

IPM CRSP Trip Report – India, Bangladesh, Nepal January 30 to February 13, 2011

Travelers: Ed Rajotte, Penn State; Sally Miller, Ohio State; S.K. De Datta, George Norton, Rangaswamy Muniappan (for India part), Doug Pfeiffer (for India part), Virginia Tech

Purpose of Trip: To review South Asia IPM CRSP program and plan for following year.

Sites Visited: Tamil Nadu Agricultural University (TNAU), Coimbatore, India; Bangladesh Agricultural Research Institute (BARI), Joydepur and Bangladesh Agricultural Research Council (BARC) and Ministry of Agriculture, Dhaka, Bangladesh; International Development Enterprises (IDE), Kathmandu and National Agricultural Research Center (NARC), Malepatan, Nepal. USAID missions were also visited and rural villages north and south of Coimbatore in India and west of Pokara, Nepal.

Description of Activities/Observations:

De Datta, Miller, Rajotte, and Norton arrived on February 1 in Coimbatore. Dr Gyawali from Nepal (affiliation) and Dr Rahman from Bangladesh (affiliation) also arrived. On February 2, they met with Director of the Center for Plant Molecular Biology at TNAU and then, with TNAU scientists, visited vegetable field trials at TNAU and farmer tomato field trials at Veerakeralem, and Karadimadai, and a pheromone demonstration field at Kinnathukadavu. After lunch, they were joined by Muniappan and Pfeiffer and visited okra IPM field trials at Pogalur and a poly-protected vegetable field. There were also interactions with a group of women farmers. The trials and demonstrations were well laid out and some suggestions for improvement in design were made.

February 3 – In the morning, the review of the of the IPM CRSP regional program began with general remarks by De Datta, Muniappan, and Rajotte. There was an interaction with farmers on vegetable insects and diseases and an inauguration of farm school IPM on air. Norton met with Dr Selvaraj, Dr. Rani, and graduate student Kiruthika on impact assessment. Which Institution?

In the afternoon we travelled to Sathyamangalm where we visited mealybug parasitoid release fields with the vice Chancellor of TNAU, Dr. PO. Boopathi and Dr. R.J. Rabindra from the biocontrol lab in Bangalore. There was a program with about 50 farmers at which several officials, farmers, and representatives from our group spoke. Farmers were very happy that the parasitoid introduction has saved their crops. Later Dr Boopathi and TNAU scientists hosted a dinner for our group.

February 4 -- A South Asia IPM CRSP planning and review meeting was held with numerous presentations. Led by Dr Mohankumar (Entomologist) with many others participating in addition to our group such as: Drs. Karthikeyan (Plant pathologist), Monoranjitham (“Mano”) (Plant pathologist), Gajendran (Head of Crop Protection), Durairaj (Entomologist), Jonathon (Director CPPS), Chandrasekar (Plant pathologist and Dept head), Gajendran (Entomologist), Selvaraj (Economist), Uma (gender specialist), Rani (Extension).

Mohankumar presented results of India IPM package trials: (1) Tomato – PBNV main virus

(2) Brinjal – *Pseudomonas* and neem cake - RKN significantly reduced. Individual components were tested separately and there is a synergistic effect. (3) Okra – Two farmer participatory trials for *Yellow vein mosaic virus*, powdery mildew, leafminer, root rot. 2 trials per season; 3 seasons – will have 6 reps. Ed suggested we look at the statistical analysis for on-farm trials – see UC (organic studies). Report needs to include the “trainees” (scholars who are taking the data); anyone working on the project more than 6 months is a trainee. (4) Cauliflower -- DBM – 5.6% (IPM) vs. 13.3% (FP), spray timing is critical – can reduce 3 sprays. Doug – getting farmers off pyrethroid insecticide would have a big impact – reduce losses of natural enemies. Nematodes reduced in IPM plots by 70% (5) Onion - Spread of technology beyond demo farms: onion bulb treatment (*Trichoderma*, Pf-1) campaign, Current Season – Onion IPM Demonstration Trials.

