Hawai'i County Clerk 11/10/2026 02:12:49 PM

MICHELLE M. GALIMBA
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Vice Chair

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COUNTY COUNCIL

County of Hawai'i
Hawai'i County Building
25 Aupuni Street
Hilo, Hawai'i 96720

COMMUNICATIONS, REPORTS, AND COUNCIL OVERSIGHT COMMITTEE

28th Session

West Hawai'i Civic Center
74-5044 Ane Keohokālole Highway, Building A
Kailua-Kona, Hawai'i

November 17, 2026
10:30 a.m.

The Hilo Council Chambers at the Hawai'i County Building, 25 Aupuni Street, will be closed.

Public attendance via Courtesy Site is available at the following locations:

- **Ocean View Community Association, 92-8924 Leilani Circle;**
- **Pāhoa Council Office, 15-2879 Pāhoa Village Road; and**
- **Waimea Council Office, Parker Square, 65-1279 Kawaihae Road, Suite 109.**

If a Courtesy Site is unavailable and/or participation is disrupted, the scheduled meeting will continue.

Oral Public Testimony via Zoom: To provide oral testimony via Zoom, email *councilremotetestimony@hawaiicounty.gov* or call (808) 961-8255 to complete the registration process and obtain meeting login information. Please contact our office to register by 12:00 noon, **Monday, November 16, 2026**.

Submitting Written Testimony: To ensure timely delivery to Council Members prior to the meeting, written testimony must be submitted no later than 12:00 noon on **Monday, November 16, 2026**, by: (1) email to *counciltestimony@hawaiicounty.gov*; (2) facsimile to (808) 961-8912; or (3) mail to the County Clerk's Office in Hilo at 25 Aupuni Street, Hilo, Hawai'i, 96720. All written testimony, regardless of time of receipt, will be made part of the permanent record. Please submit separate testimony for each item.

Hawai'i County Clerk 11/10/2026 02:12:49 PM

ORDER OF BUSINESS

CALL TO ORDER

ROLL CALL

STATEMENTS FROM THE PUBLIC ON AGENDA ITEMS

Pursuant to HRS § 92-3, oral testimony may be provided entirely at the beginning of the meeting, or immediately preceding the agenda item being opened for deliberation by the committee.

COMMUNICATIONS

Comm. 1161: REPORT OF ACTIVITIES AND PLAN OF WORK BY COUNTY-SUPPORTED EXTENSION AGENTS FOR 2025-2026
From Research and Development Director Benson Medina, dated October 22, 2026.

ADJOURNMENT

Note: B/R, when listed next to the name of an Introducer, signifies that the Council Member has agreed to introduce legislation "By Request" on behalf of the requesting party. It does not necessarily signify support of or opposition to the proposal.

Live Stream of County Council Committee Meetings: To view the live stream of this meeting, at the scheduled meeting start time, type the following into the address bar of the browser: https://www.youtube.com/channel/UCJNalwg4OoK7a_7nGnEtGPA.

If you need an auxiliary aid/service or other accommodation due to a disability, call (808) 961-8255 as soon as possible, preferably by *November 13**, 2026***. If a response is received after this date, every effort will be made to obtain the auxiliary aid/service or accommodation, but there is no guarantee the request can be filled. Upon request, this notice is available in alternate formats such as large print, Braille, or electronic copy.

Agenda items are available on the County website at www.hawaiicounty.gov. Click on Council Records to navigate to current agendas. For any questions, please contact Council Services at (808) 961-8255.

C. Kimo Alameda, Ph.D.
Mayor

William V. Brilhante, Jr.
Managing Director

Benson Medina
Director

Dennis Lin
Deputy Director

County of Hawai'i

DEPARTMENT OF RESEARCH AND DEVELOPMENT

25 Aupuni Street, Room 1301 • Hilo, Hawai'i 96720-4252
(808) 961-8366 • Fax (808) 935-1205
E-mail: chresdev@co.hawaii.hi.us

COUNTY CLERK
COUNTY OF HAWAII
2026 OCT 23 AM 11:00

October 22, 2026

Re: 2025-26 Reports of Activities and Plan of Work by County-supported Extension Agents

Dear Council Chairman Dr. Holeka Inaba and members of the Hawai'i County Council:

It is my privilege to submit the reports on the activities and the proposed 5-year Plant of Works of the two County Extension Agents that Hawai'i County supports by paying for half of their salaries. Laura Rieber works with the Pacific Crops and coordinates the East Hawai'i Master Gardener's program. Prem Mahato is the East Hawai'i Livestock Agent.

Should you have any questions, please feel free to contact Glenn Sako at 808-961-8811 or at Glenn.sako@hawaiicounty.gov.

Sincerely,

Benson Medina
Director

Comm. No. 1161
Ref. To: CRCDC
Ref. Date OCT 27 2026

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience

Extension Educational Programming

October 1, 2025 - September 30, 2026

As Junior Extension Agent for Pacific Crops and Coordinator of the East Hawai'i Master Gardener Program, I continued to develop and deliver Extension programming serving growers across Hawai'i County, including commercial, emerging and small scale producers. I provide agricultural education and technical assistance to growers while also developing demonstration and research resources related to Pacific crops and diversified production systems. Through the East Hawai'i Master Gardener Program, I provide program coordination and technical assistance to gardeners, home growers, homesteaders, youth, and community members. During this reporting period, my work included agricultural education, technical assistance, demonstration and research support, grant development, stakeholder engagement, and volunteer program coordination.

My work focused on four connected areas:

- Pacific Crops Education
- Technical Support and Integrated Pest Management
- Stakeholder Engagement and Outreach
- East Hawai'i Master Gardener Leadership

Programming was shaped by grower questions, Helpline contacts, farm visits, workshops, demonstration workdays, and collaboration with Master Gardeners, farmers, researchers, and community partners.

Focus Area 1: Pacific Crops Education

Pacific crops are often propagated vegetatively, making access to healthy planting materials integral to establishing and expanding plantings. Continued development of the Waiākea demonstration and germplasm site supports propagation, hands-on education, crop diversity, and future access to planting materials for Pacific Crops.

Programming this year increasingly focused on practical education and technical assistance for commercial producers, small-scale producers, emerging farmers and Master Gardeners. Pacific crops are often incorporated into diversified and agroforestry systems, so guidance continues to be shaped by site-specific grower needs and ongoing needs assessment.

Deliverables:

- Continued an ongoing needs-assessment process, using grower questions, technical assistance, workshops, demonstration activities, and direct engagement to guide Pacific Crops programming and resource development.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience

- Continued development of the 3-acre Waiākea demonstration and germplasm site as a long-term resource for Pacific crop hands on education, propagation, crop trials, and future access to planting materials.
- Delivered 12 recurring Pacific Crops workshops at Waiākea, averaging 12 participants per workshop and approximately 144 participant attendances across the series. Workshops combined educational instruction, hands-on activities, and technical discussion.
- Delivered a 12-month Korean Natural Farming (KNF) workshop series with Prem Lal Mahato, averaging approximately 30 participants per workshop, providing sustained education in low-input and biological approaches to crop production.
- Delivered a 5-week agroforestry workshop series, with 26 participants attending all five sessions. More than 224 Pacific crop plants representing eight crop types were provided free of charge to 28 participants to support application of agroforestry concepts in home and farm settings.
- Expanded Pacific crop germplasm collections to 73 named varieties across kō (24), 'awa (13), 'ulu (26), and dwarf coconut (10).
- Secured $49,000 in HDOA grant funding to expand 'awa germplasm developments, propagation capacity and educational resources.
- Established and maintained trials with nanea, perennial peanut, ryegrass, Inga, crotalaria, and perennial edible crops to evaluate groundcovers, mulch production, and diversified planting systems in regards to kalo production.
- Expanded the perennial edible demonstration area with Abelmoschus manihot and Cnidoscolus aconitifolius with eight more varieties propagated for future planting.
- Co-authored two publications related to Pacific crop knowledge, including *Making Mā: Fermented Breadfruit* and Propagation Techniques of 'Awa..

Outcomes:

- Growers, gardeners, and emerging farmers gained practical knowledge about Pacific crop selection, propagation, establishment, and management.
- Participants gained hands-on experience with propagation, crop establishment, groundcovers, mulch production, pruning, and diversified planting approaches.
- The Waiākea site provided a setting for growers and community members to observe and practice production approaches before applying them in their own gardens and farms.
- Stakeholder questions and technical assistance needs continued to inform workshops, trials, and educational programming.

Impacts:

- Increased local capacity to preserve, propagate, evaluate, and eventually distribute Pacific crop germplasm and planting materials.

- Expanded opportunities for growers and small-scale producers to gain practical knowledge and experience with Pacific crop propagation, establishment, and diversified production systems.
- Established the Waiākea site as a developing long-term resource for Pacific crop education, demonstration, and germplasm preservation.

Focus Area 2: Technical Support and Integrated Pest Management (IPM)

Technical assistance this year increasingly occurred through workshops, demonstration workdays, the Helpline, and follow-up communication, with eight on-site farm visits. IPM was integrated into crop trials and educational programming alongside practical guidance on crop establishment, propagation, pruning, and farm infrastructure.

Deliverables:

- Provided direct technical assistance through 8 on-site farm visits and weekly Friday Helpline support, including 86 email, 68 phone, and 77 walk-in contacts.
- Provided follow-up technical assistance to growers and workshop participants addressing crop establishment, propagation, pruning, pest and disease management, and farm infrastructure.
- Integrated IPM into Pacific Crops trials and technical assistance, with particular attention to pest and disease issues identified through grower questions and changing weather conditions.
- Provided hands-on technical instruction in fencing, pruning, air layering, grafting, 'awa production, and pest and disease management.
- Provided technical assistance and feedback in developing a guide for local growers, supporting development of practical resources for homesteaders and diversified food production.

Outcomes:

- Growers gained practical knowledge in pest and disease identification, IPM, crop management, propagation, and production practices.
- Participants gained hands-on experience applying production and propagation techniques in demonstration and workshop settings.
- Growers demonstrated interest in agroecological approaches, including mulching, intercropping, groundcovers, and diversified planting systems.

Impacts:

- Increased access to Extension technical assistance for pest, disease, crop-production, propagation, and farm-infrastructure questions.
- Supported more resilient and ecologically based approaches to crop production and pest management.
- Improved Extension's ability to identify recurring production challenges and respond with targeted education, demonstrations, and technical assistance.

Focus Area 3: Stakeholder Engagement & Outreach

Stakeholder engagement remained central to Extension programming. I continued to connect with growers, Master Gardeners, researchers, community organizations, and other Extension professionals through workshops, outreach events, demonstrations, and direct communication. Stakeholder questions and partnerships continued to inform programming and identify emerging needs.

Deliverables:

- Maintained active engagement with growers, farmers, Master Gardeners, researchers, Extension professionals, community organizations, and community members through direct communication, outreach events, demonstrations, and collaborative activities.
- Developed partnerships with Hawai'i Tropical Fruit Growers, the Center for Getting Things Done, Extension faculty and researchers, and community collaborators to expand agricultural education and outreach.
- Participated in community outreach and tabling activities to connect residents with Extension resources and identify emerging agricultural and horticultural needs.
- Supported the 2026 Plant Sale/'Ōhi'a Love event, reaching approximately 1,300 attendees.
- Maintained Pacific Crops educational outreach through the program website, social media, publications, and community-facing resources.

Outcomes:

- Participants returned for multiple workshops and follow-up questions, building knowledge across educational opportunities.
- Stakeholder questions and feedback continued to identify emerging needs and shape programming.
- Growers, gardeners, farmers, and community members had multiple opportunities to connect with Extension through workshops, the Helpline, demonstrations, and community events.
- Partnerships expanded opportunities for collaborative education, outreach, and agricultural programming.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience

Impacts:

- Strengthened networks connecting growers, Extension, researchers, and community organizations.
- Increased community capacity to apply agricultural knowledge within home gardens, small farms, and diversified production systems.
- Continued development of Pacific Crops Extension as a local resource for traditional crops, agroforestry, propagation, and diversified food production.

Focus Area 4: East Hawai'i Master Gardener Leadership

The East Hawai'i Master Gardener Program continued to expand its capacity for community education, volunteer leadership, and hands-on agricultural learning. As faculty coordinator, I provide training, coordination, and support while Master Gardeners extend Extension outreach through the Helpline, community events, workshops, demonstration sites, and volunteer projects. This volunteer network expands opportunities for community education while developing local leadership and horticultural knowledge.

Deliverables:

- Trained 30 new Master Gardeners through the 2026 cohort and certified 21 members from the previous cohort.
- Coordinated Master Gardener training, monthly meetings, volunteer projects, reporting, and ongoing program operations.
- Supported 3,737.70 Master Gardener volunteer hours, including 743 Helpline hours, extending Extension capacity for community education and technical assistance.
- Coordinated recurring volunteer workdays supporting Pacific crop propagation, kalo germplasm, perennial edible agroforestry, the learning apiary, native plants, and the Waiākea research site.
- Coordinated the 8-week Junior Master Gardener camp, with 22 youth enrolled and 20 completing the program.
- Supported Master Gardener leadership of Plant Sale committees, community events, tabling, and educational activities.
- Supported 12 Master Gardener-led workshops at Kea'au Public Library through program coordination and Pacific crop propagation resources.
- Supported propagation and distribution of planting materials, including 14 named kalo varieties, and enhancement of the perennial edible demonstration area.

Outcomes:

- Master Gardener volunteer participation expanded the program's capacity to provide community education, Helpline support, and outreach.
- Master Gardeners increasingly took leadership roles in program operations, outreach, and community education.
- Master Gardeners gained hands-on experience with Pacific crop propagation, 14 named kalo varieties, perennial edible agroforestry, native plants, and demonstration-site management.
- Junior Master Gardener participants demonstrated strong retention, with 20 of 22 youth completing the 8-week program.
- Master Gardener involvement provided additional pathways for community and farmer questions to reach Extension.

Impacts:

- Expanded the capacity of Extension to provide community-based education and technical assistance through a trained volunteer network.
- Increased local leadership and stewardship related to Pacific crops, horticulture, and culturally rooted agriculture.
- Master Gardeners and workshop participants practiced propagation and crop-maintenance activities at recurring workdays and demonstration sites
- Strengthened the continuity and sustainability of the East Hawai'i Master Gardener Program.

Funding & Program Development

- Implemented grant-supported plantings, trials, infrastructure, and educational activities at the Waiākea demonstration and germplasm site.
- Continued developing collaborative funding and program opportunities to support Pacific crop education, germplasm preservation, and grower education.

Publications, Media & Scholarly Contributions

- Published "Making Mā: Fermented Breadfruit," documenting Pacific crop knowledge and value-added applications for 'ulu.
- Submitted an 'awa propagation guide for publication; publication is pending.
- Continued development of an 'ulu nutrient management guide.
- Continued development of a Master Gardener home gardening manual for use in Master Gardener training and broader community education.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience

- Continued curriculum development focused on helping farmers examine and adapt farm management and production approaches.
- Continued maintaining the Pacific Crops website and social media to share educational resources and program activities.

