



Aloha kākou!

We were honored to host State Representative Andrew Garrett, chair of the House Committee on Higher Education, Representative Cory Chun, chair of the House Committee on Agriculture and Food Systems, and Representative Mahina Poepoe (who was born and raised on the Friendly Isle) at our CARES Ho'olehua facility on Moloka'i on August 10, as they learned about our work to

support food producers and the community. Extension agents Jennifer Hawkins and Kyle Franks shared their work with crop production, value-added processing, and marketing through the "Seed to Harvest" and "Harvest to Market" programs, both funded by the Maui County Department of Agriculture.

The Maui agriculture department's FY2026 grants to support CTAHR programs and the Youth Innovations Challenge have been approved. Please see the end of the newsletter for information about the youth innovation contest, which now aligns with the school year and the grant cycle. We are grateful for their continued support to CTAHR.

I am pleased that Dr. Rosie Boyko will be joining our team on October 1 as the Agricultural Production and Farm Economics Agent. We are also recruiting for the farm manager, ag technician, community coordinator, and farm and consumer food safety extension agent roles.

Finally, I am excited to announce that I have assumed the role of Associate Dean and Director of Cooperative Extension at CTAHR. I am excited for this opportunity that allows me to work with CTAHR extension faculty and staff across the state as we serve our diverse stakeholders and carry out the mission of strengthening families, communities, and food systems. Together with stakeholders, community leaders, and our extension team, we will work to find solutions to the urgent challenges facing Hawai'i under the leadership of Dean Grewal. My goal is to increase the visibility of our people and their programs, and elevate CTAHR Extension in creating a lasting impact. I will continue serving as Maui County Administrator as we search for the right person to take this important position.

As we publish the sixth issue, I would like to express my gratitude to all the contributors who enrich the newsletter content and support our mission.

Surendra Dara

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IPM is Plant's Comprehensive Healthcare Plan

Surendra K. Dara, Associate Dean of Extension and Interim Maui County Administrator

As agriculture evolved, plant health management also transformed from relying largely on natural processes to using natural remedies, later synthetic products, and more recently, combining these tools with a renewed emphasis on nature-based solutions. Following the widespread use of synthetic pesticides in the 1940s and 1950s, and recognition of environmental and human health effects of large-scale use, integrated approaches to pest management were developed. Organic farming predates modern synthetic pesticides and also gained popularity during this period, with regulations beginning in some states in the early 1970s. Integrated pest management (IPM) emerged as a formal approach around the same time and has continued to evolve with advances in crop science and pest management tools. IPM is important in both organic and conventional production because it promotes the balanced use of all appropriate options to suppress pests below damaging levels, protect crops, reduce risks, and maintain farm profitability.

Before delving into the details of IPM, a comparison between human and plant healthcare can help explain the concept, as both depend on many factors. Human health and development depend on genetic makeup, family environment, socioeconomic conditions, nutrition, physical activity, regular checkups, and supplements or medication when needed. Similarly, a plant's growth and yield potential, and its ability to withstand pests, diseases, drought, and other stresses, depend on its genetics; growing environment, including fertile soil, organic matter, and beneficial microbes; appropriate irrigation and nutrient management; biostimulants or other supplements; regular monitoring and early diagnosis; and pesticides when needed. Certain biostimulants and beneficial microbes

can prime a plant's natural defenses, somewhat as vaccination prepares the human immune system. The comparison is useful but not exact because plants do not have adaptive immunity in the same way humans do.

Modern healthcare increasingly combines prevention, monitoring, diagnosis, and treatment instead of relying only on a response after illness occurs. IPM is a similarly comprehensive approach that emphasizes preventive measures and informed treatment decisions. Most farmers around the world implement IPM practices to some extent, knowingly or unknowingly. However, public discussion often focuses disproportionately on pesticides, whether they are synthetic or naturally derived. The legacy of harm caused by indiscriminate pesticide use in the mid-20th century understandably continues to influence public perception. Yet a substance is not inherently safe or unsafe simply because it is natural or synthetic; risk depends on its toxicity, dose, exposure, and use. People routinely accept chemicals in food and medicines, while pesticide use often generates greater concern. In the United States, the Environmental Protection Agency and state agencies regulate pesticides through registration, label requirements, residue limits, and protections for workers and the environment. These safeguards do not make pesticides risk-free; they mean that products must be selected for the right problem, applied according to the label, and used only when justified.

In natural ecosystems, there is a balance between harmful and beneficial organisms that regulates their populations. Crop production modifies the ecosystem by raising plants in dense homogeneous populations that make it easier for diseases and pests to multiply and spread. This is similar to humans or animals suffering higher levels of communicable diseases when living at high densities with an increased need for medicines. When pests are not managed effectively, they can become areawide problems requiring coordinated and sometimes more aggressive measures. Fruit flies, for example, are major pests in Hawai'i that affect numerous fruits and vegetables. Fruit flies developing in residential vegetable gardens

and fruit trees can become sources of infestation for commercial fields, making areawide management more difficult. Awareness of pest problems, knowledge of available control options, and the use of IPM in both home gardens and commercial fields can provide effective suppression while allowing pesticides to be used only as needed.

It is important to reiterate that IPM is critical for both organic and conventional crop production. The range of pesticides permitted in organic production is narrower, and some products have shorter residual activity and may require more frequent applications. Repeated use of any pesticide with the same mode of action—whether organic or synthetic—can select for resistance and may cause unintended effects. IPM promotes good agricultural practices that maintain plant health and combines cultural, genetic, physical, mechanical, behavioral, biological, microbial, and chemical control options, with judicious use of both

natural and synthetic pesticides. Intensive interventions, such as soil fumigation, may sometimes be needed for severe or persistent problems, just as intensive medical treatments are reserved for serious health conditions. The analogy is not literal, but it emphasizes that such measures should be carefully justified and used appropriately.

