

## IPM CRSP Trip Report

**Country Visited:** Indonesia

**Dates of Travel:** Benson: November 17 – December 2

Carner and Shepard: November 15 – December 5

Fayad: November 14 – 27

**Travelers Names and Affiliations:** B. Merle Shepard, Gerald R. Carner, Eric Benson – Clemson University, Amer Fayad - IPM CRSP

**Purpose of Trip:** Visit collaborators and survey fields to learn about pest problems and IPM challenges and accomplishments. Also, to set up new activities, attend workshops and meetings, and make presentations.

### Sites Visited:

**North Sulawesi:** Manado, University of Sam Ratulangi, Tomohon, Rurukan, Gema Agape

**West Java:** Jakarta, Karawang, Bogor, Bogor Agricultural University, Puncak, Sindangjaya, Ciawi, Insstitute for Healthy farming, Lembang, Indonesian Vegetable Research Institute

**East java:** Malang, Balai Penkajian Teknologi Pertanian (BPTP), Probolinggo, Dinas Pertanian (Agricultural Extension Office), Desa Kalrah, Desa Warujinggo

**Bali:** Jimbaran, Udayana University, Bedugul, Bukit Catu, Kintamani, Lake Batur, Ubud

### Description of Activities/Observations:

The team was divided into two groups to visit cooperators and sites in Sulawesi and Java. The Bensons first traveled to North Sulawesi and then to Bogor, while Shepard, Fayad, and Carner were in the Bogor/Puncak area and then traveled to Lembang.

### Benson Activities

**Nov 21:** Eric Benson traveled from Singapore and arrived in Manado, North Sulawesi in the afternoon. Benson had initial meetings with the IPM/CRSP Team from the University of Sam Ratulangi (UNSRAT); project leader: Dr. Dantje T. Sembel, team members: Merlyn Meray, Max Ratulangi and Jen Tatuh. During this meeting the agenda and plans for Benson's visit was set.

**Nov 22:** In Manado, Benson and the local IPM/CRSP Team met with the Rector Romokoy, President of UNSRAT. Discussion were held on the project accomplishments from 2010-2011 field trials and future plans (Fig.1). The Recktor was very supportive of the IPM/CRSP projects



**Fig.1.** Eric and Lisa meeting with faculty and administrators at the University of Sam Ratulangi.

and encouraged continued collaboration. Later, a team meeting was held to discuss specific projects including, the use of *Trichoderma koningii* and plastic mulch to control wilt diseases in tomatoes and chili; the impact of *Diadegma semiclausum* on *Plutella xylostella* in cabbage, the impact of *Nesidiocoris tenuis* (tomato bug) and biopesticide research to control *Liriomyza sativae* (leaf miner) in tomatoes. In addition, an agreement was reviewed that was about to be signed by a mayor of a local farming region in Tomohon. The agreement was that the vegetable growers in the region will follow organic farming practices recommended by UNSRAT based on work from our IPM/CRSP project, and in exchange, UNSRAT will help them market their organically grown produce. Later in the day, Benson toured the UNSRAT campus and entomology/plant protection research labs.

**Nov. 23.** In the Manado area, Benson went to the field with UNSRAT cooperators, headed by Dr. Dan Sembel, to visit IPM/CRSP-UNSRAT research sites. Meetings were held with farmers collaborating on the IPM project. The first stop was a “field school” hosted by a farmer in Tomohon, a fertile region to the south of Manado. The meeting

was a co-op of 10 local farmer groups. About 40 individuals were present with approximately half women. Dr. Sembel addressed the groups about different IPM practices, and then fielded questions from the farmers (Fig.2). Most had the same worries that farmers in the US have: growing organic means higher costs and lower yields.