Summary of Achievements

Category	Summary
Extension & Outreach	52 talks, workshops, and educational sessions, including multi-session training series and hands-on learning opportunities
Special Events	2026 Plant Sale/'Ōhi'a Love Festival reached approximately 1,300 attendees
Master Gardener Program	30 new members, 21 members from the previous cohort certified; 3,737.70 volunteer hours reported across program activities
Pacific Crops Education	Continued development of 3-acre Waiākea demonstration and germplasm site; expanded collections of kō, 'ulu, 'awa, and dwarf coconut
Technical Assistance	8 farm visits plus ongoing support, feedback on industry agriculture guides, tailored workshops, Helpline, phone, email, walk-ins, and demonstration workdays
Education Materials	Published "Making Mā: Fermented Breadfruit"; 'awa propagation guide submitted for publication; additional guides and curriculum in development
Grants & Funding	$49,000 HDOA Specialty Crop Block Grant secured for 'awa germplasm development

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Since starting in August 2024, I have continued to develop Extension programming around the needs and interests of growers, gardeners, emerging farmers, Master Gardeners, and community partners in East Hawai'i. During this reporting period, I delivered educational programming, provided technical assistance through farm visits and the Helpline, coordinated Master Gardener training and volunteer activities, and continued development of the Waiākea demonstration and germplasm site.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience

In the coming year, I plan to continue developing practical education for growers and gardeners; expanding Pacific crop germplasm and demonstration resources; completing educational materials and curriculum; supporting Master Gardener leadership and outreach; and building partnerships related to diversified agriculture, local food production, and Pacific crops.



Field day at Waiakea Research Station
Groundcover trial for Kalo Production.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience



Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience



Youth learning about Pacific Crops - Kalo Production and growth habit in the JR Master Gardener 8 Week Youth Camp

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College of Tropical Agriculture and Human Resilience



Korean Natural Farming 12 Month Workshop Series averaging 30 attendees per session.

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East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience



Cassava Harvesting / Processing Workshop in Partnership with Go Farm Hawaii. Showcasing how cassava can be grown within 'ulu orchard.

Laura Rieber
Junior Extension Agent – Pacific Crops
East Hawai'i Master Gardener Coordinator
College of Tropical Agriculture and Human Resilience



Participants at the Waiākea Agroforestry Demonstration Plot receive educational instruction, hands-on practice, and one-on-one Extension technical assistance in diversified production systems.

UNIVERSITY of HAWAI'I® MĀNOA

College of Tropical Agriculture and Human Resilience
Founding College of the University of Hawai'i
Office of the Dean and Director for Research and Cooperative Extension

To: Laura Rieber, Extension Agent
Department of Tropical Plant and Soil Sciences

From: Parwinder Grewal
Dean and Director for Research and Cooperative Extension

Subject: Plan of Work (POW) 20-099

Date: September 15, 2025

Your attached POW entitled "Educate Farmers About the Value, Cultivation Methods, and Potential Markets for Pacific Crops" and "Maintain East Hawaii Master Gardener Program Current Activities and Training Course" has been approved for October 1, 2025 to September 30, 2030. Pending availability of funds, the fiscal year 2026 allocation for your project will be $3,750.00.

Should you have questions, please contact the Cooperative Extension office at extsec@hawaii.edu.

Attachment

c: Bruce Mathews
Theodore Radovich
Cheryl Izuka

3050 Maile Way, Gilmore Hall 202 Honolulu, Hawai'i 96822
Phone: 808-956-4141 E-mail: ctahrdn@hawaii.edu
www.ctahr.hawaii.edu

Attachment 1

Extension Plan of Work (POW) Cover and Signature Sheet
College of Tropical Agriculture and Human Resilience

POW number (assigned by CTAHR Administration): 20-099

Name: Laura Rieber **Agent:** X **Faculty/ Specialist:** ____ (% E ____ % R ____ % I ____)

Department: Tropical Plant and Soil Science **County:** Hawaii

POW title: Educate farmers about the value, cultivation methods, and potential markets for Pacif
Maintain East Hawaii Master Gardener Program Current Activities and Training Course

POW start date: October 1, 2025 **POW end date:** September 30, 2030
(Fast-track POWs: 1-year maximum; all other POWs: 5-year maximum; all POWs must end on September 30)

Integrated POW (involves Research and Extension activities)? ____ Yes X No
If Yes, Hatch project number associated with this POW (example: xxxH) ____ (required)

Multistate Project? ____ Yes X No
If Yes, Collaborating Land Grants: ____

CTAHR/NIFA Critical Issues (1-4): 3 (choose only 1)

1. Vibrant Tropical and Pacific Island Agriculture and Food Security
2. Ecosystem Health: Natural Resources Management and Protection
3. Resilient and Thriving Communities and Community Health
4. Workforce and Economic Development

Principle Investigator's signature: Laura Rieber - 08/13/2025

Date submitted to County Administrator or Department Chair: 08/13/2025

APPROVALS

County Administrator
X Approved ____ Disapproved Bruce W. Mathews Digitally signed by Bruce W. Mathews Date: 2025.08.18 17:10:04 -10'00'
Signature Date

Department Chair
X Approved ____ Disapproved
Signature 08/26/25
Date

Associate Dean and Associate Director for Extension
X Approved ____ Disapproved
Signature 8/28/25
Date

X Individual POW ____ Statewide POW ____ Fast-Track POW not to exceed ____
Date

Amount allocated to POW: $ 3,750 (pending availability of funds) Authorized by:
Signature

Revised 7/23/25

Attachment 1

Extension Plan of Work (POW) Cover and Signature Sheet
College of Tropical Agriculture and Human Resilience

County Administrator's Recommendation (if applicable)

X____ Acceptable as written
_____ Acceptable with revision(s); no further review needed
_____ Major revision(s) required

If it is determined that this POW requires major revision(s), how can the project be improved?

Bruce W. Mathews — Digitally signed by Bruce W. Mathews Date: 2025.08.18 17:12:26 -10'00'

Print Name | Signature | Date

Department Chair's Recommendation (if applicable)

_____ Acceptable as written
_____ Acceptable with revision(s); no further review needed
_____ Major revision(s) required

If it is determined that this POW requires major revision(s), how can the project be improved?

Print Name | Signature | Date

Revised 7/23/25

Maintain East Hawaii Master Gardener Program Current Activities and Training Course

Complete

Reporting Period
Extension 2026 (October 1, 2025 - September 30, 2026)

Level
Individual

Type
Local

State Action Plan

Status
Finished

Program Areas
Youth/Family/Community Development and Health

Unit
East Hawaii Island (District)

Critical Issues
Resilient and Thriving Community Health
Vibrant Tropical and Pacific Island Agriculture and Food Security
Workforce and Economic Development

Comments

Copied From
Maintain East Hawaii Master Gardener Program Current Activities and Training Course

Created By
Laura Rieber

Last Modified By
Laura Rieber

Created At
07/09/2025 11:26 a.m.

Modified At
08/13/2025 3:49 p.m.

PEARS Action Plan ID
34250

Collaborators

User	Contributor	View Only	View & Edit	Contribution
Laura Rieber	✓	⊘	✓	

Situation Assessment

Situation
The East Hawaii Master Gardener Program has become a cornerstone of community support, reaching over 1,800 direct contacts in 2025 through the annual plant sale, tabling events, and the weekly helpline. Membership has expanded from 20 to 97 members since 2020, with volunteers contributing over 2,000 hours and 30 new participants joining annually.

Despite this growth and high engagement, the program faces several pressing challenges that require a coordinated programmatic response. Increasing community demand for services—including the annual training program, plant sale, summer garden camp, and monthly workshops—has intensified the logistical, staffing, and resource demands of the program. Ensuring high-quality training, outreach, and volunteer support is essential to maintain program effectiveness and impact.

Addressing these challenges is critical for sustaining the program's ability to enhance community gardening initiatives, support sustainable food production in East Hawaii, and integrate educational

opportunities related to Pacific crops.

Public Value

The East Hawaii Master Gardener Program delivers substantial public value by connecting people, knowledge, and resources to support gardening, sustainable food production, and community resilience. The program enhances community engagement by facilitating active participation in gardening and food production, strengthening local connections, and fostering a sense of belonging. It supports sustainable practices by providing education and resources on environmentally responsible gardening, contributing to long-term food security and healthier landscapes.

Through workshops, summer camps, and annual training programs, the Master Gardener Program promotes education, equipping participants with practical horticultural knowledge and skills. It also encourages volunteerism, mobilizing a growing network of dedicated volunteers whose expertise and time enrich community life and support local initiatives.

The program strengthens local events by partnering with cultural and educational gatherings—such as the 'Ohia Love Festival—enhancing community experiences and raising awareness of gardening and sustainability. Finally, it improves access to resources through its helpline and outreach efforts, providing practical advice, guidance, and support to local gardeners across East Hawaii.

Outputs

Intended Outputs

1. Participate in monthly advisory board meetings to monitor and support membership growth within Master Gardener MOU guidelines.
2. Assist in planning and executing the annual plant sale, a major community engagement and fundraising event.
3. Collaborate in monthly statewide Master Gardener Coordinators meetings to maintain and improve the 14-week annual training curriculum.
4. Oversee and coordinate the 14-week annual Master Gardener Training, including teaching the hands-on lab portion.
5. Ensure the weekly community helpline is fully operational and staffed to respond to public inquiries.
6. Provide ongoing guidance and support to Master Gardener members managing demonstration garden plots and the greenhouse at Komohana Research and Extension Center, fostering future membership growth and community engagement.
7. Coordinate and teach monthly continuing education workshops for members and the public.

8. Maintain and update the statewide Volunteer Management System (VMS) to accurately track volunteer hours and contributions.

Outcomes and Indicators

Short Term Outcomes

Outcome

Increase in the number of Master Gardener members and active participants, as tracked through monthly advisory board meetings.

Indicators

- **Quantitative** membership numbers
- **Quantitative** members coming to quarterly meetings

Medium Term Outcomes

Outcome

Successful execution of the annual 14-week training program, including attendance and participant feedback.

Indicators

- **Quantitative** initial sign ups interested in program
- **Qualitative** those who finish training

Long Term Outcomes

Outcome

Number of community engagement activities, including garden demonstration plots and the operation of the weekly helpline

Indicators

- **Quantitative** community engagement activities
- **Quantitative** helpline contacts = direct and indirect

Outcome

Plant Sale Success: Revenue generated and community participation levels in the annual plant sale

Indicators

- **Quantitative** revenue generated
- **Quantitative** attendance

Outcome

- Program Enhancements: Implementation of improvements and updates to the training program and community services based on advisory board and coordinator feedback.

Indicators

- **Qualitative** Implementation of improvements

Board Chair: _____

Date: _____

Educate farmers about the value, cultivation methods, and potential markets for Pacific crops

Completed

Reporting Period
Extension 2026 (October 1, 2025 - September 30, 2026)

Level
Individual

Type
Local

State Action Plan

Status
Finished

Program Areas
Diversified Tropical Agricultural Systems

Unit
Hawaii (County)

Critical Issues
Resilient and Thriving Community Health
Vibrant Tropical and Pacific Island Agriculture and Food Security
Workforce and Economic Development

Comments

Created By

Laura Rieber

Last Modified By

Laura Rieber

Created At
07/09/2025 10:54 a.m.

Modified At
08/13/2025 3:34 p.m.

PEARS Action Plan ID
34249

Collaborators

User	Contributor	View Only	View & Edit	Contribution
Laura Rieber	✓	⊘	✓	

Situation Assessment

Needs Assessment
A 2025 needs assessment conducted with farmers and agriculture professionals on Hawai'i Island revealed a strong demand for education and technical support related to underutilized Pacific crops. Respondents reported limited familiarity with these crops' market potential and cultivation methods that can reduce pest and disease pressure while improving profitability. There was particular interest in cultivating Pacific crops within agroforestry systems that integrate the increasingly in-demand fruit crop 'ulu (breadfruit) alongside other culturally significant plants. Stakeholders expressed a desire for hands-on learning opportunities and demonstration sites to explore planting methods, the benefits of diversified farming systems, sourcing materials, propagation techniques, pest management, and value-added opportunities. These findings underscore the need for targeted outreach, capacity building, and demonstration plots to expand adoption and enhance economic opportunities related to Pacific crops.

Situation

Farmers and agricultural professionals on Hawai'i Island face a lack of knowledge and technical support regarding the cultivation, economic potential, and management of underutilized Pacific crops. This gap limits diversification, profitability, and the adoption of culturally and environmentally appropriate cropping systems. Many producers are unfamiliar with how to integrate these crops—such as 'ulu and other traditional Pacific plants—into agroforestry systems that offer ecological and economic resilience. Additionally, access to high-quality planting material remains a significant barrier. To address this, a central component of the program will be the establishment of a live germplasm collection and demonstration site, where farmers can observe cultivation practices, learn propagation methods, and access diverse planting materials to propagate and establish on their own farms. Without targeted education and planting resource access, the opportunity to revitalize culturally significant crops, meet growing market demand, and enhance local food security remains underrealized.

Public Value

By increasing knowledge, access to planting materials, and practical skills related to underutilized Pacific crops, this program provides technical assistance to farmers, supporting diversified agriculture, economic resilience, and food sovereignty throughout Hawai'i County. Farmers are educated on agroforestry systems that integrate culturally significant crops, promoting regenerative land management, climate adaptation, and the revitalization of traditional food systems across Hawai'i Island. The program emphasizes IPM strategies, intercropping orchards with Pacific crops as understory or alley crops, and understanding the long-term value of these crops. As adoption grows, communities benefit from improved food security, reduced reliance on imports, and farmers having a greater diversity of Pacific crops to develop value-added products for local consumption and tourism, strengthening the local economy. This work also contributes to the conservation of crop genetic diversity and Indigenous agricultural knowledge for future generations.

Outputs

Intended Outputs

- **Educational Workshops:** Conduct 10–12 hands-on workshops over the next five years, reaching approximately 30-50 farmers per workshop. Workshops will cover crop selection, cultivation practices, integrated pest management strategies, agroforestry system design, and value-added opportunities.
- **Demonstration Sites / Germplasm Collection:** Establish and maintain one 'ulu-based agroforestry demonstration site at the CARES Waiakea Research Center showcasing companion Pacific crops. The site will serve as a living germplasm, learning hub for workshops, field days, and on-farm consultation visits, allowing farmers to observe and practice diverse planting techniques.

- **Technical Assistance & On-Farm Support:** Provide direct guidance and support to 20 farmers a year, with a goal of 100 farmers over five years, helping them implement IPM strategies, intercropping, and agroforestry practices tailored to their farms.
- **Access to Planting Materials & Propagation Resources:** Distribute high-quality planting materials to 30–40 farmers, enabling the adoption of diversified cropping systems and supporting the integration of culturally significant Pacific crops into their operations.
- **Educational Materials & Resources:** Develop and distribute 5–10 fact sheets, crop guides, and propagation resources on Pacific crops, IPM techniques, and value-added opportunities to reinforce workshop learning and on-farm application.
- **Partnership & Community Engagement:** Collaborate with 3–5 key partners—including CTAHR researchers, cultural practitioners, local food hubs, 'Ulu Cooperative, and Go Farm Hawaii—to strengthen outreach, knowledge exchange, and market connections.
- **Monitoring & Documentation:** Track workshop attendance, technical assistance requests, adoption of agroforestry and IPM practices, and distribution of planting materials to assess program reach, progress, and outcomes over the five-year period.

Outcomes and Indicators

Short Term Outcomes

Outcome

- Farmers and agricultural professionals gain knowledge about the cultural significance, market potential, and agroecological benefits of Pacific crops.
- Participants understand propagation techniques and best practices for integrating Pacific crops into agroforestry systems.
- Awareness and access to available germplasm and planting materials increase.

Indicators

- **Quantitative** Number of participants attending workshops and on-site trainings.
- **Qualitative** Number of educational materials distributed or downloaded (fact sheets, crop guides, propagation resources).
- **Qualitative** Percentage of participants reporting increased confidence in sourcing and propagating Pacific crop planting materials.
- **Qualitative** Percentage of participants reporting increased knowledge of Pacific crop cultivation, intercropping, and IPM practices.

Medium Term Outcomes

Outcome

- Farmers incorporate Pacific crops into their farms and diversify production systems.
- Participants apply propagation, IPM, and agroforestry design techniques learned through the program.
- Germplasm materials are successfully propagated and shared within the farming community.
- Producers begin exploring market pathways for Pacific crops and value-added products.

