



## Addressing the Loss in Productivity of UH CTAHR's Waimanalo Long x Nitta Hybrid: Part II

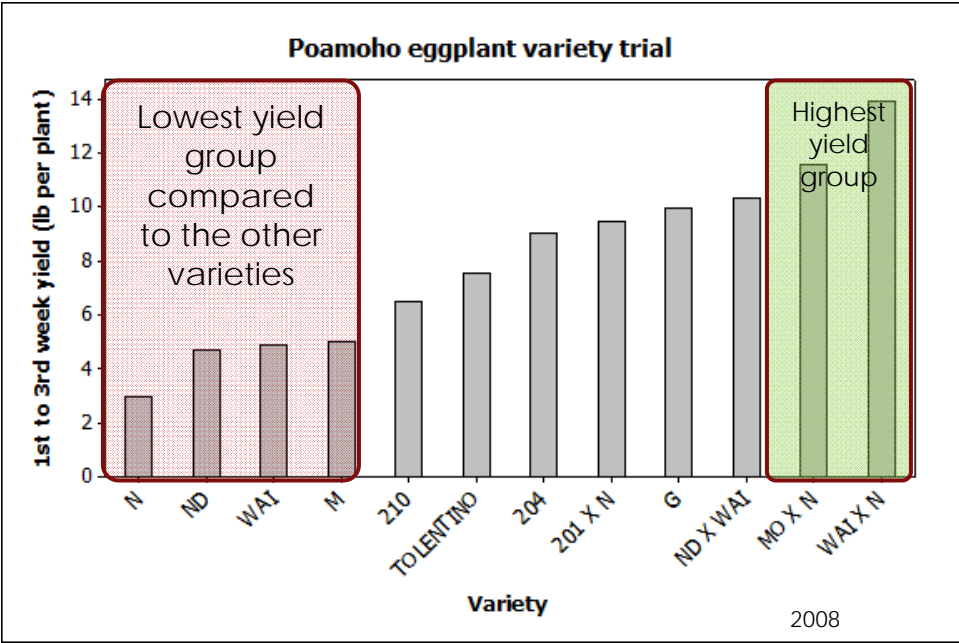
Jari Sugano, Steve Fukuda, Jensen Uyeda, Susan Migita, Desmond Ogata & Clyde Fukuyama  
University of Hawaii at Manoa  
College of Tropical Agriculture and Human Resources  
Cooperative Extension Service  
January 2015 (revised 12/22/17)

### BACKGROUND INFORMATION:

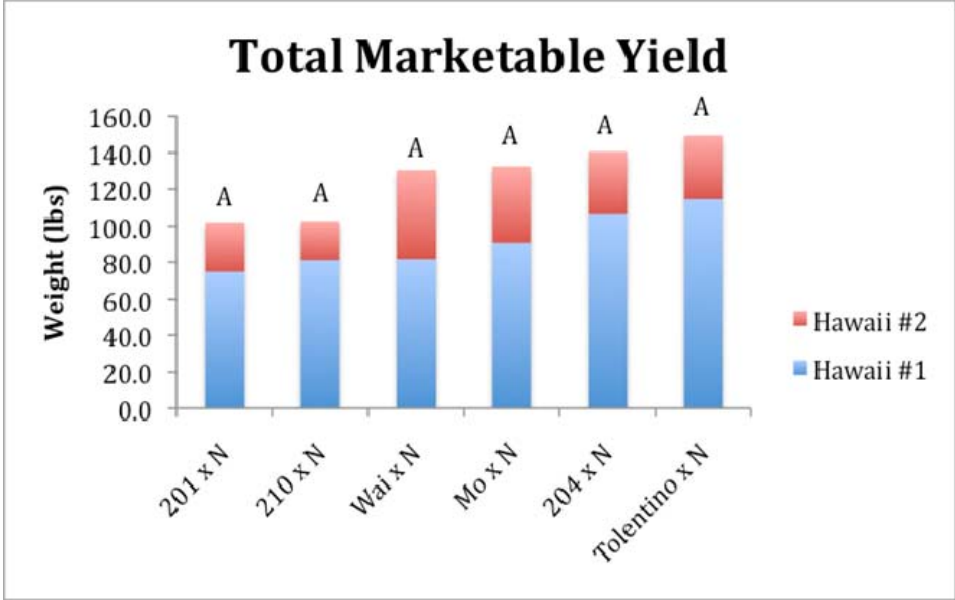
Long eggplant (*Solanum melongena*) cultivars are preferred by many Hawaii's growers and consumers. Variety trials were conducted in 2008 and 2013 using a randomized complete block design with 4 reps at the Poamoho and Waimānalo Research Stations under conventional and certified organic management. Popular commercial eggplant varieties developed by CTAHR, new eggplant hybrids developed by Dr. Kenneth Takeda, retired CTAHR horticulturalist, and Susan Migita, station manager of the Poamoho Research Station, as well as varieties with superior horticultural characteristics identified by local growers were evaluated in these study.

The objective in 2008 was to identify and establish the best parental combination for CTAHR long eggplant hybrids. Fruit count, marketable yields, fruit length, fruit diameter, sheen characteristics, and horticultural characteristics were evaluated and tabulated for Hawaii #1 (Grade A) and Hawaii #2 (Grade B) products. In 2008, Waimānalo Long x Nitta (WAI x N) and Moloka'i x Nitta (Mo X N), the current industry cultivar standards, did significantly better than the remaining 10 varieties based on total marketable yield and number of fruit/acre/week. Data was collected for 13 weeks.

