

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

Country Visited: Ethiopia

Dates of Travel: July 2-21, 2017

Travelers' Names and Affiliations: Amer Fayad, IPM Innovation Lab ME, Virginia Tech.

Purpose of Trip: To attend the planning meeting of the “Biocontrol of Parthenium” project; organize and attend the IPM Innovation Lab Technical Advisory Committee Meeting and participate in accompanying field trips; to organize and attend the Fall Armyworm awareness and management workshop; and attend the planning meeting of the “rice, maize, and Chickpea IPM for East Africa” project.

Sites Visited: Ethiopia: Addis Ababa, Ambo, Hawassa, and Wollenchiti,

Description of Activities/Observations:

July 4, 2017: Landed in Addis Ababa and arrived at the Harmony Hotel.

July 5, 2017: Parthenium Project Planning Meeting at Nexus Hotel Addis Ababa, Ethiopia. There were sixteen participants and thirteen oral presentations.

Wondi Mersie welcomed everyone to the meeting and gave the general objectives of the planning meeting. Fayad discussed the general aspects of the IPM II program and stressed the importance of reviewing the progress of the project and the need to discuss future activities as the workplans are due mid July 2017. He also discussed the Feed the Future Indicators and the need to collect and report to the ME.

The presentations focused on the biological control of parthenium in eastern and southern Africa. There were also presentations on the impact of controlling parthenium on the life of rural women as well as its distribution in Ethiopia. Fayad questioned the student on the gender research and asked for the thesis to be send to the ME. He mentioned that research questions do not target adoption but rather the perception.

Drs. Rubin and Yaacoby also made presentations on the distribution and impact of parthenium in Israel. At the end of the presentations, there was a discussion on next year's project activities as well as lessons learned. It was agreed to intensify the rearing and release of *Zygogramma* and *Listronotus* in Ethiopia and Tanzania.

Participants discussed the scaling up release and the need for secure sites (refuge spots), good parthenium stand, no pesticide application. So far:

- *Zygogramma* 10,500 in 2016, 15800 in 2017 (multiple sites once per site)
- *Listronotus* 2300 in 2017

Mersie described some of the constraints, especially the staff turnover, pests and predators at rearing sites, and the need for good quality stock, and policy issues in Kenya and Uganda. Fayad asked Mersie about the progress made in Uganda as little progress has been made there. The group pledged to help Ugandan colleagues in securing the necessary permits to introduce the two bioagents to their country.

July 6: Traveled to Ambo to visit bioagent rearing facility located at a satellite campus of Ambo University (AU) at Guder. Most of the parthenium project planning meeting participants traveled to Guder to see the facility. The group was welcomed at Guder by Dr Mulugeta Negari, Dean of the College of Agriculture and Veterinary Science. He reiterated the commitment of Ambo University to the successful implementation of the Parthenium Project. Dr. Mulugeta indicated that the establishment of the rearing facility at Guder spurred the initiation of a course on biological control of pests in the College. The visitors were briefed on the procedures followed to rear each agent and saw first-hand how the insects are cultured. After the visit to the rearing facility the group traveled to the compound of a nearby hospital where *Zygogramma* and *Listronotus* were released in June 2017. The visitors saw adults, larvae as well as eggs of *Zygogramma* on parthenium plants. The group then traveled to the main campus of Ambo University to visit with the President, Dr. Tadesse Amente. Dr. Tadesse discussed the importance of the collaboration between Ambo University and the Parthenium Project and expressed his continued support for the on-going work at Guder. The group returned to Addis Ababa after lunch.

The meeting covered mostly general aspects of parthenium and biocontrol but not necessarily, the major activities achieved in this fiscal year nor the planned activities for the next fiscal year FY18. We only had about 30 minutes to discuss planned activities and the workplan. In the future, the meeting needs to have more time to address these activities.

July 7: We traveled to Wollenchiti to visit the bioagent rearing facility located in the compound of a Farmers Cooperative office and warehouse. The group was greeted by Wondi Mersie who gave a briefing about the facility. The group met the staff members who rear *Zygogramma* and *Listronotus* at the site. Staff demonstrated how each bioagent is reared and how the cultures are maintained. The visitors asked questions about the daily operation of the facility and were given answers by staff.

In the afternoon, the visitors traveled from Wollenchiti to Koka to visit a farm where both *Zygogramma* and *Listronotus* were released on May 16, 2017. The group observed adult, larvae and eggs of *Zygogramma* on the leaves of parthenium. The visitors also saw parthenium plants defoliated by the adults and larvae of *Zygogramma*. The group returned to Addis Ababa late in the afternoon.