By keeping plants healthy, detecting problems early, and increasing the level of intervention only as necessary, IPM can reduce avoidable pesticide use, control production costs, protect yield and farm returns, and help keep produce affordable. In this way, IPM contributes to food security and affordability for a growing world population. While IPM strategies continuously evolve as new tools and technologies are integrated and implemented with the help of researchers, extension educators, and IPM practitioners, regulatory agencies further enhance sustainable crop protection through their policies.

Comparison of strategies for growth, development, and health of humans and plants		
Factors	Humans	Plants
Genetic makeup	Traits inherited from the parents	Breeding for higher yields, disease, pest, or drought resistance, or other desirable characters
Growth environment	Family culture and interactions	Seasonal conditions, stressors like pests and diseases, soil conditions, cropping system, water
	Socioeconomic conditions	Farm economics and socioeconomic conditions of the farmer growing plants
Nutrition	Balanced diet with macro and micronutrients	Balanced fertilizer regimen with macro and micronutrients
	Supplements as needed	Supplements as needed
	Probiotics	Beneficial microbes in the crop environment
Healthcare	Vaccination to build immunity	Priming with biostimulants
	Physical activity to build strength	Pruning and other practices
	Personal and environmental hygiene	Sanitation practices
	Periodic health checkups and diagnosis of issues	Regular monitoring of crop health and diagnosis of issues
	Biological treatments such as monoclonal antibodies and gene therapies	Biological treatments with botanical, microbial, or genetic materials
	Behavioral therapy for mental health	Behavior control of pests with attractants, repellents, or mating disruption
	Physical therapy and mechanical tools	Screens, traps, aspirators, and other such options
	Medicines as needed	Pesticides as needed
	Radiation, chemotherapy, and other serious interventions when needed	Radiation to sterilize male insects, fumigation, and using stronger materials when needed
Strategy	Comprehensive healthcare	Integrated pest management

CRB Control on Maui

Liangjie Dong, Assistant Extension Agent-Water Quality

Maui County still has a narrow window to prevent the coconut rhinoceros beetle (CRB) from becoming a self-sustaining island pest. Success will depend a combination of killing CRB and protecting food, pollinators, soil, and groundwater while treating the green waste where larvae develop.

A field treatment tag attached to a Maui tree makes this challenge visible. It warns residents not to consume fruit from the treated tree for one year and asks that flowers be removed during the same period to protect pollinators. The sign is simple, but the message is broad: CRB control must be fast, transparent, and environmentally responsible.

Four priorities for Maui County

1. Stop spread before isolated detections become establishment.
2. Make food-safety and pollinator restrictions visible.
3. Protect groundwater while treating contaminated green waste.
4. Develop fast, practical, and verifiable treatment technology.

Preventing the establishment and spread

CRB is about two inches long, with an impact that can be island-wide. Maui's first confirmed breeding site was found in a dead palm trunk in Kihei in November 2023 and was treated and removed. After more than two years without another detection, a dead adult female was caught in a monitoring trap at Kahului Airport on April 1, 2026. A coordinated response expanded trapping and surveys within a two-mile buffer; the response timeline reported no additional Maui detections through April 29.

The wider county picture makes vigilance even more urgent. Three adult beetles were detected on Moloka'i in April 2026, near the harbor, highway, and airport. On Lāna'i, two 2025 incidents involved CRB arriving in shipments of potted plants from O'ahu; quarantine

and destruction prevented those shipments from becoming established breeding sites. These events show both the pathway of invasion and the value of early detection.

Guam is the warning Maui should not ignore. CRB was first detected there in 2007. Guam government assessments later reported severe damage and mortality among coconut and ornamental palms, and warned that expanding populations can become self-perpetuating. Maui County therefore stands between two possible futures: repeated interception and containment, or permanent establishment. Every load of mulch, compost, potted palms, and decaying plant material can influence which future becomes reality.

Food safety

Chemical treatment of a food-bearing tree creates responsibilities beyond pest control. The treatment tag in the field photograph states that fruit from this particular tree should not be consumed for one year and that flowers should be removed to protect pollinators. That one-year instruction should not be treated as a universal waiting period for every CRB pesticide or application method. The product label, the treatment method, and the licensed applicator's instructions govern each site.



A CRB treatment notice on Maui. Photo by Liangjie Dong

Good practice requires a complete record of the active ingredient and product, treatment date, application method and dose, applicator, harvest restriction, re-entry information, pollinator precautions, and the date for follow-up. On farms, school grounds, parks, resorts, and residential properties, a visible tag translates technical requirements into public protection. Extension education should make this level of communication routine, especially wherever coconuts or other edible products may be harvested.

Treating CRB without polluting the groundwater

CRB larvae do not feed in palm crowns. They develop in decomposing organic matter such as green-waste piles, mulch, compost, rotting logs and stumps, potting media, and decaying material trapped in palms. Managing these breeding sites is therefore central to population control. Hawai'i's CRB Response identifies green-waste management as one of the most effective ways to reduce beetle populations.

Water quality must be designed into that work. Maui's porous volcanic soils, coastal settings, intense rainfall, and sensitive aquifers can move contaminants quickly from the surface into groundwater or drainage systems. Broad pesticide drenching of large, uncontained waste piles may suppress insects but create another environmental pathway through leachate and runoff.

The safer hierarchy is to contain the material, destroy or immobilize CRB physically, and verify the treatment. Whole branches, fronds, and logs can be chipped or ground. Hot composting and steam can kill CRB when the entire mass reaches the required time and temperature. Current Hawai'i compliance frameworks use 131°F (55°C) as a key treatment temperature, with duration depending on the process. Temperature must be measured and documented; a warm surface is not proof that the center of a pile has been treated.