**Fig. 2.** Government agents, Dr. Benson and Dr. Sembel talking to farmers about integrated pest management

After the farmer's field school, the team visited several other field sites that were growing organic crops. All of the fields were hand-cultivated and well-maintained. The team then traveled to Rurukan, a beautiful village where Alfred Wallace studied biodiversity in the 1800's. At the site visit to Rurukan, one of the farmers at the field school, invited the UNSRAT team to visit his new vegetable fields using IPM practices he had learned from the farmers field schools. He was organically growing chilis, bok choy and spring onions, with marigolds, tomatoes and anise interspersed. He used no pesticides, but rather used the whole environment to control pests. He was using practices he learned from the IPM/CRSP project in the area.

A final field site visit was to a co-op in a small village outside of Tomohon known as "GEMA AGAPE" (Fig.4). The building serves as a community hall for the co-op. A covered terrace surrounded the building with posters lining the walls inside, with photos of crops and harvests and descriptions of their farming practices using IPM methods.

**Nov. 24.** Benson traveled from Manado to Jakarta to join the IPM/CRSP team in Bogor.

**Nov. 25.** Benson spent the day at Bogor Agricultural University and gave a seminar on his research projects at Clemson (Fig.3). He also talked about the IPMCRSP project and our recent work to develop Adobe Connect for future workshops and linkages of our international collaborators.



**Fig.3.** A portion of the audience attending Eric's seminar at Bogor Agricultural University

### **Shepard, Fayad, Carner Activities**

**Nov. 17:** Shepard and Carner traveled from Singapore to Jakarta and Fayad traveled from Singapore to Bogor.

**Nov. 18:** Shepard and Carner visited with Russ Dilts' wife, Wahyu and their daughter, Sari and son, Bima. and the group visited his grave in Karawang. Russ was a long-time friend and collaborator on all of our IPM projects. He was also one of the founders and architects of the National IPM Program in Indonesia. Shepard and Carner then traveled to Bogor. In Bogor, Fayad met with faculty members from Bogor Agricultural University.

**Nov. 19:** Shepard, Fayad, and Carner met with the IPM CRSP Team from Bogor Agricultural University to discuss plans for our stay in Bogor and upcoming research activities.

**Nov. 20:** Shepard, Carner and Aunu spent the day working on the annual report for West Java.

**Nov. 21:** In the Bogor area, Merle Shepard, Amer Fayad and Aunu Rauf carried out surveys of insect pests, their natural enemies and plant diseases. Introduced Amer Fayad to our collaborators and carried out discussions of activities and plans for future activities. The vegetable-growing area in Cianjur, is referred to as the Puncak and feeds markets such as hotels and restaurants in all surrounding towns and Jakarta. The mixed cropping system covers over 40 different kinds of vegetables, many planted as interplants with other vegetables and spices. One of our main collaborators, Pak Ujang, a Farmer Leader, demonstrated/discussed how he produced *Trichoderma* and sold it to other farmers in several other villages. Ujang works with both male and female farmer groups. In addition to *Trichoderma*, he also produces *Pseudomonas* and *Bacillus* as biological controls or antagonists against plant diseases.

In the Bogor area, the following observations were recorded:

- Leaf onions were infested by Anthracnose and beet armyworm (*Spodoptera exigua*). Levels of infestation varied but ranged from 3-15% in leaf onion.
- Two species of whiteflies (giant whitefly and *Bemisia* sp.) were present on French beans or “buncis”. The giant whitefly also was attacking soursop, guava, hibiscus, chiotos, dutch eggplant and avocado. The giant whitefly was particularly serious on chiotos, Hibiscus (Fig. 4) and avocado. This invasive pest is spreading and should be a candidate for classical biological control.
- We counted over a dozen groups of pupal cases of an *Apanteles* sp. parasitoid that had attached a caterpillar pest of soursop. Spiders also were an abundant part of the natural enemy community.
- In chilli peppers, viruses (three different symptom types), and Anthracnose were the dominant pests. In a field of chillies of Pak Ace, our newest farmer collaborator, we estimated that at least 45% of the plants were infested with viruses and anthracnose. In that field, several, endive, Japanese eggplant, red cabbage and a crucifer called “gumek” which is used in salads, and spices such as basil and rosemary were grown. An exotic purple leafed lettuce species also was in high demand by markets in Bogor, Jakarta, Lido and Ciawi.



