Meeting Minutes

Day 1: September 23, 2019

9:00 am

Muni Muniappan, IPM IL Director, begins with opening remarks by welcoming everyone to Tanzania. IPM IL is in its fifth year and the project is coming to an end November 15, with a possibility of extension. During this meeting, he says, we will be discussing the progress made in the last year and what we should be planning for the future. Muniappan introduces the field trips that will be taken in the next two days and that Tadele Tefera, Grains IPM PI, has produced a manual on rearing and releasing parasitoids of the fall armyworm (FAW). At Morogoro, Muniappan says, we will meet with farmers to assess their satisfaction with IPM practices and technologies. Following that meeting, the Grains IPM project will meet over the weekend, and the Management Entity (ME) will travel to Ethiopia for the *Parthenium* planning meeting.

Meeting participants introduce themselves. Participants include: Muni Muniappan (IPM IL Director), John Bowman (AOR, USAID), Stephen Mruma (Fintrac), Zara Shortt (Accounting), Sara Hendery (Communications), Simon Mlay (TAHA), Silvanus Mruma (NAFAKA), Tadele Tefera (Grains IPM in East Africa), George Norton (Zoom Call—Vegetables Crops and Mango IPM in Asia), Luis Canas (Vegetable Crops IPM in East Africa), Buyung Hadi (EPIC), Le Quoc Dien (IPM for Exportable Fruit Crops in Vietnam), Wondi Mersie (Biocontrol for *Parthenium*), Allan Hruska (TAC member), Abhijin Adiga (Invasive Species Modeling), Pramod Jha (Climate Change and Biodiversity), Daniel Sumner (Gender), Lawrence Datnoff (TAC member), Dely Gapasin (TAC member), and Glen Hartman (TAC member).

Muni Muniappan, IPM IL Director

Muniappan begins his presentation. He reviews the current countries the IPM IL works in and the major aspects of IPM IL including IPM packages, short and long-term training, and invasive species monitoring and management. He covers the IPM packages by giving an example of the tomato IPM package. Some of the IPM package components include coco-pith, which helps grow stable, disease-free plants, as well as *Trichoderma*, a naturally occurring fungus, and grafting. He also introduces pheromone traps and lures, which help monitor pest entry and the use of parasitoids and predators. He covers NPV to control *Spodoptera litura*, as well as neem, which could control FAW and other pests. In Vietnam, he says, IPM IL works on four major fruit crops with a focus on Longan Witches' Broom, which affects longan yields. *Tuta absoluta*, originally from South America, he says, was introduced to Senegal in 2012. IPM IL has been involved in tracking the pest's movement and management and has been involved in awareness and management workshops for the pest. In the past, IPM IL worked on papaya mealybug, helping to resolve the issue with just 200 parasites. IPM IL also works on *Parthenium*, an invasive weed, by releasing two natural enemies in Ethiopia. In 2017, FAW reached Ethiopia and IPM IL took the angle of looking for natural enemies. *Telenomus remus*, a natural enemy, is well established in both Asia and Africa, and could be a solution. A biocontrol workshop, Muniappan says, was conducted in July in Niger, and the IPM IL sent six participants from Asia, with 20 participants altogether.

Muniappan covers communications for the IPM IL and also covers the manual that was recently published on controlling the FAW using natural enemies. He also covers the upcoming special issue of *Crop Protection*, in which there are 16 IPM articles included. IPM IL also has several upcoming symposia, including IPPC and the Entomological Society of America. IPM IL is currently working on an

associate award for Nepal, which addresses IPM for vegetables, maize, and lentil, the management of FAW, and applying IPM inclusively and equitably.

John Bowman asks about using NPV in Africa and how Muniappan feels about its introduction. Muniappan says he feels that this is naturally occurring in Africa and does not need to be re-introduced, that it's vital to look into local technologies before considering new introductions. John Bowman says it is a private sector-ready product and that is the issue, that if you have a biopesticide that's better than a chemical, that's good for us and helps us to progress in registering these products.

9:30 am

John Bowman, IPM IL Agreement Officer's Representative

Bowman says he wants to discuss the new structure of BIFAD and the Innovation Labs. Three main pressures, he says, is structural transformation, funding, and relationships with missions. He feels that relationships with the mission must be improved. Agricultural growth, he says, comes from two main sources: science-led growth and resource-led growth. IPM IL focuses on science-led growth, but amongst these current changes there needs to be a justification on why agricultural research receives funding. Investments in R&D brings back nearly 30-40% return on investment, and through the Feed the Future Innovation Labs, over 1000 technologies are developed and deployed. We are trying, he says, to focus on pushing out readily scalable technologies, which is why there is now a FTF Innovation Exchange program that shows technologies with scaling potential. FTF investments in research yields positive results. The newer way of thinking for BIFAD incorporates resilience, focusing on the shocks occurring in the 21st century and helping communities better prepare for them. For example, a stress tolerant maize variety might not produce more yields, but better yields. With the new BFA, links should be strengthened between humanitarian response, conflict/violence, stabilization, etc. Major structural changes include new water staff, new resilience staff, and nutrition is elevated hierarchically to the same level as agriculture. Bowman says that the concept of resilience has really risen to be a major priority. USAID's goal is to ensure that countries become self-reliant, and by adding new priorities such as water, USAID can better contribute to that goal. He says that one of the major challenges is headquarters versus the field. By creating country support teams, the burdens on the mission will be reduced by eliminating their need to navigate ad-hoc networks of expertise across the Agency and partner USG agencies. Bowman has been assigned to the Tanzania core team, so that whenever the mission has a demand for a Washington service, the team will decide how to address the problem.

Looking back, he says, FTF has made immense gains, such as improved access to sanitation services, but resilience is being elevated in order to prevent people on the edge of poverty backsliding into a deeper poverty. This protects gains made in food and nutritional security. The key focus is that what has been successful in the past will not be sufficient for the future. He asks, how can IPM IL adjust to these new FTF priorities? One of the ways is IPM IL must rebrand itself to become a contributor to "system resilience." He asks, how can IPM IL better contribute to suppression of sudden/emerging outbreaks? Emphasis on private sector strengthening, emphasis on youth engagement, and more activities on development co-benefitting U.S agriculture could be some of the solutions. Extension services, he says, are perpetually weak and the private sector is always there. *Tuta absoluta*, the tomato leafminer, is an example of how the IPM IL is helping to reduce threats to the U.S. He asks, how will we improve communications with missions? We need to make sure that impacts are more measurable and communicable and we need to be more involved in mission-implemented partner meetings. We also need

to build supportive roles within value chain projects at the design stage, as opposed to attempting integration after implementation has begun.

