Weed Control

Farmer-to-Farmer Participatory Training Course

Objectives

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

Weed Control

ACTIVITY: Have a group discussion about the following questions.

1. **What are weeds?**
2. **What are your two worst weeds and in which crops do they most often appear (i.e. lambs quarters in potatoes, wild millet in millet)?**
3. **List all the weeds you know on your farm and group them as being grass type weeds or broadleaf weeds.**

What are weeds?

_____
_____
_____

Weeds are undesired plants. They have the potential to be invasive and grow in managed fields and other disturbed areas.

What are your two worst weeds and in which crops do they most often appear (i.e. lambs quarters in potatoes, wild millet in millet)?

1.Weed_____ Crop _____
2.Weed_____ Crop _____

List all the weeds you know on your farm and group them as being grass type weeds or broadleaf weeds.

Grass type weeds	Broadleaf weeds
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

How do weeds reproduce?

Weeds reproduce by seeds, rhizomes (laterally growing below ground roots that are like stems), and sometimes (in the case of perennial weeds) by daughter plants which grow out along or below the surface from the motherplant.

How are weeds distributed?

Weeds are distributed by wind, soil (often through water erosion and soil attached to farm implements), unclean crop seed, livestock manure, and attaching themselves to livestock and/or people (hitchhiker weeds).

What triggers weeds to grow?

Weeds are triggered by:

- soil nutrients - very small weed seeds are highly dependent on soil nutrients, especially nitrogen and phosphorus, for initial establishment. However not all seeds germinate at once, some seeds lie dormant in the soil and may take many years to germinate.
- seed exposure to sunlight (often through tillage)
- warming or cooling of soil temperatures
- rainfall or soil moisture

Why do weeds invade uncultivated fields?

Naturally, weeds are scavengers (the first ones to germinate) which work to diversify, protect and rehabilitate the soil. In barren fields, there is no competition from other field crops for sunlight, moisture, and nutrients. Thus, weeds have an easy time establishing themselves under these conditions. This also holds true after an early harvest.

ACTIVITY: Break the farmers into groups of 3-4. Discuss what management practices contribute to weed problems.

What management practices contribute to weed problems?

- Poor soil management (i.e. improper management of soil fertility)
- Excessive use of soluble N and P fertilizers. Fertilizer like urea 46-0-0 provides nitrogen in a highly available form that can be easily and rapidly taken up by weeds (the weeds uptake the nutrients before the crops have had a chance to use it)
- Excessive use of manures
- Poor crop rotations using crops with similar seasonal growth patterns which have similar weed species associated with them

What are some conventional treatments used to control weeds?

Conventional treatments for weed control include physical removal (though the use of agricultural tools such as hoes and garden weasels to physically remove the weeds) and chemical suppression (application of pesticides, or more specifically herbicides). Herbicide application is not favored in ecological farming as it can become expensive and can lead to:

1) **Crop damage.** Non-selective herbicides have the potential to affect nearby crop production if not applied or managed appropriately.

2) **Surface water or groundwater contamination.** Herbicides can be transported off the field by stormwater and deposited into nearby streams, lakes, or rivers. Excess herbicide 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 herbicides 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 herbicides, they can end up accumulating in the bodies of those that ingest it, 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.

ACTIVITY: As a group, discuss what the difference is between weed treatment and weed prevention through proper management.

What are some basic principles for ecological weed control?

- Create a diverse ecosystem. Use as many species and types of plants as possible.
- Use a good crop rotation.
- Alternate perennials with spring-seeded and fall-seeded crops.
- Minimize tillage.
- Use mechanical controls where appropriate; blind harrowing, scuffling, weed harrow, clipping pastures, pre-plant and post-harvest cultivation.
- Match crop to fertility level in the field. Plant a crop that is well adapted to the area when the soil conditions are good (adequately prepared seedbed and warm soil temperatures)
- Compost manures. Properly compost your manure at high temperatures (composting kills weed seeds). Avoid compost application to spring planting.
- Plant competitive crops. Practice relay cropping and mixed seeding to increase competition.
- Use clean seed (free of weeds) that germinates well and has good vigour (big seed generally means better seedling vigour).
- Do everything possible to ensure fast, even germination of cultivated crop. Plant when soil and season are ready.
- Don't over fertilize your soil with manure or fertilizers as this will leave too much fertility on the soil for weeds.
- Encourage earthworms. They love eating weed seeds on the soils surface.
- Fertilize with nitrogen at a rate at which crops uptake nitrogen. N-fixing legume crops, compost, and soil organic matter release nitrogen more slowly. Too much nitrogen near

germination favours weed growth, especially true with N loving weeds like lambsquarters and foxtail. Weeds tend to be much less of a problem when N fertilizer is avoided.