**Fig. 4.** Giant whitefly on hibiscus in the Puncak area.

- Surveys of carrots revealed no serious problems. Interestingly, all caterpillar pests (mainly loopers, *Chrysodiexis* sp.) were infected by a nucleopolyhedrosis virus or by the fungus, *Nomuraea rileyi*. There are opportunities for taking advantage of this system by investigating the mechanism involved in making the looper pests more susceptible to entomopathogens. It is likely that carrots contain compounds that allow the microbes to more effectively infect the insects. Collections of the insect pathogens were made and given to our collaborators at the Bogor Agricultural University (IPB).

Carner traveled to Pelabuhan Ratu. This trip had originally been scheduled so that we could meet with Russ Dilts and discuss the status of IPM programs in Indonesia. In the area between Sukabumi and Pelabuhan Ratu, we observed drastic changes in the cropping patterns. Most of the area has been converted to palm oil plantations. We stopped at a harvesting/loading center for one of the plantations and were told that most of the plantations in the area are owned by the government. The manager said that the major pests in the area are “ulat api”, a limacodid caterpillar and “kumbang”, probably the *Oryctes rhinoceros* beetle. The major disease is “crown disease”.

**Nov. 22:** In West Java, Shepard, and Fayad visited the Bogor Agricultural University (IPB) and had the opportunity to visit labs of IPM/CRSP collaborators to discuss the follow items:

- Fayad met with the vice rector for research and collaboration and briefed him on the IPM CRSP activities.
- Fayad and Shepard met with Sri Hidayat, the plant virologist associated with the IPM CRSP project and discussed the progress of the research activities and the limitations in virus diagnostics.
- Several faculty members (Titier Siti Yuliami, Idham Haratap, and Herien Puspitawati) were involved with gender activities as part of the gender global theme. Herien gave us a progress report of what has been done and plans for next year. She is currently preparing a manuscript on her IPM CRSP gender research. Hereien and her graduate student plan on exploring the “Home Ecology and Household Management” this coming year. Currently, the collaboration between the gender specialists and other collaborators is minimal.
- Visited the entomology, bacteriology and virology labs and participated in discussions with collaborators.

In Pelabuhan Ratu, Carner visited the Dilts property and photographed insects on the multiple varieties of fruit trees being grown there. Russ had planned to turn the area into an “Agrowisata” (agrotourism site).

**Nov. 23:**

In West Java, Shepard and Fayad, along with our in-country coordinator, Dr. Aunu Rauf, surveyed crops around the Bogor area. There were heavy infestations of the cassava mealybug on cassava (Fig.5) and moderate populations of the papaya mealybug on papaya. Some of the papaya mealybugs had actually moved onto cassava. Many field of cassava were infested and the damage could be seen from a distance by the presence of a “bunchy top” condition (Fig.6) exhibited by infested plants. Viruses of chillies, longbean (kacang panjang) and snap bean (Fig.7) were present on plants interplanted with cassava and as sole crops.