Allan Hruska, FAO, asks when this new structuring will begin. The super structure, Bowman says, is already in place, but the sub-structures are not yet in place. For example, he is supposed to lead a technical hub, but cannot yet begin. Some Innovation Labs, he says, are being forced into new centers and the fear is that when recompeted, those Innovation Labs will become a different kind of project.

Luis Canas, Ohio State, mentions that he has not seen alignment of missions and innovation labs and he is hoping that this will improve in the future. Bowman says these new teams will think about how to improve relations between these two groups. Many labs do not work with the missions directly or consider how it impacts major mission priorities.

Lawrence Datnoff, TAC Chair, says that he feels there is a lack of communication with the missions, for example, a lack of knowing mission priorities.

Bowman says that the connections have not clicked enough and there is a need for co-design of priorities. In Nepal, the mission has grabbed on to the work IPM IL has done, but in other areas, that interest is not as high.

Muniappan says at the beginning of the associate awards, IPM IL met with the missions but the issue is many of those people are gone after some time and often the mission has not shown up for meetings.

11:00 am

Stephen Mruma, Fintrac

Mruma covers the main objectives of Fintrac, including scaling improvements for smallholder farmer productivity, especially among women and youth. Collaborators include agronomists, market specialists, value chain stakeholders, MEL team, and others. Some technologies being promoted are seedling trays, live barriers, stalking/trellising, plant spacing, drip irrigation, and post-harvest handling. They are increasing the adoption of technologies with three technology packages and training of trainers. Through training, farmers learn about different market windows for different crops, how to understand the cost of production, and new tech to increase quality. There is recurring training for partner agronomists, agronomy "bootcamps" with over 600 government and private sector extension agents, and government extension officer initiatives. The GEO initiative is the establishment of horticultural demonstration plots. Through this initiative, clusters of production and increased income and yields are produced. There are three packages for increased production—some are basic, others are for entrepreneurs, and others are for professionals. Advantages of the packages is increased productivity at farmers' own pace. Agronomists are also trained on IPM for pest and disease identification, with a focus on tomato, onion, sweet pepper, cabbage, watermelon, and Irish potatoes. There is a high rate of adoption of good agricultural practices.

Wondi Mersie, IPM for *Parthenium*, asks if the seedling trays are made of plastic. Mruma replies yes.

Muniappan asks what medium they use in the seedling trays. Mruma replies peat moss and that they are training farmers on the use of local medium such as saw dust and application of *Trichoderma*.

Glen Hartman, TAC, mentions that one of the slides that was presented said there was a 33% increase for all crops and asks what the farmer input is. Mruma says it depends on the farmer, but generally farmers are spending up to 20% more.

Allan Hruska says given the role of resilience, how do you plan to build resilience into your work?

Mruma replies through the IPM packages and training farmers on how to use practices to reduce erosion and use certain fertilizers.

Lawrence asks what are the packages?

Mruma replies they include a focus on nonchemical practices such as land preparation, live barriers using sorghum, and use of yellow traps to track and identify different pests. We partner with Real IPM, he says, who cultures biologicals.

Muniappan asks if there's collaboration with IPM IL.

Mruma replies there is post-harvest training and training at Sokoine University.

Dely Gapasin, TAC, says that Real IPM has been mentioned, but is that the only IPM group you're working with on IPM?

Mruma replies yes.

Muniappan asks if there were entomologists from Sokoine University helping with training and Mruma says no.

Bowman asks about GEO—is this new?

Mruma replies yes, it is in its first cycle.

Bowman says the problem is extension agents don't have the funds to work in the field, but it sounds like you're giving them responsibilities. When the project ends, what will happen?

Through our initiative, Mruma says, we are linking partners with extension agents to establish themselves in the district. Once we leave, companies will proceed to have these activities.

Bowman asks, in your tomato fields, it didn't seem like you had your own microfinance opportunities, but that you were bringing in companies to help farmers afford your inputs. What's happening with microfinance in your project?

Mruma says that we have partnerships with 7 financial institutions and farmers can get loans as individuals or in a group. Payback success rate in Zanzibar is very good.

11:30 am

Simon Mlay, TAHA

Mlay says that TAHA was established in 2004, initiated by big growers and exporters to promote and develop horticulture and address specific needs of its members. TAHA advocates for better business environment (policy/advocacy), increased access to markets for horticultural products, improved productivity and competitiveness of the horticultural industry, and always aims to enhance TAHA's effectiveness, efficiency, and sustainability. Members include large-scale farmers, processors, and companies dealing in horticulture, agro-input dealings, and smallholder farmers. They operate in 18 regions in the mainland and Zanzibar. TAHA's approach is looking at the entire value chain—enabling environment (policy, access to finance), technical services (agronomic support), and market linkage

(local, regional, international). IPM strategy focuses on techniques that minimize negative impacts on environment: use of biocontrols and natural enemies, proper land preparation, safe use of agrochemicals, applying right dose of recommended chemical fertilizers, use of plastic mulch, traps to control insects, pheromone traps, etc. Other methods include adoption of climate-smart agriculture such as preventing erosion by planting cover crops on sloppy land, use of live barriers, conduction of soil analysis, and crop rotation. Correct land use is incredibly different because of trees being cut down, erosion, etc. We also promote use of insect nets.

Lawrence Datnoff asks where the seeds come from. Mlay replies we have allied members who are input dealers and several different companies.

Allan Hruska asks what are the incentives for use of IPM?

Mlay replies last year a food safety committee began and an expert has conducted research. We are packaging this research to show people the dangers we face in using chemicals and we hope that once communities stop demand, they will not sell anymore. We are trying to set up food safe kiosks where crops only grown with biocontrol agents are being sold, but that is still a challenge because there is no difference in organic and nonorganic crops.

Lawrence Datnoff asks the difference between large and small farmers. Mlay replies small farmers have 1-5 acres and the large ones are more than 10 acres. It also depends on level of investment.

Tadele Tefera asks if farmers are spraying tomatoes. Mlay says yes, but farmers have confessed they have smaller plots at home where they don't use chemicals.

Muniappan says you interact with Real IPM, but do you interact with the World Vegetable Center? Mlay replies yes, through the grafting of tomatoes, but you cannot do it on a large scale because of bacterial wilt. We collaborate with Sokoine University to do more research on promoting horticultural practices to farmers.

Glen Hartman asks what crop is most profitable?

Mlay responds tomato, then onion. Bacterial wilt and *Tuta absoluta* are still the biggest issues.

John Bowman asks the importance of African indigenous vegetables to TAHA, that there seems to be a high market demand for only certain vegetables. What is going on in the markets?

Mlay replies we are trying to promote farming as a business but there is an issue with nutrition. Commercializing this indigenous produce is a challenge, which is why they are not as available in the bigger markets.

