



The Plant Materials Centers (PMC) support conservation objectives set by the Natural Resources Conservation Service (NRCS). The Hoolehua Plant Materials Center (HIPMC) is one of 25 Plant Materials Centers that serve NRCS Field Offices around the country (Figure 1). The service area of each PMC is based on unique environmental conditions, and together, the PMCs cover the broad environmental range within the United States. PMCs select conservation plants and develop innovative planting technology to address today's natural resource challenges and help to maintain healthy and productive farms and ranches. This report is a summary of activities the HIPMC conducted from October 1, 2021, to September 30, 2022.



Figure 1. The Hoolehua Plant Materials Center occupies 80 acres in the central part of the island of Molokai, Hawaii. Photo was taken May 8, 2022

## Studies

### Warm Season Cover Crop Adaptability Study

In July 2020, in conjunction with the PMCs of the Southeast-Tropical Region, the HIPMC began a study to identify adaptability of 17 varieties of 13 warm-season cover crop species. The study consisted of two identical trials that were planted during the same time-of-the-year in 2020 and 2021. The species evaluated included cowpea, sunn hemp, yellow blossom sweet clover, white sweet clover, alfalfa, mung bean, lablab, pearl millet, sorghum-sudan, forage sorghum, sudangrass, soybean and pigeon pea. Cover crop growth and development were observed for the 91-day growth period in both years. The data showed that particular varieties excelled for specific cover crop purposes. For example, 'Growers Choice' sorghum, 'Honey Graze' sorghum-sudan, 'Piper' sudangrass, 'Rongai' lablab and 'Tropic Sun' sunn hemp would suppress weeds well because of their quick growth, tall stature and high biomass production. For cover crop mixes, 'Tropic Sun' sunn hemp is compatible with 'Honey Graze' sorghum-sudan, 'Growers Choice' sorghum or 'Piper sudangrass based on their similarities in bloom date and height. In contrast, the trials also showed which varieties would be poor cover crops. 'Large Lad' soybean and 'Georgia Two' pigeon pea are not recommended because of heavy predation by birds that targeted these specific plots that were randomized across the field. More detailed information from this study can be found in the final report '[An Evaluation of Warm-Season Cover Crops in Hawaii, 2020 – 2021](#)'.

# Hoolehua Plant Materials Center - 2022 Progress Report of Activities

## Cool Season Cover Crop Adaptability Study

In 2015, the Plant Materials Program initiated a national effort to identify adaptability of 55 varieties of 7 cool-season cover crop species. The study consisted of two identical trials that were planted in 2020 and 2021 during the same time-of-the-year. The species evaluated were Black Oat, Cereal Rye, Crimson Clover, Daikon Radish, Hairy Vetch, Red Clover and Winter Pea. Many PMCs participated in this National Cover Crop Study, but due to limited resources, the HIPMC was not able to participate until 2020, with its first trial planted in December of that year. Field data on growth and development, insect and disease damage ratings, and canopy cover were recorded during the 91-day growth period (Figure 2). Data collection was completed in May 2022. The final report will be completed next year.



Figure 2. John Colon (left, Biological Science Technician HIPMC) and David Duvauvachelle (right, Manager HIPMC) record height of Black Oat on March 22, 2022, 49 days after planting, as part of the cool season cover crop study installed at the Hoolehua PMC, Hoolehua, Hawaii.

## A Prescribed Grazing Tool for the Pacific Islands Area (PIA)

Through the plant needs assessment, the HIPMC was able to identify a particular issue that made it challenging for Field Office staff to develop grazing plans in the PIA. The issue lay within a tool that helps planners assist clients with grazing management by determining a forage-animal balance. This tool essentially determined herd size based on forage production. It is made up of three parts: 1) a forage production model that estimates the amount of forage available for grazing, 2) an animal demand model that estimates the amount of forage a particular sized herd of animals would consume, and 3) a forage-animal balance model that gave the planner freedom to adjust certain parameters for the herd and pasture to prevent overgrazing. Looking closer at the tool, the HIPMC was able to determine that the issue stemmed from the forage production model within the tool. With this piece of information, the HIPMC, in collaboration with the State Rangeland Specialist, Carolyn Auwelo, and Rangeland Technician, Pila Young, sought to develop a new forage production model with improved accuracy.



John Colon, HIPMC Biological Technician (left), and Kawika Duvauvachelle, HIPMC Manager (right) assess seedling development of the forage production plant study at the HIPMC.

*Helping People Help the Land*

*USDA is an equal opportunity Provider, Employer, & Lender.*

## Hoolehua Plant Materials Center - 2022 Progress Report of Activities

Along with an overall goal to improve accuracy of the forage production model, the team established four objectives to accomplish their goal. 1) Rebuild the user interface to be more user-friendly and intuitive with data inputs that are relatively easy to obtain, 2) Conduct a plant study that determines maximum annual forage yield for NRCS-PIA recommended forage grasses, 3) Conduct a plant study that tested the accuracy of five “off-the-shelf” forage production models plus an “Ensemble” model, and 4) Build the “Ensemble” model that essentially combined all five “off-the-shelf” models and determined an average forage production. Establishing clear objectives is paramount in developing HIPMC plant studies and direct communication with Field Office staff was employed to better understand tool streamlining and field management needs.