Ms. Sintu manager of the rearing facility at Wollenchitti transferring *Listronotus* onto fresh parthenium plants.



A *Listronotus* larva inside the stem of a parthenium plant. *Listronotus* was released few weeks prior in this field.



Releasing *Zygogramma* in the field.

July 10, 2017: First day of the IPM Innovation Lab joint meeting of the Technical Advisory Committee and Program Coordinating Committee. Muniappan began the meeting by welcome everyone to Addis Ababa and gave a presentation on the activities and achievements of the IPM IL since the last meeting in July 2016.

Next, AOR John Bowman then gave his welcoming remarks, thanking the meeting organizers and talking about the Fall Armyworm problem and workshop. He discussed the accomplishments of IPM IL projects as well as other projects, specifically in Ethiopia.

Then Faith Bartz Tarr introduced herself and explained her role and why she finds the IPM IL valuable in Ethiopia.

Next Guru Ghosh made remarks and discussed Virginia Tech as a global land grant.

After a coffee break, Daniel Sumner presented on the role of gender in IPM. He said that gender is not just about women but also about the relations between genders.

Next, Amer Fayad and Muniappan presented administrative information. They discussed the budget cut of 40% we got in FY 2017 and that we did not get out funding until January 2017, three months late. Bowman discussed the pipeline and said that if September projects still show a lot of money on their books, they will only get the remainder in FY 2018 funding. Currently the IPM IL is in its third year and October will start its fourth year.

After lunch, the PIs gave their project presentations. Each PI presented on what they have accomplished in the last year and highlighted the achievements and challenges. They then took questions from the other PIs.

After the PI presentations, Bowman made an AOR presentation. He explained the structure of Feed the Future and discussed the major challenge for the coming year, which is funding uncertainty.



Member of the TAC and the PCC with the IPM IL ME and the USAID representative.

July 11, 2017: When the meeting restarted in the morning, the Technical Advisory Committee and Program Coordinating Committee separated for their meetings. Afterwards, both groups came together to share their thoughts with one another. The Program Coordinating Committee noted that they were worried about funding and that they wish they had had more time at the meeting the day before to ask more questions about one another's presentations and hear about what they were doing well. The Technical Advisory Committee discussed each project and explained which they saw as weaker and stronger and gave suggestions to the PIs for improvements.

After Muniappan closed the meeting by thanking the participants and ICIPE organizers, everyone left Addis Ababa for Wollenchiti to see Wondi Mersie's parthenium rearing facility. At the facility, Mersie thanked his staff and made presentations to Muniappan, Ghosh, and Bowman. Then Mersie and his staff led everyone through the rearing process, showing them the different greenhouses and simple, affordable equipment used.

Then the group traveled together to Debere Zeyt to stay overnight at the Kuriftu resort.



A farmer receives a certificate following completion of a specialized training on Push and Pull technique in Hawassa.

July 12, 2017: The next morning, the group left early for the long drive to Hawassa. After lunch, the group attended a farmer field day with the Grains IPM in East Africa project near Hawassa. Tadele Tefera, the PI of the project, presented the farmers with certificates of achievement. Then the group went to the field where farmers gave short talks, with translation, on the success of push-pull on corn in the field..

July 13, 2017: The next morning, Muniappan and the group went to Hawassa University to hear a talk from the Vegetable IPM in East Africa project and meet some students. Parker went separately with Tadesse Desalegn to Halaba to film and photograph fall armyworm damage in the field. The farmer she spoke to, through translation, said he was experiencing almost 100% crop damage to his maize. The damage was very easy to find and there were larvae in almost every plant they checked.

Parker reunited with the group for lunch and then the whole group went together back towards Addis Ababa. On the way, they stopped at a field site for the Vegetable IPM in East Africa project. Then the group returned to Addis Ababa and some members flew back to their countries of origin.



FAW damage on maize.



Stem borer damage on maize. Many farmers, scientists, and extension agents are quick to say FAW is attacking the maize when in fact it is the stem borer.

July 14, 2017: At 9am the IPM IL's Fall Armyworm Awareness and Management workshop began at the Harmony Hotel. The workshop started with opening remarks by Muniappan, Tefera, Stephen Morin, Bowman, and Guru Ghosh. Muniappan then invited all the participants to introduce themselves by organization. The morning session of the workshop included an overview by B.M. Prasanna from CIMMYT talked about the fall armyworm and challenges. Then there were country reports from Ethiopia, Kenya, Niger, and Tanzania.

