibly, be visionary and inspirational, and serve as facilitators and role models in the pursuit of innovative and trans-disciplinary solutions to real-world problems. Action Planning Teams are hard at work pursuing the strategic goals we have set for ourselves. Their tasks fall into three priority areas:

Collaboration – The days of working in our individual silos are over. We must improve communication networks and adopt policies and procedures that maximize opportunities to collaborate. We will cultivate teamwork among the faculty and expand engagement with alumni, industry, academic institutions, nonprofits, local communities, international partners, and government agencies.

Resources – In an era of declining federal support for higher education and strapped state budgets, we must find ways to enhance, broaden, and diversify revenue streams to ensure financial stability. We are exploring sustainable research, education, and extension stations; cost-recovery options; and potential new revenue sources. We are evaluating pre-award support that will help our faculty and programs become more successful at tapping into available resources.

Education – We will continue to develop top-ranked programs to help graduates thrive amid global challenges and opportunities. As we identify important and crosscutting themes, we will reorient degree programs accordingly and improve our ability to recruit, retain, mentor, and graduate students in a timely manner.

It's all about People, Place, and Promise. As the founding college of the University of Hawai'i, CTAHR was established to meet the needs of the Islands' citizens. This report describes some of the important ways we are doing that. From preserving the environment to nourishing people to promoting a sustainable economy, our land-grant mission of education, research, and outreach in service to the land and its people remains as relevant today as it was 107 years ago.

New to the discussion is the heightened and critical focus on food safety, security, and self-sufficiency. Here too, CTAHR is prepared to serve. We have identified what we need to expand our efforts in ensuring that there is a safe, sufficient, and nutritionally sound supply of food. The investment is modest considering the critical need and potential benefit. For example—

- \$500,000 over two years would support research needed to develop locally produced livestock feeds for local dairy, poultry, swine, and aquaculture production, reducing dependence on imported sources of protein.
- One additional faculty position would allow us to develop an academic program in organic agriculture to fill workforce needs of farmers in this growing area.
- \$100,000 a year would hire and equip an assistant extension agent to provide food safety certification training and coaching for producers and processors. In the area of pesticides, \$100,000 a year would allow an assistant extension agent to educate immigrant farmers on the particulars and importance of U.S. pesticide and food safety regulations.
- Consumer research will help industry convey the nutritional and economic value of buying local and assist educators in promoting healthy dietary practices to reduce obesity, particularly among children.

With talented, committed people and responsive, innovative programs, we will continue to fulfill our promises to the people of Hawai'i nei.

Meet CTAHR: Students



Four members of the 2013 Wahine Volleyball Team are CTAHR students. This spring, Kristiana “TK” Tuaniga (hitting, above) is doing her Family Resources internship with Pālama Settlement’s Pākōlea sports program for at-risk youth. Seniors Rainette Marita “Mita” Uiato and Ali Longo are also Family Resources majors. Sophomore Kayla Kawamura is majoring in Natural Resources and Environmental Management.

Enrollment by Gender

At the undergraduate level, CTAHR skews more heavily female (72%) than either UH Mānoa as a whole (54%) or land-grant university agriculture programs nationwide (61%).

CTAHR graduate enrollment is more evenly balanced at 50% women, compared to Mānoa (58% women) or all land-grant schools (61% women).



28% male Undergraduates 72% female



50% male Graduate Students 50% female

Local and Global: Enrollment by Home Address



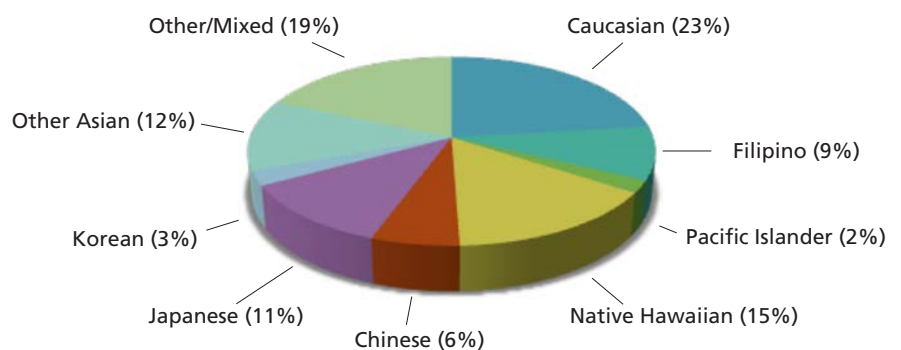
Permanent addresses of mainland CTAHR undergraduate students by state. Each dot represents one student in fall 2012.



Nearly 9 out of 10 CTAHR students are U.S. citizens. Most call Hawai‘i home—they list addresses on O‘ahu (78%), Maui (4%), Hawai‘i (3%), Kaua‘i (2%), and Moloka‘i and Lāna‘i (less than 1%).

24% of CTAHR students are pursuing advanced degrees. 1 in 3 graduate students come from other countries; many are drawn by CTAHR’s expertise in molecular biosciences, bioengineering, and natural resource management.

Diverse: Enrollment by Ethnicity



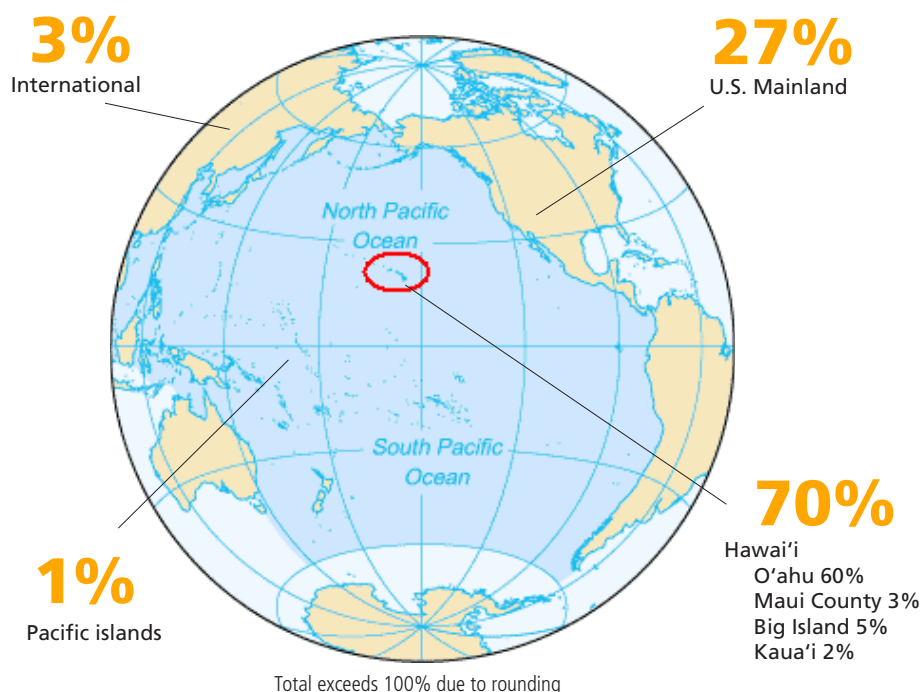
The number of Native Hawaiian students has doubled in the past five years, now constituting 15% of the CTAHR student body—slightly ahead of UH Mānoa as a whole (14%), but short of the overall state population (20%).

Native Hawaiian students are most underrepresented in Biological Engineering and Molecular Biosciences and Biotechnonology majors and graduate programs.

The college has hired two faculty members under a campus Native Hawaiian cluster initiative and approved a position in indigenous crops and agricultural systems supported by the university’s Kualī Council.

Meet CTAHR: Alumni

Local Ties: 7 out of 10 Alumni List Hawai'i as Home



2013 Outstanding Alumnus Wayne T. Iwaoka's influence

reaches far beyond the hundreds of CTAHR students he taught and mentored in Human Nutrition, Food and Animal Sciences at the University of Hawai'i. Many of the 10 critical skills that the CTAHR graduate (BS '67) developed were incorporated into the Institute of Food Technologists' criteria for food science programs worldwide to be "IFT Approved."