Silvanus Mruma says some local vegetables have high resistance to many diseases but are losing favor and this issue of monoculture is very destructive, that local vegetables are almost being treated like weeds. There is a cultural shift, and you sometimes cannot even find the seeds of these crops.

Dely Gapasin asks if the large farmers are exporting their products?

Mlay responds most of them do export and the small farmers consolidate their produce.

Dely Gapasin aks if that would be a good strategy for the market sales.

Mlay responds that some are not ready for that, but using IPM could allow them to comply with good agricultural practices, and that is one of the main reasons we came to this meeting.

1:00 pm

Silvanus Mruma, NAFAKA

Mruma presents background information about NAFAKA. It is a 5-year USAID value chain activity that focuses on 6 regions. It is focused on grants, training, and facilitation. Much of the nutrients in maize, he says, are being lost, so we are working with an American company for maize flour fortification and providing training on good manufacturing practices. Our vision for success, he says, is to produce more fertilizer sold through the private sector and rural agro dealers, increase seed sales, and increase units of crop protection products sold.

He says that rice disease challenges include grasshoppers, flea beetles, and sobemovirus transmitted by beetles.

Bowman asks why more weeds would cause more viruses. Mruma replies that weeds act as a reservoir for the flea beetles during the off-season. We do demonstration plots showing cultural practices such as weed management.

Mruma says that bacterial leaf blast is also a major challenge with yield losses up to 80%. Control measures include resistant varieties, crop protection, use of improved seed, etc. Rice blast is also a major challenge that can be transferred through seeds with an estimated yield loss of 37%. Management options include tolerant varieties, crop residues management, timely planting, etc. Pest and disease challenges include stem borers, stalk eyed fly, gall midge, grasshoppers, etc. We work with private sector companies, he says, trained by professional sprayer services. NAFAKA's approach to FAW is training extension staff in field scouting.

Allan Hruska says you have indicators for certain goals, but I didn't see goals for farmers. Do you measure how much farmers make?

Mruma says yes, we are in the process.

1:30 pm

Tadele Tefera, Grains IPM for East Africa

Tefera introduces the work of Grains IPM. Priority pests are stemborers, rice blast, RYMV, maize stem borers, FAW, chickpea pod borer, and wilts. Some products developed to protect plants include biopesticides in collaboration with Real IPM, *Trichoderma*, natural enemies, etc. Products transferred to farmers include push-pull, disease tolerant varieties of rice, water drainage, and seed dressing against chickpea wilts. One of our objectives, he says, is testing new technologies. Some of our achievements include testing biopesticides against rice stem borers and promoting rice disease tolerant varieties. Farmers who are demonstrating disease tolerant varieties are getting 2-3 tons of additional yield benefits. For rice IPM, 7 papers have been published. For chickpea IPM, raised bed wilts, resistant varieties, and botanicals have been successful. There are reduced sprays. For maize, fall armyworm is the main problem. Pheromones have helped in monitoring, while Kenyan biologics lure has been effective in trapping the pest. Local parasitoids are now being reared to use against FAW, for augmentative release of egg parasitoids. Mass rearing methods have been established at *icipe* and the parasitoid *Trichogramma* can be reared on the rice moth. Thus far, we have trained 20 partners from different organizations on rearing. For push-pull, it started with only about 50 farmers, and now we have 3,000 farmers adopting the system. Currently, we have 5 PhD and 4 Msc students and have been using WhatsApp and telegram to

share information and updates. The focus for 2020 is FAW and scaling IPM. We want to increase the number of farmers adopting IPM technologies and carry out cross-country synthesis and comparative analysis.

Dely Gapasin asks what are your new activities? Tefera replies many activities are ongoing from other years so none are completely new. There will be expansion.

2:00 pm

George Norton, Vegetables and Mango IPM in Asia (Zoom Call)

Norton introduces the main components of his project in Cambodia, Nepal, and Bangladesh. Thus far, there has been a great deal of capacity building, IPM diffusion, and impact assessment. In Cambodia, we have incorporated tomato on-farm IPM package and worked with students at the Royal University of Agriculture. In Bangladesh, we tested performance of Bt eggplant, conducted trials for mango hopper and fruit fly, field trial management of *Tuta*, and IPM packages for white mold. In Nepal, lures for fruit fly have been tested, IPM packages for chili, onion, eggplant, and French beans, and pest inclusion nets in polyhouse have been incorporated. Over 300 Community Business Facilitators (CBF) have been trained and IPM IL has trained over 1,000 service providers on *Tuta* tech. There has been a strong balance of graduate students and we are working with women in on-farm trials. There is one upcoming MS thesis on adoption and impacts of the *Tuta* package. In the coming year, we will monitor for FAW, continue with farmer field days, with delivering information via SMS, and coordinate with CESAIN.

Glen Hartman asks how will the Nepal Associate Award affect your current project?

Norton replies it will impact the project a lot. IPM packages that have been developed will be scaled up including the number of technologies in the package itself. We will be working with NARC setting up labs and help farmers look to projected benefits. Lentils and rice are going to be added.

John Bowman asks is there a distinction between CBFs and the private sector? Norton replies that CBFs are considered to be the last-mile supply for farmers who receive a percentage of profits.

Allan Hruska asks if there is a decided list of approved products. Norton says yes through the PERSUAPs and approved recommendations.

Silvanus Mruma says we have a similar model—do you have a credit guarantee? Norton replies that CBFs take orders.

2:30 pm

Luis Canas, Vegetable IPM in East Africa

Canas introduces major goals for the project including developing IPM packages and IPM communications. Thus far, the team has completed survey work, data analysis, use of botanicals and release of agents for suppression of clubroot disease of cabbage. There are 5 MS students and 5 undergrads. We have completed short term training of farmers and extension agents and use WhatsApp to advertise trainings, which has been very successful. Canas listed some success stories including a vegetable farmer who had trouble with production in tomato. Sokoine Unviersity researchers trained the farmer to use raised beds and *Trichoderma* in the soil, and this farmers has now become a model farmer.

Peter Seeruwagi has trained 499 participants. Another success story includes a farmer who increased income from 636.4 to 4,000. In 2020, there will be an end survey to see more impacts. Canas says that in Ethiopia the work has been challenging.

Muniappan asks if there has been any business opportunity out of *Trichoderma* production and Canas replies no.

Allan Hruska says he was struck by lack of communications with the national and local govt.

Stephen Mruma says we have this challenge as well because government officials ask to pay their fees.

Canas says he goes directly to the mission and local institutions because they know the local politics. Country by country it's very inconsistent.

Muniappan says he recently asked someone in Bangladesh what government official to bring to FAW training, but they did not want anyone from the government. He asks is it because Real IPM coverage is taking care of that?