No differences were found in marketable yields among the tested varieties from week 4 on. All data were analyzed by ANOVA proc GLM, means were separated by pair wise Tukey comparison.



Two tested varieties as expected had the highest yield during the first 3 weeks of harvest in 2008: WAI x N (Poa) & MO x N. Graph provides evidence of hybrid vigor.



In 2013, field data showed there was no significant difference between CTAHR's industry standards (WAI x N (Poa) & MO x N) and promising new cultivars in the pipeline.

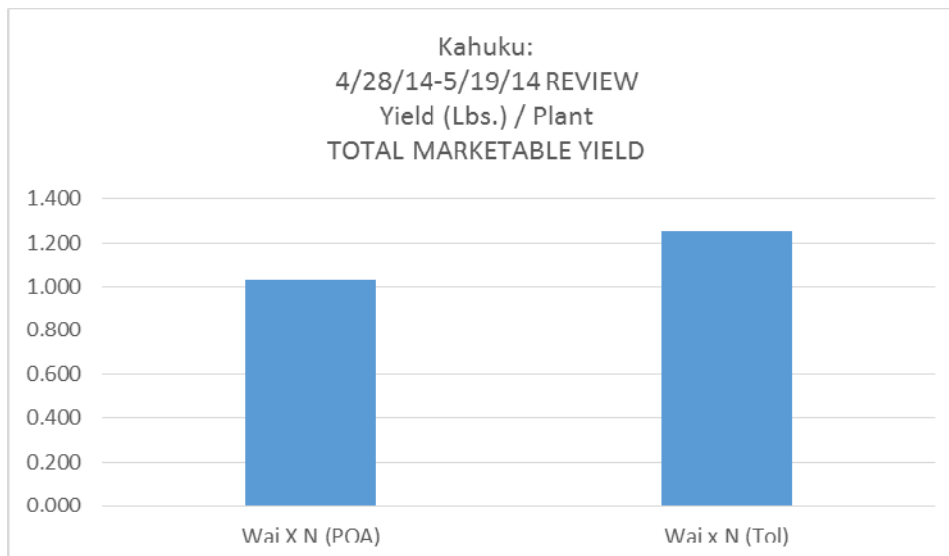
**PREVIOUS SITUATION:**

In October 2013, a commercial eggplant farmer expressed concern that the UH CTAHR Wai X N seeds (outsourced to Taiwan) was producing subpar results in terms of productivity & fruit quality. The new variety was also thought to be more attractive to an uncommon pest in eggplant, pepper weevil. The farm was suffering severe economic losses due to the change in the University's seed production policy. The farmer contemplated the sustainability of maintaining its market share with this Taiwan produced version of Wai X N.

Field trial was initiated in April 2014. It confirmed that the Wai X N (Poa) variety had the lowest yields compared to other promising new eggplant cultivars. It also showed that the improved F1 version of Wai X N (Tol) cultivar out did the Hawaii & Taiwan produced varieties. The improved F1 Wai x N hybrid used the 'Tolentino' selected Nitta eggplant variety as one of its two parents. Susan Migita crossed this 'Tolentino' (Tol) selected Nitta eggplant variety with Waimanalo Long which yielded a new F1 hybrid. We will refer to this as Wai x N (Tol). The locally produced WAI x N (Poa) produced the lowest yields at the Kahuku site and confirmed grower's complaint about the performance of the Taiwan produced variety.

*We suspect that the parental lines of the Wai X N (Poa) were starting to lose its vigor. Selections of these parents were chosen for the Taiwan contract and may be attributing to the lost in productivity.*

**KAHUKU, OAHU: ON FARM TRIAL**



Preliminary data was collected over a three week harvest period and showed there were losses in yields between the Wai x N (Poa) and the Wai x N (Tol). The grower expressed concern regarding installing the Taiwan produced seed on farm so we did not compare the improved Wai x N hybrid against the Taiwan produced hybrid.

