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Soybean Breeding and Agronomy in  
Costa Rica

Quy'en Nguyen

ISR-80-13

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International Soybean Program, INTSOY

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TRIP REPORT - Costa Rica

1. Name: Dr. Quyen H. Nguyen  
INTSOY Soybean Breeder and Assistant Professor of Agronomy/UIUC
2. Period of Travel: 25 February - 3 March 1980
3. Itinerary:
  - Feb. 25 - Depart Mayaguez, Puerto Rico  
Arrive San Jose, Costa Rica
  - Feb. 26 - In San Jose
  - Feb. 27 - To Alajuela, Canas, Guanacaste by car with Ings. Hsu and Madrigal.  
Morales and Carillo.
  - Feb. 28 - To Quexos by plane  
To San Jose by car with Mr. J. Jackson and Dr. J. B. Sinclair
  - Feb. 29 - In San Jose
  - March 1 - To Chomes by car with Dr. J. B. Sinclair
  - March 2 - Depart San Jose
  - March 3 - Arrive Mayaguez, Puerto Rico
4. Purpose:
  - A. To evaluate potential for soybean production in Costa Rica.
  - B. To assist Ministry of Agriculture (MAG) and CARE/Costa Rica to select adapted cultivars for Costa Rica.
5. Organizations and Persons Contacted:
  - CARE - San Jose  
Mr. Justin Jackson, Director  
Ing. Francis M. Hsu, Agronomist  
Ing. Hector Madrigal, Agronomist
  - MAG - San Jose  
Ing. Eladio Carmona Beer, Director of Investigaciones Agricolas  
Ing. Adrian Morales G., Agronomist, Soybean Selector  
Ing. Orlando Carillo, Inspector, National Seed Office

5. Organizations and Persons Contacted (Cont'd.):

Fabio Baudrit Station - La Garita, Alajuela

Ing. Primo Luis Chavarria, Station Director  
Ing. Efren Vargas Mendez, Agronomist

Enrique Jimenez Munez Station - Canas

Ing. in charge of the storage facility

Peace Corps - Quepos

Mr. Daniel Whitehair, Agronomist

US/AID - San Jose

Mr. John A. Fasullo, Deputy Rural Development Officer

Soybean Farmers

Sr. Oscar Ortiz, Quepos  
Sr. Guillermo Aguilar, Finca San Augustin

Soybean Processing Plant - San Jose

Planta de Extrusion Costa Rica

University of Costa Rica - San Jose

Main campus

6. Observations:

The following observations are based on information and reports collected from CARE/Costa Rica, Ministry of Agriculture (MAG)/Costa Rica, and other sources, and on personal observations, contacts, and conversations with Costa Rican officials, farmers, and students in the representative regions visited. These regions included Canas, Guanacaste, La Garita, Alajuela, Quexos, and Chomes.

Strong indications were received that soybeans are agronomically feasible in some areas of Costa Rica. There have been experiments with soybean varieties and planting dates, but these have not been sustained continuously. Seed stocks and collections already available had not been maintained. Therefore, a new working germplasm collection needs to be requested to support the national breeding program since soybeans have a narrow belt of adaptation. It is not desirable to always depend upon varieties introduced from other countries. Furthermore, a local soybean seed multiplication and distribution system needs to be developed for farmers, keeping local conditions in mind rather than importing planting seeds annually.

From 1969-1973, oilseeds were imported primarily from Nicaragua, Colombia, U.S.A., Guatemala, Honduras, El Salvador, Mexico, West Germany, and Argentina. In 1972 alone, the value of these imports mounted to U.S. \$2,500,000.

Thirteen years ago (1967), a program of selection was started with varieties from Groups VII and VIII in the regions of Parrita and Guanacaste. The varieties Bragg 66, Semmes, and Bienville were selected.

In 1970, Dr. W. T. Tang recommended the varieties Wakashima, Chung Hsin-1, CH 2, Shih Shih, Tainung 2R, Tainung 3, Tainung 4, NTU - Kaoshiung 5, and Sankua. (Of these, Wakashima, Shih Shih, and Sankua were also coincidentally selected and released in Viet Nam South in the 60's as leading varieties.)