Indicators

- **Qualitative** Number of farmers planting Pacific crops sourced from the demonstration germplasm site.
- **Quantitative** Number of farms implementing agroforestry designs featuring 'ulu and companion Pacific crops
- **Qualitative** Number of participants sharing planting materials with peers, demonstrating knowledge diffusion
- **Quantitative** Number of follow-up technical assistance requests related to Pacific crops, indicating continued engagement and application

Long Term Outcomes

Outcome

- Greater economic resilience through diversified income streams from Pacific crops.
- Strengthened local food system with increased production of culturally relevant foods.
- Enhanced environmental outcomes through wider adoption of agroforestry practices.
- Long-term access to diverse Pacific crop germplasm for Hawai'i Island producers.
- Preservation and revitalization of traditional agricultural knowledge.

Indicators

- **Qualitative** Stories or testimonials documenting cultural reconnection through growing traditional crops and generating income
- **Quantitative** Number of farms reporting increased income attributed to Pacific crops

- **Quantitative** Percentage of surveyed farmers using agroforestry practices incorporating Pacific crops after 4+ years
- **Qualitative** Ongoing maintenance and expansion of the demonstration germplasm site

Board Chair: _____

Date: _____

Junior Extension Agent: Prem L Mahato (Job Report: August 01, 2026- September 05, 2026)

A. **Joined:** August 1, 2025
B. **Submission date:** September 5, 2026
C. **Supervisors:** County Administrator: Bruce Mathews, Economic Development Specialist-Agriculture (County of Hawaii): Glenn Sako, Department Head (Department of Human Nutrition, Food, and Animal Sciences): Birendra Mishra
D. **Direct and indirect contacts made with stack holders and producers in 2025**
    1. Direct contact (in participations): 4-H state Horse Show and quiz contest
    2. Direct contact: Sheep and Goat Association Annual Meeting 2025 (Small Ruminant Workshop 2025)
    3. Direct contact: Phone calls, in-person meetings, and visits to establish a relationship with the producers for future interviews, all the contacts are saved in a google document sheet
        a. Pig producers
        b. Cattle producer
        c. Sheep goat producers
        d. Chicken producers
    4. Indirect contact: Backyard Poultry Basics Webinar Series (3 days)
    5. Indirect Contact: East Hawaii 4-H livestock Committee Monthly meeting
    6. Indirect Contact (in participations): Hawaii 4-H livestock show State committee Monthly meeting
    7. Meeting with state and county personnel to understand the ongoing barriers, regulations imposed in the Big Island, and attempts to solve the issues or possible directions (in 2025 and 2026)
        I. State vet: Dr. Kim Kozuma
        II. University of Hawaii at Manoa vet extension: Dr. Rajeev Mishra
        III. University of Hawaii at Manoa microbiology faculty for disease diagnosis and collaboration: Dr. Michael Norris
        IV. University of Hawaii Hilo: Dr. Maria Haws, Dr. Nicholas Krueger, Cyra Pomona, Jake Rodrique
        V. Malama O Puna: Amedeo Markoff, Eileen Ohara
        VI. Ulu Co-op: Dana Shapiro
        VII. Enlivened Cooperative: Kelly Teamy (For cooperative development)
        VIII. Feed mill personnel: Pomai Freitas (not in operation yet)

IX. University professionals: Dr. Rajesh Jha, Dr. Birendra Mishra, Dr. Janee Odani, Dr. Yanghua He, Dr. Caleb Reichhardt, Dr. Pacal O Aigbedion-Atalor (Entomologist, Specialist in Komohana)

X. Emeritus faculties: Dr. CN Lee and Michael DuPonte

XI. 4-H personnel: Jeff Goodwin, Lara Kalilimoku, Hawaii 4-H committee members; YQCA instructor

XII. Major producers: Victoria Tanaka (Swine), Colton Hill (Swine), Emily Tarroa (Poultry), Rene Pasterna (Poultry), Nicole Soong (4-H), Lani Petri (Cattle), Michalle Galimba (Cattle), Kian (Cattle), Sujana (Cattle)

E. Major Programs participated (In direct contact):

1. Smoke it up (Had a Booth with Dr Rajeev Mishra) (1 day)
2. Hawaii Cattleman's Council Annual Meeting in Maui (3 days)
3. Hawaii Agri policy summit 2025 (1 day)
4. Ag-Pro (Oahu) (2 days)
5. Cooperative Extension Strategic Envisioning Session (Sept 9, 2025) (1 Day)
6. Livestock booth in Ohia Love festival in 875 Komohana St, Komohana Research and Extension Center office, January 25, 2026, Hilo, Hawaii.
7. Farm Visit to Cattles Ranchers in Hawaii with grant team (Koon-Hui Wang, Mark Dragich, Roshan Poudel, Daryll) (Feb 10, 2026)
8. Ag day at the Capitol (Feb 26, 2026)
9. Co-operative Hui Virtual Workshop (Feb 26, 2026)
10. Calving and grazing Management Workshop in Mealani (April 18, 2026)
11. Extension Virtual Meeting for Training (April 23, 2026)
12. 2nd Cooperative Gathering April 30, 2026)
13. In person extension peer mentoring training in Maui (May 04, 2026)
14. In person extension peer mentoring training in Kauai (June 08, 2026)
15. Cassava Harvest and processing workshop at GO farm Hilo (June 13, 2026)
16. County 4-H show (2 day, June 19 and 20, 2026)
17. Extension Virtual Meeting for Training (June 25, 2026)
18. Hawaii Island Agrifood summit 2026 (Pahoa)
19. In person extension peer mentoring training in Oahu (July 06, 2026)

F. Major Programs Organized (Direct contact):

1. Pig producers meeting (November 1)
2. Pre-meeting discussion (Gary, Pono, Kelly) at Sweet Cane Cafe
3. Pre-meeting discussion in KREC, Conf Room A
4. Pig producers meeting (Dec 6, 2026) in KREC, Conf Room A
5. Swine co-op meeting (Jan 10, 2026)
6. Korean Natural Farming - Together Again (Jan 13, 2026), KREC, Conf Room A

7. Palm oil tree and its potential animal feed (Jan 14, 2026)
8. Extension Peer Mentoring Training (Jan 20, 2026)
9. First poultry producers meeting (Feb 03, 2026)
10. Pig producers meeting (Feb 07, 2026)
11. Korean Natural Farming - Together Again (Feb 10, 2026)
12. Micro-Grant for food security program in session (Feb 11, 2026)
13. Poultry Production talk (as a resource person), to Master Gardners class, Feb 22, 2026
14. 2nd Poultry Producers Meeting (Mar 3rd, 2026)
15. Korean Natural Farming - Together Again (Mar 10, 2026)
16. Farm Visits in Hawaii with Professors from (Perdue University) March 14, 2026
17. Pig producers meeting (March 21, 2026)
18. 3rd Poultry Producers Meeting (April 07, 2026)
19. Panewa UH Hilo Farm meeting for reproduction work for pig (Apr 10, 2026)
20. Korean Natural Farming - Together Again (Apr 14, 2026)
21. Pig producers meeting (April 28, 2026)
22. Korean Natural Farming - Together Again (May 12, 2026)
23. Korean Natural Farming - Together Again (Jun 09 10, 2026)
24. Hawaii Pig Producers Meeting (May 26, 2026)
25. 4-H poultry Screening throughout the island (Keaau to Hamakua)
26. 4th Poultry Producers Meeting (June 03, 2026)
27. Korean Natural Farming - Together Again (June 09, 2026)
28. Sheep and Goat Association Annual Meeting 2026 (2 day - Small Ruminant Workshop)
29. Co-op meeting for pig producer in Hilo, June 11, 2026
30. Poultry producer's co-op meeting (July 07, 2026)
31. Korean Natural Farming - Together Again (July 14, 2026)
32. First Formal co-op meeting for Livestock co-op (July 22, 2026)

G. Collaborations

1. Integrated weed management of invasive species (Hawaii Island)
   Dr. Koon Hui Wang, Dr Mark Dragich, Roshan Poudel and Darryl Bulosan
2. Sample collection for the lab diagnostics and research for feral swine diseases
   Dr. Michael Norris (School of Life Sciences; UH Manoa)
3. Organizing meetings for Natural Farmers
   Master Gardner coordinator; Laura Reiber
4. Black Soldier Fly Larvae potential demo and research
   Assistant Specialist (Entomology): Pascal O Aigbedion-Atalor
5. Cassava silage as a swine feed

Sharon Wages, Joanna Norton

6. Ulu waste as an Animals feed

   Indigenous Cropping System (Dr. Noa Lincoln), and Ulu-co-op (Dana Shapiro)

7. Corn and sunflower meal as animals feed

   Pacific Bio Diesel (Christopher Long)

H. Extension articles Published and submitted

1. **Published:** Screwworms: The Flesh-Eating Flies We Must Keep Out of Hawaii
2. **Submitted:** Slaughterhouse waste management: landfilling vs Black Soldier Fly
3. **Submitted:** Avian Influenza (Types, Symptoms, prevention)

I. Website development

1. Developed a working website that is active and is regularly updated.
   Each livestock has their own separate pages, that contains the most useful tools in the beginning, publications in the middle and video materials around the end of the page.
2. Website link: https://hilolivestock.ctahr.hawaii.edu/
3. Website screens shot

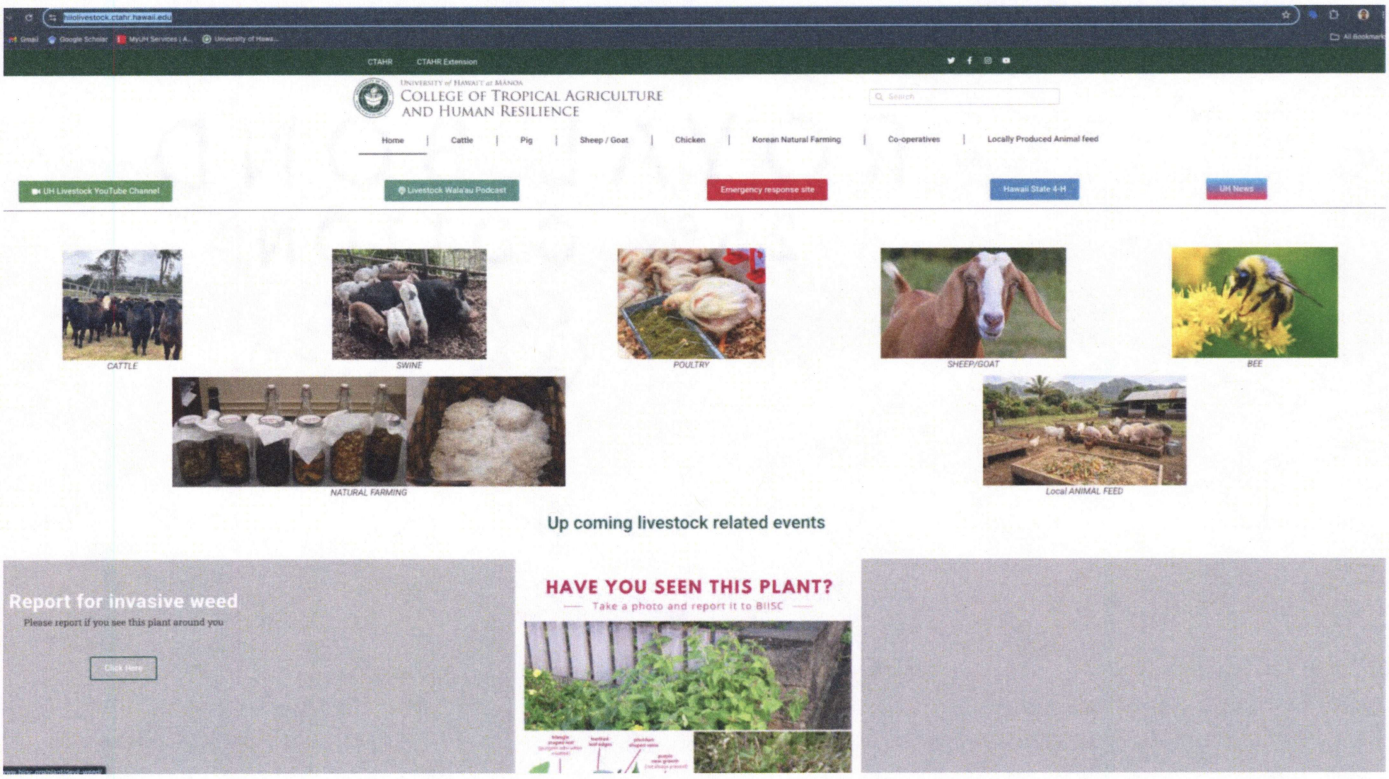


Figure..Livestock.website.with.a.page.designed.for.each.livestock?and.separate.page.for.locally.available.feed.sources

J. Parasite lab

Using POW fund, I was able to purchase microscope and other materials for the parasite egg count. This tool will be used for identifying different types of parasites, their egg load and drug resistance level by testing multiple times (Before and after deworming). The website has link for the registration and date to book a slot to get feces tested. The webpage also explains how to collect sample and why it is important.

K. Further planning

1. Reaching out to more goat/sheep and cattle producers
2. Working on successful operation of livestock co-op (Aha Aloha Aina co-op)
3. Connecting ag byproduct producers for pig producers

L. PhD progress

1. Credit requirements (completed)
2. Comprehensive and proposal (Completed)
3. Publications:
    a. Published: Age-associated changes in the shell gland transcriptomics and eggshell quality of broiler breeder hens (Published in BMC Genomics, 2026)
    b. Submitted: Age-related changes in the transcriptional profile associated with albumen biosynthesis in the magnum of broiler breeder hens (**In Poultry Science Journal**)
4. Working on - Dissertation writing: Age associated changes in broiler breeder egg quality
5. Defense (by 2027)

M. Grants/funding (Funded/waiting for decisions)

1. **Funded**: PI, Advancing.sustainable.pig.farming.through.local.feed.innovation.and.producer.education, Western SARE for **$344,000**
2. (**waiting for decisions)** Co-PI, Enhancing.Poultry.Production.in.Hawaii.through.improving.Poultry.Curriculum?Applied.Research?and.Extension.Services.(P_CARE), submitted to NIFA CARE grant for **$650,000**, decision pending in 2026.
3. (**waiting for decisions)** Co-PI, Biological.control.of.the.two_lined.spittlebug.(Prosapia.bicincta).using.Hawaiian.entomopathogenic.nematodes.in.local.ranchlands; Pre-proposals submitted to Western SARE grant in Research and Education category, Western SARE. **$350,000**; pre-proposal submitted in November 2025, Decision pending on January
4. (**waiting for decisions)** Co-PI, Cooperative.decision.tools.and.value_chain.analyses.to.enhance.specialty.crop.market.access.for.small.and.medium.farms.in.hawai'i, submitted to NIFA/AFRI for **$650,000**, decision pending in 2026

5. (**waiting for decisions)** Co-PI, Improving.Diagnostic.Capacity.and.Promoting. Biosecurity.Awareness.Among.Small_Scale.and.Backyard.Producers.in.Hawaii, submitted to NIFA/AFRI for $**280,382**, decision pending in 2026.
6. **(Waiting for decisions)**.Co_PI?Strengthening.Pastureland.Through.Soil.Health. and.Integrated.Pest.Management.To.Combat.Multiple.Invasive.Species.Including. Weeds?Spittlebugs.and.Gastro_Intestinal.Nematodes·.for **$3,000,000** in USDA-NIFA-AFRI

N. Some pictures from the programs and farm visits (August 2025, July 2026)



Figure.7.Small.Ruminants.Workshops.in.Komohana.Research.and.Extension.
Center¿Me.and.Yunuen.(Right).in.registration.desk.(868❶)



