



# WEED MANAGEMENT

GLOBAL GARDENS, BOISE ID

## Summary

Using this guide, farmers will learn about weeds, why it is important to manage them, and about different tools, techniques, and approaches for weed management they can use in their fields. They also review the effect of tilling on soil health.

**The need:** Farmers at Global Gardens typically weed in one of two ways: either by hand with a hoe, or by running a tiller between rows in their fields. The hand method is time intensive, but the tiller method results in hardpan when the same areas are repeatedly tilled. Format will be an indoor class session with a PowerPoint, with the option of a field session later.

**ISED SOLUTIONS**  
INSTITUTE FOR SOCIAL AND ECONOMIC DEVELOPMENT



This resource was prepared by ISED Solutions - a fiscally sponsored program of TSNE MissionWorks – and supported by grant no. 2015-70017-22886 from the USDA National Institute of Food and Agriculture.

# Who made this guide?

Collaboration and Testing

**ACKNOWLEDGMENTS:** This teaching resource was developed by Katie Painter of Global Gardens in Boise Idaho, in partnership with the Institute for Social and Economic Development (ISED Solutions). Refugee farmer training programs across the country provided feedback on this lesson, which is now integrated throughout the guide. From 2015 to 2017, ISED partnered with twelve refugee farmer training programs through a USDA BFRDP educational enhancement grant, to support the design and testing of new and shareable teaching resources for culturally and linguistically diverse farmers. To learn more about this project, or to access the whole list of newly developed teaching resources for refugee farmer training programs, see the [New American Resource Library at https://nesfp.org/new-american-resources](https://nesfp.org/new-american-resources). For more in-depth explanations of the teaching approaches and activities used in these materials, please see the [‘Teaching Handbook: Refugee farmer training’](#). While these resources were designed with refugee audiences in mind, they can be adapted and used in any farmer training or incubator setting.

## VARIATION:

Throughout this guide, boxes (like this one) contain variations and adaptations that serve varying programs and farmers. They are suggestions and reflections from other programs based on how they made this workshop work for them.

## TEACHING TIP:

Throughout this guide, boxes (like this one) contain teaching tips to help you better facilitate farmer learning. Most come from other programs who have tested and reflected on using this lesson.

## DEVELOPER’S NOTE:

Throughout this guide, boxes (like this one) contain notes from this guide’s developer that provide insight into how a lesson is typically taught at the developer’s program.

**ICONS:** You will find the icons below throughout this guidebook. They are there so you are prepared for the activity and can get an idea of what it will bring at a glance.



SIGNS/CARDS



POWERPOINT



WORKSHEET



DISCUSSION



VOCABULARY



INDOOR



OUTDOOR



TALKING POINTS

# Reviews and Core Skills



## WHAT TESTERS SAY:

“This is a great resource. I feel like there could be an entire module developed just about the important tillage/hardpan concept.”

- Robin, *Global Growers, Atlanta GA*

“I like the very basic vocab photo sheet. I want to replicate for all our workshops. I appreciate the in-field follow up activities to be done later in the season.”

- Elizabeth, *International Rescue Committee, Charlottesville VA*

“Weeds are always a problem... I would love to do this lesson with the farmers from my program. The explanation and the pictures to depict hardpan are amazing!”

- Jessica, *Cultivating Community, Portland ME*

## CORE SKILLS:

- Hand tools usage
- All weed management tools
- Black plastic and mulch use
- Weed ID
- Hard pan tiller management
- Weed lifecycle identification
- Weed spread by seed vs. root

# Table of Contents

Adaptable except where noted.

## 5 IS THIS GUIDE RIGHT FOR YOU

- Audience and Objectives
- Resources needed

## 7 WEEDS OVERVIEW / ACTIVITY 1 / 15 MINUTES

### Slideshow and discussion

- Participants will learn why it is important to manage weeds and learn about the weed life cycle.

## 9 TILLING: PROS & CONS / ACTIVITY 2 / 15 MINUTES

### Slideshow and discussion

- Participants will learn about advantages and disadvantages of tilling and will see the effects of tilling on the soil.

## 11 WEED MANAGEMENT TOOLS / ACTIVITY 3 / 25 MINUTES

### Slideshow and discussion

- Participants will learn about and choose tools and strategies for weed management.

