

# IPM CRSP Trip Report

## Southeast Asia Regional Project

**Countries Visited:** Indonesia, Cambodia

**Dates of Travel:** February 1-26

**Travelers Names and Affiliations:** Merle Shepard, Gerry Carner, and Eric Benson, Clemson University  
Muniappan Rangaswamy from the Management Entity (IPM CRSP) at Virginia Tech joined us for the Indonesian portion of the trip.

**Purpose of Trip: Indonesia:** The main purpose was to visit two of the national research centers, one for vegetable crops, and the other for coffee and cocoa, and look into the possibilities for collaborative activities with staff from these centers.

**Cambodia:** 1. Establish USAID-CRSP IPM sites with Cambodian researchers, collaborators and growers. 2. Increase contacts and network for future project research and collaboration.

### Sites Visited:

#### Indonesia:

**West Java:** Pelabuhan Ratu, Lembang – Indonesian Vegetable Research Center, Bogor – Institute for Healthy Farming, Bogor Agricultural University – Department of Plant Protection, PT Agrotech Sinarindo, Jakarta – U.S.Embassy - USAID

**East Java:** Jember – Indonesian Coffee and Cocoa Research Center

#### Cambodia:

Phnom Pehn (Kandal Providence)

USAID Office

International Development Enterprises (IDE) Office

Fintrac-HARVEST Program Office

Cambodian Ministry of Agriculture, Forestry and Fisheries

Kien Svay District

Government Kbal Koh Vegetable Station

Siem Reap (Siem Reap Providence)

Pungo Village/Batong Commune

Ovlok Village/Bacong Commune

Kork-Tlork Village/Kandek Commune

Kampong Cham (Kampong Providence)

Boeung Snay Village/Sangkat Sambourmeas Commune

Trapong Beny Village/Baray Commune

### Description of Activities/Observations:

#### February 4-6. Mixed farming area, Pelabuhan Ratu, West Java:

**Rice field area:** Farmers were growing Cassava, Talas (Taro), and a medicinal plant, Katuk, on the rice bunds. Katuk is used by women to improve lactation. There were spiraling white flies and what appeared to be a virus disease on cassava. On the talas, there was an unusual looking small grasshopper that was quite numerous. There were mealybugs on the katuk.

**Mixed fruit crops orchard:** We photographed the following insects on mango, guava, soursap, and banana: tussock moth caterpillar, mealybugs, and scale insects on mango, white fly on guava, and a scale insect and lepidopteran borer on soursap.

#### February 7, 8. Indonesian Vegetable Research Institute (IVEGRI), Lembang, West Java

On the grounds of the hotel where we were staying, we found heavy infestations of the giant whitefly on some of the ornamental plants. We also found this new invasive pest on the grounds of IVEGRI, mainly on hibiscus. Muni collected samples and held them for parasitoid emergence. The parasitoid was identified as *Encarsia guadaloupe*. This is a first report of a parasitoid of the giant whitefly from Indonesia.

We met with the Director of IVEGRI, Dr. Ahsol Hasyim. He had spent time in the Philippines when Merle was at IRRI, so the two spent some time talking about old times. Dr. Hasyim got his PhD in Japan and also had a post doc there. He worked on a kairomone that the parasitoid, *Cotesia* used to locate diamondback moth larvae. He mentioned that they were working on use of the insect fungi, *Beauveria*, *Metarhizium*, and *Verticillium*, for control of vegetable pests. They have some publications on this subject. The highest priority crop they are working with is potato, the 2<sup>nd</sup> is shallots, and the 3<sup>rd</sup> is chili. Chili is one of their highest value crops and currently they are having problems with virus diseases. Farmers in the area are using pesticides quite heavily on vegetable crops, but not getting good control of many pests. A big problem for farmers this year was that there was no dry season – it rained almost every day. This was especially damaging to fruit crops such as mango, durian, and rambutan with no fruit set occurring. Fruit flies (*Bactocera papayae*, *B. cucurbitae*, *B. carambolae*, and *B. tau*) have become serious pests in the

area, with *B. cucurbitae* and *B. papayae* on chili, *B. cucurbitae* on tomato, and *B. tau* on passion fruit. For *B. tau*, they use camphor extract for control. They are setting up area-wide management programs for these fruit fly pests.