Figure.8.Participants.in.the.Pig.producers.meeting.held.at.Komohana.Conf.A?on.
November.7.(Right.to.left·.Michael.DuPonte?Pomai?other.participants)



Figure.9.Participants.in.the.Pig.producers.meeting.with.Dr¡.Rajeev.Mishra.teaching.about.
infectious.diseases?held.at.Komohana.Conf.A?on.November.7



Figure.0..Second.pig.producers.meeting.at.Komohana.(In.preparation).with.Mason.(on.my.left.side)



Figure.❶Korean.Natural.Farming.together.again.meeting.at.❹❸❶Komohana.st?KREC.building.on.Conf.room.A.(Ø8.participants.with.Drake.talking.about.KNF)



Figure.❷.farm.visit.to.Mt.view.showing.feed.mill.at.one.of.the.farmers.place



Figure.3.Pig.producers.meeting.(Figuring.out.feed?Chris.Long.is.talking.about.this.feed)



Figure.4.Korean.natural.farming.meeting.in.one.of.Tuesday.evening.meeting



Figure.6..Dr¡.Rajesh.Jha.talking.about.poultry.production.in.Komohana.Research.and.Extension.
Cetner.in.the.poultry.producers.meeting



Figure.76..Ag.day.at.the.Capitol.with.Yun?Kylene?and.Mele.(from.Left.to.Right)



Figure.77.A.lamb.in.Hilo.with.ear.lesion?picture.was.taken.to.show.vet.doctor.and.ask.for.suggestion



Figure.78.Prem?.Dr.Yanghua.He.and.her.student.Hasan.in.Hilo.visiting.Komohana.Research.and.Extension.Office.after.collecting.cattle.tissue.sample.from.Paulo.Hawaii.Beef.Producers.Slaughterhouse



Figure.79.IDLS.piggeries.in.Orchid.land.drive.(Piglets.are.resting)



Figure.0.Pig.resting.in.a.pen.in.Hawaii.0_H.county.show.in.Rocking.chair.Ranch.in.Waimea



Figure.7❶Goats.in.Mt.View?collecting.fecal.sample.for.the.per.gram.fecal.egg.count

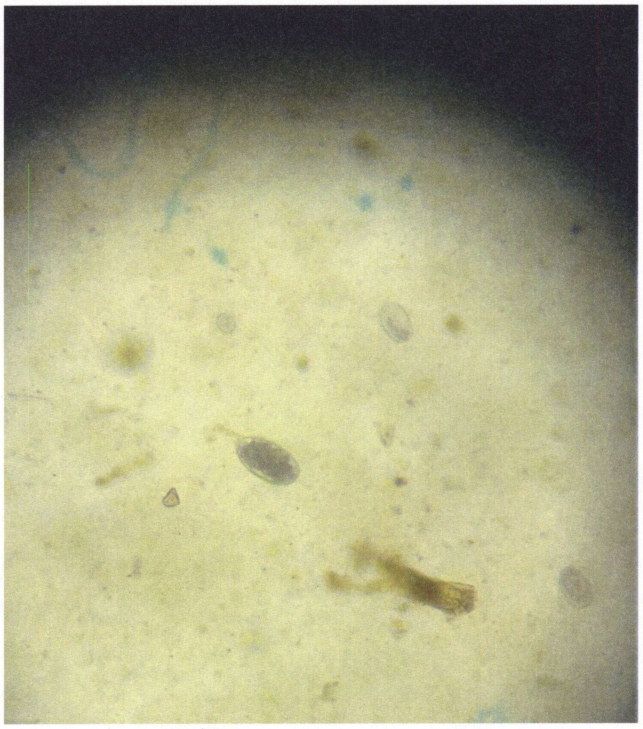


Figure.7❷Microscopic.view.of.fecal.parasite.showing.large.parasite.egg.in.the.middle.(Most.probably.Haemonchosis)



Figure.7❸.Himalayan.Yellow.Raspberry.(Rubus).(an.invasive.plant.in.cattle.ranchers.in.mountain.view)



Figure.7❹Black.Soldier.Fly.Larvae.with.food.waste?grown.in.Komohana.Research.and.Extension.Center.in.Demo.bin¡.The.bin.with.a.side.hole.in.it.had.food.waste.thrown.in.it.for.9_0.weeks¡.



Figure.7❽Rubus.leaf.with.a.caterpillar.of.blackberry.skeletonizer.a.moth.introduced.in.Hawaii.in.7❽24as.a.biocontrol.for.the.Rubus.species.detected.in.Mt.View.(Unpublished.and.not.reported.yet)



Figure.86.Moth.hatched.from.the.larvae.that.was.obtained.from.Rubus.leaf.in.mt.view.(Unpublished.and.not.reported.yet)

UNIVERSITY of HAWAI'I at MĀNOA
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESILIENCE

Screwworms

The Flesh-Eating Flies We Must Keep Out of Hawai'i

At a Glance: Maggots of two fly species, New World screwworm and Old World screwworm, eat the living flesh of warm-blooded animals. After decades of suppression, New World screwworm was detected in Central America in 2023 and has traveled north, with outbreaks ongoing in Central America, Mexico, and since June 2026, the U.S. mainland. Neither screwworm species has been detected in Hawai'i. This publication by the University of Hawai'i at Mānoa's College of Tropical Agriculture and Human Resilience seeks to raise public awareness of screwworm to support early recognition and prevention.

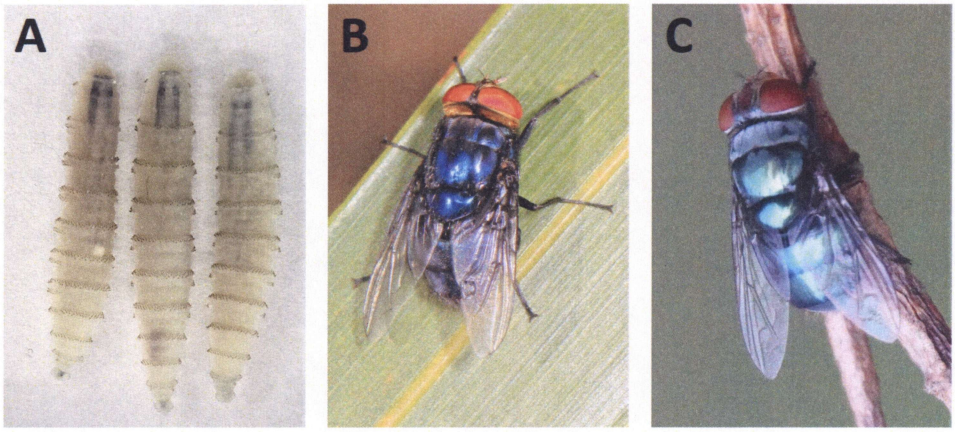


Figure 1. Screwworms are dipteran flies whose larvae eat the flesh of warm-blooded animals. **(A)** Larvae, New World screwworm (*Cochliomyia hominivorax*). Photo: Sohath Yusseff-Vanegas, Agricultural Research Service, U.S. Department of Agriculture (USDA ARS), https://www.aphis.usda.gov/livestock-poultry-disease/cattle/ticks/screwworm/new-world-screwworm-photo-gallery. **(B)** Adult fly, New World screwworm. Photo: Judy Gallagher, CC BY 4.0, https://www.inaturalist.org/observations/4918023. **(C)** Adult fly, Old World screwworm (*Chrysomya bezziana*). Photo: Soh Kam Yung, CC BY-NC 4.0, https://www.inaturalist.org/observations/91942348.

Introduction

Screwworms are the flesh-eating larvae of certain flies (Diptera: Calliphoridae), named from the screw-like shape of their larvae (Figure 1A) and their characteristic spiral burrowing motion into living tissue. The two species of screwworms differ in their regions of origin:

- **New World screwworm** (NWS, *Cochliomyia hominivorax*) is found in the Americas, including South America, the Caribbean, Central America, and Mexico; a U.S. outbreak was identified in June 2026. NWS is currently limited to the Western Hemisphere. Mature NWS flies (Figure 1B) are 8–11 mm long, with a yellow-orange face and three dark stripes on the thorax.
- **Old World screwworm** (OWS, *Chrysomya bezziana*) is found primarily in the Eastern Hemisphere, in the Old-World continents of Africa and Asia, as well as parts of the Pacific. Mature OWS flies (Figure 1C) are 8–12 mm long, metallic green or blue in color, with up to two dark stripes on the back (thorax).

June 2026
Subject Category: Insect Pests, IP-64

Rajeev Mishra, rajeevkm@hawaii.edu
Prem L. Mahato
Yunuen Bustamante
Chin Nyean Lee
Rajesh Jha
Dept. of Human Nutrition, Food and Animal Sciences

THIS INFORMATION HAS BEEN REVIEWED BY CTAHR FACULTY

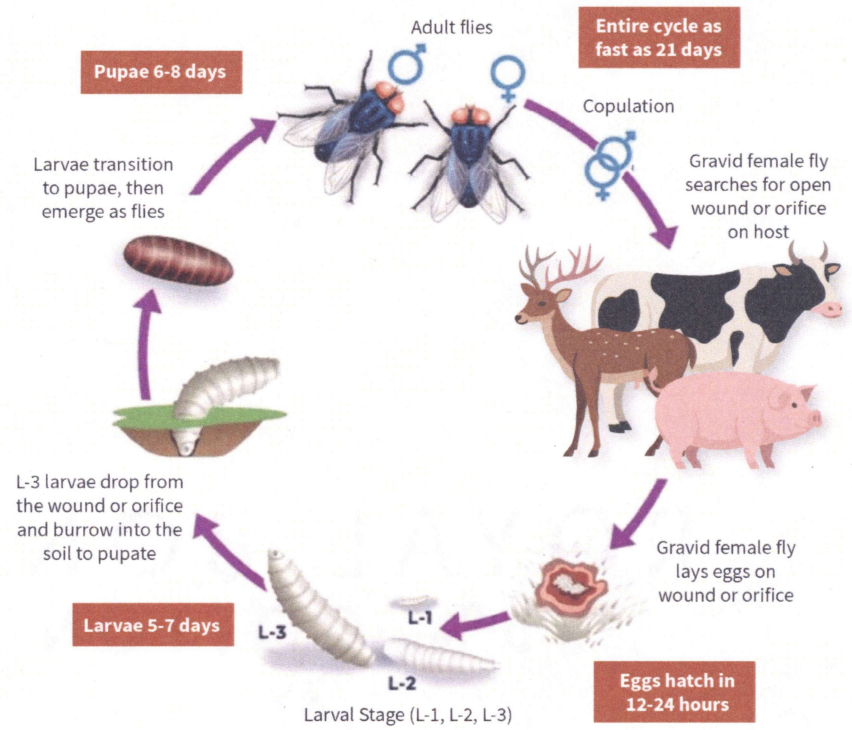


Figure 2. Life cycle of the New World screwworm. Female adults mate only once. Under favorable conditions, the cycle can be completed within three weeks. Image: USDA, https://www.aphis.usda.gov/livestock-poultry-disease/cattle/ticks/screwworm

Screwworm is classified as a foreign animal disease, meaning it is not consistently present within U.S. territories. This differs from endemic livestock diseases such as brucellosis and tuberculosis. Endemic diseases—those already present in the country at low levels—are managed by the U.S. Department of Agriculture (USDA) through ongoing surveillance and control programs. Foreign animal diseases, by contrast, pose greater animal-health and economic impacts if introduced. For this reason, USDA maintains continuous surveillance, border inspections, and control programs in Mexico and other Latin American countries to prevent screwworm from entering the United States. Because New World screwworm is not endemic to the United States, the June 2026 NWS outbreak in Texas and New Mexico is considered an emergency.

Although screwworm is best known for its devastating impact on livestock, it is also a neglected tropical zoonotic disease. Humans, wildlife, pets, and domestic animals are all susceptible, and untreated infestations can cause severe, persistent myiasis (maggot infestation). In tropical climates, screwworms may occur year-round; in temperate regions, cases are more common during the summer months.

Screwworm is not currently present in Hawai'i. The likelihood of NWS reaching the Hawaiian Islands is limited by Hawai'i's geographic isolation, strict live-animal import controls, and continuous state and federal prevention efforts. Even though the risk is low, maintaining awareness and preparedness can help prevent the introduction of this damaging pest to the islands.

New World Screwworm (NWS) Life Cycle

Cochliomyia hominivorax is a dipteran fly native to tropical and subtropical regions of the Americas. These flies infest warm-blooded animals and are considered a priority pathogen throughout the American subcontinent.

Like Old World screwworms, New World screwworms undergo complete metamorphosis, with a life cycle that includes four stages: adult, egg, larva, and pupa (Figure 2). NWS adult male flies feed on nectar; the adult female flies supplement their nectar diet with wound fluids prior to laying eggs. Crucially, NWS larvae must eat the living tissue of a warm-blooded animal for development. Male flies are ready to mate within 24 hours of emerging, and females are ready in about 3 days. Each female mates only once in her lifetime, a trait that is key to strategies for NWS suppression. Female flies are strongly attracted to fresh wounds on warm-blooded hosts. After feeding on wound fluids, they deposit their eggs along the edges of healthy tissue. A female lays about 300 eggs near a fresh wound per

oviposition and can complete four ovipositions within 15 minutes. Over her lifetime, she may lay up to 3,000 eggs.

Eggs hatch within 12–24 hours. The emerging larvae burrow into living flesh and feed on it, growing from the first stage (L1) to the third (L3) in 5–7 days. As NWS larvae consume tissue, they produce a characteristic foul, rotting odor that attracts additional gravid females, compounding the infestation (Figure 3). Wounds infested with larvae develop deep, cavernous lesions characterized by tissue liquefaction, necrosis, and hemorrhage. Without prompt treatment, these lesions can become secondarily infected with bacteria, potentially leading to systemic illness and death.

Mature larvae drop to the ground and form pupae. After about 6–8 days (longer in cool weather), adult flies emerge. The entire life cycle can be completed in 3 weeks, depending on temperature and environment. In case of adverse climatic conditions, the lifecycle can extend up to 57 days.

If NWS were to become established in Hawai'i, the consequences would be severe for livestock production and for the health of warm-blooded wildlife, companion animals, and the public. Strong biosecurity measures, rapid reporting, and early detection are essential to prevent screwworm introduction and protect Hawai'i's animals and people.

