

Development and Delivery of Ecologically-based IPM Packages in Tajikistan

Year 5 Work plans
(October 1, 2013 – September 30, 2014)

Project Management:

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Dr. El Bouhssini Mustapha, ICARDA
Dr. Megan Kennelly, Kansas State University

Potato IPM Package:

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Dr. George Bird, Michigan State University
Dr. Nurali Saidov, IPM IL Coordinator, Tajikistan

IPM Communication:

Ms. Joy Landis, Michigan State University

Links with IPM IL Global Theme Projects:

Pest Diagnostics: Dr. Sally Miller, Ohio State University
Viruses: Dr. Naidu Rayapati, Washington State University
Impact Assessment: Dr. Richard Bernsten and Dr. Mywish Maredia, Michigan State University



Farmers and collaborators in Hissor Region of Tajikistan

Michigan State University (MSU) in partnership with University of California-Davis, Kansas State University, ICARDA, and several local research and academic institutions and NGOs is implementing a regional IPM program in Central Asia.

The technical objectives of the Central Asia Regional IPM Program are as follow:

1. Develop ecologically based IPM packages for wheat through collaborative research and access to new technologies.
2. Disseminate IPM packages to farmers and end-users through technology transfer and outreach programs in collaboration with local NGOs and government institutions.
3. Build institutional capacity through education, training and human resource development.
4. Enhance communication, networking and linkages among local institutions in the region and with U.S. institutions, international agricultural research centers, and IPM IL regional and global theme programs.
5. Create a “Central Asia IPM Knowledge Network” encompassing a cadre of trained IPM specialists, trainers, IPM packages, information base, and institutional linkages.

The proposed activities for the Year 5 for the period covering October 1, 2013 to September 30, 2014 are linked to the above five technical objectives.

Objective 1. Develop ecologically-based IPM packages for wheat and potato cropping systems through collaborative research and evaluation of new technologies and approaches.

Activity 1: Establish IPM Applied Research and Demonstration Sites for evaluation of IPM packages for wheat and potato, in Tajikistan. IPM packages will include regionally appropriate: cultural practices, botanical and biopesticides, biological control agents/products, resistant varieties, pheromone traps, sticky traps, and chemical pesticides based on the best existing and new technologies. The locations for the research and demonstration sites have been selected to represent major wheat growing regions of the country and to address regional pest issues (see details in the following sections).

Participating scientists/institutions: N. Saidov, IPM Innovation Lab Project coordinator in Tajikistan, Collaborators from ICARDA, U.S. Collaborators, local scientists from research institutions and universities in Tajikistan.

Expected output: Two IPM Applied Research and Demonstration sites established in Tajikistan for wheat crop; and two sites established for potato crop.

Time line: October 2013 – September 2014

Activity 1.A: Wheat IPM Research Demonstration Sites in Tajikistan

Site #1: Wheat IPM Package for Northern part of Tajikistan

a. Name and Location of this site: Sogd region - The exact location of the larger-size demonstration plots close to well-traveled roads will be identified in collaboration with the Agriculture Department of Sogd Region during the Tajikistan IPM IL Coordinator's visit in September 2013.

b. Key Pest Problems: At this site the focus will be on the Sunn pest (*Eurygaster integriceps*) and diseases include the wheat rusts: yellow rust (*Puccinia striiformis*) and brown rust (*Puccinia recondite*). The key weeds in wheat field include; oat grass (*Avena fatua*), shepherd's purse (*Capsella bursa-pastoris*), pigweed or lambsquarters (*Chenopodium album*) and bermuda grass (*Cynodon dactylon*).



Sunn pest on wheat

c. IPM Package Components: This demonstration site will test the following IPM package components:

1. Resistant Varieties and Biological Control: Plots planted to a resistant variety to yellow and brown rusts, 3 replications (each replication with two strips of flowering plants including coriander (*Coriandrum sativum L.*), dill (*Anethum graveolens L.*), sweet basil (*Ocimum basilicum L.*), ziziphora (*Ziziphora interrupta Juz.*) and marigold (*Calendula officinalis L.*) along side the wheat plots to enhance Sunn pest egg parasitoids.