Sengattupatti village in Trichy district with the onion variety Co4-. (6) Chillies -- Leafminer, damping-off in nursery. Thrips and mites heavy on hot pepper. Viral complex severe on hybrid chillies. CMV occurrence was observed. Sue Tolin indicated that these complexes have many different viruses. Karthikeyan is working on identification with serological assays, PCR. Most production is under drip fertigation. In Tamil Nadu, bell pepper only produced in polyhouses in Hill district. (7) Cucurbit IPM --Doug – suggests that for pesticides the common name be used; also, need to define terms. Best approach is to rogue out symptomatic seedlings in nursery. Can eliminate white flies by screens over seedlings but thrips are not controlled. Virus and nematodes are major problem. Downy mildew important in January/February when temperatures are cooler. (8) Vegetables in polyhouses: Cucurbits – high incidence of RKN; recommending neem cake and *Pseudomonas*. Polyhouse conditions optimal for RKN. CMV – less in polyhouse than open field. Tomato -- RKN incidence high; whitefly. Capsicum, coriander, greens - Government of Tamil Nadu is promoting polyhouse cultivation so IPM packages are needed.

Ed – *Spodoptera*– could be controlled by screening; possibly also pheromone mass trapping. Difficult to get farmers to allow trials in greenhouses.

Publications: they know that they are lacking in refereed publications.

Hawaii meeting – APS/IAPPS – Who is going to APS meeting? 12 people in IPM CRSP – have to decide who will be going

Research topics: TNAU pheromone formulations, Biocontrol agents against pests, Breeding for disease resistance, Chitin inhibitors against *Spodoptera* (testing commercial product - DuPont) Mohan’s student looking at RNAi approach for chitin synthase gene – downregulated Effect of PF, Bb, MJ (methyl jasmonate) and salicylic acid on vegetable seedling growth – brinjal, tomatoes, chillies. Reduced whitefly populations; Brinjal, onion – have package Tomato, okra – 2 more trials to having package to recommend; Cucurbits, chillies – just starting

Muni, we need to see more diffusion of technologies. Real extension is done by other groups – not enough funds for IPM CRSP to extend technologies. But IPM CRSP is working with Extension.

Workshops, regional – proposed

- 1) Diagnostics - need to check with Naidu
- 2) *Trichoderma/Pseudomonas* mass production – June 2011

Student training – focus on sandwich programs

Nutan Kaushik, TERI, Delhi

U.P., A. P. and Karnataka states; Vegetable farmers apply 15-30 sprays of pesticides per season; don't follow PHI or re-entry rules; Purpose of work is to maximize use of biopesticides to minimize use of chemical pesticides. Demos undertaken – IPM Packages for eggplant, okra, tomato and cucurbits. Components – Disease and insect tolerant varieties; Seed and seedling treatment with *Trichoderma* and *Pseudomonas* (Pf-1) from Jayanth's company (BCRL – Biocontrol Research Laboratories, Bangalore) – commercial products; Neem cake – lots of quality variations. Some sources had 50% soil. Even quality varies when purchasing from neem extraction companies; better to get from companies extracting neem oil, not neem pesticides (take out all of the biocidal properties; limonoids); are encouraging farmers to grind their own seeds. Gender issues – northern India – women are not owners but are the principal laborers; training has to include laborers. For this year, we are encouraging farmers to use seedling trays with 1:1 pasteurized soil:coconut choco.