What effective soil cultivation strategies control weeds when planting crops?

1. *Spring Tillage prior to planting*: If a number of spring tillage operations are planned, the first should be the deepest with each successive one shallower. The first operation should be to aerate and warm the soil. The following operations should destroy weed growth while conserving as much moisture as possible. The loss of soil moisture due to tillage can be a critical problem, hindering successful crop establishment. It is important to balance the loss of soil moisture with the weed control benefits of spring cultivation.

2. *False Seedbed Technique:* Another effective technique to control weeds is fooling the early weeds to grow by creating a seed bed but then not planting it. After 5-7 days the soil should be shallowly tilled to destroy the first generation of weeds. Seeds can then be planted. This technique can often reduce weed pressure by about 50%.

3. *Blind Harrowing:* A commonly used method to control weeds in cereals and grain legume crops, like peas, is known as blind harrowing. A diamond tooth harrow or flexible tine weeder can be dragged over the crop just prior to the crop emerging (or at emergence). Usually this is about 5 days after planting.

4. *Summer Tillage:* Tillage should be as shallow as possible to avoid bringing new weeds to the surface. The initial operation should be the deepest with each operation progressively shallower. Tillage is most effective when the soil surface is dry, air temperature is high and the sun is shining. Summer tillage can be particularly effective against hard to control perennial grass weeds and thistles.

What effective strategies are used to control weeds during cultivation?

- Remove weeds from your tillage devices between fields.
- Pay special attention to problem weed patches to make sure they don't spread.
- Control weeds with hoeing at a very early stage, it is much easier and prevents weed problems later.
- Prevent weed reproduction after harvest by clipping weeds or through cultivation.
- Practice tillage following harvest. This is effective at destroying weeds that set seed after harvest, preventing winter annual weeds from establishing and helping control perennial weeds. Tillage for control of annual weeds should be shallow (less than 10 cm) to avoid burying weed seeds in the soil. Let the seeds stay near the surface where they can germinate and die or be eaten by earthworms and ground feeding insects. Control of perennial weeds is often improved if freezing temperatures occur shortly after the tillage operation.
- Plant in straight rows so you can more precisely hoe near the row to avoid so much labour of hand pulling
- When weeds are small, surface scratch the soil with a stirrup hoe as it takes little effort to remove them

- Start weeding when weeds are about to germinate (in the white stage when they are not green yet). Flick the soil with your finger to see if they have germinated.
- Hoe weeds in the morning so the sun can dry them out and kill them.

What are the characteristics of crops which make them competitive with weeds?

- Large seeds which help them establish rapidly (i.e. sunflower)
- Big root system (i.e. millet)
- Broad leaves to shade weeds (i.e. sunflower)
- Can be solid seeded and rapidly form a canopy after planting (i.e. buckwheat)
- Tall growing which helps improve their competitive ability (i.e. sunflower)
- Perennial (i.e. alfalfa)
- Disease and pest resistant so the leaves can continue to shade the weeds all season long
- Nitrogen fixing (they supply their own fertilizer while weeds go hungry)

Generally speaking, perennial forages and winter cereals have strongest competition with weeds, whereas short crops like flax and annual grain legumes like lentils are poorest in competition.

How does crop rotation help control weeds?

- Breaks weed multiplication cycles, as certain weeds are associated with certain crops (i.e. early seeded crops, late seeded crops, and winter and perennial crops have different weed species commonly associated with them)
- Maintains soils fertility which helps crop growth
- Contributes to overall healthy and productive crops which are naturally more competitive
- Allows you to use a weed cleansing crop prior to a poor weed competing crop (i.e. millet before lentils)
- Crops that have different season growth patterns compete for weed space on the field, as weeds have different growth cycles. For example:

Growth Season	Crop	Weed
Early seeded	wheat peas	Mustard
Late Seeded	corn, soybeans, buckwheat, and millet	Lambsquarters, pigweed and foxtail
Perennial	alfalfa and pasture	perennial weeds like curled dock and thistle

ACTIVITY: Select a farmer from the group. Ask him/her what weed problems he/she has on the farm. Ask the group to identify:

- **Why these weeds are growing, and**
- **What principles or strategies can be used to prevent weed growth on his/her farm?**