We next met with seven members of the Plant Protection Group (Entomology and Plant Pathology) and were given a presentation about their current projects. New crops that they have just added are paprika and sweet pepper. They are currently evaluating different kinds of mulching, testing varieties, studying multiple cropping, and evaluating different kinds of trapping methods. Tactics being tested include sulfur evaporators for greenhouses, netting houses, botanical insecticides, and the use of parasites, predators and entomopathogens. They are also working on spray volume reduction. They have received funding from ACIAR for training on potato and brassicae crops in West Java, Central Java, and South Sulawesi. They also have funding from the Dutch for Training of Trainers in IPM on sweet peppers. They have a five year program to screen shallots for resistance to anthracnose and *Phytophthora* blight. They are using border crops such as *Crotalaria* for protecting vegetable crops against whiteflies. And finally, they have a project on potato funded through the Univ. of Wisconsin for development of resistance to *Phytophthora* by inserting genes from wild potato. They have five varieties that are resistant. They are producing botanical pesticides from neem, citronella, *Artimesaia*, and several others. They are also testing “biopesticides” such as *Bacillus*, *Pseudomonas*, and *Trichoderma*. They are using *Bacillus subtilis* on hot pepper and shallots. An isolate from Brassicae is the most virulent.

We visited one of the biological control laboratories where they showed us numerous isolates of *Beauveria* and *Metarhizium* and the virology laboratory which appeared to be very well equipped. The virology laboratory has been supported by a JICA project involving the preparation of antisera against various plant viruses. It also has received funding from the Netherlands for work on shallots and hot pepper, and from AVRDC for work on gemini viruses on hot pepper.

We visited field plots and on the way to these plots, we observed papaya trees heavily infested with the papaya mealybug. In cabbage plots, we observed heavy infestations of aphids. Spraying with chemical pesticides probably caused the build-up of these aphids. Other pests present in the cabbage were *Crociodolomia* and *Plutella*. Natural enemies observed included *Diadegma* and syrphids. In onion plots we observed infection by *Alternaria*. In tomato plots, there appeared to be close to 100% infection by a virus which caused leaves to turn yellow. Muni collected leaf smears from these plots. He also distributed leaf smear cards to the staff with instructions to send their samples to Aunu in Bogor. Aunu would then send the

samples to Naidu at Washington State. In hot peppers the main problems were broad mites (*Polyphagotarsonemus latus*), thrips, *Phytophthora*, and *Anthracnose*. The price of hot peppers was very high – 150,000Rp/Kg. Squash plants were heavily infected with powdery mildew.



### **Muni distributing virus sampling cards to scientists at IVEGRI**

**February 9-11 - The Indonesian Coffee and Cocoa Research Institute,**  
Jl. PB. Sudirman No. 90, Jember, 68118, East Java, Indonesia

The 5.5 hour trip by car from Surabaya to Jember allowed us to survey several fruit and vegetable crops along the way. The mango mealybug was present along with a flatid. A lepidopteran larva were boring into custard apple in Probolinggo, Tongas.

The Indonesia Coffee and Cocoa Research Institute (ICCRI), located in Jember (East Java), has an active research group including breeders and plant protection specialists. The Institute was celebrating its 100<sup>th</sup> year anniversary as a research institute with over 200 people (60% women) in attendance. A major part of the activities included a televised “talk show” with 4 panelists, one from Malaysia, one from Australia, one from Papua New Guinea and one from our Clemson group (Merle Shepard) and hosted by Ibu Yati. The discussions centered on sustainable production of coffee and cocoa. Kopi Luwak was served at the occasion. This is

coffee made from coffee beans that are eaten by a civet cat, benatang luwak, then collected after they have passed through the animal and processed into very expensive coffee.