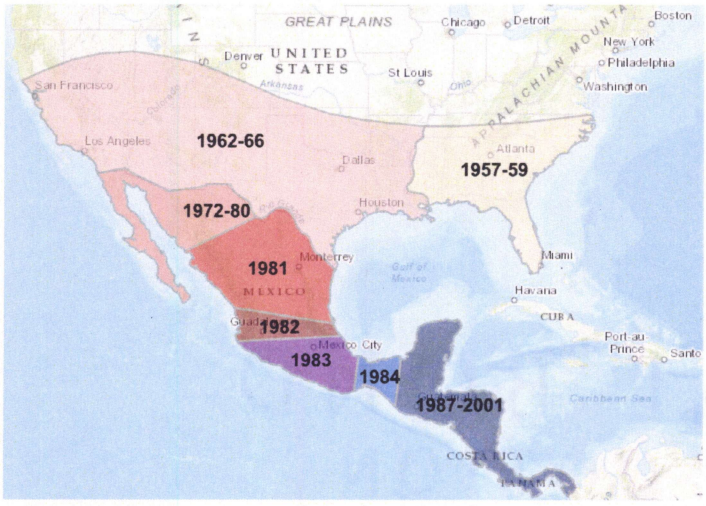


Figure 4. The development of sterile insect technique led to the eradication of New World screwworm from the U.S. mainland in 1966, from Mexico in 1991, and from Panama in 2006. This map reflects the progress made by 2001. Image: Adapted from Dr. James E. Novy, USDA, https://www.aphis.usda.gov/livestock-poultry-disease/cattle/ticks/new-world-screwworm-story-map

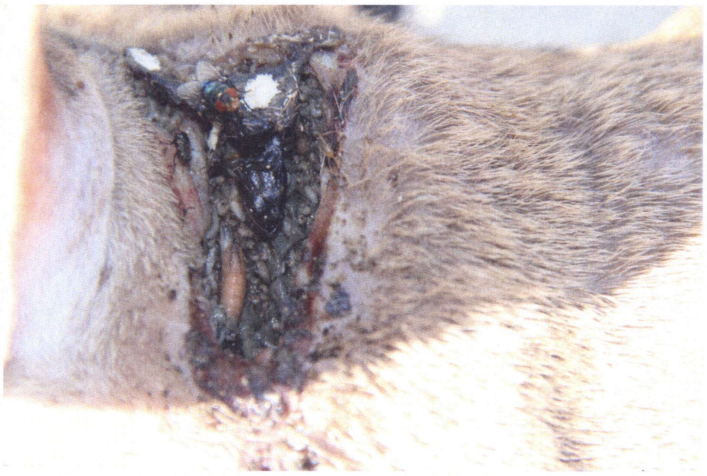


Figure 3. Animal wound infested with New World screwworm, showing a female adult fly, eggs, and larvae. Photo: Samantha Gibbs, U.S. Fish and Wildlife Service, https://www.aphis.usda.gov/livestock-poultry-disease/cattle/ticks/screwworm/new-world-screwworm-photo-gallery

History of New World Screwworm Suppression

New World screwworm was first recognized as a major livestock problem in the United States in 1863, although historical accounts indicate that cases were observed in the Southwest as early as 1842. At that time, no tools existed to control the infestation or its spread.

In 1933, transportation of infested animals from the U.S. Southwest resulted in an NWS outbreak in the U.S. Southeast and led to identification of NWS as the organism causing the outbreak. In the mid-20th century, USDA scientists pioneered sterile insect technique (SIT), in which large numbers of flies are reared in a controlled facility, made sterile using radiation, and then released into the environment. When lab-reared sterile males mate with wild females, the resulting eggs are nonviable. A sterile insect facility was built in Florida with a capacity to release about 50 million sterile flies every week. This investment led to steady NWS population decline and eventual eradication of NWS from the United States in 1966 (Figure 4).

In 1971, the United States and Mexico established a joint force called the Mexico–U.S. Commission for the Eradication of the Screwworm (COMEXA) to eradicate NWS from Mexico and create a 250 miles buffer zone. Between 1960 and 1991, the cost of NWS eradication effort in the

United States and Mexico was about $955 million. The benefits of eradication have been estimated to include about $1.3 billion of annual savings to the United States and $495 million to Mexico, adjusted to 2020 inflation.

By 1991 the NWS eradication program was expanded to Central American countries. The Panama–U.S. Commission for the Eradication and Prevention of the Screwworm (COPEG) was established in 1994. North of the Darién Gap, which functioned as a biological barrier to NWS, Panama was declared free of NWS in 2006 (Figure 4). NWS remained endemic in Cuba, Haiti, Jamaica, the Dominican Republic, Trinidad and Tobago, and some South American countries.

In the four decades following 1966, NWS was detected 27 times in animals or humans inside U.S. territory including Puerto Rico; nearly half of these detections occurred in quarantine facilities. Countries of origin were identified in most cases (Figure 5). A single case of OWS was detected in 2007 in a dog entering the United States from Singapore.

Reemergence of New World Screwworm

A renewed threat of NWS began in 2023 when Panama, Nicaragua, and Costa Rica identified an outbreak of NWS, followed by additional detections across Central America. After confirmed reports of NWS in southern Mexico in November 2024, the USDA suspended all imports of live cattle, horses, and bison entering the United States through the southern border. In February 2025, live cattle imports were temporarily reopened under strict conditions, but due to the rapid northward spread of NWS within Mexico, the U.S.–Mexico border was again closed in May 2025. A phased reopening was planned for July 2025 but did not take place as NWS continued to spread northward in Mexico. As of June 22, 2026, the Centers for Disease Control and Prevention reported that this ongoing outbreak has involved more than 185,000 animal cases and more than 2,100 human cases in Central American and Mexico. In 2025, one human case of NWS was identified in the United States, in an individual with a history of recent travel to El Salvador.

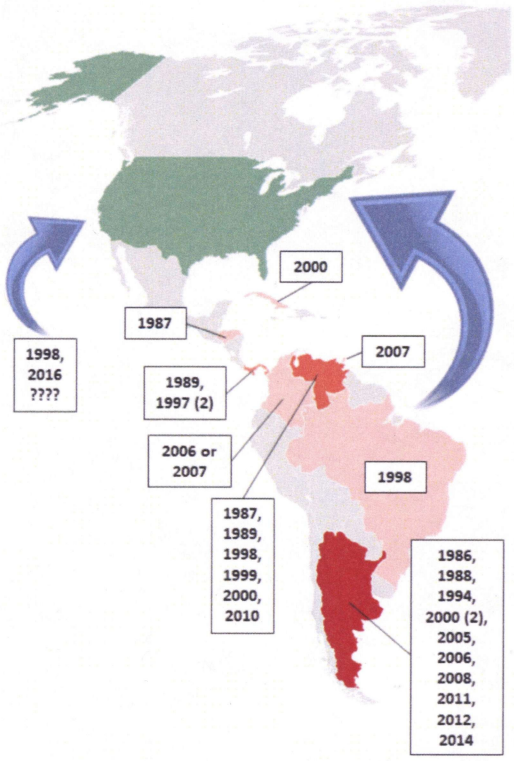


Figure 5. Countries of origin (red, darker for more recent events) of the 27 U.S. detections of NWS in animals and humans from 1986 to 2016. Two of the detections, including a 2016 Florida Keys outbreak, had unknown geographic origin. Image: USDA, https://www.aphis.usda.gov/sites/default/files/screwworm_rrg.pdf

The first confirmed case of NWS in the United States was reported on June 3, 2026. As of June 23, 2026, 19 confirmed cases had been detected in Texas and New Mexico (Figure 6). These cases involved 13 domestic cattle, three domestic goats, two domestic sheep, and one domestic dog. In response to the outbreak, all southern U.S. ports of entry for livestock remain closed to prevent further spread, and

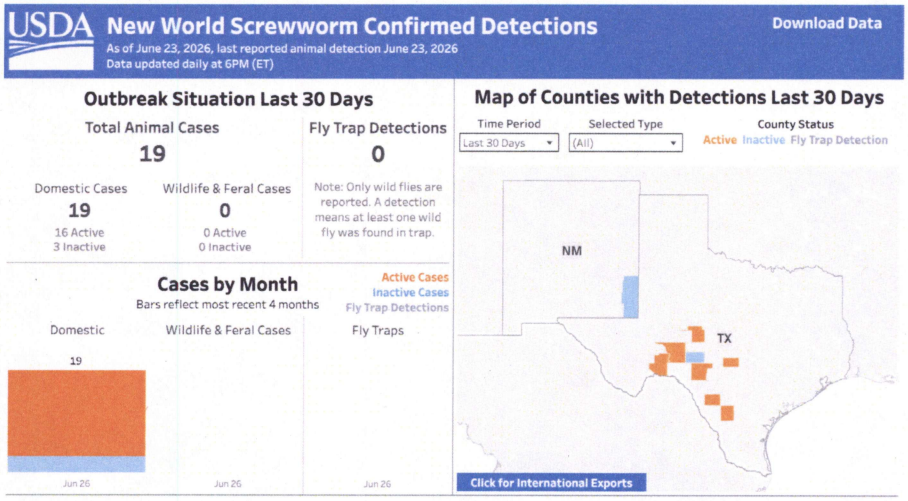


Figure 6. The Animal and Plant Health Inspection Service maintains a dashboard summarizing the 2026 outbreak of New World screwworm in the Southwestern U.S. As of June 23, 2026, cases had been identified in Texas and New Mexico. Dashboard data include the confirmed date, location, animal type (domestic, wildlife) and animal species for each case (not shown). Image: USDA, https://www.aphis.usda.gov/animals/animal-health/livestock-and-poultry-disease/current-status/us-confirmed-cases-new-world



Figure 7. Beef cattle on Hawai'i island. The Mealani Research Station beef herd is maintained by the College of Tropical Agriculture and Human Resilience, University of Hawai'i at Mānoa. Photo provided by Dr. C.N. Lee.

Canada has temporarily suspended the importation of all live animals originating from Texas due to associated disease risk.

In 2025, the United States imported approximately 5.5 billion pounds of beef, an increase of about 18% from the previous year. Major beef suppliers included Australia, Canada, Brazil, Mexico, New Zealand, and Argentina. Increased U.S. beef imports largely reflect a continued decline in the national beef cattle inventory: in 2025, the U.S. cattle herd reached its lowest head count in 75 years.

The United States imports live beef cattle only from Canada and Mexico; all other beef products enter the country as boxed or processed meat. From 2020 to 2024, Mexico provided about 62 percent of U.S. cattle imports, a trade flow that is highly vulnerable to disruption during animal-health emergencies. If the threat of NWS is not contained in timely manner it is estimated that the Mexican beef industry and associated sectors could incur annual losses of approximately $470 million.

The breach of the southern U.S. border by NWS poses a significant threat to the U.S. cattle and calf industry, valued at $112 billion in 2024. If the current outbreak were to expand to levels similar to those seen in 1976, when NWS infested approximately 1.5 million cattle and 330,000 sheep and goats, Texas livestock producers could face an estimated $732 million in losses, and the broader Texas economy could experience an economic impact of approximately $1.8 billion.

Relevance to Hawai'i

Screwworm is not currently present in Hawai'i, and Hawai'i's geographical isolation, strictly regulated and limited live-animal importation, and ongoing preparedness efforts by state and federal agencies greatly reduce the likelihood of introduction. USDA provides updated information on surveillance and prevention strategies on its website, and these national efforts support Hawai'i's local biosecurity measures.

Hawai'i's homegrown beef cattle industry (Figure 7), valued at $86.4 million in 2024, currently ships about 75% of calves born in Hawai'i to the mainland for finishing due to the state's limited feedlot capacity and high feed costs. Hawai'i imports roughly 90% of its consumed beef as chilled or processed meat, making the risk of NWS introduction through beef products extremely low.

The primary path by which screwworm could enter Hawai'i is the importation of live animals from regions with known screwworm activity. Importation of live animals from countries other than the United States is rare, and Hawai'i's import and quarantine rules make it unlikely that an infested animal would pass through a port of entry undetected.

According to the Hawai'i Department of Agriculture and Biosecurity, "New World screwworm (NWS) can affect animals and people, but the risk to Hawai'i is currently low. ... Hawai'i has updated its livestock import requirements to include inspection and certification that animals are free of NWS, and current case updates are available from USDA APHIS at **https://www.aphis.usda.gov/animals/animal-health/livestock-and-poultry-disease/stop-screwworm**. Pet owners and animal caretakers are encouraged to contact their private veterinarian if they have any health concerns or observe unusual wounds or signs of possible infestation."

Although human cases are rare, travelers can also reduce risk by practicing good personal hygiene, keeping any cuts or scrapes clean and covered, and seeking medical attention if a wound becomes painful or unusual after travel in areas where screwworm is active.

Hawai'i's tropical climate, extensive rural landscapes, and abundant feral animal populations, including pigs, chickens, and axis deer, would create ideal conditions for rapid spread if NWS were introduced. Maintaining strict biosecurity measures for all live-animal imports from the mainland United States, particularly from states bordering Mexico such as Texas, New Mexico, and Arizona, is essential. USDA and its state partners continue to educate stakeholders

about signs to look for before importing live animals, and the USDA website remains the most reliable source for up-to-date information on NWS surveillance and prevention. Strengthening import protocols and surveillance can significantly reduce the risk of NWS introduction and protect Hawai'i's livestock industry, wildlife, and public health.

How Screwworm Spreads

Adult female NWS flies typically travel shorter distances (2 to 12 miles) under favorably warm and humid conditions with higher host densities, but may disperse nearly 200 miles in less favorable, arid conditions. Long-distance spread is most often associated with the movement of infested animals or people. Screwworm outbreaks can spread quickly through:

- Movement of infected animals
- Warm, humid climates
- Presence of wild or stray animals
- Adventure tourism and uncontrolled animal movement
- Poor awareness and wound management

Signs of Screwworm Myiasis (Maggot Infestation)

Signs to watch for in animals include:

- Restlessness, irritation, or depression
- Reduced feeding or lying down more often
- Head shaking (in ear infestations)
- Bad smell from the wound
- Visible fly larvae (maggots) in the wound
- Isolation from herd or flock
- Reduced meat, milk, or wool production
- Weight loss, reduced fertility, or death in severe cases

Sampling for Identification

A suspected case can be recognized by seeing live maggots in a wound and smelling rotting flesh. Sampling should always be conducted by veterinarians examining the animal. For confirmation:

1. Collect larvae from deep tissue.
2. Place larvae in 70% ethanol to preserve specimen.
3. Send specimen to a veterinary diagnostic laboratory for species identification.

Reporting

Any suspicion of New World screwworm should first be discussed with your local veterinarian. A prompt examination by your regular veterinarian ensures the animal receives appropriate care and establishes a clear and reliable flow of information. Accredited veterinarians are trained to recognize unusual conditions and will report suspected cases to the State Animal Health Official, the APHIS Area Veterinarian in Charge, and other required authorities within the reporting window.

Products to Prevent and/or Treat Screwworm

The U.S. Food and Drug Administration (FDA) has issued conditional approvals and Emergency Use Authorizations for several products to prevent and control NWS infestation in livestock and companion animals, including:

- Dectomax®/Dectomax®-CA1 (doramectin injectable solution, non-prescription, Emergency Use Authorization) for indications of NWS in beef cattle, prevention and treatment of NWS in dairy cattle, and prevention of NWS in horses, swine, sheep, and deer.
- Exzolt® Cattle-CA1 (fluralaner topical solution; prescription, conditionally approved) for prevention and treatment of NWS in cattle.
- Ivomec® (ivermectin injectable solution; non-prescription, Emergency Use Authorization) for prevention of NWS infestation in cattle, including use within 24 hours of birth or during routine farm procedures such as castration, dehorning, or when wounds are present.
- Credelio™ Quattro-CA1 (lotilaner, moxidectin, praziquantel, and pyrantel chewable tablets; prescription, conditionally approved) for treatment of NWS infestation in dogs.
- Credelio™ CAT (lotilaner chewable tablets; prescription, Emergency Use Authorization) for treatment of NWS infestation in cats.
- NexGard® (afoxolaner chewable tablets; prescription, Emergency Use Authorization) for treatment of NWS infestation in dogs.
- NexGard® COMBO (esafoxolaner, eprinomectin, and praziquantel topical solution; prescription, Emergency Use Authorization) for treatment of NWS infestation in cats.
- Negasunt™ Powder (coumaphos, propoxur, and sulfanilamide topical powder; authorized users, Emergency Use Authorization) for prevention and treatment of NWS in multiple species, including cattle, swine, goats, sheep, horses, donkeys, domestic hybrid equids, and captive wild, exotic, and zoo mammals.
- F10® Antiseptic Barrier Ointment with Insecticide and F10® Antiseptic Barrier Spray with Insecticide (benzalkonium chloride, polyhexanide, and cypermethrin topical; non-prescription, Emergency Use Authorization) for prevention and treatment of NWS in multiple species, including cattle, horses, sheep, goats, deer, wild birds, pet birds, and captive wild, exotic, and zoo mammals.

FDA guidance on withdrawal times must be followed when using products to treat milk- or meat-producing animals, to ensure that product residues do not enter the food supply.

Treatment

If untreated, screwworm-infested animals may die within 7–10 days.