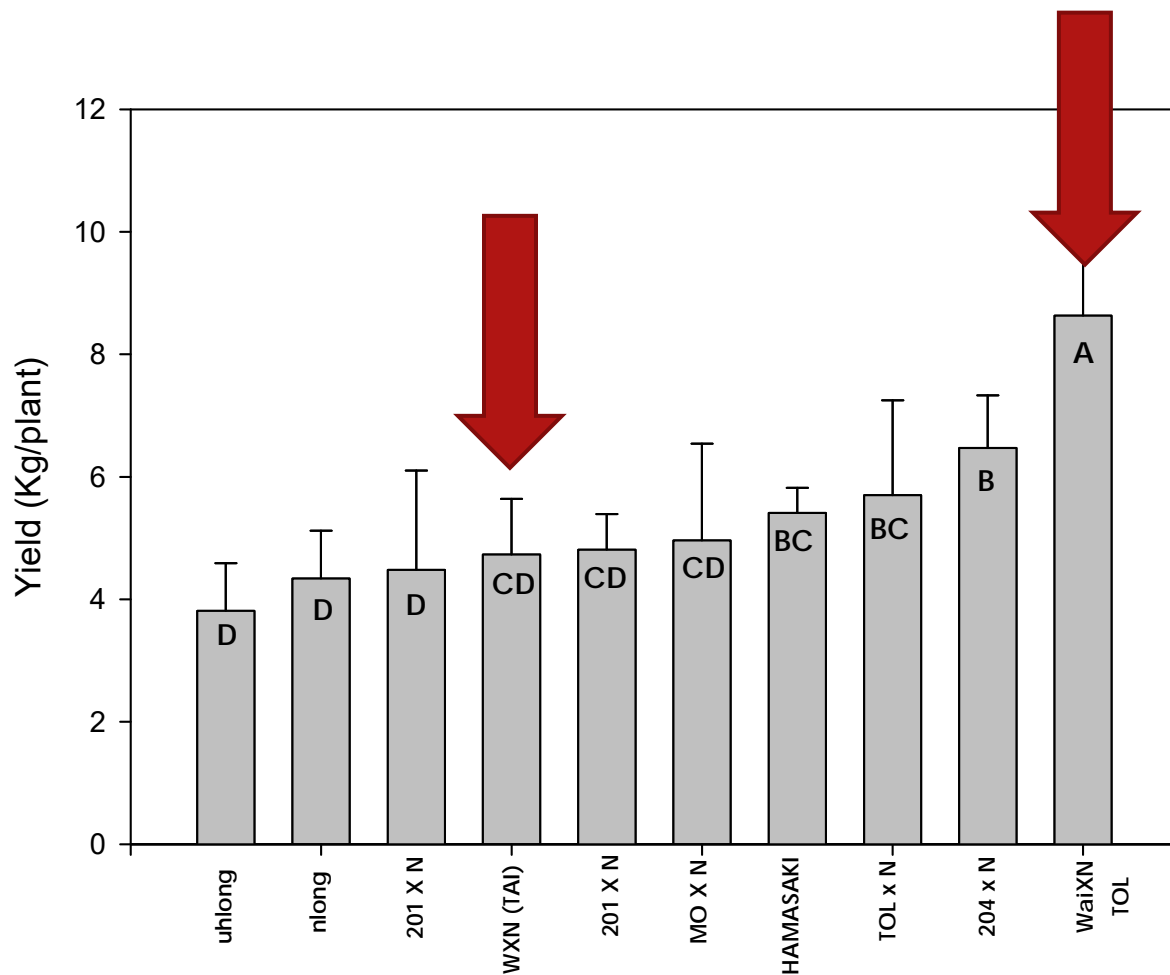
#### **STATEWIDE ASSESSMENTS:**

**<https://gms.ctahr.hawaii.edu/gs/handler/getmedia.ashx?moid=3710&dt=3&g=12>**

Supplemental CTAHR funds sponsored a statewide eggplant variety trial to finalize the commercialization of promising new cultivars with the assistance of statewide agents and specialist (Radovich, Motomura, Akahoshi, Shimabuku, and Shingaki). Review of the statewide data also shows a trend that the grower's concerns were warranted.

Statewide eggplant variety screenings were conducted at Waimanalo, Poamoho, Laie, Hilo, Kahului and Kula in 2014. In most areas the Taiwan produced seeds did significantly worse than the standard Hawaii produced Wai X N (Poa) and Wai x N (Tol).

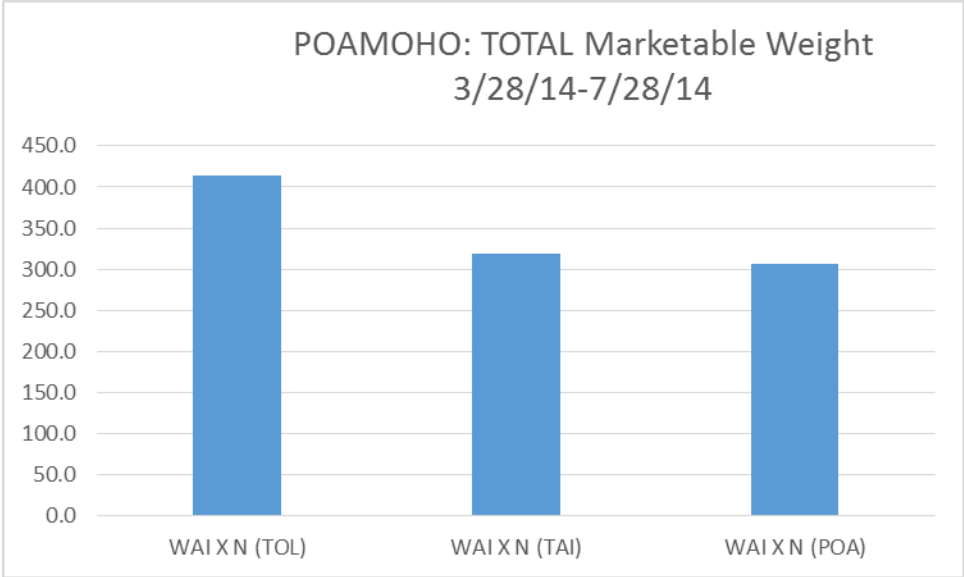
WAIMANALO Research Station (organic) data: June-August 2014