Our host for visits to the field plots and to the plant protection laboratory was Endang Sulistyowati, an entomologist. Major constraints in production of these crops are the coffee berry borer (CBB) and the cocoa pod borer (CPB). Losses can be up to 50% unless these pests are managed.

Mass trapping of CBB, using a chemical that attracts both male and female CBB, has been carried out with some success but requires 25 traps per hectare. In addition, sprays of the entomopathogen, *Beauveria bassiana* (strain BP 715) has shown some success but needs to be applied every 10 days. Coffee genotypes are being screened for resistance to nematodes and drought. The insect fungal pathogen, *Paecilomyces*, also is being tested against CBB. Botanical pesticides also have been tested as has an endophytic *Beauveria* sp. Two species of parasitoids also have been reared from CBB but these are generally not effective in controlling the pest.

The experimental farm area is about 100 hectares and employees there grow and distribute cocoa seedlings (15 million distributed last year) with a goal of 40 million distributed this year. Cocoa seedlings are first grown in tissue culture, then transplanted to a shaded area. In the field, both cocoa and coffee were shaded by fast growing *Leucina* and *Glericidia* trees (which also served as trellises for black pepper). Cocoa seedlings are grown and distributed and sold by employees of ICCRI.



### **Cocoa seedlings produced by ICCRI by somatic embryogenesis for distribution throughout Indonesia**

One management strategy for suppression of the cocoa pod borer is to provide nesting sites (see [photo](#)) for black ants, *Dolichoderus thoracicus*. These ants aggressively attack the eggs of CPB. Vascular streak dieback (VSD) also is a serious problem in cocoa. Entire limbs will die from infestation by the obligate Basidiomycete (*Oncobasidium theobromae*). Breeding efforts are underway in an attempt to control this disease. Pruning infected branches helps reduce VSD and sanitation, removal of all infested fruit, is an important management strategy for CPB. Thinning of the plant canopy also is important. Pheromone traps have been used for CPB with varying degrees of success. Pod-sleeving, using biodegradable sleeves, is also effective but rather labor intensive. This work was started several years ago in Sulawesi (Hassanuddin University in Makassar, S. Sulawesi and University of Sam Ratulangi, in N. Sulawesi) under an earlier USAID-funded Clemson project. Nestle is providing significant funding for research at ICCRI.

At the request of the farmer, the team visited a field of edible (edamame) soybeans. The farmer was spraying for whiteflies and armyworms (*Spodoptera litura*) at about 10 day intervals but was concerned about pesticide residues (his market was Japan). These insects clearly were not causing yield losses. We suggested that the farmer

leave part of his field unsprayed and compare yields to those that were being sprayed. It was obvious that he was applying insecticides when none were necessary.

We visited a shallot field along the road back to Surabaya (Gorongon Village, Subdistrict: Leces, District: Probolinggo) where a farmer had enclosed the entire field in screen mesh to control armyworms. The screening had been used previously on tobacco.

We held meetings with the director of ICCRI (Dr. Teguh Wahyudi) as well as the Director for Research (Dr. Soetanto Abdoellah) and both expressed a strong interest in collaboration with Clemson and Institut Pertanian Bogor (Bogor Agriculture University) scientists.

### **February 12 – Lembaga Pertanian Sehat (Institute for Healthy Farming)**

Since our visit last July, Samsudin, the director of this NGO, has moved his operation to a larger building and has expanded his operations. He has a staff of 28. He works with farmers all over the country, producing and distributing microbial biocontrol agents and botanical insecticides for use in IPM programs. There are 1788 farmers in 7 clusters associated with his NGO. His goal is to have 100,000 farmers in his organization. He has just recently started producing *Trichoderma* and has a large order from Dinas Pertanian, the Indonesian Agricultural Extension Service. He is experimenting with various materials that can be added to formulations of insect viruses to enhance activity. He has had good results with activated carbon and boric acid. He said that 268 farmers that belong to a farmer coop in Brebes are using the *S. exigua* NPV. They are also using *Trichoderma* on shallots in Brebes for control of *Fusarium*. He also produces entomopathogenic nematodes (Heterorhabditids) and farmers use them to control the white stem borer on rice. During our visit, members of his staff were working on filling an order from Dinas Pertanian for 2000 bottles of neem concentrate (Pasti). This was prepared by grinding neem seeds, soaking overnight, and hand squeezing the liquid from this slurry. The solid by-product (neem cake) was then added to a compost mixture which was sold as organic fertilizer. Turmeric was added to the Pasti as a natural sticker and UV protector.