2. Cultural practices (planting date, seed rate and the use of certified seeds, fertilizer application and safe use of pesticides for pest and weed control) will be as recommended in the region.

3. Hand collection of Sunn pest adults during 2 to 3 weeks beginning at the time of migration to wheat fields.

This package will be compared to farmer practices in the same area with 3 replications and each replication without strips of flowering plants.

d. Planting and harvesting time for wheat at this site: Wheat will be planted in October-November 2013 and harvested in June-July 2014.

e. Through farmer field days, all interested stakeholders (farmers, extension specialists, agronomists from Agriculture department, etc.) will participate in field training courses related to the weed control, safe use of pesticides and the use of certified seeds.

f. Names of the local scientists and collaborators: Dr. Anvar Jalilov and Mr. Tavakal Mirzoev from Institute of Plant Production "Ziroatparvar" of Tajik Academy of Agricultural Sciences and Agriculture Department and Farmer Association of Sogd region.

Site #2: Wheat IPM Package for Southern part of Tajikistan

a. Name and Location of this site: Hissor district - The exact location of the larger-size demonstration plots close to well-traveled roads will be identified in collaboration with the Agriculture Department of Hissor district during the Tajikistan IPM IL Coordinator's visit in September 2013.

b. Key Pest Problems: At this site the focus will be on the cereal leaf beetle (*Oulema melanopus*) and diseases include the wheat rusts: yellow rust (*Puccinia striiformis*) and brown rust (*Puccinia recondite*). The key weeds in wheat fields include; oat grass (*Avena fatua*), shepherd's purse (*Capsella bursa-pastoris*), pigweed or lambsquarters (*Chenopodium album*) and bermuda grass (*Cynodon dactylon*).

c. IPM Package Components:

1. Resistant Varieties and Biological Control: Plots planted to a resistant variety to yellow and brown rusts, 3 replications (each replication with two strips of flowering plants including coriander (*Coriandrum sativum* L.), dill (*Anethum graveolens* L.), sweet basil (*Ocimum basilicum* L.), ziziphora (*Ziziphora interrupta* Juz.) and marigold (*Calendula officinalis* L.) along side the wheat plots to enhance cereal leaf beetle parasitoids.

2. Cultural practices (planting date, seed rate and the use of certified seeds, fertilizer application and safe use of pesticides for pest and weed control) will be as recommended in the region.

3. Weed management with cultural practices and application of low toxicity herbicides. This package at these pilot sites will be compared to farmer practices in the same area.

d. Planting and harvesting time for wheat at this site: Wheat will be planted in October-November 2013 and harvested in June-July 2014.

e. Through farmer field days, all interested stakeholders (farmers, extension specialists, agronomists from Agriculture department, etc.) will participate in field training courses related to the weed control, safe use of pesticides and the use of certified seeds.

f. Names of the local scientists and collaborators: Dr. Anvar Jalilov and Mr. Tavakal Mirzoev from Institute of Plant Production "Ziroatparvar" of Tajik Academy of Agricultural Sciences and Agriculture Department and Farmer Association of Hissor district.



Anvar Jalilov in wheat screening nursery

Activity 1.B: Potato IPM System Development and Validation in Tajikistan

Develop ecologically-based IPM Package/System for introducing pathogen-free potato seed pieces in Tajikistan through collaboration with the Tajikistan Regulator Officers, Tajikistan Agrarian University, local potato growers and U.S. private sector producers of mini-tubers with international distribution experience. The cultivars-lines selected for the potato IPM systems will be selected based on their resistance to late blight, Colorado potato beetle, golden nematode, verticillium, scab and viruses.