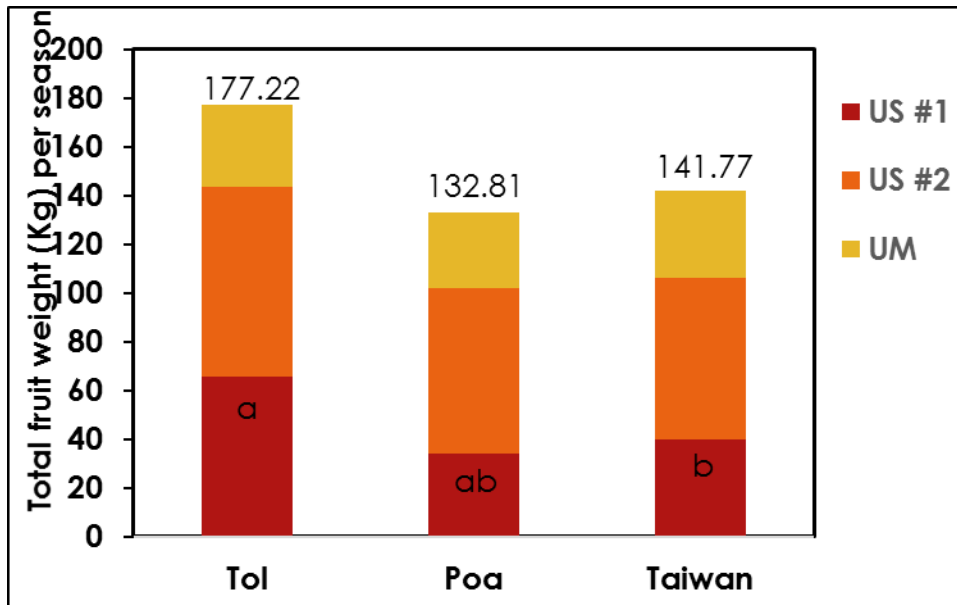
WAIMANALO NOTES: Waimanalo organic eggplant transplanted in April, Harvests every 2-3 weeks. Three replications. WAI x N (Tol) out performed the Wai N (Taiwan) under organic culture. Yields of the Taiwan produced WAI X N were significantly different than the WAI X N (Tol) line.

A closer examination of the three lines at the Poamoho Research Station found that the Wai x N (using the improved (Tol) Nitta line) did significantly better than the Taiwan and Hawaii produced Wai X N eggplant hybrids. This confirmed grower's concern regarding this newly produced hybrid seed from Taiwan.

POAMOHO RESEARCH STATION: 3 REPLICATIONS

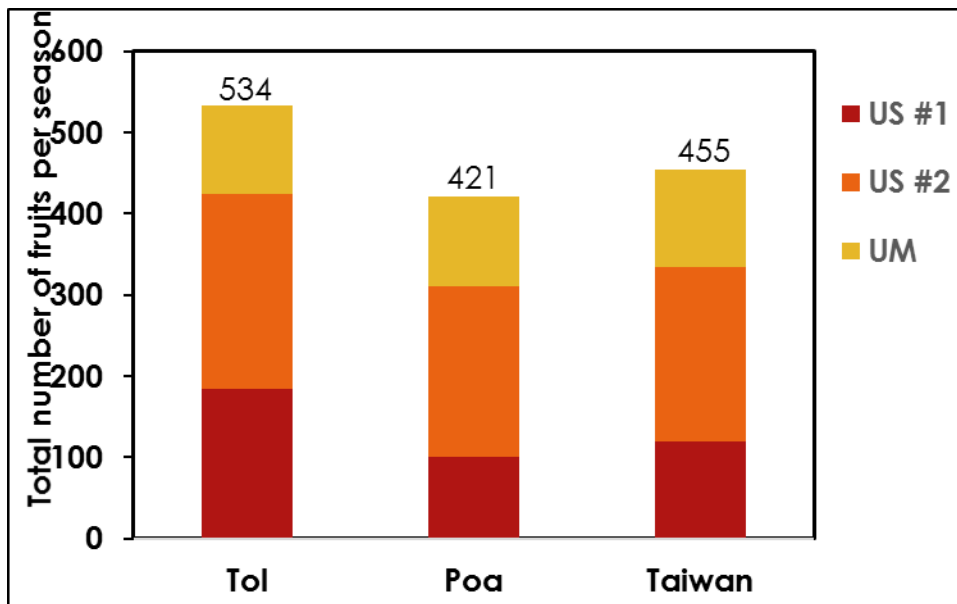


Noteworthy, the new Wai X N (Tol) using an improved line of Nitta did significantly better than both Hawaii (POA) and Taiwan (TAI) produced Wai X N lines in locations with replication such as Poamoho and Waimanalo.



Total fruit weight over 4 months:

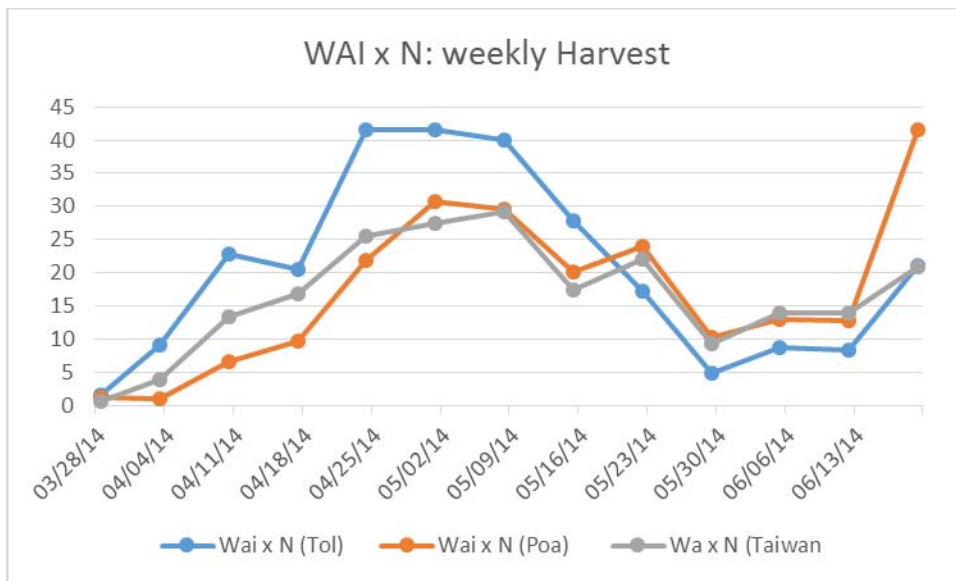
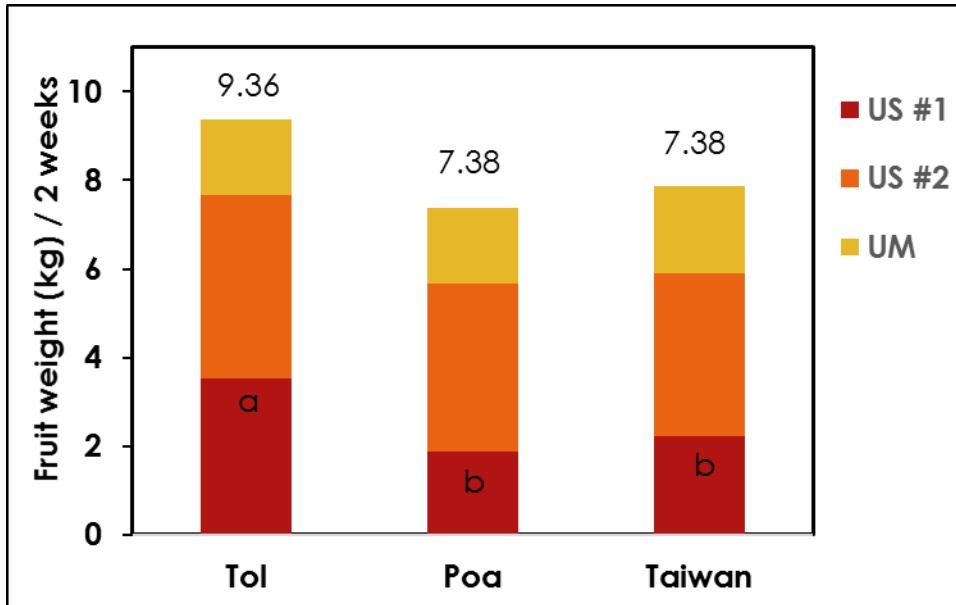
This graphs shows that there is a significant difference between Tol (Wai x Nitta (new Nitta parent), Poa (Hawaii produced Wai x N cultivar, and Taiwan (Taiwan produced Wai X N) produced eggplants.



Total number of fruits over 4 months:

This graphs shows that there is a significant difference between Tol (Wai x Nitta (new Nitta parent), Poa (Hawaii produced Wai x N cultivar, and Taiwan (Taiwan produced Wai X N) produced eggplants.

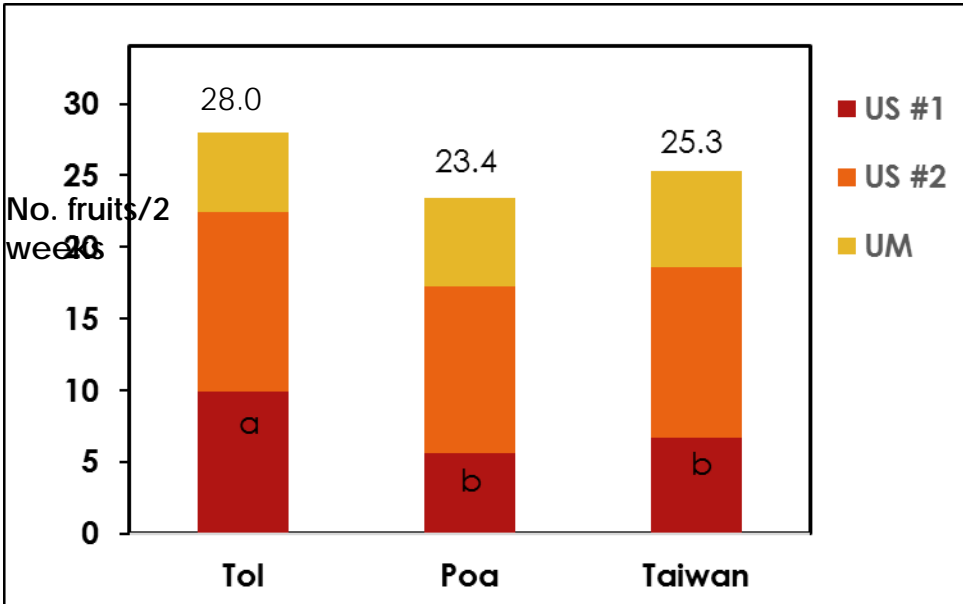
produced eggplants. It also confirms grower's observation that the Taiwan variety yields a lot of fruit.