Improving green-waste treatment

The available tools are scientifically sound, but field implementation remains difficult. Large chippers are expensive and hard to move. Hot composting requires uniform aeration, moisture, pile management, and temperature verification. Steam systems can be

effective but may be costly or unavailable. Untreated material cannot simply wait in an open pile, because the pile itself can become a breeding site.

Maui needs a practical technology pipeline for ports, transfer stations, landscaping companies, farms, resorts, and neighborhoods. Priorities should include mobile chipping and grinding units; compact in-vessel heat or steam systems; sealed, beetle-resistant containers; low-cost temperature sensors and digital logs; impervious work pads with leachate capture; and rapid-response equipment that can be deployed near a new detection before material is moved across the island.

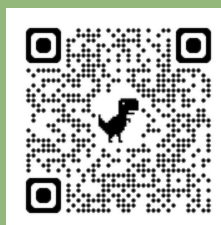
A useful engineering standard is to kill, contain, and verify. The process must kill every CRB life stage, contain contaminated material and liquid, and produce a record showing that treatment conditions were actually met. Innovation is not an optional addition to biosecurity. On an island, the speed and practicality of treatment often determine whether an introduction is stopped or becomes permanent.

Conclusion

Guam shows the long-term cost of allowing CRB to become established. Maui's recent detections show that the threat is real, but also that surveillance and rapid response can work. The goal is not to choose between aggressive pest control and environmental safety. Environmental safety, food protection, pollinator care, groundwater protection, and accountable green-waste treatment must all become part of pest control.

Sources and Notes

1. CRB Hawai'i: Current Status
2. CRB Hawai'i: Maui and Moloka'i Response Timeline
3. Hawai'i Department of Agriculture & Biosecurity: Lāna'i Detections
4. CRB Hawai'i: Treatments and Breeding-Site Management
5. Guam Department of Agriculture and Guam Wildlife Action Plan



Watch more on the
YouTube channel:
HiWaterAndPlants

The song Niu, the Tree of Life was enthusiastically received at the inaugural Aha Niu Festival. In just one month, the video has reached over 100,000 views, serving as a vital platform for sharing CRB control information. Scan the QR code or click the link below to watch the video. Please leave a comment!
<https://youtu.be/Af3FcHTDtr0?si=cWUU0qobcYmsur5m>

Bean Varieties for Food and Nutritional Security in Maui County

*Amjad Ahmad, Associate Extension Agent,
Sustainable & Organic Agriculture Program*

Beans play an important role in U.S. agricultural production, food security, and diet quality. Dry beans and lima beans are widely consumed plant-based protein sources globally and contribute significantly to human nutrition through their protein, fiber, mineral, and bioactive compound content. At the same time, beans are an established crop within major U.S. agricultural regions, supporting domestic markets, institutional food programs, and export supply chains.

Dry beans like black, pinto, and kidney beans are known for their low inputs (water and fertilizer) requirements, while producing high protein (~21%) healthy crops. Dry beans are nutritional powerhouses that offer high amounts of dietary fiber, and essential minerals

They support heart health, improve blood sugar control, and aid in digestion. Additionally, beans are known for their association with a bacteria (some strains are native to Hawai'i) that builds nodules on the beans roots and fixes the atmospheric nitrogen in a symbiotic relation. Dry beans are also great component of crop rotation which could help in suppressing pest and improving soil properties.

Federal dietary guidelines recommend fresh beans as a vegetable and dry beans as an important source of protein. Consumption of beans helps to reduce bad cholesterol, prevents constipation, regulates and balances blood sugar, improves bone strength, supports brain health, and helps with weight management. Beans are also a good source of iron. In Hawai'i, over 50 varieties have been tested to evaluate their suitability and select the highest-performing ones (based on high yields, marketability, and other traits) for recommendations to the local growers. The project team is working with local organizations, such as Maui Local Harvest, and local growers on Maui and Moloka'i to test these varieties on a production scale.



Varieties selected among >50 developmental varieties evaluated on Maui. Photo by Amjad Ahmad

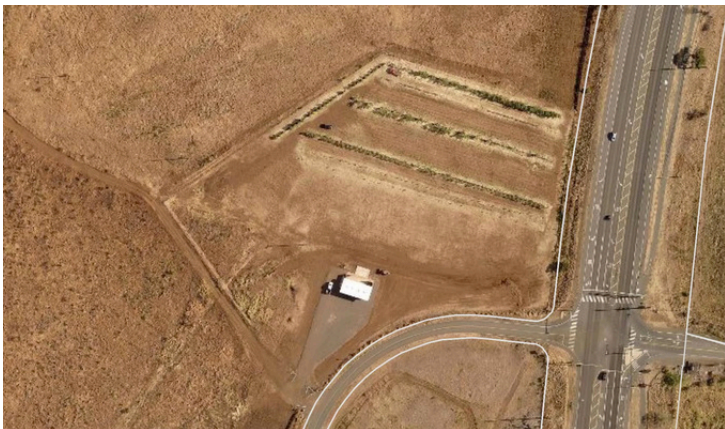
GoFarm Hawai'i: Maui site quarterly update

Lily Nguyen, Program Manager

Training site transformation

GoFarm Hawai'i's Maui training site at Pūlehunui continued to expand opportunities for beginning and aspiring farmers this summer through hands-on training, community partnerships, and innovative educational programming.

Three years after GoFarm Hawai'i began stewarding the Pūlehunui training site, the landscape has undergone a remarkable transformation. The site now supports thriving crop production, native trees, pollinator habitats, and diverse learning spaces used by beginning farmers. To see the transformation from above, watch the drone overview video on GoFarm Hawai'i's Instagram (@gofarmhawaii).



