

Disease and Pest Management

Farmer-to-Farmer Participatory Training Course

Objectives

- Identify factors that contribute to plant disease
- Recognize that ecological management practices provide a more effective and sustainable solution than conventional treatments
- Identify ecological management practices that can prevent or solve these problems



Disease and Pest Management

Disease Management

ACTIVITY: Have a buzz with your neighbors and answer the two questions below:

1) What plant diseases are causing you problems on your farm?

2) How do you control these problems?

What causes plant diseases and disease outbreaks to occur?

Microorganisms such as fungi, bacteria, viruses and nematodes cause plant diseases. These organisms, however, will only cause disease when:

- A) There are many infectious pathogens,
- B) There is a susceptible host with poor genetics, and
- C) Environmental conditions suitable to diseases, especially wet conditions and a thick crop canopy, are present

What are the conventional treatments for disease control?

The use of chemical products for disease control is one of the most widely used conventional treatments. This mainly includes the use of pesticides, but also fungicides, and insecticides. The continual application of these products can become expensive and can often lead to:

- 1) **The killing of beneficial insects.** Pesticide products are often not species selective and can end up killing beneficial predatory insects such as butterflies.
- 2) **Surface water or groundwater contamination.** Pesticides can be transported off the field by stormwater and deposited into nearby streams, lakes, or rivers. Excess pesticide can also infiltrate through the soil and be incorporated into groundwater, or worse, a drinking water aquifer. Such contamination may lead to the ingestion of pesticides by aquatic and terrestrial plants and animals, including humans.

- 3) **The bioaccumulation of toxins.** Since digestion does not break down many of the toxins found in pesticides, they can end up accumulating in the bodies of animals that ingest them, such as those of aquatic species. As these animals are eaten by their predators, toxins are transferred from the body of one species to another and continue to accumulate. This results in high concentrations of toxins in the bodies of species which are high up in the food chain, such as humans. The presence of toxins has the potential to significantly affect one's health, causing diseases such as cancer or damage to the neurological system.

How can you address the three factors causing disease problems?

To prevent plant diseases in an effective and environmentally sustainable manner, you need to address all three factors which cause plant diseases.

A) How can we reduce the presence of infectious pathogens on our farms?

- 1) *Practice crop rotation:* One of the easiest ways to manage soil and crop residue borne diseases is to cut off the food source of the disease causing organisms by diversifying and planting unrelated crops. If this is done the number of disease organisms will decline rapidly. Some pathogens, like *Sclerotinia*, can live for longer periods (3-4 years); therefore, for some diseases you will need longer rotation periods to prevent them from reoccurring. As a general rule, it is good to alternate a grass crop (wheat, millet, oats, corn) with broadleaf crops (peas, potatoes, buckwheat, lentils, mustard, flax). This however does not apply in every case. A nitrogen fixing and low water using pea crop can make a good prior crop to potatoes if the pea field is free of diseases.
- 2) *Plant clean seed and tubers:* Because many pathogens are seed-borne it is important to save your own seed or tubers from healthy disease free fields that are managed under a good crop rotation. For potatoes, it is best if you buy first class seed and multiply it up on clean fields for larger field plantings the next year. Also pull out any diseased plants from areas where you are saving tubers. However many hybrid seeds can not be produced by farmers themselves. When buying tubers or seeds, you must make sure that the seeds come from a reliable supplier, such as big seed companies and research institutes. Sound seed structure is also important, particularly in crops such as flax and pulses where cracks in the seed coat may serve as entry points for soil-borne microorganisms that rot the seed after it is planted. Soaking seeds in compost tea can help suppress some diseases. Compost tea is made by putting compost in a barrel and adding water.
- 3) *Use compost manure on fields:* The composting process kills diseases found in manure. Compost also encourages higher populations of soil microorganisms that compete with or destroy soil pathogens. Some farmers even spray teas made from compost on their crop leaves to establish populations of beneficial microorganisms. These prevent disease causing microorganisms from getting established on the leaf surfaces and adding nutrients directly to the leaves. Compost can therefore work both

in the soil and on the plant to prevent diseases! The best disease suppression results using compost occur when it is at least 4 months old and applied to the field several months before planting.

- 4) *Use green manures:* Green manures also increase soil microbial activity and create a healthy soil environment. The soil's capacity to suppress disease is typically related to the total level of microbial activity, so use green manure where possible.
- 5) *Practice field sanitation:* Reduce the use of volunteer plants on fields to help reduce the spread of diseases. Related crops can also be hosts. For example, clipping the heads of grasses can help prevent the spread of ergot in cereals. If you are burning crop residues as fuel for cooking and heating, straw from infected crops should be burnt as fuel first.

B) What practices can make field environments less conducive to growing diseases?

- 1) *Create a healthy soil environment for the crop:* When plants grow in productive and fertile soils they have an enhanced ability to ward off plant diseases. Soils with good aeration and drainage are especially important to prevent root diseases. Potatoes on more acidic soils are less affected by potato scab.
- 2) *Avoid dense crop canopies:* Seeding crops too thickly or applying excessive rates of nitrogen fertilizer makes lush canopies that can create conditions for diseases to flourish. A dense canopy creates greater leaf surface area for pathogens to become established on, and can make for wetter canopy and surface soil conditions.
- 3) *Increase air circulation:* Plant crops in an east west direction if you have the option; this allows for better air circulation and sunlight penetration into the canopy. Some disease susceptible crops can also be planted in wider rows. Fruit trees can be heavily pruned to promote air circulation.
- 4) *Develop diversity in the field:* Having less canopy of any one crop in a field helps prevent the spread of disease. The use of strip cropping and development of multiple cropping systems with mixed seedlings can be quite helpful in this regard. Planting field buffer areas with plants and trees that attract beneficial insects and birds can also help control disease transmitting insect pests.

C) What strategies can we use to make our crops more resistant?

- 1) Select varieties that are resistant or less susceptible to the predominant diseases in your farm. Many new varieties have been found to have great resistance to some diseases. For example, potato crops with more upright leaf canopies tend to have less foliar diseases (e.g. potato blight) because moisture does not stay on the leaves.
- 2) Use mixtures or several varieties of crops in your fields to have a wider genetic base in case a disease outbreak occurs.

ACTIVITY: Entire group discussion:

Invite a farmer to summarize the training. Have the farmers discuss the following question:

What strategies can you use to prevent the diseases you are now experiencing?

Pest Management

Separate training session?