Average of total fruit weight every 2 weeks

This graphs shows that there is a significant difference between Tol (Wai x Nitta (new Nitta parent), Poa (Hawaii produced Wai x N cultivar, and Taiwan (Taiwan produced Wai X N) produced eggplants. If new genetics are incorporated into the current Hawaii or Taiwan produced lines, yields could significantly be affected.

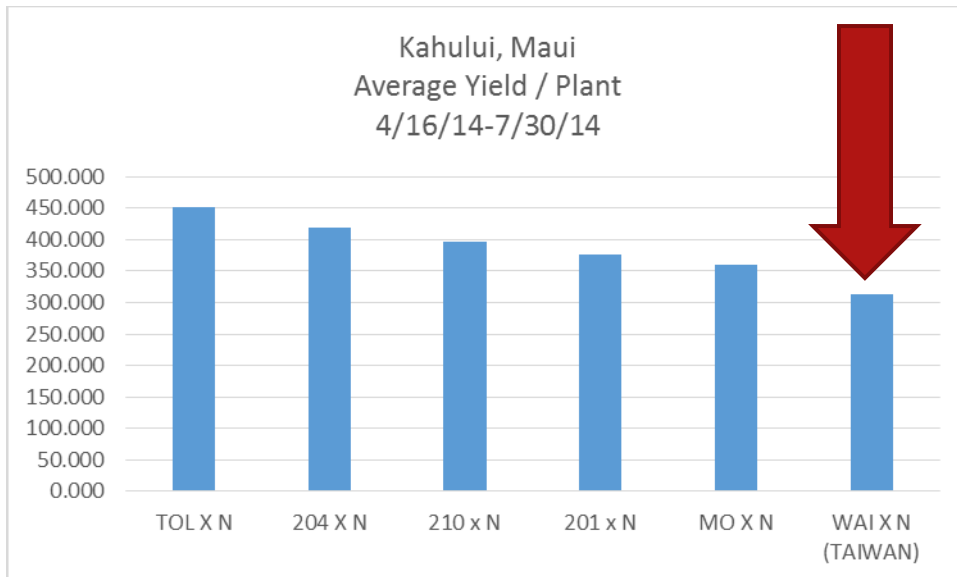


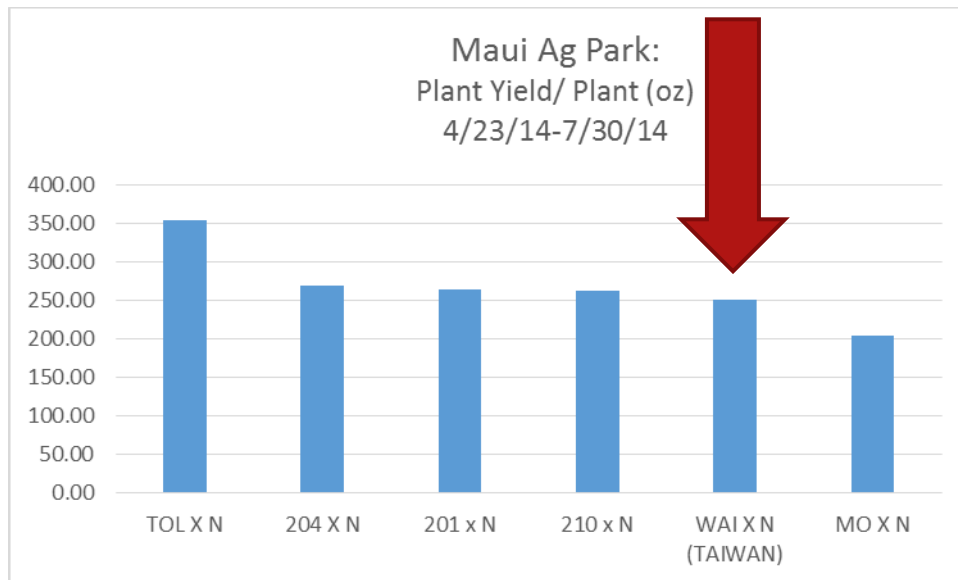


Total fruit counts every 2 weeks

This graph shows that there is a significant difference between Tol (Wai x Nitta (new Nitta parent), Poa (Hawaii produced Wai x N cultivar, and Taiwan (Taiwan produced Wai X N) produced eggplants.

MAUI: KAHULUI AND KULA AG PARK (REPLICATED)