**Samsudin (right) and assistant in new laboratory at Lembaga Pertanian Sehat**

### **February 12 – Farmer Participatory Appraisal for Papaya – Kecamatan Rancabungur**

This event was held on the front porch of a farmer's house and was organized by faculty from the Department of Plant Protection, Bogor Agricultural University (including four of our Clemson graduates – Ruly, Yayi, Pudji, and Idham). The purpose was to convene all of the papaya growers of the village for a discussion of cultural practices, varieties grown, and problems that they are having. There were 18 men and 11 women in the group. Diseases were the major problem on papaya and the one the farmers considered to be the most serious was a bacterial (*Erwinia*) disease called crown rot which infects the upper part of the main stem of the tree and eventually kills the tree. Another disease was anthracnose which affected the fruit. Farmers call this the “mata ikan” or “fish eye” disease because of the shape of the lesions on the fruit. We visited a papaya grove where most of the trees had been cut down because the terminals had been killed by the *Erwinia* disease. In a neighboring eggplant field, there was a heavy infestation of *Epilichna*.





**Participatory appraisal meeting organized by IPB for papaya farmers near Bogor**

**February 14 – Department of Plant Protection, Bogor Agricultural University**

Gerry Carner presented a seminar entitled “Insect Pathology: Past, Present, and Future”. The audience was mainly undergraduate and graduate students in the Department. There were 18 women and 12 men in the group. After the seminar we visited Dr. Aunu’s biological control laboratory and the insect pathology laboratory where Drs. Teguh, Yayi, and Ruly work. We also visited the plant pathology laboratory where they were producing *Trichoderma* to be shipped to Papua to be used in an oil palm plantation. We went to the Administration Building and met with the Vice Rector for Research and Collaboration, Dr. Anas M. Fauzi.

**February 14 – PT Agrotech Sinarindo (AGSI) – Bogor**

We visited the headquarters for this company in Bogor. They make microbial products for use in “biointensive sustainable agriculture” Their products under the brand name Naturina include Actigrow which contains *Bacillus polymixa* and *Pseudomonas flourescens*, Fitplanta which contains macro and micro nutrients for plants, Golden Grain containing a mixture of plant stimulants for rice and corn,

Decomax containing decomposer organisms, and Stopgra containing the NPVs of *Spodoptera exigua* and *S. litura*. The company is headed up by two faculty members who are plant pathologists at IPB.

**February 16 – U.S. Embassy, Jakarta – USAID Mission**

Our group met with Dr. Sanath Reddy who provided funding for the IPM CRSP Associate Award for Indonesia. We reported on our visits to ICCRI and IVEGRI and discussed ways that funding could be provided for scientists from both institutes to be able to attend the IPM CRSP Workshop in the Philippines. Sanath also gave us information on the new AMARTA project that would be funded this year and we discussed how our project could collaborate with AMARTA.

**17 February:** Thursday. Travel from Jakarta to Phnom Penh, Cambodia. Met by Chou Cheythyrieth, IPM Coordinator with the General Directorate of Agriculture (GDA) for Cambodia, and our main contact.

**18 February:** Friday. Met with Philip Charlesworth, Agriculture Program Manager with International Development Enterprises and Nico Janssen Section Coordinator with SNV Netherlands Development Organization, to explore area of mutual project interest, overlap and potential collaboration. Later in the day, continued with meetings at Cambodian USAID office in Phnom Pehn. Met with Ms. Ronit Gerard, Agriculture Officer. We discussed our project and potential collaboration with other programs in Cambodia, such as the HARVEST program, directed by Fintrac. Fintrac is a US-based consultancy company with a goal of developing agricultural solutions to end hunger and poverty. In the afternoon, we met with Dennis Lesnick with Fintrac and the Director and Chief of the Cambodian HARVEST Program concerning potential collaboration.