Previous awardees have made significant contributions on local and international stages. They include senior USAID leaders **Mary Ann Anderson** and **Donald Plucknett**, South Korea's "father of maize" **Soon Kwon Kim**, and the Sentricon termite technology developer **Nan-Yao Su**.

\$640

average amount of a CTAHR alumni gift

One out of 3 CTAHR alumni are UH donors. Together, they have contributed more than \$5 million to the University of Hawai'i since 1974.

In 2013, 33% of the 10,356 living CTAHR alumni directed gifts to CTAHR and its programs.

Student Profile: For 2013 CTAHR Alumni and Friends Scholarship recipient **Emily Guynn**, family vacations in national parks sparked a love for nature, and high school studies ignited an interest in conservation. Applying to 24 colleges

"NREM offered me ... skills for identifying problems in ecosystems, how to plan for solutions, and the economic and political knowledge needed to implement them."

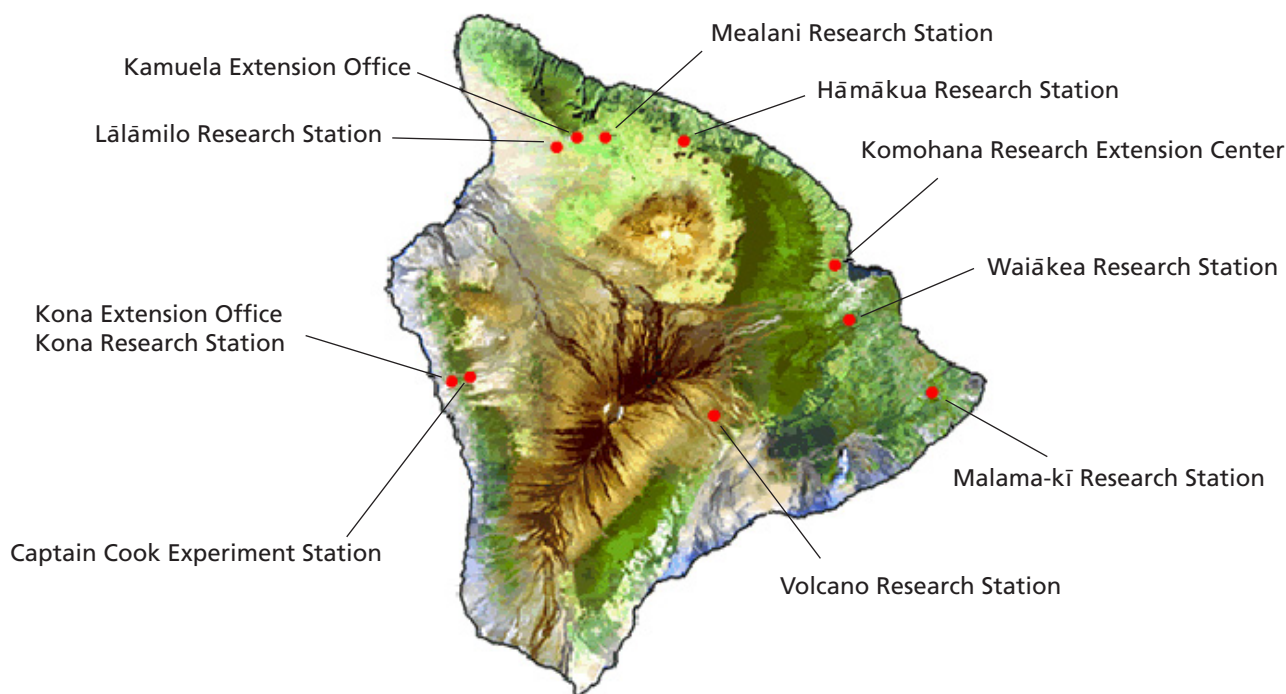
across the country, the Arizona native chose UH Mānoa "because O'ahu had a lot of mountains for me to climb and a city I could explore."

The alumni-supported scholarship helps her pursue a degree in Natural Resources and Environmental Management with a focus on plant ecology. Guynn is studying the effects of wildfire on carbon storage as a directed research project.

"I have learned a lot more than I expected," she says, including how to solve problems independently and apply for funding. On track to graduate in 2014, she hopes to find work restoring an ecosystem or helping farmers manage their resources wisely. In the meantime, she tends a rescued cat named Kaipo and the "tiny Eden" she cultivated on a barren scrap of soil at her apartment.



CTAHR: Hawai'i County



Hawai'i County

Latest HDOA Farm Facts

Number of farms.....	4,650
Total farm acreage.....	670,000
Market value of ag products sold:	
Crop sales	\$137 million
Livestock, Aquaculture ..	\$56 million
Value of ag tourism.....	\$13 million
Number of farm workers.....	2,350
Agricultural product with the most:	
Crop acreage	Coffee (3,800)
Farms ... Fruit (non-pineapple) (880)	
Livestock operations	Cattle (680)

CTAHR 2013 Fast Facts

CTAHR students from the county ...	30
Permanent faculty in the county	16
Support staff in the county	26
Active alumni listings.....	530
Workshops and field days held	351
Direct public contacts made.....	29,072
Food safety training recipients.....	250

With the opportunity to keep beef cattle at home in Hawai'i for the local-finish market, ranchers essentially become grass farmers, observes Hawai'i County Extension Agent Michael DuPonte. Little wonder the Hawai'i Beef Initiative Group drew on a cross-disciplinary team of CTAHR talent. Soil and plant experts worked to remediate sugarcane and pineapple land, improve forage, and control toxic fireweed. Animal scientists addressed herd management and animal health and taught artificial insemination techniques. Meat scientists focused on carcass quality and packaging, and an economist evaluated operation costs and markets.

Ultimately, says DuPonte, "genetics is a significant tool to improve the herd." Moloka'i Ranch provided 800 head as study cattle. Sustainability-minded Ulupono Initiative funds a team of CTAHR research and extension experts, who monitor DNA markers. Within a few years, this technology can demonstrate the best traits of parent breeds—such as efficient-feeding Hereford and hardy, high-quality Angus.



A \$46-million industry in Hawai'i, cattle ranks third in diversified agriculture.

"Looking at our previous work on herd genetics, we saw carcass quality at the end of seven years that was unheard of for grass-fed beef," DuPonte says. Studies suggested that pasture-finished beef satisfied consumers. The markets confirmed it: 11,600 grass-fed head (24 percent of the state's cattle market) were locally marketed in 2012. Whole Foods Market reported that Maui Cattle Company accounted for 39 percent of its total beef sales in 2012.

The team generated 24 grants, produced 31 publications, and started Mealani's Taste of the Hawaiian Range, an agriculture festival, to support ranchers and farmers. Drought and competition for land and water resources are continuing challenges, but the Beef Group sees strong markets for Hawai'i cattle.

Out of Kona: Integrated Effort Counters the Coffee Berry Borer

A beetle barely a sixteenth of an inch long, the coffee berry borer threatens a \$34-million signature Hawai'i crop. While 800 farms maintained 8,000 acres in coffee last year, the harvest declined by 200 acres, and yield was down 30 pounds per acre, according to the USDA. Higher prices bolstered farm revenue, but growers expect limited sales this year due to the pest.

Female coffee berry borers drill into the coffee cherry, laying 2–3 eggs per day for 20 days. They and their larvae damage the coffee bean as they feed. Female offspring bide their time between seasons, emerging after a rain, already pregnant, in search of a new home. "This beetle isn't going anywhere," says Assistant Extension Agent Andrea Kawabata, farmers' champion in the berry borer battle.

Kawabata has strong Island roots. Her uncle was a Big Island orchid grower. While studying agriculture at UH

CTAHR was awarded a \$949,000 USDA grant for areawide mitigation and management of the borer.

Hilo, she was a student employee at CTAHR's Beaumont Research Station. Even as a master's student at Mānoa, she did research in Hilo on rambutan trees. She joined the Kona Extension Office not long after the coffee berry borer's presence was confirmed in South Kona in late 2010.