Farm-to-Table course

GoFarm Hawai'i concluded its first Farm-to-Table Course on July 19 with a "Growing & Gathering" student-led farm-to-table dinner celebrating Maui's local food system. Over six weeks, participants worked



alongside Chef Lisa Villiarimo of The Aloha Lifestyle and GoFarm partners to learn the stages of planning and hosting a successful farm-to-table event, including budgeting, marketing, permitting and regulatory requirements, menu development, sourcing local ingredients, hospitality, and event execution.

The course culminated in a community dinner at the GoFarm site featuring ingredients and flowers sourced from farms and producers across Maui, highlighting the collaboration between local farmers, chefs, educators, and community partners while providing participants with practical experience in building value-added agricultural enterprises.

AgOrchard program highlights

GoFarm's second Maui AgOrchard cohort took place in June-July with participants exploring a wide range of orchard production systems and management approaches through hands-on learning experiences which included mango and avocado grafting, commercial agroforestry, coconut production, and diversified orchard management.

Field visits included Greenleaf Farm, where participants



learned about a 20-year homestead integrating fruit trees and vegetable production, and Mahi Pono's 'ulu agroforestry operation, Waiopua Garden. The cohort also attended the 'Aha Niu Maui Nui Coconut Celebration Festival at Maui Nui Botanical Garden to learn about coconut cultivation and community efforts to address Coconut Rhinoceros Beetle (CRB).

Hands-on workshops

In June, GoFarm Maui hosted a Greens Bubbler and Spinner Workshop. Coach Jake Sipes demonstrated how to convert a washing machine to a greens spinner, and how to install a greens bubbler setup for washing leafy greens. Participants learned how small-scale farms can significantly reduce labor while improving produce quality, with equipment that can be used to process greens approximately ten times faster than traditional hand methods. Get the comprehensive guide for how to build your own greens bubbler and spinner at the GoFarm website: <https://gofarmhawaii.org/farmer-resources-2/foodsafety/>



AgIncubator highlights

GoFarm's AgIncubator program supports the growth of new and established farm businesses across Maui. Jean (Kahikulani Farms) joined the program as the site's newest AgIncubator, and existing incubators expanded their market presence through increased sales with Maui Hub (mauihub.org) and the Central Valley Farmers Market.



The site also welcomed a new freeze dryer, providing AgIncubator farmers with expanded opportunities to develop value-added products. An upcoming workshop led by DJ Parsons will introduce participants to freeze-drying techniques and product development.

Community outreach



GoFarm Maui participated in Maui AgFest, where staff distributed native Hawaiian trees and seeds, including aʻaliʻi, kou, and milo, while sharing information about beginning farmer training opportunities. AgIncubator farmers also joined to showcase and sell locally grown products to the community.

Upcoming Opportunities

GoFarm Maui is now recruiting for its next beginning farmer training cohort.

Cohort 11 Dates:

- AgCurious (Informational Webinar): September 3, 2026
- Applications Open: September 4, 2026
- AgXposure: September 17 – October 14, 2026
- AgXcel: January 7 – July 17, 2027

Additional educational opportunities this fall include a beekeeping course (November/December) and a free Women's Farmer Power Tool Workshop on August 22, where participants will build nursery tables while gaining hands-on experience using drills, circular saws, and staple guns in collaboration with Hi'ilei Bacalso.

To learn more or register for upcoming events, visit gofarmhawaii.org, follow [@gofarmhawaii](https://www.instagram.com/gofarmhawaii), or contact info@gofarmhawaii.org.

Dairy Goat Series, Part 1: An Introduction for Producers and Educators

Rajeev Kumar Mishra, Extension Veterinarian

Goats, one of the world's oldest and most adaptable domesticated species, are valued for their production of meat, milk, and fiber. They efficiently convert low-quality forages into these essential resources. Beyond traditional roles, they are utilized globally for biological fire and weed mitigation, and in modern society, they are even popular companions for yoga. For families and part-time farmers, a small herd can provide supplemental income and nutrition. This article provides an overview of dairy goat industry in Hawaii to help new and existing producers understand local production systems, market opportunities, and common challenges.



Fig. 1. Commercial goat operations in Hawai'i. Graphic by Rajeev Mishra

Raising dairy goats can be a full-time enterprise or a part-time alternative, depending on available resources and time. In the U.S. and Hawai'i, successful operations span both scales. Examples of full-time operations include Sweet Land Dairy (O'ahu), Hawai'i Island Goat Dairy (Big Island), Haleakala Creamery (Maui), and Surfing Goat Dairy (Maui), while North Shore Goat (O'ahu) and Honomu Goat Dairy (Big Island) serve as examples of part-time, alternative operations (Fig. 1). Additionally, many individuals across Hawaii are involved in homestead dairy goat production. Most of these operations offer more than just milk production; they also provide agritourism experiences such as farm tours, goat-feeding sessions, hands-on interaction, and seasonal events. Some farmers host

activities like goat yoga, Valentine's Day specials, and family-friendly play areas, creating additional revenue streams while engaging the community. Together these commercial dairy companies of Hawai'i produce about 150 gallons of milk every day.

A farm with 5 to 19 does is considered small, 20 to 99 are considered medium, and more than 100 does is considered a large operation. The majority of the milk from small dairies is used for feeding kids or other farm animals and for personal consumption, while the majority of milk produced at larger farms is sold, traded, or given away as liquid milk, or processed on-farm for cheese production.

