



Hawai'i Tea Growers' Survey 2014

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In June 2014, the University of Hawai'i's College of Tropical Agriculture and Human Resources (CTAHR) partnered with Mauna Kea Tea and The Kohala Center to conduct a survey targeting existing Hawai'i tea growers and those who had taken steps toward becoming tea growers. The survey therefore provided a snapshot of the fledgling Hawai'i tea industry. The purpose of the survey was also to identify problems that CTAHR might address in future research and Extension programs. Funding support was provided by Hawai'i Department of Agriculture and United States Department of Agriculture.

A link to an online survey was distributed to mailing lists maintained by the partners, the Hawaii Tea Society, and various government agencies and organizations. Respondents were self-selected. There were 39 valid responses.

Summary of findings

Farm characteristics: Nearly three-quarters, 72%, of the respondents were from the Big Island, and they were distributed relatively evenly over the island. Six respondents were from Maui County, three from O'ahu, and two were from Kaua'i (Q1). A fifth of the operations were at sea level to 1000 ft elevation, over half at 1000 to 2500 ft, and a quarter above 2500 ft. (Q2). Survey results indicated that 43% receive less than 80 inches of rainfall a year and therefore, based on tea's water requirements, may need



to irrigate at least during some part of the production season (Q3). Eighteen respondents reported that they did irrigate their crop (Q4).

In terms of soil depth, 40% had more than 20 inches of soil, while 23% had from 10 to 20 inches and 28% had 10 inches or less of soil (Q5). Soil pH ranged from less than 4.5 to over 6.5 (Q13). Given our experiences, these results indicated that improper soil pH will be a significant limitation to optimal

tea growth and production. Only 9% (3 growers) had soil that was in the 4.5–5.0 optimum range, with another 9% (3 growers) with a pH of 5.0–5.5. One third, 32% (11 growers) had soil with pH that was too high (6.0 or higher). Of note is that one fourth of the respondents (9 growers) did not know their soil pH.

Tea plantings: Most operations (74%) had grown tea for 5 years or less, while the oldest operations (3 farms) had had tea plants for 10 to 15 years (Q6). Nearly all growers had no more than 2 acres in tea, with 36% having ¼ acre or less (Q7). These results imply that the total acreage in tea (as reported in this survey) is no more than about 40 acres, and more likely around 23 acres. A quarter, or 26%, grew their plants in full sun, 34% had the entire planting in partial shade, and the remainder had a mix, with some plants growing in full sun and some plants under shade (Q12). Growing the tea plants under trees was the likely source of the shade.

The majority of growers, 63%, had 1000 plants or less, while the largest (5 growers) had between 5000 and 10,000 plants (Q8). Twelve growers, or 44% of those responding to the question, reported growing only seedlings, while 14 growers (50% of respondents) grew only plants from cuttings (Q9). Thirteen growers reported having *assamica* varieties; 16–18 growers had at least one of the varieties *Benikaori*, *Bohea*, *Yabukita*, or *Yutaka Midori*; 9 reported *Chin shin oolong*; and 6 respondents had other varieties (Q10). The source of plants for most growers (46%) was “other,” including several plant-distribution programs. This was closely followed by CTAHR/USDA, with 44%, then other growers or friends, with 36% (Q11).

Harvesting and processing: The majority of respondents were not yet harvesting on a regular basis (responded with “not sure/don’t know”). More than a quarter, 29%, harvest 6 or fewer times per year, while 2 growers (6%) report harvesting more than 35 times per year (Q21). In an open-ended question, eight growers reported harvesting more than 10 pounds of tea in 2013 (Q22). Nearly all processed by hand (Q24). Three used some machinery, while two reported using machines and no hand-harvesting. Green was the most commonly produced type of tea, by 67% of respondents (Q25). Many also produced black (40%) and white (37%) teas, while 9% processed oolongs. (Note: A long-term goal should be to develop and use Hawaii Tea terminology.) Most sold directly to final consumers (Q26). When asked about *banji* (shoot dormancy), over half (53%) didn’t know or were unfamiliar with the condition (Q23). Of the remainder, those without a problem outnumbered those with excessive *banji* by a 2:1 ratio (32% vs 16%).

Bottlenecks/Problems: Respondents were also asked to describe their top barriers to production in an open-ended question (Q30). Lack of labor; processing issues, including the lack of equipment/facilities and knowledge; and the lack of planting material were limitations most often mentioned.