**19 February:** Saturday. Toured city. Developed a potential vegetable grower contact via the owner of the Anise Hotel who uses organically grown vegetables in his restaurant from a local grower.

**20 February:** Sunday. Travel day from Phnom Pehn to Siem Reap.

**21 February:** Monday. Siem Reap Providence. First site visit was to Pungo Village/Batong Commune. This is one of our research sites, evaluating rice straw mulch with compost treated with trichoderma at 1kg diluted in water/1000 kilos of compost, in a field of cauliflower. This was a site established via our funding and in conjunction with Dr. Kean Sophia. Five rows of cauliflower were treated with mulch plus trichoderma and 3 rows were control (farmer's practice) with no mulch or

trichoderma. Also participated with the farmers IPM club and field meeting. Present were 15 farmers which included 9 women. The farmers reported that the no-mulched areas needed watering twice a day and the mulched areas required watering only once per day. Also reported was the keen need for more locally grown vegetables to meet the needs of the rapidly growing tourist population visiting Angkor Wat and other surrounding temples.



### **Farmer Field School at Pungo Village**

Second visit was to Ovlok Village/Bacong Commune. This is our second research site in the area, under the direction of Kean Sophia. A field with Chinese kale was planted with two rows receiving rice straw mulch and compost treated the trichoderma and two rows received no-mulch or trichoderma treated compost. The farmers had trouble with root rot and were hoping the trichoderma would solve the problem. A well was on the property and the fields including the Chinese kale, chilies and black gourd looked good. The farmer also had a covered and well tended plant nursery.

Site visit three was to Kork-Tlork Village/Kandek Commune. We met with the female farm owner, Phoug Malay. She was planting tomatoes in consultation with

Dr. Kean Sophia. The experiment included tomatoes planted with rice straw mulch and compost treated with trichoderma and tomatoes planted with no mulch or trichoderma.



**Farmer Phoug Malay (left) preparing organic peppers for market. Tomato plots with rice straw and *Trichoderma* can be seen in the background.**

Our fourth visit of the day was with Tat Bunchheun, the Director of the Siem Reap Agricultural Area. The Director informed us that 80% of people in his province rely on farming income. Siem Reap now has over one million tourists per year, putting a great strain on the ability of local farmers to produce enough food to meet the demands of the tourism industry. To meet the needs, more and more food is being imported, but Tat Bunchheun wants to increase the capabilities of the local farmers and was encouraged by our IPM project to aid vegetable growers.

In the evening, we made brief site visits to local hotels as a potential meeting site for our annual IPM Workshops, slated to be held in Cambodia in 2012. Hotels in the area include the La Meridian, Angkor Century, Sokah, Angkor Hotel, Goldiana Hotel, Apsara Holiday Hotel, Majestic Angkor Hotel, Angkor Resort, Dragon Royal Hotel, Pacific Hotel, Szalina Hote, Hotel Delapaix and the Royal Crown Hotel. The

team decided that a location in downtown Siem Reap near Pub Street may be a good choice for a future workshop.

**22 February:** Tuesday. Left Siem Reap and drove south to Kampong Cham. First visit was near the city of Kampong Cham to the village Boeung Snay/Sangkat Sambourmeas Commune. We met with a local farmer, Seng Samul. He and his wife were applying 1 kg of trichoderma in water to 1 ton of compost. They were preparing a Chinese kale plot as part of our project and under the direction of Dr. Kean Sophia. They were evaluating kale grown with trichoderma treated compost to untreated kale plots. To get the trichoderma to “set” in the compost, the farmer covers the treated pile with a plastic tarp for a week to keep the pile moist. The farmer also talked about a problem with worms eating the young heads of his cauliflower. We noted that it was a species cabbage budworm, genus: *Hellula* (Family: Crambidae (Superfamily: Pyraloidea)). The farmer started using b.t. based products with good success.