After lunch, farmer case studies from Ethiopia and Kenya were presented. Fayad presented on the distribution and taxonomy of the fall armyworm. Tadele presented on the Grains IPM in East Africa project and monitoring pheromone traps. L.R.M. Bhanu presented on pheromone traps produced by her company. Muniappan presented on the biology and host plants. Abhijin Adiga presented on the spread of the fall armyworm and modeling opportunities. R. Srinivasan presented on host plant races and Prasanna presented on host plant resistance.

That evening, Muniappan joined Bowman and others for an invite-only dinner to further discuss the fall armyworm in East Africa.



Participants at the FAW workshop, including the HE the Ethiopian minister of Agriculture.

July 15, 2017: The meeting continued. The Ethiopian Minister of Agriculture, H.E. Dr. Eyassu Abrha, attended the morning section of the second day. He addressed the participants on the danger the FAW poses to Ethiopia and how important it is to have workshops like this one to help address the problem. Next, Winfred Hammond from FAO presented on FAO programs for FAW in Africa. Then Muniappan presented on physical, cultural, and biological control, along with Malick Ba. Laouali Amadou presented on FAW in Niger and the potential of a local parasitoid that has parasitized FAW in the lab. Then two students presented on their FAW research and Menale Kassie presented on the economic impact of FAW.

After lunch, the workshop split into three groups to come up with recommendations on FAW. From the groups and following presentations, the IPM IL came up with a list of recommendations:

They are:

- Integrate cultural, physical, chemical, and biological controls with host plant resistance in management of FAW.
- Survey and document natural enemies of the FAW in East Africa.
- Evaluate the efficacy of the local larval parasitoid *Habrobracon hebetor* on FAW.
- Evaluate the efficacy of the local egg parasitoid, *Trichogrammatoidea armigera* on FAW.
- Evaluate the efficacy of other local natural enemies of FAW.
- Screen and identify the correct pheromone lure combination for attraction of FAW strains in East Africa.
- Screen insecticides included in the PERSUAP for efficacy and safety under local conditions.
- Governments should consider fast track registration of pesticides for control of FAW.
- Conduct FAW host preference and host range studies in East Africa.
- Collaboration within local governments, private companies, and international agencies.
- Integrate management technologies developed for FAW in the IPM package developed for maize and other crops in East Africa.

The workshop closed with thanks to everyone.

July 16: Fayad traveled to Hawassa for the planning meeting of the “Rice, Maize, and chickpea IPM for East Africa” project.

July 17: the planning meeting started by welcoming remarks from Tadele Tefera (PI) and Amer Fayad. Both stressed the importance of reviewing progress of the project and plan for the coming year’s activities. Fayad discsses the PERSUAP and the need to strictly follow this document for approved pesticides

Progress reports were delivered by each country group (Kenya on maize, Tanzania on maize and rice and Ethiopia on maize and chickpeas). There were nine (9) presentations from students among them, 5 were PhD students (1 from Kenya, 2 from Tanzania and two from Ethiopia) and 4 were Masters students (1 from Kenya, 1 from Tanzania and 2 from Ethiopia)

Paddy Likhayo from KARLO: Maize stem borer IPM in Kenya. Paddy mentioned that PPT is not widely practiced in central and south rift valley and that most farmers lack information on it. The project collaborated with KAVES value chain project and extension staff and 40 farmers. Partners include Caritas, staff from state dept. of Ag., farmers, local administration, KAVES, icipe. Josephine Wetangula (MS. Student): described her work on FAW; FAW is advancing rapidly, very destructive, threat to

food security. Extent of damage not analyzed. Plans to determine extent of damage to maize, establish life cycle on other crops (maize, rice, beans, sorghum), and identify what strains are present.

Nsami Elibariki from National Biological Control Programme, Kibaha Tanzania: Management of maize stem borers in Tanzania using Push pull Technology (PPT). Cereal stem borers 30-53% losses in maize, striga 20-90% depending on infestation level.

He mentioned the need to create awareness to farmers and extension agents and that no weeding needed after desmodium establishment. Data collection: stem borer, FAW, striga. Value chain partners include NAFKA in Morogoro and Mvomero. He reported that mean yield increased by 24.9%, plant height by 3%, exit hole decreased by >50% and decrease in stem borer damage. Farmers prefer Brachiaria to napier grass as a pull.

Challenges encountered are FAW, inadequate desmodium and brachiaria seeds, termite at harvesting stage, bird scaring against brachiaria seeds.

Dr. Charles Chuwa, ARI-Dakawa, Tanzania: Screening and disseminating rice varieties against rice blast and Rice yellow mottle virus. Charles said that 50 rice genotypes have been screened for resistance to the three diseases. Field days about 52%M 48%F. He reported that major challenges include distributing rice seeds, field days, training, mass media....

