

# Home Garden Toolbox



World Vegetable Center



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## Encouraging Peer-to-Peer Learning through Gardening Support Groups

## FACILITATOR'S GUIDE:

# Encouraging Learning through Participant Engagement

*Adapted from USAID's "Permagarden Adult Learning Training Resources"*

TOPS/ Mercy Corps: Permagarden Adult Education Training Resources (2017) | [Source](#)



# Key aspects of a participatory training

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## What is a participatory training?

A participatory training requires gardeners to work together with a facilitator towards a learning goal. Rather than a traditional lecture, where a teacher stands in front and presents new information, a participatory training constantly requires input from the participants themselves. As such, gardeners are asked to share their own knowledge, ask questions, and have frequent discussions about why certain things happen and what can be done about it.

## Creating a “safe” and respectful learning environment

In order for participants to feel safe, it is important to establish a good learning environment from the very beginning. All participants need to feel safe and respected during the training to encourage their learning. Respectful dialogue is the most effective way to encourage learning. Dialogue helps participants make sense of new information by allowing them to weave it together with their previous experiences, information they have heard from others, and open questions they have. Taking time at the beginning of the training to establish a safe, trusted environment can make a huge difference in participants’ ability to learn.



### SUGGESTIONS:

- Start a training with introductions and allow participants to share something about themselves and why they have come to the training so that participants get to know each other.
- Allow participants to share expectations and fears about the training.
- Create a group agreement for the training (“we listen when others speak” as an example).
- Conduct an “ice breaker” at the beginning of the training and at the start of each new session. Some examples of ice breakers are provided in the appendix.
- Be aware of power dynamics in the group. Allow quiet participants to also be heard.
- Make it clear at the beginning of the training that dialogue is expected and welcomed.

## Considering gender dynamics during a participatory training

- Women may be less inclined to speak up in the presence of men. If this is the case, then it may be necessary to organize separate sessions for men and women.
- Women may feel more at ease if the facilitator is also a woman. Since home garden programs usually target women, consider using mostly women facilitators.
- Women and men may have different literacy levels, so women may not be able to fully participate when the facilitator uses flipcharts or other tools with written text. Design your trainings so that it is appropriate for the lowest—not the average—level of literacy that you expect within the group.
- Women’s time is often less flexible than men’s time as many women have responsibilities within their households, such as meal preparation, cleaning, and childcare, in addition to paid work and community responsibilities. Carefully consider this when deciding on the time and length of the training session as lengthy training sessions may preclude women from participating or place undue stress on them. Short but frequent sessions are usually easier for busy participants than training events that occupy the whole day.
- Women may have less access to means of transportation than men and may need to walk to the training location. This is important to consider when choosing the training location as inconvenient or far locations may prevent women from attending.
- In some places, women may need the consent of their husband or another family member to attend the training and to set up or expand the home garden. It can be important to inform and sensitize the community to the project before the start of the training so that women participants feel supported and are encouraged to attend.
- In many societies, women have a limited voice in decision-making within their household or community and are not often asked to share their opinions. Participatory learning methods can initially be confusing, and potentially scary, if they are dramatically different than what women are used to. This requires the facilitator to be extra patient and understanding as women learn new methods of behaving.

# How adults learn

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In order to become a good facilitator, it is important to understand how adults learn. Unlike children, adults will arrive at a training with their own thoughts, opinions, previous experiences, and biases. It can work against a facilitator if you ignore these.

## **Adults learn best when the content of the training is relevant to their own lives.**

Adults must see how the content of the training is relevant to their own lives or they will easily disengage from the learning process. If the content is relevant and useful to their lives, adults tend to learn very quickly.

### **SUGGESTIONS:**

- Take time to understand what is important to participants. Make time during the first training for participants to share what they hope to learn and continuously check in with participants.
- Connect content with participants' daily lives and real needs by using stories and examples that apply to that context.
- Ask participants to relate content to their own lives when asking questions. For example, ask participants to share their experiences of composting or crop rotation and then discuss these as a group.
- Use local examples in your discussions. For instance, ask participants to name locally available materials and plants whenever possible.

## **Adults learn best when they can see an immediate value of the training to their own lives.**

If participants can see an immediate application of what they are learning, they will be more eager to try and implement it on their own.

### **SUGGESTIONS:**

- Start your trainings by asking participants to list clear and concrete benefits they will receive from the training in order to peak their interest early.
- Help participants find opportunities to immediately apply what they are learning.
- Ask them directly to describe when and where they will apply what they have learned.
- Break big changes down into smaller steps so participants do not feel overwhelmed.
- Discuss the challenges participants are facing and ask if any of the content in the course can be used to solve these problems.

## **Adults learn best when they feel safe and respected.**

Adults feel respected when they can safely voice their opinions without judgment and when their knowledge and experience are acknowledged as important.

### **SUGGESTIONS:**

- Provide a safe learning environment (see previous section).
- Consider gender dynamics within the group and how they might affect a participant's ability to feel safe and respected (see previous section).
- Encourage participants to share their own experience and knowledge, ask questions, and voice their concerns.
- Avoid activities and games that can be embarrassing for people.
- Use constructive and supportive feedback. Always show appreciation for participants' contributions and acknowledge them as important. NEVER respond to a participant's contribution by laughing at them or saying it is wrong.

## Adults learn best when they are fully engaged and included in the learning process.

Adults enjoy being engaged in the learning process rather than being treated as passive recipients of information. Adults highly value contributing to a problem-solving process, therefore trainings are much more effective if everyone is working together to solve a problem. It is important to recognize that adults come to trainings with existing knowledge and rich life experience that can be beneficial to everyone, including the facilitator.

### SUGGESTIONS:

- When introducing a new subject, start with asking participants what they know about the subject before explaining it. Consider how the training material may reinforce or disprove something participants already think so that you can better help participants reflect on the new material.
- Spend less time presenting information and more time engaging participants through discussions or practical, hands-on activities.
- Ask participants to relate what they are learning to their previous experiences.
- Guide conversations to ensure that louder voices are not dominating the training and quieter voices can be heard.
- Use work in pairs and small groups so that everyone is engaged, even quieter voices.

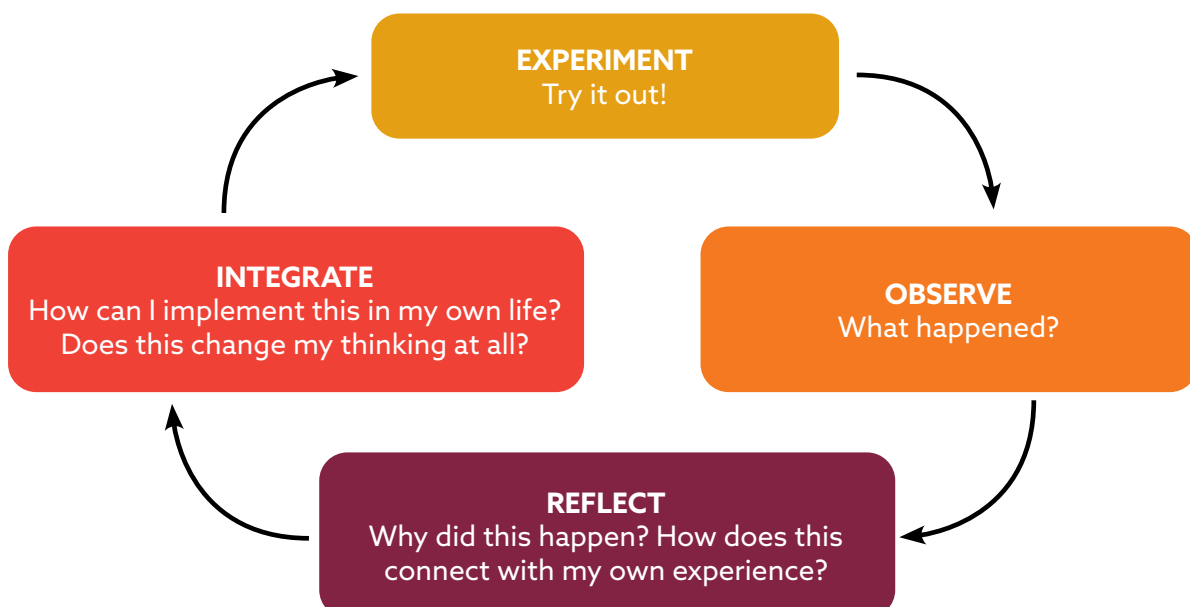
## Adults learn best when they can use experimentation to solve problems.

Adults learn best when they are encouraged to experiment in a safe setting and then reflect on the outcomes. This promotes an attitude of curiosity and desire to problem solve rather continuing to view problems as insurmountable or failure as inevitable. While experimenting, participants are also building their confidence to try new things. If adults do not think they will succeed when they try something new, they are much less likely to even try. Experimenting and problem-solving in a safe space can build this initial confidence.

### SUGGESTIONS:

- Incorporate experiments and hands-on activities into the training sessions and work out solutions as a group.
- Encourage creativity and debate when problem-solving.
- Create an environment where it is safe to 'fail' because 'failure' is an opportunity to learn.
- Have participants offer ideas and strategies for how to improve the techniques they are learning. Encourage participants to try their ideas at home and report back to the group.

### Experiential Learning Diagram



# Learning styles

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Just like there will be a diversity of personalities in any group, there will also be a diversity of 'learning styles' in any group. A learning style refers to the way a person prefers to learn. Some people are practical and learn best by doing. Some are visual learners who learn through observing facilitator presentations or seeing others learn. Some are auditory learners who learn through discussion. Many will prefer a combination of learning styles. Each training should incorporate a diversity of ways to learn so that all learning styles are included. Learning styles are also influenced by age and literacy for example.

Different learning styles can be summarized as:

**Learning by seeing:** Seeing pictures, diagrams, and illustrations.

**Learning by hearing:** Listening to presentations, lectures, other people discussing around them, and recordings.

**Learning by reading and writing:** Reading materials and writing notes.

**Learning by doing:** Being engaged in practical activities, observing activities taking place, and experimenting.

# Becoming a facilitator

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When talking about participatory trainings, the word 'facilitator' is used rather than 'trainer' or 'teacher.' This is because a participatory process requires someone to **facilitate the learning process**. A 'trainer' is someone who trains others in a new task or idea, but does not incorporate the perspectives of the trainees into the material. Even a 'teacher' is supposed to teach – but we have already seen that adults learn best if they feel that they are in charge! On the other hand, a facilitator models to participants **how to learn** through respectful dialogue, critical thinking, problem solving, and collaboration toward a common goal.

Becoming a good facilitator requires us to nurture the following skills and attitudes in ourselves:

## Be an active listener

- A good facilitator is a good listener. This means listening with curiosity and not judgement. By listening attentively, a facilitator can confirm that the training material is relevant and of immediate value to the participants (see adult education principles above). If facilitators are listening, they will also know if participants are confused, unconvinced, unmotivated, not confident, or overwhelmed by the information shared.
- One way of showing that a facilitator is actively listening is to repeat back to the participant what they asked, for example by stating, **"So what John here is saying is that his basil grows very well together with his tomatoes - am I right John?"** One way of making sure the whole group is actively listening is to ask another participant to state what they have heard another participant say but in their own words.

## Be comfortable with silence

- Questions are often met with silence while participants think. However, silence can also mean that something is not clear to participants. As a facilitator, it is important to allow time for participants to process questions, but it is also important for the facilitator to provide clarification when needed.

## **Stay focused on objectives while being flexible**

- It can be easy for discussions to go off topic in a participatory training that encourages discussion. As a facilitator, it is important to stay focused on the objectives of the session. Bring the conversation back to the topic of the session while encouraging participants' ideas by saying, *"This is really interesting to explore further another time but let's return to the topic of this session."*
- While it is important to stay focused on objectives, it is also important to be flexible. A facilitator can never know exactly how a training will go and may have to deal with unexpected situations. Sometimes a facilitator will need to shorten an activity or adapt a session so it is more appropriate for the participants and the context.
- It takes time for a facilitator to develop the skills needed to meet the training objectives while allowing for flexibility. It is helpful for a facilitator to recognize that they too will grow through this process.

## **Foster mutual respect among the participants and the facilitator**

- It is very difficult to learn in an environment where one does not feel safe and respected. It is important to give encouragement to participants either through verbal or non-verbal actions; even the facilitator nodding their head as a participant speaks can make a participant feel more comfortable. If a participant says something a facilitator disagrees with, a facilitator should consider why the participant might have this perspective before responding. A facilitator can either probe deeper to get more explanation or acknowledge that it is ok for people to have different opinions or ways of doing things.

## **Allow time for reflection**

- Providing time for reflection is a crucial part of learning (see experiential learning diagram). Create time for participants to reflect on what they have learned, how it reinforces or challenges what they thought before, and how they will apply this new thinking in their daily lives.

## **Use questions**

- Ask questions that encourage participants to share more than just 'yes' or 'no' and connect what they are learning with their own lives or with previous sessions to help participants "layer" new information onto existing information. It is helpful to ask questions in a variety of different ways. (See Tips on How to Use Questioning)

## **Use a flipchart or board to reinforce concepts**

- Visuals or illustrations can reinforce concepts for participants and helps summarize complex discussions. (See Tips on How to Visually Present Information)

## **Incorporate practical activities that allow participants to build confidence**

- Practical activities allow participants to learn by doing and build confidence as they go.
- Start by demonstrating a task yourself, explaining what you are doing as you do it, before engaging participants.
- Small scale modelling of techniques is a useful tool to demonstrate practical activities before starting the work. It can help participants understand what the finished product will look like and therefore better understand what they are doing.
- Split participants up into smaller groups to work on different tasks so everyone is engaged.



## Tips on How to Use Questioning

**OPEN QUESTIONS:** These questions often start with 'who' 'what' 'why' or 'when.' These questions allow participants to think and share their thoughts around a specific topic. Open questions are useful to check if participants have understood because you hear a participant explain something in their own words.

FOR EXAMPLE: *"Why is mulching important for soil health?"*

**CLOSED QUESTIONS:** These questions are answered with either a 'yes' or 'no.' Closed questions are useful only if you want to check a fact or get a short answer, but they are not useful for learning or checking if participants have understood content. A closed question can be useful as a way to get participants on the same page.

FOR EXAMPLE: *"Does anyone know of the plant Tithonia?"* If someone then says yes, then this can be followed by the open question, *"Can you explain how this plant can be useful for our gardens?"*

**REFLECTIVE QUESTIONS:** These questions help people reflect on what was just discussed by allowing them to recap material. This gives participants a chance to learn from each other and solidify new concepts.

FOR EXAMPLE: *"How could you apply this technique in your own garden?"*

**PICK-UP QUESTIONS:** These questions help you return to a previous point or session. These can help participants make linkages between the different modules.

FOR EXAMPLE: *"Recall how in our Garden Establishment session we looked at the benefits of taking time to plan what we plant and where. What do you think are the benefits of this planning now that we are learning about Crop Rotation?"*

**DIRECT QUESTIONS:** These questions are directed to a specific participant who has knowledge in a certain subject. It can also be a way to get a participant's attention.