Nepal (B. K. Gyawali, Nepal coordinator)

IPM CRSP Nepal works closely with NARC, DOA and NGOs (who work directly with farmers)
Focus on vegetables but some work on tea and coffee
Phase II – IPM package development for vegetables
Baseline survey -- Most farmers are undereducated; Most are using indigenous farming system
Small landholders (1-2 A); Most use hybrid seed; Farmers not aware of hazards of chemical applications; Agro-vets are source of information for pest management

Grafting -- Very good results with *S. sissymbriifolium* in two locations but not in one (Lalitpur) – difference in *R. solanacearum* virulence
Tea – bio-fertilizers and bio-pesticides – best results with combined bio-fert and bio-pesticides
Paecilomyces- nematicidal product; in India it is not yet registered

For the annual report we need to have the source of the product (Manufacturer, location manufactured)

This information also has to be submitted to VT for PERSUAP

IPM Packages

Tomato – Terai, Mid hill, high hill
Cucurbit – Hills, Terai
Eggplant
Cabbage

Doug will put all of today's presentations on the Scholar site – password protected

M. A. Rahman, BARI, Bangladesh

Component technologies

Pest resistant varieties

Eggplant BW – Bari Begun-6, -7, -8 and -9 (all released)
Virus resistant pumpkin – BARI Misti Kumra-1 and -2

Grafting eggplant and tomato for BW control

Farmers in 3 districts having benefit from grafting
Rainy season starts in March; production up to then not affected

Produce in tunnel in summer (rainy season; used grafted tomato)
Soil Amendment with poultry refuse and mustard oil cake

Soil improvement

Control of soilborne diseases including RKN

RKN very serious in okra and Indian spinach, especially

Decomposition of poultry refuse

Collected in polybags with sufficient moisture and allowed to incubate in the sun
for 2 months

Spodoptera in cabbage – pheromone traps

IPM package – cabbage

Hand picking

Inundative release of *Trichogramma* + *Bracon* + lacewing

Fruit fly control in cucurbits

Sanitation

Pheromone bait trap

Community approach

Weekly release of two parasitoids

- egg parasitoid *Trichogramma chilonis*

- Larval parasitoid – *Bracon*

Tricho-compost production

Soil improvement

Soilborne disease control

Plant growth and productivity

Water hyacinth, cow dung, molasses,

Leachate from composting - fertilizer + anti-fungal activities

-2,000 farmers using Tricho-compost

-Production cost 8.0 T/kg

Economic weed management

2 hand weedings at appropriate stage

IPVD – Karthikeyan, coordinator

Peanut Bud Necrosis Virus

Stunting, necrosis (from young leaves down)

Fruit mottling, leaf spots

PBNV-infected fruit have significantly less Zn, Vitamin A, carbohydrates, total sugars,
and lycopene

Protein, antioxidants, fat increased

Documentation of plant viruses in vegetable ecosystems of Tamil Nadu

Survey – samples collected on FTA cards

Can be used for PCR/RT PCR

Tomato: ToLCNDV isolate –CTM

Bitter gourd

Amaranthus – *Basella rugose mosaic* virus isolate BR
Several others

Field performance of hybrid and resistant lines to PBNV

Fifteen cultivars of tomato (public and private)
All seed treated with *Trichoderma* + Pf-1
3/15 had low incidence of PBNV
6/15 had low incidence of TLCV
H24 resistant to PBNV and TLCV

Evaluation of roguing of infected plants

Removed infected seedlings until 45-days post germination
43.2% increase in fruit yield compared to non-rogued plants

Candidate for community IPM

48.2% increase in profit; need to compare across the season since prices change

Technology approved for adoption by the Scientific Workers' Conference –
recommendation will be included in govt production guide

Seed treatment with Pf-1 and *Trichoderma*

Damping-off reduced
Next season will include seed treatment

Seed transmission of *Tobacco streak virus* (TSV) in okra

IPVDN – workshop conducted – 25 scientists

Also conducting a study on the spatial and temporal spread of PBNV in tomato

IPDN - Mohankumar

India IPDN

Assess diagnostic capacity

Preliminary survey on 25 national labs, 56 professionals

List of labs for inclusion in IPDN prepared

National meeting held during virus workshop

In Year 2 will identify labs in Nepal and Bangladesh

Key areas of focus

Virus-vector interactions (Tospoviruses, Begomoviruses, Potyviruses)