1. Manually remove all larvae and eggs. (This step is essential.)
2. Clean the wound thoroughly.
3. Apply insecticidal wound treatments, following veterinary guidance.

Prevention and Control

- Awareness: Recognize symptoms early.
- Quarantine: Isolate and inspect new animals from affected areas.
- Sterile insect technique (SIT): Release sterilized male flies to reduce breeding success.
- Quarantine and buffer zones: Control animal movement around outbreak areas.
- Wound care: Keep wounds clean and covered with approved insecticides.
- Chemical control: Use permethrin topical sprays to repel and kill the flies.
- Research tools:
  - Vaccines against OWS have reduced larval weight by 45% but are not commercially available for use.
  - Bait-toxicant systems have reduced adult NWS populations by 65–85%.

Online Resources

- **screwworm.gov** (U.S. Department of Agriculture, Animal and Plant Health Inspection Service)
- **copeg.org/en** (Panama–United States Commission for the Eradication and Prevention of Screwworm Infestation in Livestock)
- **New World Screwworm Outbreak** (Centers for Disease Control and Prevention)

Disclaimer

Mention of a trademark or proprietary name does not constitute an endorsement, guarantee, or warranty and does not imply recommendation to the exclusion of other suitable products or businesses.

Acknowledgements

The authors extend their sincere appreciation to Dr. Caleb Case Reichhardt, Dr. Yanghua He, Dr. Raquel Wong, and Dr. Birendra Mishra for their time, expertise, and support in reviewing this article.

References

Alexander, J.L. 2006. Screwworms. Journal of the American Veterinary Medical Association 228(3):357–367. **https://avmajournals.avma.org/view/journals/javma/228/3/javma.228.3.357.xml**

Cardoso, G.A., V.A. Cunha, B.C. Genevcius, T. Madeira-Ott, B. Costa, B.M.d.A. Rossoni, D.M. P.J. Thyssen, and T.T. Torres. 2025 Origins and Diversification of Myiasis Across Blowflies. Ecology and Evolution 15(2):e70993. **https://pmc.ncbi.nlm.nih.gov/articles/PMC11825212/**

Catts, E.P., and G.R. Mullen. 2002. Myiasis (Muscoidea, Oestroidea). In: G. Mullen and L. Durden, eds. Medical and Veterinary Entomology, 317–348. San Diego: Academic Press.

Centers for Disease Control and Prevention, Division of Parasitic Diseases and Malaria. 2026. Lab Identification of New World Screwworm. Accessed June 11, 2026, from **https://www.cdc.gov/dpdx/resources/pdf/benchaids/NWS-Bench-Aid-2024-508.pdf**

Cozzens, T. Beef demand jumped in 2025. What about 2026? Beef Magazine, March 23, 2026. **https://www.beefmagazine.com/market-news/beef-demand-jumped-in-2025-what-about-2026-**

Denton, A.S. 2025. New World Screwworm Found in Newborn Calf 197 Miles from U.S.-Mexico Border. Drovers, December 31, 2025. **https://www.drovers.com/news/industry/new-world-screwworm-found-newborn-calf-197-miles-u-s-mexico-border**

Denton, A.S. 2026. U.S. Cattle Inventory Hits 75-Year Low at 86.2 Million Head. Drovers, January 30, 2026. **https://www.drovers.com/news/industry/u-s-beef-herd-continues-downward-86-2-million-head**

Food and Drug Administration. 2026. New World Screwworm: Information for Veterinarians. Accessed June 11, 2026, from **https://www.fda.gov/animal-veterinary/safety-health/new-world-screwworm-information-veterinarians**

Fresia, P., S. Pimentel, V. Iriarte, L. Marques, V. Durán, A. Saravia, R. Novas, T. Basika, A. Ferenczi, D. Castells, T. Saporiti, U. Cuore, S. Losiewicz, F. Fernández, G. Ciappesoni, M. Dalla-Rizza, and A. Menchaca. 2021. Historical perspective and new avenues to control the myiasis-causing fly *Cochliomyia hominivorax* in Uruguay. Agrociencia Uruguay 25(2):e974. **https://doi.org/10.31285/AGRO.25.974**

Hammack, L., and G.G. Holt. 1983. Responses of gravid screwworm flies, *Cochliomyia hominivorax*, to whole wounds, wound fluid, and a standard blood attractant in olfactometer tests. Journal of Chemical Ecology 9(7):913–922.

Hightower, B.G., A.L. Adams, and D.A. Alley. 1965. Dispersal of released irradiated laboratory-reared screw-worm flies. Journal of Economic Entomology 58(2):373–374.

Mastrangelo, T., and J.B. Welch. 2012. An overview of the components of AW-IPM campaigns against the New World screwworm. Insects 3(4):930–955. **https://pmc.ncbi.nlm.nih.gov/articles/PMC4553557/**

Novy, J.E. n.d. Screwworm control and eradication in the southern United States of America. Food and Agriculture Organization of the United Nations. Accessed June 11, 2026, from **https://www.fao.org/4/u4220t/u4220T0a.htm**

Rahn, J.J., and G.L. Barger. 1973. Weather conditions and screwworm activity. Agricultural Meteorology 11:197–211.

State of Hawai'i, Department of Agriculture and Biosecurity, Market Analysis and News Branch. 2026. Statistics on Hawai'i's Cattle and Calves: State of Hawai'i, 2019–2024. Accessed June 18, 2026, from **https://dab.hawaii.gov/add/files/2026/02/Cattle-Calves-Stats_Jan.2026_Final.pdf**

Texas Animal Health Commission. 2024. New World Screwworm (Emergency Management Guide). Accessed June 11, 2026, from **https://eu-assets.contentstack.com/v3/assets/blt4175b16074920322/blt8c6b8fcff831a322/674f4e49fd5cb93c52bc0e6b/EMGuide-NewWorldScrewworm.pdf**

Thomas, D.B., and R.L. Mangan. 1989. Oviposition and wound-visiting behavior of the screwworm fly, *Cochliomyia hominivorax* (Diptera: Calliphoridae). Annals of the Entomological Society of America 82(4):526–534.

United States Animal Health Association. 2004. Report of the Committee on Parasitic Diseases. United States Animal Health Association Proceedings. Accessed June 11, 2026, from **https://www.usaha.org/upload/Committee/ParasiticVectorBorne/ParasiticDiseases/report-pd-2004.pdf**

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. n.d.-a. Importing Live Cattle and Bison from Mexico to the United States. Accessed June 11, 2026, from **https://www.aphis.usda.gov/live-animal-import/cattle-bison-germplasm/mexico**

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. n.d.-b, New World Screwworm. Accessed June 11, 2026, from **https://www.aphis.usda.gov/livestock-poultry-disease/cattle/ticks/screwworm**

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2016. New World Screwworm Ready Reference Guide—Maps & Timelines. Accessed June 11, 2026, from **https://www.aphis.usda.gov/sites/default/files/screwworm_rrg.pdf**

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2025. New World Screwworm Ready Reference Guide—Historical Economic Impact. Accessed June 18, 2026, from **https://www.aphis.usda.gov/sites/default/files/nws-historical-economic-impact.pdf**

U.S. Department of Agriculture, Economic Research Service. n.d. Cattle & Beef—Sector at a Glance. Accessed June 18, 2026, from **https://www.ers.usda.gov/topics/animal-products/cattle-beef/sector-at-a-glance#cattle**

U.S. Department of Agriculture, Economic Research Service. 2026. Cattle/calf receipts comprised the largest portion of U.S. animal/animal product receipts in 2024. Accessed July 18, 2026, from **https://www.ers.usda.gov/data-products/chart-gallery/76949**

Valdez-Espinoza, U.M., L.A. Fadda, R. Marques, L. Osorio-Olvera, D. Jiménez-García, and A. Lira-Noriega. 2025. The reemergence of the New World screwworm and its potential distribution in North America. Scientific Reports 15: 23819. **https://doi.org/10.1038/s41598-025-04804-9**

Vargas-Terán, M., J.P. Spradbery, H.C. Hofmann, and N.E. Tweddle. 2021. Impact of screwworm eradication programmes using the sterile insect technique. In: Sterile Insect Technique, Principles And Practice In Area-Wide Integrated Pest Management, Chapter 7.1. CRC Press. **https://doi.org/10.1201/9781003035572**

Venegas-Montero, D.P., M.J. Alfaro-Vellanero, D. Rojas-Araya, Ó. Calderón-Arguedas, C.M. Vargas-Castro, A. Baldioceda-Villarreal, L.E. Chaves-González, J. Camacho Leandro, and A. Troyo. 2024. Case Report: Re-emergence of *Cochliomyia hominivorax* in Costa Rica: Report of a Human Myiasis Case 23 Years after Elimination. American Journal of Tropical Medicine and Hygiene 111:1020–1023. **https://pmc.ncbi.nlm.nih.gov/articles/PMC11542512/**

World Organisation for Animal Health. n.d.-a. World Animal Health Information System (WAHIS). **https://wahis.woah.org/#/event-management**

World Organisation for Animal Health. n.d.-b. Screwworm (Old World and New World). Accessed June 18, 2026, from **https://www.woah.org/fileadmin/Home/eng/Animal_Health_in_the_World/docs/pdf/Disease_cards/SCREWWORM.pdf**

World Organisation of Animal Health (WOAH). 2024. New World Screwworm (*Cochliomyia hominivorax*) and Old World Screwworm (*Chrysomya bezziana*), In: Manual of Diagnostic Tests and Vaccines for Terrestrial Animals, 13th edition, Chapter 3.1.15. Accessed June 11, 2026, from **https://www.woah.org/fileadmin/Home/eng/Health_standards/tahm/3.01.15_SCREWW.pdf**

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Prem Mahato (Junior Extension Agent)
5-year Plan of work 2026/7 to 2031/2

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B. Department or County

a. Department: Department of Human Nutrition, Food, and Animal Science
b. County: County of Hawaii (East Hawaii)

C. Program Title

East Hawaii Small Livestock and Poultry Assistance

D. Critical issue

Workforce and Economic Development (Sustainable food production and economic development)

E. Statement of Issues

I. Background

Hawaii agricultural products contribute about $673 million, out of which the livestock industry contributes about $159 million. Coffee, greenhouse nursery, and cattle are the top 3 commodities (USDA/NASS, 2024). The livestock industry in Hawaii is mainly dominated by the cattle industry, where most of the calves produced in the state are shipped to the mainland (Heaton, 2026), , which significantly contributes to the Hawaii economy. Livestock in Hawaii also includes poultry, swine, sheep, and goats. USDA 2024 reports that Hawaii has a total of 133,000 Cattle (USDA/NASS, 2026), while 12,278 goats, 21,510 sheep, 6,574 pigs, 298,360 layer hens, and 12,768 broiler chickens were reported in the 2022 report (USDA/NASS, 2022). Despite high cattle operations on the island, beef is imported along with other meat.

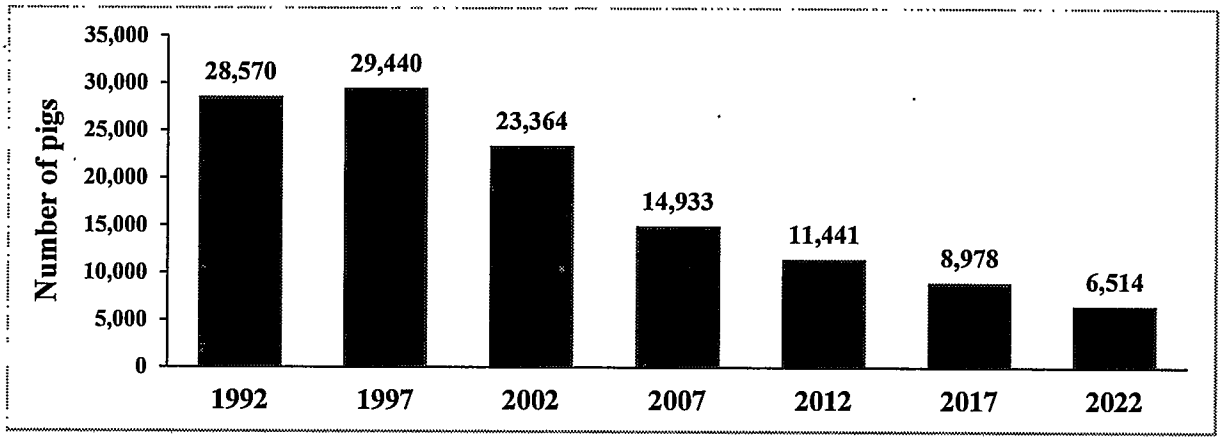


Figure 1. Bar graphs Showing number of pigs trend since 1992, Department of Business, Economic Development and Tourism State of Hawaii reported on Hog production and Hog Harvest in State of Hawaii based on USDA-NASS Census of Agriculture.

Food imports in Hawaii are notoriously high; they reach around 90% (Gurung, 2024; Jany, 2023). Due to a lack of active animal feed companies in the state, all commercial feed is imported. Hilo has high moisture and humidity, and it takes about 10-60 days to import feed, which causes it to deteriorate quickly. Some producers (swine and cattle) use locally sourced agricultural byproducts as a source of feed. In the past, the papaya industry produced plenty of byproducts, which were a major source of swine feed. It was available for free, which attracted many pig producers. Hawaii

used to produce a lot of swine; since the papaya industry collapsed along with various other reasons, swine production has also declined (DBEDT, 2025), as represented in Figure 1.

The livestock inventory since 1990 is shown in Table 1, which shows that the cattle industry is the most stable of all. Poultry has declined the most, followed by hogs (State of Hawaii data book, 2019).

[In thousands. As of January 1 for cattle. As of December 1 for hogs and chicken. Marketing year for bee colonies]

Year	Cattle and calves 1/					Hogs	Chickens 3/	Bee colonies
	Total	Milk cows	Beef cows	Calves	Other cattle 2/			
1990	205	11	75	49	70	36	1,183	10
1991	215	11	80	43	81	34	1,213	10
1992	200	10	77	53	60	35	1,109	9
1993	178	11	78	44	45	33	1,012	9
1994	165	11	78	39	37	35	981	9
1995	178	11	82	45	40	34	933	8
1996	174	10	81	44	39	28	876	8
1997	172	10	83	39	40	29	863	9
1998	180	9	88	40	43	29	747	8
1999	173	9	86	40	38	28	721	8
2000	164	9	84	35	36	26	722	7
2001	150	7	81	34	28	27	659	8
2002	152	7	78	35	32	24	625	7
2003	151	7	79	32	33	23	600	7
2004	156	6	82	36	32	22	598	8
2005	155	6	81	34	34	19	547	9
2006	161	5	87	35	34	16	470	10
2007	158	4	85	35	34	15	398	10
2008	152	2	83	34	33	13	375	10
2009	150	2	84	32	32	13	381	10
2010	151	2	81	36	32	13	366	10
2011	141	2	79	30	30	12	(D)	9
2012	140	2	78	32	28	12	(D)	10
2013	135	2	72	33	28	12	(D)	13
2014	133	2	72	34	25	9	(D)	15
2015	133	2	69	32	30	9	(D)	1/ 16
2016	140	2	73	34	31	10	(D)	1/ 18
2017	142	2	74	34	32	8	(D)	19
2018	144	2	75	34	33	9	(D)	17
2019	142	2	76	33	32	11	(D)	16

D Data not shown separately to avoid disclosure of individual operations.

1/ Revised from previous *Data Book.*

2/ Includes other heifers, bulls, and steers.

3/ Excluding broilers.

Source: USDA National Agricultural Statistics Service, Quick Stats <https://quickstats.nass.usda.gov/> accessed April 13, 2020, and records.