FOR EXAMPLE: *"Janet, you have a compost pit in your garden, can you explain why we start with putting these sticks at the bottom?"*

## Tips on How to Visually Present Information

Some tips on how to write on a flipchart or board most effectively:

- Prepare what you will write in advance. If using a flipchart, you can write out the training agenda or the title of the different sessions at the top of the page in advance.
- Write in big, print letters (not cursive) and use different colors (darker colors are easier to see on a flipchart).
- Stand by the side of the flipchart and look directly at participants when discussing. Only turn towards the flipchart when writing. In order to reinforce what has been written, read it out loud once you have turned to face the participants.
- Use illustrations, drawings, tables, and graphs to illustrate concepts.
- In some cases there may not be funding for flipcharts or no flipcharts available – this is OK! A training can also be done easily with dialogue and demonstrations modelled or written on the ground using sticks and stones.

# Working with groups

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## Working with smaller groups

Working in smaller groups helps increase engagement in the training, builds relationships among the participants, and helps prevent trainings from becoming too top-down. Use a variety of group break-out methods to make the training more interesting and keep participants engaged.

**PAIR WORK:** Participants have discussions in groups of two or three. Pair work allows quieter voices to be heard and is a great way to build relationships within the group.

**BUZZ GROUPS:** Buzz groups are a great way to get everyone engaged quickly and can act as an energizer for the group. Buzz groups are small groups discussing a specific question for a short amount of time only (approximately five minutes). If a facilitator intends to use buzz groups frequently, they should consider how the seating should be set up to facilitate this.

**SMALL GROUPS:** Breaking participants up into small discussion groups of four to six participants is a great way to ensure that everyone is engaged. Try to make groups diverse and rotate participants between groups every once in a while. A simple way to split participants up into small groups is to conduct a count. For example, if you want to split the participants up into four groups, have participants count "one, two, three, four," assigning a number to each participant as you move around the group. Repeat the count until all participants are assigned a "one," "two," "three," or "four." Make sure to give clear instructions for the group work before the groups form.

## Dealing with difficult group dynamics

Many groups work well together for the duration of the training. However, sometimes facilitators are confronted with participants with challenging behavior that can disrupt the group. Here are some suggestions to deal with this:

**Read the group.** Often the facilitator can tell early on if someone might become disruptive. Be aware of group dynamics early so you can mitigate conflicts using some of the strategies below.

**Let the group work it out.** Participants are often able to work out disagreements among themselves and there is no need for you to get involved. Avoid getting yourself caught in a tricky situation where you may be forced to choose sides for or against any participant or group of participants.

**Introduce group agreements.** Have a discussion on what makes a safe learning environment for all participants and revisit it if necessary. This allows all participants to voice their needs and concerns and can diffuse the situation.

**Do not take it personally.** If a participant is being negative about the training, it is important as a facilitator to listen but not take it personally. The issue is often not about the facilitator but about something else.

**Use the break to discuss issues.** If a participant is challenging during the training, offer to have a private discussion in the break time to understand what is going on. Remember not to take it personally!

**Use energizers and ice-breakers.** Games help build trust and can sometimes also help change the group's energy.

**Allow complaining.** It is important for participants to be able to raise concerns but do not let it drag on. Facilitators can allow individuals to voice a concern and then move on to looking for positive solutions.

**Be flexible.** Be prepared to change the plan if it seems obvious that your plan is not working.

**Introduce a tool to deal with issues.** For example, place a flipchart on the wall where participants can write down their concerns and then dedicate some time during the session to work through those concerns as a group.

# APPENDIX

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## Ideas for ice breakers, group formation, energizers, and recap/review sessions

### Getting to know each other:

**Circle introduction.** Participants stand in a circle. Each participant says their name and the name of the participant before them. The last person has to say all the names. This exercise is also fun to do with a simple clapping rhythm at the same time.

**Anna the Ape.** Participants stand in a circle. Each participant introduces themselves, saying their name plus the name of an animal starting with the same letter. For example, "Anna the Ape, Eric the Elephant, Fernanda the Frog."

**Who are you?** Like the Anna the Ape game above but instead of an animal name, participants add an adjective to describe themselves. The adjective does not have to describe them correctly and creativity is encouraged! For example, "Affable Anna, Excited Eric, Fabulous Fernanda."

**Ball game.** Participants stand in a circle and the facilitator introduces a ball. The person holding the ball must say the name of the person they are throwing it to. Allow the ball to be thrown around at random but make sure that it has been passed to everyone at least once. If you want to make it more fun, you can introduce more balls but only once there has been a round where everyone has said their name.

**Rank in line.** Ask participants to line up according to a ranking criterion, for example, height. If you want to make it more involved, use a ranking criterion that will make sure participants engage in more of a discussion such as 'years having been a gardener.'

**Stand up if you...** The facilitator prepares a set of statements and asks participants to stand up quickly if the statement applies to them. For example "Stand up if you have children. Stand up if you like sweets. Stand up if you like to grow chili peppers."

**Sharing songs.** A nice way to start the day is for the facilitators to ask if a participant has a song to share. Often, they will sing a song that everyone knows and can sing along.

### Methods for splitting into groups:

**Random formation.** Ask participants to form groups of four as quickly as possible.

**Fruit teams.** Count participants into teams using fruits instead of numbers.

**Pick an item.** During break time, facilitator picks a different mix of leaves, sticks, stones, or other commonly available items and puts them in a pile. Make sure to have enough for each participant and the quantity of each type of item to match the size of the preferred group. For example, if the facilitator is splitting participants into groups of four, then the facilitator will want four leaves, four stones, four sticks. Tell participants to grab an item from the pile and then find other participants with the same type of item.

## Wake up and energize:

**Are we together?** This is a quick exercise that can be used whenever the facilitator senses that participants may be drifting off. The facilitator instructs participants in the beginning of the training to respond to the call 'Are we together' with 'Yes, we are together' and to throw their hands up in the air while doing so.

**Spell words with your body.** Stand in a circle and ask participants to spell a word like 'coconut' with their bodies by first forming a 'C' with their body, then an 'O,' and so on.

**Follow the leader.** Participants stand in a circle. Facilitator steps into the middle of the circle and makes a movement and then asks participants to copy. Facilitator then steps out and asks another participant to offer another movement.

**Spot the leader.** One person leaves the room or goes somewhere where they cannot see or hear the group. The group assigns someone to be the 'leader' and then the person outside is called back. The leader then makes different movements and the group copies and the person coming in must guess who the leader is.

**Thunderstorm.** Stand in a circle. The facilitator guides participants to start rubbing their hands together vigorously. Walk around the inside of the circle and indicate that, as you pass, participants should change what they are doing to what you are doing. Complete one round within the circle rubbing your hands together, then change to snapping your fingers. Participants will also start to snap their fingers as you pass them. Complete one or two circles, then start slowly clapping. Complete another round or two within the circle and then increase the speed of your clapping. Eventually start clapping and stamping your feet until everyone in the group is going as fast as they can. Either end abruptly by throwing up your hands in the air and saying 'lightning' all at the same time, or end slowly by reversing the movements until everyone is again rubbing their hands together slowly.

**Sun stretch.** The facilitator asks participants to stand up and identify where the sun rises and where it sets. Ask participants to stretch their arms up, clasping their hands together with their index fingers pointing straight up. Point first towards where the sun rises and then trace towards where the sun sets, asking participants to stretch as high up as they possibly can.

**Yoga stretches.** Ask participants to stand up and take a deep breath in while stretching their arms above their heads. Breathe out while flying your arms down to your legs and bringing your head as close to your knees as possible. Breathe in again and raise your back just until it is straight and forming a right angle with your body. Breathe all the air out of your lungs and again lower your head until it is close to your knees. Slowly roll your spine up until you are again standing straight. Have participants hold their arms straight out and make small circles and then big circles, first forward and then backwards. Challenge participants to balance on one leg, and the other. For an additional challenge, have participants try to balance while first holding their arms in a 'Y' shape above their heads and then by closing their eyes at the same time.

## Recap and review:

**Throw the ball.** Participants stand in a circle. Facilitator throws a ball to one participant and asks them to share a lesson or key thought from the session. Once the participant has shared, the facilitator asks them to throw the ball to someone else.

**What inspired you?** The facilitator asks participants to say something that inspired them from the session and how they will use it in their own lives. The facilitator should keep it short and make sure to take input from a several participants, switching who is asked lesson to lesson.

**Paper on the floor.** Participants write a key message or key point they have learned during the session on a piece of paper and then place it on the floor. Each participant then picks a different card and reads it out loud to the others.

**Bus stop.** Participants are split into groups. Each group stands in a different place or corner and is assigned a different topic from the session to discuss. They take two minutes noting the key lessons from the topic and then move on to the next 'stop.' This continues until all groups have visited all 'stops.'

# Identifying Resources

*Identifying resources necessary to achieve a home gardener's goals*



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will be able to critically evaluate the resources available to them and how these resources can help them achieve their gardening goals.

## DURATION



## MATERIALS NEEDED

- A shaded discussion area close to where gardeners can conduct a group walk to identify resources around their community
- Flipchart and markers
- Pencils and notebooks for all gardeners



## KEY CONCEPTS

**Let's start talking about the resources gardeners already have rather than what they lack!**



### NATURAL

Soil, chicken manure, plants and seeds, water sources, air, light



### PHYSICAL

Tools and buildings



### HUMAN

Labor, knowledge, technical capacity



### SOCIAL

Support from family and community, labor sharing



### FINANCIAL

Money, bartering, work-trades

- Gardeners have untapped resources all around them. Let's help them identify new ways of using these resources.
- We find that there is immense wealth around us when we go around our community and think about new ways to use the resources available to us.
- When gardeners share their knowledge about local resources, it helps them build confidence in their own knowledge and ability and allows them to learn from each other.

## TRAINING AGENDA

1	Introduction and warm-up	DISCUSSION	10 min
2	Setting our gardening goals	DISCUSSION	30 min
3	How to build our ideal garden	DISCUSSION	1 hour
4	Identifying the resources around us	PRACTICAL ACTIVITY	1.5 hour
5	Closing discussion	DISCUSSION	10 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. Setting our gardening goals

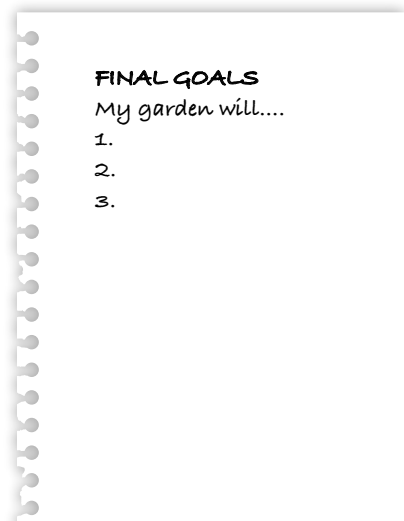
## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners envision their future gardens and identify their garden goals.

### MATERIALS NEEDED:

- Flipchart and markers
- Pencils and notebooks for all gardeners

1. Engage gardeners in a visioning exercise of what their ideal garden would look like. Start by asking them to think in their heads or write in their notebooks what their garden goals are: "My garden goals are..."
2. Ask gardeners to share these goals and discuss some of the following questions as a group:
  - What are some examples of successful gardens they have seen and why were they successful?
  - Will their gardens look different after several seasons of gardening? Better? Worse? Why is this important?
  - Is it possible for their garden to serve multiple purposes? How will they make sure their gardens best serve them and their households?
3. Ask gardeners to review the garden goals that were mentioned during the discussion. List these goals on your flipchart for all to see.
4. Ask gardeners to revisit the original goals they thought about or wrote in their notebooks and revise them as necessary.



## 3. How to build our ideal garden

### INTERACTIVE DISCUSSION

**GOAL OF ACTIVITY:** Gardeners identify the different resources needed to build a successful garden.

**FACILITATOR PREPARATION:** A flipchart divided into five columns

**MATERIALS NEEDED:** Flipchart and markers

1. Engage gardeners in a discussion around the resources needed to build a successful garden:
  - What do we mean by 'resource'?
  - What are some local examples of resources?
  - What resources do we need to build a successful garden?
2. As gardeners name resources, write them in the different columns so they are grouped into the 5 Resources categories. When they have finished, write the name of the category at the top of each column and explain the concept of the 5 Resources.
3. Ask gardeners if they can think of any additional resources that can be added to the list.
4. Discuss which resources can be found locally.

### 5 RESOURCES BACKGROUND INFORMATION

It is easy to get discouraged if we think we are not capable of achieving success or achieving good results from our actions. If we focus our energy on finding deficits in our current situation, we will most likely find them. We start thinking it will be too difficult to change our current situation, so we end up not trying or not trying very hard. But if we change our mindset and instead focus on finding new resources or strengths that we can apply to our situation, we will find that little changes over time end up helping us achieve our goals. Building a positive mindset is especially important for gardeners who may have experimented with gardening in the past and gotten discouraged when they had poor yields, suffered from pest infestations, or been asked to grow something by a well-meaning extension agent or NGO that they did not know how to use when it came time to harvest. These gardeners will be skeptical that they should try any new practices that YOU introduce to them!

To encourage gardeners to build a garden that best suits them and their household's needs, we will help them think about how they can use the resources that are already all around them - rather than asking them to invest time and money into a garden that is not right for them. When we think about resources as belonging to one of five categories, we see that many helpful things already exist around us. The five categories of resources are: Natural, Physical, Human, Social, and Financial. Resources can be owned by individuals or households - or they can be collectively owned or available to the entire community. For example, a wheelbarrow (Physical resource) may be individually owned, but a nearby forest (Natural resource) may be owned or used by the entire community or surrounding communities. Sometimes, a resource can fall into two categories, such as a stream that is used by many community members for irrigation water. The stream is a Natural resource for a gardener who wishes to use it to water their garden, but it may also takes Social resources for that gardener to have the rights or social status to access the stream if not all community members have equal access to this water. We might also see that increasing one resource leads to an increase in another resource, such as when we sell livestock (Natural resource) to gain money (Financial resource). The opposite may also be true, for example if we invest money in our garden (Financial resource) but we do not see good yields (lower Natural resources). Our goal is to build our stock of resources in all categories so that we have a rich toolkit to draw from when we embark on a new project, such as growing a garden.



# Examples of 5 Resources



## 1. NATURAL

Natural resources are the natural elements around us that we must nurture so we can use them to better our situation.

*Soil, forests, land, water, plant and animal diversity, locally-available fencing materials*

## 2. HUMAN

Human resources are the capabilities possessed by us and our community.

*Our knowledge and skills, our good health and nutrition, the skills and health of our family or community members*

## 3. SOCIAL

Social resources are our connections to other people, our membership in groups, and our ability to barter and benefit from the people around us.

*Religious groups, savings groups, community groups, collective land clearing or transporting vegetables to market, good relationships within our community*

## 4. PHYSICAL

Physical resources are the infrastructure or things around us that help us achieve our goals.