## 14 FOLLOW UP IN THE FIELD / ACTIVITY 4 / 1 HOUR

### Optional in-field follow up

- Participants will get hands-on practice with weed identification and tool usage.

### VARIATION:

The soil structure and tilling section would be helpful even outside of weed management. One reviewer mentioned adding this to a soil fertility or organics lesson. "These sections can also be pulled out especially if hardpan and tilling is not an applicable issue to your program."

### VARIATION:

For an added discussion on how weeds multiply and how to control them through lowering the seed count in spaces, see the **Advanced Weed Management** lesson.

# Audience and Objectives

Adaptable except where noted.

## **OBJECTIVES: At the end of this module, growers will be able to:**

- Say what strategies are best to eliminate weeds spread by seed vs. those spread by root.
- Know the four primary stages of a weed's life-cycle.
- Compare the advantages and disadvantages of tilling for weed management.
- Name eight tools used for weed management.
- Choose what tools they want to use or try for the first time this season and explain why.

## **Optional in-the-field objectives:**

- Identify names of common weeds and weeds at different stages of growth in the field.
- Use weed management tools that might be unfamiliar.

**WHO: Refugee farmers and growers**

**LANGUAGE / LITERACY: Appropriate for all levels with interpreter**

**FARMING EXPERIENCE: One season growing in US**

This lesson is best suited for farmers that have at least one season growing in the US, but can be used with all farming levels.

**REGION / CLIMATE: Any region**

Appropriate for any region. Weeds in the PowerPoint can be changed to reflect the weeds most common in your region.

**SEASON: Any time**

Can be done any time, but if adding outdoor activities this lesson should be taught when fields are active.

# Resources needed

Adaptable except where noted.

**TIME:** One hour in classroom, followed up with activities in the field

**STAFF / INTERPRETERS:** One staff member and one interpreter

**LOCATION:** Classroom with outdoor follow up

Classroom session, ideally followed up by outdoor session, though either could stand on its own.

**SUPPLIES:** For classroom session:

- PowerPoint showing weed life cycles, tilling and hardpan
- Flashcards of weed management tools and strategies
- Reflection sheet

**For field session:**

- Tools to demonstrate and try:
  - Wheel hoe
  - Scythe
  - Weed wacker
  - Weed burner
  - Black plastic mulch
  - Cardboard and compost for sheet mulch
- Ideally, a field with various sized weeds

## Managing weeds



FLAME WEEDER



DRIP TAPE



Which weed management tools would you like to try? Share your plan.



WEED MANAGEMENT POWERPOINT

FLASHCARDS

REFLECTION SHEET

# Weeds Overview

1

**TIME:** 15 Minutes

## OVERVIEW:

The major concepts introduced here are why it is important to manage weeds, how to treat weeds differently depending on whether they are seed or root spreaders, and why it is important to know about the life cycle of a weed.

## MATERIALS NEEDED:

- PowerPoint presentation

## OBJECTIVES / LEARNING:

By the end of this activity, participants can:

- Say what strategies are best to eliminate weeds spread by seed vs. those spread by root.
- Know the four primary stages of a weed life cycle.

### SLIDE 1: TITLE PAGE

### SLIDE 2: HOW DO YOU MANAGE WEEDS?



- a. Open discussion on how participants manage weeds now. Most of the farmers have some good practices already.
- b. To manage the discussion, ask each farmer to say one way they take care of weeds in their field right now.

#### TEACHING TIP:

One reviewer mentioned that they might add a discussion up front about why weed management is so important in relation to 1) addressing pest and water issues, and 2) greater profitability and yields.

### SLIDE 3: WEED LIFE CYCLE



- a. Important points on this are that if weeds go through their entire life cycle, weed seeds end up in your garden and can stay in your soil for a long time..
- b. **Ask:** When should you take care of weeds? At what point in the life cycle?

## SLIDE 4: WEEDS CAN REPRODUCE BY SEEDS OR ROOTS



If you know which kind of weed you have, you can determine the right strategies to eliminate it.

### DEVELOPER'S NOTE:

These are weeds that we frequently see in our fields. You may want to change them to weeds that are prevalent in your area.

