# Annual Report FY 2011-12
# October 1, 2011 to September 30, 2012

## Development and Delivery of Ecologically-based IPM Packages in Tajikistan

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Michigan State University (MSU) in partnership with Kansas State University, ICARDA, and several local research and academic institutions and NGOs is implementing the Tajikistan IPM program. The technical objectives of the Tajikistan IPM CRSP Program are:

1. **Develop ecologically based IPM packages for wheat and potato 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 CRSP 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 following activities were implemented during the FY 2011-12 covering the period from October 1, 2011 to September 30, 2012 linked to the above five technical objectives.

## Objective 1: Develop ecologically-based IPM packages for Wheat and Potato cropping systems in Tajikistan through collaborative research and evaluation of new technologies and approaches.

One of the main activities of the Central Asia IPM CRSP program is to establish IPM Applied Research and Demonstration Sites for testing and evaluating the existing and new approaches and technologies for IPM packages for Wheat and Potato in Tajikistan. The IPM packages include a range of methods, tools and approaches including cultural practices, botanicals and biopesticides, biological control agents/products, resistant varieties, etc. The applied IPM research and demonstration sites have been established and implemented for wheat and potato (see more details in the following sections).

**Wheat Crop:** Wheat is the main staple crop in Central Asia. A team of scientists consisting of Dr. Doug Landis (MSU), Dr. Megan Kennelly (KSU), Dr. Mustapha Bohssini (ICARDA), Dr. Nurali Saidov (Tajikistan) and Dr. Anwar Jalilov (Tajikistan) worked together and established three Wheat IPM applied research and demonstration sites in Tajikistan.

The 2012 year was generally a favorable for wheat production in Tajikistan. Yellow rust was first observed on May 28-30 with up to 30% infection on susceptible wheat varieties but little to no infection on resistant varieties. Brown rust was apparent by mid-June in irrigated areas and, by harvest, had reached a maximum of 70-80% infection on susceptible local wheat varieties including Navruz, Sharora. In contrast, the resistant Ormon variety only reached 10% infection.

Due to the late infection of Brown rust and lack of progression of Yellow rust infections, the overall impact of these diseases on wheat yield was minimal.

Sunn pest pressure continued to be high in northern Tajikistan where it is a consistent pest. While the Sunn pest can occasionally be found in the southern and eastern regions, populations remained quite low in 2012. In contrast, Cereal leaf beetle is absent in the north, but populations were moderate to high in the southern and eastern regions in 2012.

**IPM Applied Research and Demonstration Sites for Wheat 2011-2012:** Three IPM research and demonstration sites were established for wheat, one in in the Spitamen district of Sogd region in the North, a second in the Hissor district in Southern Tajikistan, and a third in the Muminabad district of Khatlon region in Eastern Tajikistan.

**1. North Tajikistan Site:** This demonstration site was located on a farm named for its founder "Ilhom Boimatov" in the Spitamen district of Sogd region, (North part of Tajikistan). Mr. Akmal Boimatov is the current local grower. In this site focus was on the Sunn pest (*Eurygaster integriceps)* and diseases including 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*). The following IPM package components were compared to local farmers' practices in the same area:

- Plots of 10 X10 m planted to a resistant variety to yellow and brown rusts, 4 replications with two strips of flowering plants including coriander *(Coriandrum sativum L.),* dill *(Anethum graveolens L.),* sweet basil *(Ocimum basilicum L.),* ziziphora *(Ziziphora interrupta* Juz.), marigold *(Calendula officinalis L.)* and winter cress (*Barbarea vulgaris)* alongside the wheat plots to enhance Sunn pest egg parasitoids.
- Cultural practices (planting date, seed rate, fertilizer application, and weed control).
- Hand collection of Sunn pest adults during 2-3 weeks beginning at the time of migration to wheat fields.

**Location:** Ujteppa village, Tagoyak Jamoat of the Spitamen district of Sogd region.
**Farmer:** Mr. Akmal Boimatov
**Other Farmer Participants:** (n=20)
**GPS data:** N 40.13382; E 069.30801; Altitude: 460m
**Date of demo establishment:** October 24, 2011
**Date of rust evaluation:** May 17, 2012
**Date of Sunn pest evaluations:** April 19 and May 17, 2012
**Date of yield evaluation:** June 15, 2012
**Seed sowing rate:** 2 kg per plot or 200 kg/ha
**Farmer variety:** "Ulugbek"
**IPM Demo Variety:** "Ormon"
**Treatments:** In the IPM practice, the wheat seeds were treated with "Vitavaks 200 FF" at 2 kg per ton wheat seed.

Yellow rust infection in May was low to moderate, averaging 37.5% in the Farmer Practice plots and 5% in the IPM demo plots. Brown rust infection in May was low to moderate, averaging

30% in the Farmer Practice plots and 5% in the IPM demo plots. Sunn pest pressure was low to moderate and increased from April to May. Combined counts of Sunn pest adults and larvae in April averaged 3.5 per $m^2$ in Farmer Practice plots versus 1.5 per $m^2$ in IPM Demo plots, while in May, counts averaged 6.8 per $m^2$ in Farmer Practice plots versus 3.0 per $m^2$ in IPM Demo plots.

**Table 1.** The results of Farmer Practice and IPM package treatments on Sunn pest damage and wheat yield, North Tajikistan, 2011-12*****

| | **Mean ± SEM number of Sunn pest damaged heads/$m^2$** | **Mean ± SEM yield of wheat from plots (kilogram)** |
|---|---|---|
| **Farmer practice** | 7.0 ± 0.71 a | 30.75 ± 0.96 a |
| **IPM package** | 2.3 ± 0.25 b | 52.05 ± 0.56 b |

*Values within the same column followed by different letters are significantly different at the P≤0.001 level, T-test.

Overall, Sunn pest damage was significantly lower in the IPM Demo plots than in Farmer Practice plots. Each of the yield components were higher in the IPM Wheat package plots resulting in a 41% increase in final yield (from 31 to 52 kg/plot) in wheat yield in the IPM Package plots. A report on the results was presented to the farmers, the Research Institute of Farming and will be shared at subsequent grower meetings.