**Fig. 5.** Dr. Aunu showing cassava leaf infested with cassava mealybug.



**Fig.6.** Dr. Aunu examining "bunchy top" of cassava caused by cassava mealybug.





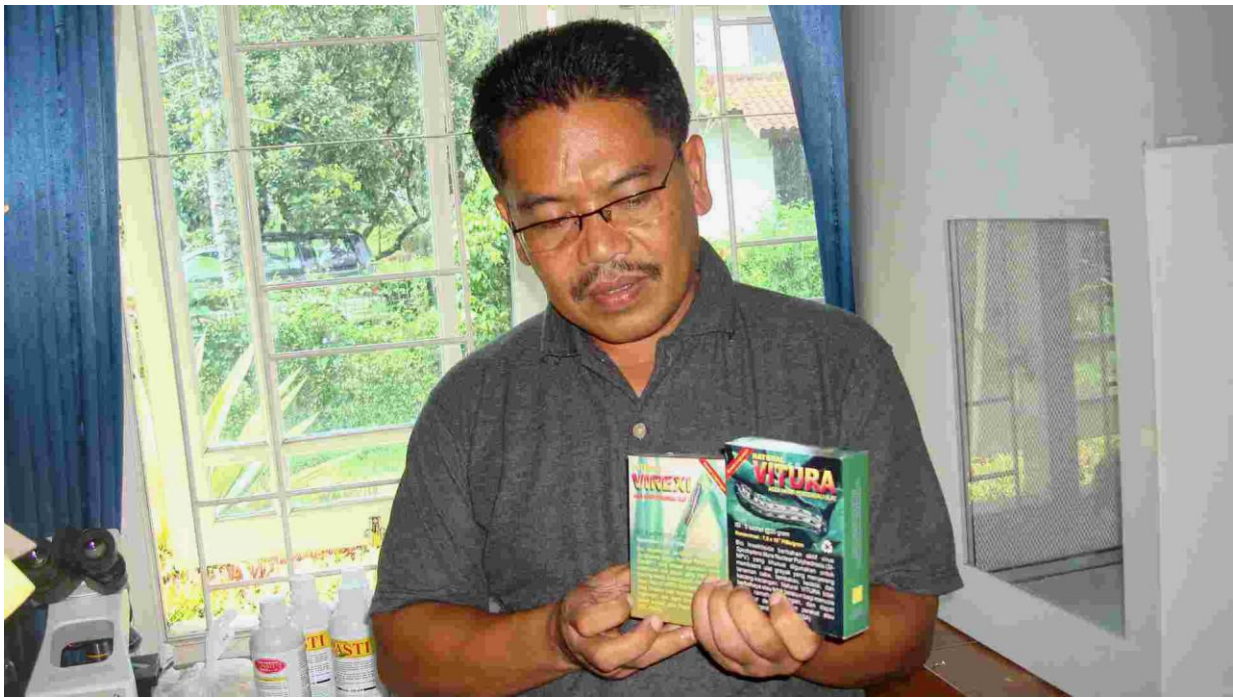
**Fig. 7.** Snap beans near Bogor showing virus disease symptoms.

The ladybeetle predator, *Carinus*, was seen feeding on the cassava mealybug. This predatory ladybeetle was introduced in the 1990s for control of psyllids. Samples of both cassava and papaya mealybugs were collected and brought back to the laboratory at IPB for determination of the incidence of parasitism and possible presence of entomopathogens. These also will be used to add new genetic material to the stock culture that is being maintained by Dr. Aunu Rauf at IPB.

Surveys in the Kebun Raya botanical gardens revealed the presence of the giant whitefly on hibiscus and banana. This may be the first report of this pest on banana. The cycad mealybug also was present both in the Kabon Raya botanical garden and in other locations.

Carner returned to Bogor from Pelabuhan Ratu.

**Nov. 24:** Shepard, Fayad, and Carner, along with Dr. Aunu Rauf, visited Samsudin at the Institute for Healthy Farming, an NGO that produces *Trichoderma* and several insect pathogens and botanical insecticides (Fig.8). Samsudin recently received his Ph.D. from IPB and has expanded his activities to include coffee, coccao, tea and cowpea for small holder farmers. He is



**Fig.8.** Samsudin showing two of his insect virus formulations produced by his NGO.

also employed by the Industrial Crops Research Institute in Sukabumi. This is a government run institute that focuses on small holder farmers. His activities also will be expanded to include field demonstrations with farmers. Samsudin also has recently acquired a virus from “ulat api” (*Thosea asigna*), a Limacodid caterpillar pest of oil palm and plans to increase the stock of this virus for in field tests with farmers.

Samsudin plans to carry out farmer participatory research with 15 clusters of farmers (with 15 farmers per cluster). This will include activities at Brebes a major shallot-growing area in Indonesia where the beet armyworm (BAW) is a serious pest. Prior activities there have included the use of the BAW virus. This effort will be revitalized by Samsudin and by our IPM CRSP project. The staff at Samsudin’s NGO also are culturing entomogenous nematodes, *Heterorhabditis*, for control of stem borers and other pests. In addition, he produces organic fertilizers and is working with the government to provide soil testing kits and microscopes for each farmer cluster. Samsudin receives no IPM CRSP funding but works closely with our collaborators at IPB.