Based on the number of milking does, Sweet Land Dairy (O'ahu), Hawai'i Island Goat Dairy (Big Island), and Surfing Goat Dairy (Maui) are categorized as large operations, while Haleakala Creamery (Maui), North Shore Goat (O'ahu), and Honomu Goat Dairy (Big Island) are categorized as medium-sized goat dairies. All goat dairies in Hawai'i are Type B. They are not legally allowed to sell liquid milk but can process goat milk for cheese, caramel, and kefir, which are the major products of Hawaii's dairy goat industry. Skin care products are another major product line.

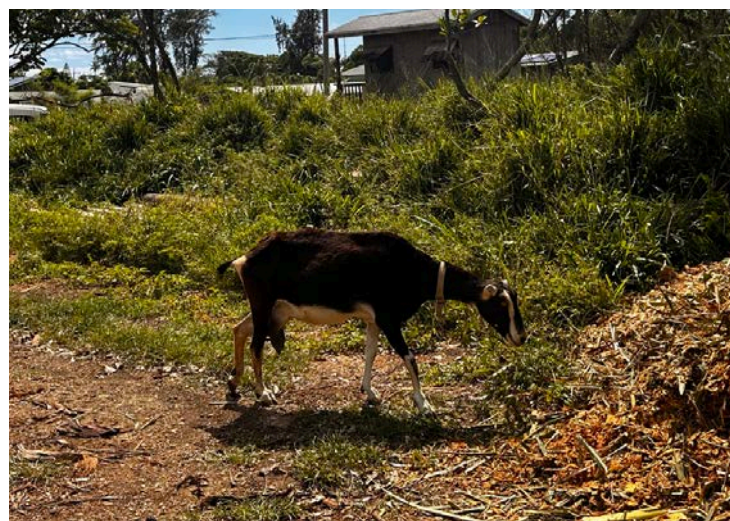
While many raise dairy goats for personal consumption, goat milk also serves as a vital nutrient source in developing countries and as a specialized dairy product in developed nations. Often referred to as "the poor man's cow" or a "walking freezer," goat milk is prized for being easy to digest due to its smaller fat globules and softer curd formation. It also offers lower allergenicity and a profile rich in beneficial fatty acids.

The American Dairy Goat Association (ADGA) recognizes five principal dairy goat breeds: Alpine (2a), American LaMancha (2b), Nubian, Saanen, and Toggenburg. In Hawaii, the Nubian and American LaMancha breeds are the most prevalent.

As of a 2017 report, the U.S. dairy goat population totals approximately half a million, with Nigerian Dwarf and Nubian breeds accounting for about 55% of the herd. Wisconsin leads the nation in dairy goat



Fig. 2a. Alpine goat at Sweet Land Farm (above). Photo by OCEC, and 2b. American LaMancha goat at North Shore Goat (below). Photo by Rajeev Mishra



numbers, followed by California, Iowa, Texas, and Minnesota. In Hawaii, there are approximately 1,700 dairy goats across nearly 100 farm operations, with the previously mentioned operations accounting for roughly 30–35% of the state's total population.

Based on USDA NAHMS data, the vast majority of U.S. dairy goat operations provide supplemental nutrition, including concentrates, commercial goat feed, minerals, vitamins, or by-product feeds, in addition to forage. Only about 1% of operations rely solely on roughage, indicating that supplementation is standard practice to support milk production and herd performance. This trend holds true for dairy goat production systems in Hawaii as well, where the majority of goats are raised on pasture alongside supplemental concentrates, minerals, and vitamins.

The main challenges faced by dairy goat producers in Hawaii include gastrointestinal parasitism, lack of fodder, and high feed costs. Tropical climatic conditions are ideal for gastrointestinal parasite growth. This makes parasite management a year-round priority for Hawai'i producers. Because most concentrate feeds are imported, price volatility directly affects profitability. Climate change and the cyclical nature of drought conditions are further constraints faced by dairy goat producers in Hawaii.

Despite these challenges, Hawai'i's dairy goat industry continues to grow through agritourism, and community engagement. Understanding the structure and needs of local goat dairies provides the foundation for improving herd health, nutrition, and productivity.



Goat kids at North Shore Goat. Photo by Rajeev Mishra

About the author:



Dr. Rajeev Mishra, DVM, MS, is the Extension Veterinarian in the Department of Human Nutrition, Food, and Animal Sciences at CTAHR. His work focuses on improving livestock health across the islands through producer outreach.

He leads statewide efforts in disease surveillance, practical herd management education, and emergency response support for livestock producers. He also contributes to teaching and student mentorship in animal science, helping build the next generation of Hawai'i's agricultural professionals.

Rooted in Resilience: Seed to Harvest and Harvest to Market on Moloka'i

The Moloka'i team: Kyle Franks, Jennifer Hawkins, Kawehi Horner, and Benson Becony

Over the past year, CTAHR has continued its commitment to strengthening local agriculture through hands-on education with two complementary programs funded by FY25 County of Maui Grant: Seed to Harvest and Harvest to Market. Together, these initiatives provide participants with a pathway from learning the fundamentals of growing food to exploring the opportunities and challenges of producing for market.

Developed specifically for Moloka'i's unique agricultural landscape, both programs emphasize practical experience, place-based learning, and building the confidence necessary to become successful home gardeners, community growers, or agricultural entrepreneurs. Participants represent a wide range of backgrounds, from those planting their very first garden to experienced growers seeking to expand their knowledge and improve production.

Seed to Harvest

Seed to Harvest was designed to equip participants with the foundational skills needed to produce food successfully and sustainably. Through a combination of classroom instruction and extensive hands-on activities at the Moloka'i CTAHR CARES Center, participants learned each stage of the growing process while developing a deeper understanding of the biological systems that support healthy plants and growing systems.

Topics included site selection, bed preparation, irrigation installation and management, soil health, composting, seed starting, transplanting, crop planning, fertility management, integrated pest management, harvesting, and post-harvest handling.

