IPM CRSP Trip Report

Names of the Travelers: Adrian Ares and R. Muniappan

Dates of Travel: September 22 to 28, 2012

Country Visited: Ecuador

Purpose of the Trip: To review IPM CRSP and SANREM CRSP programs in Ecuador and to develop collaboration between them.

Description of Activities:

September 22: We left Roanoke at noon and reached Quito at 9.45 pm. Victor Barrera received us at the airport.

September 23 (Sunday): Jose Ochoa met with us.

September 24: Victor Barrera, Adrian Ares and Muniappan visited USAID mission and met with Dr. Hugo Ramos, Project Management Specialist, Economic Development Office. We briefly explained the IPM and SANREM CRSPs programs and the projects in Ecuador. He mentioned that the mission is interested in the improvement of potato, coffee and cacao cultivation. He requested that IPM and SANREM keep him updated of new developments and publications. He also expressed his interest to visit INIAP laboratories and IPM and SANREM CRSPs’ sites.

At 11.00 am, we visited INIAP headquarters and met with Dr. Victor Hugo Cardoso, Director of Production and Services, and acting Director of INIAP. We explained activities of both CRSPs in Ecuador and he encouraged the CRSPs to assist small scale agricultural input providing businesses. He mentioned that the INIAP mandated crops are beans, potato, maize, rice, cacao, coffee, plantain, banana, oil palm and Andean crops.

In the afternoon, we traveled to Santa Catalina and had lunch with the Station Administrators and Faculty. Later Muniappan visited Plant Pathology and Entomology laboratories and Ares visited the Soil Science laboratory where he met Soraya Alvarado and students funded by SANREM. In the evening we traveled to Guaranda.

September 25: We traveled with V. Barrera, J. Ochoa, Franklin Valverde, and Luis Escudero to SANREM and IPM CRSPs sites at Alumbre, Chillanes. These sites are located at 1,900 m altitude in mountainous sloppy terrain. In the field we were joined by Aníbal Martínez, César Asaquibay, Moazir Céleri, Patricio Chiriboga (a reporter with the University of Bolívar), Mercy Villares, Juan Arévalo, Mary Cruz Suárez, Ruth Suárez, Olmedo Zapata, Oliver Espinoza, Vinicio Paguy, Luis Ilbay, and Flor Vacacela.

Tree tomato (Solanum betaceum, syn. Cyphomandra betacea): It is grown in about 8,000 hectares in Ecuador and mostly used for preparing juice and jam. IPM CRSP scientists
have found that by grafting desired scions of tree tomato on *Solanum auriculatum* in wet areas and *Nicotiana glauca* in dry areas, resistance to root rot and nematodes is achieved. Grafting also extended life expectancy of the crop. However, some plants showed symptoms of potivirus infestation. Jose Ochoa informed us that he will be getting some assistance from the virus global theme project in identification of the virus(es).

Naranjilla (*Solanum quitoense*): It is a native of north-eastern part of South America. It is grown mainly for its juice. *Fusarium* wilt and nematodes are serious problems in naranjilla cultivation. IPM CRSP scientists have found that grafting desired scions of naranjilla onto *Solanum hirtum* overcome these problems. Naranjilla fruit borer, *Neoleucinodes elegantalis* does not occur in this region.

Maralfalfa (*Pennisetum sp.*): According to SANREM CRSP experiences this perennial grass in rows along the contours prevent soil erosion and provide livestock fodder given it high crude protein content (20% in some growth stages) This species arrived to Ecuador from Colombia and is probably *P. violaceus* or a hybrid.

Other crops grown in SANREM CRSP experiments in the Rio Alumbre micro-watershed are hard maize (from January/February during nine months) followed by an admixture of oats and vetch (*Vicia sativa*) for soil improvement, and then bush beans during 75-90 days. SANREM also promotes plantation of native trees to restore degraded areas.

In the afternoon, we visited Bolívar University’s College of Agriculture and met with the Dean Ing. Olmedo Zapata Illanes, Dean, and faculty (Carlos Monar, Nelson Monar). We explained IPM and SANREM CRSPs’ activities around the tropical world in general and Ecuador in particular. They indicated their interest to participate with both the CRSPs.

In the evening, Ares participated in the evening news of the Chanel 5 TV at Guaranda and explained about SANREM and IPM CRSPs and their activities in Ecuador.

