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Volunteer Name: Jim Fawcett

Country: Ethiopia

**Country project: Grain Crops Production
and Sector Support (IPM)**

Host: ECC-SDCOHo

Venue: Hadiya & Kembata Zones

**Audience: Farmers, Cooperatives,
Agricultural Specialists**

Number of people : 282

Dates: 3/28/16-4/6/16



1. Assignment Objectives as in SOW

1. Farmers and staff will understand the advantages of IPM and understand the major components of IPM including pest identification, scouting, and decision making, and will understand why IPM is important.

2. Achievement of the assignment objectives (Objective 1)

1. A total of 270 farmers and workers at cooperatives and 12 agricultural professionals were given instruction on the 5 major components of IPM: 1) identification and understanding the life cycle of pests, 2) scouting, 3) knowing available control methods, 4) making a decision, and 5) evaluation of the results. A post-test after the instruction indicated all the ag professionals understood the major components of IPM after the instruction. (44% correct on pre-test and 96% correct on post-test)

2. Achievement of the assignment objectives (Objective 1), cont.

1. Emphasis was given to both the farmer groups and ag professionals on understanding the life cycle and different control options available for the African maize stalk borer, a major pest in the area.

African Maize Stalkborer (*Busseola fusca*)



Creamy white larva
with brown head



African Maize Stalkborer Life Cycle

- Moths lay about 200 eggs in a row between stem and leaf sheath on younger leaves
- Eggs hatch in 3-5 days
- Larva move into whorls to feed
- Older larva tunnel into stalks
- Larva pupate in tunnels and moths emerge in 7-14 days



African Maize Stalkborer Management

- Cultural Practices:
 - Intercropping with non-host (legumes) or repellent plants (silver leaf desmodium) or trap plants (Napier grass), which draws moths away from crop
 - Crop hygiene (destroy maize residue by burning or removing volunteer plants)
 - Slash maize stubble soon after harvest to allow sun to destroy larva and pupa

African Maize Stalkborer Management

- Biological control:
 - Several natural enemies can help to reduce stalkborers, but biological control alone is unlikely to prevent damage to maize. Using insecticides only when necessary can help to maintain populations of the natural enemies
 - Parasitic wasps are the most common.

African Maize Stalkborer Management

- Chemical Control:
 - 2 applications of NEEM powder (a natural insecticide from an evergreen tree native to India) into the leaf whorl at 30 and 45 days after crop emergence has provided good control
 - Insecticides are not effective after the larva borer into the stalk
 - Many other more broad spectrum insecticides, including Cymbush (cypermethrin) and diazinon are also available, but more likely to kill beneficial insects

African Maize Stalkborer Life Cycle & Management



3. Recommendations to the host with regards to the assignment (Objective 1)

- 1. More effort needs to go towards providing training to ag professionals on the specific pest problems that they are seeing in the field. More time was spent with ag professionals on the basics of IPM and less time on specific pest problems because of a shortage of time.

4. Anticipated Impact (Objective 1)

Grain crop productivity will increase due to more attention to preventing pest problems and reducing crop losses.

1. Assignment Objectives as in SOW (2)

- Farmers and staff will understand the interaction between pests, the enemies of pests, and crops and what control methods are available, including pest prevention through cultural control.

2. Achievement of the assignment objectives (Objective 2)

- A total of 270 farmers and workers at cooperatives and 12 agricultural professionals were given instruction on the 4 types of pest control methods; 1) cultural, 2) mechanical, 3) biological, and 4) chemical. Cultural and mechanical control are common with Ethiopian farmers and many also use chemical control. There was much interest among farmers and ag professionals about biological control and the importance of minimizing disturbing natural control by using insecticides only when other control methods are not effective.

Cultural Control



Mechanical Control



Biological Control



Chemical Control



3. Recommendations to the host with regards to the assignment (Objective 2)

1. A new maize disease, maize lethal necrotic disease, has recently spread to Ethiopia from Kenya. Yield losses up to 80% have been reported. I saw this disease in one field, but based on my discussion with pest specialists in the region I do not believe the disease is common yet, but it does pose a major threat to maize production if it is allowed to spread. The viral disease is spread mainly by aphids and thrips. Research in Kenya has indicated that 3-4 insecticide applications may be necessary to manage the disease by killing the insect vectors. Fortunately soapy water is an economical and safe alternative to insecticides for controlling aphids and thrips. This control technique should be demonstrated in the field to see how effective it is.

