

SPECIALITY CROP BLOCK GRANT PROGRAM- FARM BILL

GUAM DEPARTMENT OF AGRICULTURE

FINAL PERFORMANCE REPORT

AMS Agreement 12-25-B-1223

Project Coordinator
Ricardo Lizama
Agriculture Development Service
Tel. 671-300-7972
Email: rilizama@yahoo.com

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**In Vitro Propagation of yams for Guam's local production
Agreement 12-25-B-1223
Final Performance Report
12/16/14**

Project Summary

Yam has been an important food staple in Pacific islands since the first inhabitants settled them from Southeast Asia thousands of years ago. Today many varieties of yam are known. The Secretariat for Pacific Communities, or SPC, maintains a collection of yams in tissue culture, and makes stock plants available to the islands in the region.

Local varieties on Guam require tall trellises for good tuber production. Other Pacific varieties are known today that produce well even when grown on shorter trellises. Trellis size is directly proportional to cost, of course. Furthermore, taller trellises are more susceptible to wind damage.

In September 2012 we imported to Guam 14 varieties of disease-free, short-trellised and anthracnose-resistant yam from SPC. Today in 2014 we have 5 varieties of yams, which are easy to grow, produce good quality tasty and decent size of fruits and are resistant to anthracnose. Local growers have an access to disease-free planting material of short-trellised yams, which can be produced more economically.

This project started in 2011 and will be finalized in 2014 but yams cultures will be maintained in tissue culture lab, in the nursery and in the field.

Yes, it partially did. This project used facilities, tools and equipment that were purchased from previous projects. Its availability allows DOA to continue work initiated by SCBGP in 2015.

Project Approach

In September 2013 (after one year delay) we have received 14 yams varieties and we were able to established most of them in tissue culture for further propagation. The shipment was delayed because the SPC laboratory was out of most yams varieties that we needed.

Delayed import resulted in delayed employment of technician which consequently a resulted in quite large salary savings. We requested permission to use \$15,000.00 to build a tropical greenhouse, \$3,000.00 for supplies, \$5,650.00 to attend the International Horticulture Congress in Brisbane. We also moved \$14,000.00 from

fringe benefits category to salary category and hired part time employees in last year of this project.

All 14 varieties were propagated in tissue culture and produced hundreds of plants available to farmers. Plants were anthracnose resistant but regrettably susceptible to local rust diseases. Growers who planted them were initially satisfied, however unusually large amount of precipitation in 2013 and 2014 resulted in outbreak of diseases that practically destroyed all planted plants. The same occurred in DoA nursery and resulted in huge losses of planting material. Since most of growers could not harvest any meaningful amount of yams, they lost interest to plant yams again. In the same time DoA lost the most of planting material and overall project was completed only with limited success. It was also discovered that Guam's soils are not conducive to imported varieties of yams.

Goals and Outcomes Achieved

- Over the last 2 years we imported 14 new varieties of yams (one was from Africa, 7 from Papua New Guinea and 6 from Vanuatu). Imported germplasm will be maintained by Guam's Department of Agriculture for future use.
- Only 5 of the varieties, one from Africa, one from Vanuatu and three from PNG were established in tissue culture as well in the field. Remaining 9 varieties were unsuccessful to establish or were lost in the field due to wild animal damage.
- AF 01 was the most successful variety to propagate in the tissue culture and in the nursery. We started with several plants and then propagated hundreds of plants in tissue culture. Most of them were later transferred to the nursery and to the field. This variety is especially valuable because of its semi resistance to anthracnose, desired shape and size, as well as excellent taste. Local population desires tubers of this variety.
- PNG 12 was also easy to grow in the pots as well in tissue culture and in 2013 we have propagated a few hundreds plants. However, most of them showed susceptibility to fungal diseases and many of them were unsuccessful in the field. In addition, this variety is not appreciated local people because of black skin after cooking. We still keep several plants in tissue culture as well at the nursery and filed with the intension to revisit suitability of cultivating this highly yielding variety.
- PNG 22 was more challenging to propagate but eventually we got almost 100 plants in the early 2013. We keep many plants at the nursery and in the field. They grow quite well and we were able to harvest some. We have conducted preliminary taste tests (mostly among workers at DOA) and results are promising. These varieties will be recommended to local public at the future workshop.