"If growers don't manage the coffee berry borer, it can wipe out nearly 100 percent of the crop," she says. The good news is that farmers are mounting a promising defense using strategies developed by CTAHR scientists and endorsed by USDA, the state Coffee Berry Borer Task Force, and industry groups. Kawabata helped organize a coffee berry borer summit in 2013 and has been island-hopping to help explain the Integrated Pest Management strategies to coffee growers from Kā'ū to O'ahu. The IPM recommendations (posted at www.ctahr.hawaii.edu/site/cbb.aspx and



Two-thirds of growers turned to CTAHR experts like Andrea Kawabata to save their crop.

available in Spanish, Ilokano, and Marshallese) include

- Appropriate application of pesticide, fungus, or kaolin clay mineral film.
- Use of baited traps to gauge insect activity and better target treatment.
- Pruning, harvesting, and transport practices that minimize spread of the beetle.
- Hot-air quarantine treatment to kill borers lurking in harvested beans.

"We make sure any help we offer is scientifically proven," Kawabata says.

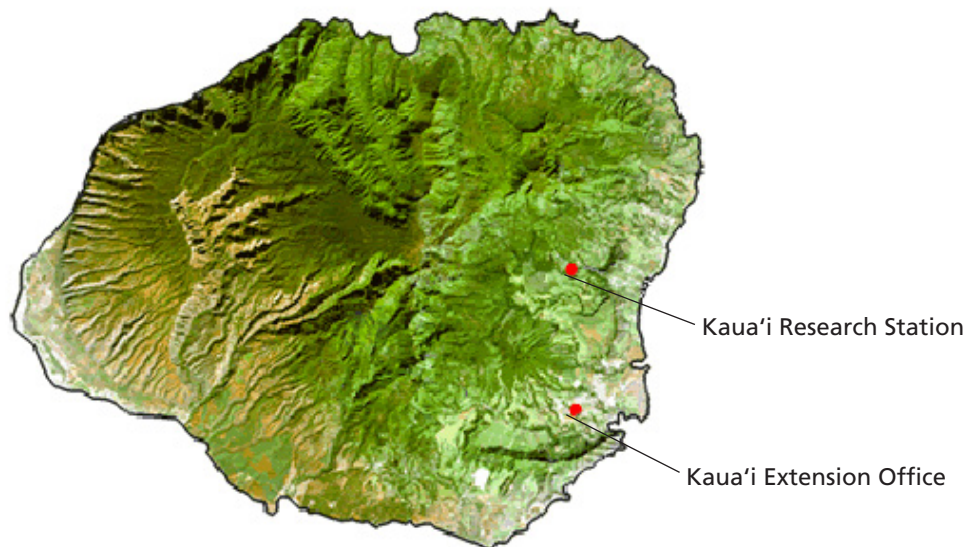
It appears to be working. A September 2012 survey of coffee cherry farmers and processors found there was a significant jump in the number of farmers using recommended practices. The green bean recovery ratio—the amount of cherries it takes to produce a pound of coffee beans—has stabilized, and there are hints it is improving. The survey confirmed her observation that farmers tend to look to each other for advice, but it also indicated that nearly two-thirds get information from CTAHR's website and workshops.

Student Profile: It's telling that Makana Agcaoili was Pāhoa High School's head tutor

for AVID, the acronym for Achievement Via Individual Determination. Steeped in the virtues of hard work and helping others, he moved to the Big Island at age 16 to help care for his grandparents, overcame a difficult speech impediment, got involved in Future Farmers of America, and won parliamentary procedure and public speaking competitions. He earned the CTAHR Dean's Scholarship and other financial aid to attend UH Mānoa, where he is a resident assistant, honor student, Peer Review Board member, and CTAHR Student Ambassador. He explored the feasibility of implementing rooftop gardens like the one atop C-MORE Hale as a freshman, then decided to major in Plant and Environmental Biotechnology. "I found it amazing that we are able to modify organisms to make them stronger and safer for people and the environment," he says. "Maybe if more people understood the science, there wouldn't be as much opposition and fear towards biotechnology." His letters on the topic appeared in the *Hawai'i Tribune* and *Civil Beat*. Contemplating a future in teaching or research, he says: "CTAHR works very closely with all of its students and helps everyone to achieve their dreams."



CTAHR: Kaua'i County



Kaua'i County

Latest HDOA Farm Facts

Number of farms.....	750
Total farm acreage.....	150,000
Market value of ag products sold:	
Crop sales	\$75 million
Livestock, Aquaculture.....	\$3 million
Value of ag tourism.....	\$6 million
Number of farm workers.....	550
Agricultural product with the most:	
Crop acreage	Sugar (5,200)
Farms	Fruit (non-pineapple) (195)
Livestock operations.....	Cattle (120)

CTAHR 2013 Fast Facts

CTAHR students from the county ...	22
Permanent faculty in the county	5
Support staff in the county	4
Active alumni listings.....	210
Workshops and field days held	57
Direct public contacts made.....	4,784
Food safety training recipients.....	52

Faculty Profile: Junior Extension Agent Kim Perry grew up eating fresh, healthy food from her grandfather's Victory-style garden in the Chicago suburbs. She studied biology in Iowa and ecology in Madagascar, was a Peace Corps environmental specialist in Jamaica, taught in Spain, and worked on a small farm in Mexico. The constant, she realized, was involvement in community gardening and local food projects. So she enrolled in a California State Polytechnic University master's program focused on regenerative agriculture and food systems, where she researched the use of beneficial microorganisms in soil amendment and helped maintain the organic agricultural demonstration site.

"I hope to apply some of the knowledge and experience I gained to promote garden and landscape practices that conserve and regenerate Kaua'i's native habitat and natural resources," Perry says. She provides outreach to home gardeners and small, diversified farms growing mixed vegetables. She also coordinates the Kaua'i Master Gardener Program. A small cadre of active volunteers has done a large amount of outreach—teaching in school gardens, holding workshops and demonstrations, participating in Farm Fair and Arbor Day events, and hosting hundreds of fifth graders for Ag Awareness Day. They will train more volunteers yearly.

"People here are really interested in sustainable, organic gardening," Perry says. It was the number-one topic emerging from the survey she conducted after arriving at the CTAHR Extension Office in Līhu'e a year ago.



Perry describes vermicasting (worm composting); follow Kaua'i Master Gardener activities online at www.facebook.com/kauaimgs

Barking Sands and Overseas: 4-H Serves Military Kids

Hawai'i is one of four states delivering Military 4-H programs to U.S. military facilities overseas as well as at home. CTAHR administers the federally funded 4-H clubs at nine Hawai'i locations, including Barking Sands, as well as bases in Japan, Korea, and Kwajalein Atoll in the Marshall Islands.

In all, 854 youth participated in science, healthy living, and service activities and joined clubs ranging from cooking and gardening to art and photography during 2012. The young people contributed to the community by planting native flora, cleaning beaches, and visiting an orphanage. In addition, CTAHR offered 10 training sessions attended by 200 leaders in person and via webinar.

The college also coordinates Operation: Military Kids (OMK) as part of the 4-H/Army Youth Development Project. OMK's 79 deployment-support experiences reached more than 1,700 military-connected young people in 2012. Working with community partners and volunteers, the program offered camps, workshops, babysitter training, opportunities to share experiences, and access to a Mobile Technology Lab to communicate with deployed family members.



More on Military 4-H in Hawai'i at www.ctahr.hawaii.edu/4h/omk/, or contact Extension Educator Claire Nakatsuka at nakatsuk@hawaii.edu.

In Wailua: Herbicide Ballistics Effectively Tackles Invasive Threat

A determined paintball battle is being waged against miconia weed trees in Wailua State Park and across Hawai'i. The sun-hogging, erosion-promoting, prolific seed producer from tropical America has impacted tens of thousands of acres of Hawai'i's watersheds since its introduction 40 years ago. Listed among the world's 100 most invasive species, it overwhelmed two-thirds of Tahiti's forests. "It has the potential to destroy our entire watershed," Kaua'i Invasive Species Committee project coordinator Keren Gundersen told the *Garden Island*.

Leading the counterattack is Assistant Researcher James Leary, a Michigan native who came to Hawai'i in 1997 to study weed science. In spite of his Hawai'i roots (his mother was raised on Maui and earned a nursing degree from UH Mānoa), he says, "I was like most malihini, fooled by the romance of year-round food production. In a very short time, I found out that weeds grow year-round as well."