## SLIDE 5-6: CANADIAN THISTLE AND THISTLE ROOTS

Canadian thistle is a weed that reproduces both ways and is prevalent at Global Gardens in Boise, ID. (Replace with a weed from your area.)

### VARIATION:

One reviewer said that they adapted this to reflect “some of the tools and methods used/permissible on our farm. Additionally, we would change the weeds in the PowerPoint to highlight our problem weeds.”

## SLIDE 7: STRATEGIES FOR ROOTS VS. SEED WEEDS



The slide lists helpful strategies for dealing with root vs. seed weeds. Farmers with more beginning levels of English could benefit from having a physical motion associated with each action below. This is a fun way to teach vocabulary, using kinesthetic learning styles, and have an easy way for farmers to demonstrate their learning.

### For SEEDS:

- Kill before seeds
- Cut
- Burn flowers
- Throw away
- Pull out by roots
- Don't water

### For ROOTS:

- Pull out by roots
- Smother
- Till
- Don't water

### VARIATION:

One reviewer mentioned that they would add a discussion on disposal of weeds since: “We have a huge Bermuda grass issue and our farmers are still learning to throw away certain green materials vs. composting.”

## WRAP UP: REFLECT AND ASSESS



Show farmers pictures of the two weed examples you showed to illustrate seed and root spreading. Ask them which strategies they would use. If they have used the words for the different methods, they could use the words or point to the words. However, if they are using motions, they could show you the motion for “don't water,” or “pull out by roots,” etc.

# Tilling: Pros & Cons

2

**TIME:** 15 Minutes

**OVERVIEW:**

In this activity, farmers will learn about some advantages and disadvantages of tilling with an explanation of hardpan and choosing the right tiller for the job.

**MATERIALS NEEDED:**

- PowerPoint presentation

**OBJECTIVES / LEARNING:**

By the end of this activity, participants can:

- Compare the advantages and disadvantages of tilling for weed management.

**SLIDE 8: WEEDING WITH A TILLER**



Many of our farmers at Global Gardens like to weed by tilling between rows. Advantages and disadvantages of this method are shown on this slide. This is a photo of preparing soil for planting, which is an important difference to note.

**SLIDE 9: TILLER SIZE**



Small tillers are for weeding, larger ones are for soil prep. When farmers use larger ones to weed, it causes even more hardpan.

**SLIDE 10: HOW DOES TOO MUCH TILLING DAMAGE THE SOIL?**

**SLIDE 11: VIEW OF HEALTHY SOIL**

- This slide shows an underground view of healthy soil. This example is of several types of cover crop roots.
- Note that roots are many different shapes and sizes and do not have difficulty penetrating the soil. There are also worms, root nodes, and microorganisms present in the soil which benefit plant roots in various ways.

**SLIDE 12: HEALTHY SOIL PHOTOS WITH WORMS AND ROOTS**

If you till too close to this plant when it's in the ground, root structure will be interrupted.

### SLIDE 13: VIEW FROM ABOVE GROUND WHEN YOU TILL

### SLIDE 14: VIEW BELOW GROUND

The tiller mechanism constantly scrapes and compacts the same plane under the soil and causes the hardpan. Above the hardpan line, you see soft, tilled soil, but below that line is a hard surface that is difficult for plant roots and water to penetrate.

### SLIDE 15: PHOTO OF A TWO-LAYER HARDPAN AND PLANT ROOTS THAT CAN'T PENETRATE SOIL VERY FAR

### SLIDE 16: TILLING INTERRUPTS SOIL STRUCTURE

Soil is made up of structures called aggregates, which are basically balls of minerals, microorganisms, plant debris, and organic matter - all the things that make up soil. Tilling interrupts these structures.

#### TEACHING TIP:

If you want to change the vocabulary, you could substitute the term “cultivation” for small tiller and “tilling” for land preparation.

### SLIDE 17: GOOD SOIL STRUCTURE

Here's some soil that has good soil structure and looks healthy.

### SLIDE 18: POOR SOIL STRUCTURE

This soil looks unhealthy. It's compacted and cracked by watering. Reasons can be too much tilling, overwatering, exposure to elements like wind and rain without enough plant cover, and not enough organic matter in the soil.

