

Feed the Future: Innovation Lab for Integrated Pest Management Trip Report

Country(s) Visited: Cambodia (Phnom Penh)

Dates of Travel: June 11-19 2016

Travelers' Names and Affiliations: E.A. "Short" Heinrichs and Stephanie Parker, IPM IL Management Entity

Purpose of Trip: To supervise and do communications for the *Trichoderma* workshop, sponsored by IPM IL and organized by iDE Cambodia at the Royal University of Agriculture.

Sites Visited: Royal University of Agriculture, Phnom Penh

Description of Activities/Observations:

June 11-12: Short flew from Lincoln, NE to Chicago, IL, where he took an overnight flight to Shanghai and then a flight to Phnom Penh, where he arrived around midnight June 13. Stephanie's flight from Roanoke was almost four hours delayed, causing her to miss her connection in Chicago. She was rerouted on a flight to Hong Kong, where she stayed overnight on June 12th and took a flight on the morning of the 13th to Phnom Penh, arriving at the workshop around 1pm, missing the inaugural activities.

June 13: Short and Dr. Nakkeeran arrived at the workshop in the morning for the inaugural activities and group photo. At 9 a.m., Dr. Seng Kim Hian, iDE welcomed the participants, explained the rationale of the workshop and introduced the VIPs: Dr. Ngo Bunthan, Rector, RUA; Dr. Sang Lee, USAID Mission Director, Cambodia and Dr. Mike Roberts, iDE Cambodia Country Director. Other workshop participants came from organizations and institutions such as IRRI, CARDI, and GDA.

Dr. Ngo Bunthan, Rector, RUA explained that RUA was collaborating with three Innovation Labs: Virginia Tech on vegetable IPM, UC Davis on horticulture, and Kansas State University with the Sustainable Intensification Innovation Lab on transforming farming systems for smallholders. He stressed the need for workshops like this is that they promote the use of biocontrol agents as alternatives to pesticides in vegetable production.

Then, Dr. Mike Roberts, iDE, explained the IPM IL project and iDE's role as subcontractor. Dr. Sang Lee welcomed all participants on behalf of USAID. She mentioned the problems with pesticide use in Cambodia and the need to validate the IPM packages and to scale up technologies including the use of *Trichoderma*. She stated that few components have been scaled up in Cambodia due to their complexity.

From 10:00am – 12:00pm, the participants introduced themselves, presented their current activities, and indicated why they were attending workshop, what they expected from the workshop, and what they planned to do with the knowledge gained from the workshop. Then Dr. Nakkeeran provided an overall summary of the daily program and what will be covered in the lectures and the labs.



12:00-1:00pm: Lunch

At 1:00pm, Ms. Parker arrived, bringing with her some of the necessary materials for the workshop, such as Agar, Sodium Chloride, Sucrose, and Talc among other things.

From 1:00-3:00pm, the group discussed:

1. Objectives of the workshop
2. An introduction to Trichoderma
3. Claudius Bredehoeft, GIZ explained the Biocontrol Agents Program of the GIZ ASEAN Sustainable Agrifood Systems (ASEAN SAS)

At 3:00pm, Dr. Nakkeeran takes all the participants to the lab to teach them how to grow Trichoderma using potatoes. He splits the participants into two groups so they could try two different methods of rearing the fungus.



June 14: Ms. Parker, Dr. Heinrichs, and Dr. Nakkeeran were picked up at the hotel at 8am by Dr. Kim Hian Seng of iDE and her assistant to drive to the Royal University of Agriculture. The workshop began around 9am with a lecture from Dr. Nakkeeran about how to select *Trichoderma* and retrieve it from the field. He talked about looking at the stage of the crop, where to locate the fungus, how to identify it, how to quantify its virulence, and how to formulate and deliver the fungus.

He said that in a field of plants with diseases, it is best to choose one that is relatively free from disease, because that indicates that it has a more potent species of *Trichoderma*. He talked about isolating *Trichoderma* and the different strains of the fungus. He also talked about *Trichoderma*'s broad spectrum of action – the fact that *Trichoderma* can fight a number of different pathogens. Dr. Nakkeeran then briefly talked about *Pseudomonas*, how to isolate it from the soil.