The majority of growers indicated that the pests listed in the survey were either not a problem or at worst a mild problem (Q18). On a scale of 1 = no problem to 10 = unmanageable problem, half to two-thirds rated each pest as 0 = not a problem. Some individuals were having significant problems, most often with Chinese rose

beetles. The great majority, 87%, of the growers reported not using any pesticides (Q17).

Several grasses, vines, and shrubs were listed as problems (Q20). Non-chemical methods were the predominant form of control, with the most popular being hand-weeding (used by 90% of respondents), mowing/weed whacking (67%), and mulching (54%). Chemical methods were less popular, but 21% reported using herbicides (Q19).

More than half, 55%, conducted soil analyses (Q14), while only 8% conducted plant tissue analyses (Q15). Growers reported using a variety of synthetic and organic/“natural” fertilizers and amendments (Q16).

Respondents were asked to rate the likelihood of their attending workshops on various tea topics if they were offered by CTAHR (Q27). The scale used ranged from 1 = not likely to 5 = very likely. In general, responses to most topics fell into two groups, with a larger portion in the 4 and 5 range and a smaller group with 1 and 2 responses. Business-management and recordkeeping topics had fairly large groups with 3 = neutral/so-so response. All topics had more growers likely to attend than not. The most popular topics were harvesting and processing, pruning, and tea cultivation. These were followed by soil and tissue sampling and marketing topics. The two business subjects and propagation rounded out the topics. The four topics in greatest demand were verified when respondents were asked to select the top three topics of interest to them (Q28). In this question, propagation replaced marketing as the fifth-most demanded topic.

A conference-type venue could be a good method to educate tea growers and provide periodic updates, and could also help to foster an industry organization. A majority of respondents, 63%, stated they would definitely attend, and another 29% said they might attend an annual industry conference (Q29). Three individuals stated they were not sure or probably would not attend such an event.

The remainder of this document provides more detailed results for each survey question and commentary on these results.

Survey Introduction and Instructions

Thank you for participating in this Hawaii tea growers' survey. The purpose of this survey is to assist The Kohala Center and University of Hawaii College of Tropical Agriculture to determine growers' most significant barriers to production. Reading and thoughtfully answering the questions may give you insight into typical problems and solutions in tea farming. Results of this statewide survey and invitation to subsequent tea growing workshops will be distributed to survey participants who provide their contact information.

Should you manage more than one area of tea production, please fill out this survey once per unique area farmed. Thank you again for your participation.

Q1. Where is your operation located?

- Most (72%) are from the Big Island, then Maui, O'ahu, Kaua'i, and Moloka'i.
- Combined non-Big Island count is 11 growers compared to 28 on Big Island.

Location	n	%
Kā'ū-Volcano-Puna	15	38.5%
Kona-Waimea-Hilo	13	33.3%
Maui	5	12.8%
Moloka'i	1	2.6%
O'ahu	3	7.7%
Kaua'i	2	5.1%
Total	39	100%

Q2. At approximately what elevation is this farm?

- The Mealani Research Station is at 2800'. Three quarters, 74%, of respondents are at a lower elevation and 18% are higher.

- One difference relating to elevation is that growers at the lower elevations seem to have had more problems with the Chinese rose beetle compared to growers with farms at the higher elevations.

Elevation	n	%
0–500 ft	6	15.4%
500–1000 ft	2	5.1%
1000–1500 ft	8	20.5%
1500–2000 ft	5	12.8%
2000–2500 ft	8	20.5%
2500–3000 ft	3	7.7%
3500–4000 ft	4	10.3%
4000+ ft	3	7.7%
Total:	39	100.0%

Q3. What is your approximate annual rainfall?

Inches/year	n	%	cum. %
0–40	3	7.7%	7.7%
40–80	13	33.3%	41.0%
80–120	9	23.1%	64.1%
120–180	6	15.4%	79.5%
180–240	4	10.3%	89.7%
240+	2	5.1%	94.9%
Not sure / Don't know	2	5.1%	100%
Total	39	100%	

Q4. Do you irrigate? () Yes () No

- 41% of farms may need irrigation at least during some part of the year.
- 46% (18 farms) reported that they had irrigation.

Q5. What is your approximate soil depth?

- 62% had plantings in fields with at least a foot of soil.
- The greatest impact of having a shallow soil depth might be that the plants could be more prone to water stress during drought and the cost of establishing the field might be higher.

Depth	n	%
0–5 in	4	10.3%
5–10 in	7	17.9%
10–20 in	9	23.1%
20+ in	15	38.5%
Not sure / Don't know	4	10.3%
Total Respondents:	39	100.0%

**Q6. How long has tea been growing at this location?
0–3 yrs, 5–10 yrs, 10–15 yrs, 15+ yrs**

- No respondent had been in operation for more than 15 years.
- Half of the respondents had been growing tea at their current location for three years or less, and three fourths for five years or less.