Bacteriology

Infrastructure development for serological and molecular diagnostics in the PP department

Pests that emerged

Brinjal gall midge

Liriomyeza sp., *Spodoptera exigua* and *Iris yellow spot virus* in onion

Little leaf in beetroot and *Tobacco streak virus* in cotton were recorded

Fact sheets, bulletins available in local languages – get from them for posting on web portal

Characterization of whitefly population using sequences of mitochondrial cytochrome oxidase COI gene
Also confirmed *S. exigua* and *S. litura* in Tamil Nadu state

Identified a list of insect taxonomists
Need to do the same for pathologists
Submitted a proposal for DNA barcoding

Mealy bug – working on SOP
PBNV – tomato – working on SOP

Sally will contact Xin about including India/Bangladesh/Nepal in the IPDN web portal

Gender – Uma – Regional coordinator for South Asia and contact for gender global theme

Looking at community based approach to adopting IPM including reducing pesticide use, relevance to women's crops, impact on their workload and their contribution as unpaid labor.

Women are more efficient in resource use compared with men. Important for increasing adoption level as well as ensuring sustainability

Sensitize men to women's roles

Including women in all tech transfer activities

Workshop to explain the role of women in IPM, status of women in agriculture, activities associated with women

Rapid gender assessment – resource mapping, knowledge assessment, control over resource procurement and use, activity constraints (lack of time, etc.)

Recommended strategies

Hands-on training at village level for women

Research demonstration with women

Field diagnostic guide

IPM Training

Training on safe use of pesticides

Dosage of chemicals and time adherence more in women farmers (reported by male farmers)

IPM Impact in Vegetables – Selvaraj

IPM in Onion and parasitoid on mealybug

Ha surveyed 30 farmers with detailed questionnaire and will be surveying more this year. Has preliminary report from the first 30 farmers. Completed onion and is working on other crops now.

Onion – Trichy, Parambalur >3000 Ha. increase in area but decrease in productivity – what is wrong?

Wrap up – Ed Rajotte, Doug Pfeiffer

Publications are encouraged

Will try to rotate regional meeting among countries

Doug: Thanks for all of the participation and activities; A lot of data already generated; showing impact for IPM farmers; Goal is to get information to a large number of growers

Presentations will go to the scholar website; there will also be a site to load photos. Can follow up items be placed on the Scholar website? Ed – trip report will go on the website; can also put the trip report in the scholar site. Doug will make a link in the Scholar site to journals/author instructions. Muni -- This is the first regional workshop for the South Asia site. APS/IAPPS joint meeting in Honolulu in Aug 2011. Special symposium on Feed the Future

De Datta, Norton, Rajotte, Miller travelled to Bangladesh later that day and Muniappan left for Indonesia and Pfeiffer returned to the States.

February 5 – Arrived in Dhaka in the afternoon and met with Dr Karim, site coordinator.

February 6 – Travelled to BARI and met first with BARI Director of Research, Head of Entomology, Horticulture, and others. Discussion included capacity building (more training of agricultural scientists), GMOs.

Met with BARI IPM CRSP scientists for progress review. Introductions and opening remarks by Dr. Karim; Dr. M. Shirazul Islam Director of Research; Dr. M.Z. Abedin – IRRI; Dr. Sanas, Gender Specialist with two students; Mafruha Aros, Plant Pathology

Shahabuddin Ahmed – IPM package for summer tomato production - 2010 budget was late (May) - work incomplete; TYLCV and bacterial wilt are main problems; Grew seedlings under net cover; could not do grafting; IPM package will be done next season; Results: 3 demos; starting in April. Package: grafting (not done), net cover of seedlings for TYLCV management, Tricho-compost; Bacterial wilt highest August - November