Dr. Hartwig suggested PI 240.826 (from the Philippines) and PI 274.454 (from Okinawa).

Ing. Hsu, the present CARE/Costa Rica agronomist, brought into the country a collection of more than 300 cultivars from Taiwan as a Chinese Mission member in the 70's. Unfortunately, the collection was not maintained properly and no results of their performance is available.

Past results have indicated that Group VII cultivars were best adapted. Yields of 1.15-3.01 T/ha were obtained with Bragg 66; 0.72-3.53 T/ha with Semmes; 1.15-2.60 T/ha with Improved Pelican; and 1.00-3.50 T/ha with Biloxi.

In addition to the introduction by Hsu, there were 62 cultivars and PI's introduced from Formosa, U.S.A., Uganda, South Africa, Angola, Philippines, Okinawa, Mexico and Nigeria during 1967-1972, thanks to FAO, CARE, USAID, USDA, and other sources.

In July of 1979, CARE/Costa Rica imported about 35 tons of Jupiter variety seed and 193 kg of inoculant to support 200 ha contracted with demonstrator-producers. These seeds were planted in the August-September season.

A very important event took place in June 1979, when the President of the Republic of Costa Rica, Lic. Rodrigo Carazo Odio, personally inaugurated the "Low-cost Extrusion Cooking Plant" in San Jose. Among the platform guests were the President of CARE, Costa Rica's Ministers of Agriculture and Health, the Director of USAID, and other dignitaries. Soybeans were then officially made a part of Costa Rica's "Basic Grains Program" and approved by major banks of Costa Rica for credit. It should be noted that the participating farmers selected by CARE ranged from small (1-5 ha of soybeans on farm holdings of 2-50 ha) to medium and large farmers (5-40 ha of soybeans on farm holdings of 200 ha or more).

Climatic conditions are favorable for commercial production. However, a unique distribution of rainfall in the Guanacaste region will influence the time of planting. There is considerable risk with the May and June plantings because wet conditions at harvest time in September, October and November decrease yields 10-30%.

Soybean research is now underway at both MAG and the University of Costa Rica, where variety introduction and date of planting trials with tropical soybean varieties are being conducted. So far, no soil fertility or soybean inoculant research has been done. Problem acid soils have not been investigated. However, MAG is expanding its program to encompass production technology and

practices, including planting densities, soil fertility, and control of weeds, insects, and diseases. There is interest in elevating research in short cycle oil crops (including soybeans) to a separate activity, rather than a secondary area of study within other crop programs.

7. Recommendations:

A. Variety selection

Results of past work by MAG have showed that Jupiter, Improved Pelican, Clark 63, UFV-1, and Siatsa 194 have stable good performance. A black seed coat cultivar, Negra i SPS-25, has been shown to be well adapted to Costa Rica. Bragg, Hill, Acadian, Biloxi, and Lee all yielded above 2 T/ha in a 1971 trial carried out at Enrique Jimenez Station, and Hardee yielded over 3 T/ha. Bossier, Williams, SJ-2, Rillito, CH-3, Orba, and Acc 2120 all yielded well in both May and November plantings. Observations are based on an INTSOY ISVEX trial planted at the Enrique Jimenez Station on 19 November 1979. Jupiter, Improved Pelican, Hardee LS and Negra SPS 25 could be used for initial field production.

New accessions can be made available through INTSOY/Puerto Rico along with breeding lines at F<sub>6</sub> and F<sub>7</sub> generations. Some F<sub>2</sub> and F<sub>3</sub> segregating material from crosses made in Puerto Rico for resistance to green stink bug (Nezara viridula) can be sent to Costa Rica for screening if the INTSOY Entomologist and breeder can assist in evaluating lines at the appropriate stage. The Costa Rican soybean selector can be trained in the rating and selection. Costa Rica has a serious problem with stink bug and is closer to Puerto Rico than Thailand or Sri Lanka, which are also troubled with Nezara damage.

Efforts should be made continually to maintain all germplasm resources available in the country. A few of the best adapted varieties should be entered in agronomic trials.

For the benefit of Costa Rica, INTSOY should send a SPOT trial to Costa Rica. One SIEVE could be sent to Costa Rica, rather than duplicate the Florida site in Texas. The ISVEX should be continued and remnant seed should be preserved by the soybean selector for seed multiplication and as parents for crosses with other accessions.