3:30 pm

Buyung Hadi, EPIC

Hadi covers the main successes of the EPIC project thus far. There have been 7 papers published, 2 more in preparation. There has been up to 90% reduction in injury over various IPM components. An innovative research platform, gender equity and research, and annual review meeting is still to occur. Thus far, many IPM components have tested including ise of microbials against insect pests. For nematodes in Cambodian rice fields, 60 fields are monitored in irrigated area. For sesame, mungbean, sponge gourd, and chilli we used flowers and biologically it worked, but if it doesn't have immediate benefits for farmers they will not stay with it.

Muni Muniappan says you mentioned ecological engineering has disappeared in Cambodia, but what about in China? Buyung said it continues there because the provincial government can make things happen.

Buyung says there is no significant different in yield between ecological engineering (no insecticides) and conventional practices (2-3 insecticide sprays), which is really important data for the EPIC team.

Muniappan asks do you think the trap system for rodent control will be widely adopted?

Buyung replies that we will have to incentivize for that to happen. We can make the system more sustainable, more recyclable. There's reason to believe the government might bless this system. The IPM components we're recommending can be adopted quickly. We want to work out a subsidy to make the price of chemicals more expensive so that the price of microbials are less expensive.

Muniappan says this is not the case for Bangladesh and Nepal. Buyung says it is because in Cambodia there is no competition. We are talking to Harvest II because they are interested in making microbials more affordable for farmers.

Bowman asks what is the difference between rodent management and IPM? Buyung says in the beginning, some farmers want to only try rodent management and nothing else.

Lawrence asks can farmers get a premium for selling rice without chemicals?

Buyung replies that's what we are trying to do in the next year. We are trying to do field symptom diagnostics through IVR with Viamo. The two Cambodian participants returned from the IPM IL Niger trainings and are currently scouting for FAW. The national IPM forum will be in Cambodia in October.

Buyung says proposed activities include mass rearing and release of FAW parasitoids, nematode management, farmer training on rice IPM, IPM business incubator for young entrepreneurs, etc. There is co-investment into many of these activities.

Lawrence asks when do you put *Trichoderma* out for blast control? Buyung replies during seed treatment and during flowering.

4:00 pm

Le Quoc Dien, Exportable Fruit Crops for Vietnam, Presentation

Dien introduces the main activities of the Vietnam Project. Work on 4 main crops—longan, lychee, dragon fruit, mango—in Vietnam. Activities include taking stock of current fruit production, pests, and management measures. There has been adoption and scale success on dragon fruit for canker disease and excessive pesticides as well as development of plastic sleeves. We use neem products, yellow traps, SOFRI protein bait, planting flowers around dragon fruit field, 8 new bacteria clones to control anthracnose, and more. For longan fruit, we manage longan witches' broom caused eriophyid mite, which can be controlled by pruning and sulfur. For mango, we manage anthracnose, leafhoppers, thrips, and fruit flies. We use biocontrol agents, cover fruits with paper bags, and yellow traps. For lychee, we manage lychee shoot borer.

The IPM package for dragon fruit in Vietnam includes recommendations such as removing disease infected cladodes, destroying crop residues, covering flower buds with plastic, and promotion of certain biopesticides. Planting impatiens, he says, helps.

Bowman asks who is providing the impatiens? Dien replies SOFRI.

The IPM package for longan includes setting up light traps to monitor pests and use entomopathologic fungi to control mealybugs. IPM package for mango includes pruning trees, bagging, pheromone traps and fruit fly control, and enhanced use of organic fertilizer or compost inoculated with *Trichoderma*. IPM package for lychee includes *Beauvaria* for stinkbugs and chemicals used as a last resort. Thus far, we have introduced IPM packages at 8 enlarged IPM models and 240 households at 7 provinces.

Bowman says I don't see you taking measurements in farms who aren't doing what you're doing—are you taking data? Dien replies that for dragon fruit farm gate prices of IPM models are high at 10-40% compared to control and IPM packages have reduced chemical sprays 4-7 times. Dien says training has been done for 663 farmers and extension staff in 17 training courses, and after interviewing 75 farmers, IPM preferences have been surveyed. Household decision making surveys have also been taken from 150 men and 150 women. Not yet complete is VietGAP certifications for 2 models of mango and lychee.

We hope to register advanced tech for IPM packages, Dien says, expand IPM transfer and evaluate IPM.

John says you have to make the connection about how you're reducing pesticide use, expecially for mangos going to the U.S. If you could estimate, for example, that a certain amount of longan farms exist in Vietnam, we need to know what it would it look like if they all adopted lower pesticide use.

4:30 pm

Wondi Mersie, Biocontrol for *Parthenium*, Presentation

Mersie introduces the main components of the project. *Parthenium* is a major invasive weed that replaces native species and also affects human and animal health. In 48 countries, it is an invasive plant. In Ethiopia, we have the permit to release two natural enemies. Next we evaluate the impact of released agents as well as new biocontrol agents for their safety to non-target plants. *Listronotus*, the natural enemy, is more resilient than *Zygogramma*. We have rearing facilities in Wollenchiti and Ambo University. We are proposing to close Wollenchiti as a cost cutting approach. We have released over 100,000 *Zygogramma* since the beginning of this project. For *Listronotus*, not so many are needed.

Lawrence Datnoff asks when do you release? Mersie replies the rainy season, which is especially important for *Zygogramma*.

Mersie says one of our goals is to duplicate this work in many parts of the country. In Arba Mintch, if land is left fallow, it will be covered with *Parthenium*.

Lawrence asks how large a population do you need to release so that predators don't take them? Mersie replies *Listronotus* immediately goes into the plant. On Aug 18, 2017 we released 3,000 adults of *Zygogramma* and one year later you can see it established. You find it about 100 meters from where you released it. *Listronotus* was also released in 2017.

Mersie says his team will complete an impact assessment to determine in the impact of *Parthenium* biocontrol on yield of major food crops such as Teff and evaluate new *Parthenium* biocontrol agents for safety to non-target plant species under quarantine. Through Daniel Sumner and Maria Elisa Christie, gender assessments are currently being prepared and we have helped obtain permits for *Zygogramma* and *Listronotus* in Kenya and Uganda. Policy change has come out of this project.

Glen asks if it is safe for all the crops? Mersie replies we have to test against other crops. Kenya and Uganda need to first rear and release because permits take a very long time.

Muni Muniappan says that in a square meter, there could be 90% *Parthenium*. We need to measure and quantify when *Parthenium* is killed what is taking place in that space (importance value).

Dely asks would Pramod's modeling be useful for your Parthenium project? Parthenium may have a wider range. Mersie replies yes.

Lawrence asks have you been able to quantify the reduction of Parthenium using natural enemies? Mersie replies it is underway. Andrew, a collaborator, used climex model—the climex model doesn't take into account where *Parthenium* grows.