Ibrahim Hashim. SUA PhD student: Evaluation of microbial pesticides for rice. They are looking at resistant varieties, use of fungicides and cultural practices. Foliar sprays of bio fungicides *Trichoderma asperellum* and *Bacillus subtilis* (Real IPM, Nairobi). Inhibition on *P. oryzae* in culture. The two were found to have elite inhibition in dual inoculation. Fayad questions on sources of *Trichoderma*, why not harzianum? Why not other sources? Ibrahim also mentions the use of fresh roots of *D. elliptica* and *N. mitis* collected from field and Fayad asks if has he compared results with previously published ones.

Nana Amiri, MS. student University of Dar es Salaam: 2 sites. They are major rice cultivation areas. They need to increase number of collections. Include upland and low land. They need to use current literature on production levels.

Asrat Zewdie, Plant pathologist, EIAR, Debrezeit, Ethiopia: Chickpea wilt, blight and pod borer IPM in East Shoa. There seems to be a problem with experimental design, no proper controls example no treatments and only insecticide treatment. Need to revise the experiment.

Tarekegn Fite, PhD student Ambo University: Management of chickpea pod borer in Ethiopia. He reported a 30-40 yield loss. Farmers rely on pesticides because of immediate action on target pests. Population genetic structure not known! Pheromone traps could be used for monitoring. They need to evaluate biopesticides ex *Beauvaria* spp.

We need to know what is the source of microbial pesticides? Is it the Desert Locust project or Ambo Plant Protection Research Center?

Gezahegn Getaneh, PhD student. Jimma University: IPM chickpea Fusarium wilt and Aschochyta blight in Ethiopia. He is using locally isolated *Trichoderma* isolates and conducting lab inhibition tests. We need to know how many isolates did he start working on and how he selected the 6 isolates/6 species? Why didn't he include a commercially available one? Any plans to scale production?

Birhanu Sisay, Ms student Haramaya University. Management options for FAW in Ethiopia: he plans to use Pheromone traps but needs to be coupled with meteorological data. Ferdu mentions that farmers will not recognize first instar. Need to look for Egg parasitoid: need to find early detection areas.

Denberu Kebede Ms student University of Addis Ababa: Endophytes against spotted stem borer. He plans to do molecular identification of endophytes. Need to add a resistant variety to the study for comparison. Molecular analysis will be done at icipe Nairobi. Student will only isolate DNA and send the samples to the lab for analysis.

Josphat Korir, PhD student University of Nairobi: Economics of rice maize and chickpea IPM in East Africa. He reported that Chickpea pod borer loss can reach up to 90%. He needs to identify adoption potential, assess cost benefit and ex ante, assess productivity

95% farmers were willing to pay for IPM (WTP). Incremental acreage on which they were willing to produce under IPM.

Very few women were involved in making decisions on pest control. Other decisions were made jointly.

Geoffrey Muricho, Economist ICIPE, Nairobi: Impact of women empowerment and PPT adoption on women nutrition and farm labor. He used WEAI, WDDS women dietary diversity score based on recall of 9 food groups consumed in the last 7 days.

Labor measured in person days (8 hrs of work). Which food group was least likely to be consumed? He reported that PPT increased harvesting and threshing labor (due to increased yield).

William Hutchinson, University of Minnesota, USA; Digital IPM pest Diagnosis using a Mobile App. He discussed the smart phone app being developed for insect pest

identification (extension farm advisors). He also mentions the work on an IPM animation: PPT and the need to decide on 2nd animation (FAW?). these should be in English, Amharic, and Swahili.

Desalegne, Tadesse, Communication expert, ICIPE, Ethiopia: Communication plans. He described planned activities for a Website for the project and Branding and Marking. Fayad mentioned the need to follow the Marking Branding guidelines set by the Feed the Future.

Menale Kassie, ICIPE, Nairobi: Baseline study report (Chickpea, maize and rice) and report on indicators and gender mainstreaming, he reported the following

- Maize 300 households in 12 villages 3 districts
- Chickpea 200 growers 2 districts 9 villages
- Kenya 200 households in Bomet and Nakuru counties
- Tanzania 400 households rice and maize
- Data project indicators, consultants identified review pesticides and IPM policy
- Demos 11 villages in Ethiopia, 17 in Kenya and 17 in Tanzania
- 68% maize and 85% chickpea producers in Ethiopia have mobile phones, 98% Kenya. We need to ask what kind of mobile they have, is it smart phone?

He suggests the need to focus on few villages and described a major challenge facing farming and agriculture in general and that is “aging farmers”. It is better to focus on few farmers but get more significant information. Fayad asks for clarifications on why the study only looked at benefit to women and not children, especially children for the first 1000 days of life. Menale explains that it was due to lack of resources and planning.