- PNG 59 was similar to PGN 22. After challenging initial propagation and fine-tuning our propagation techniques until the end of 2013 we were able to produce 100 plants. About 20 were planted in the field and produced above average crop. We were able to harvest them and conducted taste assessment at Guam's DOA with a good responses from the workers.
- VAN 70 came badly contaminated but managed to clean it and produce 100 plants. It is a significant variety because of its excellent taste and good yield. Unfortunately, it is susceptible to anthracnose that presently makes it unsuccessful for back yard cultivation. We planted VAN 70 in the field and harvested 30-40 tubers. The taste was outstanding but the yield was very small and tubers were skinny. Overall this variety was not appreciated among our workers. We keep germplasm as useful for possible future breeding.
- Most of the varieties that responded well to Guam's climate and soil and were appreciated by workers at the DOA are still maintained in tissue culture, at the nursery and field. We will harvest them and afterwards we will conduct a workshop to introduce all of them to local people. We plan one workshop conducted together with taro and bananas, other project funded by SCBGP.
- We have built a tropical greenhouse. This needed facility will allow to keep yams plantlets in adequate conditions. We will control the intensity of light and amount of water during periods of heavy rains.

In 2014 Alicja Wiecko attended International Horticulture Congress held in Brisbane, Australia where she presented results of SCBGP projects (including this project). She also attended several related symposia such as "Root and Tuber Crops: Sustaining lives and livelihoods into the Future" and participated in round table discussions with regional (mostly Pacific) colleagues.

Request for travel to the conference to Brisbane Australia was submitted to SCBGP and approved within request for budget change (please see attached).

- In collaboration with Guam's Cooperative Extension Service as well local newspaper we made several announcement related to new yams varieties available to farmers. We emphasized mostly the varieties resistant to damaging fungal diseases. Responses from farmers were poor, from back-yard growers somewhat better. Most of Guam's farmers cannot manage the harm done by wildlife on their fields. The number of wild pigs on Guam is high and pigs go after yams quite early after planting. Consequently, in most cases, wild pigs damage plantations before any considerable crop can be harvested. Some back-yard growers indicated difficulties related to soil. Many say that yams are not growing well in their coral type of soil and

growing taro is more profitable than growing yams.

- Overall we distributed a several hundreds plants to the public. Production of yams increased and several farmers are making little profit.

The goal to make clean planting stock of disease resistant yams available to local growers was not adequately achieved. It was impossible to overcome important challenges related to disease outbreaks influenced by weather patterns, wild live damage, detrimental soil conditions etc. All these resulted in diminished desire to cultivate yams on Guam. Target that at least 10% of growers would plant new cultivars was not achieved. However, DoA maintains several new imported varieties that are superior to previously available varieties (before SCBGP was initiated) and hope that some growers will try again in the future and achieve meaningful success. Despite of somewhat discouraging results of this particular project, knowledge and experiences were gained and hopefully would result in future progress on yam's production.

BENEFICIARIES

Farmers.

Three farmers took hundreds yams varieties and planted them in the field.

Homeowners.

In the last year approximately one hundred people got the new varieties of yams. They liked the fact that all of them are disease free, resistant to anthracnose and short-trellised which are perfect for their small back yard gardens.

LESSONS LEARNED

We learned that local residents are interested in opportunities to obtain new varieties, especially resistant to devastating diseases on Guam.

But we observed that most popular local varieties are still their most favorite one and they would grow them despite losses and difficulties. The massive problem with wild pigs stopped farmers to grow yams on a large scale. Some invested significant amount of money to fence their plantations. In addition to wildlife challenge, weather on Guam is non predictable and typhoons can be catastrophic.

We found that many are reluctant to invest in yams because of risky outcome. Over the last several decades anecdotal evidence (presented by

farmers and general public) blamed deficiency of suitable varieties for lack of yams on Guam's market. This project has proven that other factors both biological and economical have substantial influence on yams production. Suitable varieties are available and will be kept until other conditions will alter and hopefully favor production of more yams on the island of Guam.

We also found out that many varieties that were very promising with potential to be desired by local market, did not respond well during tissue culture propagation. Some of them did not adopt well at the nursery and/or in the field showing many fungal diseases. Yield was also not as good as we expected with typical size of a tuber "too small" (in opinions of DOA local workers). Another challenge on DOA field was with wild chickens eating the new shoots of yam plants. We had to cover the whole plantation with a net and often repair it. We also had to deal with damage done by the wind and heavy rain.

The goal of this project was not adequately achieved as well as the target of 10% was not accomplished. The lesson learned is that improvement is welcomed only if very sizeable. Growers tend not to adopt moderate improvements and prefer to cultivate varieties they understand and know for years.

Submitting this project we have anticipated dramatic improvement in yam's yield but combination of unfavorable circumstances resulted in only little improvement. Improvement was insignificant for growers to change their farming practices.