Glen asks will you have 100% control? Wondi says they will reach equilibrium.

Adjourn for the day.

Day 2: September 24, 2019

8:30 am

Allan Hruska, FAO

Hruska introduces major focus on smallholder IPM and what we think is guiding national programs to best help farmers at different levels. He covers FAW life cycle and FAW key characteristics. FAW is polyphagous, difficult to control, attracted to grasses especially maize, strong flyer, and once it arrives it will not be eradicated because it moves so quickly. He covers map of rapid global spread; it has now spread throughout Asia. He predicts it will move into Europe soon. FAO responds to country requests in order to help countries address their needs. FAW has caused extreme damage in Africa and farmers were alarmed as first time farmers had never seen this kind of damage. Most damage from FAW is in the whorl and also acts as a leaf cutter. In Africa, the pest enters into the actual crop. However, much of the yield loss from FAW is overstated. There is 10-20% yield loss at high infestation, but there are mostly reports of 100% loss. This is a tremendous overestimate, so one of our main messages is for farmers not to panic. Many countries are responding by giving smallholders pesticides in a way that puts farmers at risk (some products banned in other countries). Not all farmers have experience applying safely. At FAO, our smallholder IPM program is context specific. Ultimately, smallholder farmers who spray pesticides will lose money. Before choosing pest management methods, it is important to check whether economically feasible.

Most smallholder maize farmers don't have access to international markets – they sell their production locally to intermediaries. IPM uses pesticides as a last resort. How do you use other plants in your local field to help manage FAW? Planting common beans reduces oviposition significantly. Increased diversity of certain plants decreases FAW. There is also manual control by collecting caterpillars by hand and crushing egg masses. Farmers also use sand, ash, and soil in leaf whorl. There is also locally available neem, chili, sugar spray, or fish soup. Microbes in the soil are also beneficial. You can also construct bird perches, 10/acre, in early stages of the crop. Host plant genetic resistance is an option with genetically built in resistance, but there aren't actually any varieties ready. Naturally occurring biological control should be the basis to managing the FAW. 60% natural larval parasitism, 92% egg parasitism, 92% pupal predation. The level of natural mortality could be very high.

When we first found FAW in Yemen, fungus had naturally killed the pest. You have to let the natural enemies build in different areas. You can reproduce natural enemies. One thing we have done is create FAW Monitoring and Early Warning System allowing for data collection and use. The App will recognize FAW damage and it will identify it. Farmers then learn what damage looks like. That information then goes to a global platform, which contains all the data collected worldwide. Big data use will allow us to make correlations of what methods to try. The other thing the App does is provides info back to the farmers; working with VIPS (Norway), we have local meteorological data allowing for local conditions data to be given to farmers. Real time precision information for smallholders is especially helpful.

Abhijin asks how is the App processed? Plant Village is providing the backend development of the App. Plant Village has hundreds of thousands of users with many diseases and crops included.

Tadele Tefera asks if another invasive pest occurs, what do you do with the FAW? We will continue to work on FAW but take advantage of this work to then work on other pests. What we're doing with FAW is learning how to be efficient with one pest and learning how to address others. Not all farmers have digital phones but most will in five years. We've been struggling for fifty years but now this offline App will help. We can learn from FAW to know how to proceed with other pests.

John Bowman asks if there is work being done in terms of what is least destructive to natural enemies? Some synthetics are safer for natural enemies but the real problem with this work is the cost. Safe

pesticides are ten times more expensive than the unsafe ones. Botanicals are probably the best bet because they don't affect natural enemies as much and could be cost effective locally.

Muni Muniappan says you're recommending naturally occurring enemies but in the case of NPV it is a different story because it is being incorporated from the US.

Hruska says that if USAID is pushing that introduction, at least they're having the conversation about using a biopesticide. That's progress. Neem controls FAW really well but if you go to certain forums, you'll hear otherwise. The point is, it can validate the discussion of the use of a technology that wasn't brought up before.

Muni Muniappan says the problem with this taskforce is they never allowed other ideas to be discussed openly.

Dely Gapasin says in Indonesia they have a national IPM policy, which is very helpful.

Allan Hruska says we constantly have to come back to that but the pressure to sell products is very strong. Newer products are safer but the problem is the cost.

Lawrence says with this App, it seems like it could work well as an alert system as well, but is it being utilized that way?

Allan Hruska says we need to get more of that community exchange use and the national programs picking it up will do just that. In Ethiopia, there is a program using SMS messages to tell farmers FAW is in their areas.

Tadele Tefera says one of the challenges is when a new pest comes in, countries have no preparation. Is there any move from FAO to develop national invasive pest strategies?

Allan Hruska says that working on FAW, I piggy back off of the locust work. Rather than policy, we need teams to respond to these crises. What you really need is national capacity for local teams to come up with response that is context specific and it must be institutionalized.

Muni Muniappan says in IPM IL we've identified two natural enemies. We are mass producing and releasing but what is your opinion on that?

Allan Hruska says this raises the importance of biocontrol at the national level. It is awareness raising as a valid approach and you're beginning to build local capacity to produce these natural enemies, which becomes a booming aspect in a country. Next you're helping farmers to understand the value of this.

John Bowman says for those who don't believe in the biocontrol, is there a methodology to compare biocontrol and synthetic pesticides? Have you seen statistical ways to prove value?

Allan Hruska says for FAW we have focused on peak FAW, but natural enemies build up. Yield loss is extremely important to talk about. We need to get ministers to want to do this research so that we can understand the cost-benefit analysis. Smallholder economics is important. Only market prices are available but what about what the farmers make? We need to do that research to support the story. For chemical control, what's the sustainability of giving pesticides away? You need to convince farmers what options work best and they help reach the government level. It's not just data, but perceptions.

9:00 am

Abhijin Adiga, Invasive Species Modeling

Adiga introduces the main objectives of the project, which is to create agent-based models to study spread of invasive species in countries yet to be affected or just invaded. Each time we study a region, the model changes because each region is different. Each region has its own challenges and we are driven by the data we get from each region. We are using a trade pathway model, based on paper reviews, and need to focus more on functional relationships. Last year's work is based on the first version of the model; analysis shows spread pattern. This year's primary focus is the spread in Southeast Asia, which considers ten countries and accounts for natural spread and human mediated spread. Previous model only focused on trade. Another component now being used is machine learning. Key challenges are unavailability of quality data; we had to go through 50 reports, papers, and news articles. Our models are very complex and structurally they depend on the region.

Lawrence Datnoff asks was there useful information in the reports?