While miconia has no trouble creeping up into Hawai'i's remote rainforests and watersheds, human access



HBT reduces weed density with minimal herbicide. Video at www.ctahr.hawaii.edu/invweed/video.html

is quite limited, so Leary developed Herbicide Ballistic Technology, or HBT. Paintball gun technologies in liquid encapsulation and pneumatic delivery systems, among others, deliver pesticides with surgical precision and long-range accuracy. He adapted and refined equipment, identified effec-

tive utilities in the field, established quality control in production facilities, and standardized safeguards for practitioners...a soup-to-nuts approach in technology transfer.

In collaboration with the National Park Service and Maui Invasive Species Committee, Leary has conducted more than 60 helicopter operations since 2012, eliminating more than 5,000 miconia targets and protecting more than 4,000 acres of the East Maui Watershed. HBT has reduced the density of incipient miconia populations by more than 90 percent while using less than 1 percent of the maximum allowable rate of herbicide.

Leary joyfully describes delivering a pinpoint dose of herbicide to one miconia target: "We saved a native 'ōhi'a in its midst. It's what we like to call 'releasing the hostage.'" Constantly updating the science and technology of invasive weed management in his stakeholder projects, he hopes to collaborate with research organizations on new projects and see an advanced degree program for neighbor island practitioners.

Selected Highlights: CTAHR Outreach

March 23, 1907

Governor Carter signs Act 24, which establishes the College of Agriculture and Mechanic Arts; an Extension Department is established two years later.

1933

Range Grasses of Hawai'i is published to help ranchers.



1948

The college helps establish the Hawai'i Farm Bureau Federation, which saves farmers money through cooperative buying.



1914

Cooperative Extension Service is established nationwide. The first Hawai'i 4-H program is offered.

1919

Research on taro disease begins on Moloka'i.

1929

Gov. Farrington signs the Territorial Extension act. President David Crawford, right, is named the director of extension, UH receives its first land-grant funds, and USDA extension agents are transferred to UH.



1957

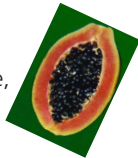
Mabel Walker's work on sodium and fat leads to recommendations for military meals and school lunches.

1944

Alice Trimble pens publications on family businesses for homemakers.

1911

The Solo papaya is introduced; Sunrise, Masumoto, and Kapoho follow.



1928

UH Extension and Experimental Stations merge.

1936

Monthly data on supplies, planting, and marketing comprises state's first agricultural statistics reporting.

1950

Statistics of Diversified Agriculture in Hawai'i forms the state's first agriculture economics report. *Fundamentals in Landscape Gardening* launches the Islands' landscape industry.

1910 1920 1930 1940 1950 1960

1917

Breeding begins on new varieties of sweet potato.



1929

A research station is established at Kona.

1940s

William Storey's cytogenetics work explains color inheritance in orchids, and Mamoru Ishii discovers methods to protect orchids from parasites.



1957

The Food Processing Laboratory establishes commercial guava processing.

1911

Seminars, lectures, and correspondence courses are offered on neighbor islands.

1921

Waiākea Experiment Station assists homesteaders with sugarcane, diversified crops, and livestock.



1936

Carey Miller's *Fruits of Hawai'i* popularizes guava.

1950

Waimānalo Research Station is established.

1947

The *Honolulu Star-Bulletin* publishes *Poultry Production in Hawai'i*.

1914

Poultry Management is first comprehensive poultry publication.



1930s

In-depth research on coffee helps Kona farmers achieve the highest yields in the world. Selection begins for macadamia cultivars that now make up the majority of world's orchards.

1939

UH hosts first meeting of the Hawai'i Dietetic Association



1950s

Edward Rada's first Floral Clinic brings growers, scientists, and marketers together. Haruyuki Kamemoto begins his prolific anthurium breeding program.

Selected Highlights: CTAHR Outreach

1962

The college helps to develop the Hawai'i Turfgrass Association.

1970s

CTAHR pioneers field-scale monitoring of runoff, erosion, and sediment movement in agricultural watersheds.

The discovery that termites can't tunnel through gravel of a certain size launches UH Basaltic Termite Barrier patent.



1967

James Koshi helps draft the Milk Control Act and create the 50th State Dairy Cooperative.

1984

The Agricultural Diagnostic Service Center opens for business on campus.



1990

Faculty help organize the Hawai'i Interagency Water Quality Action Plan; economists demonstrate the viability of using non-potable water for landscaping.



May 8, 2014

CTAHR and other land-grant institutions mark the centennial of the national Cooperative Extension Service.

2002

Comprehensive termite control outreach effort is launched.



2004

Decades of soil and water research intensify efforts to protect coral reefs from land-based pollutants.

2006

Toward Sustainable Agriculture: A Guide for Farmers is published, followed by *Best Native Plants for Landscape*.



1978

Cooperative Extension merges with the Hawai'i Agriculture Experiment Station to form the Hawai'i Institute of Tropical Agriculture and Human Resources.

1991

CTAHR's integrated pest management team saves anthurium from blight.

1992

Researchers engineer the Rainbow papaya to counter the ringspot virus.

1982

Agricultural Leadership Program helps in transition to sustainable diversified agriculture.

1960 1970 1980 1990 2000 2010

1965

Ludwig Auer introduces a computer accounting program for farmers.



1960s

Mealani Research and Waiale'e Livestock Experiment Stations are established.



1980s

Kula Experiment Station develops protea hybrids from seedlings, eventually releasing more than 100 new cultivars.

College efforts produce an influential new mechanical shrimp grader, improved grazing methods, and analysis of cacao for production in Hawai'i.



1981

CTAHR launches online Pesticide Information Retrieval System.

1988

Planning for Profits begins helping creative people start businesses.

1997

Taro: Mauka to Makai provides a business guide for Hawai'i growers.

Low-water processing system for coffee cherries becomes the industry standard. Later, heat pumps to dehumidify coffee reduce processors' petroleum use by 40–75%.

1996

CTAHR sponsors the first Taste of the Hawaiian Range.



2000s

GoFarm Hawai'i and LIFE programs begin helping new and immigrant farmers. Agribusiness Incubator Program assists value-added businesses.

1993

The Urban Garden Center opens in Pearl City.



2010

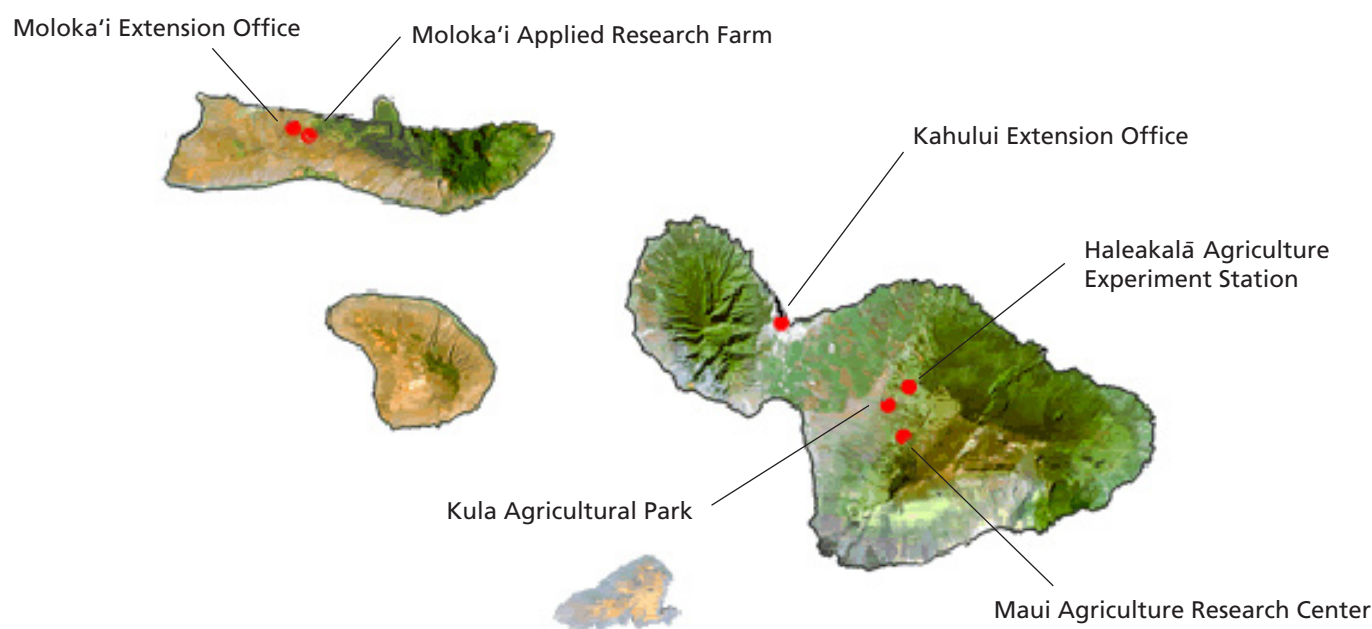
CTAHR hosts first Bee Pollinator Expo.



