

Establishing "Bush Tucker" in Hawaii

Final report for FW20-370

Project Type: Farmer/Rancher

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Host Institution Award ID: G274-20-W7900

Grant Recipient: Hawaii Tropical Fruit Growers

Region: Western

State: Hawaii

Principal Investigator:

[Ken Love](#)

Hawaii Tropical Fruit Growers

Project Information

Abstract:

Hawaii owes much of its agricultural sustainability and economic successes to Australia with its small fruit farms, new varieties of fruit crops and development of new production approaches. Commodities such as Queensland nut (macadamia), Hawaii's main export avocado (Sharwil), Blackgold Jackfruit and newer fruit crops such as finger limes are developing as an economic boon for Hawaii's growers. The domestication of previously wild edible crops referred to as "Bush Tucker" are traditional aboriginal foods. Hawaii Tropical Fruit Growers (HTFG) members have expressed a desire to learn what other crops might be beneficial for farm resiliency, economic and environmental sustainability.

Preliminary research and interactions with local chefs has shown that some of the "bush tucker" fruits have tremendous potential in Hawaii both in culinary applications and as value-added product ingredients.

This project proposes to clone and distribute trees of Ooray (*Davidsonia pruriens*), Midgen berry (*Austromyrtus dulcis*), Finger limes (*Citrus australasica*), Lemon aspen (*Acronychia acidula*), and Lemon Myrtle (*Backhousia citriodora*). The project will collaborate with American Culinary chefs to evaluate the fruit already producing in Hawaii and develop special dishes and value added products. This would include finger limes, Ooray, and Midgen berries. Additional germplasm of these species and Australian selections would be brought into Hawaii, following USDA-APHIS protocols, in seed form, then grown out at seven collaborator locations along with the already cloned trees mentioned above. This project will add to grower economic sustainability through diversification, providing options for value added products and have potential for large scale commercial commodity following the example of Macadamia.

The expedancy at which this project was completed was in part due to an extremely good crop year. In 2019 the "mother repository" had 32 inches of rain and in 2020 we are up to 101 inches which is quite rare for this part of Hawaii. The

pandemic also made travel and other projects impossible to perform so more time was available for this project and we were able to clone and distribute plants much faster than originally anticipated.,

Project Objectives:

1. Prepare trees for each of seven locations which includes cloning those already in Hawaii and obtaining additional seed or plant material from Australia.

In addition to the above, we were able to produce hundreds of extra trees that were distributed to members. A good crop year enabled sufficient fruit to be given to chefs and value added product producers.

2. Distribute trees to each repository location. Three at each location will be planted while seeds and other material from Australia will be grown out by the PI for later distribution.

Trees were sent to each location although in some cases meetings were not permitted due to the pandemic. The trees for this locations on Kauai and Hilo are being help by the repository manager until such time they can be put in the ground.

3. Obtain and distribute fruit for testing to each chef and value added product collaborator.

Ooray puree and finger limes were distributed to a dozen chefs and value added producers to experiment with. When the pandemic closed hotels in Hawaii, some chefs were unable to complete their roll while others came up with additional uses for the products. Arguably in Hawaii chefs are the growers best customers. The adoption of ooray onto major hotel menus like the four seasons and Kohanaiki promise growers a valuable market for the future. Products produced from test fruit provided by this project include fingerlime sugar & salt and fingerlime guacamole. Ooray, jam, jelly, syrup, selzer water, reductions, curry base, vinegar, hot sauce and meat sauces for lamb and venison.

4. Monitor tree health and growth at each location. Note differences due to climatic conditions.

Trees were monitored on each island at HTFG repositories and a few private farms. On Kauai and in Hilo in heavy rain areas no supplemental irrigation was needed although on Kauai the irrigation is in place in case of the occasional dry spell. At locations in Kona irrigation is in place and in some instances used briefly (8 minutes per day with 1/2 and gallon per hour emitters) in other cases due to the abnormal rainfall year no irrigation was supplied to finger limes but was supplied to lemon aspen, midgen berry and magenta lily pilly (*Syzygium* sp).

Maui had a lengthy dry spell and irrigation supplied or in some case s deep watering on a biweekly basis. Molokai and Lanai have irrigation in place and usd as needed. Over the course of the project no unusual temperatures were reported.

5. Prepare extension publication that will be available free online with a limited

print run for distribution at the HTFG annual conference and other meeting..

Both publications have been uploaded in conjunction with this report.

6. Discuss project at annual conference. This discussion will focus on project improvement and the sharing of production technologies, observations and marketing avenues.