Abhijin Adiga replies that just to create the basic model we used the reports. We ran around 1 million simulations. We look at all these models that most closely fit. When we compared different simulation output, you see different spread patterns. The key takeaway is that more data is needed on flying capacity and trade pathway. *Tuta absoluta* slowly spreads by itself, but quickly spreads through trade. Within country, the pest can spread in 2-4 years unmitigated, and doesn't depend on size of country. Production regions close to urban centers are at high risk. Our model suggests it will spread more southward before eastward. If trade doesn't exist, it's possible that spread will not happen.

Muni Muniappan asks are there quarantine programs in China? Adiga replies there is so much spraying of insecticides that there is no presence. If the border is porous, it depends. There's not much trade in a place like Myanmar so it has not spread away from it.

John Bowman asks can your model show how the pest moves through non-trade movement? Adiga replies it's too random and we're not sure if we want to go there. When it comes to trade, we can model, otherwise it's difficult.

Wondi Mersie asks what about the role of natural disasters and wind? Adiga replies we have not modeled based on wind. We have data from our Senegal collaborator on seasonal tomato flow. Resulting networks will be included in the spread model developed for Southeast Asia for retrospective analysis. If we can quarantine or reduce *Tuta* in markets, it can be very beneficial. Because of this project, we have a grant from NIFA with funding secured for the next few years that will help us project *Tuta* spread to the U.S. We now know that in lower temperature, *Tuta* can go into diapause. In Senegal, we have been studying the impact of natural enemies. Collection of groundnut leadminer information has begun and indicates leafminer found in India and Africa.

9:30 am

Pramod Jha, Mapping of Invasive Weeds in Nepal

Jha covers major project objectives including mapping distribution of major invasive alien species (IAS) over time between 1990 and 2019. The goal is to draw a trend of distribution and draw linkages between distribution and climate change. In 2019, spatio-temporal distribution of IAS in CHAL was completed. We made predictions of present and future distribution of *Parthenium* and *Ageratina* and monitored gall

fly along elevation gradient. We have assessed nutrient variation in finger millet and buckwheat along gradient as well as the impact of *Ageratina* on associated plant species, varietal trials for nutrient management, assessment of maize insect diversity at different elevations, fungal pathogens on *Parthenium* and *Ageratina*, and analysis of 2017 and 2018 data. 12 papers have been published, and 2 more are on the way. Over time, the area of *Parthenium, Chromolena*, *Ageratina*, and *Mikania* distribution has increased significantly. Distribution of *Ipomea* has actually decreased from 1992 because its habitat is changing; it occurs on roadsides and people harvest it. Other weeds are spread by wind.

Analysis of gall fly distribution shows that it is mostly found in the 2000 m range. Also analyzed is the protein of crops at different elevations. Activities that are still in process is species distribution using high resolution imageries of digital globe, drawing of trend with climate change, and deep learning approach to develop species distribution. We will validate IAS distribution results using knowledge based and deep learning approach and further assess impacts of IAS on native species. 8-10 papers planned for publication in 2020. Altogether 22 presentations in the last 2 years.

Abhijin Adiga presents how he is collaborating with Jha's project. Adiga says his project is incorporating models from *Tuta* on IAS. Hardly any work has been done on IAS mapping. Challenges are difficulties with field survey, it is expensive, and there is sparse coverage.

Lawrence Datnoff asks if drone technology is being used. Adiga replies yes, we're trying to use a combination of images for land coverage and digital globe. We take the high resolution images, cut them into small pieces, and check to see if they have the species.

10:30 am

Daniel Sumner, Gender

Sumner presents the main aspects of his gender research in IPM IL. The focus, he says, is no longer why but how to consider gender in pest management. He used established and innovative approaches, methods, and tools to generate rich quantitative and qualitative data. For example, he conducts research on how *Parthenium* might disproportionately impact women and men. Gender norms continue to be linked to IPM practices and are influential in framing who within the house makes IPM decisions. Through this project, 29 women are supported through long-term degree training. In short-term training, 7,384 women have been supported, and it is important to consider how training can better fit women's participation in IPM. We are promoting women's access to info; for example, SOFRI began working with women's union, and a step beyond that is a new training activity of increasing market information for women's unions. Another activity is documenting benefits of IPM in Push Pull. It has shown that more empowered women are more likely to adopt Push Pull.

Sumner says he has been piloting most significant change technique. IPM practices can increase amount of time women and men spend on pest management, but the overall benefit is more valuable to men and women. The important thing to remember is understanding not all women and men are the same and intersectionality but be applied. For example, in Nepal, we are looking at gender disparities, but also racial and caste differences as well. Another important research idea is assessing differences in how women and men are impacted differently by pesticide use. We need to look at how we can mobilize existing platforms to enhance partnerships and expand our lens beyond a production focus. We need to look at gender roles, norms, and relations and how they are socially defined and continue to change. Men need to be involved and engaged in the gendered dimensions of pest management.

Dely Gapasin asks how do you train more women? In Indonesia, men come for training and say they will train wives, but it doesn't happen.

Sumner responds it has to be a concerted effort because in our Vietnam project women weren't attending so we had to change the way we were reaching women. How do we continue to give women opportunity to gain income even when something gets commercialized?

John Bowman asks did we give you an opportunity to compare notes on findings?

Sumner replies yes, we had a conversation with Krista Jacobs as well as at Innovation Council meeting.

John Bowman asks have you written what you got out of that? Sumner says he can share the report.

John Bowman asks do you have any idea in the extension year what you will do?

Sumner replies we have 3-4 publications and continue to work on most significant change.

Muni Muniappan says IPM IL is one of the only Innovation Labs with a gender specialist in our ME.

Allan Hruska says you mentioned inclusivity in caste and ethnicity.

Sumner replies yes for the Nepal associate award we have discussed separate trainings for castes and we know there is increasing change because of male out migration, so there are opportunities for public and private spaces to shift.

Muni Muniappan says that in Nepal associate award asked IPM IL to specifically look at caste and gender. Does this also exist in Africa?

Allan Hruska replies certainly class differences are ingrained in society there as well. Sumner says it is increasingly important to be aware of those differences and nuances and remain conscious of them.

11:00 am

Additional Meeting Comments and Questions

Buyung Hadi says rodent damage is worse in irrigated areas but before the trap barrier system they used electric fences which is a problem because they are not well made and every time it gets tripped husbands have to stay awake at night for several nights. Trap barrier allows husbands to stay home with family. What we are now trying to do is look for plastic that is more sustainable and receive government endorsement.

Dely Gapasin asks based on IRRI experience, are there other countries with this level of rodent problems? Hadi replies yes, in Indonesia there is a major problem.

Dely Gapasin says that she was asking Wondi how he was going to use results of imageries to relate to the other modeling projects. You have to trace the benefits and connections to both.

Glen Hartman asks what are you telling farmers? Are you recommending IPM?

