

SPECIALITY CROP BLOCK GRANT PROGRAM- FARM BILL

GUAM DEPARTMENT OF AGRICULTURE
FINAL REPORT

AMS Agreement 14-SCBGP-GU-0014

Project Coordinator
Ricardo Lizama
Agricultural Development Service
Tel. 671-735-3950
Email: rilizama@yahoo.com

Starting date: 09/2014

Education and Training of Local Workforce Through Tissue Culture Production of Healthy Bananas on Guam.

**Agreement 14-SCBGP-GU-0014
Final Report
Submitted on December 20, 2017**

PROJECT SUMMARY

Commercial production of bananas has been restricted because of limited availability of clean, disease free planting stock. This challenge was overcome by substantial achievements of successful SCBGP project conducted several years ago that allowed an establishment of efficient tissue culture laboratory at the Department of Agriculture. Creation of the lab, adequate plant nursery and adjacent facilities permitted the initiation of the second phase of this effort, i.e. to develop sustainable tissue culture services that could permanently replace activities funded by this short term grant from SCBGP. Hence, facilitation of *in vitro* commercialization became the focus requiring both education and training of the local workforce. This goal was not only achieved but also exceeded.

Project Approach

The objective was to reach the largest possible group of potential work force by introducing the subject of tissue culture plant propagation and employment opportunities

at numerous local events. Initially, several groups of university students (ranging from 18 to 20 persons) learned basic process and techniques of bananas propagation *in vitro* during 3-hour training sessions conducted by Ms. Alicia Wiecko.

In 2015 SCBGP project hired two part time students at the tissue culture laboratory who learned (through hands-on) the entire process of banana propagation. In 2016, SCBGP hired three university students as summer apprentices at the tissue culture laboratory who worked part time and also learned (through hands-on under professional supervision) the entire process of banana propagation in tissue culture. Similar to part time students hired in the previous year, all summer interns achieved excellent results and at the end of their apprenticeship and they completed their projects producing plants entirely by themselves.

The goal of producing 3,000 disease-free banana plants (mostly Macao, Manila, Williams, Dwarf Cavendish, FHIA 01, FHIA 02 and FHIA 03) have been achieved. We were very fortunate to hire several interns that greatly surpassed our expectations. Initially it was intended that they work for 6-8 weeks and acquire skills to produce 20-30 plants in tissue culture (possibly have time to transfer them to the nursery). In fact, they produced over 100 plants and one of them remained employed (not as intern but part time worker) until the next summer. Over that time, she managed to produce several hundred plants (not only bananas) and mastered her propagation skills to the professional level. Other two students, after completing internship, were visiting our lab several times and developed amiable relationship with us, hence, they became a pool of potential lab employees. In addition to students, regular lab employees worked on this project as well and produced over 2,000 plants in 2016 and 2017. All plants produced in the tissue culture were cultivated in the adjacent nursery and then distributed to local growers.

Goals and Outcomes Achieved

In 2015, 2016 and 2017 groups of University of Guam agriculture/horticulture students completed several labs to learn tissue culture techniques. We have presented our program, explained its importance and taught them basics of tissue culture propagation. All students were exposed to fundamental techniques of bananas propagation *in vitro*. Pre-activity survey tested student's knowledge associated with tissue culture propagation methods. Overwhelmed majority of students have not heard about tissue culture as a method of quick and ample plant propagation. Nobody ever heard about agar growing medias, necessity for setting up and maintaining sterile laboratory and economical importance of tissue culture propagation in horticulture activities. According to post-activity survey all participating students understood principals of tissue culture, knew its purpose and advantages. Their knowledge increased way above targeted 50%. More aspiring (about half in a group) who practiced hands-on could successfully prepare growing media, propagate plants by placing microscopic pieces of banana tissue on agar media and stimulated their growth. Several students took advantage of extra credit opportunity, worked in the lab after hours and produced bananas that were later distributed to local farmers.

As already mentioned, in 2015 and 2016 SCBGP project hired university students at the tissue culture laboratory who worked as apprentices and part time hires. The knowledge of university students was tested prior and toward the end of their work experience. Pre-activity and post-activity survey tested student's knowledge associated with laboratory environment in general and specifically in tissue culture propagation methods. Their initial knowledge was sketchy and skills were very limited. After several weeks our interns achieved excellent results and at the end of their apprenticeship all of them completed a project producing plants entirely by themselves.

Student workers (part time hires and apprentices) as well as larger groups of university students taking classes fulfilled Goal 1: to educate students in producing healthy banana plants in tissue culture and also fulfilled Goal 2: to educate and train 12 to 15 workers with skills desired by commercial tissue laboratories.

In 2016 and 2017 Middle School students toured laboratory and nursery learning about tissue culture propagation about importance of bananas and horticulture science in general. Unfortunately, high school students were unable (not sufficiently matured) to develop skills of propagation.

In 2015, 2016 and 2017 about 20 local citizens from Guam were visiting Tissue Culture Laboratory to ask questions and learn how plants could be propagated *in vitro*. They always received very cordial treatment and if possible were given an opportunity to visit facilities. Results achieved on Guam were presented at the American Society of Horticulture Meeting held in Atlanta, GA and International Banana Congress held in Sydney Australia.

At the beginning of this project, local TV station filmed activities performed by tissue culture lab and presented a short program to the public multiple times over the period of one year. During UOG Charter Day and Department of Agriculture Organic Festival, Ms. Alicja Wiecko presented "Different way of propagating plants" to a large group of people (farmers and general public). During the second and third year similar activities were conducted with more university students and high school students involved in the program.

Beneficiaries.

The main beneficiaries of this projects is Guam's agriculture industry, mainly nurseries, that gained ability to expend their endeavors to include production of healthy banana seedlings in tissue culture laboratories. Several years ago, setting up a considerable production of banana plants in tissue culture by any commercial nursery was not possible because local work force did not exist. Now, about 15-20 people on Guam have sufficient skills to perform required tasks. These 15-20 people are beneficiaries of SCBGP. Their acquired skills are unique on Guam, which makes them competitive on the job market. Their skills allow them also to start small business and with minimal investment to create

a job bringing moderate income and potential for further growth. Another group of beneficiaries are university students. General laboratory skills and experiences gained during apprenticeships or part time employment made them competitive for scholarships and graduate school programs. Competitive graduate programs at UC Berkeley, Virginia Tech and North Carolina State University accepted three of our students.

Lessons learned.

Several years of propagation of healthy bananas in tissue culture (this project as well as previous SCBGP project) completely changed local banana production practices. Until very recently, for generations, local people propagated bananas by transplanting suckers from selected desired plants from their neighbor field to their own field. Unintentionally they also transmitted diseases and pests as well as genetically fragile material between plantations and overall produced the crop of low and inconsistent yield. Presently, thanks to SCBGP successful projects, nearly nobody attempts to propagate bananas in old-fashioned way. Most of banana growers on Guam appreciate The Tissue Culture Lab and Nursery at Guam Department of Agriculture as the only reliable source of healthy plants.

We learned that scrupulously targeting a specialty crop such as banana along with providing comprehensive education as well as fully reliable and better planting material has potential to change agricultural practices within a short period of time. Guam growers desire tissues cultured bananas because they acquired reputation of superiority. After our program is terminated establishment of commercial tissue culture service would likely fill up the void. We are confident that Guam has enough skilled work force to meet that demand.