Years	n	%
0–3 yrs	19	50.0%
3–5 yrs	9	23.7%
5–10 yrs	7	18.4%
10–15 yrs	3	7.9%
15+ yrs	0	0.0%
Total	38	100%

Q7. At this location, how many acres are planted in tea?

¼ acre or less, ¼–1 acre 1–2 acres, 2–3 acres, 3–5 acres, 5–10 acres, 10–20 acres, 20–50 acres, 50+ acres

- Based on this survey, the total acreage reported to be planted in tea in Hawai'i is somewhere between just under 16 acres and 42 acres.

- The largest tea planting is 5–10 acres in size.
- Most (83%) are an acre or less.
- This is information from 36 respondents. In addition we were aware or have heard of a handful of potential growers, each with intentions to plant anywhere from 50 to 100+ acres.

Acreage	n	%
¼ acre or less	13	36.1%
¼–1 acre	17	47.2%
1–2 acres	5	13.9%
2–3 acres	0	0.0%
3–5 acres	0	0.0%
5–10 acres	1	2.8%
10+ acres	0	0.0%
Total	36	100%

**Q8. How many tea plants are at this location?
500 or less, 500–1000, 1–2 thousand, 2–5 thousand, 5–10 thousand, 10,000 or more, Don't know**

# Plants	n	%
500 or less	11	28.2%
500–1000	14	35.9%
1–2,000	6	15.4%
2–5,000	3	7.7%
5–10,000	5	12.8%
10,000+	0	0.0%
Total	39	100.0%

Q9. About what percentage are:

_____ % Seedlings _____ % Cuttings
_____ % Don't know

- Nearly $\frac{2}{3}$ reported having no more than 1,000 plants; 28% have 500 or fewer plants.
- These results are questionable. That is, if 44.4% said they had plantings consisting of 100% seedlings, it must mean that they have zero cuttings. However,

only 14.3% stated that. As a check, the actual numbers are 12 of 27 respondents with 100% seedlings and 4 of 28 with zero cuttings.

- Similarly, 14 of 28 (50%) stated that their plantings consisted of 100% cuttings, but only 6 of 27 (22.2%) had zero seedlings.

Q10. What varieties and numbers of plants are planted?

Variety	#
() Assamica vars	-----
() Yabukita	-----
() Yutaka Midori	-----
() Benikaori	-----
() Bohea	-----
() Chin Shin Oolong	-----
() Other clones	-----
() Seedlings	-----

- Very few growers have more than 1,000 plants of any one variety.
- The varieties Yabukita, Yutaka Midori, Bohea, and Benikaori were fairly evenly distributed.
- Many responded that they had Assamica varieties, but it was unclear whether the respondent meant clonal or seedling.

Q11. What was the source of these plants?*

(_____)

*optional

- The original CTAHR-USDA distribution program apparently accounted for a large proportion of the plants.
- Under “other,” the Byron Goo/Tea Chest program was most frequently mentioned. Other sources include Cam Muir/Elijah Halpenny and Eva Lee/Chiu Leong/Tea Hawaii.

Q12. Are your tea plants growing in:

() Full sun () Partial shade () Mixed (some in full sun/some in shade)

	n	%
Full sun	10	26.3%
Partial shade	13	34.2%
Mixed (sun & shade)	15	39.5%
Total	38	100%

Q13. What is your current soil pH?

- Given our experiences, these results indicate that improper soil pH will be a significant problem. Only 9 percent (3 growers) are in the 4.5–5.0 optimum range, with another 9% (3 growers) with pH of 5.0–5.5. Eleven growers, 32%, have soil with a pH value that is definitely too high to support healthy tea growth.
- One grower mentioned that lime is being applied, although at a very low rate.
- Of note is that one fourth of the respondents (26.5%, 9 growers) did not know their soil pH.

pH	n	%
<4.5	1	2.9%
4.5–<5.0	3	8.8%
5.0–<5.5	3	8.8%
5.5–<6.0	7	20.6%
6.0–6.5	9	26.5%
6.5+	2	5.9%
DK / Not sure	9	26.5%
Total	34	100.0%

Q14. Do you conduct soil nutrient analysis?

() Yes () No

- Twenty-one respondents did, 17 did not.
- Since 9 stated they did not know their soil pH, the difference from the 17 who did not do an analysis could be a problem.

Q15. Do you conduct foliar/tissue analysis? Yes No

- Only 3 respondents conducted plant tissue analyses. This indicates that plant tissue analyses are underutilized and education in this area may be warranted.