*Tools, equipment, machinery, buildings, other built resources*

## 5. FINANCIAL

Financial resources are the money or wealth you have.

*Cash, savings, credit, assets available for selling*



# 4. Identifying the resources around us

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners are encouraged to become observers of their own environment, identifying the richness of resources that they have around them that can help them meet their garden goals.

**STEP 1.** Organize gardeners to go on a group walk to identify natural resources in their local area that are useful for home gardens. Many of these resources are freely available, for example, animal manures, plants that can be used for mulching, or ashes from cooking fires. **Ask gardeners to each pick up at least one resource on their walk to bring back with them.**

**STEP 2.** After the walk, gather gardeners in a circle and ask them to show their resource to the group. They should **explain what their resource is and what it is used for.** Encourage gardeners to explain how the resource will help their garden.

**STEP 3.** At the end, ask gardeners to think about how the resources they saw will further their gardening goals. Ask gardeners, **“what new resources did you see that you are excited about? How will you use this resource to further your gardening goals?”** Have as many gardeners share their thoughts as possible.



Photos by Elin Duby

# 5. Closing discussion

Ask gardeners to share with the group:

1. Something they learned in the session
2. How they are going to use this in their own homestead

# Site Evaluation

*Evaluating your landscape and selecting a garden site*



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will be able to assess their landscape and climate and understand how to most efficiently grow food in this environment.

## DURATION



## MATERIALS NEEDED

- A shaded area for gathering together to discuss







## KEY CONCEPTS

**Plants, just like people, have some basic needs that need to be taken care of in order for them to thrive.**



- They need water, nutrients, air, light, and protection from damage.
- The basic needs of plants tell us the key criteria for selecting a good site for our home garden. We need a site with good soil, easy access to water and nutrients, enough sunshine and with protection from animals, strong winds, and rain.
- By carefully considering these criteria and observing our land, we can select a good site for our home garden. This will allow plants to thrive while we spend as little energy as possible maintaining them.

## TRAINING AGENDA

1	Introduction	 DISCUSSION	10 min
2	Basic needs of plants	 DISCUSSION	30 min
3	Identify the best site for a home garden	 PRACTICAL ACTIVITY	1 hour
4	Closing discussion	 DISCUSSION	10 min

## FACILITATOR NOTES

Encourage gardeners to engage and discuss as much as possible. They are the ones with the local knowledge of the landscape so their input is essential.

# 1. Introduction and warm-up

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Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. Basic needs of plants

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners learn that plants, just like people, have basic needs that need to be taken care of in order for them to thrive. Gardeners can successfully select a site for their gardens by thinking first about these basic needs and how to satisfy them.

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1. Engage gardeners in an interactive discussion around:

- The basic needs of plants
- How these needs compare with the needs of humans
- What these needs tell us about the key criteria for selecting a site for a home garden

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## KEY MESSAGES

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Plants have very similar needs as humans and livestock. They all need adequate water, food, air, protection, and care to thrive.

We can ensure that our gardens are set up for success by taking care where we place our gardens.

Given these basic needs, the key criteria for selecting our garden sites should be spaces that provide:

- **Accessibility to all household members** for easy maintenance and harvesting
- **Good quality soil** that is free of stones
- Easy **access to water**
- Easy **access to nutrients** – can a compost be placed near?  
How else will nutrients enter the garden soil?
- At least **five hours of direct sunlight** a day, but also not too exposed to strong sun.  
If strong sun, then partial shading is desired.
- **Protection from livestock and theft** – is there room for a fence?
- **Protection from strong winds and potential flooding**

## 3. Identifying the best site for a home garden

### PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Encourage gardeners to stop and observe their landscape before selecting a garden site. If we take time to observe and evaluate our site and understand the flow of water, how the sun moves across the land, and the quality of the soil and access to water, then we can choose a site for our garden that will provide a good home for our plants and allow them to thrive. In addition, by carefully choosing a site for our garden, we will ultimately reduce the time, energy and cost required to set it up and maintain it.

---

**STEP 1.** Walk with gardeners around the homestead to identify the best site for a home garden. Ask them to keep the key criteria for a home garden in mind.

**STEP 2.** During the walk, probe gardeners with questions to help their critical evaluation of the landscape:

1. How does rainwater naturally move across the landscape?  
How can the rainwater be stopped, slowed and spread effectively?
2. Is there any place on the land that tends to flood during the rainy season?
3. Is there a water point such as a well, a river or a rainwater tank?
4. Is there a slope? Does the site need terracing?
5. Is there easy access to manure and/or compost?
6. Is there a flow of nutrients we can make use of?
7. Is there easy access to mulch material?
8. What is the soil quality?
  - Is the soil soft and worked already or hard?
  - Is there evidence of soil life in the soil?
  - Is the soil sandy and dry or moist and full of organic matter?
  - Are there signs of soil erosion?

**STEP 3.** Split gardeners up into groups of 2 or 3 and discuss where the best site for a home garden would be while considering the key criteria. Encourage them to walk around if they feel it necessary.

**STEP 4.** Gather with gardeners again and ask each group to give their suggestion for the best site. Ask them to explain why they feel that site is the best. Agree with gardeners on a site for the garden.

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## CONSIDERATIONS FOR SELECTING A GARDEN SITE

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**RAINWATER:** Water moves from the highest point to the lowest point in a landscape. If there is a slope on the land, water will move to the lowest point and cause erosion of precious topsoil. By digging a ditch perpendicular to the slope ("on contour"), water running down the slope can be slowed, sunk into the soil, and spread across the land. If we dig this ditch above where we put our garden we will protect the garden from flooding and 'bank' water in the soil for the plants to use.

**FLOODING:** If there are places on the land that tends to flood we should not put our gardens there. Diversion drains can help divert some of the water from the area that tends to flood.

**TERRACING:** The garden needs to be on as flat land as possible, otherwise the soil will wash away. If the land is on a steep slope there may be a need to terrace the land in order to have a home garden.

**EASY ACCESS TO MANURE AND COMPOST:** If we place the garden near the compost or manure heap it will reduce the energy spent getting the compost to the garden.

**EASY ACCESS TO MULCH MATERIAL:** Mulch such as dried leaves or grasses help reduce evaporation and adds organic matter to the soil. Identifying sources of mulch is important for our garden.

**FLOW OF NUTRIENTS:** A compost heap or a heap of manure contains nutrients for the soil. When it rains some of those nutrients will flow away with the rain water. By placing a garden site down slope from a chicken coop or a compost heap, the nutrients will flow down with rainwater into our gardens so we can use them effortlessly.

**SOIL QUALITY:** We need good quality soil for our home garden. If the soil is degraded, very compacted, sandy, or very dry then it will require a lot of work to build a garden. If there is a site on the land where the soil is good this may be a good place to start the garden.

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*You may find that there is a site with good soil but it tends to flood or is far away from the house. Likewise, there may be a site near the compost heap, but it is very steep and requires a lot of work to terrace it and the soil is degraded. Selecting a site is about balancing all the considerations and finding the site that works best for you. Our goal is to meet the basic needs of plants with as little additional effort on our parts as possible.*

10 min

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## 5. Closing discussion

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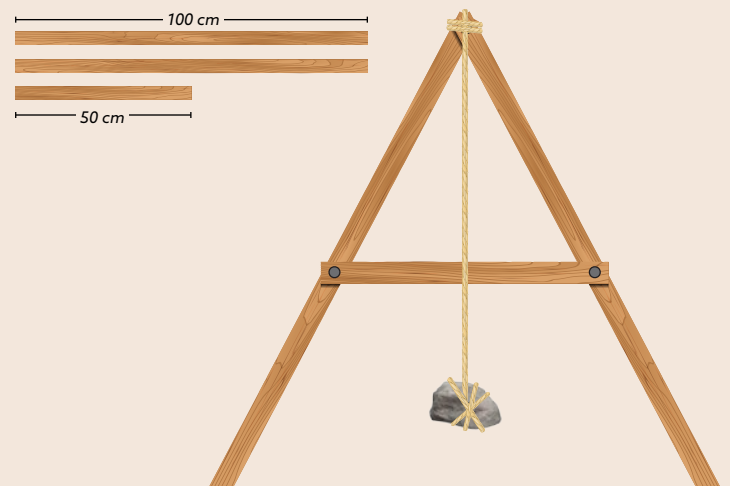
Ask gardeners to share with the group:

1. Something they learned in the session
2. How they are going to use this in their own homestead

# Establishing Your Garden



Photo by Elin Duby





# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will be able to prepare a garden bed with the appropriate soil tilth, nutrient additions, and protective mulch. They will understand how to store water and nutrients in their garden beds by first analyzing how these elements flow across a landscape and then stopping, spreading, and sinking them where they want them.

## DURATION



## MATERIALS NEEDED









- A flipchart or board with markers
- A site where gardeners can construct garden beds with swales and berms
- Hoes, rakes, and other tools for the group to use
- At least 20 liters of water
- Mulching materials
- Compost, green manures, cooking ash, and other organic material to enrich beds
- Two pieces of wood exactly the same size for every A-frame created (recommended 1m)
- One piece of wood half the size of the longer two pieces for every A-frame created (recommended 50 cm)
- String
- Nails
- Hammer
- Pen or pencil
- Fist-sized rocks



## KEY CONCEPTS

- Well prepared garden beds contain lots of added nutrients, are deeply dug to reduce compaction, and store water from the landscape in them.
- When garden soils are double dug, plants can easily access the water, nutrients, and air they need to thrive.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	Key elements of a well-prepared garden bed	 DISCUSSION	30 min
3	Water storing	 PRACTICAL ACTIVITY	15 min
4	Orienting garden beds, pathways, and berms	 PRACTICAL ACTIVITY	30 min
5	Making an A-frame	 PRACTICAL ACTIVITY	30 min
6	Using an A-frame to identify contours	 PRACTICAL ACTIVITY	30 min
7	Dig a double dug garden bed	 PRACTICAL ACTIVITY	45 min
8	Closing discussion: the benefits of fixed beds	 DISCUSSION	20 min

# 1. Introduction and warm-up

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Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. Key elements of a well-prepared garden bed

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Help gardeners recognize important elements of a well-prepared garden bed and motivate them to invest time in this activity.

---

**MATERIALS NEEDED:** Flipchart and markers

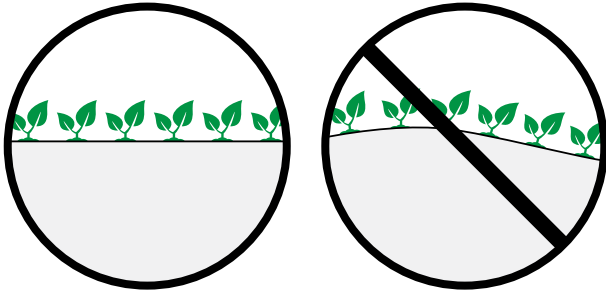
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1. Split gardeners up into small groups to discuss the key elements of a well-prepared garden bed. Have them write down the elements they feel are most important.
2. Bring gardeners back together and lead a discussion where they share their ideas. Write down all their suggestions on a flipchart, plus any additional key elements they did not list.
3. Ask gardeners to share why they think each element is important to have in a garden bed. Write down their reasons to the right of each element. Discuss each reason why and answer questions as they arise.
4. Show gardeners the **illustration of compacted soil** to help them visualize what is happening within the soil. Explain that many of the key elements listed on the flipchart work together to reduce compaction and help plants access water and nutrients.

# Elements of a well-prepared garden bed

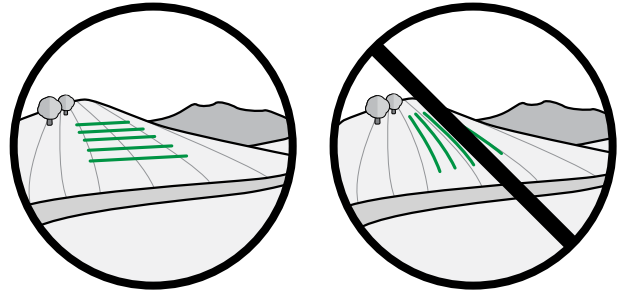
## Flat surface

Having a flat bed reduces runoff and soil erosion from the bed during heavy rains.



## Oriented perpendicular to slope

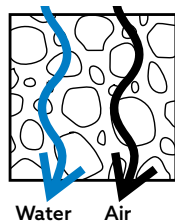
Beds that are oriented perpendicular to the slope can stop rainfall from running down the slope, but beds that follow the slope risk having rainfall run straight through them. Heavy rains will erode the beds' topsoil and can wash newly planted seeds away.



## Fine soil tilth

Fine soil tilth reduces stress on plant roots as they are growing and allows roots to have good contact with the soil so they can easily absorb nutrients, air, and water.

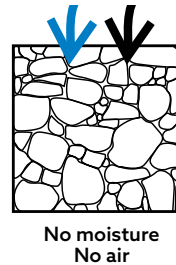
Good soil structure



## Reduced compaction

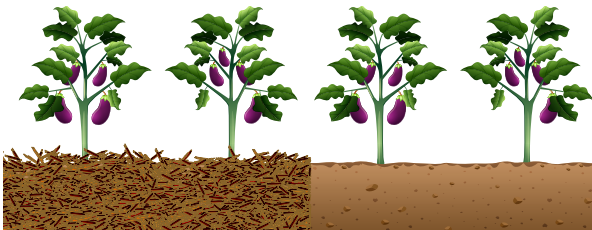
Air and water pores remain intact throughout soil profile.

Compacted soil



## Reduced bare soil by using mulches

Bare soil is prone to erosion and water evaporation during sunny days. Give gardeners examples of how to cover soil here with either living or 'dead' mulch. 'Living mulch' are plants that will cover the soil, while 'dead' mulch is dried leaves, grass, or other parts of dried plants. Soil can also be covered with rocks or bark from a dead tree.



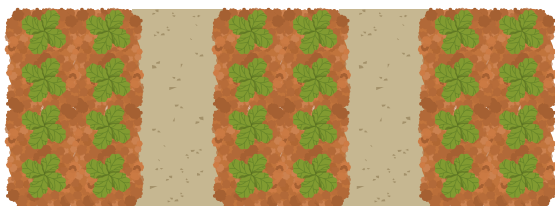
## Free from weed seeds as much as possible

Less work throughout the season to remove weeds. Weeds compete with crops for water and nutrients.



## Has designated pathways

Pathways allow us to tend to our gardens without stepping on our beds. When we step on our garden beds, we destroy the air and water pores our plants need to access nutrients and water.



## Width allows weeding the center of the bed without stepping in it

A bed with the appropriate width allows us to tend to our garden without stepping in our beds and compacting our soil.



# 3. Demonstration of water storing

## PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Demonstrate to gardeners that soils can store large amounts of water when garden beds are prepared using swales, mulch, and deep digging.

---

**FACILITATOR PREPARATION:** Do some preliminary scoping to find a sloped piece of land where all the gardeners can gather and observe the demonstration.