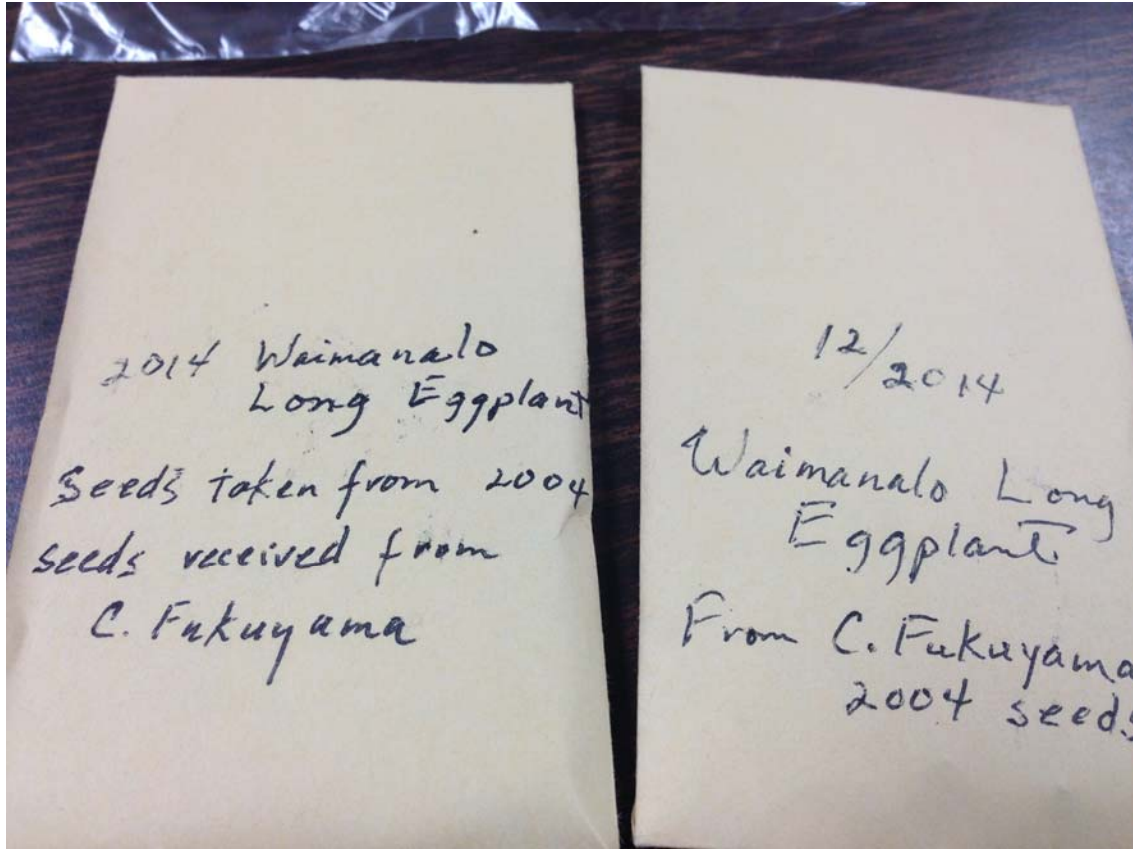
At two locations of Maui, the Taiwan produced Wai x N did not perform as well as the new CTAHR eggplant cultivars being evaluated for commercialization. In this location only 1 cultivar of Wai x N was selected for evaluation (a different project & objectives).

**SUMMARY:**

Results from these trials suggest that the new Wai X N (Tol) hybrid using the 'Tolentino' selected Nitta eggplant variety as a parent performed significantly better than both Hawaii and Taiwan produced Wai X N lines in locations with replication such as Poamoho and Waimanalo. It also points out that the current parental lines being used to make the Wai x N (Poa) and the parents which were sent to Taiwan were subject to poor plant vigor.

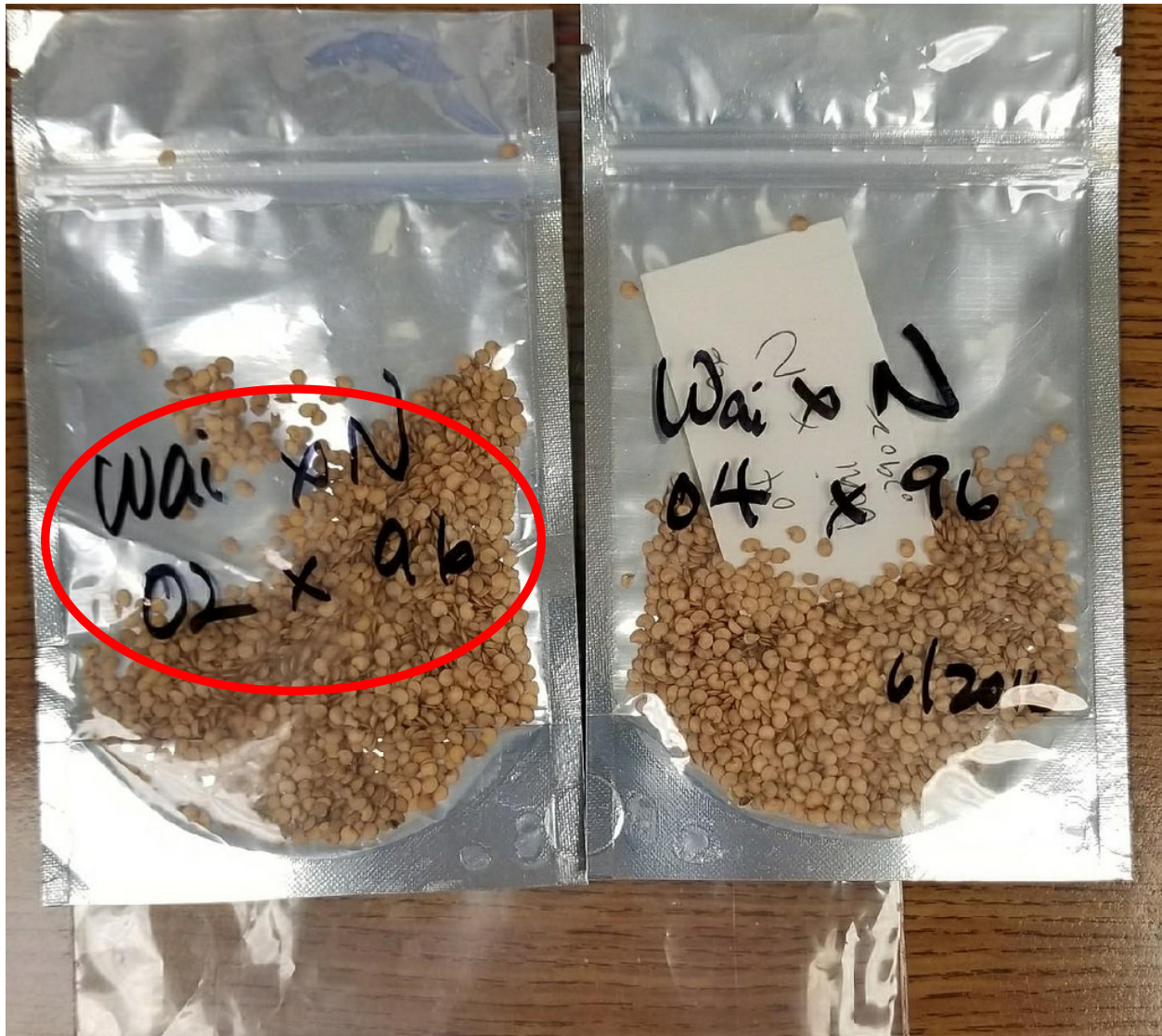
It was our recommendation that CTAHR ADSC Seed Lab should initiate a new F1 Wai x N hybrid using the 'Tolentino' selected Nitta eggplant variety as a parent. This hybrid did significantly better than the Taiwan produced Waimanalo Long X Nitta and the Poamoho selected Nitta eggplant variety X Waimanalo Long. All future hybrid crosses which utilize Nitta as a parent should use the 'Tolentino' selected Nitta for consistency.