1976

UH Extension Service becomes the lead agency for pesticide safety training, teaching more than 12,000 applicators over the next 30 years.

CTAHR: Maui County



Maui County

Latest HDOA Farm Facts

Number of farms.....	1,150
Total farm acreage.....	230,000
Market value of ag products sold:	
Crop sales	\$144 million
Livestock, Aquaculture.....	\$7 million
Value of ag tourism.....	\$5 million
Number of farm workers.....	1,700
Agricultural product with the most:	
Crop acreage	Sugar (34,500)
Farms	Fruit (non-pineapple) (270)
Livestock operations.....	Cattle (150)

CTAHR 2013 Fast Facts

CTAHR students from the county ...	22
Permanent faculty in the county	9
Support staff in the county	12
Active alumni listings.....	3
Workshops and field days held	325
Direct public contacts made.....	10,275
Food safety training recipients.....	551

Grant Profile 1: Maui's native silversword evolved to survive amid the hot, dry cinders and freezing winds of Haleakalā, but can it adapt to climate change? Already the iconic, threatened 'āhinahina is dying from conditions that are warmer and drier than usual. Dr. Paul Krushelnycky is trying to determine the long-term viability of the succulent and associated biological communities in the face of climate change. A \$212,431 award from the U.S. Department of the Interior's Pacific Island Climate Science Center funds the assistant researcher's work to understand population trends and factors that influence seedling drought tolerance. The results will suggest management strategies and pave the way for similar conservation efforts likely to become necessary for other native Hawaiian species. The research is also supported by a four-year \$260,000 National Park Service Grant for ongoing work to control Argentine ants, which are also a threat to the silversword.



Grant Profile 2: Among Dr. Susan Crow's nearly \$1.5 million in grants addressing soil change due to climate change and land use in both natural and managed lands is a five-year, \$543,000 USDA contract to study carbon dynamics and sustainability of biofuel production on HC&S land in Central Maui. The assistant professor in Natural Resources and Environmental Management is evaluating eucalyptus plantations as a potential feedstock source for biofuel or bioenergy in addition to tropical grasses such as sugarcane.

From Moloka'i: A Peach of a Potential New Crop



Moloka'i Applied Research Farm is one of 50 sites on 6 islands testing low-chill peaches.

Realizing that mango doesn't grow well in all of Hawai'i's microclimates, Assistant Extension Agent Alton Arakaki sought a fleshy fruit, good fresh or baked, that would do well where mangoes don't...like a peach. Not the fruit found in some Island backyards that is primarily made into pickles, but the plump, juicy, flavorful

CTAHR's work to control fruit flies eliminated one barrier to re-introducing peaches as a feasible crop.

favorite of Chinese emperors and European kings. Problem is, peach trees require a period of cold weather, below 45 degrees, to blossom.

Arakaki learned of low-chill varieties sold by Burchell Nursery in California, which introduced him to horticulturist David Byrne of Texas A&M. "You tap the expertise of the community you want to learn about," he says. Byrne develops peach varieties that have low chill-hour requirements for commercial operations where winters are mild. Already testing varieties in Mexico and Thailand, he and the nursery provided trees to Arakaki in exchange for data on their performance in Hawai'i.

Arakaki, who is based on Moloka'i, invited fellow extension agents in neighboring counties to be part of the peach team, although he couldn't offer direct funding for their efforts. His goal was to test the trees in a wide temperature range from hot, dry Wai'anae and Ho'olehua to high, cool Kula and Kamuela. The result is trials of four publicly available low-chill varieties—Tropic Prince, Tropic Beauty, Tropic Sweet, and Tropic Snow—and some experimental cultivars at 50 sites on six islands.

Peaches aren't entirely alien. While an earlier "Hawaiian" variety is described by the USDA *Handbook of Peaches and Nectarines* as "poor quality, unattractive, low yielding," it yielded the low-chill genetic stock used

"The college can take some risk trying new things so it will be more predictable for farmers."

extensively as a parent in early low-chill breeding work. CTAHR evaluated peach varieties planted in the 1960's on upper-elevation experiment stations, but found that insufficient chill hours for the available varieties and high populations of fruit flies limited commercial viability. Since then, CTAHR's work on fruit fly management strategies and the development of high-quality low-chill varieties by Florida and Texas breeders have addressed those issues.

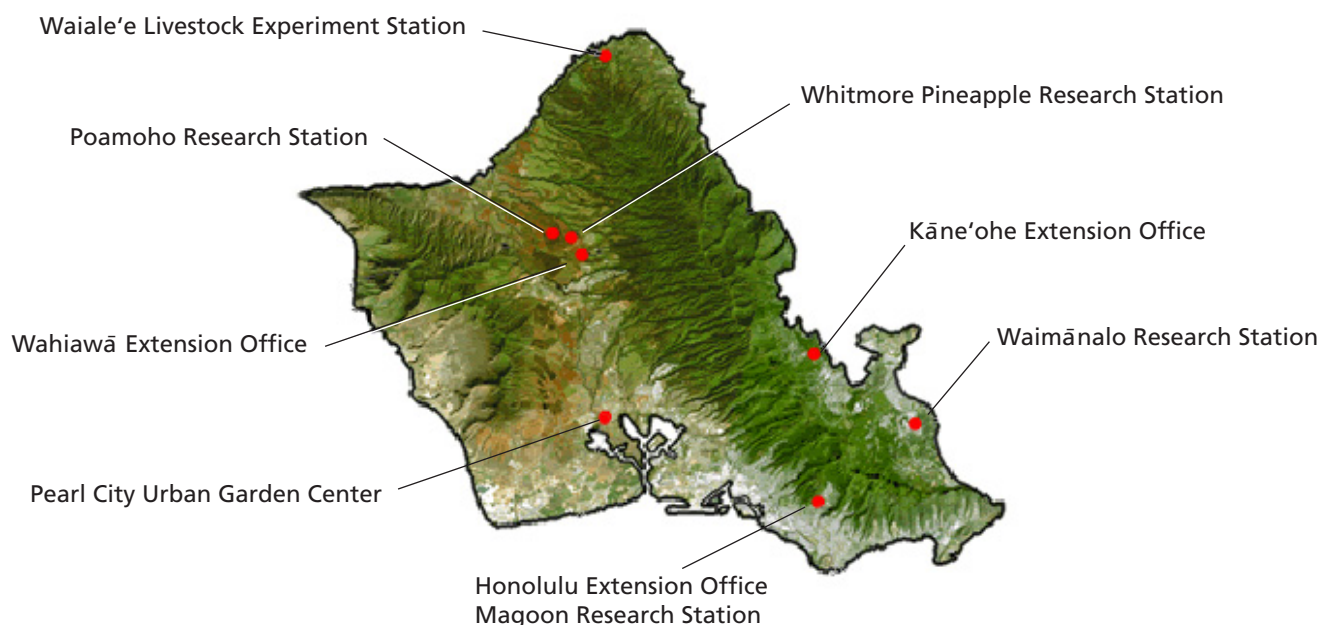
Still, given the substantial investment of time, capital, and acreage required to establish a new tree crop, commercial orchards are hesitant to take an economic gamble on an experimental crop. "You never know until you're growing," Arakaki says. "The college can take some risk trying new things, such as discovering the behavior of a plant with deciduous characteristics in tropical conditions, so it will be more predictable for farmers."