Photo 1. Farmers during field training in Spitamen district.

Photo 2. Farmers in the Spitamen district find that “Ormon” wheat resistant variety is better than the local “Ulugbek” variety which is susceptible to rusts.

**2. South Tajikistan Site:** The location of the demonstration site was at the farm of Mrs. Makhbuba Sattorova located in the Hissor district of Hissor region. In this site focus was on the Cereal leaf beetle (*Oumela melanopa)* and diseases including the wheat rusts: yellow rust (*Puccinia striiformis*) and brown rust (*Puccinia recondite*). The key weeds in the wheat field include; oat grass (*Avena fatua*), *s*hepherd's purse (*Capsella bursa-pastoris),* pigweed or lambsquarters (*Chenopodium album)* and bermuda grass (*Cynodon dactylon*). The following IPM package components were compared to local farmers’ practices in the same area:

- Plots of 10 X10 m planted to a resistant variety to yellow and brown rusts, 4 replications 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.)* alongside the wheat plots to enhance Cereal leaf beetle natural enemies.
- Cultural practices (planting date, seed rate, fertilizer application, and weed control).
- Biopesticide application of “Nim” (a Neem product from China) targeted to control Cereal leaf beetle.

**Location:** Andrevka village, Hissor district of Hissor region.
**Farmer:** Mrs. Makhbuba Sattorova
**Other Farmer Participants:** (n=20)
**GPS data:** N 38.51392; E 068.64054; Altitude: 750m
**Date of demo establishment:** December 16, 2011
**Date of rust evaluation:** May 28, 2012
**Date of CLB evaluations:** April 14 and May 12, 2012
**Date of yield evaluation:** June 19, 2012
**Seed sowing rate:** 2 kg per plot or 200 kg/ha
**Farmer variety:** "Norman"
**IPM Demo Variety:** "Ormon"
**Treatments:** In the IPM practice, the wheat seeds were treated with "Vitavaks 200 FF" at 2 kg per ton wheat seed.

Yellow rust infection in May was low to moderate, averaging 25% in the farmer practice plots and 0% in the IPM demonstration plots. Brown rust infection in May was low, averaging 15% in the farmer practice plots and 1.3% in the IPM demonstration plots. Cereal leaf beetle pressure was moderate and increased from April to May. Combined counts of Cereal leaf beetle adults and larvae in April averaged 9.3 per $m^2$ in Farmer Practice plots versus 6.0 per $m^2$ in IPM Demo plots, while in May, counts averaged 14.8 per $m^2$ in Farmer Practice plots versus 10.0 per $m^2$ in IPM Demo plots.

**Table 2.** The results of Farmer Practice and IPM package treatments on Cereal leaf beetle damage and wheat yield, South Tajikistan, 2011-12*****

| | **Mean ± SEM number of CLB damaged leaves/$m^2$** | **Mean ± SEM yield of wheat from plots (kilogram)** |
|---|---|---|
| **Farmer practice** | 10.5 ± 0.96 a | 30.25 ± 1.10 a |
| **IPM package** | 6.0 ± 0.41 b | 40.45 ± 1.04 b |

*Values within the same column followed by different letters are significantly different at the P≤0.001 level, T-test.

Overall, Cereal leaf beetle damage was significantly lower in the IPM Demonstration plots than in Farmer Practice plots. Each of the yield components were higher in the IPM Wheat package plots resulting in a 25% increase in final yield (from 30 to 40 kg/plot) in wheat yield in the IPM Package plots. A report on the results was presented to the farmers, the Research Institute of Farming and will be shared at subsequent grower meetings.

Photo 3. Flowering plant stripe in IPM demonstration site in Hissor district.

Photo 4. IPM trainer Dr. Anvar Jalilov showing to farmer a role of flowering plant stripe in attractiveness of natural enemies to wheat field, Hissor district.

Photo 5. Flowering plant stripe in IPM demonstration, Hissor district 2012.

**East Tajikistan Site:** The location of demonstration site was the private Farmer Mr. Haidar Rakhimov located in the Muminabad district of Khatlon region. In this site focus was on the Cereal leaf beetle (*Oumela melanopa)* 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*). The following IPM package components were compared to local farmers' practices in the same area:

- Plots of 10 X10 m planted to a resistant variety to yellow and brown rusts, 4 replications 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.)* alongside the wheat plots to enhance Cereal leaf beetle natural enemies.
- Cultural practices (planting date, seed rate, fertilizer application, and weed control).

**Location:** Muminabad district of Khatlon region
**Farmer:** Mr. Haidar Rakhimov
**Other Farmer Participants:** (n=15)
**GPS data:** N 38.08113; E 069.98137; Altitude: 1187 m

**Date of demonstration establishment:** December 5, 2011
**Date of rust evaluation:** June 1, 2012
**Date of CLB evaluations:** April 28 and May 31, 2012
**Date of yield evaluation:** June 30, 2012
**Seed sowing rate:** 2 kg per plot or 200 kg/ha
**Farmer variety:** "Norman"
**IPM Demonstration Variety:** "Ormon"
**Treatments:** In the IPM practice the wheat seeds were treatment by "Vitavaks 200 FF" at 2 kg per ton wheat seed

Yellow rust infection in May was low to moderate, averaging 30% in the farmer practice plots and 4.5% in the IPM demonstration plots. Brown rust infection in May was low, averaging 15% in the farmer practice plots and 4% in the IPM demonstration plots. Cereal leaf beetle pressure was moderate and increased from April to May. Combined counts of Cereal leaf beetle adults and larvae in April averaged 5.5 per $m^2$ in Farmer Practice plots versus 6.0 per $m^2$ in IPM Demo plots, while in May, counts averaged 12.0 per $m^2$ in both Farmer Practice and IPM Demo plots.