Muni Muniappan replies we are looking at invasive species and they are matching that with satellite images; this gives us the spread information. Many of these species are affecting agriculture, but also national parks and forests.

Glen Hartman asks what's the impact to the farmers when the project ends? Muniappan replies the hope is that we will instill policy making once we show that land is changing.

Wondi Mersie says that most of the surveys he has done are roadside surveys but having that data helps to target areas and prioritize areas.

Glen Hartman says that the satellites could also affect where farmers plant certain crops.

1:00 pm

PCC Meeting Discussion

The meeting, run by Wondi Mersie, begins. He asks the group how should we engage the mission in our projects? Luis Canas says in my case, every time I've come to East Africa I make a point to go the mission, which sometimes goes well and sometimes it doesn't. The one thing that helps is coming up with success stories; if you could connect through that way, we could develop more aligned goals.

Buyung Hadi says in order to do that, you need information. Because I am embedded in country, the mission has monthly meetings to share updates and what they are looking for. If you employ someone in country, maybe they could attend the meeting, but you have to be invited to attend. All that took was a visit to them and they then invited me.

Wondi Mersie says the challenge is that someone coming from the U.S doesn't always have the same opportunity and you have to find someone at the mission you can have a long term relationship with.

Pramod Jha says that in Nepal there are no monthly meetings.

Wondi Mersie says another issue raised yesterday was youth engagement.

Luis Canas says that one way to connect with young people is via social media. One group I work with is using WhatsApp and young people respond very well. Most people are past high school age. Daniel Sumner says youth is identified as much older than just high school. The Youth Power Initiative is a good online practice with different resources for youth engagement, entrepreneurship, and what they see as their aspirations.

Buyung Hadi says USAID mission in Cambodia has a very strong focus on youth and creates opportunities for projects to engage with youth. They conduct training for young students on how to design solutions and give mini-grants for groups of entrepreneurs. As long as it is Rice IPM, we could invest in that.

Abhijin Adiga says that since my work relates to the U.S, we have had two interns and in UVA they have capstone projects which is a little more than a final year project. Two students are using this as their capstone projects.

Tadele Tefera says that we should be careful about how we're defining engagement. Do we have to address youth in job creation, internship, or something else? Engaging in agriculture also means land requirement and ownership which young people don't always have.

Luis Canas says that in our case, Sokoine has a separate program and they call it youth business enterprise program. They have green houses and youth does everything from learning how to grow a crop to how they would sell it. We have tried to provide training on IPM, which is one component of a bigger

approach. I think our definition needs to be broader. Agriculture is a big industry; throughout the value chain it changes.

Pramod Jha says we all are engaging youth in our project. For example, there are 22 students who have completed their degrees and so we are engaging youth through research. Now, there are many youth conferences. After completing their degrees, can USAID give student support for engagement in IPM activities?

Wondi Mersie says we also could all volunteer our time to speak at schools and discuss international activities as well. Abhijin Adiga says on the USAID website, the definition of youth is very broad.

Wondi Mersies says another issue to discuss is involvement with value chains.

Buyung Hadi says in Cambodia the value chain projects do not focus on rice, but vegetables. They invite us every month and we are able to identify common ideas, which is biocontrol agents. We are discussing distribution of biocontrol agents and possibly working together.

Tadele Tefera says over the last three years we have engaged with them. They existed before we did, so we follow them and try to overlap especially in site selection. They participate in our workplan and it is not easy to bring all of these things together apart from training.

Daniel Sumner says the KISAN project in Nepal is asking us to synergize information. We should share our success stories with them and vice versa. If we find out when they are scheduling those field days, we can try to attend.

Le Quoc Dien says in our country we go to the cooperatives to link the groups together.

Wondi Mersie asks what further issues do you have that you'd like to discuss?

Luis Canas says it is a good opportunity to finish things that we were unsure if we were going to finish.

Buyung Hadi says there are questions from our business office as well – do we need to spend all of our funds in this phase and in this year? Or based on learning from previous years, is it wise to not spend it in case there is any delay? Can we carry over this budget? Tadele Tefera says any expenditure over Nov 15 is not yet certain.

Wondi Mersie says if they allow carryover, use additional funds. If the project is going to continue past 2019, we need documentation that it will be continued. Our business office will not allow us to spend past the end date.

Luis Canas says I would find it helpful to do a quarterly meeting, at least over Zoom, with Daniel.

Abhijin Adiga says increasingly, for students on visas, after their term is over students have to return to their countries. Could we better work out this system?

Wondi Mersie says I don't know how many students you all have, but my understanding is that the student funding is going to end by Nov 15 unless they have special permission.

Pramod Jha says my students will take some time to finish their dissertations.

Wondi Mersie asks what about having a final meeting in 2020? Would it have any value?

Tadele Tefera says I think it would be beneficial to have a communication workshop where we share with stakeholders what we have gained from our project. I'm not sure if we have this kind of meeting or meeting with stakeholders like a dissemination workshop.

Wondi Mersie asks if you are conducting that kind of workshop, what kind of funding would that require?

Tadele Tefera says for Vegetable IPM in East Africa and Grains IPM for East Africa, it would be possible to have joint meetings.

Daniel Sumner says if we did regional workshop, it would help with area of influence.

Luis Canas says with our annual meetings we also have a separate meeting to discuss impact. A final impact statement would also be helpful. There was a statement by John that we don't know what will happen in the future. My idea is that this meeting could be discussing goals for the next period. I don't want to go blind for the last part of the project.

Daniel Sumner says that in addition to forming messages, we should craft what could happen next. It could influence the vision of the next phase if it's going to happen. We would also have to discuss what value chains would still be around.

Wondi Mersie says another issue is collaborating with the private sector.

Buyung Hadi says our approach from the beginning is what we call leveraging market ready solutions. Everything we test is already in the market. After we validate those, during year three of field days, we have a mini trade fair in which we invite providers. It has been a success because one of our providers decided to open a hub in Battambung. We also engage seed sellers so that companies can be packaged together.

Luis Canas says if we extend invitations to industry to showcase products, and if we're clever, we can include those products in our research. We can then provide unbiased data, which requires engagement early on with those companies.

Daniel Sumner says my own personal frustration is that the private sector also includes farmers who are actors in the private sector system and we shouldn't lose sight of that.

Buyung Hadi says a farmer he works with is renting out a service to his neighbors and he is becoming an agent of change. It creates a new enterprise.

Wondi Mersie says USAID pushes for this collaboration with the private sector quite a lot.

Daniel Sumner says the emphasis is not always the private sector but working with the other Innovation Labs in general. Do any of you have successes? I had a positive experience collaborating with gender researchers.

Buyung Hadi says if we were to look at a longer period, it would make sense to make a stronger connection with Innovation Labs, for example, the SIL has been working in Cambodia. The only thing we do together is a demonstration plot.