It's still early, but the peach team is excited. "The trees on Moloka'i and Kamuela fruited well this year," Arakaki says, indicating potential for wide climatic fruiting range. "They're

still young, but the fruit has full-bodied peach flavor." Word has leaked out, and area chefs are already asking how they can get Hawai'i-grown peaches to incorporate into their menus. The college has provided supplemental project funding to continue documentation and help determine if this year's fruiting was an anomaly or a predictable genetic and scientific achievement that growers can bank on.



CTAHR: O'ahu County



O'ahu County

Latest HDOA Farm Facts

Number of farms.....	950
Total farm acreage.....	60,000
Market value of ag products sold:	
Crop sales	\$167 million
Livestock, Aquaculture...	\$17 million
Value of ag tourism.....	\$14 million
Number of farm workers.....	1,600
Agricultural product with the most:	
Crop acreage	Seed, misc. (9,500)
Farms	Flowers, nursery (270)
Livestock operations.....	Hogs (70)

CTAHR Fast Facts

CTAHR students from the county ..	737
Permanent faculty in the county....	115
Support staff in the county	96
Active alumni listings.....	6,222
Workshops / field days held.....	1,542
Direct public contacts made....	57,806
Food safety training recipients...	1,022

Grant Profile: Dr. Andrew Kaufman is testing coastal bio-shields

to prevent the severe property damage and human injury that can result from tsunami and storm surges caused by tropical cyclones. With a \$75,000 Department of Land and Natural Resources grant, the associate professor and landscape specialist will build on his previous research—which suggests that a coastal forest with high stem density and complex vertical structure provides the greatest protection. He will establish five experimental coastal reforestation plots using primarily native and Polynesian introduced species in a joint effort with Bellows Air Force Base and quantify the ecological services performed by existing coastal forests in Hawai'i to create guidelines for the restoration of coastal forests with a high capacity to act as tsunami or storm surge bio-shields.

Student Profile: Mc Millan Ching was one of 10 U.S. high



school students selected to participate in AgDiscovery 2012, a federally sponsored program organized by CTAHR faculty and USDA staff to encourage outstanding youth to consider agriculture careers. A 16-year-old college freshman in the Philippines, he had enrolled in Campbell High School to ease the transition of immigrating. Now a CTAHR Molecular Biosciences and Biotechnology major, he's unfazed by his daily four-hour commute because he sees biotechnology's potential to "give rise to novel ideas, occupations, markets, and discoveries," from increasing the world's food supply and providing drinkable water to developing systems that process waste products and greenhouse gases. Whatever lies ahead—medical school has been a dream since he lost a sister to liver cancer—he hopes it involves doing research to find solutions to real-world problems. He has shadowed CTAHR plant geneticist Ming-Li Wang and interned with a UH cardiovascular research team. "CTAHR provides me the opportunity to grow as an individual by providing scholarship and volunteer opportunities that truly enhance my sense of community as well as my character," he says.

Coming to Hālawā: Project Creates Roadside Nursery for Natives

Weed specialist Dr. Joseph DeFrank is working with the Hawai'i Department of Transportation (HDOT) to showcase native landscapes and harvest seeds on right-of-ways under two three-year grants worth \$430,000.

Working on a demonstration site inside the University Street on-ramp to westbound H1, DeFrank and his graduate students are establishing the protocols for preparing sites, readying planting materials, establishing plants, and producing seeds. The work will expand to the larger Hālawā interchange in 2014.

Plants, selected from candidates identified by USDA's National Resources Conservation Service Plant Materials Center on Moloka'i, include four native groundcovers (piligrass, 'emoloa,

kāmanomano, and konakona) and five shrubs ('a'ali'i, 'āhinahina, 'āweoweo, 'ilima, and 'uhaloa). DeFrank plans to simulate a dryland ecosystem on steeper banks and harvest seed on flat areas. Beyond controlling erosion, benefits include

- creating an easily accessible reservoir of native seeds,
- providing habitat for beneficial insects, such as pollinators, and food for birds that help disperse the native seeds,
- displacing invasive species, which typically advance along roadways,
- reducing maintenance costs and describing a new contracted services option for HDOT,
- teaching Adopt-a-Highway groups to recognize native species and



Scott Lukas, Joe DeFrank, and Orville Baldos turn "just another maintenance expense for the state" into seed-producing farms.

help harvest seeds, and

- countering the heating and drying effects of hard urban landscapes.

At Mānoa: Processing Lab Engineers Better, Safer Food Handling

With Japanese visitors eager to buy Big Island Abalone products as omiyage, the Kona company turned to Associate Professor Soojin Jun. He had worked with NASA on flexible food packaging using retort pouches—vacuum-packed, steam-processed "canning" minus the heavy, land-fill-clogging metal containers.

It's just one of the technologies Dr. Jun's Food Processing Laboratory explores. Jun and master's student Jin Hong Mok work on a promising supercooling method, which combines pulsed electric and magnetic fields to reach subzero temperatures without

turning liquids solid. A frozen chicken breast remains pliable, fruit thaws without turning mushy, produce can be stored and transported without losing its fresh-food character.

Jun's lab also developed a patented technology that combines ohmic heating by electric current (efficient for liquids) with microwave heating (good for solids). Current methods for foods such as soups require heating components separately, which is inefficient, or else overheating solids, which degrades quality and nutrition.

"I'm not a foodie guy," Jun insists—just an electrical engineer at heart.

Originally inspired by the automation in a Korean tofu factory, he sees similar potential for companies processing local foods like poi and kava. "There are so many things you can do as an engineer."

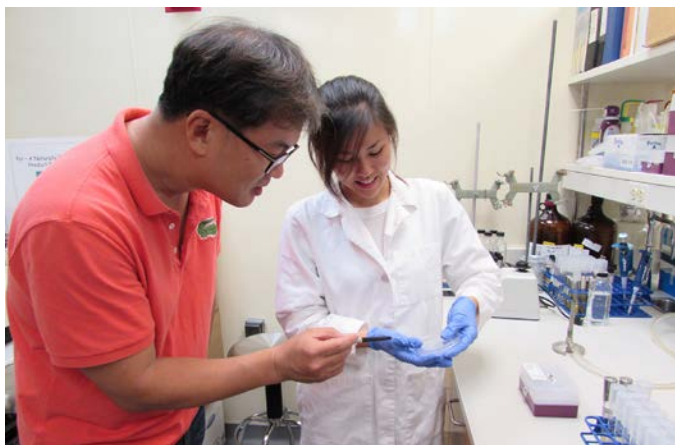
Lab member Kara Yamada helped

develop recipes for UH's Kulanui line of dressings and sauces as a CTAHR undergraduate. After Meadow Gold and Hawaiian Host internships shifted her focus to quality assurance and

The ability to retain fresh foods' character during shipping and storage would expand markets.

food safety, she's doing her master's thesis on carbon nanotube-based biosensors to fabricate a sensitive, portable biosensor to rapidly detect food-borne pathogens. "If we could add action so the sensor not only detects but also neutralizes the pathogen, how cool would that be?" muses Jun.

Supported by more than \$1.5 million in USDA, industry, and international grants since 2008, his team also researches pathogen-fighting technologies such as laser decontamination of fresh produce and nano-material coatings to reduce bacteria-promoting biofilm buildup on the surfaces that come in contact with food during processing. He'd also like to explore biodegradable or edible films as waste-reducing packaging.

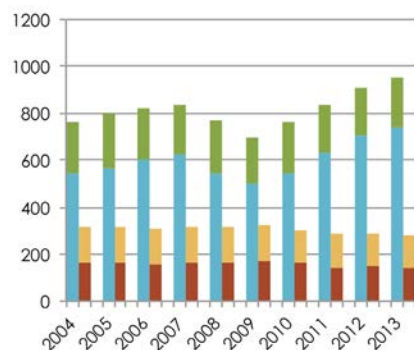


Dr. Jun and Kara Yamada work on pathogen-detecting bio-nanotubes.