### WRAP UP: ASSESS AND REFLECT



- a. **Ask:** Look at the two pictures. What soil is healthy, what soil is not healthy? Why do you think that is?
- b. **Ask:** Will you use a tiller this coming year? When will you use it?
- c. Remind farmers that you will be talking about alternatives next, if they don't know what methods they would use instead of tilling.

#### TEACHING TIP:

Reviewers suggested adding in some discussion questions such as ‘how did you manage weeds when farming in your country?’ or, ‘did you ever experience hardpan farming back home?’

# Weed Management Tools

3

**TIME:** 25 Minutes

## OVERVIEW:

In this activity, farmers will learn the different tools and approaches to weed management through pictures, and then will choose what methods and tools they want to use this coming season and why.

## MATERIALS NEEDED:

- PowerPoint presentation
- Reflection sheet
- Pictures of the different tools

## OBJECTIVES / LEARNING:

By the end of this activity, participants can:

- Name eight tools used for weed management.
- Choose what tool they want to use this season and explain why.

## VOCABULARY

Flame weeder    Wheel hoe  
Weed whacker    Scythe  
Drip irrigation    Black plastic  
Spacing    Solarization (or white plastic)  
Sheet mulching



## SLIDE 19: ADDING DIFFERENT WEEDING STRATEGIES REDUCES HARDPAN AND MAINTAINS GOOD SOIL STRUCTURE

### VARIATION:

One reviewer suggested the idea of "opening the tool section of a *Johnny's* catalog (or whatever farmers are familiar with) and talk about how each tool accomplishes each of the weed disruption techniques identified."

## SLIDE 20: WEED WHACKER AND SCYTHE



The weed whacker and scythe do the same job of cutting tall weeds off at the root. The weed whacker uses fuel to do this while the scythe just uses the motion of our bodies. These are good for maintaining field edges, sprinkler lines, and pathways where weeds are sometimes neglected and go to seed.

## SLIDE 21: WHEEL HOE

A wheel hoe is an alternative to tilling between the rows. Must be used when weeds are small. It scrapes weeds off the surface using a back and forth motion, but doesn't dig very far enough into the soil to make hardpan.

## **SLIDE 22: WHEEL HOE VIDEO**

Watch the wheel hoe video at YouTube: [https://youtu.be/wp4hvcT9d\\_c](https://youtu.be/wp4hvcT9d_c)

## **SLIDE 23: WEED FLAMER**

- a. A flamer attaches to a propane tank and uses heat to kill weeds. Many organic farmers like to use this on direct seeded beds for slow emerging seeds like carrot.
- b. For example, if carrots take two weeks to germinate, you'd till and plant the bed in Week 1, flame any emerging weeds in Week 2, and the carrots would emerge in Week 3 into a bed with less weed competition.

### **DEVELOPER'S NOTE:**

We've also successfully used this to burn flowers off areas with a lot of goatheads, which tend to be prominent in non-production areas of our farm, like around the sheds and greenhouses. This method is faster than pulling all the weeds and keeps them from making seeds for the next year.

## **SLIDE 24: BLACK PLASTIC**

- a. Black plastic mulch is put down and the plants go into holes you cut.
- b. Normally used for transplanted hot crops like tomatoes or peppers. Weeds don't emerge through black plastic, and additional soil heat can help hot crops in a northern climate. Usually used with drip tape, as it can be hard to water using sprinklers.

## **SLIDE 25: DRIP IRRIGATION**

By putting water only where we want our plants to grow, pathways, etc. can stay dry and fewer weeds will grow where we don't want them.

### **DEVELOPER'S NOTE:**

Farmers in our program tend not to prefer using drip irrigation, as the initial costs can be higher and can be more work to maintain than sprinklers.

## **SLIDE 26: PLANT SPACING**

The peppers shown are spaced to need two weeding sessions before the plants will touch each other and shade out any weed competition.

## **SLIDE 27: SHEET MULCH**

- a. Sheet mulch is cardboard covered with any kind of organic material like leaves, straw, manure, or compost. Start this process in fall to kill all weeds in an area.