IPM IL "Tajikistan Potato Variety-Line Seed Piece Increase"

Based on result of evaluating the agronomic properties of various U.S. potato cultivars-lines with pest/pathogen resistance such as Boulder, Missaukee, Dakota Diamond, Kalkaska, MSP270-1, MSQ176-5, MSL268D, and MSM182-1 under Tajikistan growing conditions, it is known that these varieties-lines can yield up to four times that of the current local varieties. It is also known that after several years of using foreign cultivars in Central Asia, this yield advantage is lost, most likely due to virus infections. This mandates that a new system of potato seed piece production and increase be developed to take advantage of existing pest/pathogen resistance germplasm.

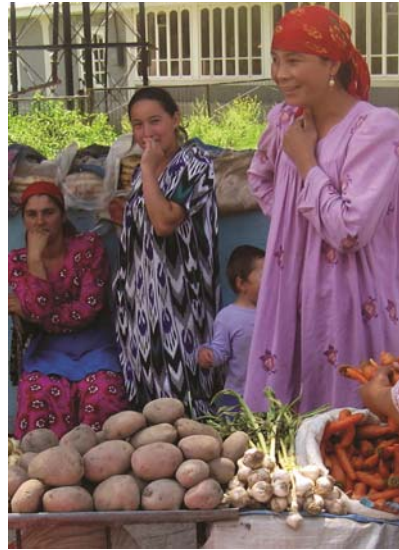


Site # 1: Potato IPM Package/Seed Piece Increase Site for Low-land Potato Production in Tajikistan

- a. A key farmer in the Khatlon Region will be identified to work with the Tajikistan Regulatory Officers and Tajikistan Agrarian University to initiate a pest/pathogen free seed piece production system initiated with mini-tubers from a U.S. private sector producer with international distribution experience.
- b. Key Pest Management: The following key pests will be managed in a system designed to produce certified seed for distribution throughout the Khatlon Region: Colorado potato beetle (*Leptinotarsa decemlineata*); the diseases late blight of potato (*Phytophthora infestans*) and potato leafroll viruses M, S, X, and Y; and potato root-knot nematodes (*Meloidogyne chitwoodi* and *M. fallax*). The key weeds in potatoes at this site include swine's-bane (*Chenopodium rubrum L.*) and houndsberry (*Solanum nigrum L.*).
- c. IPM Seed Piece Increase IPM System will be based on strong biological and environmental monitoring practices and the following biological control whenever possible. In these research and demonstration sites, we will test the following IPM package components:
 1. Biological control of potato spring inoculation of potato seeds and of field soil with biopesticides such as Thrihodermin, Strepmaitis and *Bacillus thuringiensis*; application of immune-response modulating agent such as "Baikal" type; application of "Bacillus subtilis;" and application of "Biolegnin."

2. Potato Post-Harvest Storage Evaluation: Identified local traditional knowledge of potato post-harvest storage will be evaluated in regards to development of the certified seed system.

d. Names of the local scientists and collaborators: Senior researchers Mr. Mahmadzamon Sulangov and Mr. Bahrom Sanginov from Research Institute of Horticulture and vegetable of Tajik Academy of Agricultural Science, local students from the National University of Tajikistan (biology faculty) and Tajik Agrarian University.



Site # 2: Potato IPM Package for Mountain area of Tajikistan

- a. A key farmer in the Jirgatol Region will be identified to work with the Tajikistan Regulatory Officers and Tajikistan Agrarian University to initiate a pest/pathogen free seed piece production system initiated with mini-tubers from a U.S. private sector producer with international distribution experience.
- b. Key Pest Management: The following key pests will be managed in a system designed to produce certified seed for distribution throughout the Jirgatol Region: Colorado potato beetle (*Leptinotarsa decemlineata*); the diseases late blight of potato (*Phytophthora infestans*) and potato leafroll viruses M, S, X, and Y; potato root-knot nematodes (*Meloidogyne chitwoodi* and *M. fallax*) and the key weeds in potatoes identified in this region such as swine's-bane (*Chenopodium rubrum L.*) and houndsberry (*Solanum nigrum L.*).
- c. IPM Seed Piece Increase IPM System will be based on strong biological and environmental monitoring practices and the following biological control whenever possible. Biological control of potato spring inoculation of potato seeds and of field soil with biopesticides such as Thrihodermin, Strepmitis and *Bacillus thuringiensis*; application of immune-response modulating agent as “Baikal” type; application of “Bacillus subtilis;” application of “Biolegnin.”
- d. Potato Post-Harvest Storage Evaluation: Identified local traditional knowledge of potato post-harvest storage will be evaluated in regards to development of the certified seed system.