Mission: Instruction

Enrollment Growth

Opening day enrollment reached a 26-year high in fall 2013 at 954.



The number of undergraduate (blue) and graduate (green) students is up 25% since 2004. The number of faculty (red) and other staff (orange) declined 12% during the same period.

It's a CTAHR Fact—

Animal Sciences is the fastest-growing major, up 165% from 2008.

Molecular Biosciences and Bioengineering is the fastest-growing and largest CTAHR graduate program.

CTAHR offered 131 classes in fall 2013; average class size was 26 students.

CTAHR students won recognition from the International Food and Agribusiness Association, Institute of Food Technologists, International Conference on Challenges in Environmental Science and Engineering, and others last year.

Five-year enrollment growth of 18% mirrored the 17% increase for land-grant colleges nationally from 2007 to 2012.

About 60 CTAHR scholarships worth \$300,000 are awarded annually. 80% of graduate assistants are funded by extramural grants, third highest among UH Mānoa schools and colleges.

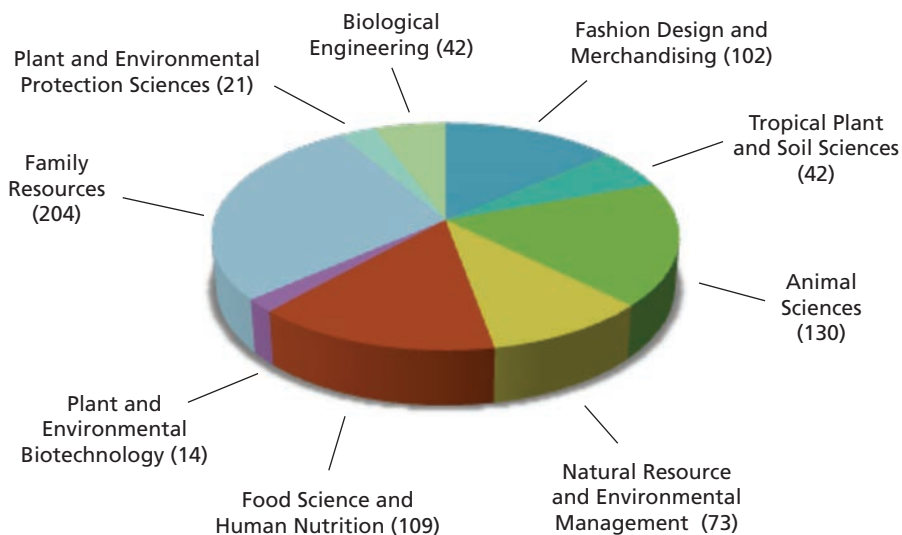
11 college-sponsored activities for students—from social to academic to career oriented—drew more than 700 participants in 2012. CTAHR is reputed to hold the most student-centered events of any Mānoa college.



Student Profile: Kiana Ebeling

considers herself a small-town girl with a thirst for new experiences and an appreciation for supportive family and friends back home. The Waiākea High School graduate has spent a semester on exchange at the University of Rhode Island and is studying Spanish and international business in Seville. "I want to meet new people, experience new ways of life, and learn more about other cultures," she says. A Fashion Design and Merchandising major with a minor in business, she would like to own a boutique someday. "I love the fact that a new outfit can change somebody's entire persona and make them feel more confident about themselves," she explains. She promotes CTAHR as a Student Ambassador. "I feel every CTAHR student gets specialized attention and support," she says. "People ask me all the time if I miss home and all the warmth and beautiful beaches, but the truth is I miss my family and friends the most. Being so far away has truly made me realize how lucky I am."

Undergraduate Enrollment by Major (headcount)



Faculty Profile: Dr. Creighton Litton received the 2013 UH Regents' Medal for Excellence in Teaching.

A child's interest turned into a passion for plant biology in college and brought him to the Big Island as a postdoctoral scientist studying the aggressive African fountain grass invading tropical dry forests. Now a CTAHR associate professor of forest ecology and management on O'ahu, he maintains offices and labs on both islands and teaches undergraduate and graduate courses to prepare the next generation of land managers in Hawai'i. Growing up in Appalachia, Dr. Litton spent a lot of time in the woods. In Hawai'i, he collaborated with federal agencies to develop Teaching Change, a conservation education program at the Hakalau Forest National Wildlife Refuge, to inspire local youth to pursue careers in natural resource management in Hawai'i. When he's not focused on the forests, he spends time in his outrigger canoe and growing a variety of crops and native plants with his wife at their Windward O'ahu home.

Mission: Research

Building Biosensors to Keep the Food Supply Safe

Salmonella enterica accounts for nearly half the cases of food-borne illness worldwide. The bacterium causes hundreds of deaths and thousands of hospitalizations in the United States and racks up billions in medical costs and lost wages each year. Even agricultural producers who aren't responsible for the outbreaks take an economic hit when fearful consumers stop buying their goods.

That's why the USDA National Institute of Food and Agriculture awarded Dr. Daniel Jenkins a \$500,000 grant to improve the detection of harmful bacteria in plants.

Jenkins, an associate professor of Molecular Biosciences and Bioengineering, takes aim at *Salmonella* and other pathogens with Smart-DART, an inexpensive and simple-to-use battery-powered hand-held platform for real-time, gene-specific detection of disease-causing organisms. He and students-turned-partners Dr. Ryo Kubota and Scott Shibata won top honors at the 2010 UH Shidler College Business Plan Competition.

Additional startup funding came with the NASA Johnson Space Center Best Earth/Space Life Science Innovation award in the 2011 Rice University Business Plan Competition and a USDA Small Business Innovation Research grant. Their startup firm, Diagenetix, Inc., is licensed by UH to commercialize the technology—an example of the leap from innovative university research to commercial marketplace.

Back at Mānoa, Jenkins and his new students continue to work on novel assays to detect trace amounts of other pathogens, physical and biological technologies to improve the platform, and Web-based interfaces for smart phones and other portable computing technologies. For example, incorporating data from

Additional applications include screening quarantined material for exotic organisms, environmental monitoring, and rapid detection of infectious diseases.

GPS and internal sensors allows him to map delivery of herbicides to invasive plants via projectiles (see page 7). Similar geospatial

information can be combined with quantitative pathogen analysis to generate spore density maps to help growers understand and manage disease risk. Additional applications are numerous, from monitoring environmental changes to screening quarantined materials for exotic organisms to rapid detection of infectious disease following natural disasters. Jenkins holds five patents related to molecular instrumentation. A sixth is for a decidedly different technology—an automatic flush trigger for toilet-trained cats. "My mom is a veterinarian, so growing up we always had a variety of pets (dogs, cats, the odd duck, and the small menagerie of animals at my parents' old farm). Since graduate school, I've consistently had street cats make the decision to move in with me."

A second-generation agricultural engineer (his father worked for USAID), Jenkins studied at Cornell University and the University of California, Davis. "My professors and advisors were all very altruistic, visionary people who had a passion for solving really critical problems about how to feed people. Having seen a lot of hunger and poverty first hand I really looked up to them," he says.



It's a CTAHR Fact—

Hawai'i ranks 4th among the 13 western land-grant states for competitive funding in 2012 USDA data. Only larger land-grant schools in California, Oregon, and Arizona out earn CTAHR.

CTAHR placed 5th for amount of extramural research funding among UH Mānoa units. Only the much larger College of Natural Sciences and the research-intensive School of Ocean and Earth Science and Technology, Institute for Astronomy, and School of Medicine received more.

The largest number of grants (31) went to the Department of Plant and Environmental Protections Sciences.

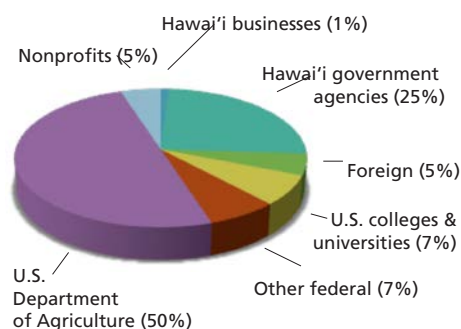
The most extramural dollars (\$6.4 million) were brought in by the Department of Human Nutrition, Food and Animal Sciences.