Rather than focusing solely on lectures, each lesson emphasized learning by doing, allowing participants to practice the techniques being discussed.

Throughout the program, students maintained their own growing spaces while also working collaboratively within the demonstration garden. This approach encouraged problem-solving, observation, and shared learning as participants experienced both the successes and challenges that naturally occur throughout a growing season.

The demonstration farm itself became an outdoor classroom where participants could observe production systems under local conditions, compare management practices, and gain experience using common agricultural tools and equipment. Discussions frequently extended beyond the day's lesson as participants shared their own experiences, asked questions specific to their properties, and learned from one another.

Successful production practices but also reinforced the value of growing fresh, nutritious food for families and the broader community. For Seed to Harvest, we had 36 students who grew a total of 708.4 lbs of produce.



Processing cabbage for making sauerkraut, a value added product. Photo by Kyle Franks

Harvest to Market

While Seed to Harvest focused on production, Harvest to Market built upon those skills by introducing participants to the business side of agriculture while also growing a single crop of cabbage to add to the hands-on and practice within the market. The program recognized that growing quality crops is only one component of a successful farm enterprise. Understanding markets, managing costs, developing a brand, and building relationships with customers are equally important skills for long-term success.

Participants explored enterprise planning and crop selection while considering the realities of farming on Moloka'i. Discussions examined production costs, pricing strategies, budgeting, recordkeeping, and evaluating profitability. Students learned how thoughtful planning can help farmers make informed decisions before investing significant time or resources into new crops or enterprises.

The program also covered post-harvest handling, food safety, packaging, marketing, and customer service. Participants discussed various marketing opportunities available on Molokai, including farmers' markets, direct-to-consumer sales, local businesses, and cooperative



Students presenting their business pitches as their final exam. Photos by Kyle Franks

One of the most rewarding outcomes of the program was watching participants gain confidence over time. Individuals who had little previous gardening experience began harvesting vegetables they had grown themselves while developing the skills needed to continue growing food long after the program concluded.

Throughout the season, participants harvested a wide variety of vegetables including tomatoes, cucumbers, leafy greens, herbs, root crops, and other seasonal produce. These harvests not only demonstrated

marketing approaches that strengthen the island's local food system.

Branding and storytelling became another important component of the curriculum. Participants were encouraged to think beyond simply selling produce by considering how they communicate their values, farming practices, and connection to place. These conversations emphasized that successful agricultural businesses often grow through trust, consistency, and meaningful relationships within the community.

Hands-on activities complemented classroom discussions by allowing participants to evaluate crop quality, practice grading and packaging techniques, calculate production costs, and examine different marketing scenarios. By connecting production practices with economic decision-making, participants developed a more complete understanding of how successful farms operate.

Rather than presenting a single model for success, Harvest to Market encouraged participants to identify approaches that matched their own goals, available resources, and desired scale of production. For some, this meant exploring small-scale commercial production, while for others it reinforced opportunities to supplement household income through seasonal sales or value-added products.

Building a stronger agricultural community

Although each program had distinct objectives, they were intentionally designed to complement one another. Seed to Harvest established the technical foundation needed to grow food successfully, while Harvest to Market introduced the planning and business skills necessary to transform production into economic opportunity.

Equally important were the relationships developed throughout the programs. Participants learned not only from instructors but from one another, creating an environment where knowledge, experiences, and encouragement were freely shared. These connections continue beyond the classroom as participants exchange ideas, visit one another's farms and gardens, and support each other's agricultural journeys.

The programs also reflect CTAHR's broader mission of providing research-based, locally relevant education that addresses community needs. By focusing on practical skills, accessible instruction, and place-based solutions, these initiatives help strengthen food security, support agricultural diversification, and encourage the next generation of growers on Moloka'i.

As interest in agriculture continues to grow, Moloka'i Extension remains committed to expanding educational opportunities that serve beginning and experienced producers alike. Future programming will continue building upon these foundations through workshops, field demonstrations, and advanced training covering topics such as agroforestry, soil biology, perennial crop production, grafting, and sustainable farming systems, such as our next program - Moloka'i Orchard Short Course.

We extend our sincere appreciation to all of the participants who invested their time, energy, and enthusiasm throughout these programs. Their willingness to learn, ask questions, share experiences, and support one another helped create an engaging learning environment that reflects the collaborative spirit of agriculture on Moloka'i. Participants have formed a "Growing Hui" to keep learning and helping each other. This Hui meets every Tuesday at 8:30 a.m. at each other's farms. It's an encouraging group who welcome new members.

We also gratefully acknowledge the support of our community partners and funding organizations whose investment made these programs possible. Together, we are helping cultivate not only productive gardens and farms, but also stronger communities, greater food resilience, and new opportunities for local agriculture.



Hawaiian chilli peppers grown by course participants. Photo by Amber Kaholooa

More Mosquitoes around Smaller Buildings

*Jia-Wei Tay, Associate Professor, Department of
Plant and Environmental Protection Sciences*

The Asian tiger mosquito, *Aedes albopictus*, is one of the most common mosquito species on O‘ahu and Maui, and it is the most common day-biting mosquito in the state. It occurs in urban, residential, and forested environments. This adaptability has allowed the mosquito to remain widespread in Hawai‘i despite decades of mosquito-control efforts.

Aedes albopictus is also a vector of dengue virus. It was the primary vector during the 2015–2016 outbreak on Hawai‘i Island. Understanding where this mosquito is most abundant can therefore help residents and public-health programs prepare for future outbreaks. Our study in Nu‘uanu Valley on O‘ahu examined a practical question: Which environmental and urban features are most closely associated with *Aedes albopictus* abundance?