September 26: We visited IPM and SANREM sites at Illangama, Alto Guanujo with V. Barrera, Patricio Gallegos, Escudero, Chiriborga, and three students from University of Bolívar. This site is located at about 4,000 m. Here, we observed two SANREM experimental plots where the rotation is potato (four months), oats+vetch (four months) and barley (six months) to improve overall yields and soil organic matter and nitrogen. In farmers’ fields, this type of rotation or similar one are usually followed by pastures during 4 or 5 years. In another SANREM experiment, 16 treatments of different CAPS and farmers’ practices are bein tested. Rows of lupine (*Lupinus mutabilis*) were planted for soil conservation and N fixation. Also, we visited an IPM CRSP field that is being prepared for potato planting and different strategies to discuss.

September 27: We traveled to a naranjilla field in Tandapi, an area with subtropical climate, with Barrera, Ochoa, and Gallegos. Mr. Jonathan Williams, a migrant from U.S.A. and a future naranjilla farmer also joined us in the trip. The farmer, Mrs. Rosario Rodríguez and her son have been grafting naranjilla onto *S. hirtum* and selling the grafted
seedlings for $1.25 and also using in their farm. Naranjilla is planted at 2.5 m x 3 m. or 2.5 m x 2.5 m. There were incidences of occurrence of naranjilla fruit borer, *N. elegantalis* and late blight. In the past, farmers moved to new fields after cultivating naranjilla for one season in a field due to *Fusarium* wilt. Controlling *Fusarium* wilt by grafting on resistant rootstock has resulted in abandonment of shifting cultivation and saving deforestation of the rain forest. In site we visited, this was the third planting of naranjilla in the same place.

We left Quito at 11.30 pm and reached Blacksburg at noon on September 28th.

**Recommendations:**

It is recommended that the main findings of SANREM and IPM CRSPs' research work in Ecuador be combined to developed integrated packages for cultivation systems for potato, naranjilla, tree tomato and blackberry.

*Potato cultivation package:*

Farmers in Alto Guanujo own on average about five hectares of land. They cultivate potato in about quarter of a hectare and the rest of the land is kept as pasture. Potato cultivation is shifted to different location within the property after one season. We suggest that the following SANREM recommended crop rotation to adopt the IPM package for potato.

The rotation system to be followed:

<table>
<thead>
<tr>
<th>Potato</th>
<th>Oats+Vetch</th>
<th>Barley</th>
<th>Pasture</th>
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<tbody>
<tr>
<td>6 months</td>
<td>4 - months</td>
<td>6 - months</td>
<td>5 - years</td>
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</table>
Minimum tillage will be implemented and oats-vetch residues will be left to decompose in place. Herbicides and fertilizers will be used as needed. For potato fields, the current recommendation is 120 kg N, 240 kg P and 80 kg K per ha and year.

**Potato Cultivation:**

1. Treat soil with Phosphorus-solubilizing bacteria.
2. Treat seed potato with *Tecia solanivora* NPV.
3. Place potato shoots treated with an insecticide in different part of the field and cover them with grass cuttings to attract and kill the residual population of Andean potato weevil.
4. Dig a trench around the field and line it with plastic to prevent immigration of Andean potato weevil from outside.
5. Treat seed potato with *Trichoderma harzianum* before planting.
6. Take up other plant protection practices as needed.

**Naranjilla Cultivation Package or System:**

1. Plant *Pennisetum* sp. or other grass row on the top and every 3 or 5 rows of naranjilla depending up on the slope of the field.
2. Graft desired naranjilla shoots onto *Solanum hirtum* rootstock.
3. Treat roots of grafted plants with *T. harzianum* before planting.
4. Use cover or inter crop such as sweet potato in the lower altitudes.
5. Adopt other plant protection measures as needed.

**Tree tomato cultivation package or system**

1. Plant *Pennisetum* sp. or other grass row on the top and every 3 or 5 rows of naranjilla depending up on the slope of the field.
2. Graft desired tree tomato scions onto *S. auriculatum* in wet areas and *N. glauca* in dry areas to provide resistance to root rot and nematodes.
3. Avoid using scions from virus infected plants.
4. Treat roots of grafted plants with *T. harzianum* before planting.
5. Prune trees a year after establishment.
6. Adopt other plant protection measures as needed.
Blackberry cultivation package or system

1. Plant *Pennisetum* sp. or other grass row on the top and every 3 or 5 rows of naranjilla depending up on the slope of the field.
2. Treat roots of blackberry seedlings or cuttings with *T. harzianum*.
3. Trellis the plants.
4. Adopt other plant protection measures as needed.

**List of Contacts Made:**

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<thead>
<tr>
<th>Name</th>
<th>Title/Organization</th>
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