*Nanea Babila, NRCS Conservation Planner (left), and Lexis Kalawe, Molokai Conservation District Staff (center), assist John Colon, HIPMC Biological Technician (right), with collecting monthly forage clipping samples.*

After more than three years from start to finish, the PIA Prescribed Grazing Tool was revised with a newly embedded forage production model. Forage yield data had been collected from contrasting environments to identify the most accurate model among the six tested. The modified tool was demonstrated to the Area Resource Conservationist Jedidiah Dunn and Assistant Director for Technology Michael Constantinides who both approved it for use. Training on the use of the newly revised tool was provided soon after, and now Field Office staff in the Pacific Islands Area have an improved Prescribed Grazing Tool that will help prevent over-grazing, conserve soil, and improve water quality. NRCS-PIA Field Office Planners have access to the tool through the [PIA Field Office Technical Guide](#)

## Technical Note

### A Climatological Forecast Tool for Estimating Optimal Planting Dates

In response to NRCS Field Office Planners need for a method to identify planting dates for forage grass establishment, the HIPMC developed the Rainfall Sufficiency Tool. In the tropics, the conventional practice is to plant forage grasses at the beginning of the wet season. Whether the wet season will produce enough rain to meet the need for forage grass establishment is not readily known from easily obtainable information, such as historical rainfall average. The Rainfall Sufficiency Tool is an Excel spreadsheet composed of a database and user display. The database is a summary of climatological data, 1991-2020 for 110 locations in the Pacific Island Area, from the National Climate Data Center (2022). Four temperature-based evapotranspiration equations were tested against the well-recognized Penman-Monteith equation at three sites in Hawaii. Among the four equations, the calibrated Hamon equation (1961) performed the best. Evapotranspiration is calculated using monthly temperature and modified with a pre-selected crop coefficient. Evapotranspiration will be considered as the benchmark for sufficient rainfall.

*Helping People Help the Land*

*USDA is an equal opportunity Provider, Employer, & Lender.*

# Hoolehua Plant Materials Center - 2022 Progress Report of Activities

Evapotranspiration is plotted against a transformation of the 30-year historical rainfall that has been categorized into below-, near-, and above-normal terciles, providing a climatological forecast. The Rainfall Sufficiency Tool gives the planner a monthly approximation of the chances of having sufficient rain to establish forage grass.

## Training

### Utility Terrain Vehicle Operator Training

NRCS conservationists and engineers commonly use Utility Terrain Vehicles (UTV) in their day-to-day activities transporting themselves and materials across rangelands, forests, or large farms. For their safety, and the safety of others, NRCS policy requires all staff who operate or ride a UTV be trained on its safe operation. David Duvauchelle (Manager, HIPMC) is a certified UTV trainer accredited by the Recreational Off-Highway Vehicle Association that provides a unique opportunity for staff to fulfill policy requirements. On July 22, 2022, two engineers and a soil conservationist from the Hilo Field Office attended the UTV training course at the HIPMC. They reviewed maintenance and safe operation of the UTV in class, followed by hands-on driving through closed-circuit obstacle courses and off-road courses (Figure 3). All trainees successfully completed the certification requirements and are ready to use the skills they learned in their workplace.



Figure 3. David Duvauchelle (left, Manager HIPMC) signals Kyle Honda (inside vehicle, civil engineer Hilo Field Office) to execute a highspeed emergency stop during the Utility Terrain Vehicle training held at the Hoolehua PMC on July 22, 2022.

## Technology Transfer

- Technical Note: Rainfall Sufficiency Tool
- Prescribed Grazing Tool  
<https://efotg.sc.egov.usda.gov/#/state/HI/documents/section=4&folder=-186>
- Final Study Report: Warm Season Cover Crop Study  
<https://www.nrcs.usda.gov/plantmaterials/hipmcsr13938.pdf>

*Helping People Help the Land*

*USDA is an equal opportunity Provider, Employer, & Lender.*

# Hoolehua Plant Materials Center - 2022 Progress Report of Activities

## New Hire

Benson Bicoy joined the HIPMC staff on September 12, 2022 (Figure 4) as the new WAE Biological Science Technician. Mr. Bicoy was born and raised on the Island of Molokai, Hawaii. He has extensive experience in agriculture that spans over 20 years, having worked with two large seed companies and a large coffee plantation. He is an avid hunter, fisherman, and family man. His experience, strong work ethic and humble personality makes him a valuable addition to the HIPMC team.



Figure 4. Benson Bicoy started work as the new Biological Science Technician at the Hoolehua PMC on September 12, 2022.

## Who We Are

The HIPMC is one of 25 centers operated by the NRCS. The HIPMC services the PIA which includes the State of Hawaii, American Samoa, Guam, Commonwealth of Northern Mariana Islands, The Federated States of Micronesia, The Republic of Palau, and The Republic of the Marshall Islands. The HIPMC was initially established on the island of Maui in 1957 and was later relocated to the island of Molokai in 1973.

## What We Do

The mission of the NRCS Plant Materials Program is to assemble and test plant species for use in conservation programs to solve natural resource concerns. The program's vision is to function as the plant experts for NRCS, fully integrated and coordinated with technical and field office staff, developing and delivering vegetative solutions and conservation technology for NRCS customers. In working with a broad range of plant species, including grasses, forbs, trees, and shrubs, the program seeks to address priority plant needs of the NRCS field offices and land managers in both public and private sectors. Where practical, the use of native plants to solve conservation problems and to protect and restore ecosystems is emphasized.

## HIPMC Staff

- David Duvauchelle, Manager - [david.duvauchelle@usda.gov](mailto:david.duvauchelle@usda.gov)
- Richard Ogoshi, Agronomist - [richard.ogoshi@usda.gov](mailto:richard.ogoshi@usda.gov)
- John Colon, Biological Science Technician - [john.colon@usda.gov](mailto:john.colon@usda.gov)
- Benson Bicoy, Biological Science Technician - [benson.bicoy@usda.gov](mailto:benson.bicoy@usda.gov)

*Helping People Help the Land*

*USDA is an equal opportunity Provider, Employer, & Lender.*