Discussions/ Recommendations

- Scaling approach, Beneficiaries, and Adopters
- Size of demonstration plots so farmers see benefit or benefit is feasible to farmers. A push Pull Village model?
- Paddy said farmers use maize bean intercrop. Can we do bean/Desmodium/maize? In Ethiopia intercropping is not an issue. Challenge is western Kenya. Fayad said this would be dangerous; need to validate first otherwise will send a wrong message if results are not favorable.
- Need at least 0.5-1 acre to demonstrate benefit of a technology.

- Investigate the effect on pest management and increase fodder and animal health and milk production.
- Ferdu mentions that if the area is infested with stem borer then farmer will probably accept PPT. Need to look for areas infested with the stem borer for it to be likely to succeed. We don't need to put PPT everywhere.
- Geoffrey: in case of Striga, farmer will sacrifice bean and use PPT to save maize. Fayad clarified that they can work in Striga-infested areas if we do not exhaust resources.
- Cannot stretch beyond two locations for chickpea. Can invite from other sites at field days.
- Identify Champion farmers in demonstrations, training.
- IPM village? Concentrate resources. Cluster farming: put similar crops in one area. Community based PPT in Uganda was good.
- Need to show local government how technology works and is beneficial. Ethiopian government are supportive.
- Recognition ceremony for farmers and their positive influence on technology dissemination and adoption.
- Seed availability for *Desmodium* and *Brachiaria*. Seed supply is a challenge. Kenya seeds in Kenya for *Desmodium*. *Brachiaria* not available. Icipe is trying to work with different companies. Import these from Thailand. Will try to source seeds this year on time.
- Country level planning. Need to meet with each country group and have in detail planning.
- Tadele stresses the need to send invoices on time. Need to plan properly and reach more farmers. Activities will pick up. Need to move with full speed.

July 18: we visited three farmer field plots where the PPT is implemented in Hawassa. Two farmers expressed their satisfaction with the technology. They reported less damage due to stem borer, increase fodder for livestock, and healthier livestock, and more milk production. One farmer said he has not seen the benefits yet as this is his first season using PPT.



Field demonstration plot with the PPT.

July 19: we returned to Addis Ababa.

July 20-21, 2017: Fayad returned to the U.S.

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 | | |
| Planning Meeting: Biocontrol of Parthenium Project | 07/05- 07/07 | 16 | 13 | 3 | Virginia State University | The review progress and plan for FY18 activities |

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|---|-------------|----|----|----|------------------------|--|
| Technical Advisory Committee Meeting | 07/10-07/13 | 25 | 20 | 5 | IPM Innovation Lab | To present on IPM IL projects to the PIs and Technical Advisory Committee |
| Fall Armyworm management and awareness workshop | 07/14-07/15 | 75 | 60 | 15 | The IPM Innovation Lab | To raise awareness of the fall armyworm in East Africa and encourage collaboration |
| Planning Meeting: Rice, Maize, and Chickpea IPM East Africa project | 07/17-07/19 | 24 | 21 | 3 | icipe | The review progress and plan for FY18 activities |

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

Biocontrol of Parthenium

1. Future planning meetings should focus on reporting the progress made during the current reporting year and address activities/ workplans for the coming fiscal year.
2. Need to produce quality parthenium stock for rearing the bioagents on a regular basis.
3. *Zygogramma* should be released in areas that receive rainfall above 800 mm per year and a relatively long wet season.
4. Release *Zygogramma* at sites with heavy soil that remain moist for a relatively long time during the dry season.
5. *Listronotus* will be released both in wet and dry areas in the coming year.

6. Follow up on monitoring the establishment and spread of the released agents.

TAC Meeting/ FAW Workshop

1. Have more time for the TAC/PCC meeting. Some PIs members noted that they did not feel they had enough time to do their presentations and have discussion.
2. Following up on the recommendations from the FAW workshop.
3. Releasing *Habrobracon hebetor* in the field to see if it will parasitize FAW in the field like it does in the lab and then write a note for a journal.

Rice, maize, and Chickpea IPM for east Africa Planning Meeting

1. Investigate the effect on pest management and increase fodder and animal health and milk production.
2. Should not pursue field demonstration on bean/Desmodium/maize at this time and this has not been field tested and validated. In case results are not beneficial, will send a wrong message about the PPT and could jeopardize the adoption of PPT.
3. Need to submit invoices in a timely manner.
4. Need to show local government how technology works and is beneficial. Ethiopian government is supportive.
5. Need to investigate the benefit of IPM to children and the whole family, not just women.

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