Later in the day, Shepard, Fayad and Carner traveled to Lembang for developing farmer participatory research plans for work to be carried out with collaborators at the Indonesian Vegetable Research Institute (IVEGRI). Surveys of plants on the grounds of the Sindang Reret Hotel revealed a hispid beetle pest of banana, palms and other plants.

**Nov. 25:** The group met with the IVERGRI staff at the vegetable research center. Prior to the meeting, we surveyed plants around the vicinity and found heavy infestations of the giant whitefly on Begonia. This is the first report of this pest on Begonia and this sighting clearly shows that this pest is expanding its range. A lymantrid pest also was found on cycad palm along with cycad scales.

The IPM/CRSP team was welcomed by the Director of IVEGRI, Mr. Ahsol Hasyim. An overview of activities currently being carried out by the IVEGRI staff was presented to us. We discussed plans for collaboration with plant protection staff supported by an associate award from USAID. Ibu Nita (Dr. Laksminiwati Prabaningrum), Head of Plant Protection, will be the coordinator and will serve as the point of contact for the new activities with IVEGRI. Wiwin Setiawati (entomologist) and Rakmat Sutarya (plant pathologist) will be key members of the team that focuses on shallots and chilies in the Brebes area using SeNPV for beet armyworm control, *Trichoderma* for disease control and NPV for *Helicoverpa armigera* in Chilies. Pheromones of *Spodoptera exigua*, *S. litura* and *H. armigera* may be used to correctly time NPV applications. Suggestions were made that that VAM also might be an option for testing for soil borne diseases. Farmers in the Brebes area have just started to use netting to protect shallots against beet armyworm. This practice was first used by farmers in the Probolinggo area of East Java and has spread to other shallot growing areas. Our tests will include netting as a control strategy for BAW and we will compare this practice with the use of the armyworm virus (SeNPV).

### **Shepard, Carner, and Benson Activities**

**Nov. 26.** The entire team traveled to Jakarta. Fayad departed for the US and the rest of the team overnighted at the Kemang Hotel.

**Nov. 27.** The Clemson group traveled to Surabaya and Malang.

**Nov. 28.** At the Balai Penkajian Teknologi Pertanian (BPTP) (Center for Applied Research) in East Java (Malang) we were welcomed by Dr. Kuntoro Boga Andri, head of the BPTP. He and his staff gave us an excellent overview of agricultural activities in East Java. He was quite proud of the fact that East Java, which has only 2% of the agricultural land in the country, produces 30% of the rice, 35% of the corn, 45% of the mango, 50% of the mangostein, 90% of the apples, 40% of the shallots, and 25% of the chilis. Five years ago, there was not much emphasis on horticultural crops. Then the Horticulture Law was passed with a mandate to emphasize these crops. Horticulture zones were created for each commodity. For example, Probolinggo is a mango zone, a shallot zone, and a potato zone. Malang is a zone for ornamentals, apples, vegetables, and organic vegetables. For each commodity zone there are five activities that are

followed in sequence and a farmer field school is conducted for each one. These activities are: (1) Integrated Pest Management practices (2) Standard agronomic practices (3) Establishment of Good Agricultural Practices (GAP) (4) Good handling procedures (harvest to market) and (5) Good marketing procedures. However, Dr. Boga did comment that many farmers don't want to be involved - they are too busy and the whole process is too complicated. (we probably would agree with this).

The seasonal cropping pattern for Probolinggo is: Rainy season (Dec. – Mar.) – padi; First dry season (Mar. – June) – shallot; Second dry season (July – Nov.) – tobacco and corn. Chili is also grown during all seasons. Average number of sprays for chili – rainy season – 2/wk, dry season – 1/wk. However, this changes when commodity prices are high. When chilies were 120,000Rp/kg (\$10), farmers were spraying every day. For shallots, farmers spray 3 times/wk in the rainy season and 2 times/wk in the dry season. One of the big problems with shallots is the quality of seed starts – our team needs to keep this in mind when setting up field tests.