Urbanization is more than developed land

Urban areas can differ greatly in their suitability for mosquitoes. An industrial area containing several large warehouses is very different from a residential neighborhood containing many small homes, yards, gardens, ornamental plants, and shaded spaces. Building footprint size (the ground area occupied by a building) may provide information about these differences. Neighborhoods containing many small buildings are often dominated by single-family homes, whereas areas with larger building footprints may contain warehouses, etc. The study evaluated whether building size and density could help explain differences in mosquito egg abundance, along with rainfall, elevation, and the availability of potential larval habitats.

What we studied

Mosquitoes were surveyed at three sites along an urbanization and elevation gradient in Nu‘uanu Valley:

- Low site: An industrial and business area near Honolulu Harbor

- Middle site: A residential neighborhood dominated by single-family homes
- High site: A forested area within the Honolulu Watershed Forest Reserve

At each site, researchers placed 15 ovitraps (egg traps). These traps consisted of water-filled black cups containing wooden paddles on which female mosquitoes could lay eggs. The paddles were collected and replaced weekly for four consecutive weeks.

The researchers also:

- Surveyed potential water-holding habitats within 10 m of each trap
- Classified habitats as anthropogenic or natural
- Recorded elevation and estimated annual rainfall
- Measured urbanization using building-footprint maps
- Evaluated building size and density within several distances of each site

Potential anthropogenic habitats included bottles, plastics, cans, tires, gutters, drains, and other human-made objects. Natural habitats included tree holes, rock pools, snail shells, and water-holding plants such as bromeliads.

What we found

A total of 526 mosquito eggs were collected during the four-week study. All mosquitoes successfully reared from the collected eggs were identified as *A. albopictus*. Egg abundance differed substantially among the three sites:

- Residential middle site: 410 eggs, or 78% of the total
- Forested high site: 85 eggs, or 16%
- Industrial low site: 31 eggs, or 6%

Building footprint size was the strongest predictor

Among the environmental and urban variables examined, average building footprint size was the most influential predictor of mosquito egg abundance.

More eggs were associated with areas containing a high density of small buildings. The residential middle site contained many small buildings, most of which were single-family homes, and had substantially more mosquito eggs than either the industrial or forested site.

Elevation was not a significant predictor

The study sites ranged from approximately 3 to 1125 feet in elevation. Although elevation and rainfall differed considerably among the sites, elevation did not significantly predict mosquito egg abundance in the final model. This finding is consistent with the ability of *Aedes albopictus* to survive in a wide range of tropical and subtropical environments.

Why might smaller buildings be associated with more mosquitoes?

The buildings themselves do not produce mosquitoes. Instead, smaller building footprints may indicate the type of environment surrounding them. Single-family residential properties commonly contain yards, gardens, ornamental vegetation, shaded areas, and numerous small objects capable of holding rain or irrigation water. Examples may include plant saucers, buckets, toys, bottles, tarps, unused containers, clogged gutters, and water-holding plants. These features can create favorable places for adult mosquitoes to rest and for females to lay eggs. Vegetation and shade may also reduce heat and water loss, helping containers remain suitable for longer periods. In contrast, large warehouses and industrial buildings may be surrounded by extensive pavement, fewer gardens, and less shaded vegetation. These areas may offer fewer suitable resting and oviposition locations even when the total developed area is high.

Building footprint size should therefore be viewed as an indicator of the surrounding urban environment, not as proof that every small building or residential property has a mosquito problem.

What this means for Hawai'i residents

The findings suggest that mosquito prevention should receive particular attention in neighborhoods containing many single-family homes, yards, and landscaped areas.

Inspect the area around the home

Residents can regularly check for items that collect water, including:

- Buckets, cups, bottles, cans, and unused containers
- Plant pots and saucers

- Tarps, outdoor furniture, and children's toys
- Tires and other materials stored outdoors
- Clogged gutters and poorly draining areas
- Bromeliads and other plants that retain water

Containers can be emptied, removed, covered, stored under shelter, or maintained so that they do not continuously hold water.

Look beyond obvious containers

A yard may appear free of standing water while still containing small or hidden mosquito habitats. Water can collect in folded tarps, plant axils, clogged drains, discarded materials, or objects concealed by vegetation.

The study found that simply counting visible potential habitats did not adequately predict mosquito egg abundance. Regular and careful inspection is therefore more useful than assuming that a property is mosquito-free because few containers are immediately visible.

Coordinate with neighbors

Mosquitoes do not remain within property boundaries. Removing containers from one yard may have limited benefit when suitable habitats remain throughout the surrounding neighborhood. Community cleanups, shared reminders, and coordinated inspections can reduce breeding opportunities across a larger area. Neighborhood-level participation may be especially valuable in densely developed residential areas.

Maintain prevention between outbreaks

Mosquito reduction becomes more difficult once an outbreak has begun. Routine source reduction and monitoring can help lower local mosquito populations before dengue or another mosquito-borne disease is detected. During an outbreak, residents should also follow current guidance from Hawai'i public-health and mosquito-control agencies, such as the Hawai'i Department of Health, including recommendations on mosquito prevention, personal protection, and reporting possible breeding sites.

Implications for mosquito-control programs

Building-footprint maps are widely available and can help agencies identify neighborhoods that may require closer surveillance. During an outbreak, areas



Building footprint maps of three sites with 100 m, 250 m, 500 m, and 1000 m radii. Building footprints are black polygons. A: Low site. B: Middle site. C: High site. Data from City & County of Honolulu Building Footprint map.

containing high densities of small residential buildings could be prioritized for:

- Ovitrap and adult-mosquito monitoring
- Community education and outreach
- Inspection and removal of water-holding containers
- Targeted public-health messaging
- Coordinated neighborhood mosquito-control operations

Building footprint should not be used as the only measure of mosquito risk. Vegetation, shade, rainfall, household practices, drainage, seasonal conditions, and the quality of larval habitats can also affect mosquito abundance.