Maize Lethal Necrotic Disease

- Viral disease caused by combined infection of Maize Chlorotic Mottle Virus and one or more of the viruses that infect cereals
 - Sugarcane mosaic virus
 - Maize dwarf mosaic virus
 - Wheat streak mosaic virus



Maize Lethal Necrotic Disease

- Spread by several insect vectors
 - Aphids
 - Thrips
 - Leafhoppers
 - Also perhaps rootworm beetles, flea beetles, and cereal leaf beetles

Maize aphid



thrips



Maize Lethal Necrotic Disease

- Spread to Ethiopia from Kenya
- Chlorotic and necrotic streaks on leaves
- Plant death
- Little to no grain formation



Maize Lethal Necrotic Disease Management

- Current strategy is to remove all infected plants and bury or burn them
- Resistant varieties?
 - Perhaps in future
 - A few inbreds with resistance have been found



Maize Lethal Necrotic Disease Management

- Insecticide seed treatments (Gaucho)
 - Early season control of insect vectors
- Foliar insecticides to control vectors
 - Research by Bayer in Kenya indicated best control with 3-4 applications of “Thunder*” 2 weeks apart beginning 1-3 weeks after emergence

*Imidaclopride + Betacyfluthrine



Maize Lethal Necrotic Disease Management

- 3-4 insecticide applications probably not feasible for most Ethiopian farmers
- If aphids and/or thrips are the primary vector, a safe and economical alternative to commercial insecticides is a possibility –
–Soapy Water



Maize Lethal Necrotic Disease Management - Soaps

- “Insecticidal soaps” and soapy water are commonly used in Iowa to control aphids and thrips in gardens
- Probably not quite as effective as commercial insecticides and more applications are required, but very safe and economical
- Try on one of two plants first to make sure it does not damage plant



Maize Lethal Necrotic Disease Management - Soaps

- Mix 2% solution of soap (20 ml liquid dish soap in 1 liter of water)
- In Iowa the brand “Dawn” is promoted for this (liquid soap for washing dishes)
- Will only kill aphids and thrips present at time of application, so multiple applications necessary
- Is thought to plug air openings so pests cannot breath
- Will not cure infected plants



3. Recommendations to the host with regards to the assignment (Objective 2), cont.

- 2. The major insect pest of maize in the region is the African maize stalk borer. Farmers and ag professionals agree that the insecticides needed to control this pest are too expensive for most farmers. Ag professionals would like the government to make pesticides more affordable for farmers so more farmers could use them. There is a possible alternative to the use of synthetic insecticides. Research has shown that two applications of NEEM, a natural oil from the Neem tree, made at 30 and 45 days after maize emergence can manage the pest. The neem tree is native to India but also grows in west Africa, so may also be adaptive to east Africa. It should be investigated whether it would be possible for local farmers to grow this tree and use it as a source of a natural insecticide.

Neem Tree – Possible Future Source of Home Grown Insecticide?



3. Recommendations to the host with regards to the assignment (Objective 2), cont.

- 3. The question I received the most from farmers concerned a problem they are having with ensete (false banana). From my observations I believe that the plants have a disease that is being spread by leafhoppers. Agricultural professionals are also aware of the problem and they also think it is a disease spread by insects. I suspect it is a viral disease because leafhoppers are known to spread viral diseases and there are similar diseases in banana and plantain. Soapy water is also effective on leafhoppers (especially on the young nymphs). This practice of soapy water to kill the leafhoppers should be investigated to see if it slows the spread of the disease.