Since the parental lines of many UH eggplant seeds are open pollinated varieties, we also suspect contamination of the Waimanalo line has affected plant vigor and productivity. With the help of Mr. Clyde Fukuyama, we were able to obtain a 2004 version of Waimanalo Long. We were also able to locate the 2002 version of Waimanalo Long and a 1996 version of Nitta. We then replaced the Nitta (Tolentino) parent with the 1996 line.





Work began in 2015 to re-establish the Waimanalo line and bring it back to its original vigor. Noteworthy, a similar effort was performed in 2013 when we discovered variation with the Molokai parental line. With the assistance of Mr. Steve Fukuda and Susan Migita that line has been recently re-established. Field trials were re-established to assess the new hybrids and their vigor.



A dedication of effort and resources are needed to maintain the purity of parental lines from this point on. *In 2017, the parental lines were re-established. Sales re-opened and farmers were able to retain market share.* Currently, there are limited seeds remaining. We will continue to screen varieties to determine if we should offer the Wai (02) x Nitta (96) or the Wai (04 x Nitta (96) in 2018 and beyond.

**LONG TERM PROBLEM:**

UH CTAHR has not had a dedicated horticulturalist involved with the ADSC seed program since Richard Sakuoka's retirement. To service commercial agriculture producers with a consistent and quality product, there is an eminent need to devote additional time, resources and manpower into maintaining the parental lines of important UH CTAHR produced seeds to retain key horticultural characteristics and genetics.

Three different Nitta parental lines yielded varying results: Wai x N (Nitta parent from W. Tolentino), Wai x N (Nitta parent from Poamoho), and Wai X N (Taiwan produced hybrid).

For homeowner sales, the differences are subtle. But on a commercial scale, the differences are significant. This quality control issue caused significant economic damage to a devoted collaborator of CTAHR. We hope there is continuing interest by eggplant farmers and UH CTAHR to bring the original genetics of the parental eggplant lines back to where they were in 2008.

If CTAHR wishes to continue in offering high quality seeds in support of our local farming industry, a seed specialist should be high priority for the college. The seed specialist's responsibility would be to continually monitor and adjust the horticultural characteristics of open pollinated plants for quality controlled seed production. The lack of a dedicated seed specialist could be the culprit of the seed quality management issues of open pollinated parental crops used to produce many of CTAHR's seeds for sale, such as eggplants, sweet corn, leafy greens, etc. Without such commitment, the impacts of the supplemental funding we received to identify new vegetable varieties for commercialization is wasted.

**Notes:**

CTAHR's Nitta long eggplant variety is an open pollinated long eggplant cultivar discovered by a Waianae eggplant farmer. It was given to CTAHR by Mr. James Nitta who made selections from a local variety he grew. Nitta remains a popular and productive eggplant variety used by many Hawai'i farmers. Waimānalo Long is an open pollinated cultivar developed by CTAHR. It is a hybrid between Takii Long Black and Moloka'i Long. Molokai Long is an open pollinated variety. It is suspected to be a local selection from a variety most likely introduced to Hawaii via Asian immigrants that came to work on sugar/pineapple plantations. Nitta, Waimānalo Long and Moloka'i Long are the common parental lines utilized at CTAHR today. Tolentino long eggplant is a variety offered to CTAHR from Warlito Tolentino a Waianae eggplant farmer for hybridization.