Federal funding sources include NASA (satellite-based infrared monitoring of vegetation) and the National Science Foundation (upgrades and databasing of the UH Insect Museum). Project list at www.ctahr.hawaii.edu/Site/ProjectEx.aspx.

Japan-based Horimasa Co. awarded \$595,000 for investigation of integrated and soil-less food-production technologies in FY 2013.

The highly productive Center on the Family generated \$1.4 million and nearly 4 awards per faculty member with a research appointment during FY2013.

Extramural Funding by Source



137 successful applications for nearly \$20 million in extramural funding represented a 5% increase in funding success for CTAHR faculty in FY2013.

Mission: Extension

Retirement has reduced the number of agents and specialists from a high of 77 in 2009 to 61 in 2012, challenging the college's ability to deliver services statewide. To address the gaps, CTAHR provides travel funds for agents willing to cover multiple counties and uses program assistants to perform extension duties under the direction of experienced extension faculty.

It's a CTAHR Fact—

Volunteers provided more than 120,000 hours of service to CTAHR extension programs in 2012.

26 CTAHR proposals totaling \$1.2 million were funded through a National Institute of Food and Agriculture competitive grant process emphasizing multi-state cooperation and the integration of research and extension.

Statewide working groups have been established on nutrition and wellness, sustainable agriculture, pollination services, Master Gardener, and 4-H to increase efficiency by sharing resources.

The Department of Hawaiian Home Lands funds CTAHR agricultural extension services for agricultural lessees on Moloka'i and Hawai'i Island.

CTAHR representatives sit on boards and task forces from the state's Invasive Species Council and Water Conservation Advisory Group to the Hawai'i Taro Security and Purity Task Force and Landscape Industry Council.

Participation in Outreach

	Direct Contact	Workshops	Demonstrations
Agriculture and Natural Resources Programs	50,790	18,537	19,325
Family, Health, and Consumer Science Programs	57,160	29,381	10,374
TOTAL	107,950	47,918	29,699

Extension programs reached 185,567 people in 2012; more than half were served in non-agriculture activities.



On Maui, Lance Mohler, left, and fellow Master Gardeners assist residents with plant issues.

Volunteer Profile: Lance Mohler is a Master Gardener on Mission Control. Before retiring, he worked on ignition, remote sensing, spacecraft electronics, space shuttle communications, and satellite operations. Now he brings an engineer's acumen to the Maui Master Gardener program.

A Kula property owner since 2001, Mohler agreed to take the Master Gardener course with a family friend who shared his frustration over gardening woes. He soon became a board member and officer and even filled in as coordinator.

A Master Gardener is a volunteer who completes a certified course of study—from basic botany and soil science to sustainable vegetable production and landscape design—pledging to share knowledge with others. On Maui, that means three hours in class weekly for 16 weeks, an intern period on the public help desk, and at least 50 hours of service annually for five years to become and remain certified.

"We provide research-based information for the public to make informed decisions."

—Mohler

The help desk responds to walk-ins, calls, and emails three mornings a week in space generously provided by UH Maui College. Master Gardeners also staff booths at fairs and other events, hold workshops, help schools, and write newspaper advice columns. "We provide research-based information for the public to make informed decisions," Mohler says. That means remaining neutral on issues such as genetically modified organisms and sharing best practices, both conventional and organic.

"Lance has become our expert entomologist and one of the instructors for the program," says Assistant Extension Agent Lorraine Brooks. "He is taking courses at UH Maui College in order to increase his knowledge in gardening and share it with the program." To help other Master Gardeners be more comfortable diagnosing plant problems, he worked with Brooks to create a six-week plant doctor course. And he helps her recruit new Master Gardeners.

The program is geared for those with a passion for home gardening. People with strictly vocational interest need not apply, he says. But they will be referred to agriculture courses at UH Maui College's EdVenture program right next door.

Accountability

Measures of Academic Responsiveness

Average time to a bachelor's degree is 5 years for CTAHR undergraduates. Doctoral candidates complete degrees in just over 5 years on average, about the same as engineering PhDs at UH Mānoa; only medicine and business do better.

More than 8 out of 10 CTAHR undergraduates say they are able to tap into university resources and services to identify and achieve their goals; more than 2 out of 3 say they can design a reasonable and timely academic plan leading to a bachelor's degree in their desired field.

CTAHR Student Ambassadors reached 1,500 secondary students through college and career fairs, Agriculture Awareness Day, and other events during FY2013. The college placed special recruiting emphasis on reaching out to Native Hawaiian students.

Committed to expanding distance education opportunities, the college hired an education specialist in Fall 2013 to coordinate the effort.

CTAHR always tries to make college an experience. It's not just a group of majors, but a family. Every semester, we are emailed about job opportunities and social events. Students are really encouraged to get involved!

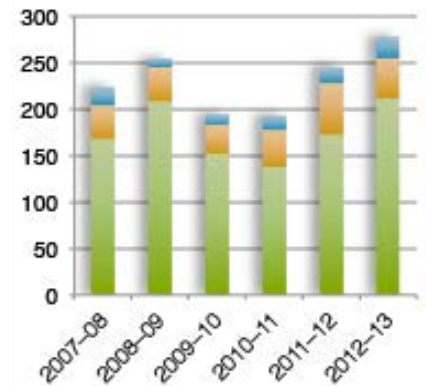
—Student survey response from the strategic planning process

Measures of Research and Extension Productivity, 2012

Priority Program Categories	FTE Staff Involved	Workshops/ Other Public Activities	Peer-Reviewed Publications/ Presentations	Grant Awards (in millions)
Food: Food safety; global food security and hunger	21.5	153	122	\$3.0
Agriculture: Diversified tropical crops systems for sustainability, competitiveness	19.4	306	67	\$5.2
Community: Youth, family, and community development; health/wellness; childhood obesity	28.8	968	131	\$4.7
Environment: Environmental protection, natural resource management; invasive species; climate change; sustainable energy	22.7	371	149	\$9.2
TOTAL	92.4	1,798	469	\$22.1

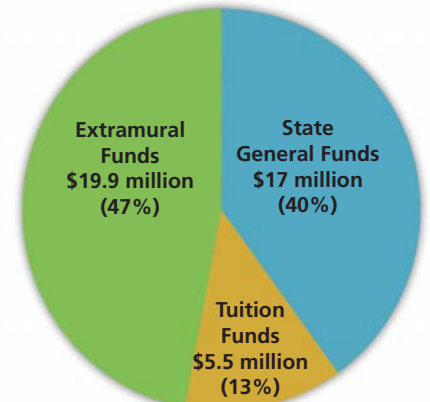
Source: University of Hawai'i Combined Research and Extension Annual Report of Accomplishments and Results.

The number of degrees awarded by CTAHR increased by 24% in 5 years.



BS (green) and MS (orange) degrees earned increased by 25%; PhDs (blue) by 16%.

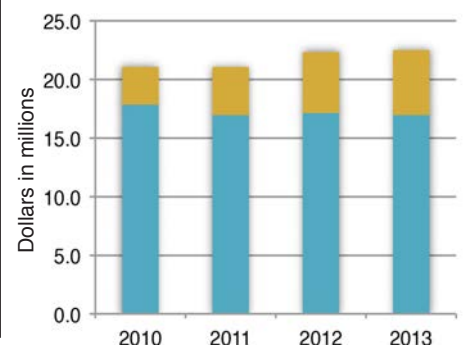
Revenue by Source, FY2013



CTAHR generated \$1.17 in outside funding for every dollar provided by the State.

Funding History, FY2010–13

Increased tuition revenue from rising enrollment and tuition rates offset declining State support over the past four years. State General Funds (blue) declined by nearly \$1 million or 5%, while tuition revenue (orange) jumped \$2.2 million (69%).



In 2013, in his sixth decade of extraordinary service as a CTAHR professor and researcher, Dr. James Brewbaker made a \$1 million gift to provide graduate fellowships so that future generations of students can continue his legacy of plant breeding to enhance crop quality and productivity. He tells why at <http://vimeo.com/81243691>

Excellence
Education
Integrity
Service