Other staff members at the BPTP included Ibu Eka, Agronomist, Ibu Evi, Agronomist, and Ibu Hani, Socio-economist. Ibus Evi and Hani had just returned from a training course in Thailand.

Arief of FIELD will coordinate activities in this region working closely with Joko Maryiono (AVRDC) and with BPTP personnel. We toured childrens' gardens near the BPTP headquarters. This area was designated for school children to monitor the growth of vegetable crops and understand how to manage pests in a more ecologically compatible manner. This is an AVRDC funded project to promote vegetables as an important part of a family's diet.

We then traveled to Probolinggo where the kepala Dinas (head of the agricultural extension office) in Probolinggo, Mr. Nanang Trijoko S., welcomed us and explained the current practices for control of *Spodoptera*. Nearly 50% of the farmers use screen netting to control this pest which is most serious in the dry season. The cost of the netting is very high for small scale farmers (21 million Rupiah/ha). The netting lasts for 6 growing seasons. The netting allows for 90-95% reduction in sprays during the dry season, but farmers still have to spray fungicides and most farmers still include insecticides when they spray (Tracer, Buldok, Dursban). The virus is still used by some small farmers (the inoculum was originally from FAO). However, production is a problem because there are very few larvae available during the rainy season. We need to address this issue before we can recommend widespread use of the virus. The answer may be to encourage large scale virus production during the dry season and make sure that the virus is stored under proper conditions. Mr. Trijok said that resistance by *Spodoptera* to chemical

pesticides was a serious problem and that resistance to a new pesticide can develop within one year.

We visited three locations where shallots were being grown under netting and at Desa Warujinggo, we met the farmer, Pak Jumair, who is credited with introducing the idea of using netting as a control tactic. Eric videotaped an interview with him (Fig.9) that we will be placed on our IPM CRSP website. We took soil samples from each of the three sites where our proposed farmer participatory research will be conducted. These will be analyzed by Brawijaya University in Malang.

**Probolinggo, E. Java.** Our main collaborator for the activities in E. Java will be FIELD, with Arief L. Hakim ([arieflih@uni-bonn.de](mailto:arieflih@uni-bonn.de)) as the contact person. These activities will be carried out on shallots in E. Java (Probolinggo) in 3 villages. All activities will be closely coordinated with AVRDC (Joko Mariyono, “Adit” Aditiajaya, and Greg Luther). The focus will be on introducing an insect virus (SeNPV) for control of *Spodoptera exigua*. Farmers will be trained on virus production, application and evaluation. The use of SeNPV will be compared with the current practice of covering shallot crops with netting which is very expensive (21 million rupiah/hectare) and with farmers’ usual practice of frequent insecticide applications. The key contacts for extending the technologies will be the BPTP - Extension Service, Dr. Kuntoro Boga



**Fig.9.** Eric interviewing Pak Jamair, a shallot farmer in Probolinggo. Pak Arief is the translator.

Andri ([kuntoro@gmail.com](mailto:kuntoro@gmail.com)) – Badan Penelitian dan Pengembangan Pertanian – Malang, E. Java, FIELD and AVRDC.

**Nov. 29:** The group returned to Surabaya and flew to Denpasar, Bali. At the Udayana Lodge, we met with Dr. Greg Luther (AVRDC), Joko Maryiono (AVRDC), Arief L. Hakim (FIELD) and Dr. Peter A. C. Ooi and discussed our schedule for the next few days.