---

**MATERIALS NEEDED:**

- Hoes
  - Mulching materials
  - At least 20 liters of water
- 

**STEP 1.** Find a slightly sloped, completely bare piece of land and draw two squares, each about 0.5m x 0.5m, in the soil using a stick. One square is left completely bare. For the other square, dig down a few centimeters to make mini contour lines and place stones as needed along the contour. The contour lines do not need to be perfect.

**STEP 2.** Ask gardeners to collect mulch materials and water. Place all the mulch on the deeply dug square. Explain that this square is the field of a gardener who understands how to stop and spread water so that it can help them with their gardening. While slightly scratching with the hoe at the surface of the bare square, explain that this is the field of a gardener who plowed their field quickly and did not want to leave any unsightly material on their field after plowing.

**STEP 3.** Ask gardeners to come up close to observe what happens. Mimic a rainstorm by pouring water equally over the two squares. Make sure it is enough water to fully saturate the squares. Ask them to observe what happens with the water and with the soil. Which square has stored their water? What happened to the water of the other square?

**STEP 4.** Ask gardeners to come and feel under the mulch and see how much moisture is retained. Dig into both squares if necessary to investigate where the water has gone.

**STEP 5.** Ask gardeners to share their observations.

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## KEY MESSAGES

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- Water moves from the highest point to the lowest point. When water moves across the landscape, it takes nutrient-rich topsoil with it.
- A bare piece of land where no efforts are made to store the water will have water running off the land together with topsoil.
- By digging a ditch and berm on contour upslope from a garden bed and orienting our garden beds to be perpendicular to the slope, we will help slow the flow of the water, sink it into the soil and spread it more evenly throughout the landscape. By placing a ditch on contour just above our garden bed, we can store water in the soil for our plants and also protect our garden from the effects of a heavy rainfall. These steps can be taken in combination with using mulch and continuously keeping the soil covered to minimize evaporation and water runoff.

## 4. Orienting garden beds, pathways, and berms

### PRACTICAL ACTIVITY

---

**GOAL OF ACTIVITY:** Gardeners will learn how to orient and mark out their garden beds, pathways and berms after evaluating rainwater flows across a landscape.

---

**FACILITATOR PREPARATION:** Identify a suitable garden site where farmers can gather and establish some double-dug garden beds with swales and berms. Farmers will be working here for the duration of the training session.

---

**STEP 1.** Gather participants at the garden site.

**STEP 2.** Ask participants to look at the site and consider the key elements of a well-prepared garden bed and the results of the previous activity. Ask them to discuss in pairs where they think the garden beds should best be located.

**STEP 3.** Ask participants to share their thoughts and explain why.

**STEP 4.** Identify the highest point of the garden space and talk about how water moves through the space. Have gardeners provide their insights and identify any areas where they see existing erosion or wet areas where water is pooling. Ask participants where they would place berms and beds given the flow of water.

**STEP 5.** Mark out areas for garden beds and pathways together with participants. All beds should run perpendicular to the slope and all gardeners should be able to reach the center of each bed while standing in the pathway. A suggested size for garden beds is 1m wide and 3–4 m long.

**STEP 6.** Identify locations for berms with participants. Berms should go perpendicular to the slope and should be located upslope from the garden bed. Remind participants of the previous activity.

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### KEY MESSAGES

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- A contour line is an outline of a natural feature such as a hill. Every point of a contour line is on the same elevation. This means that the contour line never runs upslope or downslope. Contour lines can be drawn as close together or as far apart from each other as is needed for your situation. For garden beds, they can be drawn 1–4 m apart, as is necessary.
- Each garden design will be different depending on your situation and the landscape. The key is to choose a location that works for your situation and that helps to reduce the cost of maintenance and enhance garden productivity.
- The berms should be dug on contour, perpendicular to the slope. These are designed to protect the garden beds from heavy rainfall by diverting an overflow of water away from the beds. They can also help capture water and sink it in the ground to store it for future use.

# 5. Making an A-frame

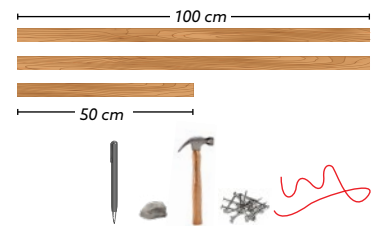
## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Demonstrate the construction and use of an A-frame to identify contours in the landscape.

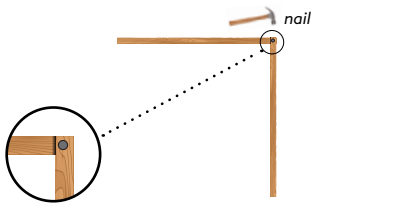
### MATERIALS NEEDED:

- Two pieces of wood exactly the same size for every A-frame created (recommended 1 m)
- One piece of wood half the size of the longer two pieces for every A-frame created (recommended 50 cm)
- String
- Nails
- Hammer
- Pen or pencil
- Fist-sized rocks

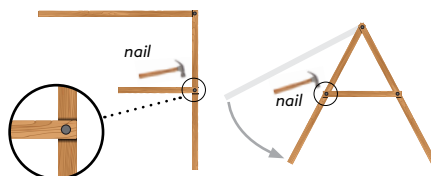
**STEP 1.** Lay the pieces of wood, the string, nails, and hammer on the ground. Explain to participants that you are going to make a frame that will help dig a berm that runs with the contour of the land. Ask participants if they remember why we want to dig berms on the contour of the land and why the berms should be perpendicular to the slope. Berms help stop and spread water evenly throughout the landscape.



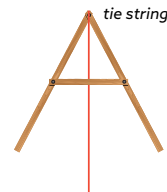
**STEP 2.** If only one A-frame is being made, select two participants to help with the process. If several A-frames are being made, split participants up into groups to have each group making A-frames at the same time.



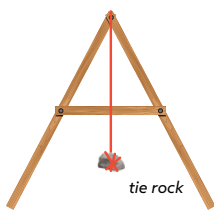
**1.** Instruct participants to nail the two long pieces of wood together at the top, ensuring that they are equally long on each side.



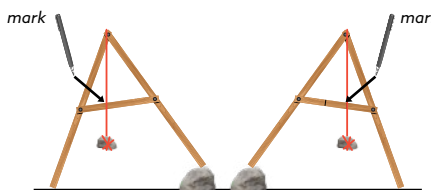
**2.** Take the smaller piece of wood and fit it halfway down the longer pieces as a crossbar (to form an 'A')



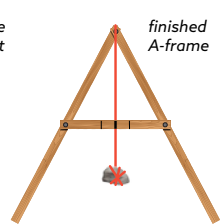
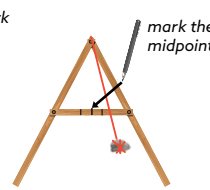
**3.** Tie the string at the top of the A-frame where the two longer pieces of wood meet. The string should be long enough to reach well below the crossbar.



**4.** Find a small rock and tie it to the end of the string. The string should move freely.



**5.** Calibrate the A-frame by finding a step or a flat rock about 15–20 cm high. Place one leg of the A-frame on level ground and the other up on the step or rock and mark the spot where the string hangs on the crossbar. Then switch and put the other leg up the rock or step, making sure to put the legs in exactly the same spot. Mark where the string falls on the cross bar. Then measure the distance between the two marks and find the mid-point. If you do not have access to a measuring tape, then measure this distance with a piece of string and fold the string in half to mark the mid-point.



## KEY MESSAGES

- An A-frame helps us find contours on the land.
- An A-frame can easily be constructed with locally-available materials and used by anyone.

# 6. Using an A-frame to identify contours

## PRACTICAL ACTIVITY

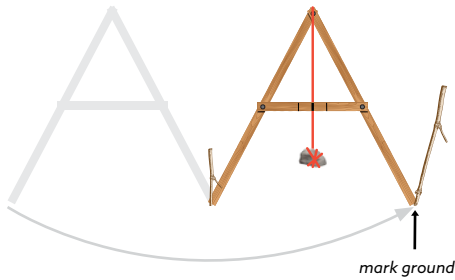
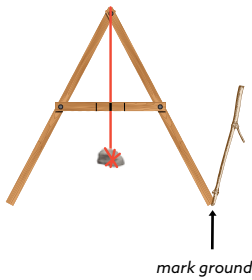
**GOAL OF ACTIVITY:** Demonstrate to gardeners how to build swales and berms at their garden sites.

**FACILITATOR PREPARATION:** Walk the land before the training to get a sense of a good place to start digging the ditch on contour.

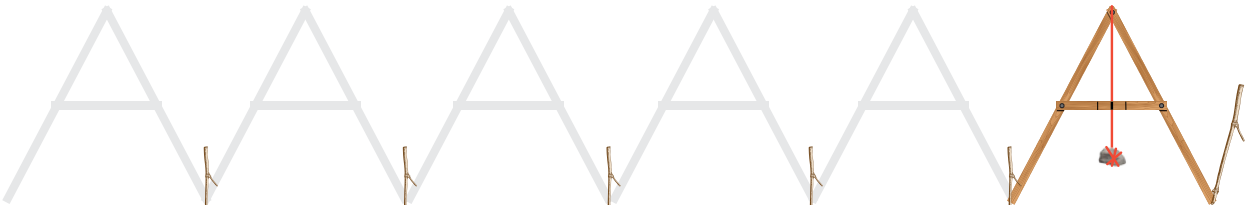
**STEP 1.** Ask participants to collect sticks about 20–30 cm long. The sticks will be used to mark out the contour lines found by the A-frame. Show participants the first couple of steps of how to measure the contour:

**1.** Mark your starting point with a stick in the ground and put one leg of the A-frame by the stick. Then find the spot where the string hangs exactly in the middle by moving the other leg. Keep the leg by the starting point fixed and move around to find the spot where the string hangs exactly in the middle. Mark this spot in the ground with a stick.

**2.** Keep the leg by the stick fixed in the ground while swinging the A-frame around 180 degrees to find the next point where the string hangs at the marked mid-point. Mark this point with a stick.



**3.** Repeat.



**STEP 2.** When you have marked a decent enough distance with your sticks, dig or trace a very shallow line along the sticks to mark the contour line. Once you have the line marked, you can dig down a bit deeper, placing the soil on the lower side of the slope to create your berm. It is helpful if the end of the swale is directed towards a place that would benefit from excess water, such as a fruit tree or bananas.

**STEP 3.** Once you have dug the swale, pass the A-frame inside the ditch also to ensure it is level inside.

**STEP 4.** Explain to participants that the berm is another productive opportunity, for example for planting beans or sweet potatoes. Berms should be protected from erosion.

# 7. Dig a double dug garden bed

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Have gardeners practice digging a bed using the double-dug technique and understand how this practice can help their plants.

**FACILITATOR PREPARATION:** Identify a suitable garden site where gardeners can gather and establish some double-dug garden beds. They will be working here for the duration of the training session. Ask them to collect local soil amendments, such as manure and ash, before beginning the exercise.

**MATERIALS NEEDED:**

- Soil amendments such as manure and ash
- Local tools, such as fork hoe, shovel, and rake

**STEP 1.** Explain to gardeners what double digging is and how it helps plants grow. Ask them to recall the elements of a well-prepared garden bed discussed earlier. If possible, show them the flipchart paper to refresh their memory before starting to dig.

**STEP 2.** Begin by marking with string or simply drawing a line in the dirt where your garden bed will be located. Make sure that all the beds, pathways, swales, berms, and holes are measured and marked before beginning to double dig. Divide the garden bed into "trenches" that are the width of the spade you are using.

**STEP 3.** In the first trench, take out the top 20 cm of topsoil and place it at the end of the bed.

**STEP 4.** Identify a couple of volunteers from the group and ask them to dig the next 20 cm of subsoil from the same section of the trench. They should just loosen and aerate the soil by rocking the spade back and forth but not removing the soil from the trench. Keep loosening the whole section until most of the larger soil clods have been broken up.

**STEP 5.** Start to add any available soil amendments such as compost, manure, ash, and charcoal dust to the loosened subsoil. One shovel or several handfuls of each amendment is enough.

**STEP 6.** Using a shovel, mix these amendments into the subsoil.

**STEP 7.** Ask another volunteer from the group to dig 20–30 cm of topsoil in the next 40 cm section. As it is dug up and loosened, place this topsoil on top of the subsoil section that was just amended. Make sure that all the topsoil gets removed.

**STEP 8.** Ask a new person in the group to further loosen and aerate the subsoil, as in Step 4.

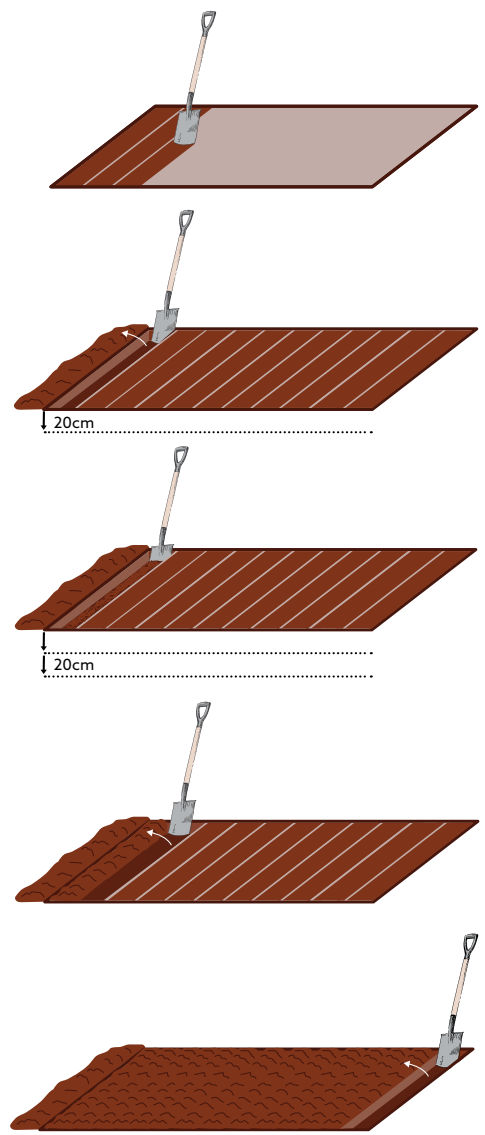
**STEP 9.** Amend the soil again, as in Step 5. (You may need to ask participants to keep collecting soil amendments)

**STEP 10.** Repeat Steps 3–6 until bed is complete. The saved topsoil from the start of the bed should be used to build up the bed in the last 40 cm section.

**STEP 11.** Once the double digging process has been completed, add more manure, compost, and soil amendments to the finished bed, mixed well into the loosened soil at the bottom of the hole. The idea is to have a good organic matter-soil mix that is as deep as the root systems of the garden plants.

**STEP 12.** Smooth out the top with a rake or hoe or by hand, creating a flat planting space. The garden is now ready for planting or seeding.