12:00-1:00pm: Lunch

After lunch, Dr. Nakkeeran took everyone out into the field at the university for a practical lesson in rearing *Trichoderma*. Students pulled a maize plant, an okra plant, and a rice plant from the roots to gather soil samples, from which they would rear *Trichoderma*. They bagged soil samples and brought them back to the lab, where they used the PDA (potato dextrose agar) media they had made the day before to grow the *Trichoderma*. Each student took turns doing work in the lab to learn how to do it so that they would each have some product to take with them by Friday.



June 15: Ms. Parker, Dr. Heinrichs, and Dr. Nakkeeran were picked up at the hotel by Dr. Seng and her assistant and began the workshop around 9:15am. Dr. Nakkeeran began the day with a lecture on how to mass produce *Trichoderma* in an economical way. He talked about what kinds of facilities participants would need if they wanted to have a business supplying *Trichoderma* in Cambodia, what kind of lab they would need, and how to avoid contamination. Some of the minimal equipment requirements he talked about for the lab are air conditioner, microscope, media preparation tank, and refrigerator. He explained that even without a lot of

resources or fancy laboratories, participants in Cambodia would be able to mass produce *Trichoderma* in an economical way.

After a short coffee and tea break, Bruce Cussen, owner of Asia Irrigation (Cambodia) Trading Co, LTD., came to speak about drip irrigation and its potential with *Trichoderma*. He talked about his desire to use more biocontrol agents and admitted shortcomings in that regard, and said he hoped to learn from the workshop participants about ways to use more biocontrol. His talk led to a discussion about drip irrigation, climate change, and ways of collaboration.

12:00-1:00pm: Lunch

After lunch, Dr. Nakkeeran led another practical session, this time to inoculate maize with *Trichoderma*. He also brought out the soil samples from June 14, but found that there was no *Trichoderma* present in any of them. He had also tested the *Trichoderma* brought by Mr. Cussen the day before and found that the product was contaminated with other types of bacteria.



For the last hour of the day, Dr. Nakkeeran led a discussion about registration of *Trichoderma* in Cambodia, talking about the rules and regulations involved. Some of the participants left early, but the majority stayed and participated in the discussion, offering information about registering pesticides in the country. Dr. Nakkeeran gave a presentation on the registration of biopesticides in India. He talked about how and why to register your product, and then which biopesticides can be registered with CIB. He explained that if you do not register your biopesticide, you can be brought to court. He also listed the antagonistic fungi and bacteria.

June 16:

The day started at 9:10am with a two-hour lecture by Dr. Nakkeeran on “Selection of *Bacillus* spp., and formulation development.” It began with an explanation of the bacteria and he talked about the biodiversity of the *Bacillus* species. He then talked about the anti-fungal properties and anti-bacterial properties of *Bacillus* when it comes to plant protection.

12:00-1:00pm: Lunch

In the afternoon the group returned to the lab to look at the *Trichoderma* they had grown under the microscope.



June 17: The final day began with some informal networking over coffee and tea. Ms. Parker filmed some participants to get their feedback and takeaways from the workshop, and also filmed Dr. Nakkeeran so he could talk about the workshop, the students, and what he hopes to see happen with *Trichoderma* in Cambodia in the future. Dr. Seng then gave out evaluation forms and all the participants had a discussion about what things they would like to see happen now that the workshop is over, in order to continue with what they've learned. The consensus is that we need to make sure to follow-up on the training they've been given. They have learned a lot from the workshop, and now have contact with Dr. Nakkeeran. However, there are not a lot of resources in country or at RUA, and there are no experts on the ground here.

Other comments were about increasing market availability of *Trichoderma*. A participant from iDE discussed the importance of private sector partnerships. So while NGOs can work on awareness among farmers, there is a need to strengthen the capacity of private sector companies to produce *Trichoderma* so that once the awareness and demand is created, *Trichoderma* will be available to farmers. He also asked that the IPM IL continue to create workshops on *Trichoderma* and other biocontrol agents to be used in promoting sustainable agriculture in Cambodia. "I want the IPM IL project to involve more private sector in the workshop and involve more skilled people from RUA and NGOs and involve people from the companies because the companies play an important role in selling a deciding to invest in *Trichoderma*." Discussion also included the importance of embedded service from private sector companies.

Dr. Nakkeeran then raised the issue of what kinds of rules and regulations exist in Cambodia. Dr. Sophea Kean spoke on this issue, saying that we need GDA permission, even just to donate the *Trichoderma* we reared during this workshop to farmers to conduct field tests. After lab tests and field tests, you must register your product to sell it.