**Nov. 30:** We met with personnel at Udayana University (UNUD) at the Faculty of Agricultural Technology Building. At Udayana University, the Faculty of Agricultural Technology is separate from the Faculty of Agriculture, but members from both faculties were present at the meeting. At the meeting, we established contacts with key faculty members: Dr. Made S. Utama, ([supartha\\_utama@ftp.unud.ac.id](mailto:supartha_utama@ftp.unud.ac.id)) – Professor of postharvest physiology and technology and Dr. Putu Sudiarta ([putu.ueda@yahoo.com](mailto:putu.ueda@yahoo.com)), Biological Control Specialist. Also in attendance were 6 Udayana students. Greg Luther presented his proposed activities to Udayana personnel which will be involved extensive testing of possible resistant tomato and chili germplasm at several sites in Bali. Grafting tomato onto resistant eggplant rootstock (EG 203 and Hawaii 7996) also was part of the AVRDC plans. Merle Shepard provided an overview of our current IPM activities in Indonesia, Philippines and Cambodia. In general, some major problems and opportunities in Bali included pests on tomatoes and chilies. Also, pests and diseases of broccoli, shallots and cabbage were discussed. Major diseases present include anthracnose, club root and geminivirus. Major pests included fruit flies, whiteflies and diamond-back moth. After the presentations, we discussed how our IPM/CRSP Associate project could mesh with and enhance the AVRDC and UNUD Indonesian Project. Overall we discussed how our project could work with the AVRDC project objective to produce new knowledge using researcher managed, replicated plot studies.

**Dec 1:** Team members from UNUD, AVRDC and our IPM/CRSP team went to the field and visited six sites in the Bukit Catu area, near Lake Bécatan in the village Pancasasi and fields along Lake Batur. Most of the sites were being established as research areas by UNUD faculty and staff under the guidance of AVRDC/Greg Luther. The first stop was where one set of the AVRDC tomato and pepper variety trials will be conducted. The second stop was at an organic farm with screen houses where seedlings for the variety trials will be started. At this site, we surveyed tomato (Fig.10) and bean fields. In the tomatoes, we observed *Helicoverpa* damage on the fruit (Fig.11) and saw evidence of virus infection in the plants. There were also white flies on the plants. A neighboring snap bean field had a fairly heavy infestation of white flies. Many of these appeared to be infected by an Entomophthorales fungus. The third stop was on a hilltop site in Bukit Catu where one set of tomato trials will be run. At this site, a field of broccoli was

heavily infected with clubroot. The farmer said that this is a big problem in the Bedugul area. The fourth stop was a farm with screenhouses and greenhouses that is owned by Putu's father. This is where the tomato/eggplant grafting will be done. This farm could serve as a field laboratory for both the AVRDC and our project. The fifth site was on the shore of Lake Batur inside the crater. This is where AVRDC will have a chilli variety trial. Other crops grown in this area include shallots, cabbage, tomato, and beans (Fig.12). Our IPM/CRSP team is considering several of these sites as locations where IPM research will be implemented to compliment the AVRDC/UNUD research. Emphasis in these Bali sites will be on production, use and evaluation of SeNPV for control of *Spodoptera exigua* in shallots and the use of NPV of *Helicoverpa* in chillies. In addition, project activities will include the production and use of *Trichoderma* for control of clubroot in broccoli and cabbage. There also are possibilities for the use of



**Fig.10.** Eric and Gerry surveying a tomato field in Bedugul, Bali.



**Fig.11.** *Helicoverpa* damage on tomato in Bedugul, Bali.

*Pseudomonas florescens* and *Bacillus subtilis* for diseases of vegetables. All activities will be closely coordinated with the local Dinas/BPTP (Technology Dissemination), Ketut Kariada.





**Fig. 12.** Woman weeding a bean field in the Lake Batur area of Bali.



**Fig.13.** Students in a school garden in Ubud, Bali.

**Dec 2:** In the morning, AVRDC, UNUD and IPM/CRSP members met again at the University to formalize research plans and collaboration. The Dean of the Faculty of

Agricultural Technology, Ganda Putra, was present at the meeting and we discussed the establishment of a MOU between Clemson and UNUD. In the afternoon, we visited two “school gardens” in the Ubud area where both grammar and middle school children grow and consume a wide array of organic vegetable crops and spices and learn about IPM (Fig.13). This program which is funded by AVRDC is similar to the one in Malang, East Java, except that the gardens are on the school grounds instead of at the BPTP. The program is managed by Ketut Kariada of the BPTP in Denpasar.

**Dec. 3 – 5.** Return to South Carolina

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