The second site visited was Trapong Beny Village/Baray Commune in the Prey Chhor District. The farmer was Keb Sorn. Present were 11 men, 6 women and many children. They were in the process of establishing another research site for our project with trichoderma vs. no-trichoderma treated compost for tomatoes. They were also using tomato seedling, half planted with trichoderma-treated soil and half without trichoderma-treated soil. The commune was very progressive with other research sites establish with FAO funding. In a lettuce field they had a complete replicated block design looking at the impact of lime applications vs. pre-planting burying vs. un-treated controls. They were also rearing predatory earwigs for biological control in a variety of vegetable fields.

The third visit was near Kampong Cham to a FAO research site where a project was developed to help local farmers headed by Mr. Son, grow organically raised chilies for export to Thailand. We were present post-harvest and during the packaging of the certified organic chilies being boxed for shipment to Thailand that night, after our visit. Ultimately the chilies are made into a hot sauce that is exported to Europe. This FAO project has a key goal of connecting farmers to markets, taking them from subsistence farming to entrepreneurial farming.

In the evening we met with Chheng Nareth, the Deputy Director of Agriculture for Kampong Cham Providence. Deputy Director Chheng was the first IPM trainer in the providence. He stated that an important goal of their administration was to get more farmers in the providence trained in IPM and was encourage by the work of FAO and IPM CRSP projects.

**23 February:** Wednesday. We departed from Kampong Cham and headed back to Phnom Pehn in Kandal Providence. On the way we stopped at Kos Prak near Phum Thum, off Highway 1. We visited with a farmer, Ho Sophal, who was also an IPM Area Coordinator. With FAO support, he was experimenting with sprays of neem vs. synthetic pesticides for insect pests in tomatoes.

By noon, we were back in Phnom Penh for a meeting with So-Khan Rithykum, the Director of GDA. We discussed the scope of our IPM CRSP Cambodian project and our collaboration with GDA, Chou Cheythyryth and the funding provided to Dr. Kean Sophia to establish 10 research sites for the project.

Our final visit for the day was to Kbal Koh GDA Agricultural/Vegetable Research Center in Phnom Pehn. A major emphasis of the station is to develop and test vegetable varieties for Cambodia. We saw a new screen house being installed for future vegetable IPM research funding by our project. We also discussed the potential for future research biological control of lepidopteran pests using the wasp parasitoid, *Cotesia* (Braconidae) in staggered plantings of cabbage. *Cotesia* is well established at the Kbal Koh Station.



***Cotesia plutellae* parasitoid with pupal case**

**24 February:** Thursday. Attended the U.S. Government Food Security Coordination Meeting in Phnom Penh. The meeting was opened at 8:00 AM by Mr. Flynn Fuller, USAID Director in Cambodia. The main presentation was by Dennis Lesnick of

Fintrac and Director of the Cambodian HARVEST program. Dr. Merle Shepard also made a presentation outlining our USAID-CRSP IPM project in Cambodia. We left the meeting around 10:00 AM for the airport and our return trip home via Singapore.

### **Suggestions, Recommendations, and/or Follow-up Items for Cambodia:**

Continue to monitor and develop research sites in coordination with Chou Cheythyryth (GDA) and Dr. Kean Sophia.

Develop network and contacts for future research and opportunities.

Send a proposal to Fintrac/HARVEST program for collaboration.

Pursue potential research opportunities using Cotesia wasp as biological control agents for lepidopteran pests in vegetables, starting with a project at the GDA Kbal Koh Research Station.