**STEP 13.** Ask gardeners to share what they have observed and how this method differs from their current practices.





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## KEY MESSAGES

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- Double digging involves the loosening of two layers of soil, and the addition of organic matter.
- Deeply dug soil reduces stress on plant roots.
- When soil has good tilth, plants can be spaced closer together since they can more effectively use the space below them.
- Double-dug beds are long lasting, so gardeners do not have to use as much energy in following seasons.
- All plants require air around the roots for good root health and function. Double-dug beds aerate the soil deep in the soil profile.
- Soil amendments such as compost, manure, wood ash, and charcoal dust can be sourced locally to improve soil organic matter.

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## KEY DEFINITIONS

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### ***Aeration***

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The process of creating openings in the soil to help air, water, and nutrients move into the soil to plant roots, alleviating soil compaction.

### ***Topsoil***

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This is the upper, outermost layer of soil, usually the top 5-10 inches. It has the highest concentration of organic matter and microorganisms and is where most of the soil's biological activity occurs.

### ***Subsoil***

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This is the soil lying immediately under the topsoil. It is typically more compacted than the topsoil and has greater nutrient imbalances.

## 8. Closing discussion: the benefits of fixed beds

### INTERACTIVE DISCUSSION

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**GOAL OF ACTIVITY:** Gardeners think about the benefits of fixed garden beds and what can be done if they need to shift their beds around season to season.

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1. Engage gardeners in a discussion around the pros and cons of having fixed garden beds.
2. Discuss reasons why you would need to shift sites season to season and what gardeners can do in these situations.

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### KEY MESSAGES

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- Fixed garden beds allow gardeners to build soil fertility year after year and actually improve the health of the soil in these plots. After many seasons of adding compost, manure, and other organic material to the same soil, gardeners will notice more soil life, more water holding capacity, a more loamy texture, and a darker color. Gardeners may have never seen soil actually improve over time; they may have only noticed it become depleted. This is because they have been spreading their energy around, rather than investing a lot of time and attention into a single plot.
- Fixed garden beds allow gardeners to maintain soil tilth year and year if they avoid walking on beds and use permanent pathways around beds.
- Fixed garden beds allow gardeners to take advantage of the work they did building swales along contours and berms to capture water. Gardeners may also notice improvements they can make for next year as they observe how rainfall moves across their beds throughout the season.
- Some gardeners may have difficulties accessing the same garden sites year after year however. Moving beds from site to site gives gardeners flexibility when they need it.

# Fence Making



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will understand the importance of a fence and the multiple uses of a fence to help improve production. Gardeners will also be able to identify suitable local fence materials.

## DURATION



## MATERIALS NEEDED






- A shaded area for gathering together to discuss
- Locally available fencing material
- Tools required to build a fence



## KEY CONCEPTS

- Chickens, goats and other small animals can quickly destroy a home garden unless it has a fence.
- Fences can benefit a gardener beyond providing garden protection: living fences can provide mulching materials, timbers, poles, stakes, and even fruit and nutritious leaves. The fence can also be used as a trellis for vining fruits, such as passion fruit.
- A sturdy fence can be made completely with locally-sourced materials. Termite resistant wood is preferable for the corners of the fence that bear the majority of the weight of the fence.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	The multiple purposes of a fence	 DISCUSSION	5 min
3	Fencing options	 DISCUSSION	15 min
4	Fencing the garden	 PRACTICAL ACTIVITY	1 hour
5	Closing discussion	 DISCUSSION	10 min

## FACILITATOR NOTES

Engage gardener in a discussion that brings out local knowledge on good fencing practices and good local fencing materials before suggesting materials to use.

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. The multiple purposes of a fence

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners understand the importance of having a fence to protect their home gardens and can identify some additional benefits of a fence that can increase their garden's overall productivity.

1. Discuss with gardeners why a fence is necessary and other purposes a fence can serve.

## KEY MESSAGES

Protecting the home garden with a fence is important if we want to ensure we have a good crop. Chickens, goats and other small animals can quickly destroy a home garden if it is not fenced. If small animals are let into the home garden, they can not only eat the crops very quickly but also compact the soil by stepping on it. A good fence will also help protect the garden from harsh winds that can dry the soil.

A fence can also provide vertical growing space, for example by growing a climbing plant such as passion fruit or grenadilla across it. It is also possible to grow a living fence that can bear fruit and provide staking, mulching, and composting material.



# 3. Discussing fencing options

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners are able to identify locally available examples of a 'dead' fence and a 'living' fence and the pros and cons of each of them.

1. Ask gardeners to describe and give locally-available examples of:
  - A 'dead' fence
  - A 'living' fence
2. Ask gardeners to discuss in pairs some local options for fencing of the demonstration garden.
3. Discuss the suggested options as a group, examining the pros and cons of each and deciding on an option for the demonstration garden.

## KEY MESSAGES

One example of a **'dead' fence** is thorny branches piled together around the garden. While this fence does a good job of protecting the garden from livestock, it cannot produce any material that can be useful for the gardener or their household.



**Living fences** can be made from trees found in the area by taking cuttings to use as living fence poles. When watered and cared for, these poles will eventually produce leaves and branches that can be used as mulching materials or stakes.



If **fruit trees** are incorporated into the fence, gardeners will eventually be able to harvest fruit from their fence.



**Sisal** is a living fence option that eventually creates a thick impenetrable fence around the garden and produces fibrous material that could be useful to gardeners and their households.



1 hour

## 4. Fencing the garden

### PRACTICAL ACTIVITY

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**GOAL OF DISCUSSION:** Gardeners learn how to make a fence around their home garden using locally-available materials.

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**MATERIALS NEEDED:**

- Locally available fencing material
  - Tools required to build a fence
- 

**STEP 1.** Discuss the size of the fence with gardeners and outline in the garden where the fence will be erected. Instruct gardeners to collect the types of fencing materials agreed to during the group discussion.

**STEP 2.** Build the fence with gardeners.

*Note: If the activity is not finished within the allocated time of the training, the gardeners can finish the fencing on their own. But insist the fence is finished before the next module begins!*

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### KEY MESSAGES

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#### Good fences...

- ... Have adequate thorn bush or thick material at the bottom to ensure chickens cannot enter.
- ... Use termite resistant wood when needed. This is especially true if dead wood is used as stakes to build the corners of the fence.
- ... Have a well-planned entrance or gate. Ensure the bottom of the entrance is also chicken proof.

10 min

## 5. Closing discussion

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Ask gardeners to share with the group:

1. Something they learned in the session
2. How they are going to use this in their own homestead

### Specialized Garden Designs

# Unconventional spaces and urban gardening





# Unconventional spaces and urban gardening

## LEARNING OBJECTIVE

Gardeners will learn techniques for growing gardens in small, unconventional spaces.

## DURATION



## MATERIALS NEEDED

### Bring with you:

- Flipchart and pens
- Container types for all three kinds of gardens (horizontal sack gardens, vertical sack gardens, and container gardens)
- A cylindrical tube (such as downpipes for rainwater harvesting or a bucket or tin that has been opened on both ends) that can be used to add a column of rocks into the center of the vertical sack garden. The diameter of the tube should be smaller than the diameter of the sack.
- Multiple seed options
- Seedlings for demonstration
- A knife for cutting holes in containers and sacks

### Prepare at the training site:




- Water
- Rocks
- Mulching material
- Compost, composted manure, and/or high-quality soil



## KEY CONCEPTS

- Not every household has a backyard or field where they can build a garden. But that's ok! Plants can grow almost anywhere if they have a bit of soil, sunlight, and water.
- Just a few well-chosen plants can help families access more vegetables that can be incorporated into their daily meals.
- If space is an issue for your area, consider if container or sack gardens are appropriate for your participants.

## TRAINING AGENDA

1	Introduction to container or sack gardening	 DISCUSSION	30 min
2	Identifying container or sack garden resources around us	 PRACTICAL ACTIVITY	1 hour
3	Building container and sack garden	 PRACTICAL ACTIVITY	1.5 hour

# 1. Introduction to container or sack gardening

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners learn how to identify new resources and spaces that can help them grow vegetables in containers or sacks to improve their daily diets.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Introduce the concept of container or sack gardening to gardeners.
2. Ask gardeners to brainstorm vegetables that are well suited to grow in a container or sack and list these vegetables and their benefits for all to see. Have gardeners think about what they like to eat and discuss if it can be grown in a container.
3. Remind gardeners of the 5 Resources categories introduced in Identifying Resources. Ask gardeners to name resources that could be used in container or sack gardening. Encourage gardeners to think creatively about the resources around them.
4. Discuss with gardeners the best places to put a container or sack garden. The key characteristics of a good site for a container or sack garden are similar to those of a good garden site, as introduced in Site Evaluation.

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## KEY MESSAGES

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### WHAT IS A CONTAINER OR SACK GARDEN?

- Container gardens use different kinds of buckets, pots, barrels, baskets, tins, boxes or other containers to produce vegetables. The container must be large enough to hold the plant(s) you want to grow, and have drainage holes so excess water can escape. Care should be taken with dark-colored containers that might retain too much heat in hot months.
- Sack or bag gardens use sacks with drainage holes in them to produce vegetables. Sacks can be placed either upright or on their sides.
- Container or sack gardens can be used by gardeners who are limited in the planting space available to them, experience a lot of crop theft in their area, or are limited in their personal mobility to fields because of cultural norms or safety conditions in their area.
- Gardeners can place either individual plants or a small assortment into a vessel that is then are placed in well-thought out areas around a household.

### WHAT VEGETABLES SHOULD I GROW IN MY CONTAINER OR SACK GARDEN?

- The depth of the container will determine the type of root structure that will fair best. Shallow containers, such as a jerrycan cut in half, will be best suited for shallow or fibrous rooted vegetables, such as leeks. Large containers, such as rice sacks, can grow vegetables with more extensive root systems, such as tomatoes.
- Local indigenous vegetables are hardy species that may grow well in container or sack gardens.
- What vegetables will provide ample yields that can easily be incorporated into family meals? For example, chard leaves can be harvested regularly and used in cooking daily for many months while taking up very little space. Bushy plants, like eggplants, may take up a lot of space while only yielding a few fruits.

# 2. Identifying container or sack garden resources around us

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners are encouraged to become observers of their own environment, identifying the richness of resources that they do have around them that can help them build a container or sack garden.

**FACILITATOR PREPARATION:** Select a training site where gardeners can walk around their community freely to find resources that can be used for container gardening. They will need to end at a homestead or other suitable place where they can identify locations to place garden containers.

**STEP 1.** Organize gardeners to go on a group walk to identify natural resources in their local area that are useful for container or sack gardening. Many of the resources needed for container or sack gardening are freely available: discarded containers/sacks, rocks, animal manures, or plants that can be used for mulching. Ask gardeners to each pick up at least one resource on their walk to bring back with them.

**STEP 2.** After the walk, gather gardeners in a circle and ask them to show their resource to the group. They should explain what their resource is and what it is used for. Encourage gardeners to explain how the resource will help them grow plants in unconventional spaces.

**STEP 3.** Ask gardeners to look around and identify sites where garden containers or sacks can be placed. In addition to spaces on the ground, have gardeners think about vertical or above-ground options.

## KEY MESSAGES

- Useful resources for sack or container gardens are all around us, such as manure, ash and fertiliser plants such as *Tithonia diversifolia*.
- Containers or sacks can be placed on window sills, rooftops if they are accessible and partially shaded, low walls, or in places where vining plants, such as squashes or climbing beans, can fill vertical spaces.



# 3. Building container and sack gardens

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners participate in building three types of gardens (horizontal sack gardens, vertical sack gardens, and container gardens) and learn the skills required to repeat the exercise on their own.

### MATERIALS NEEDED:

**Bring with you:**

- Flipchart and pens
- Container types for all three kinds of gardens (horizontal sack gardens, vertical sack gardens, and container gardens)
- A cylindrical tube (such as downpipes for rainwater harvesting or a bucket or tin that has been opened on both ends) that can be used to add a column of rocks into the center of the vertical sack garden. The diameter of the tube should be smaller than the diameter of the sack.
- Multiple seed options
- Seedlings for demonstration
- A knife for cutting holes in containers and sacks

**Prepare at the training site:**

- Water
- Rocks
- Mulching material
- Compost, composted manure, and/or high-quality soil

**STEP 1.** Set up three stations around the training site, one for building a horizontal sack garden, one for a vertical sack garden, and one for a container garden. Assemble the necessary equipment at each site, such as soil, compost, and rocks, or put it in a centralized location where all can easily access it.

**STEP 2.** Do each station with gardeners gathered around and explain the steps as you go.

**STEP 3.** Discuss with gardeners the benefits of each style of container garden and how each might be used for different crops and spaces.

## KEY MESSAGES

- Container and sack gardens are beneficial for small spaces and places with no arable land, such as in urban spaces. When you add high-quality soil and compost to the container it will stay loose and fluffy for longer, but poor quality soil will easily become compacted. Container gardens will need to be watered more frequently than plants in the ground as water easily evaporates out.
- All manner of sacks and containers can be used for gardening. Encourage gardeners to be creative!

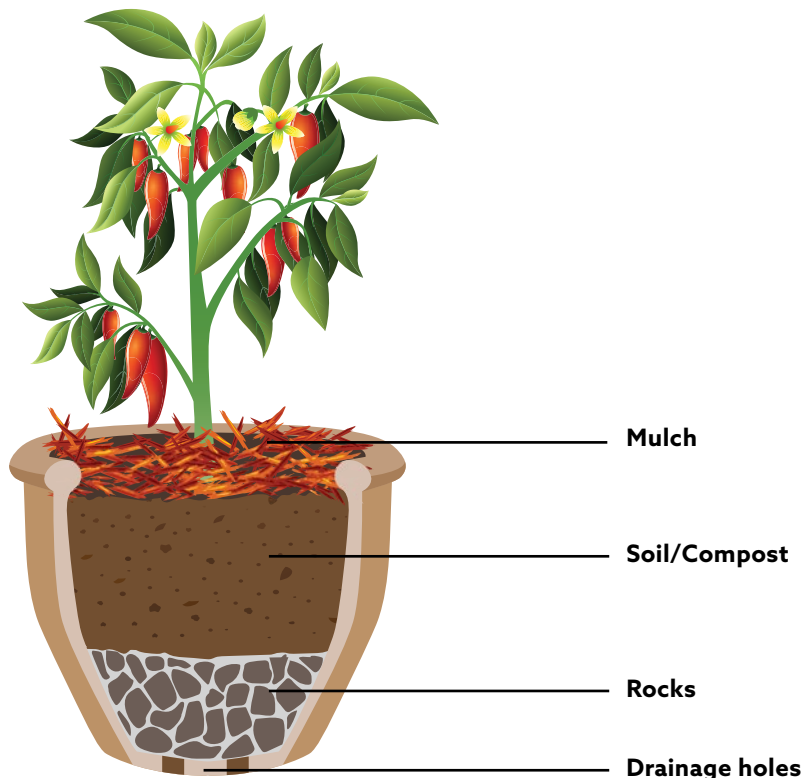




## HOW TO

## BUILD A CONTAINER GARDEN

1. You can use many different kinds of buckets, pots, barrels, baskets, tins, or boxes to produce vegetables. Look for containers that are at least 25 cm (10 in) wide and 30 cm (12 in) deep. Bigger containers hold more soil and retain moisture longer, so you do not have to water as much.
2. On the side, mix soil and compost together in a 50/50 ratio.
3. Poke several holes in the bottom of the container for drainage.
4. Add a layer of rocks at the bottom of the container about 3 cm (1 in) deep.
5. Fill the container with the soil/compost mixture plus manure if available. Leave about 8 cm (3 in) space at the top so there is room to water.
6. Thoroughly water the soil in the container before adding seeds or seedlings. Soak the soil completely, then allow it to sit for a few hours to drain excess water. This time can be reduced during a demonstration but stress to gardeners that the soil should not be waterlogged when seeds are introduced.
7. Sow seeds directly into container or use seedlings. If using seedlings, leave 8–10 cm (3–4 in) of space in between each plant, or according to the seed spacing recommendations. Set seedlings in the soil at the same level they were growing in their pot.
8. Cover the soil in the container garden with a layer of straw, old leaves, or other mulching material to prevent it from drying out.
9. Check plants daily and water when necessary to keep them healthy and productive.
10. Starting about a month after planting, vegetables should be fed about once a week with botanical manure tea.
11. Plants that grow tall or produce vines, like tomatoes and cucumbers, will need support in a container, such as poles or a wire mesh cage.