M.A. Rahman - Disease management in IPM package; IPDN - survey of new insect pests and diseases of various crops in Bangladesh -- cucurbits, tomato, papaya, jackfruit, eggplant. need to select a few to do first reports. IPM package for cabbage - farmers field: Hand picking/pheromone trapping; Tricho-compost 1.5 T/HA; Tricho-compost 1.0 T/HA; Farmer practice. IPM package for okra – OYVMV, No treatments controlled virus; Tricho-compost controlled nematodes

M. Nahar-- Tricho-compost and tricho-leachate. Tricho- compost controlled bacterial wilt on one demo farm- related to RKN control? poultry refuse controls bacterial wilt; Tricho-compost is 50% poultry refuse; trichoderma does not control bacterial wilt; Not controlling *Pythium* Working with NGO to reach farmers; Working on registration with NGO Being used in 10 districts; 3000 farms; Should work with Prof. Shanaz (gender)

S.N. Alam - Mass rearing ladybird beetle and parasitoid; *Bt* evaluation in cabbage - *Bt* now Registered in Bangladesh; IPM packages: Fruit fly community control - mass trapping; IPM package for fruit flies of gourds

Papaya mealybug: New record in Bangladesh. Minister of Ag very aware of work being done

G.M.A. Halim - IPM package for cucumber: Low yield and quality major problem; diseases and insects a problem -- Tricho-compost effective; On- station trial

Gender studies

Umme Habiba - Univ. Dhaka; Gender studies - Food security and homestead gardening - women's role

Tahera Sultana - Univ. Dhaka; Women's role in using IPM inputs with emphasis on poultry refuse; Two villages in Jessore district

Muquit, A. IPVDN – Virus survey - 5 regions; Cucumber, sponge, bottle and ridge gourds, yard long beans, okra, tomato, Country bean, teasel gourd, no symptoms

Used Adgen kits -- Most samples negative for virus; no problems for kits will check for Gemini viruses this year; Sent pictures to Naidu; thinks could be geminivirus; Naidu can send FTA cards; problem with sending them via DHL

Quazi M. Shafiqul Islam - baseline survey on IPM adoption completed

Arefur Rahman - MCC Bangladesh

Technologies: Poultry refuse, Mustard oil cake, Tricho compost in seedbed, Hand picking to control cabbage worm, Sex pheromone traps for BSFB, CFF, Limited hand weeding

Using Tricho leachate to inoculate later batches of Tricho compost with *Trichoderma*

Ed will contact the MCC office in Akron OH to try to get an article about this work in their magazine "Commonplace"

Request for IPM CRSP to include mango, papaya in project

Planning Meeting

Split up into disciplinary groups

Okra IPM package - need to spray to control whiteflies-- What is the vector? In India it is *Bemisia tabaci*; Either don't do the package or do it during the virus free period; Try somewhat resistant okra variety (Bari 0212 vs Bari 1 and Bari Dehrose1); Okra OYVMV - Muquit will test with *African cassava mosaic virus* ELISA; *Ralstonia*-- -collect strains Aug –Nov; -screen against genotypes in India; -can't screen at BARI because there is no greenhouse; tricho-compost Pythium in seedbed nursery; combine with solarization

Publication - local journal submitted

Will put together a paper for international journal

Will work with Ispahani to produce and test fermented *Trichoderma*

New program on nursery production of seedlings

Tomato - quantitative resistance

Pumpkin - IPM package development

IPDN and IPVDN surveys will continue

Sally ask Rahman and Nahar for emails of the PP strain - need to work with them on the IPDN and IPVDN projects

Summary

Plant Pathology

Tricho compost continuation

Disease management in seedbeds including *Pythium* management

Tomato - screening for qualitative resistance to several pathogens

Tomato - *Ralstonia* strain characterization and screening of genotypes

IPDN and IPVDN

There is a request for gummosis control in jackfruit. Would need additional funds - outside the IPM CRSP