**Table 3.** The results of Farmer Practice and IPM package treatments on Cereal leaf beetle damage and wheat yield, East Tajikistan, 2011-12*****

| | **Mean ± SEM number of CLB damaged leaves/$m^2$** | **Mean ± SEM yield of wheat from plots (kilogram)** |
|---|---|---|
| **Farmer practice** | 9.8 ± 0.63 a | 27.65 ± 0.54 a |
| **IPM package** | 5.8 ± 0.25 b | 38.20 ± 0.64 b |

*Values within the same column followed by different letters are significantly different at the P≤0.001 level, T-test.

Overall, Cereal leaf beetle damage was significantly lower in the IPM Demonstration plots than in Farmer Practice plots. Each of the yield components were higher in the IPM Wheat package plots resulting in a 26% increase in final yield (from 28 to 38 kg/plot) in wheat yield in the IPM Package plots. A report on the results was presented to the farmers, the Research Institute of Farming and will be shared at subsequent grower meetings.

## IPM Applied Research and Demonstration Sites in Tajikistan for Potato, 2011-2012:

The Tajikistan Potato Project was designed to evaluate modern potato varieties/lines with pest resistance under Tajikistan and Central Asia growing conditions. This research was designed as a two-step process, with the first year dedicated to documenting the agronomic properties of both the pest resistant and local varieties/lines. The second phase is to evaluate the varieties-lines under specific sets of pest pressures: with special reference to the golden nematode, Colorado potato beetle, late blight and potato scab.

**Potato Crop:** Although potatoes are a very important crop in Tajikistan and often referred to as the *second bread*, potatoes are a relatively recent crop in Tajikistan. They were first introduced

to the country about 150 years ago. Because of the dynamics of pre-Soviet times, Soviet times and post-Soviet times, there is an extremely limited modern agronomic or IPM research base in relation to potato production in Tajikistan. A team of scientists consisting of Dr. George Bird, (MSU), Dr. David Douches (MSU), Dr.Walter Pett (MSU), Dr. Nurali Saidov (Tajikistan) and Dr. Anwar Jalilov (Tajikistan) worked together and established two Potato IPM applied research and demonstration sites in Tajikistan.

Two potato variety trials (one low land and the other mountainous) were conducted in Tajikistan in 2012 as part of the IPM CRSP applied research and demonstration sites. Ten varieties/lines were evaluated for tuber productivity at both locations. The varieties/lines were selected based on the results of the 2011 research in Kyrgyzstan. Eight of the varieties/lines used in the 2012 research represent germplasm with resistance to golden nematode, late blight, potato scab and Colorado potato beetle, while the other two are commonly grown, local varieties (Table 1).

| Table 1. | Variety/Line | IPM Characteristic |
|---|---|---|
| 1 | Boulder | Golden nematode resistant |
| 2 | Missaukee | Golden nematode resistant |
| 3 | Dakota Diamond | Colorado potato beetle tolerant |
| 4 | Kalkaska | Scab resistant |
| 5 | MSP270-1 | Scab resistant |
| 6 | MSQ176-5 | Late blight resistant |
| 7 | MSL268D | Late blight resistant |
| 8 | MSM182-1 | Late blight resistant |
| 9 | Cardinal - Taj-1 | Local variety No. 1 |
| 10 | Picasso - Taj-2 | Local variety No. 2 |

The first trial was conducted in the Irgatol District, Jamoat Muksu, Tupi Boiho Village and planted on May 12, 2012. Pest population densities were monitored and were relatively low throughout the growing season. All of the varieties/lines sent to Tajikistan performed well for agronomic characteristics at the Irgatol location. The tubers were harvested on September 24, 2012 (Table 2). All of the varieties/lines evaluated yielded more (mean yield = 3.2 kg/plot) than the local varieties (mean yield = 1.4 kg/plot). The results of this trial form a solid foundation for designing potato pest management specific variety/line research and demonstration trials in Tajikistan in 2013, to be conducted under specific pest population density pressures. The second 2012 Tajikistan potato trial will be harvested during the last week of October.

**Table 2. Total harvested potato yield (kg)**

| Number (#) | Variety/Line | Total - kg | Mean (kg) |
|---|---|---|---|
| 1 | Boulder | 7.8 | 3.9 |
| 2 | Missuakee | 6.5 | 3.25 |
| 3 | Dakota Diamond | 9.5 | 4.75 |
| 4 | Kalkaska | 8.3 | 4.15 |
| 5 | MSP270-1 | 5.1 | 2.55 |

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|---|---|---|---|
| 6 | MSQ176-5 | 4.6 | 2.3 |
| 7 | MSL268D | 4.3 | 2.15 |
| 8 | MSM182-1 | 5.4 | 2.7 |
| 9 | Cardinal - Taj-1 | 3.4 | 1.7 |
| 10 | Picasso - Taj-2 | 2.2 | 1.1 |

The following is a pictorial description of the 2012 Irgatol District potato research (Figures 1 through 11.).

**At planting**


Fig.1. Potato seed received from United States.


Fig. 2. Potato seed received from United States.

Fig. 3. Potato seed before planting.

Fig. 4. Potato trial field after planting.

Fig. 5. Potato trial view after planting.

**Mid-season**


Fig. 6. General view of potato trial during observation.

Fig. 7a. Potato line MSM182-1 during mid-season.

Fig. 7b. Potato variety Dakota Diamond during mid-season.

**At harvest**

Fig. 8. During potato seed harvesting.

Fig. 9. Visual observation during potato harvest.

Fig. 10. Total potato seed harvested.

Fig. 11. Potato seed before submission to storage.

## Objective 2: Disseminate IPM knowledge and packages to farmers and students through technology transfer and outreach in collaboration with local NGOs, universities, and government institutions.

**Farmers Field Schools for Wheat:** One of the important objectives of this IPM CRSP project is to transfer IPM knowledge and demonstrate existing and new IPM technologies to local farmers and students through the establishment of Farmers Field Schools (FFS) in collaboration with local agriculture ministries, local NGOs, universities.

Photo 6. Farmers during field training in Muminabad district.