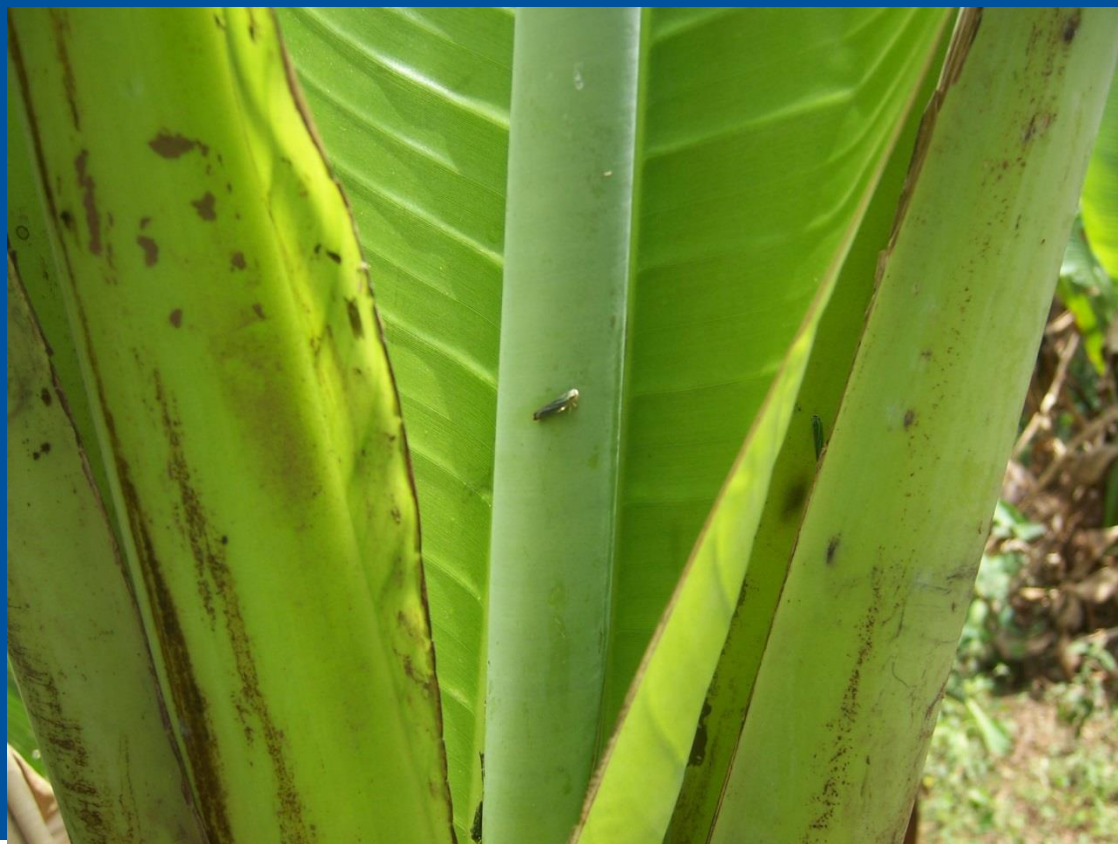
Ensete (False Banana) Problem

- Insect or Disease?



Ensete (False Banana) Problem

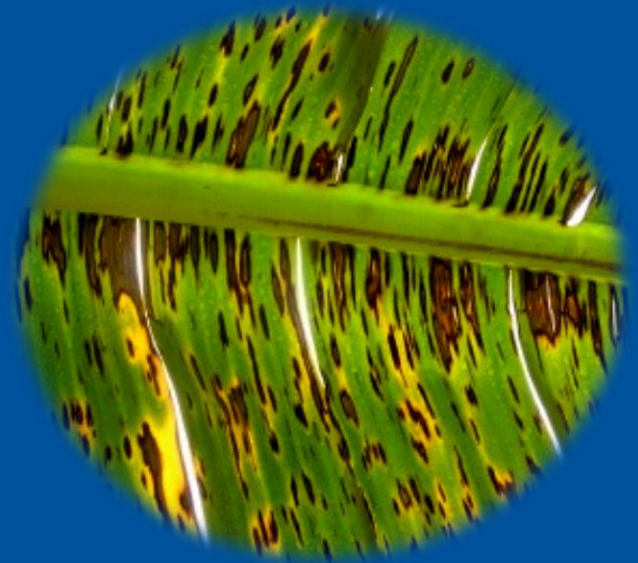
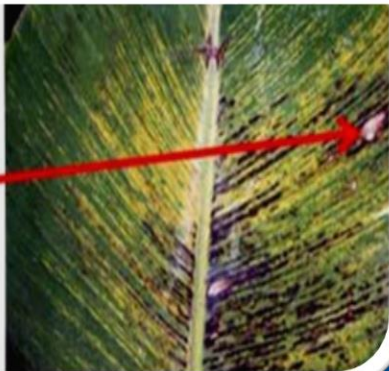
- Viral Disease Spread by Leafhoppers?