Names of the local scientists and collaborators: Senior researchers - Mr. Mahmadzamon Sulangov and Mr. Bahrom Sanginov from Research Institute of Horticulture and vegetable of Tajik Academy of Agricultural Science, local students from the National University of Tajikistan (biology faculty) and Tajik Agrarian University.

Objective 2: Disseminate IPM packages to farmers and end-users through technology transfer and outreach in collaboration with local NGOs and government institutions.

Activity 1: Establish Farmers Field Schools (FFS) at IPM Demonstration sites in Tajikistan

to transfer knowledge and demonstrate existing and new IPM technologies to local farmers

Participating scientists/institutions: N. Saidov, in collaboration with local agriculture ministries, local NGOs, universities, ICARDA regional program, and U.S. Collaborators. As outlined in Objective 1, the sites have been selected and plans are being developed for the next planting season. One FFS of 25 to 30 farmers each will be established at each site. These farmers will meet regularly to learn how to produce a good wheat

crop. For example, at pre-season to discuss variety selection and planting rate; at planting to view planting methods; and two to three times per season to view various insects, diseases, weeds and beneficial flowering plants. They will also learn about the biology of pests, diseases and weeds, and the damage they cause, the economic threshold, natural enemies and cultural practices, and safe use of pesticides.

Expected output: Farmers Field Schools established at IPM Demonstration sites for wheat, in each of the demonstration plot sites, and information shared with local farmers and NGOs (20 - 30 farmers per FFS).

Timeline: October 2013 – July 2014.



Nurali Saidov (center) discussing one of the beneficial flowering plantings with other team members.

Objective 3: Build institutional capacity through training and human resource development.

Activity 1. Graduate Student Training in IPM in Wheat:

Ms. Shahlo Safarzoda from Tajikistan is currently a Masters degree student in the Department of Entomology at Michigan State University. Her thesis research focuses on the “Relative Role of Epigeal and Foliar Predators in Biological Control of Cereal Aphids in Wheat.” The main objective of her research is to determine the relative contribution of ground-dwelling predator communities (such as carabids and spiders) and foliar predator communities (such as coccinellids and syrphids) on suppression of cereal aphids in wheat. Ms. Safarzoda will complete her degree program by September 2014.



Shahlo Safarzoda in the lab at Michigan State University.

Activity 2. Pest Diagnostics and Viruses: In collaboration with two global theme programs, Dr. Naidu Rayapati will conduct a one-week survey for viruses in potatoes and tomatoes in Tajikistan during June 2014. This will be carried out in collaboration with host country institutions. Symptomatic samples from potatoes and tomatoes will be tested using virus-specific immunostrips and ELISA kits, and select number of samples will be spotted on FTA cards and

nitrocellulose membranes. The FTA cards and nitrocellulose membranes will be brought to Washington State University and processed for accurate identification of viruses by cloning and sequence analyses. During these visits, Dr. Rayapati will give lectures on virus diseases and their management at local research institutions and universities in Tajikistan.

Participating scientists/institutions: N. Saidov, in collaboration with global theme programs in pest diagnostics and viruses (Sally Miller-OSU, N. Rayapati-WSU, Sue Tolin-Virginia Tech).

Expected output: Enhanced virus and pest diagnosis skills of scientists and NGOs, and efficient field diagnosis of viruses in potato and tomato.