Wondi Mersie says certain trainings can be combined especially for pest related trainings.

Buyung Hadi says I'm going to still try to pitch that to them in this coming year.

Wondi Mersie says for meetings, people from the U.S need to come at a time when they can go into the fields.

2:30 pm

TAC Meeting Debrief

Lawrence Datnoff says that we're very impressed with the quality and quantity of the projects. You should prioritize maybe 3 things for the end of the project. You might want to think about action items for the last parts of your projects such as reaching out to policy makers so that this work is more influential. If you can show the impacts to agriculture, but also to people, that would be very telling. As you go along, what are some of the knowledge gaps? If there is a call, you will be able to have those ready. As you're covering those knowledge gaps, those would be helpful for year 6.

Glen Hartman says thanks for everyone giving us this information and when we look at things we look at impact and there are all kinds of impacts at different levels. You need to think about the practicality of impacts for developing testimonials and webinars. Not everyone is going to understand the journal lingo, so we need to translate that into more laymen's terms.

Allan Hruska says thanks for the invitation to join. I'm very impressed. What's being requested is that everything is done at Nov 15. Think about what you can draw out of what you've done, and what you can say you've achieved in these past five years and what you can do with that in the next coming years. Reach out to national programs and others to make recommendations at the national and policy level. You need to be able to put forth what you've done.

Dely Gapasin says that as we close any project, there are new areas that will bring in new things to do to going forward. Things like modeling and other tools could help get policy makers get on board because it brings newsness. It is allowing farmers to get information more readily. In Indonesia, every woman that comes to the meeting has a cell phone. We hope policymaking will be your priority.

Luis Canas ask if there is a one year no cost extension?

Muni Muniappan says if you recruit a grad student, make sure they are done by the end of year 5.

Luis Canas we have two students, Buyung has one, and Pramod has five PhD students.

John Bowman says we're thinking about the knowledge gaps and we're asking PIs to think on policy, and what might be actionable items, but we should set a due date.

Daniel Sumner asks should we also do a two pager specific to policy?

John Bowman says to give two paragraphs about how you might work with policy and two paragraphs of what to do if you get another year.

3:00 pm

PCC Meeting Debrief

Wondi Mersie says in the meeting we discussed engagement with mission and how we should share success stories. We agreed we should do more with communicating our work to the mission. We also discussed youth engagement. Youth engagement should be specifically defined. As far as collaborating with value chain, some we cannot work with because they only work on vegetables. Training is a good way to collaborate and participate. But we have to communicate with them and pass on our success stories to them. We discussed that that could have a multiplying effect on disseminating research. We

discussed the extension period and we absolutely need a document from the ME saying whether we are extended or not. Our business centers need this information. We discussed a final workshop which is difficult to factor in budgets. It might be expensive but it would be useful to summarize and pass along our results to our partners. These meetings should be done in the rainy season. It was also discussed that the meetings could be regional, summarizing what was developed.

John Bowman asks will you all need workplan meetings?

Tadele Tefera says this meeting next week is reviewing from the last year and looking forward to the next year.

Wondi Mersie says we have to be able to take people to the field.

John Bowman says a meeting in DC is a possibility as well.

Buyung Hadi says the goals will be different if we do one big meeting versus a regional meeting. If we want to share results with stakeholders, it should be done in country.

John Bowman says the benefit of doing a DC meeting is making a good story about what you've done in the past 6 years.

Muni Muniappan says if we have a new award, then we will be able to decide. In the Horticulture meeting, they simply regurgitated what they've done.

John Bowman says we don't have a new Hort Lab ready, but the chances of another IPM IL is more readily available.

John Bowman says if we could do two meetings, it would be more important for the TAC to attend the last meeting.

Wondi Mersie says we touched on collaboration with other Innovation Labs and trying to work with them if the projects are implemented in the same regions.

Lawrence Datnoff says there has to be some kind of planning rather than it just being ad hoc. If there's no way to bring the labs together, it doesn't make sense.

John Bowman says in Cambodia the Hort Lab had a project and I tried to force the collaboration. The IPM IL was concerned about how much to get involved, but it could have been really beneficial on what tech really works better.

3:30 pm

John Bowman Discussion

Bowman says you were one of the only labs that got money in September. There are no guarantees and the best we can do is one year and to end in November 2020. It's my high priority to work out the extension so that Muni can give you documentation. Once Muni knows what he has he then has to make decisions on how to parse that out. Be aware that a lot of difficult back and forth communication went on and in no way is IPM IL being cut back because of under-performance. In terms of buy-in, capacity building, and publication records there is not a lab that has done as well. There is an intense environment to create competition of awards and certain forces think there's too much entitlement of programs that don't have to go through competition. Going forward, it's going to be hard for any Innovation Lab and

you can't think of the ten year time frame anymore. Some labs got another five years, but that won't be the rule for others going forward. I think we should try to do more IPM within systems instead of our traditional packages. We can work more closely with the sustainable intensification lab to do that. Does that sound valid to pursue?

Buyung Hadi says obviously rice systems with pesticides aren't going to help the fish, so it is all connected.

Bowman asks how much time do you need to do productive systems in IPM?

Buyung Hadi says that with rice, we wouldn't be starting from scratch. There are lessons learned that we can use.

Luis Canas says you mentioned a connection with climate resilience; I think that missions will be interested in that.

Glen Hartman says you also have to think about innovation and what you can do better.

Muni Muniappan asks why can't we have IPM IL work on the commodity crops of the other Innovation Labs? On the reports I see coming out of the Innovation Labs there are mistakes.

Allan Hruska says that the vast majority of smallholders are using a landscape approach and it's really important to have at least a small impact on many farmers rather than a big impact on few. Improving nutrition is what we should be doing and FAO would be very interested in doing that as well.

John Bowman says another area to concentrate on is relationship with the private sector. I'd rather see youth involved in non-pesticide activities. Have any of you seen bright opportunities where a project like ours could work with the private sector? Perhaps if not in year 6, in the next phase.

Luis Canas says the model we have with Real IPM works well and I think it's good to do more of that. There has to be a better connection between researcher and up and coming startups. Reaching service providers is one way to do that; it involves testing.

Muni Muniappan says in the Nepal Associate Award we refer to a *Trichoderma* company where a woman-owned company creates compost and leachate. We are proposing it as a youth activity.

Luis Canas says if we want to involve youth who want to be entrepreneurs there has to be an economic impact that will intrigue them. We could also connect with the local government or link with other organizations that are already tapped into those spaces.

4:30 pm

Muni Muniappan Final Discussion

Muniappan says he approached Congress and tried his best to advocate for IPM IL and also approached many USAID folks as well as BIFAD folks on extension of IPM IL.