Timeline:

Month	Action / Objective	Responsible person
1	Review plan	Ken Love / Dr Robert Paull
2	Prepare trees for locations	Ken Love
2	arrange for seeds/ germplasm to be shipped from Australia	Peter Salleras / Ken Love
3	Have trees inspected / shipped to each location	Ken Love
4	Planting and meeting Oahu	Noe Neumann
4	Planting and meeting Kauai	Dave Whatmore / Rob Rosen
5	Planting and meeting Molokai	Viola Mundrick Wichman
5	Planting and meeting Lanai	Dave Embrey
5	Planting and meeting Maui	Jordan Longman
6	Planting and meeting Honomu Hawaii	Brian Lievens
6	Planting and meeting Honaunau Hawaii	Chantel Chung
7	Monitor and gather data on tree conditions.	Ken Love and all island collaborators
9	Gather fruit for chefs and producers.	Ken Love
9	Distribute fruit and collect data and recipes	Ken Love
9-10	Hold annual conference to discuss project with growers	Ken Love
11	review data with TA prepare & distribute extension publication	Ken Love / Dr. Robert Paull
12	write final report	Ken Love / Dr Robert Paull

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Research

Materials and methods:

1. Prepare trees for each of seven locations which includes cloning those already in Hawaii and obtaining additional seed or plant material from Australia.

First priority will be the three species, Ooray (*Davidsonia pruriens*), Midgen berry (*Austromyrtus dulcis*) and Finger limes (*Citrus australasica*). These species will be prepared then shipped in soilless media to each of the locations. Additional species include in the second round will be Lemon aspen (*Acronychia acidula*) and Lemon Myrtle (*Backhousia citriodora*) which will be acquired from Australia following USDA-APHIS protocols. Other species with potential will also be considered if seen as also having potential for Hawaii.

The species mentioned above were shipped to Maui, Molokai, Lanai, Oahu, and Kauai, They were given to the Big Island based repositories for planting as well. Instead of the Backhousia, we were able to obtain *Syzygium paniculatum*; the magenta lily pily,. *Acronychia acidula* is currently being grown out for distribution at a later date.

Most of the trees have been planted with the exception of Hilo and Honaunau repositories due to pandemic restrictions on groups meeting on Hawaii Island but are being grown out for inclusion at a later date.

2. Distribute trees to each repository location.

Once trees are established and recovered from transplanting, they will be shipped to each of the seven repository locations on Kauai, Oahu, Molokai, Lanai, Maui, Honoumuli and Honaunau. When ready, the PI will work with the local repository manager to establish a date where teams on each island can plant the trees and hold an educational workshop on the trees and bush tucker fruit.

All the trees have been distributed and planted out with the exception of Hilo and Honaunau where plants are being grown out in pots for later post pandemic planting. All face to face workshops have been prohibited for groups over 10 but the bush tucker fruits have been discussed in various presentations put together for an online October zoom presentations on <https://www.htfg.org/2020-conference> in the New Cultivars and Species and the project produced publications are available under Bonus Materials section.

3. Obtain and distribute fruit for testing to each chef and value added product collaborator.

As it is virtually impossible for Hawaiian growers to accurately predict when these rare fruits will become available The PI will monitor all trees that HTFG has knowledge of in order to obtain fruit for distribution to 3 chefs and 3 value added product producers.

Ooray and Finger limes were given to the chefs at Four Seasons Hualalai, Royal Kona Resort and Palamanui Culinary School. The other fruits have not produced in quantity to distribute yet. Products will also give to value added product producers at Hawaiian Goodness, Rourk Regan and Love Family Farms, the PI's family farm produces over 150 products. Products made include flavored sugars, salts as well as jelly, syrups, glazes and in mixed fruit compotes. Chefs have said that they want to purchased ooray and more finger limes when restaurants reopen.

4. Monitor tree health and growth at each location. Note differences due to climactic conditions.

The PI will record growth rate and condition based on data supplied by each location manager. Rain and or irrigation data will be included. Having three trees on each island will enable HTFG members to experiment with fertilizer and other inputs to see how growth might differ.

Most growing data is included in the publications with this report but briefly, Ooray growers roughly 1 foot per year in all climates and elevations. in wet areas like kauai it was advise that more amounts of cinder should be used so that water drains well. Irrigation on average is at 1/2 gallon per hour for 10 minutes, every morning during normal times but in heavy rain times this was turned off or the timer turned to as low as 30% of normal or 3 minutes.