Q16. What kind of fertilizer do you use? What is the application rate (e.g., lbs. per month)?

Type	Rate
<input type="checkbox"/> Organic:	_____
<input type="checkbox"/> Conventional:	_____
<input type="checkbox"/> Other:	_____
<input type="checkbox"/> None	

- Many of the materials listed were organic or “natural” rather than from synthetic sources.

Q17. Do you use pesticides? Yes No

- Five growers reported using pesticides, likely those reporting significant pest problems.

Q18. What are your main pest or disease problems, and how serious is the problem? Please provide your rating for each of the following. (Scale of 1 to 10, with 1 being no problem, 10 being unmanageable).

- The vast majority indicate that the pests listed are either not a problem or at worst a mild problem. Half to ²/₃ say they are not a problem.
- Some individuals are having significant problems,

most often with rose beetles.

- Scales may not be considered an issue because they are not apparent?
- Others:
 - Three list mites.
 - Four list vog/acid rain—would there be pest symptoms that mimic these conditions? This has not been a problem at Volcano station.
 - One respondent mentioned that light brown apple moth caterpillars loved to feed on tea shoots. This could be confusion with caterpillars of the Mexican leafroller.
- This may indicate a need for education on pest/symptom identification.

Q19. How do you control weeds? Herbicide Weedmat Mowing/Weedwhacking By hand Animals Mulch

- Non-chemical methods of weed control predominate.

Method	n	%
Animals	1	2.6%
Herbicide	8	20.5%
Weedmat	13	33.3%
Mulch	21	53.8%
Mowing/Weedwhacking	26	66.7%
By hand	35	89.7%
Other	6	15.4%
Total	39	100%

Pest	1 - No problem	2	3	4	5	6	7	8	9	10 - Unmanageable	Total	Avg. rating
Scales	13	5	2	0	0	0	0	0	0	0	20	1.52
Aphids	10	5	4	0	0	1	0	0	0	1	21	2.45
Anthraco-nose, Fungal	11	5	1	2	0	0	0	0	1	0	20	2.19
Rose Beetles	13	1	0	2	0	0	2	1	1	0	20	2.90
Caterpillars	13	2	2	1	0	1	0	1	0	0	20	2.24

Q20. What are your main weed problems? (Fill in the blank)

- Several grasses, vines, and shrubs were listed.

**Q21. How often do you harvest each plant in a year?
() 1–3 () 4–6 () 7–12 () 13–24 () 25–35
() More than 35**

- Overall, less than half of the respondents have crops in the harvest stage.
- Of those reporting harvest, most are not yet harvesting on a regular basis.
- See next question on amount harvested.

Frequency	n	%
1–3	4	13%
4–6	5	16%
7–12	1	3%
13–24	3	9%
25–35	0	0%
More than 35	2	6%
Not sure / NA	17	53%
Total	32	100%

Q22. How many total pounds of wet leaf did you harvest in 2013? (Fill in the blank)

- Eighteen out of 32 (56%) had not harvested yet.
- Another 8 (25%) harvested test/very small quantities.
- Six (19%) harvested significant quantities (over 25–30 lbs) for the year.

Q23. Do you have problems with banji? () Yes () No

- More than half did not know what banji is, or whether they have it.
- Of those who know, a third (16% of all) report having excessive banji.

- Problems with excessive banji are likely to manifest later when the crop is being harvested regularly and when proper cultural practices are not followed.

	n	%
Yes	6	15.8%
No	12	31.6%
Don't know	20	52.6%
Total	38	100%

Q24. How do you process your tea?

() By hand () Continuous machine () Machine assist

- Nearly all respondents process by hand.
- Two reported using only machines; another 3 reported some machine use.

Method	n	%
By hand	27	96%
Only machine	2	7%
Machine assist	3	11%
Total	28	

Q25. What type of tea is your end product? (More than 1 choice may be selected.) () White () Green () Yellow () Oolong () Black () Other

- Green is most popular, with the other types somewhat evenly distributed.

Type	n	%
White	11	37%
Green	20	67%
Yellow	3	10%
Oolong	9	30%
Black	12	40%
Other	8	27%
Respondents	30	

- Perhaps Hawaii Tea terminology should have been used, but many might not be familiar with it.
- “Other” includes pekoe, silver needle, aged (pu-erh like), and several herbal “teas.”

Q26. How do you characterize your buyers? () Tea Shops _____% () Food Service _____% () Direct _____%

- Most sell direct to final consumers and other.
- Eleven responded.