Table 1. Livestock Inventory: 1990-2019

Farm size has a big influence on farm profitability. The bigger the farm operation, the bigger the effect on the economy, but the majority of Hawaii's farmers are small-scale, and >70% of the farmers are over 55 years old (DBEDT, 2025; USDA/NASS, 2022, 2026).

II. Statement of problem

Hawaii is geographically isolated from other larger landmasses, which makes it the biggest challenge at the present moment. Among all other island chains, the County of Hawaii (Big Island) is the biggest and has plenty of agricultural land and farms, while the County of Oahu has the largest population and the greatest consumption capacity. Surplus produce on the Big Island has to be transported to Oahu, and for commercial farm it is nearest target for their consumption. There are only two means of transportation: by ship and by air; both add transportation charges to the agricultural products, resulting in higher selling prices.

Despite being a successful industry, most cattle ranchers are insecure about rainfall patterns and drought. Rainfall patterns have not been consistent; when it rains, they get better ranch and grass growth, but during drought they have to feed their cattle hay cubes, which are purchased and imported, making production expensive. On top of that, weeds like Himalayan Raspberry, Himalayan Blackberry (Rubus spp.), and Devil weed are taking over the grazing land, reducing forage quality. Some ranches in Mountain View have seen Two-lined Spittlebug, which can wipe out nutritious Kikuyu grasses and replace them with weeds.

Hilo is mostly wet, which brings a lot of green pasture. The moisture also helps internal parasites thrive. There has not been any report of how many goats or sheep have been infected, but anecdotally, some farmers have lost all their sheep due to parasitic infestation.

- **Feed**

The swine industry has been continuously shrinking, and there is a major reason behind that: its lack of cost-effective and accessible feed. Some swine producers collect store waste for their swine; others use farm waste. In both cases, the hogs lack a balanced diet. Due to a lack of a balanced diet, the hogs become less efficient and lack the proper flavor in their meat. Store-purchased commercial feed is not consistently supplied, or its quality is not consistently managed. On top of that, the feed is very expensive compared to mainland feed due to freight charges and middlemen. FDA restricted freely accessible antibiotics in 2023, which is impacting producers now. When their livestock gets sick, they are forced to pay expensive veterinary charges to save their livestock. All these factors increase the cost of production, and in the end the food is getting more expensive, and/or we are losing producers.

- **Slaughterhouse**

Even if some producers fight all these challenges and raise their animals to marketable size, they still must process their animals in a slaughterhouse or a USDA-certified facility to commercially sell their meat. But Hawaii producers demand more slaughterhouses to meet the local demand. Some ranchers wait for weeks before their animals are slaughtered.

The heavy rain in Hilo brings plenty of water to the area, and the landfill in this part was shut down due to the leaching issue. To properly dispose of the slaughter waste, slaughterhouse transport their waste to the Kona side, which requires a lot of fuel and resources. Amedeo Markoff had a plan to control the feral hog population by processing them for commercialization, but due to the lack of a slaughterhouse, he has not been able to proceed with his plan. This leaves the feral pigs more

chances to expand. A Slaughterhouse and cold storage of higher capacity would help producers get their animals slaughtered on time and also would increase the local meat availability on the island.

- **Poultry feed and processing**

Poultry are small animals and are very easy to grow when compared to other animals. Most Hawaii residents are used to chicken, and many families have small-scale production in their backyard. Despite the commercially available feed, they have similar issues to those of hog producers. In general, feed is not supposed to be stored for more than 3-6 months after it's been manufactured, but transportation itself takes about 2 months, leaving less quality feed and limited time for use. The thought of not having feed for 1000 birds prevents some entrepreneurs from starting the farms.

USDA exempts slaughterhouse inspection for less than 20 thousand birds slaughtered annually, so small-scale producers can process on their own. Poultry processing is a time-consuming process and can take days for a small number of employees. Having an automated processing system for meat growers would save a lot of time and might reduce production costs.

F. Stakeholders input

Surveys: Surveys will be conducted after each workshop and trainings
One-on-one interview: Interviews will be conducted during farm visits
Meetings and workshops: Participation in various meetings, seminars, conferences, and workshops gives me chances to understand the ongoing issues and is also a great opportunity to connect with individual producers or agricultural professionals

G. Multistate and Multi-institution Collaboration

H. Extension and Research Integration

The issues with livestock production in Hawaii will not be solved easily, and there is no silver bullet to this solution. For some issues, working together will help producers a lot, while for other issues, the university will have to support the community. As my position is funded partially by the county and partially by the university, my role might be counted as a combined effort by the university and Hawaii County. I alone cannot solve the whole issue; hence, I will be collaborating with other UH faculty. Programs that will help the animal production in Hilo, and where my focus is, are listed below:

- **Program 1: Feed formulation, trial, and education (3 years)**
  The lack of a functioning feed mill remains one of the biggest challenges that the livestock industry in Hilo is facing. Although there have been several efforts to establish one, a sustainable feed mill has not yet been developed. Historically, limited access to feed ingredients and lack of processing capacity were major barriers. However, availability of local feed resources has improved through efforts such as Pacific Biodiesel's production of corn, sunflower meal, and canola meal on Kauai and Maui.
  Local producers are also utilizing agricultural by-products such as off-grade sweet potatoes, papayas, grocery waste, macroalgae by-products from Symbrosia, and cassava silage, which are potential feed resources. While these ingredients are available, producers need research-based information on how to properly utilize them to balance the diet and determine their economic feasibility.

A WSARE funded research and education project (Funded to Prem) will evaluate locally available feed resources in Hawai'i and American Samoa and provide producers with practical recommendations through feed trials, demonstrations, field visits, workshops, and Extension publications. This effort will help improve feed security, reduce production costs, and support a more sustainable livestock industry.

- **Objectives**
  - Evaluate the nutritional value, feed efficiency, and economic feasibility of locally available agricultural by-products for livestock feed
  - Develop practical feed recommendations using locally available resources
  - Increase producer knowledge and confidence in utilizing alternative feed ingredients
  - Improve feed security and reduce dependence on imported feed resources
- **Outputs**
  - Feed trials conducted using locally available agricultural by-products
  - Nutritional composition and feed efficiency data generated
  - Producer demonstrations and field visits conducted
  - Workshops and Extension programs delivered
  - Extension publications and educational materials developed
  - Locally available feed resources documented and shared with producers

Outcomes and their indicators

- **Short-term**
  - Producers increase their understanding of locally available feed resources and their nutritional value
  - Producers learn how to incorporate agricultural by-products into balanced livestock diets
  - Producers gain awareness of cost-effective alternatives to conventional feed ingredients
  - Extension develops research-based recommendations for local feed utilization

  Measurements:
  - Number of producers participating in workshops and demonstrations
  - Pre- and post-training knowledge assessments
- **Medium-term**
  - Producers begin adopting locally available feed ingredients in their livestock operations
  - Increased use of agricultural by-products reduces feed waste and disposal challenges
  - Producers improve feed management decisions through better understanding of nutrition and economics
  - Greater collaboration develops among producers, agricultural industries, and waste generators

  Measurements
  - Number of producers implementing recommended feed practices
  - Producer follow-up surveys documenting adoption and benefits
- **Long-term**
  - Increased availability and utilization of locally produced feed resources in Hawai'i
  - Reduced dependence on imported feed ingredients
  - Lower feed costs and improved sustainability of livestock production

- Development of a more resilient and circular agricultural system through the utilization of agricultural by-products
- Improved local food security through stronger livestock production capacity

Measurements

- Long-term producer adoption of local feed strategies
- Estimated reduction in imported feed use or agricultural waste diversion
- Changes in livestock production efficiency where records are available

- **Impact**
  - This program will strengthen Hawai'i's livestock industry by increasing the use of locally available feed resources and reducing dependence on imported feed ingredients. Through research, demonstrations, and Extension education, producers will gain the knowledge needed to efficiently utilize agricultural by-products, reduce production costs, minimize waste, and improve the sustainability and resilience of local livestock production systems.

- **Program 2: Co-op formation for livestock and collective problem solving (>5 years)**
  Pig production in Hawai'i has been steadily declining, and the state of Hawai'i now imports nearly 98% of the pork consumed. Many producers are reluctant to expand their operations because of the limited availability of high-quality, locally produced animal feed. Others choose not to increase production because they prefer to use local feed sources for further expansion and seek greater feed security. Although bulk feed purchasing is an option, it is often impractical for individual producers due to the large quantities required for import. Collective purchasing through a cooperative offers a more efficient solution, allowing producers to purchase only the amount of feed they need while benefiting from reduced costs.

  Slaughter capacity and waste management are additional challenges facing Hawai'i's livestock industry. Existing slaughterhouses are insufficient to meet producer demand, and there is a significant need for a centrally located slaughterhouse in Hilo to serve producers in Hilo and the Puna district.

  Both challenges can be addressed by forming a producer-led cooperative that secures funding and develops shared agricultural infrastructure. A livestock cooperative has been initiated in Hilo to advance these goals. The cooperative aims to establish a feed mill to serve livestock producers across the state, develop a zero-waste slaughterhouse, and create a hatchery to support local poultry producers. In addition, the cooperative seeks to strengthen Hawai'i's food security by increasing local livestock production and connecting agricultural by-products and food waste generators with pig producers, thereby reducing feed costs, minimizing waste, and promoting a more sustainable agricultural system.
- **Objectives**
  - Strengthen Hawai'i's livestock industry through the development of a producer-led livestock cooperative
  - Improve producer access to affordable, locally sourced feed through collective purchasing and future feed mill development
  - Increase slaughter capacity and promote sustainable waste management through the planning of a zero-waste slaughter facility
  - Enhance collaboration among livestock producers and support the growth of local food production and food security

- **Outputs**
  - Livestock cooperative established, and membership expanded
  - Producer meetings and planning sessions conducted
  - Grant proposals submitted to support cooperative initiatives
  - Business and feasibility plans developed for a feed mill, zero-waste slaughterhouse, and poultry hatchery
  - Partnerships established among producers, Extension, government agencies, and agricultural stakeholders
  - Network created to connect agricultural by-products and food waste sources with livestock producers

Outcomes and their measurements

- **Short-term outcomes and measurements**
  - Producers gain awareness of the benefits of cooperative membership and collective purchasing
  - Increased communication and collaboration among livestock producers
  - Producers identify common production challenges and shared infrastructure needs
  - Greater awareness of funding opportunities and cooperative-led initiatives
  - Stronger engagement with Extension and agricultural partners

  Measurements
  - Number of cooperative members enrolled
  - Number of producer meetings and participant surveys
- **Medium-term outcomes and measurement**
  - Producers participate in collective feed purchasing, reducing feed costs and improving feed availability
  - Increased collaboration among producers for sharing resources, equipment, and knowledge
  - Grant funding secured to support cooperative projects
  - Planning and development of a feed mill, slaughterhouse, and hatchery progresses
  - More producers utilize agricultural by-products as livestock feed, reducing waste

  Measurements
  - Number of producers participating in cooperative activities
  - Grant funding awarded and cooperative projects initiated
- **Long-term outcomes and measurements**
  - Establishment of shared livestock infrastructure, including a feed mill, zero-waste slaughterhouse, and hatchery
  - Increased local production of pork, poultry, and other livestock products
  - Reduced dependence on imported feed and meat products
  - Improved profitability and long-term sustainability of livestock farms
  - Increased utilization of agricultural by-products, contributing to a circular agricultural economy
  - Stronger food security and resilience within Hawai'i's livestock industry
  - A self-sustaining producer cooperative that continues to support livestock producers through shared services and collaborative initiatives

  Measurements
  - Completion and operation of cooperative-supported infrastructure
  - Growth in cooperative membership and local livestock production

- **Impact**
  The livestock cooperative will strengthen Hawai'i's livestock sector by providing producers with shared resources, coordinated purchasing, and access to critical infrastructure that would be difficult to develop individually. By supporting the establishment of a feed mill, zero-waste slaughterhouse, and poultry hatchery, the cooperative will reduce production costs, improve feed security, increase processing capacity, and promote sustainable waste utilization. These efforts will enhance producer profitability, increase local food production, reduce dependence on imports, and contribute to a more resilient and sustainable agricultural economy in Hawai'i.

- **Program 3: Website development and information sharing (Continuous)**
  CTHAR has extension publications that are free for the public to read. There are many extension publications on the CTAHR website, but is it enough to just publish? I would disagree; it should also be easily available for the public to read. Despite being free, it's not easily accessible; it's very hard to find the right publications. To solve this problem, a website needs to be developed where articles and information are categorized and easy to find.
  A website has been developed (https://hilolivestock.ctahr.hawaii.edu/) that makes it very easy to find livestock-related articles from CTAHR publications. The website also features upcoming events on its home page, along with information about the livestock extension faculty. The website links to the livestock-related co-ops website to guide the public if they want to join any of the co-ops for common benefits. Locally available agricultural products have their own page, where producers can contact farmers for off-grade produce. The website is regularly updated and features the newly published extension articles and extension videos.
- **Objectives**
  - Improve public access to CTAHR livestock Extension publications and educational resources
  - Organize Extension information into an easy-to-navigate website for producers, students, and the public
  - Increase awareness of Extension events, livestock specialists, producer organizations, and locally available agricultural resources
  - Regularly update the website with new publications, videos, and educational content
- **Output**
  - Livestock Extension website developed and maintained
  - CTAHR livestock publications organized into searchable categories
  - Upcoming Extension events and educational videos posted
  - Directory of livestock Extension faculty, producer organizations, and local agricultural products available
  - New educational content added on a regular basis

  Outcomes and their measurements
- **Short-term**
  - Producers become more aware of available CTAHR Extension resources
  - Increased access to research-based livestock information
  - Users can quickly locate publications, videos, and upcoming events
  - Greater awareness of local livestock organizations and agricultural products
  - Improved communication between Extension and the public

Measurement
  - Website traffic and page views
  - User feedback surveys
- **Medium-term**
  - Increased use of Extension publications and educational materials
  - Greater participation in Extension workshops and outreach events
  - More producers connect with livestock cooperatives and Extension faculty
  - Increased adoption of recommended livestock management practices through improved access to information
  - Enhanced collaboration among producers, Extension, and agricultural organizations

  Measurement
  - Website analytics (return visitors and downloads)
  - Event participation and producer feedback
- **Long-term**
  - The website becomes the primary online resource for livestock Extension information in Hawai'i
  - Improved knowledge transfer leads to greater adoption of science-based livestock management practices
  - Stronger connections among producers, Extension, and industry partners
  - Increased accessibility of Extension resources supports a more informed and resilient livestock community
  - Sustainable digital delivery of Extension education expands the reach and impact of CTAHR programs

  Measurement
  - Long-term website usage trends
  - Growth in Extension engagement and resource utilization
- **Impact**

  The website will enhance the accessibility and visibility of CTAHR livestock Extension resources by providing a centralized, user-friendly platform for publications, videos, events, and producer information. By making research-based information easier to find, the website will strengthen producer education, increase engagement with Extension programs, promote collaboration within Hawai'i's livestock community, and improve the adoption of best management practices.

- **Program 4: Parasite egg count and resistance measurement lab (3 years/ continuous)**

  Small ruminants are very useful in controlling weeds and reducing fire fuels on the island. These animals are easy to manage and can be sources of milk and milk products as well as meat. These animals do not require much area and require less effort as compared to cattle. Generally, East Hawaii is wetter, making it very prone to parasitic infestation. Many of the producers use copper to meet the copper deficiency (Nishimura et al., 2025) and to reduce the parasites in them (Soli et al., 2010). However, copper cannot be used more than twice a year as an oral supplement to control the parasite, and sheep are very prone to its toxic effects. On top of that, antiparasitic medicines (deworms) can develop resistance; hence, high doses are sometimes recommended. It also depends on the season. So, knowing whether the parasites in the location are resistant to some dewormer or not would help

producers manage the parasite in that area. A lab set up at the Komohana Research and Extension Center will help diagnose parasitic infestations and resistance.

