



Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program

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Trip Report: Ecuador September 22-28 2012

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

Sites visited : Santa Catalina Research Station; Alumbre, Chillanes, Guaranda, and Ilangama, Bolivar Province

Description of Activities

The main purpose of this trip was to explore possibilities of collaboration between SANREM-CRSP and IPM-CRSP, since both programs work in Ecuador in some cases on the same crop (i.e., potato) and with the same host-country institution (i.e., INIAP). Projects for both programs have made significant progress in developing conservation agriculture production systems (CAPS) in steep and high-elevation sites and IPM strategies for controlling important pests. The program directors found a strong interest in collaboration among host-country personnel and institutions. A cropping system including potatoes, oats-vetch, barley and pasture was chosen for future demonstrations involving CAPS and IPM packages applied simultaneously on relatively large areas in selected farms. These packages encompass minimum tillage, crop rotations, trenching, use of biological control agents like *Trichoderma* and other methods. Strategies to disseminate SANREM and IMP technologies among a large number of farmers and to communicate findings to relevant stakeholders were discussed and will be implemented soon.

Our first visit was with Jose Ochoa, plant pathologist for INIAP. The following day we met with Victor Barrera, and Adrian Ares and Muniappan visited the USAID mission and met with Dr. Hugo Ramos, project management specialist, Economic Development Office. We briefly explained the IPM and SANREM CRSP programs and the nature of our 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 in visiting INIAP laboratories and IPM and SANREM CRSP sites.

At 11:00 a.m. we visited INIAP headquarters and met with Dr. Victor Hugo Cardoso, director of production and services, and acting director of INIAP. We explained the 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.

On September 25th, 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 Anibal Martinez, Cesar Asaquibay, Moazir Celleri, Patricio Chiriboga (a reporter with the University of Bolivar), Mercy Villares, Juan Arevalo, Mary Cruz Suarez, Ruth Suarez, Olinedo Zapata, Oliver Espinoza, Vinicio Paguay, Luis Irbay, and Flor Vacacela.

Crops

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 potyvirus 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*): 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 in Ecuador from Colombia and is probably *P. violaceus* or a hybrid.

Other crops grown in SANREM CRSP experiments in the Rio Alumbre subwatershed 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.

On September 26th we visited IPM and SANREM sites at Illangama, Alto Guanujo with Barrera, Gallegos, Escudero, Chiriboga, and three students from University of Bolivar. 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 methods, is usually followed by fallow pastures for four or five years. In another SANREM experiment, 16 treatments of different CAPS and farmers' practices are being 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 found several different strategies to discuss regarding this field.

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

In the evening, Ares gave an interview to the local Channel 5 TV news team at Guaranda, explained the mission of the SANREM and IPM CRSPs and their activities in Ecuador.

On September 27th 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 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 the site we visited, this was the third planting of naranjilla in the same place.

Recommendations

It is recommended that the main findings of SANREM and IPM CRSP research in Ecuador be combined to developed integrated packages for cultivation systems of potato, naranjilla, tree tomato and blackberry. To this end we have developed a "package" to strategize cultivating these crops.

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:

Potato	Oats+Vetch	Barley	Pasture
Jan. - June	Aug. – Nov.	Jan. - June	
6 months	4 - months	6 - months	5 - years

Five Hectare Land Owned by a Farmer

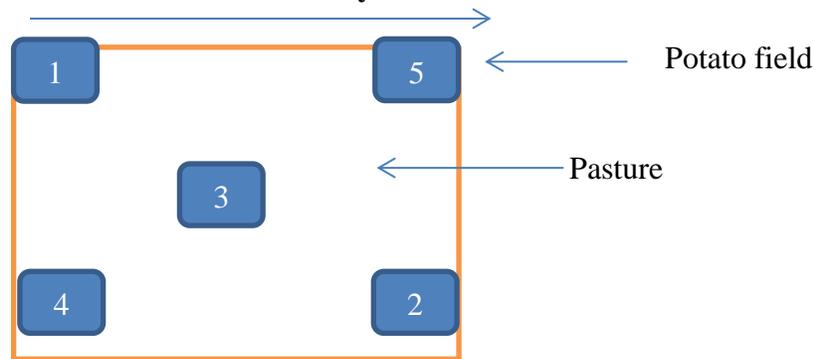


Fig. 1

Note: Numbers indicate location of potato fields shifted after one season of cultivation.

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 narnajilla 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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