To accomplish this transfer of IPM knowledge, we are conducting farmer field schools (FFS) at the IPM demonstration sites. Here is a summary of FFS activities:

| Date | Host farmer | Key topics addressed | Total number participants | Number women participants | Other comments |
|---|---|---|---|---|---|

| Spitamen district of Sogd region | | | | | |
|---|---|---|---|---|---|
| October 24, 2011 | Mr. Akmal Boimatov | (1) Choosing varieties based on rust resistance and yield potential; (2) Observe seeding rates in IPM plots, compare to farmer standard; (3) Establishment of demo plot. | 20 | 5 | Several students from Tajik Agrarian University and Khudjand Stae University also observed. |
| March 5, 2012 | Mr. Akmal Boimatov | (1) How to establish flowering plants to attract beneficial insects (2) Establishment of flowering strip in IPM plots. | 20 | 5 | Farmers were excited to learn how traditional herbs for medicines could also attract "good bugs." |
| March 18, 2012 | Mr. Akmal Boimatov | (1) Observation of weed plant. (2) Application of herbicide "Grand plus" for control of weeds in IPM plots. | 20 | 5 | Farmers learned how to prepare of herbicide application rates. |
| April 2, 2012 | Mr. Akmal Boimatov | (1) Analysis of effectiveness of herbicide "Grand plus" for control of weeds two weeks after application. (2) Application of carbamide and ammophos in rate of 100 kg per ha or 1 kg in each IPM plots. | 20 | 5 | (1) Farmers learned that by accurately applying herbicide, they can control up to 90% of weeds in wheat fields. (2) Farmers learned how to prepare fertilizer rates for application during wheat vegetation. |
| April 19, 2012 | Mr. Akmal Boimatov | How to identify Sunn pest and its evaluations. | 20 | 5 | Several students from Tajik Agrarian University and Khudjand Stae University also observed. |
| April 30, 2012 | Mr. Akmal Boimatov | Observe beneficial insects in flowering plants | 20 | 5 | Many beneficials were present – coccinellids, lacewings, syrphid flies, good bugs, bees and spiders. |

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| May 17, 2012 | Mr. Akmal Boimatov | How to identify Sunn pest and its evaluations. | 20 | 5 | Several students from Tajik Agrarian University and Khudjand Stae University also observed. |
| May 17, 2012 | Mr. Akmal Boimatov | How to diagnose yellow rust compared to brown rust. | 20 | 5 | Farmers were interested to see differences in rust severity in resistant wheat in IPM plot compared to susceptible wheat in farmer standard plot. |
| June 15, 2012 | Mr. Akmal Boimatov | Wheat yield evaluation | 20 | 5 | Farmers were interested to see differences in high wheat yield result in IPM plot compared to yield in farmer standard plot. |
| **Hissor district of Hissor region** | | | | | |
| October 17, 2011 | Mrs. Makhbuba Sattorova | (1) Choosing varieties based on rust resistance and yield potential; (2) Preparing plots for planting. | 20 | 7 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| December 16, 2011 | Mrs. Makhbuba Sattorova | (1) Observe seeding rates in IPM plots, compare to farmer standard; (2) Establishment of demo plot. | 20 | 5 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| February 28, 2012 | Mrs. Makhbuba Sattorova | (1) How to establish flowering plants to attract beneficial insects (2) Establishment of flowering strip in IPM plots. | 20 | 7 | Farmers were excited to learn how traditional herbs for medicines could also attract “good bugs.” |
| March 28, 2012 | Mrs. Makhbuba Sattorova | (1) Observation of weed plants. (2) Application of herbicide “Grand plus” for control of weeds in IPM plots. | 20 | 8 | Farmers learned how to prepare herbicide application rates. |

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| April 10, 2012 | Mrs. Makhbuba Sattorova | (1) Analysis of effectiveness herbicide "Grand plus" on control of weeds two weeks after application. (2) Application of carbamide and ammophos in rate of 100 kg per ha or 1 kg in each IPM plots. | 20 | 8 | (1) Farmers learned that by accurately applying herbicide, they can control up to 90% of weeds in wheat fields. (2) Farmers learned how to prepare fertilizer rates for application during wheat vegetation. |
| April 14, 2012 | Mrs. Makhbuba Sattorova | How to identify cereal leaf beetle and its evaluations. | 20 | 5 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| April 25, 2012 | Mrs. Makhbuba Sattorova | Observe beneficial insects in flowering plants. | 20 | 7 | Many beneficials were present – coccinellids, lacewings, syrphid flies, good bugs, bees and spiders. |
| May 12, 2012 | Mrs. Makhbuba Sattorova | How to identify cereal leaf beetle and its evaluations. | 20 | 7 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| May 28, 2012 | Mrs. Makhbuba Sattorova | How to diagnose yellow rust compared to brown rust. | 20 | 5 | Farmers were interested to see differences in rust severity in resistant wheat in IPM plot compared to susceptible wheat in farmer standard plot |
| June 19, 2012 | Mrs. Makhbuba Sattorova | Wheat yield evaluation | 20 | 5 | Farmers were interested to see differences in high wheat yield result in IPM plot compared to yields in farmer standard plot. |
| **Muminabad district of Khatlon region** | | | | | |
| December 5, 2011 | Mr. Haidar Rakhimov | (1) Choosing varieties based on rust resistance and yield potential; (2) | 15 | 7 | Several students from Tajik Agrarian University and Tajik |

