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Postharvest Institute for Perishables

COMMENTS AND SUGGESTIONS ON THE
TROPICAL AGRICULTURE RESEARCH SERVICES
(SIATSA)

for the
U.S. Agency for International Development
Tegucigalpa, Honduras

by

William E. Bolton

for the
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Addendum

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Tropical Agriculture Research Services (SIATSA)

This one and only agriculture research center cannot be permitted to go up in smoke. If a monetary value could be placed just on the files alone, it would have to be in the many millions area. Once only a research arm of the UBCo. Banana and African Palm Oil Divisions, SIATSA became a most diversified research and outreach service organization offering expertise to the agriculturists of Central America principally.

Although SIATSA's contributions to the development of improved varieties of rice, corn, sorghum (milo), soybean, peanut, cowpeas and many others have been documented (as have their efforts in numerous other fields), their contributions to the banana world economy is something that only a few have any idea of. The magnitude of their contributions (self-assisting also) has gone virtually unknown and totally unassisted by their competitors, large and small; banana farmers worldwide, large and small; banana growers and brokerage associations; and even to the final consumer.

When the economic/financial weight of the banana industry is examined, particularly from the point of Honduras and Central America, the importance of this research center becomes clearer. Of the 40 million metric tons of bananas now reported as total world production, 7 million tons are exported. Of this total world export figure, 80% is exported from Central America, Ecuador and Colombia. Over 5.5 million tons equal to 378 million boxes of bananas are exported from this area each year. Banana production in Central America is a multibillion-dollar industry that will continue supplying jobs to thousands for years to come.

Black Sigatoka is today costing banana growers \$1200 per ha. each for only partial control. Plantain exports from Honduras just a few years back were over 600,000 boxes - this year estimates indicate less than 5000 boxes will be the total for 1983.

SIATSA has a number of potentially more effective and less expensive fungicides under investigation. They are also testing every batch of cement for a new hydroelectric dam, El Cajón, under construction. They also assist U.S. and other seed companies with the tedious and complicated field trials involved in developing new and/or improved varieties of seed. Chemical companies, agricultural machinery and equipment companies as well as growers have all benefitted from SIATSA services.

A diversified experimental farm (2) including a foundation seed program for basic and other grains, oilseed crops plus fruits and vegetables was a large undertaking assumed by SIATSA. This has been completely discontinued as of this year.

Dr. Phil Rowe's article for the press in laymen's language is as follows:

"Imagine a world without banana splits, banana cream pie or that wholesome snack of the fruit which the British statesman Benjamin Disraeli called the most delicious thing in the world.

"It almost happened. In fact, the Gros Michel banana, the variety upon which the trade was established and which was still the only banana exported from the tropics just 30 years ago, now cannot be planted for commercial production. It is susceptible to a soil borne fungus called Panama disease which kills the plants. From 1920 to 1960, approximately 100,000 acres of bananas were abandoned due to this disease.

"Bananas are unique among food crops in that the varieties grown are products of natural evolution. This means that the commercial banana, in contrast to practically every other food eaten by man, has not been improved over its natural state by controlled genetic manipulation. Fortunately, when continued cultivations of Gros Michel became impossible, the Cavendish variety which for some unknown reason is not affected by Panama disease could be planted as a substitute. With this change of varieties, the more delicate Cavendish fruit had to be shipped in boxes and the traditional whole stalks of Gros Michel bananas hanging in the supermarket were replaced by displays of individual clusters of fruit.

"But what happens if a new form of Panama disease or some other disease suddenly appear and destroys the Cavendish banana? Nature has not provided an alternative to this variety. United Brands Company, with its banana breeding program in Honduras, has picked up where nature left off. This is the only scheme in the world currently involved in the development of new banana hybrids.

"This endeavor to improve bananas by cross pollination and selection of superior hybrids was begun in 1959. Some 850 genetically different plants were collected from Southeast Asia, the center of origin of bananas, and shipped to the Honduran experimental station. Sources of genes for resistance to various diseases and other genetic traits were readily identified in this diverse collection of plants.

"For the cross pollinations made to combine the different desirable qualities of individual plants into one plant to be successful, these pollinations must result in seeds from which the hybrid plants are grown. The banana breeder must produce seeds in a seedless fruit, and from these seeds grow a plant that produces fruit without seeds.

"In approaching this assignment, the Gros Michel variety again becomes very important. It is the invariable female parent in all cross pollinations made to produce new commercial hybrids. (For breeding purposes, Gros Michel is replanted frequently to avoid the perils of Panama disease). Thus, banana breeding consists primarily of developing the other plant with the desired disease resistance and agronomic properties for using as a male parent in cross pollinations onto Gros Michel.