### **Training Activities Conducted – West Java, Indonesia**

| Program type<br>(workshop, seminar, field day, short course, etc.) | Date          | Audience | Number of Participants |       | Training Provider (US university, host country institution, etc.) | Training Objective   |
|--|---------------|----------|------------------------|-------|---|--|
|  |               |          | Men                    | Women |   |  |
| Participatory Appraisal Workshop                                   | Feb. 12, 2011 | Farmers  | 18                     | 11    | Bogor agricultural University                                     | Determine major problems facing papaya farmers in the Bogor area |
| Seminar  | Feb. 16, 2011 | Students | 12                     | 18    | Clemson University  | Create interest in the use of insect pathology in IPM programs   |

### **Training Activities Conducted – ICCRI, Jember, East Java, Indonesia**

| Program type           | Date              | Audience  | Number of Participants |              | Training Provided                  | Training Objective  |
|------------------------|-------------------|---|------------------------|--------------|------------------------------------|---|
| Television “talk show” | February 10, 2011 | Scientists, administrators<br>Farmers, Industry personnel | 96<br>Men              | 123<br>Women | Lecture on IPM in cropping systems | Dissemination of information on the sustainability of IPM in Coffee and Cocoa |

## Contacts for Indonesia:

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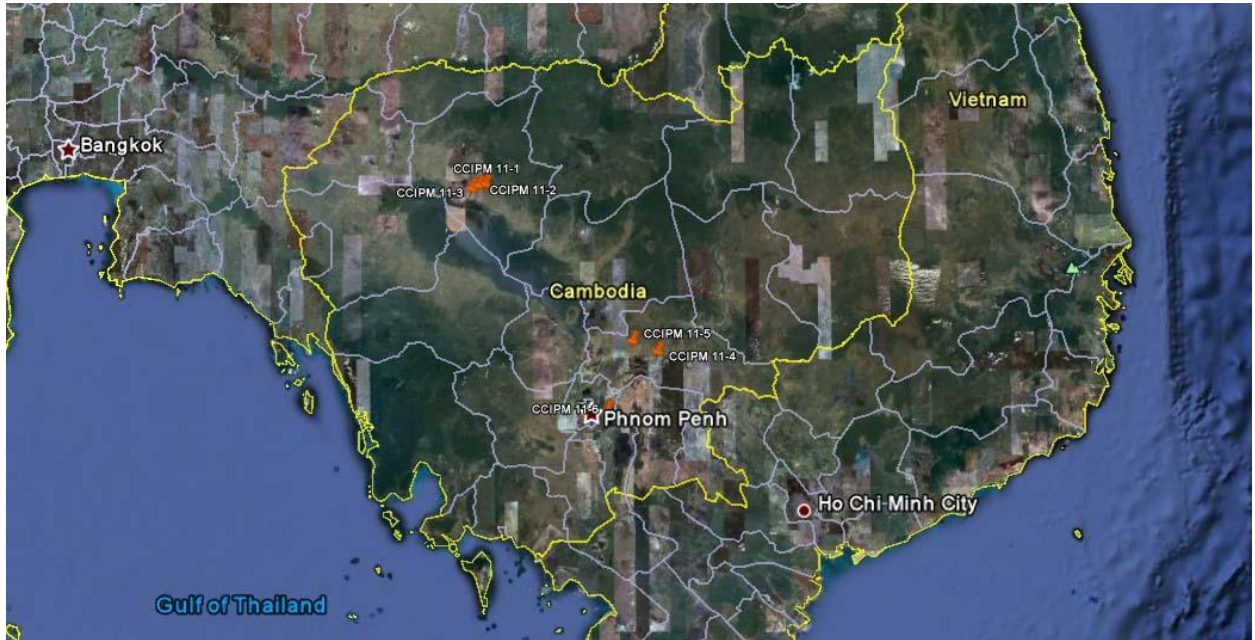
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## List of the contacts made during the Clemson University USAID-CRSP team trip to Cambodia, February 18 – 24, 2011.

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| <b>CAMBODIA</b>   |   |  |
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## Clemson Research Sites in Cambodia – Google earth



## Locations of 6 Clemson Research Sites visited by the Team



## Locations of three research sites in the Siem Reap Area



**Locations of two research sites in the Kampong Cham area**



**Location of one research site in Kandal Province**