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|---|---|---|---|---|---|
| | | Observe seeding rates in IPM plots, compare to farmer standard; (3) Establishment of demo plot. | | | National University also observed. |
| March 20, 2012 | Mr. Haidar Rakhimov | (1) How to establish flowering plants to attract beneficial insects (2) Establishment of flowering strip in IPM plots. | 15 | 7 | Farmers were excited to learn how traditional herbs for medicines could also attract "good bugs." |
| April 10, 2012 | Mr. Haidar Rakhimov | (1) Observation of weed plant. (2) Application of herbicide "Grand plus" for control of weeds in IPM plots. | 15 | 7 | Farmers learned how to prepare herbicide application rates. |
| April 28, 2012 | Mr. Haidar Rakhimov | (1) Analysis of effectiveness herbicide "Grand plus" on control of weeds after two weeks of application herbicide (2) Application of carbamide and ammophos in rate of 100 kg per ha or 1 kg in each IPM plots | 15 | 7 | (1) Farmers learned that by accurately applying herbicide, they can control up to 90% of weeds in wheat fields. (2) Farmers learned how to prepare fertilizer rates for application during wheat vegetation. |
| April 28, 2012 | Mr. Haidar Rakhimov | How to identify cereal leaf beetle and its evaluations. | 15 | 7 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| May 10, 2012 | Mr. Haidar Rakhimov | Observe beneficial insects in flowering plants. | 15 | 7 | Many beneficials were present – coccinellids, lacewings, syrphid flies, good bugs, bees and spiders. |
| May 31, 2012 | Mr. Haidar Rakhimov | How to identify cereal leaf beetle and its evaluations. | 15 | 7 | Several students from Tajik Agrarian University and Tajik National University also observed. |
| June 1, 2012 | Mr. Haidar | How to diagnose yellow rust compared to | 15 | 7 | Farmers were interested to see |

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| | Rakhimov | brown rust. | | | differences in rust severity in resistant wheat in IPM plot compared to susceptible wheat in farmer standard plot. |
| June 30, 2012 | Mr. Haidar Rakhimov | Wheat yield evaluation | 15 | 7 | Farmers were interested to see differences in high wheat yield result in IPM plot compared to yields in farmer standard plot. |

**Local Tajik Students involved in research with the IPM CRSP project and their research area/topic, 2011-2012:** Ms. Madina Pulatova – Biological faculty of Tajik National University, Dushanbe, Tajikistan; She prepared and defended a thesis on the subject "Biology of Cereal leaf beetle and their method of control" obtaining her MSc diploma in Biology.

**Publications:**

***a) Articles in Refereed Journals***

Jalilov A., Eshanova Z., Azamov C., Sharma R. Efficiency of resistance genes of wheat to pathogen of a yellow and brown rust in Tajikistan. In the book "Actual problems, prospects of development of agriculture for maintenance of food security in Tajikistan". Dushanbe 2012, Volume 7, p. 51-55.

***b) Thesis***

O. J. Alabi, J. M. Crosslin, N. Saidov, R. A. Naidu. First Report of *Potato virus Y* in Potato in Tajikistan. Disease Notes. *Plant Disease* are published by APS. July 2012, Volume 96, Number 7. Page 1074. http://dx.doi.org/10.1094/PDIS-03-12-0249-PDN.

## Objective 3: Enhance communication, networking and linkages with U.S. institutions, international agricultural research centers, and IPM CRSP regional and global theme programs to access IPM technologies, information and expertise.

**Participation in International Meetings:** Dr. Karim Maredia, Ms. Joy Landis, and Ms. Shahlo Safarzoda (Ph.D Graduate Student at MSU from Tajikistan) attended the 7th International IPM Symposium, "IPM on the World Stage-Solutions for Global Pest Challenges," held in Memphis, Tennessee, USA from March 27 - 29, 2012. They presented three posters covering the activities related to the Tajikistan IPM CRSP project (see Objective 4 of this report). At the International IPM symposium, Dr. Maredia organized and moderated a special workshop on IPM packages for Vegetable Crops, where the research and outreach work of IPM CRSP from regional programs and global theme programs was highlighted.

Dr. Nurali Saidov (IPM CRSP Coordinator in Tajikistan) attended the 15$^{th}$ Annual Meeting of the Steering Committee of the CGIAR Program for Central Asia and the Caucasus in Isiqul, Kyrgyzstan from September 4 - 6, 2012 and presented the progress report of the Tajikistan IPM CRSP project. Dr. Maredia attended the IPM CRSP Technical Committee (TC) meeting on March 26, 2012 in Memphis, Tennessee. Dr. Maredia also participated in the IPM CRSP TC meeting on September 18, 2012 that was held via conference call and presented the summary of the progress made in the Tajikistan IPM CRSP project.

## Objective 4: Create a "Central Asia IPM Knowledge Network" - Information base

**IPM Communication (Ms. Joy Landis, Michigan State University):** The Central Asia IPM CRSP project web site (http://www.ipm.msu.edu/central-asia.htm ) was updated to include links to:

- Three posters presented at the 2012 International IPM Symposium in Memphis, TN, USA (March 27 – 29, 2012)
- Four flyers on IPM packages
- Latest reports, new publications
- Updates to program components, team members, and partners

The 7th International IPM Symposium, "IPM on the World Stage-Solutions for Global Pest Challenges," was held in Memphis, Tennessee, USA from March 27-29, 2012. Three posters were developed with authors and presented at this symposium. These three posters included:

1. Development and Delivery of Ecologically-based IPM Packages for Wheat in Central Asia;
2. Ecologically-based IPM Packages for Food Security Crops in Central Asia; and
3. Gender Issues in IPM in Tajikistan.

Joy Landis and Frank Zalom were contacted by Greg Franklin, Executive Producer of Silk Road Newsline, and helped him make arrangements for filming about our IPM work. Silk Road Newsline is a non-profit media service managed through the Central Asia and Caucasus Institute at Johns Hopkins University School of Advanced International Studies (SAIS). Stories are made available to registered news media in Central Asia.

Profiles with photos about our three graduate students were provided to IPM CRSP headquarters for its website.

## Objective 5: Build institutional capacity through training and human resource development.

**Long-term Training - Graduate Student Training in IPM in Wheat:** Ms. Shahlo Safarzoda from Tajikistan is currently a PhD student in the Department of Entomology at Michigan State University. Ms. Safarzoda successfully completed her first year of graduate classes (2011-12) and completed her first season of field research. Her research focuses on the influence of natural enemies on aphids and virus spread in wheat. Initial studies in 2012 were focused on refining a study system that is amenable to addressing the following questions: 1) What natural enemies may be important in consuming the bird cherry oat aphid under Michigan conditions? 2) Are natural enemy communities effective in suppressing aphid populations in the field? 3) What is the relative importance of coccinellids and carabids in controlling aphids in wheat? In order to answer these questions three experiments were conducted.