"The genetic peculiarities of bananas make it impossible for the banana breeder to freely choose the male and female parents for a cross pollination as is common in the genetic improvement of other crops. Consider that practically all plants and animals are diploids. This means they have two sets of chromosomes, the carriers of genes which regulate inherited characteristics. Both the mother and father, upon reproduction, give one set (or one-half) of their chromosomes to the progeny and this cycle is repeated generation after generation. Not so with the banana.

"The plants used as male parents to cross onto Gros Michel have two sets of chromosomes and behave normally during reproduction by giving one set to the progeny. But Gros Michel has three sets of chromosomes and an unexplained phenomenon occurs upon reproduction. Gros Michel, instead of contributing one-half of its chromosomes to its progenies contributes all three sets intact. Thus, crossing onto Gros Michel produces progenies with four sets of chromosomes, the one set from the male parent plus the three sets from Gros Michel.

"This genetic abnormality of Gros Michel is what makes banana breeding possible. It is the only variety with three sets of chromosomes which produces seeds (an average of one seed per 100-pound bunch) when pollinated and which gives all three sets of chromosomes to its progenies. These extra sets of chromosomes provide the genetic stimulus necessary for the desired fruit size in new hybrids. The male parents with only two sets of chromosomes have slender fruit which never develop to acceptable size. By selecting male parents with genes for female sterility, these hybrids with four sets of chromosomes are seedless and can be evaluated for their potential as new bananas.

"Over a period of twenty years, some 200,000 hybrid seedlings have been evaluated in search of the perfect plant for using as the male parent in crosses onto Gros Michel. This male parent must be resistant to Panama disease and have the desired agronomic qualities such a large bunches. Ideally, this plant would also be resistant to nematodes (almost microscopic parasitic worms which eat the roots) and Sigatoka disease (a fungus which cause defoliation by killing the leave). Control of the latter two diseases is currently a multimillion dollar annual expense in banana production.

"The most difficult, and most rewarding, achievement to date has been the transfer of genes for nematode resistance from a plant which has no pollen and very sparse seed development into a more fertile plant. The pollination of some 10,000 bunches of nematode resistant plant which was brought from Southeast Asia resulted in only one useful progeny. But this progeny is not only resistant to nematodes. It is also highly resistant to Panama disease and

Sigatoka disease. And it has pollen and seeds which means that is readily usable in subsequent cross pollinations for further development of the genetically superior parents for crossing onto Gros Michel. From the standpoint of the banana breeder, a breakthrough of this magnitude is what make attempts to improve on nature worthwhile.

"Just when a new banana hybrid will become a member of the "green revolution" is difficult to predict. But banana growers have learned from firsthand experience that the most important agricultural insurance is to have alternative varieties available. Banana breeding is just a matter of doing what has to be done to make sure that bananas are here to stay."

Many of the major costly problems of the banana industry may be solved or dramatically reduced within 5-6 years. Dr. P.R. Rowe, plant breeder in charge of the banana breeding program, is projecting a new hybrid resistant to Black Sigatoka and to the principal damaging nematode. This particular line of breeding was started 24 years ago and will be a success by 1988/89. Other breeders have worked 60 years without obtaining results already realized from this program. By 1988/89 such a hybrid as described would not only be so outstandingly unique but would be the result of an accomplishment never before seen or equaled throughout the banana world.

The economic results from such a revolutionary discovery will be tremendous. Example: conservative estimates predict over 50% of the above-mentioned \$1200 per ha Sigatoka cost would be economized for the entire world banana economy. Similar results will be seen for the plantain industry.

This breeding program alone has cost many millions of dollars. It is most urgent that steps be taken by USAID and UBCo. leaders to sign a letter of intent at the earliest possible date.

Comments and suggestions which resulted from meetings with G.C. Millensted, Director, Doctors H. Stover, P.R. Rowe and others are submitted for consideration.

Board of Directors should be limited to no more than 8, if possible.

Principal donors should definitely become board members.

UBCo. one member only.

USAID one member only.

GOH one member only, MNR preferably.

The 11 MNR outstations were not included in proposed budget.

Do not legally tie this foundation to El Zamorano - a working relationship, yes. It was felt that El Zamorano is and should remain an educational institution. SIATSA should be restructured as an autonomous, private foundation at the earliest possible date!

Their mandate would be set by the board, however, suggestions as to priorities are as follows:

1. basic grains
2. diversification
3. plantain
4. bananas and traditional exports

SIATSA staff has been reduced severely, yet their major works somehow continue.

Repeating for emphasis, this institution is all too important to the overall economics of Central America to let it become a shell and soon disappear. Urgent action is strongly suggested.