Two different groups of cultivars are initially recommended:

- (1) For the May-June planting (recommended planted date is June)  
Bossier, Bragg, Williams, Hill, and Negra SPS-25.
- (2) For the August-September planting (recommended planted date is August)  
Improved Pelican, Jupiter, Siatsa 194, Hardee Late Selected, Ecuador 1, Acc 2120, and Santa Maria.

Basic breeder seed stocks of Hardee Late Selected, Ecuador 1, Acc 2120, and Santa Maria can be obtained from INTSOY, Isabela, Puerto Rico.

The January, February, and March months are not recommended for planting based on observations made in Chomes, where the Jupiter cultivar flowered in fewer than 30 days and only reached an average height of 1.6m.

Soybeans can complement the existing cropping pattern. At the present time in the Guanacaste area, the crop year rotations include the following: rice, rice-sorghum; sorghum-sorghum; cotton; maize-sorghum; and soybean. However, the following rotations are possible: soybean-maize; soybean-sorghum; and soybean-soybean. More applied research is needed to support alternate rotations.

The report of J. B. Sinclair should be consulted for a discussion of the disease situation on soybeans.

#### B. Seed production

The National Seed Office can carry out soybean seed production with their experience gained from other crops. Inspector Orlando Carillo is interested in this task and could be assisted by Ing. Morales upon his return from training in Puerto Rico. Infrastructure for seed production and seed storage is adequate at the Enrique Jimenez Munez Station in Canas, Guanacaste area. In fact, a sophisticated new low temperature storage facility has just been completed at the station, technically assisted by Mississippi State University and financially supported by Venezuela. The manager in charge has allocated space for 100 metric tons of soybean seed out of the 200 metric ton total capacity.

Present leading varieties such as Jupiter, Improved Pelican, and breeder stocks should be increased on a large scale. At full flowering stage and at maturity, varieties should be rogued to discard off-type plants. The soybean selector should supervise roguing. Not more than 0.1% varietal mixture should be permitted. This foundation seed should be used for certified seed in the next seed increase step on government stations throughout Costa Rica or planted by selected farmers who are competent and reliable in roguing and proper care of the field. Agronomists from MAG and CARE should visit and assist the cooperator-farmers. After harvest, the seed lots should be analyzed for varietal mixtures and germination. Not more than 0.5% varietal mixture should be permitted. Germination should not be less than 80%.

Starting with one ton to plant 10-20 ha in the first season, this basic stock should yield about 10-20 tons of seed. Ten tons of foundation seed will plant about 100-200 ha, which should then yield around 100-200 tons of certified seed, depending on the severity of roguing and acceptance of fields for seed production.

#### C. Staffing

It is recommended that 100% of the time of the soybean selector, Ing. Adrian Morales, be assigned to soybean work. At present, 30% of this position is assigned to soybeans and that amount is not adequate time to organize and carry out a strong selection program.

Additional manpower for soybean improvement should be assigned from presently available scientists in many disciplines. The INTSOY Soybean Breeder and other INTSOY scientists can assist through visits and consultation trips at least twice a year. The Center for Tropical Agricultural Research and Education (CATIE) is located at Turrialba and could cooperate with MAC in sharing facilities and consultancy visits by scientists.

D. Training and Orientation for Soybean Selector

The proposed development plan for suggested time and date of visit of the Costa Rican Soybean Selector-Breeder to Puerto Rico in 1980 and 1981 seems feasible. The chosen candidate for this assignment, Ing. A. Morales, would benefit more if his fluency in the English language is improved. A stopover at Gainesville, Florida, Stoneville, Mississippi, or Beaumont, Texas to visit USDA and university soybean programs could be made on the way to or from Puerto Rico. Additional funds should be provided for books and journals for the soybean selector. A complete set of INTSOY publications should be sent both to the selector and to the MAG library in San Jose.

E. Acknowledgements

Appreciation is expressed to Mr. Justin Jackson and Ing. Hsu, CARE/ Costa Rica, who generously gave their time and attention during my visit.

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*Soybean  
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Soybean - Varieties*

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