Timeline: January 2014 - September 2014.

Activity 3: Impact assessment of IPM CRSP project activities in Tajikistan: In FY 2012, we carried out a baseline survey of 170 wheat farmers in two districts of Tajikistan -- Hissor District (near Dushanbe) and Spitamen in the north. In each district, all of the project collaborators were interviewed, plus a random sample of non-collaborating wheat farmers. In FY 2014, the impact assessment component of this project will focus on conducting a follow-up survey of the wheat farmers interviewed in 2012. The survey will be designed to assess the current status of wheat production practices and constraints in Tajikistan, and assess changes in farmers' knowledge of IPM and use of IPM practices since the 2012 baseline survey.

Data to be collected in the follow-up survey will include:

- Inputs, outputs and price
- Crop management practices including the use of biological, cultural, chemical, etc. and their associated costs
- Farm household characteristics and demographic data
- Farmer perspective on potential constraints to adoption of IPM technologies
- Gender role in the cropping systems of focused commodities.



Spitamen farm cooperator

Collaborating Scientists and Institutions: R. Bernsten and M. Maredia, Michigan State University; Host Country PIs/Research Fellows (N. Saidov and S. Safarzoda) and other U.S. and host country collaborators.

Expected Outputs: Data and an assessment of the impact of the project on farmers' knowledge and use of IPM.

Start and end-date: October 2013 to September 2014.

Objective 4: Enhance communication, networking and linkages with U.S. institutions, international agricultural research centers, and IPM IL regional and global theme programs to access IPM technologies, information and expertise.

Activity 1: Participation in International Meetings and workshops: Facilitate participation of IPM IL coordinator and local scientists from host countries to interact with IPM IL Regional Programs and other international meetings and workshops. In addition, facilitate participation of project PI or Co-PIs in ICARDA-PFU Annual meeting and other international meetings related to IPM to share research results and experiences of Tajikistan IPM IL Project.

Participating scientists and institutions: N. Saidov, Tajikistan, S.Safarzoda, MSU, K.Maredia, MSU

Expected output: Enhanced linkages and collaborations with IPM IL regional programs, and other international programs.

Timeline: October 2013 – September 2014.

Objective 5: Create a “Central Asia IPM Knowledge Network” encompassing a cadre of trained IPM specialists, students, IPM packages, information base, and institutional linkages.

Activity 1: Update, expand and enhance the website of the Tajikistan IPM program in collaboration with project team members. Use social networking and other means to publicize on-going activities of the project. The website address is:

http://www.ipm.msu.edu/international/central_asia_ipm

Participating scientists/institutions: J. Landis, MSU.

Expected output: Enhanced communication with stakeholders, expanded access to resources and knowledge developed in other activities, greater publicity for IPM IL project impacts.

Timeline: October 2013 – September 2014.

Activity 2: Develop communication pieces about the Project’s work and activities. Develop communications about components of the project such as gender issues, success stories, or other communication resources and reports. Contact media, university sources and IPM IL web editors with information about graduate student Safarzoda’s study and research in wheat and the capacity building this creates for Tajikistan, a Feed the Future country. Feature Safarzoda’s experience as a graduate student at MSU and the applications she sees returning to Tajikistan.

Participating scientists/institutions: J. Landis, MSU, and U.S. and Central Asia collaborators.

Expected output: Enhanced communication with stakeholders, increased awareness of the Project’s impact.

Timeline: October 2013 – September 2014.

Activity 3: Conduct Central Asia Regional IPM training workshop in Tajikistan: This workshop will be an end-of-the-project workshop with participants from Tajikistan and other Central Asian countries. The topics will include IPM packages, seed issues, agronomy/weed management, and safe use of pesticides.

Participating scientists/institutions: IPM IL Tajikistan Team, MSU, and U.S. and Central Asia collaborators.

Expected output: Enhanced communication with stakeholders, increased awareness of the Project’s impact.

Timeline: May 27 – 29, 2014.