Entomology

Several potential pubs mentioned

Year 3 work plan

Parasitoids of *Epilachna* beetle

String bean package

Mites and thrips on eggplant, several beans and tomato - component research

Country bean and cabbage - continue to evaluate

Fruits - papaya mealybug - work with TNAU to get the parasitoid

will publish in international journal

used IPDN funds to do survey

Oriental fruit fly package

Social sciences

Conduct adoption surveys in several more districts

Send data from this year to George

Questionnaire to George and Maria Elisa - work with the two gender students

Questions

Muquit - wants more networking on virus management. How to get more information from India and Nepal

February 7 – Worked in hotel due to national strike.

February 8 -- Meeting with Chairman of BARC (Dr. Waid Kabir), Minister of Agriculture Choudhury, Secretary of Agriculture

Concerns by Minister about BPH on rice, other pests and high fertilizer prices. Grafting necessary for summer tomato production; Need to use mass media to popularize grafting technology; especially emphasize grafting as a business opportunity for women. Could work out a small, low-interest (2%) loan program, if needed; cost of set-up for grafting is 2,000-2,500

Taka; Discussion about funding of agricultural research in the US and coordination of research, outreach and training; BARC Chair having difficulties with segregation of Universities, Research and Extension under different ministries so it is very difficult to make changes. He has difficulty in making the best use of Universities; not happy with research results. S.K. described transformation of agriculture system in India to land grant concept (paired Indian and US land grants e.g. OSU-Punjab University); Bangladesh should consider this approach

After lunch hosted by BARC, traveled to BARI to participate in 8th Annual Entomological Society Meeting in Bangladesh. Ed Rajotte gave a presentation.

February 9 – Met with USAID representatives (including Mark who is leaving soon) in Dhaka. They ask that we send workplans each year to them. IRRI and CSISA working in the south of Bangladesh. Bangladesh investment plan on the web. CSISA has “Hubs” working with rice, fish, and horticulture. Four new Ag hires in Mission. Gates Foundation and USAID funding. CIMMYT and World Fish also part of it.

Flew to Kathmandu, Nepal

Ed, Sally, S.K. and George (along with Luke Colavito from IDE) met with USAID representatives (Bill Patterson and Amy Prevatt. Mission programs focus on 16 districts in the Far and Mid West for Feed the Future. Focusing on high value vegetables.

February 10 – Flew to Pokara and drove to Aarukharka to meet with a farmer who was doing grafting and growing tomatoes. This farmer grafted 1600 in year 1, 1800 in year 2 and 3000 in year 3. Provided costs and returns information and amounts sold. Second farmer now selling seedlings as well. Also interacted with group of leaders from vegetable collection center. 17 groups with 53 female and 86 male members, 250 households. Cold storage. Sells to wholesaler.

After lunch visited 3 women cabbage farmers. They are making a sizable profit.

Feb 11 – Pokara IPM CRSP meeting. 3600 high tunnels in western region. IPM CRSP focusing on tomato. Gyawali – tomato grafting, mulching on cucumber, biofertilizers and biopesticides on both. Did cost analysis. Verifying package in 13 districts for tomato, cucumber, cabbage, eggplant, tea, and coffee. Soap water, grafting, mashed sweet gourd. 3 grafting houses in 2 districts in mid hills. 3647 plastic houses. RKN a major threat, whiteflies and late blight. 1500 farmers trained in FFS IPM two-thirds female

Year 2 experiments were discussed and listed out for tomato, cucurbits, cabbage/cauliflower, eggplant, tea and coffee.

Flew back to Kathmandu

February 12 -- Met with Luke Colavito. He suggests proposals on polyhouses and IPM with a focus on women and food safety. Need strategy to move pockets of success to widespread adoption. Need to involve private sector, organize farmers.

Discussed sub-contract issues.

Flew back to the States.