**Experiment 1.** Adults of the most abundant carabid and coccinellid beetles were collected from wheat fields on the campus of Michigan State University, East Lansing, MI during May 2012 and tested as potential natural enemies of wheat aphids. Dry (without any killing solution) 11 cm diameter pitfall traps were used to collect carabid beetles, coccinellids were collected by sweeping vegetation. In the lab, wheat leaves with 5 bird cherry oat aphids were placed in

100mm x 15mm Petri dishes and allow to settle before addition of natural enemies. Dishes were observed at 3, 6 and 24h to determine aphid consumption.

Results: Adults of the two most abundant coccinellid beetle species; *Harmonia axyridis* and *Coccinella septempunctata*, the two most abundant carabid beetle species; *Scarites subterraneus* and *Anisodactylis santaecrusis* readily consumed bird cherry oat aphid in the lab tests (Figure 1-4).

**Figure 1**

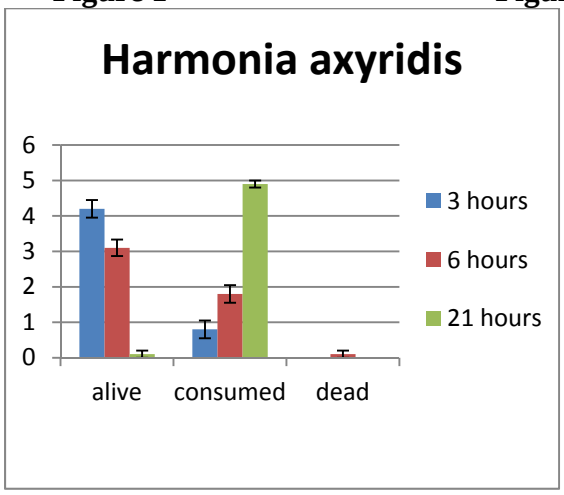



**Figure 2**

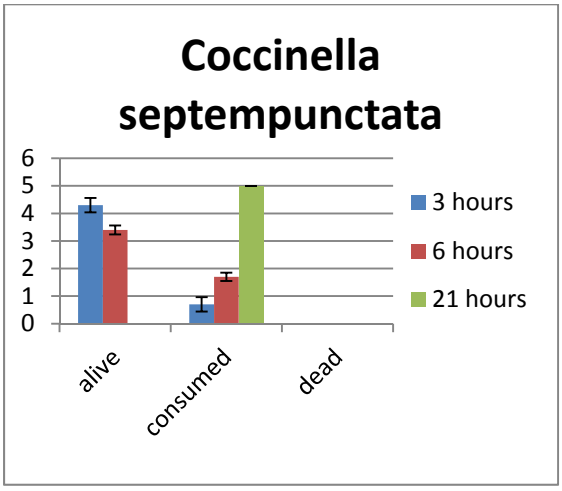



**Figure 3**

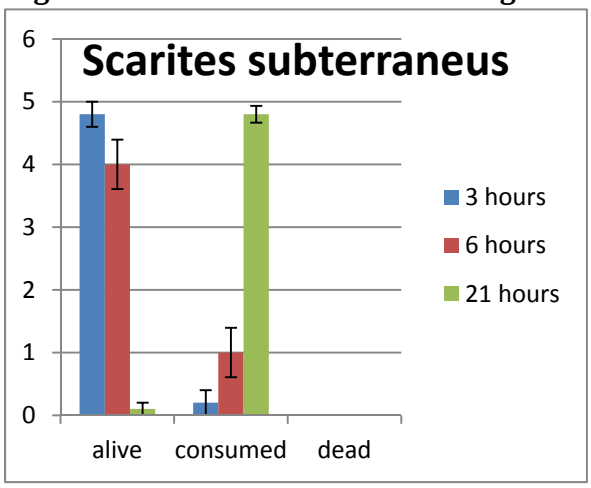
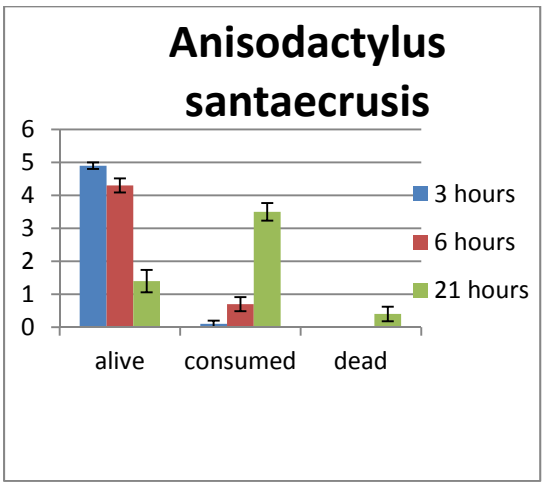
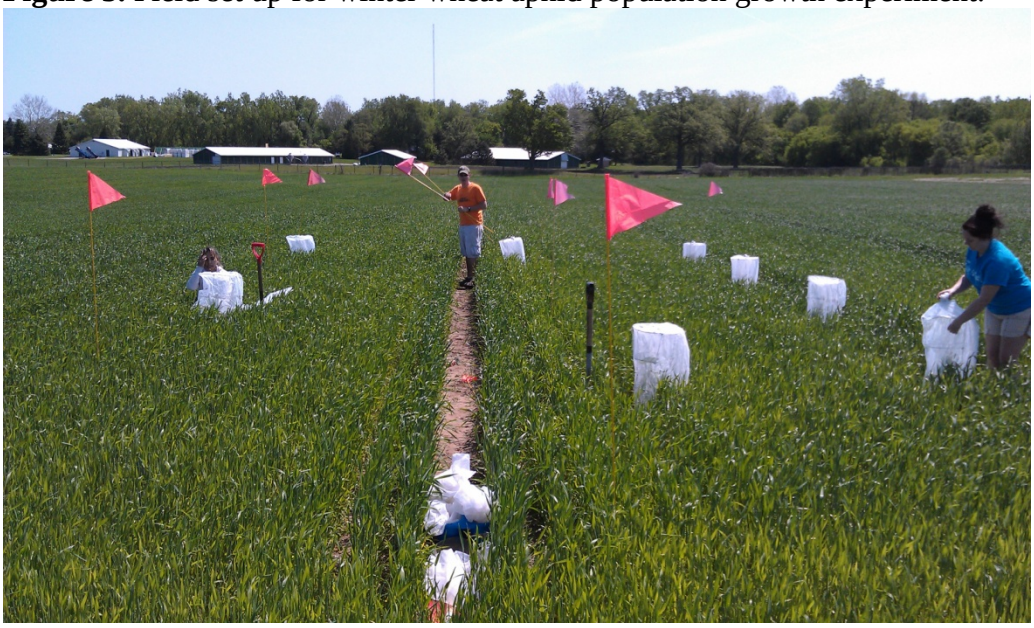



