

## **IPM Modules: Agriculture**

Note: IPM learned and practiced in this module should be reinforced with a field trip to a local farm specializing in vegetable, fruit, or field crops, and if possible, should be practiced in the school garden. Additionally, an interview with a knowledgeable farmer or IPM manager, who administers a successful IPM program, will help students understand IPM. This module was designed in a very general sense, giving examples only for common crops. It may be necessary to alter the module to accommodate region specific crops. The resources listed below will aid in gathering information.

### **Resources**

Penn State IPM – Field Crop Manual

<http://www.cas.psu.edu/docs/CASDEPT/IPM/FldCrop/default.html>

University of Missouri – Columbia IPM

<http://ipm.missouri.edu/fieldcrops.htm>

Database of IPM Resources (DIR) – Vegetable IPM links

<http://www.ippc.orst.edu/cicp/Vegetable/vegindex.htm>

Illinois Extension – Fruit and Vegetable IPM

<http://www.aces.uiuc.edu/ipm/fruits/fruits.html>

Board of Regents, University of Wisconsin System – IPM

[http://ipcm.wisc.edu/green/Pest\\_management.htm](http://ipcm.wisc.edu/green/Pest_management.htm)

Minnesota Department of Agriculture – Fruit and Vegetable IPM

<http://www.mda.state.mn.us/ipm/fandvipm.html>

University of Minnesota – Radcliffe’s IPM world textbook

<http://ipmworld.umn.edu/textbook.htm>

North Carolina State University – pests of tomato

[http://ipm.ncsu.edu/AG295/html/tomato\\_key.htm](http://ipm.ncsu.edu/AG295/html/tomato_key.htm)

Cornell University vegetable MD online

[http://vegetablemdonline.ppath.cornell.edu/factsheets/Tomato\\_List.htm](http://vegetablemdonline.ppath.cornell.edu/factsheets/Tomato_List.htm)

For further resources the terms: vegetable IPM, field crop IPM, Livestock IPM, and Fruit crop IPM, give rise to a variety of links in [www.google.com](http://www.google.com) searches.

## Objectives

Students will:

- Learn about pests and diseases in gardens, on farms, and other large agricultural production systems
- Observe pests that occur in these systems
- Research pest biology, monitoring techniques, damage caused, and management techniques
- Implement IPM in a school garden
- Use microscopy to identify the pests

## Vocabulary

Fruit

Vegetable

Field Crop

Community garden

Livestock

Sweep net

Insects

Diseases

Frass

Cast Skins

Malformed

Discolored areas

Chewed areas

Windowpane appearance

Speckled yellow spots (stippling)

Row crop

Direct Damage

Indirect damage

## Activity

### Step One, Discussion:

This could be a wonderful opportunity for students to learn more about their family farms (if applicable) and/or gardens. Perhaps a family farmer would be willing to participate in this module. Discuss with students their experiences with farming or gardening.

- Have they ever helped in a family vegetable garden?
- Do they help on the family farm?
- What fruits, vegetables, or field crops do they grow?
- Have they ever noticed any insect pests?
- What kind were they?
- What type of damage did they cause?
- Have they ever observed any diseases?
- What did the plant look like?
- Did it change color?
- Did it have yellow or brown spots?
- Was the garden or field large or small?
- What was around the garden or field, trees, homes, roads, etc?

### Step Two, The garden or farm:

If the school has a garden, visit it in this next step. If it is not possible to use the school garden, make arrangements to visit a local community garden or commercial farm. At

the garden or farm, have the students take detailed notes about their findings. They will need **hand lenses, rulers, pencils, and paper**. They should make notes about:

- Plants in the garden or farm
- Plants that look healthy, height, color, leaf shape
- Plants that look unhealthy, height, color, leaf shape
- Areas that have wilted, damaged, or unhealthy looking plants
- Under leaves and along stems for insects
- Did they observe any insects, insect waste (frass) looks like black specks
- Presence of shed or cast skins
- Soil conditions, too wet, too dry, moist
- Shaded areas and low spots
- Discolored leaves and stems
- Malformed leaves and stems
- Leaves and stems with yellow, brown, or black spots
- Chewed leaves
- Leaves with speckled yellow spots
- Leaves with a windowpane appearance
- Entrance/exits areas of the garden or farm
- Cultivation equipment used
- Previous pesticide applications
- Plants previously grown in the area
- Pests of plants previously grown in the area
- Surrounding area, neighboring farms, roads, etc

### Step Three. Community garden or commercial farm

This step may be easiest to accomplish while at garden or commercial farm. However, if the class has not visited the garden or farm, or is not able to, ask a University extension agent knowledgeable in IPM or a farmer with a successful IPM program to visit the class. You may choose to have the IPM agent/manager or farmer present an IPM program to the class, or have the class interview the IPM agent/manager or farmer about an IPM program in practice. Points that should be addressed during the visit include:

- What pest prevention techniques are used?
- What insect pests are common to gardens and crops?
- How are insects monitored?
- How are insects managed?
- What diseases are common in gardens and crops?
- How are diseases monitored?
- How are diseases managed?
- What weeds are problems in gardens and crops?
- How are they monitored?
- How are they managed?
- Are biological controls used?
- Are natural enemies conserved (protected) or enhanced (provided with food, water, shelter, etc.)?