- **Objectives**
  - Establish a parasite diagnostic laboratory at the Komohana Research and Extension Center
  - Improve producer knowledge of small ruminant parasite identification, monitoring, and control
  - Assess gastrointestinal parasite burdens and anthelmintic resistance on small-ruminant farms across East Hawai'i
  - Promote integrated parasite management strategies that reduce reliance on routine deworming
- **Output**
  - Parasite diagnostic laboratory established and operational
  - Fecal egg count and anthelmintic resistance testing services provided
  - Producer workshops and on-farm consultations conducted
  - Educational materials and parasite management recommendations developed and distributed
  - Parasite surveillance data collected to support Extension programming

Outcomes and their measurements

- **Short-term**
  - Producers increase their understanding of parasite life cycles, fecal egg count testing, and anthelmintic resistance
  - Producers become aware of the risks of copper toxicity, especially in sheep, and the importance of targeted parasite control
  - Producers learn to make treatment decisions based on diagnostic results rather than routine deworming
  - Extension gains baseline data on parasite prevalence and resistance patterns in East Hawai'i

  Measurement
  - Knowledge surveys before and after training
  - Number of producers using diagnostic services
- **Medium-term**
  - Producers adopt fecal egg count testing and targeted selective treatment programs
  - Reduced unnecessary use of dewormers and copper supplements
  - Improved parasite control through evidence-based treatment decisions
  - Increased collaboration between producers and Extension for ongoing parasite monitoring
  - Better record-keeping of parasite treatments and animal health

  Measurement
  - Follow-up producer surveys
  - Number of farms implementing recommended parasite management practices
- **Long-term**
  - Reduced development and spread of anthelmintic-resistant parasites
  - Improved health, productivity, and welfare of sheep and goats
  - Lower production losses associated with parasitic disease
  - Increased sustainability of small ruminant production in Hawai'i

- Establishment of a regional parasite surveillance program that supports long-term Extension and research efforts

Measurement

- Trends in parasite resistance and fecal egg count data over time
- Adoption of integrated parasite management practices by participating producers

- **Impacts**

The program will improve the health and productivity of Hawai'i's sheep and goat industry by providing producers with access to parasite diagnostics, resistance testing, and science-based management recommendations. By promoting targeted parasite control rather than routine deworming, the program will help slow the development of anthelmintic resistance, reduce production losses, improve animal welfare, and support the long-term sustainability of small ruminant farming in Hawai'i.

- **Program 5: Reproduction training (3 years and continuous)**

After feed requirements, reproduction is the biggest factor in animal production. Without proper reproduction, animal production cannot thrive. Hawaii does not have a maintained breeding herd, but UH Hilo does maintain some crossbreeds that produce piglets and sell them to the public. They are limited to piglets; they do not have a semen production program and facility. If producers want to breed their animals with a boar, they must have transportation and biosecurity figured out or must have their own boar. In this case, artificial insemination (AI) is a great tool, but the producers do not have the skill set. A workshop/program will be designed to train them. A hands-on workshop in collaboration with the UH Hilo farm can be organized to train the interested producers. Together with this program, we can train these producers to collaborate with each other and exchange genetics through piglets when needed.

- **Objectives**
  - Increase producer knowledge and skills in swine AI
  - Provide hands-on AI training through workshops in collaboration with the UH Hilo Farm
  - Improve producer access to improved genetics while reducing biosecurity risks associated with moving live animals
  - Encourage collaboration among producers for sharing genetics and breeding resources
- **Outputs**
  - Hands-on AI workshops conducted
  - Producers trained in swine reproductive management and AI techniques
  - Educational manuals and training materials developed and distributed
  - Partnerships strengthened with the UH Hilo Farm and local swine producers

Outcomes and Measurements

- **Short-term**
  - Producers gain knowledge and confidence in swine reproductive management and AI procedures

Measurements:

- Number of producers trained
- Pre- and post-workshop knowledge assessments
- Participant confidence surveys

- Workshop satisfaction ratings

- **Medium-term** .
  - Producers begin implementing AI and improve breeding management on their farms

  Measurements:
  - Percentage of participants adopting AI within 6–12 months
  - Number of AI procedures performed by trained producers
  - Number of producers collaborating to share genetics or breeding stock
  - Follow-up surveys documenting changes in breeding practices
- **Long-term**
  - Improved reproductive efficiency, increased access to superior genetics, and a stronger, more self-sufficient swine industry in Hawai'i

  Measurements:
  - Increased litter size or farrowing rates among participating farms (where records are available)
  - Reduced reliance on transporting live boars for breeding
  - Increased producer participation in collaborative breeding networks
  - Continued use of AI and producer retention in the training program
- **Impact**

  This program will strengthen Hawai'i's swine industry by increasing producer capacity to use artificial insemination, improving access to quality genetics, and reducing biosecurity risks. Over time, the program will support more productive, collaborative, and resilient swine operations while enhancing local pork production and long-term agricultural sustainability.

- **Program 6: Demonstration of BSFL production to reduce waste and feed dependency (5 years)**

  Waste management in Hilo is challenging because Hilo does not have a landfill, or the existing one is not in active status. This situation makes waste management hard, and the only landfill in Kona is far from Hilo residents. Landfills do produce some methane gas, which can potentially be trapped and used as energy, but Hawaii lacks the system, so it goes directly into the environment and contributes to global warming. Food waste can be utilized if managed properly using the Black Soldier Fly Larvae (BSFL). This fly is naturally present in Hawaii (DuPonte & Larish, 2003). The fly lacks mouthparts, so it does not harm humans or livestock; it lays eggs and dies. The larvae can eat a lot of food waste and grow rapidly, and after reaching the prepupa stage of life, they secrete antibiotics in their gut, which reduces the pathogen, and it becomes sterile. It is fat- and protein-rich, which makes it an ideal protein source for animals and can be utilized for biodiesel production (Aigbedion-Atalor et al., 2024). Its production using waste should be encouraged to the public; we should have some demos for them to see. A bin has been set up in the Masters Garden lot at the Komohana Research and Extension Center so that producers can see the setup and use the waste to produce animal feed. An extension article has been submitted for publication in the CTAHR extension publication focusing on BSFL and slaughterhouse waste utilization.
- **Objectives**
  - Demonstrate the use of Black Soldier Fly Larvae (BSFL) to convert food and agricultural waste into valuable animal feed
  - Increase public awareness of sustainable waste management practices

- Educate producers on establishing and managing small-scale BSFL production systems
- Promote circular agriculture by reducing waste while producing local feed resources

- **Outputs**
  - BSFL demonstration Bin established at Komohana Research and Extension Center
  - Producer demonstrations and farm visits conducted
  - Extension publication on BSFL and slaughterhouse waste utilization
  - Educational materials distributed to producers and the public

Outcomes and Measurements

- **Short-term**
  - Increased knowledge of BSFL biology, waste management, and feed production
  - Measurement: Number of participants reached, surveys, and educational materials distributed
- **Medium-term**
  - Producers adopt BSFL systems for managing food or agricultural waste.
  - Measurement: Number of producers implementing BSFL production and follow-up evaluations
- **Long-term**
  - Reduced organic waste entering landfills, increased local production of sustainable animal feed, and improved environmental sustainability
  - Measurement: Producer adoption rates, estimated waste diverted from landfills, and continued use of BSFL systems
- **Impacts**

  The program will promote sustainable waste management by converting organic waste into high-quality animal feed using BSFL. It will reduce waste disposal challenges, support local feed production, improve producer knowledge, and contribute to a more resilient and environmentally sustainable agricultural system in Hawai'i.

- **Program 7: Individual farm visits (Continuous)**

  People get animals from their neighbors; some inherit them from their family. New producers keep looking for resources and information on how to do things and what to do with their animals. So, farm visits help us understand exactly what is happening on the farm. When the producer explains, it can be different from what we understand; looking at their farm makes more sense, and it's easier to understand. Farm visits also give us knowledge of the producer; it helps us make better connections with them. I will do at least 4 farm visits in each semester.
- **Objectives**
  - Conduct on-farm visits to livestock producers to assess farm management practices, production challenges, and educational needs
  - Provide individualized, science-based recommendations to improve animal health, nutrition, biosecurity, pasture management, and farm sustainability
  - Increase producers' knowledge and confidence through one-on-one education and technical assistance
  - Build long-term relationships between producers and Cooperative Extension, encouraging continued use of Extension resources

- Identify common challenges faced by beginning and small-scale livestock producers to guide future Extension programming and educational materials

- **Output**
  - Number of farms visited
  - Number of livestock producers receiving one-on-one consultations
  - Educational fact sheets and resource guides distributed
  - Referrals made to veterinarians, USDA agencies, NRCS, FSA, or other agricultural partners
  - Producer contact database developed for future outreach
  - Common production issues documented for Extension programming

Outcomes and their measurements

- **Short-term expected outcomes and measurements**
  - Producers gain knowledge of proper livestock management practices
  - Producers become aware of Extension services and available agricultural resources
  - Producers better understand animal nutrition, parasite control, biosecurity, and record keeping
  - Extension staff develop a better understanding of producer needs through direct observation of farms

  Measurements
  - Number of educational recommendations implemented
  - Producer satisfaction surveys
  - Number of follow-up questions received after visits

- **Medium-term expected outcomes**
  - Producers adopt recommended management practices
  - Improved animal health and welfare
  - Increased use of preventive health measures, including vaccination, parasite management, and biosecurity
  - Stronger relationships between producers and Extension personnel

  Measurements
  - Percentage of producers implementing recommendations
  - Number of repeat Extension contacts
  - Workshop participation following farm visits
  - Producer self-reported improvements in farm management
  - Reduction in common management problems identified during follow-up visits

- **Long-term expected outcomes**
  - Increased sustainability and profitability of Hawai'i livestock farms
  - Improved local livestock production and food security
  - Strong statewide network of informed livestock producers
  - Increased resilience of farms to disease outbreaks and environmental challenges
  - Greater adoption of best management practices across the livestock industry

  Measurements
  - Long-term producer retention in agriculture
  - Improvements in herd or flock productivity
  - Economic indicators (reduced production losses, improved profitability where applicable)

- Increased adoption of sustainable livestock practices across participating farms

- **Impact**

  The project will strengthen Hawai'i's livestock industry by providing personalized, on-farm technical assistance tailored to the unique needs of beginning and established producers. Farm visits allow Extension personnel to directly observe management practices, facilities, and environmental conditions that cannot be fully understood through phone calls or emails alone. This personalized approach builds trust between producers and Extension, leading to stronger relationships, increased adoption of research-based practices, improved animal health and welfare, and more sustainable livestock operations. Ultimately, the project will contribute to a more resilient local food system, enhance agricultural education, and improve the long-term viability of livestock farming in Hawai'i.

I. Timeline

Year/ Program	2026/27				2027/28				2028/29				2029/30				2030/31			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Program 1																				
Program 2																				
Program 3																				
Program 4																				
Program 5																				
Program 6																				
Program 7																				

Program 1: Feed formulation, trial, and education
Program 2: Co-op formation for livestock and collective problem solving
Program 3: Website development and information sharing
Program 4: Parasite egg count and resistance measurement lab
Program 5: Reproduction training
Program 6: Use of BSFL to reduce waste and reduce feed dependency
Program 7: Individual farm visits

J. **Internal and external linkage (Collaborations):** List linkages with other CTAHR faculty, other UH faculty, and other institutions, organizations, and individuals who will be used to strengthen the project

a) **Extension Specialist and Agents:**
Human Nutrition, Food, and Animal Sciences: M. Thorne, M. Oshiro, Y. Bustamante;
Plant and Environmental Protection Science: M. Dragich, P. Aigbedion-Atalor;
Tropical Plant and Soil Sciences: L. A. Rieber, J. Mollinedo (Maui);
Family and Consumer Science: M. Hampton, K. Hanoa

b) **Researchers:**
Human Nutrition, Food, and Animal Sciences: B. Mishra, R. Jha, Y. He, C. Reichhardt, J. Yang, A. Seal, R. Mishra;
Plant and Environmental Protection Science: K. Wang;
School of Life Sciences: M. Norris

c) **Departments and Experimental Stations:** M. Fergerstrom

d) **Emeritus faculty advisors:** M. DuPopnte, CN. Lee, G. Fukumoto
e) **County and USDA Vets:** Dr. Kim Kozuma, Dr Kimberly Hencken
f) **Other organizations:**
Ridge to Reef: K. Harris
Enlivening Learning: Kelly Teamy
Sheep and Goat Association: Roland
Aha Aloha Aina (Newly formed livestock co-op): Rose Hatori, Nicole Soong, Colton Hill
Hawaii Cattleman's Association: N. Galase
Hawaii Pork Industry Association: K. Souga
Korean Natural Farming Hawaii: Drake
Malama O Puna: A. Markoff, E. Ohara
USDA PBARC: R. Mayer
UH Hilo, College of Natural Science and Health Science: C. Tomona, J. Rodrique, N. Krueger

K. **Target Audience(s):** Who are the stakeholders who will benefit from this work? Examples of stakeholders are families, consumers, farmers, processors, other scientists, etc.
a. Animal and plant Producers
b. Students and interns
c. 4-H clubs
d. Other interested parties (potential producers or related organizations)

L. **Budget Sheet:** Required only for Team POWs. Include a budget sheet (materials and supplies, travel, and direct costs) and a detailed justification for each item.

M. Plan of Work Duration

10/01/2026 to 09/30/2031

N. REFRENCES

Aigbedion-Atalor, P. O., Fening, K. O., Adeyemi, A. O., Idemudia, I., Ojukwu, K. C., Nwobodo, M. A., Sunday, O., Isiogu, N. C., & Oke, A. O. (2024). Regenerative edible insects for food, feed, and sustainable livelihoods in Nigeria: Consumption, potential and prospects. *Future Foods*, *9*, 100309. https://doi.org/10.1016/j.fufo.2024.100309

DBEDT, S. of H. (2025). *Hog production and Hog Harvesting in Hawaii.*

DuPonte, M., W., & Larish, L. B. (2003). Soldier Fly. *Cooperative Extension Services.*

Gurung, T. H., Matia Jones, Noel Morin, Jeannette. (2024, December 17). Hawai'i Needs To Get More Serious About Food Security. *Honolulu Civil Beat.* https://civilbeat.org/2024/12/hawaii-needs-to-get-more-serious-about-food-security/

Heaton, T. (2026, May 26). Hawai'i Is Sending These Animals To The Mainland In Record Numbers. *Honolulu Civil Beat.* https://civilbeat.org/2026/05/hawaiis-livestock-are-racking-up-the-miles-moving-offshore/

Jany, P. (2023, April). *Food Sovereignty In Hawai'i.* https://hilo.hawaii.edu/news/kekalahea/spring-2023/april/food-sovereignty-in-hawaii

Nishimura, S. N. R., Bulosan, J. S., Thorne, M. S., Oshiro, M. A., Odani, J. S., & Reichhardt, C. C. (2025). Observed Trace Mineral Deficiencies in a Group of Locally Harvested Sheep in Hawai'i. *Veterinary Sciences*, *12*(10), 1002. https://doi.org/10.3390/vetsci12101002

Soli, F., Terrill, T. H., Shaik, S. A., Getz, W. R., Miller, J. E., Vanguru, M., & Burke, J. M. (2010). Efficacy of copper oxide wire particles against gastrointestinal nematodes in sheep and goats. *Veterinary Parasitology*, *168*(1–2), 93–96. https://doi.org/10.1016/j.vetpar.2009.10.004

State of Hawaii data book. (2019). *Livestock inventory: 1990 to 2019.*

USDA/NASS. (2022). *Hawaii State profile 2022.*

USDA/NASS. (2024). *Hawaii agriculture report.*

USDA/NASS. (2026). *Market Analysis.*