- b. In the spring, nothing will come up under the cardboard and you can dig through or plant directly into the mulch surface. Mulch would act like a fertilizer and you don't need to remove it. Good for an infestation of a root-propagating weed like thistle or bindweed/morning glory, or for killing grass to start a garden.

### SLIDE 28: WHITE PLASTIC

- a. Solarization works by heating the soil to such a temperature that weeds, weed seed, and roots are killed.
- b. White plastic also kills beneficial bacteria and basically sterilizes the soil if done right, so be careful. Use clear plastic and lay as flat as possible on damp soil. Use during the hottest part of the summer and leave on for 1-2 months. Good for infestations of hard to kill, root-propagating weeds.

### SLIDE 29: FLASHCARDS AND WORKSHEET



- a. You can use the flashcards to make sure farmers are familiar with all the different tools and methods just mentioned.
- b. Hand out the Reflection Worksheet, which shows all the techniques gone over in the PowerPoint. This can be printed and given to each farmer. Ask them to think about the weed issues they need to address and tools or methods they are interested in trying.
  - Tell farmers to circle the tools and methods they would like to try and ask them to explain their weed management plan to the group. This also helps staff know which materials to get for the field session.

#### VARIATION:

Reviewers mentioned how they could adapt some of the teaching points and materials for a larger or smaller scale. For example, one reviewer said that all initial prep on their farm is done with a tractor, and maintenance is done by farmers. Another reviewer said that their space is too small for machines. Tilling examples can be easily modified to fit with our setting/tools.

# In-Field Follow Up

Optional Activity

4

**TIME:** 1 hour

## **OVERVIEW:**

Farmers will practice tools and techniques reviewed in classroom presentation. Farmers will identify weeds at different growth stages.

## **MATERIALS NEEDED:**

- Printout of weed life cycle
- Weed ID book or online resources
- Weeding tools you plan to teach
- 4 or 5 staff and possibly interpreters, if needed by your farmers

## **OBJECTIVES / LEARNING:**

By the end of this activity, participants can:

- Farmers will identify names of common weeds and weeds at different stages of growth
- Farmers will gain hands-on practice with weed management tools that might be unfamiliar



## **STEP 1: ORGANIZE INTO FIVE GROUPS**

Break farmers into five groups that will switch stations throughout the training.

## **STATION 1: IDENTIFY WEEDS AND STAGES OF GROWTH**

The facilitator will ask farmers to find some weeds. Ask whether they know the name of the weed, and if not, try to identify it. Ask if they know whether it reproduces primarily through seeds or roots. Look at the weed life cycle picture to determine what stage of growth the weed is in. Do this for several weeds. Also, look for weed seeds that have not yet sprouted.

## **STATION 2: PRACTICE WITH TOOLS THAT CUT DOWN TALL WEEDS**

The facilitator will demonstrate proper use of the weed whacker and scythe. Facilitator will need to know how to operate the weed whacker that the program owns. Important points to touch on are that they usually use a special fuel mix, how to turn it on, and safety procedures such as using closed-toed shoes. The scythe must be very sharp to be effective, so consider demonstrating how to sharpen it. Participants could race, with one person cutting weeds with a whacker and the other cutting the same length section with a scythe.

### **STATION 3: PRACTICE WITH A WHEEL HOE**

Facilitator will demonstrate use and farmers will practice, ideally killing small weeds between rows. Important points are that weeds must be small and you must use a back and forth motion. Specifics may depend on what kind of wheel hoe the program has.

### **STATION 4: PRACTICE WITH FLAME WEEDER**

Facilitator will demonstrate use and farmers will practice. Important points are how to light it and turn it off safely, leaving propane tank closed. Wear pants and closed-toed shoes.

### **STATION 5: PRACTICE WITH MULCHES**

- a. Facilitator will guide farmers in setting up a sample area of any of the following: black plastic mulch, sheet mulching, and/or solarization (white plastic). Unroll plastic or cardboard and secure to the ground. For the black plastic, drip tape can either go underneath, or review with farmers how to make a large enough hole for watering to occur. Review which kinds of crops are best suited to black plastic.
- b. **Optional:** The sheet mulch and solarization (white plastic) are only for certain kinds of weed infestation and involve taking land out of production, so might not be as applicable to all programs.