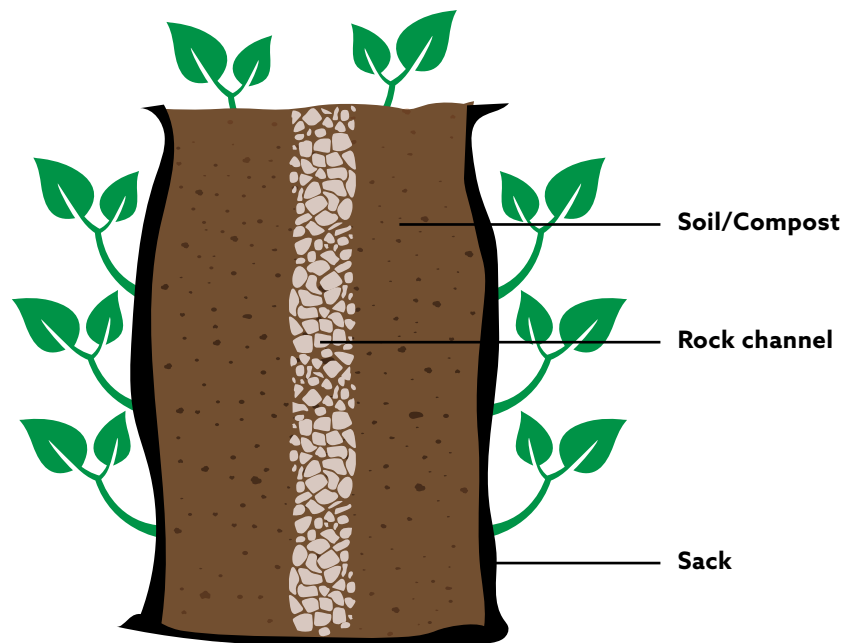




## HOW TO

## BUILD A VERTICAL SACK GARDEN

1. Carefully choose the location for the sack garden as it is challenging to move when full of soil.
2. On the side, mix soil and compost together in a 50/50 ratio.
3. Place about 12 cm (5 in) of the soil/compost mixture at the bottom of the sack. Set the cylindrical tube in the center of the sack and fill with rocks.
4. Surround the tube with soil until you reach the upper rim of the tube. Then slowly lift up the tube so that the rocks remain in the center. Again set the tube in the middle of the sack and fill it with rocks. Surround the tube with more soil. Lift the tube up when this layer of rocks and soil are in place. Repeat until the sack is full. This "rock channel" will make it easy to water your sack garden. Alternatively, you can use some wire mesh, make a cylinder, and set it in the middle of the bag. Fill it with rocks, and then add the soil all around to the top of the sack. The cylinder will stay in the center of the sack.
5. Poke holes into the side of the sack at an even distance about 20 cm (8 in) apart.
6. Transplant seedlings into the holes and tamp soil lightly around the roots.
7. Beets, carrots, lettuce or other vegetables or herbs can be direct-seeded on the top of the sack.
8. Water your sack garden from the top: Pour water into the rock channel until it comes out of the bottom holes.





## HOW TO

## BUILD A HORIZONTAL SACK GARDEN

1. Carefully choose the location for the sack garden as it is challenging to move when full of soil.
2. On the side, mix soil and compost together in a 50/50 ratio.
3. Fill the sack with the soil/compost mixture.
4. Sew up or secure the opening of the sack. Lay the full sack flat on the ground or surface.
5. Poke 1 cm (0.5 in) wide drainage holes into the bottom side of the sack at an even distance about 10 cm (4 in) apart. If the sack is made from loosely woven material that will allow water to drain, you do not need to do this step.
6. On the top side of the sack, cut hole openings for seedlings, or cut row openings for seeds.
7. Transplant seedlings into the holes and tamp soil lightly around the roots OR sow seed in rows at the appropriate depth.
8. Water your sack garden gently from the top.



### Specialized Garden Designs

# Arid and drought-prone environments





# Arid and drought-prone environments

## LEARNING OBJECTIVE

Gardeners will learn sustainable gardening techniques for arid and drought-prone environments.

## DURATION



## MATERIALS NEEDED

### Bring with you:

- Flipchart and markers
- Multiple seed options
- Seedlings for demonstration

### Prepare at the training site:




- Compost or composted manure
- Local tools such as hoes, axes, and spades
- Mulching materials



## KEY CONCEPTS

- Some gardeners live in environments that have very little or erratic rainfall and soils that do not have good water holding capacity. This makes it challenging to grow vegetables as vegetables can quickly become water stressed.
- In areas where gardeners grow gardens in hot, water-stressed climates, it is especially important to store water in the soil for future use. This can be done by using sunken beds and zai pits that trap water and funnel it to where plant roots will find it.

## TRAINING AGENDA

1	Why is watering so important for home gardens?	 DISCUSSION	45 min
2	Different bed designs for arid and drought-prone environments	 DISCUSSION	30 min
3	Building sunken beds and zai pits	 PRACTICAL ACTIVITY	1.5 hour

# 1. Why is watering so important for home gardens?

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will understand the importance of reducing water stress on vegetable plants.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask gardeners why they think vegetables require constant access to water, but other crops may survive without irrigation.
2. Write the key stages of a plant's life on the board. Ask gardeners to describe what is happening at each stage and how water is needed to do this work.

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## KEY MESSAGES

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### WHY DO VEGETABLES REQUIRE REGULAR WATERING?

- Vegetables have **short roots** compared to other crops.
- Vegetables are **rapidly growing** and need water at every stage so their growth is not stunted.
- Vegetables grow much quicker than many other plants. They need water constantly to quickly **establish their root structures** and **grow above ground structures** (stems and leaves).
- Vegetables contain a lot of water in their **stems, leaves, and fruits**. They need to pull water from the soil in order to build these parts.
- Compared to trees and shrubs, vegetables have very short roots. Trees and shrubs can reach deep into the soil to access water, but **vegetables have to rely on what is near the surface**, which can quickly get dried out. Even maize has much deeper roots (1.8 m or 6 ft) when mature than most vegetable plants. Tomato roots are some of the deepest vegetable roots (0.9 m or 3 ft) whereas onions have some of the shallowest roots (0.4 m or 1.5 ft).
- **Fruiting crops** (eggplants, tomatoes, maize) cannot develop flowers or set fruit well if they are water stressed. It is especially important to make sure these crops have adequate water during their flowering and fruiting stages.
- **Leafy vegetables** need water at every stage of growth to make sure they are continuously growing the leaves that we eat.
- **Root crops** (carrots, beets, onions, potatoes) do not have very deep roots and therefore cannot access water deep in the ground.

# The life cycle of plants

GROWTH STAGE	WHAT IS HAPPENING?	WHY IS WATER IMPORTANT?
<b>Germination:</b> when a seed starts to grow	Seed is taking in water from soil, the seed coat is softening, and the young plant is emerging from the seed coat.	Water is needed to start this process and ensure the young seedling does not dry out.
<b>Establishment:</b> true leaves have emerged and plants are starting to grow	Early shoots are growing and roots are elongating in the soil.	Water is needed to fuel this growth and make sure root structures are fully formed. Stunted roots can lead to poor water and nutrient absorption later on.
<b>Vegetative growth:</b> plants are putting their energy into growing roots, stems, and leaves	Root masses are increasing and roots are getting deeper. Plants are growing the stems and leaves they need to capture energy from the sun through photosynthesis. The more green leaves they have, the more energy they can capture.	Lots of water is needed to fuel this rapid growth.
<b>Reproductive growth:</b> plants start putting their energy into flowering	Plants start to produce flowers. Flowers are fertilized and start to grow fruit. Leaves may die as plants focus on fruit growth.	Water stress during this stage can cause flowers to die and fruit to become withered.
<b>Ripening and dying:</b> Fruits are maturing and vegetative parts of plant may die	All the plant's energy is put towards ripening its fruits and the seeds within these fruits.	For many vegetables, water is less critical during this stage. Too much water may actually cause fruits to crack because they take up too much water.

## 2. Different bed designs for arid and drought-prone environments

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will understand how sunken beds and zaï pits can help them store water and nutrients so that they are more readily available to plants growing in arid conditions.

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1. Describe sunken beds and zaï pits and discuss how they trap water and retain it longer than other bed designs.
2. Review the key criteria of selecting a site for your garden beds and explain how these same principles are used for sunken beds and zaï pits.

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### KEY MESSAGES

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#### **SUNKEN GARDEN BEDS ARE BETTER THAN RAISED GARDEN BEDS IN ARID CONDITIONS FOR SEVERAL REASONS:**

- They are easier to water efficiently by flood irrigation.
- The raised pathways give the moist soil and young seedlings some protection from drying winds and sun.
- Young plants can easily be protected by laying palm fronds or other material across the beds.
- When wet season rains are intense, garden soil is not eroded and rainwater is funneled into the beds.

#### **ZAÏ PITS ARE ALSO BENEFICIAL IN ARID CONDITIONS. THEY GROW FEWER VEGETABLES THAN SUNKEN BEDS, BUT ARE ALSO LESS WORK.**

- Zaï pits are a farming technique that store water and soil nutrients in “pits” before the planting season. The pits are typically 20–30 cm in diameter and 20–30 cm deep.
- Pits are spaced 90 cm apart in each direction if the gardener wants to cover a field, but pits can also be strategically placed where vegetables are desired.
- Zaï pits protect vegetables and store water and nutrients in the same way as sunken beds, but require less space and labor.

# 3. Building sunken beds and zai pits

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Demonstrate to gardeners how to build sunken garden beds and zai pits that trap water and nutrients in environments where water and nutrients are scarce.

<b>MATERIALS NEEDED:</b>	<b>Bring with you:</b>	<b>Prepare at the training site:</b>
	<ul style="list-style-type: none"> <li>• Multiple seed options</li> <li>• Seedlings for demonstration</li> </ul>	<ul style="list-style-type: none"> <li>• Compost or composted manure</li> <li>• Local tools such as hoes, axes, and spades</li> <li>• Mulching materials</li> </ul>

**STEP 1.** Build a sunken bed with gardeners

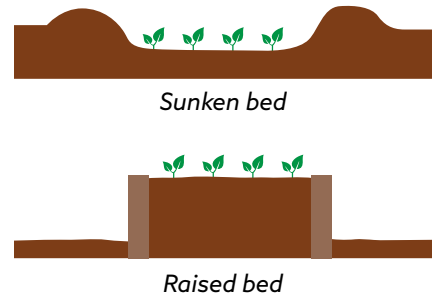
**STEP 2.** Construct 4–5 zai pits to plant a few select vegetable plants, like squashes, tomatoes, or watermelon. Put 2–3 seeds per hole, instructing gardeners to thin down to only one plant per hole when seedlings have developed a few true leaves. Gardeners should select the healthiest seedling to keep. Alternatively, plant one transplant in each zai pit and apply mulch around it.



### HOW TO

### CONSTRUCT A SUNKEN BED

1. Determine the appropriate site for your sunken beds. Consider proximity to a water source, nutrients, sunlight, and other key elements of a garden bed when determining where to place your sunken beds.
2. Use an A-frame to mark out the contours found within the landscape. Even with sunken beds, it is important to build your garden beds along the contours of the landscape to minimize erosion from the beds and most effectively capture rainwater.
3. Mark out beds so they run perpendicular to your slope and each bed is on the same contour line, i.e. does not go down or up slope. Bed widths should be slightly narrower than normal so that gardeners can continue to access the center of the beds without stepping in them. Alternatively, add some stepping stones to the bed.
4. Remove the richer topsoil from the bed and set it aside. Stop digging when it is clear that another soil horizon has been reached. Topsoil is typically found in the first 1–10 cm of the soil.
5. Continue digging 30–45 cm (1–1.5 feet) to remove the subsoil from the pit.
6. Use the subsoil to raise the pathways around the bed. By raising the pathways, you can make the pit as deep as 60 cm (2 feet).
7. If the bottom of the pit is severely compacted soil, use local tools to loosen it.
8. Create a level surface in the bottom of the pit before adding the topsoil back into the pit.
9. Fill the pit with enough compost or composted manure to plant into.
10. Sow seeds or plant seedlings directly into the compost.
11. Apply mulch to the bed as appropriate.
12. Palm fronds or large branches can be laid over the bed to provide shade and extra protection for young seedlings.





## HOW TO

## CONSTRUCT A ZAÏ PIT

1. Look at your landscape and find the slope. Even land that appears flat will have a slight slope that will determine which way water will flow. This is very important in arid environments where we want to trap any water that flows across the landscape.
2. Using a hoe, dig zaï pits in orderly lines. Each pit should be spaced 90 cm apart from each other in every direction.
3. Dig each pit so it is around 20–30 cm in diameter and 20–30 cm deep.
4. Excavated soil is placed down slope of the hole to form a berm.
5. A spade of compost or composted manure is placed in each hole. Fresh manure should not be used since seeds are sown directly into this material.
6. Sow seeds or place seedlings directly into compost or composted manure.
7. Mulch should be placed on top of pits to slow down water evaporation from pits.
8. Evaluate if other measures, such as stone barriers placed upslope from the zaï pits, can slow and spread water so that it can be more easily captured within the pits.



### Specialized Garden Designs

# Garden designs for heavy rains and flood-prone environments



# Garden designs for heavy rains and flood-prone environments

## LEARNING OBJECTIVE

Gardeners will problem solve how to protect home gardens from heavy rains and flooding and will learn gardening techniques for flood prone areas.