**Figure 4**




**Experiment 2.** To understand how existing natural enemies impact aphid density in the field, experiments were conducted in two winter wheat fields on the Michigan State University General Farm, East Lansing, MI. Tomato cages covered with fine mesh were used to exclude natural enemies, and contrasted to sham cages with 4 cm holes to allow natural enemy entry, and uncaged controls. The experiment was set up in a completely randomized design (CRD) with 4 replicates (Figure 5).

**Figure 5.** Field set up for winter wheat aphid population growth experiment.



Results: In both sites, wheat aphid populations grew rapidly in the closed cages but remained near zero in the sham and open cages (Figure 6-7) demonstrating that existing natural enemy communities were highly effective at control in wheat aphids under these conditions.

**Figure 6.** Aphid population growth in closed, open, and sham cages, Inland lake site, MSU 2012.

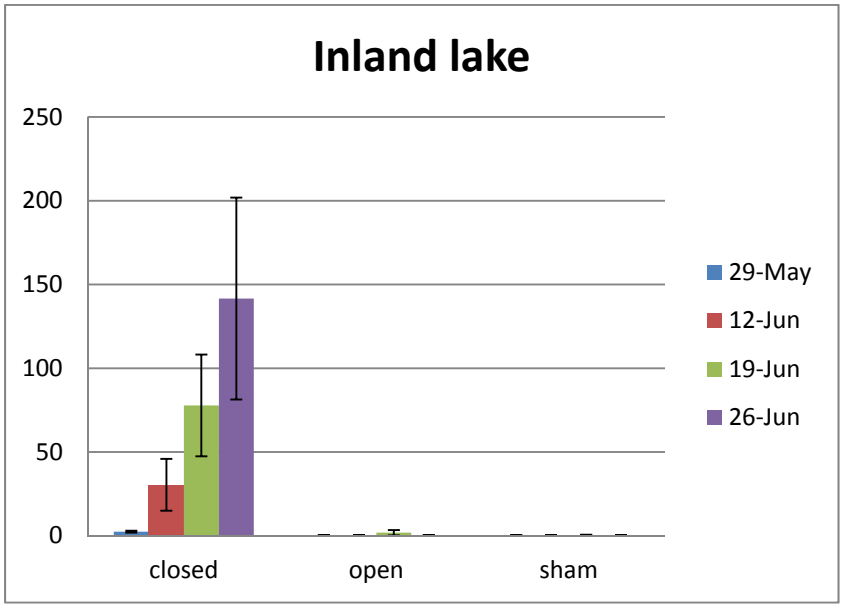
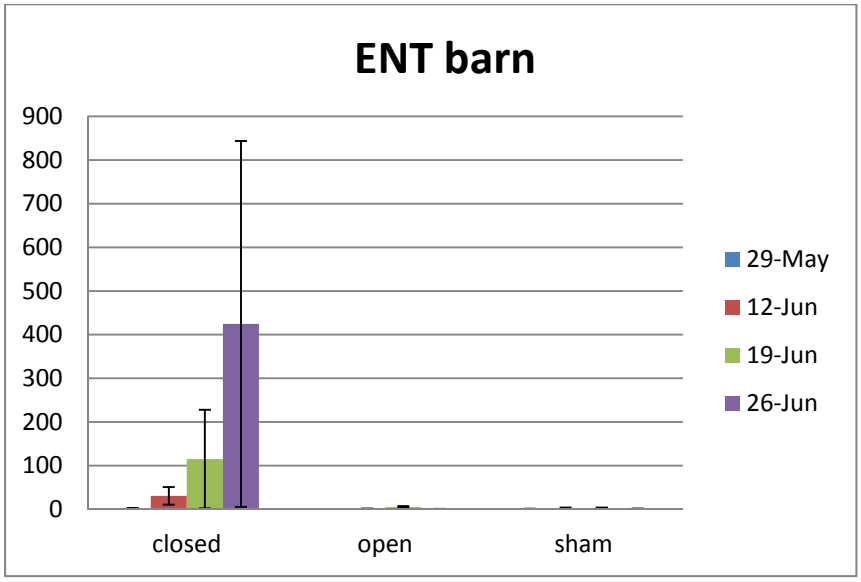