- Are cultural controls used?
- Are physical and mechanical controls used?
- When are pesticides necessary?
- What kinds of pesticides are used?

#### Step Four, Garden and Field Crop IPM discovery

Working in pairs, students should use a variety of materials such as Internet resources, extension information, books and manuals to research the variety of pests that can occur in a garden or field. Students must discover and report to the class:

- Name of the Pest
- Pest Host
- Pest Biology
- Pest Damage
- Monitoring/scouting methods
- At least one method for managing pests

Students may choose to investigate pests interesting to them or pests mentioned by the IPM manager or grower. Groups of students should research the life histories, major problems caused (yield loss and economic loss), and monitoring and scouting programs for insects or diseases. Below is an abbreviated list of common pests of some crops. Students may need to research the pests and diseases of the crop or garden plants with which they are working. It is recommended to do a Google search (<http://www.google.com>) with key words such as: corn pests, corn diseases, lettuce pests, lettuce diseases, carrot pests, carrot diseases, etc.

#### Soybean:

- Insects – Seedcorn maggot, Green cloverworm, Two Spotted Spider Mite, Woolly bear caterpillar, grasshoppers, corn earworm, stinkbugs, Mexican bean beetle, Velvetbean caterpillar
- Diseases – Brown Stem Rot, Phytophthora Stem and root rot, soybean cyst nematode

#### Peach:

- Insects – Oriental Fruit Moth, Plum Curculio, Tarnished Plant bug, stink bug, Japanese beetle, Western Flower Thrips
- Diseases – Apple Scab, Fire blight, Peach leaf curl, Crown Gall of Peach, Powdery Mildew, Rhizopus

#### Potato:

- Insects – Armyworm, Aster leafhopper, Cabbage Looper, Colorado Potato Beetle, Green Peach Aphid, Potato Aphid, Potato Fleabeetle, Tarnished Plant bug, White grub
- Diseases – Bacterial ring rot, Bacterial soft rot, Early blight, Late blight, Fusarium Wilt, Leaf roll, Rhizoctonia canker

#### Tomato:

- Insects – Tobacco budworm, tomato pinworm, blister beetles, cabbage looper, flea beetles, hornworms, aphids, whiteflies, stink bugs

- Diseases – Tomato anthracnose, bacterial canker, bacterial speck, bacterial spot, blossom end rot of tomato, *Botrytis* gray mold

Weeds:

- Yellow Nutsedge, Barnyardgrass, Yellow Foxtail, Giant Foxtail, Green foxtail, Fall Panicum, Large Crabgrass, Wild buckwheat, Smartweed, Pigweed, Velvetleaf, Morningglory

Step Five, Garden and Crop IPM in practice:

Now that your students are much more familiar with specific pests, allow them to revisit the community garden, school garden, or field crop and begin looking for their specific pest. *Note: If students perform this step in a community garden or in a grower's field, permission must first be obtained, and scouting should be done with the supervision of a professional crop scout.* Students should implement the scouting and monitoring techniques they have just researched. Be sure they take detailed notes about what they find (location, number, and damage severity). Have them collect samples to bring back to the classroom for further identification

Once students have returned to the classroom, they must use the information they have researched (pictures, descriptions, etc.) to confirm they have found their pest. Students should also confirm their findings by using **microscopes, and slides, hand lenses, and rulers.**

If students are practicing IPM in a school garden and after they have verified their pest, they should be allowed to scout the area once again to make more notes about pest abundance (numbers), pest life stage, pest location on the host, host plant health, and weather conditions. They should then present a scouting report to the class. Their scouting report should include if they found their pest, how many of their pest did they find? Were there any other pests? What were they? What was the life stage of their pest? Do they think management measures are necessary? What would they recommend? How often should this management measure be used? Why did they choose this management tactic? If students are unable to re-scout the area, they should speculate about what they might find if they could scout the area again. Then students should write a report answering the afore stated questions about pests and management tactics.

If the students have access to the school garden and are able to continue their IPM program they should set up and use the sampling devices they have research for their pest such as, pheromone, pitfall, light traps, sweep nets or other traps. They may choose to take plant tissue (to test for viruses) and soil samples (to determine nutrient needs). Students should also obtain information about previous pest problems, management tactics, and end of the year/post harvest procedures, to help them predict pest problems that may occur during the time period students are working in the garden or on the farm. The students should continue the garden IPM program throughout the school year.

Step Six, Take Action:

This step may not be available to all teachers. However, if it is possible students should implement their management tactics (if it is necessary). Students should continue scouting and making notes at regular intervals. Periodically discuss their findings and have students report them to the class. It may be necessary to re-evaluate and change management strategies.

**Materials**

Transportation for field trip

Pencil

Paper

Rulers

Hand lenses

Old shoes

Sweep nets

Flags for denoting troubled areas

Bags for sampling

Microscopes

Microscope slides