Dr. Heinrichs asked if there is research and information already existing to be given to farmers on *Trichoderma* in Cambodia. Dr. Sophea said that there is no expertise from GDA or DAL (Department of Agricultural Legislation).

GIZ is planning to have another training with IRRI for testing biocontrol agents in Cambodia for rice.

Another participant discussed that some farmers are aware that *Trichoderma* works for things like damping off disease, but the farmers have no access to the product. She suggests that the way to make *Trichoderma* to the farmer is to do a training for farmers for awareness on *Trichoderma* and teach them to make it on their farms. “This training is not difficult. It is easy to apply to farmers to teach them to produce.”

Dr. Nakkeeran and Dr. Seng suggest that RUA can lead this effort. They can produce the starter or mother culture and give to the farmers and then the farmers will be able to produce the *Trichoderma* themselves. This could happen within farmer cooperatives and groups.

Another participant discussed the importance of monitoring the quality of the *Trichoderma* produced by the farmers. It would be helpful to have a technical person here who can help to evaluate the quality of *Trichoderma* so that they are producing the most effective product. He discussed wanting to do a trial in rice in terms of how it would work, how it would stay dry in the wet field since it's aerobic. He also would like to explore the other bioagents from the workshop, such as *Pseudomonas*. He would like to learn more about *Pseudomonas*, do more experiments.

Another participant (who studied in Vietnam) discussed that it might not be so easy to produce *Trichoderma* and that if it's produced with low quality, that even if the product is cheap, if the farmer uses it and it doesn't work, then they will not use it again and will go back to using conventional pesticides. “We have to have the expertise of a professional because we want to keep the quality of the product and keep the benefit to the customer. We have to produce the high quality product, then the customer will multiply because the quality is so strong.”

Dr. Sophea added that the project needs to invest in equipment for farmers so they can multiply the *Trichoderma*.

An RUA student working with the Horticulture Innovation Lab suggested that IPM IL needs to work on student perspectives as well. IPM IL should provide technical support to students. “We are lacking in the human resources in the biocontrol agents as well. It's important to change the student's perspective on chemical agents and biocontrol agents. If a student plants corn for example and there is a disease, their first thought for control is chemical pesticides.” He wants IPM IL to raise awareness among students of biocontrol agents. “As you know, the student is the future of agriculture here in Cambodia, so if the student is thinking mostly about biocontrol agent, then this will be the future of agriculture in Cambodia.”

Before the workshop was over, Dr. Nakkeeran took all the participants to the lab and showed them how to process the *Trichoderma* they had grown into something portable and marketable that they could take home. They mixed some with talc powder and some with corn starch and put it in bags so they could take it with them.



After that, each participant received a certificate of completion for their work over the past week, and Dr. Nakkeeran was presented with a certificate of appreciation for leading the workshop. There was then a celebratory goodbye lunch before everyone left.



Training Activities Conducted:

Program type (workshop, seminar, field day, short course, etc.)	Date	Audience	Number of Participants		Training Provider (US university, host country institution, etc.)	Training Objective
			Men	Women		
<i>Trichoderma</i> workshop	06/13- 06/17/2016	Students, NGOs, Government, scientists	29	7	Royal University of Agriculture, Phnom Penh, Cambodia	To train participants in the benefits and rearing of <i>Trichoderma</i> and other beneficial rhizobacteria.

Suggestions, Recommendations, and/or Follow-up Items:

1. Leave more time for travel. Scheduling to arrive the night before means that if there are any missed connections, the participant will miss important activities. From now on, leave at least a day to arrive.
2. Because of limited planning time for this workshop, there were some materials for the lab that the Royal University did not have and did not have time to get. It would have been desirable to have more time to plan the workshop.
3. There wasn't enough time to cover everything. The days were very full, which was good for learning, but tired out some of the participants. However, although Dr. Nakkeeran was leading the workshop on his own, he was a great teacher with a lot of energy.
4. Sometimes Dr. Nakkeeran may have spoken too quickly for the Cambodian students, and some of the information may have been too technical. It would probably have been helpful to have had someone like Sophea as a co-presenter, because he can speak Khmer and he did his Ph.D. on *Trichoderma*.

5. Follow-up is important. While this was a very informative workshop with many enthusiastic participants, it is important that we build on what we've created during this workshop. People will need more training, information, and opportunities to network.

6. Maybe it would have been good to start the first day with a roundtable so everyone could talk about their prior expertise

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