## MATERIALS NEEDED

- Flipchart and markers


## DURATION



## KEY CONCEPTS

- Too much water can wash away topsoil and seeds. Heavy rains can damage plants and create waterlogged conditions that suffocate plant roots.
- Gardeners can help each other develop solutions to protecting their home gardens when flooding and heavy rains create challenging conditions.
- Raised beds and elevated container and sack gardens can help gardeners direct excess water away from plant roots. Flat garden beds help protect topsoil from erosion.

## TRAINING AGENDA

1	Protecting our gardens from heavy rains and flooding	 DISCUSSION	1 hour
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# Protecting our gardens from heavy rains and flooding

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners think through how to protect their gardens from heavy rains and/or floods.

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**FACILITATOR PREPARATION:** A flipchart with two columns

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask gardeners to brainstorm some challenges to gardening when heavy rains and/or floods are a problem. Write the challenges gardeners say on the left side of the paper. Add any challenges that they missed.
2. As a group, discuss possible solutions to these challenges. Ask gardeners what they can do to prepare for heavy rains or floods when they are preparing their garden. Ask them to share examples of gardeners who have successfully protected their crops from heavy rains or floods.
3. For areas with heavy rains, discuss the importance of a flat garden bed to reduce erosion and stop, spread, and sink water before it reaches garden beds.
4. Draw a picture of a raised bed and show how rainwater can quickly percolate downwards away from plant roots when loosened soil is piled up on the garden bed surface.

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## KEY MESSAGES

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Many gardeners are experiencing heavier rains or more frequent flooding than normal due to climatic changes.

### TOO MUCH WATER CAN BE DAMAGING TO GARDEN BEDS:

- Garden bed soil can be eroded. When topsoil is eroded away, many nutrients are lost, including any nutrients from fertilizer that was added.
- Seeds can be washed away.
- Small seedlings can be washed away or damaged in the rain.
- Even large plants can be damaged from heavy rains. Delicate flowers and fruits can also be damaged.
- Plant roots can be sitting in water for long periods of time. This means they cannot access any air and plants can suffocate as a result.

### PROPER USE OF RAISED BEDS:

- Raised beds drain water out of them quicker than if plants were planted at the original soil level. This is important so that plant roots are not sitting in flooded soil.
- It is possible to create a very deep garden bed by digging down below the bed and then creating the raised garden bed on top of where you just dug. This gives the roots extra space to explore without compaction.
- Raised beds can be very prone to erosion, especially during heavy rain storms. It is important to reinforce the sides of the beds with locally-available materials, such as stones, banana stems, timbers, or wood panels so that topsoil does not get washed away.
- Raised garden beds should be aligned perpendicular to the slope to reduce erosion. Rainwater should be stopped and slowed with berms located upslope from the garden beds. Garden beds should be flat to avoid runoff and always mulched.

*Note: Horizontal and vertical sack gardens strategically placed on high areas such as walls, flat lying roofs, or hills can also help gardeners grow vegetables in areas with seasonal flooding.*

### Specialized Garden Designs

# Gardening on steep slopes



Photo by Elin DUBY



Photo by Good Life Permaculture



# Gardening on steep slopes

## LEARNING OBJECTIVE

Gardeners will observe how water can remove topsoil from steep slopes and discuss how terracing can help.

## MATERIALS NEEDED

- Flipchart and markers
- A jug or jerry can of water for the demonstration
- Local tools such as hoes, axes, and spades
- Two pieces of wood exactly the same size for every A-frame created (recommended 1 m)
- One piece of wood half the size of the longer two pieces for every A-frame created (recommended 50 cm)
- String
- Nails
- Hammer
- Pen or pencil
- Fist-sized rocks

## DURATION



## KEY CONCEPTS

- Gardeners who plant on steep slopes face problems with severe erosion. Erosion carries away nutrient-rich topsoil through rain and wind, leaving behind poorer quality subsoil.
- Gardeners have used terracing for centuries, but terracing can be made more effective by placing the terrace along the contours of a landscape and by reinforcing the outer wall of a terrace with thick grasses.

## TRAINING AGENDA

1	Understanding terracing	 PRACTICAL ACTIVITY	1 hour
2	Using contours to build effective terraces	 PRACTICAL ACTIVITY	1.5 hours

# 1. Understanding terracing

## PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Gardeners share knowledge of terracing techniques using a soil mound that helps them visually understand.

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**FACILITATOR PREPARATION:** In advance, prepare a soil mound. The soil mound should be at least 50 cm high and wide.

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**MATERIALS NEEDED:** A jug or jerry can of water for the demonstration

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**STEP 1.** Explain to gardeners that the session is about sharing knowledge around terracing techniques. Gather gardeners around the soil mound and ask them to gather sticks and put them on the mound to represent plants.

**STEP 2.** Ask gardeners what happens to soil on slopes when it rains. After gardeners give their answers, pour a jug or jerry can of water over the mound and observe what happens. Ask gardeners to share their observations.

**STEP 3.** Ask gardeners how they would address this problem. If they live in an area with steep slopes they are likely to have knowledge of terracing techniques. Ask gardeners to demonstrate terrace building on the soil mound and explain what they are doing and why.

**STEP 4.** Pour water over the terraced soil mound and ask gardeners to observe what happens and share their observations.

**STEP 5.** Ask gardeners to summarise key points about terracing and write them on a flipchart. Elicit any key points that gardeners may have missed.

**STEP 6.** Demonstrate step by step how to build a terrace by building a mini terrace on the soil mound. Point out key points as you go along.



## 2. Using contours to build effective terraces

### PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners learn how to use contours to improve their terrace building.

**FACILITATOR PREPARATION:** Identify a slope on which to mark out contour lines. Review the Key Messages about contour lines in Establishing Your Garden before the session.

### MATERIALS NEEDED:

- Two pieces of wood exactly the same size for every A-frame created (recommended 1 m)
- One piece of wood half the size of the longer two pieces for every A-frame created (recommended 50 cm)
- String
- Nails
- Hammer
- Pen or pencil
- Fist-sized rocks

**STEP 1.** Gather gardeners at a site with a steep slope where they may practice marking out contour lines.

**STEP 2.** Demonstrate to gardeners how to build an A-frame.

**STEP 3.** Have gardeners mark out a few contour lines where they may start digging a terrace. Contour lines should be marked out 10–12 meters upslope or downslope from each other to allow enough space for each terrace.

**STEP 4.** Gardeners do not have to dig each terrace to completion, but make sure participants understand how terrace building would proceed after marking out contour lines.



### HOW TO

### BUILD A TERRACE

1. Use an A-frame to mark out the contours of a slope.
2. One meter deep trenches are formed along the contours of a slope. Soil from these trenches is thrown upward to form banks along the edge of the upper terrace.
3. Terraces should be made level as much as possible.
4. Trenches can be dug every 10–20 m to form a new terrace.
5. Over time, the banks on the outer edges of the terrace will even out. They can be planted with grasses to prevent downward erosion. It is best to plant thick grasses that can be used as animal fodder. One example is vetiver grass, which has very deep roots. Bananas or yams can be planted in the trenches of the terraces where water will collect. Trees along the sides of the terrace will further prevent erosion.
6. Terraces must be maintained by throwing soil back onto the uphill terrace as necessary.



### Specialized Garden Designs

# Keyhole gardens



# Keyhole gardens

## LEARNING OBJECTIVE

Gardeners will understand the concept of a key hole garden and when it is useful. They and will also practice building a keyhole garden.

## MATERIALS NEEDED

- Flipchart and markers
- Lots of high quality soil and compost
- Brick, stone or metal for the outer walls
- A sheet of wire mesh to create a cylinder about 30 cm in diameter or wood poles if wire mesh is not available
- Pegs and a string
- Stones, branches, twigs for the bottom of the garden
- Water
- Mulching materials
- Vegetable seeds and/or transplants
- Local tools such as spades, axes, and hoes



## DURATION



## KEY CONCEPTS

- Keyhole gardens require upfront time, labor, and materials and are best used when gardeners do not have arable land, so must create it.
- The plants in a keyhole garden are elevated, which makes them suitable for people with disabilities.
- Keyhole gardens should be used when gardeners can identify a challenge that can be solved by using the keyhole garden design.

## TRAINING AGENDA

1	Is a keyhole garden right for you?	 DISCUSSION	1 hour
2	Building a keyhole garden	 PRACTICAL ACTIVITY	2.5 hours

# 1. Is a keyhole garden right for you?

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn what a keyhole garden is and if it is a suitable solution for their gardening problems.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Discuss with gardeners the key characteristics of a garden bed.
2. Draw a picture of a keyhole garden and discuss each individual component of the garden design with gardeners. Ask gardeners to brainstorm how each component helps create a suitable environment for plants to grow.
3. Discuss with gardeners what materials and labor are needed to construct a keyhole garden and what maintenance they might need to be done the following season and each subsequent year.
4. Ask gardeners if the keyhole garden helps them solve any problems they may currently have with growing vegetables.
5. Finish the discussion by brainstorming a list of locally available materials that would be suitable for building each component of a keyhole garden.

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## KEY MESSAGES

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### ARE KEYHOLE GARDENS RIGHT FOR YOU?

Keyhole gardens require a lot of upfront time, labor, and building material. They are best used in situations where gardeners do not have arable land in which to grow vegetables. The plants in a keyhole garden are elevated above the ground, which also makes them suitable for people with disabilities. If keyhole gardens are built to the right height and contain a lot of rich soil and compost, they can produce an abundance of vegetables in a very small space. However they require yearly maintenance to repair broken walls and replace soil nutrients that were harvested. The central "compost pit" must be maintained and soil amendments added to counteract the soil settling over time. Prior to building a keyhole garden, evaluate gardeners' resources and access to land to ensure that other garden bed designs are not more appropriate. Check in with gardeners to confirm their interest in maintaining the keyhole garden structure throughout the course of its lifetime.



## 2. Building a keyhole garden

### PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Gardeners will gain practical experience of building a keyhole garden.

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**FACILITATOR PREPARATION:** Identify a piece of land where the keyhole garden can be placed and gather gardeners there. Ensure that all building materials have been collected in advance. It is essential that soil used in the keyhole garden is of the best quality, therefore make sure enough organic material is available to properly fill the central circle and the inner layer of the keyhole garden. This might mean you need to start locating good soil or building compost piles many months in advance to prepare for building the keyhole garden.

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**MATERIALS NEEDED:**

- Brick, stone or metal for the outer walls
  - A sheet of wire mesh to create a cylinder about 30 cm in diameter or wood poles if wire mesh is not available
  - Pegs and a string
  - Stones, branches, twigs for the bottom of the garden
  - Water
  - Mulching materials
  - Vegetable seeds and/or transplants
  - Local tools such as spades, axes, and hoes
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**STEP 1.** Gather gardeners at the site where the keyhole garden will be constructed.

**STEP 2.** Explain the materials gathered to the gardeners and what they will be used for.

**STEP 3.** Assign gardeners to different tasks and construct the keyhole garden.

**STEP 4.** Discuss with gardeners what should be planted where to make the best use of planting space in the keyhole garden. Plants that are more frequently harvested or are harvested quickly can be planted on the outer rim of the garden, whereas plants that require longer to mature can be placed towards the inner circle of the garden.



## HOW TO

## BUILD A KEYHOLE GARDEN

1. Determine a suitable place for your keyhole garden, taking into account hours of sunlight, access to water, and security of the garden structure.
2. Using pegs and string, mark two nesting circles: One 2 m (6 ft) in diameter and one 30 cm (1 ft) in diameter.
3. Mark out where the entrance of your garden should be, by leaving a wedge shape or "keyhole" that goes from the outside edge of the widest circle to the center. This allows gardeners to access the middle of the structure.
4. Create your outer structure by building a wall out of brick, stone or metal. Build up the wall until it is about 1 m (3 ft) high.
5. Use the sheet of wire mesh to create a cylinder about 30 cm in diameter, or make a rough basket cylinder from wood poles and dried grasses.
6. Set the cylinder in the center of the circle and put a layer of stones and twigs on the bottom for drainage.
7. Add a layer of wood ash to provide potassium to the soil and an extra layer of grass retains the moisture.
8. Add soil on top of the wood ash. Fill nearly to the top, making sure the soil slopes down from the center to the garden edges.
9. Fill the compost basket with raw vegetable scraps, coffee grounds, eggshells, grass, leaves.
10. Vegetables and herbs that will be picked often should be planted around the edges of the garden.
11. Plants that are harvested once, such as carrots and beets, should be planted toward the center.
12. Water the garden by pouring water into the composting cylinder.



# Understanding and Identifying Healthy Soils



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will understand the importance of healthy, living soils and learn a series of simple steps to test a soil's health.

## MATERIALS NEEDED

- Flipcharts and markers
- Spades and hoes
- String or tape measure
- Notebooks and pens for gardeners





## DURATION



## KEY CONCEPTS

- A healthy, living soil is key to growing healthy plants. If our soil is not healthy, our plants will be stunted and will not yield well.
- We can easily test our soils to see if they are healthy or not.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 mins
2	Why is a healthy soil so important?	 DISCUSSION	1 hour
3	How can you tell if a soil is healthy? Simple soil testing techniques	 PRACTICAL ACTIVITY	1.5 hour
4	Closing discussion	 DISCUSSION	10 mins

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

## 2. Why is a healthy soil so important?

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Participants will reflect on the importance of healthy soil and relate it to their own experiences with staying healthy.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask participants to silently reflect on what the words 'soil health' mean to them—abundant crops or lots of earthworms for example.
2. Have participants discuss in pairs why a healthy soil is so important. Ask participants to share their reflections with the larger group and note the answers on a flipchart.
3. Using the pairs that worked together on the last question, put two pairs together so that they are now small groups of four. Ask the group to think about:
  - How healthy people can become sick but can also get better by eating nutritious food. Does the same apply to our soils?
  - If so, what can we give soils that are 'sick' so that they can get better?
  - How can we maintain our soils' health by feeding it nutritious food?
4. Ask participants to share their reflections. Note them on a flipchart.

### KEY MESSAGES

- A healthy soil is a living soil. Healthy soil is crawling with earthworms, beetles, ants, and many other organisms. Some organisms, called microbes or microorganisms, are too small for humans to see, but you know they are there if you see decomposing leaves or roots. Many microbes and other forms of soil life live in dark, loamy soils.
- A healthy soil is key to growing healthy plants with lots of nutrients. If our soil lacks nutrients, then our crops will be stunted and will not yield well.
- We can improve degraded soils by ensuring they are always covered by either dead or living mulch and continuously feeding our soil with lots of organic matter, such as well-rotted manure. It takes many seasons of work to improve the health of a degraded soil, but improvements in yield can be seen right away.



# 3. How can you tell if a soil is healthy? Simple soil testing techniques\*

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will learn simple, no-cost soil testing techniques to help them distinguish healthy and non-healthy soils. They will be able to apply these techniques easily in their home gardens and fields. Through the testing process they will understand the components of a healthy soil and start to understand how to build and maintain healthy soils.