The study was conducted at three sites over four weeks during one season. Additional monitoring across more neighborhoods and seasons would help determine how broadly the findings apply elsewhere on O‘ahu and throughout Hawai‘i.

Concluding remarks

The Asian tiger mosquito remains an important nuisance and public-health concern in Hawai‘i. In Nu‘uanu Valley, *Aedes albopictus* egg abundance was most strongly associated with areas containing many small buildings, particularly a neighborhood dominated by single-family homes. Elevation and the density of visible potential natural habitats were not significant predictors in our model.

These findings highlight the importance of peridomestic environments, such as the yards, gardens, vegetation, and outdoor materials surrounding homes, in mosquito prevention. Regular removal of water-holding containers, careful landscape maintenance, neighborhood participation, and sustained monitoring can help residents and agencies reduce mosquito abundance and prepare for future dengue outbreaks.

Full details of the study can be found at:

Kirsch, M., & Tay, J.-W. (2025). Modeling *Aedes albopictus* (Diptera: Culicidae) abundance in Nu‘uanu Valley, Hawai‘i: The role of building footprint size. *Journal of Asia-Pacific Entomology*, 28, issue 4. <https://doi.org/10.1016/j.aspen.2025.102509>

About the author



Dr. Jia-Wei Tay is an Associate Professor in urban entomology in the Department of Plant and Environmental Protection Sciences, CTAHR, University of Hawai‘i at Mānoa. Her research focuses on the biology, behavior, and management of invasive species, particularly insect pests adapted to urban environments, using integrated pest management strategies. She teaches Medical and Urban Entomology (PEPS 463/TRMD 463) during fall semesters.

Dr. Boyko named Ag Production and Farm Economics Agent



CTAHR Maui is happy to share that Dr. Rose (Rosie) Boyko will be joining us on October 1 as the Assistant Extension Agent for Agricultural Production and Farm Economics. Please join us as we warmly welcome her

to our team, and read more about herself and her plans as she serves the Maui communities in her new role.

Please tell us about yourself

I am Dr. Rose (Rosie) Boyko and I'm really looking forward to joining CTAHR as the Assistant Extension Agent serving Maui County. Originally from western Massachusetts, I have an interdisciplinary background in soil science, agronomy, and sustainable agriculture (plus women and gender studies), with experience spanning research, teaching, and farmer engagement in both the United States and the United Kingdom. Before joining CTAHR, I was a Lecturer and Researcher at Scotland's Rural College (SRUC) and Deputy Programme Leader for the MSc Soils and Sustainability program at the University of Edinburgh. My work has focused on soil health, nutrient cycling, sustainable grassland systems, greenhouse gas mitigation, and supporting resilient agricultural landscapes. At CTAHR, I am excited to work alongside Maui County's farming community to develop practical, research-based solutions that strengthen farm resilience, improve soil and water stewardship, and support economically sustainable agricultural enterprises. My aim is to build strong partnerships with growers and community organizations in the county while helping connect university research with the needs of Hawai'i's diverse agricultural sector.

How do you see your role supporting Maui County growers?

I see my role as building strong relationships with growers and supporting them with practical, science-based solutions that help their farms thrive. Every farm is different, so listening to producers and understanding their goals will be my first priority. I hope to work alongside farmers to improve soil health, strengthen farm resilience, explore value-added opportunities, and connect them with research, training, and resources that support long-term success for Maui County's agricultural community.

What are your top three priorities in the first six months?

My first priority will be getting out into the community and ideally volunteering as much as possible, meeting farmers, learning about local operations, and understanding the opportunities and challenges they face. Secondly, I want to identify areas where Extension can provide immediate support through workshops, demonstrations, and one-on-one technical assistance. Finally, I'd like to begin building partnerships with local organizations, schools, government departments, food system operations and agricultural groups to strengthen collaboration and ensure Extension programs reflect the needs of Maui County's diverse farming community.

What is your vision for Maui County and its farmers?

My vision is to have a thriving, resilient agricultural sector where farms of all sizes are supported to succeed economically while caring for and protecting the island's natural resources. As increasing local food security is a major goal of the state, I hope Extension can help strengthen local food systems by promoting sustainable farming practices while increasing efficiency, encouraging innovation and technology into practice, supporting the next generation of producers, and creating opportunities for farmers to add value to their products. I'm aware each island system has particular challenges, an essential aim is to cater advisory services to the needs of each community.



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KEY DATES:

- September 30, 2026 – Deadline to submit Letter of Intent
- October 31, 2026 – Project selection notifications sent
- November-April 2027 – Development and model testing
- May 2027– Final demonstration and presentation event



House Committee on Higher Education visits CTAHR Molokai Facility



Jennifer Hawkins and Kyle Franks explaining their programs at the CARES Ho'olehua facility to State Representative Andrew Garrett, chair of the House Committee on Higher Education, Representative Cory Chun, chair of the House Committee on Agriculture and Food Systems, and Representative Mahina Poepoe on August 10, 2026.

Photos by S. K. Dara

Community Engagement on Maui



James Keach (CTAHR Kauai) teaching orchid care to the Master Gardeners at a workshop. Photos by J. Mollinedo



The Ag Leadership Foundation of Hawaii class at CARES Kula (left, photo by Christine Brammer) and the CTAHR team at the Maui AgFest (right, photo by S. K. Dara)



Javier Mollinedo speaking about the coconut rhinoceros beetle in a workshop he co-organized with Liangjie Dong (photo by L. Dong)



Mark Dragich providing pesticide handling and application training to the Master Gardener volunteers (photo by S. K. Dara)