Q27. On a scale of 1 to 5, with 5 being very likely and 1 being not likely, please rate your likeliness to attend the following workshops: Soil and Tissue Sampling, Cultivation, Pruning Harvesting & Processing, Propagation, Recordkeeping, Business Management, Marketing Topics

Q28. What are the top three topics where you would be interested in assistance from CTAHR?

1. _____
2. _____
3. _____

Topic	n	%
Tea cultivation	16	45.7%
Pruning/banji	16	45.7%
Harvesting and processing	16	45.7%
Soil and tissue sampling	15	42.9%
Propagation	11	31.4%
Other	11	31.4%
Business management	10	28.6%
Marketing topics	6	17.1%
Recordkeeping	4	11.4%
Total	35	100%

Topic	1 - Not likely	2 - Somewhat unlikely	3 - Neutral, so-so	4 - Somewhat likely	5 - Very likely	Total	Rating average
Soil and tissue sampling	4	2	3	11	15	35	3.89
Tea cultivation	2	2	4	10	17	35	4.09
Pruning	4	0	5	5	21	35	4.11
Harvesting and processing	3	1	3	7	20	34	4.18
Propagation	8	4	2	4	13	31	3.32
Business management	4	2	8	8	10	32	3.56
Recordkeeping	3	3	11	6	10	33	3.52
Marketing topics	2	3	6	11	10	32	3.75

Q29. How likely are you to participate in an annual industry conference-type event?

- () **Would definitely attend** () **Might attend**
() **Would not attend**

	n / 35	%
No, I would definitely not attend	0	0.0%
I would probably not attend	1	2.9%
Not sure, undecided	2	5.7%
I might attend	10	28.6%
Yes, I would definitely attend	22	62.9%

Q30. Please describe your top barriers to production. (Quotes given below.)

- None
- Top barrier is huge Lava Rocks up to 70lbs.
- Need labor but can't afford labor until producing more but can't produce more without labor...
- 1. Need for seedlings 2. Need for money to pay labor to keep weeds at bay 3. Interested buyer of tea. We would just like to grow rather than value-add.
- Right now we still have everything in the growing pots under a shed, our plants are 6-7 months old as of this time.
- Slow growth; initially failure to prune early on... therefore, bushes aren't as thick and dense as should like.
- Concerns about processing harvested tea. No facility on Maui and equipment expensive plus not much expertise here either. Also LBAM (little brown apple moth) love the new tips. Really a problem here.
- Seedlings result in mixed genetics. Plants are not uniform resulting harvesting issues and mixed quality.
- Poor clay soils and high labor costs.
- Obtaining quality plant material.
- Cost and availability of processing equipment, time availability & labor cost, affordable access to farmland with long-term lease (at least 40 yrs.)
- Knowledge
- Brand new...don't know much about anything yet.
- Not enough time to prune, weed and manage fields all by myself.
- Lack of processing education and equipment
- None assessed, but availability of processing equipment.
- Irrigation and time!
- Production cost, human labor, available services
- So far none. Plants doing very well. Concerned about market, but that's down the road (we have about 6,000 cuttings, few mature plants.)
- Labor
- Labor. It is so labor-intensive to plant, partly due to all the hand labor to make the soil amendments. And, pruning and harvesting and processing are all so laborious. We probably won't be able to exceed $\frac{3}{4}$ acre due to these constraints.
- I am still trying tea growing; I have a very few # plants. Not enough for production.
- Not enough plants. At present there is not a Processing facility. One is badly needed or the industry will remain a backyard undeveloped industry. The potential for Tea to become a main industry for the Hawaiian Islands is overwhelming strong, however, without the infrastructure for processing the product, it will stagnate into a small household type of a business.
- Young plants, green algae seems to wipe out some plants if not removed by hand.
- Manpower
- Drought

- Labor
- We don't have a full time farmer. We have approximately 2000 tea plants in the ground. We acquired the plants from a local grower on the Big Island. They are all an Indian variety "Darjeeling". My partner attended the CTAR Tea Class in May 2014. We would like to acquire some Japanese variety to plant on our farm but are unsure on how to pursue.
- Lack of water as we're off the grid, expense to obtain more plants.
- Rain

Q31. Please contact me for

- Upcoming workshops** **Assistance in determining pH and soil & tissue nutrient analysis**
 Survey results

	n	%
Upcoming Workshops	32	91.4%
Assistance in determining pH and soil & tissue nutrient analysis	18	51.4%
Survey results	23	65.7%
If you wish to be contacted please provide your information here: - Name - Email - Phone	29	82.9%
Total	35	100.0%