**Figure 7.** Aphid population growth in closed, open, and sham cages, Entomology Farm site, MSU 2012.

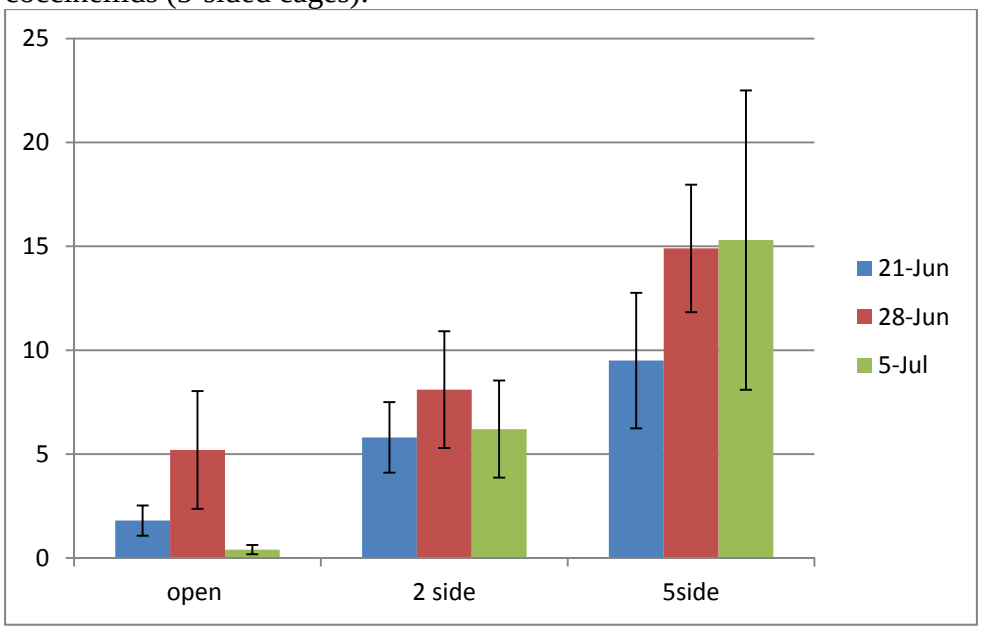



**Experiment 3.** Finally, the relative importance of coccinellids and carabids in controlling aphids was investigated. This experiment was conducted in a spring-planted wheat field on the MSU campus and compared aphid (greenbug) growth in fully open plots, to that in plots enclosed on 2-sides to reduce coccinellid density, and 5-sided cages that nearly eliminated coccinellids. In both 2- and 5-sided cages, the barriers did not extend to the ground, thus carabids had full access to all plots (Figure 8). Aphids were counted approximately every seven days for three weeks following establishment of the barriers.

**Figure 8.** Field set up for spring wheat aphid population growth experiment showing 2- and 5-sided cages.

Results: During the experiment, conditions were very hot and dry and the wheat was near maturity causing aphid populations to grow slowly. However after three weeks, wheat aphid populations were generally higher in the 2- and 5-sided cages and lowest in the open cage treatment (Figure 9). This experiment suggests that coccinellids are important in suppressing summer aphid populations. Additional studies that selectively exclude carabids will be required to isolate their impacts in this system.

**Figure 9.** Aphid population growth results from reducing (2-sided cages) or eliminating coccinellids (5-sided cages).




## Objective 6: Links with Global Themes:

**Socio-Economic Impact Assessment: Dr. Mywish Maredia and Richard Bernsten, Michigan State University, Ms. Tanzila Ergasheva, Agricultural Economics Division of Tajik Academy of Agricultural Sciences.**

**Impact Assessment:** The socioeconomics team is responsible for implementing a study to document the impact of the project's wheat-focused farmer field schools (FFS), which the project is implementing in two districts of Tajikistan (Hissor and Spiteman District). The socioeconomics team will evaluate impact by carrying out a baseline survey in Year 1 and a second survey in the future to identify how the project has impacted the farmers who participated in the FFS and neighboring farmer (non-FFS participants).

In late Fall (November 25 - December 5) 2011, Bernsten visited Tajikistan to meet with Ms. Ergasheva, Dr. Nurali Saidov, groups of farmers, and government officials to gain insights regarding the wheat production farming system, socioeconomic characteristics of wheat farmers,

and the implementation of the project's FFS. Subsequently, with insights gained through the above described meetings, the socioeconomics team designed a baseline survey.

**Baseline Design Survey:** A draft of the baseline survey was completed in February 2012 and sent to the projects Tajikistan collaborators for their comment and suggestions. Subsequently, the survey was translated into Russian. In mid-February, Ms. Ergasheva received approval from MSU (UCRIHS) to conduct research on human subjects (i.e., supervise the survey). After several revisions, the questionnaire was finalized in early April 2012.

**Enumerator Selection and Training:** Four enumerators were selected from among staff and graduate students at the Institute—Abdulloeva Mavsuma, Davlatov Dilshod, Kurbonov Mahmadali, and Pirov Daler. Of the four enumerators, one was a woman. Since many farmers in both of the two targeted districts speak Uzbek, two enumerators were selected who were fluent in Uzbek.

The two-day enumerator training session, which was conducted on May 22-23, 2012, was supervised by Ms. Ergasheva. In addition, IPM project representative Jalilov Anwar was invited to participate in the training. Following the enumerator training, the questionnaire was pre-test in Hissor District on May 25, 2012.

**Survey Sample:** The original survey design envisioned surveying 160 wheat farmers (i.e., 80 farmers in Hissor and 80 farmers in Spitamen District). In each district, all of the wheat farmers who participated in the village-based FFS were to be selected, plus 60 neighboring farmers were to be selected at random from a list of wheat farmers in the villages surrounding the village where the FFS was based.

The final sample included 20 FFS/project participants in Hissor District, but only 13 in Spitamen District, as there were only 13 FFS participants in this district. To select a representative sample of non-project participants, in each district five villages were randomly selected and then in each of these villages 12 wheat farmers were selected in each village for a total of 60 non-project participants per district. All of the sampled farmers consented to be interviewed.

**Survey Implementation:** Because of the difficulty of traveling to the target villages in the winter due to snow, the fieldwork was postponed until early Summer 2012. The survey was conducted in Hissor District from June 18-24 and in Spitamen District from July 30 to August 5, 2012.

**Data Entry:** In early August, MSU collaborator designed a data entry (DE) form, which they sent to Ms. Ergasheva and subsequently discussed via Skype. Staff of the Institute completed entering the data into the DE form, which was sent to MSU in early September 2012. A review of the data file identified the need to further clean the data (i.e., resolve possible issues related to DE errors, missing data)

**Data Analysis:** Once the data are cleaned, analysis will focus on documenting the characteristics of project participants and non-participants (e.g., socioeconomic traits, wheat technology/inputs utilized, knowledge of IPM). A follow-up household survey of the same farmers will be

conducted in year 5 of the project. The combined panel data from the baseline and follow-up surveys for the project participants and non-participants will be used to assess the impact of the project using the difference-in-difference analysis techniques.