Banana Streak Virus

- Affects many banana and plantain species
- Perhaps the same or similar virus that affects ensete

Necrotic symptom



Ensete (False Banana) Problem

- Leafhoppers are known to be vectors of other viral diseases
- Soapy water is also effective on leafhoppers (especially the nymphs)



4. Anticipated Impact (Objective 2)

By integrating a combination of pest management techniques, farmers will be able to manage pests without an over-reliance on pesticides.

1. Assignment Objectives as in SOW (Objective 3)

- Farmers and staff will understand the importance of the responsible and safe use of pesticides, including protecting beneficial insects and bees, and using personal protective equipment including chemically resistant gloves.

2. Achievement of the assignment objectives (Objective 3)

- A total of 270 farmers and workers at cooperatives and 12 agricultural professionals were given instruction the importance of protecting beneficial insects and bees by not over-relying on the use of pesticides. It was emphasized that if insecticides are used that bees be protected by only using the pesticide early in the morning or late in the evening when bees are less likely to be present. Farmers expressed their appreciation about the education they received about protecting bees. The use of personal protective equipment, including chemically resistant gloves, boots, and goggles was demonstrated in the field. Farmers were especially appreciative of the training on the importance of protecting themselves from being harmed by pesticides, and some commented that they were not aware of the toxicity of pesticides.

Gloves



- Chemically resistant to the pesticide being used
- Unlined
- Long enough to cover the wrist
- Properly sized
- Wash before removing

Demonstration of Using Chemically Resistant Gloves



3. Recommendations to the host with regards to the assignment (Objective 3)

- The appropriate government officials and/or chemical suppliers should be encouraged to find ways to make personal protective equipment more available and affordable to farmers who are applying pesticides and more education should be provided on using pesticides safely.

4. Anticipated Impact (Objective 3)

Proper personal protective equipment, including chemical resistant gloves will become more available in the area, resulting in more safe use of pesticides and less adverse health effects to farmers.

5. Recommended future volunteer Assistance

- 1. An entomologist and/or plant pathologist to focus on economical alternatives to managing maize lethal necrotic disease to try to keep it from spreading in the region.
- 2. An entomologist and/or plant pathologist to work with specialists in the country to try to learn more about the problem affecting ensete and how to manage it.

5. Recommended future volunteer Assistance, cont.

- 3. A volunteer to work with government officials and suppliers to make personal protective equipment (PPE) more available and affordable to farmers and to provide education to farmers on the use of the PPE.
- 4. A volunteer to focus on pest problems and other concerns affecting teff, including the new insect pest “red teff worm.” This should be in the rainy season (late August).

6. Recommendations to other non-host stakeholders

- Because of the dense population and small farms, it is difficult for many farmers to afford the inputs (such as pesticides) that may be desirable to increase crop production and decrease crop losses. Efforts need to focus on pest management alternatives that are economical for farmers – such as the use of soapy water to control aphids.

Action plan for host recommendations

Recommendation	Specific Action	Responsible person	By when
1. Use personal protective equipment when using pesticides	Work with government officials to make chemically resistant gloves and other safety equipment more available	CRS person and/or volunteer	2017 or sooner
2. Experiment with soapy water to control aphids and leafhoppers	Have farmers and pest specialists try soapy water for controlling leafhoppers on ensete and aphids on maize	Farmers and pest management specialists, volunteer (gardeners)	2017 or 2018
3. Provide education on teff production	Have volunteer provide education on pest management and other concerns in teff including the red teff worm	Volunteer from America who is working with teff and interested in learning more about it	August, 2017

7. How can CRS improve future volunteer experience

A schedule (perhaps tentative) that showed what I would be doing each day and where we would be traveling (including a map) would have been useful. I am not clear where we were each day and what groups we visited with.

Thank You!