8-8-8 was used at some locations, 14-14-14 at others and mulch with foliar compost tea at others. No significant differences were found. Detailed information is found in the extension publications with this report.

5. Prepare extension publication.

The PI will review data and draft a publication following the University of Hawaii format. The publication will be reviewed within the university system as all as by our Australian collaborators.

The extension publications have been finished and are with this report as well as in the bonus materials section of htfg.org

6. Discuss project at annual conference.

The publications will be reviewed by the technical advisor and other familiar with these crops. The final publication for each fruit will be released at the conference at the conclusion of the project.

As real time conference was prohibited due to covid, the results were discussed in a recorded zoom video on htfg.org

Research results and discussion:

With an unusually good year for Ooray production, we were able to produce close to 500 plants with 400 being distributed to members and to others. The ooray and midgen and finger limes were used as incentives for participation in other projects such as work days are repositories or given away with the purchase of other trees at the HTFG nursery. This program continues distribution with additional trees produced through the project including magenta lily pilly (Syzgium p.) Normally, Hawaii Tropical Fruit Growers (HTFG), holds a yearly conference where this project would have been discussed but given the covid situation and state rules limiting groups to fewer than 10 the conference which became virtual includes the publications online, created thanks to this project. At the bottom of

<https://www.htfg.org/2020-conference> these publications are available. They will also be hosted by the University of Hawaii once the university reopens -- post pandemic.

Other pandemic effects prevented a trip to Australia to collect additional plant material and seeds. Instead teh project as able to receive some by mail with proper permits and from Fla. which have been grown out and distributed to HTFG repository sites on each HAWAIIAN island. Once established, growers on each island will have access to the material. This includes 1800 members of HTFG.

Ooray (Davidsonia puriens)					
Location	Irrigation /rainfall	Emitters used	Average growth	Fertilizer & frequency	Notes
Kauai	86cm rain	none	10 inches per year	none	
Oahu	46cm rain	none	10 inches per year	14-14-14 to start - 0-10-10 flowering 5-1-1 foliar if needed. Sometimes 2-4-3	
Molokai	½ gal per hour	Used every other day ½ hour but turned off during rainstorms.	8 inches per year	14-14-14	
Lanai	15.5 cm in 3 months	“Hand watered a few times”	9 inches per year	14-14-14 2 times per year	

Maui	43.9 cm rain	1 gal per hour emitter 3x per week. Additional days added in drought times	10 inches per year	Bone meal and worm compost 2 times per year. Foliar compost tea as needed	
Honomu	335cm rain 2019	none	12 inches per year	Slow release 14-14-14 once a year	
Kona	1 gallon per hour used first year, ½ gal emitter for 2 to 3 years. 1 gal hr. 15' Spray covering 2 trees	Daily for 10 minutes in all cases	12 inches per year	Handful of 8-8-8 4 times per year.	2019 totaled 32 inches of rain and 103 from Jan to Nov.1, in 2020

*Some Ooray trees gave fruited in 12 years while others here in less than 5. Some fruit under the canopy while others out of the bark when the tree is notched. Notching and stress after the tree is well established has proved beneficial in increasing production.

Fingerlimes (<i>Citrus australasica</i> , F. Muell.) ca, F. Muell.)						
Location	Irrigation /rainfall	Emitters used		Average growth	Fertilizer & frequency	Notes
Kauai	86cm rain	1 gallon per hour during dry season or when needed		4 inches per year	5-2-6	
Oahu	46cm rain	none		6 inches per year	14-14-14 to start 5-1-1 foliar	
Molokai	½ gal per hour	Used every other day ½ hour but turned off during rainstorms.		5 inches per year	10-10-10 0-0-21 k mag	
Lanai	15.5 cm in 3 months	"Hand watered a few times"		7 inches per year	14-14-14 2 times per year	

Maui	43.9 cm rain	1/2 gal per hour emitter 4x per week. Additional days added in drought times		6 inches per year	Bone meal and worm compost 2 times per year. Foliar compost tea as needed	
Honolulu	335cm rain 2019	none		4 inches per year	Slow release 14-14-14 once a year	
Kona	1 gallon per hour used first year, 1/2 gal emitter for 2 to 3 years. 1 gal hr. 15' Spray covering 2 trees	Daily for 10 minutes in all cases but during heavy rain periods timers are turned to 80% of normal= 8 minutes per day		4 inches per year 5 to 8 in subsequent years	Handful of 8-8-8 4 times per year. 0-0-50 is used 2 times per year to sweeten citrus	2019 totaled 32 inches of rain and 103 from Jan to Nov.1, in 2020

Additional Notes.

Lemon Aspen

Acronychia acidula F.Muell.

Seeds are quite variable two pots of seeds from the same fruit with the same soil mix, gave a four-foot plant in 14 months while the next plant was 6 inches in that time. We have been unable to figure the difference.

Midyim (Midgen)

Austromyrtus dulcis (C.T.White)

While the shrubs produce copious amounts of attractive white flowers, less than one percent form a white blueberry type fruit. This same problem exists with test plantings in Fla and Calif.

Researchers suspect that all of these plants originated from the same plant genetics. Our plan is to visit Fisher Island Australia in order to obtain additional seeds.

Magenta Lilly Pilly

Syzygium paniculatum Gaertn,

While common in parts of the US mainland as an ornamental, it is rarer to find in Hawaii. Cuttings have been rooted and given to the HTFG repository sites, but growth is slow, and, in some cases, additional cuttings were made available due to heavy rainfall.

Participation Summary

1800 Farmers participating in research

Educational & Outreach Activities

- 10** Consultations
- 2** Curricula, factsheets or educational tools
- 3** On-farm demonstrations
- 2** Online trainings
- 25** Tours
- 2** Webinars / talks / presentations
- 25** Workshop field days

PARTICIPATION SUMMARY:

- 254** Farmers

- 15** Ag professionals participated

Education/outreach description:

HTFG will hold its 30th annual conference in Sept. of 2020 where the project will be introduced to members and the media. At the 2021 conference updates will be given and a PowerPoint prepared showing trees at each location. Prior to this, at each of the seven locations, HTFG chapter members will be encouraged to assist at the plantings of the trees in the repository system and a meeting will be held to explain what the trees require so they can assist the local collaborator in insuring tree health. The PI has already started to clone the trees needed as it takes some time for them to achieve maturity. The PI and TA will prepare a University of Hawaii Extension publication covering bush tucker fruit in Hawaii that will be released at the end of the project. HTFG maintains a facebook page for each chapter as well as a statewide page with over 6000 members. Regular updates will be posted as the project progresses.

Learning Outcomes

- 100** Farmers reported changes in knowledge, attitudes, skills and/or awareness as a result of their participation

Project Outcomes

- 25** Farmers changed or adopted a practice
- 25** Farmers intend/plan to change their practice(s)
- 14** New working collaborations

Project outcomes:

Using a number of the bush tucker fruit plants as an incentive for participation enabled us to distribute about 400 trees. The Hawaii Tropical Fruit Growers (HTFG) nursery is open to members and the public each Saturday. Trees were given to participants in the work trade program each week as an additional bonus. Visiting chefs would discuss using the fruit with those on site almost weekly and continue to do so. This on-going effects of this project will last for some years to come as other trees become available, The Pandemic and state laws prohibit more than 10 people on site so instead the program continues weekly with this limitation. Similar programs on other Hawaiian islands at HTFG repositories are less frequent than Kona but have taken place on Maui, Molokai, Kauai and Oahu. A smaller gathering on Lanai had members assist with planting 4 of the bush tucker trees.

Discussions with the growers through Hawaii Master Food Preservers yielded member experiments with Ooray and Finger limes in producing a number of value added projects which, in two cases, have peaked the interest of Whole Foods. It becomes a matter of time before a sufficient quantity of fruit can be produced in order to have products for distribution. Within the next 2 or 3 years there will be Ooray and fingerlime products in the local market. With a number of growers planting fingerlimes in quantity, the USDA has taken an interest and now developing an export protocol and pest risk assessment that will eventually enable growers to ship fingerlimes to the US Mainland.

Success stories:

A producer of value added products in Kona produced fingerlime salt and sugar which is being sold at a local farmers market. The producer is now working with dried and pickled Ooray which they hope to be able to sell soon. The project PI has produced other samples of jellies and syrups with project fruits and has given them to chefs. Chefs were given fruit to work with and asking for more when tourists are allowed back into Hawaii. The project has frozen over 80 cups of fruit in anticipation of providing puree to chefs.

Recommendations:

The use of free trees generated by the project enabled greater participation in HTFG events. Although these events and other functions were limited due to the pandemic, the frequency of weekly meetings eventually reached great numbers of participants than if there was one general meeting. Growers knew and continue to know they can visit weekly in Kona or monthly in other locations in order to discuss and better understand bush tucker and other unusual fruits.

Information Products

- [Finger Limes](#) (Bulletin)



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