**FACILITATOR PREPARATION:** Identify a suitable garden site where gardeners can gather. Before the training, identify a site where gardeners can test two patches of soil: one that is covered in organic matter and relatively healthy and one that is exposed to the sun and is degraded. This activity can be done any time of the day, however the soil temperature test is most effective once the sun is up and has warmed the soil.

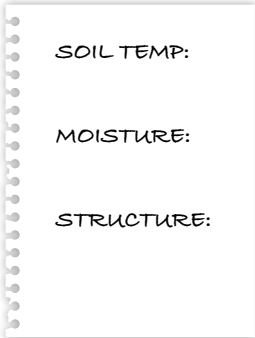
**MATERIALS NEEDED:**

- Spades and hoes
- String or tape measure
- Notebooks and pens for gardeners

Exposed Soil



Covered Soil



**STEP 1.** Gather participants at the designated area. Explain to participants that they are going to go through some simple soil testing steps they can use at home to help them evaluate if a soil is healthy or not.

**STEP 2.** Mark out two equally sized squares on the ground, one on the exposed soil and one on the covered soil. The squares should be around 50 cm on all sides. Explain to gardeners that you are going to compare the characteristics of the exposed soil to the characteristics of the covered soil.

**STEP 3.** Before digging, take the soil's temperature in each square. Ask participants first to put their hand or wrist on the exposed soil - what is the temperature? Then ask them to feel the temperature of the covered soil and compare.

**STEP 4.** Split participants up into two groups and assign them to a square. Have the groups carefully remove the soil from the square until there is a 30 cm deep hole. This is the upper part of the root zone. Try as much as possible to carefully lift the soil out of the hole to preserve its structure. Keep the soil off to one side.

*\*Adapted from the Permaculture Association UK Soil Test Handbook*

**STEP 5.** Have the participants gather information about the soil's smell, structure, texture, moisture content, the presence of soil organisms such as earthworms and other animals and depth of topsoil in their square. Each group should assign a notetaker to record the information found by the group.

### **Soil temperature**

Record if the soil surface was cool, warm, or hot.

### **Smell test**

Ask participants to grab a handful of soil and smell it. Record if the soil has no smell, an earthy or sweet smell, or a bad smell.

### **Structure test**

Remove a large clump of soil and examine it to see if it has any air pockets or pores running through it. Break large clumps apart to observe the structure of the soil inside. Note how common it is to find large clumps with lots of easy-to-see pores running through them. Pull out a few examples to compare to the other soil from the other square later.

### **Texture test**

Ask participants to examine the texture of the soil by taking a handful of soil and squeezing it in their hand. Does it fall apart as soon as you open your hand or does it hold its shape? Does it crumble if you poke it lightly or does it still stick together?

### **Moisture test**

Ask participants to take another handful of soil and squeeze it. Does the soil have little moisture, no moisture or a lot of moisture?

### **Soil life test**

Ask participants to sift through the soil they excavated from the hole and record any signs of soil life. It would be best if they count and record the number of different soil organisms, such as earthworms or other animals, they find to compare to the other group.

### **Depth of topsoil**

After participants have sifted through the first 30 cm of soil in their square, ask them to measure the depth of the topsoil using a string or tape measure and record it. The topsoil depth could be very shallow (<1 cm) or very deep (>30 cm). A gardener will recognize when the soil starts to look and feel different. The subsoil will be more compact and probably a different color than the topsoil.

**STEP 6.** Gather participants together at one square and have that group report their findings. Switch groups so that both groups can see the soil excavated from each square.

**STEP 7.** Move away from the squares to a place where participants can sit. Discuss each concept with participants:

### **Soil temperature**

- What happens when the soil is too hot? Compare with a child with fever.
- What can we do to ensure the soil does not get too hot?

### **Soil smell**

- What is the smell of a healthy soil?
- What does it mean if there is no smell?
- What can you do if there is no smell?
- What does it mean if the soil smells bad?
- What can we do about it if the soil smells bad?

### **Soil structure**

- What is the structure of a healthy soil?
- How does stepping on wet soil affect a soil's structure?
- What soil structure is best for growing plants? Why?

### **Soil texture**

- What is the texture of a healthy soil?
- What soil texture is best for growing plants? Why?

### **Soil moisture**

- Why is soil moisture important?
- How would soil moisture differ if soil is covered or exposed?

### **Soil life**

- Why is soil life important?
- Why do some soils have a lot of soil life and others have very little?
- What can we do to encourage more soil life?

### **Depth of topsoil**

- Why is the depth of topsoil important?
- Is there anything we can do to build more topsoil?

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## KEY MESSAGES

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### Soil temperature

The surface of the soil should not feel too hot or too cold. Below the surface, the soil should feel slightly cool to the touch. Soil that exposed to the hot sun often gets too hot, just like someone with a fever. If the soil gets too hot, it is difficult for young plants to grow. Soil organisms, such as earthworms, leave in search of cooler soil. Covering soil with mulch or keeping living plants growing in the soil is a first step towards preventing soils from becoming too hot.

### Soil smell

Healthy soil should have an earthy, slightly sweet, smell. If the soil smells earthy, sweet, or fresh this indicates a healthy microbe community living in aerobic (plenty of oxygen) conditions. If the soil is sandy and dry, it will have little or no smell at all. This soil needs lots of organic matter added to it. If the soil has a sour or putrid smell, then it is most likely frequently waterlogged and it may be easier to find another spot instead. If the soil has a strong chemical smell, it is best not to use it for a garden site.

### Soil structure

Healthy soil has pores and air pockets running through it. These are created by soil life burrowing through soil. These pores act as water channels, so water can infiltrate into all parts of the soil equally. They also create air pockets so that plant roots can access air, and soils can dry evenly. When soils do not contain enough organic matter, there will be few burrowing soil organisms living in the soil who can create pores and any pores created can easily collapse. Gardeners can also easily destroy pores by applying heavy pressure on the top of soil when walking or driving over soil or by digging in the soil too much.

### Soil texture

Healthy soil holds its shape after you squeeze it and crumbles if you poke it lightly. This soil type is called loam. Loamy soil contains just enough clay and silt to make it stick together but not make it too compact. Loamy soils are good for growing plants because they act as a “sponge” that lightly retains moisture so that plants can easily use it. A soil that sticks together when wet has a lot of clay in it. Both loamy and clay soils are rich in nutrients and contain lots of organic matter. Clay soils will not drain easily, so it is important to have good drainage systems when using these soils so plant roots are not waterlogged. A soil that falls apart as soon as you open your hand is a sandy soil. This soil drains water quickly—sometimes too quickly for plants to use it—and is low in nutrients. It also needs a lot of organic matter dug into it to provide nutrients and improve its “sponge-like” texture.

### Soil moisture

If there is no moisture when you squeeze the soil, and the soil does not stick together, then it is too dry. This soil needs lots of organic matter to retain some moisture in order for plants to grow well. If there is no water coming out when you squeeze the soil, but you can sense moisture and the soil sticks together, then the soil is moist. This is great for growing plants. If you see water coming out when you squeeze the soil, then the soil is wet. Soil that is too wet will cause plant roots to rot and deprive them of air.

### Soil life

A healthy soil should have lots of soil life, not just earthworms but lots of different creepy crawlies, such as termites or ground beetles. These organisms in the soil helps plants decompose so the nutrients in them can be returned to the soil. As insects move through the soil, they move nutrients from the bottom layers of the soil to the top layers, which also replenishes soil nutrient levels. Insects and earthworms also create pores in the soil that facilitate water movement and root growth. It is important not to disturb these pores by walking on freshly dug garden beds!

Even though we cannot see many small organisms when we are gardening, we can be pretty sure that if we see lots of earthworms, our soil will also contain many small organisms. These small organisms (also called microbial organisms or microbes) are enriching our soil with many nutrients and are even helping us fight off many soil diseases. Soil organisms thrive when soil is moist and rich in organic matter.

### Topsoil

Topsoil is the uppermost layer of soil. It was formed by the slow decomposition of the plants that have grown on it. It takes a long time to build topsoil, but very little time for it to disappear once exposed to air, wind, and rain. Some topsoils can be very deep (>30 cm or more), while others very shallow (<1 cm). The deeper the topsoil, the better the plant growth. Although it takes many years to increase the depth of a soil's topsoil, continuous additions of organic material and minimum tilling will slowly improve the topsoil and make it easier for gardeners to grow vegetables.

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## 4. Closing discussion

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Invite participants to share what they have learned about soils.

10 min



# Building Healthy Soils



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will understand how to improve and maintain soil health using simple techniques.

## MATERIALS NEEDED

- Flipchart and markers
- 1 small bucket of finished compost
- Small bag of water-soluble inorganic fertilizer, like urea
- 2 cups or empty water bottles
- Water


## DURATION



## KEY CONCEPTS

- Soil health can be maintained or improved by consistently using multiple good soil management practices. Each practice on its own is helpful, but soils will be most protected when multiple practices are used together.
- Even severely degraded soils can be restored to good health by adding compost or well-rotted manure and keeping soils moist and covered at all times.
- Inorganic fertilizer contains nutrients that plants need but must be applied carefully in order not to harm the soil and its living organisms.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 mins
2	Gardening practices that improve and maintain soil health	 DISCUSSION	1 hour
3	How to restore degraded soils back to health	 DISCUSSION	15 mins
4	Understanding inorganic fertilizers	 DISCUSSION	45 mins
5	Closing discussion	 DISCUSSION	10 mins

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today’s topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator’s Guide: Encouraging Learning through Participant Engagement.

# 2. Gardening practices that help improve and maintain soil health

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will discuss practices that help improve and maintain soil health using locally available resources.

**MATERIALS NEEDED:** Flipchart and markers






1. On your flipchart, draw a grid like the one below. Going up the left side of the paper, write “What We Can Do” and then list various soil management practices. Across the top of the paper, write “The Result We Can Get” and list desirable soil characteristics. You may wish to do this before gardeners arrive.

What can we do?	The result we can get					
	Not-too-hot temperature	Earthy, sweet smell	Lots of pores and air pockets	Moist, but not wet	Abundant soil life	Deep topsoil
Apply mulch	X			X		X
Add compost and other organic matter		X	X	X	X	X
Use cover crops	X	X	X	X	X	X
Reduce compaction	X	X	X	X	X	
Plant a diversity of crops					X	X

2. Ask gardeners to break into pairs or small groups to think about how each soil management practice will affect the soil. What outcomes can they expect from consistently using each practice?
3. Starting with “applying mulch,” have each small group report their thinking about one soil management practice to the larger group. Fill in the grid on your flipchart with an “X” when the larger group agrees that the practice will help build the desired soil characteristic.
4. Have the small groups take turns presenting until each soil management practice has been covered.
5. Ask gardeners to describe any other soil management practices they have used that they find beneficial. List these practices below the other soil management practices and discuss with the group how they could contribute to healthier soils.

## KEY MESSAGES

Soil health can be maintained or improved by consistently using multiple good soil management practices. Each practice on its own is helpful, but soils will be most protected when multiple practices are used together.

What can we do?	The result we can get					
	Not-too-hot temperature	Earthy, sweet smell	Lots of pores and air pockets	Moist, but not wet	Abundant soil life	Deep topsoil
Apply mulch 	<b>X</b>			<b>X</b>		<b>X</b>
Add compost and other organic matter 		<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Use cover crops 	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Reduce compaction 	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	
Plant a diversity of crops 					<b>X</b>	<b>X</b>

### Why do we mulch?

Mulch can be dried leaf litter, dried grasses, dried crop residues, or paper spread on the soil in between crops. Mulch forms a protective covering over the soil that reduces evaporation, so soils remain moist for longer, and regulate soil temperature. Mulches help control soil erosion by cushioning the impact of raindrops and slowing runoff. They suppress weeds by shading them out and will enrich soils as they decompose.

### Why do we apply compost and other organic matter?

Compost and other forms of organic matter will return nutrients to the soil that otherwise will be lost. Organic matter is any plant material, such as crop residues, kitchen waste, leaf litter, or dried grasses. Manure and urine from plant-eating animals are also organic matter. Enriching the soil with organic matter will improve the soil's structure and its ability to hold water. Soils that contain a lot of organic matter will have an earthy, sweet smell. Organic matter also provides food and habitat for many forms of soil life. Thus, adding organic matter can improve soil life. Over time, topsoil that is enriched with organic matter will get deeper. Soils have an amazing ability to absorb organic matter; it is nearly impossible for a gardener to add too much organic matter to their soil!

### Why do we use cover crops?

Cover crops are often leguminous plants that pull nitrogen, an important plant nutrient, out of the air. When parts of these plants die, this nitrogen is added to the soil. Cover crops keep beds “covered” because they are planted in between cropping seasons when garden beds are normally bare. This reduces erosion and regulates soil temperature. The roots of cover crops will slowly add nutrients to soil, create pores for water infiltration, and provide food for soil life as they die. This can create a more porous soil texture and a deeper topsoil over time.

### Why do we reduce soil compaction?

Soils can become compacted when animals and humans walk on them. When soils are compacted, it becomes harder for plant roots to grow and for water to penetrate the soil surface. A sign of soil compaction is when water is pooling on top of the soil instead of infiltrating. A compacted soil is hard to dig and can be either very wet or dry. When we reduce compaction by not walking on our beds, we preserve the soil pores created by roots and insects. These pores allow plants to easily access water and air. It also reduces stress on plant roots so that they can easily grow.

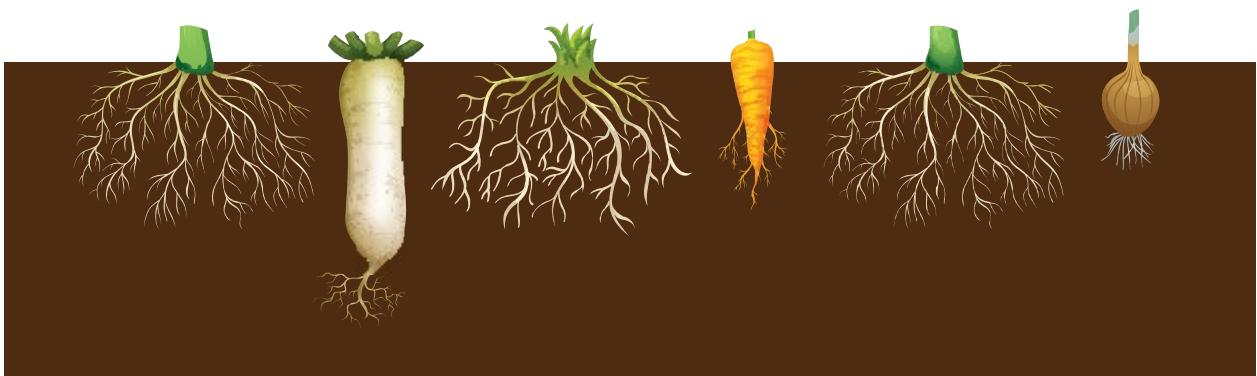
### Why do we plant a diversity of crops?

Each vegetable crop uses soil nutrients and soil space differently. Some plants use more of one particular nutrient than others and are considered “heavy feeders,” while others are “light feeders.” The rooting system of each crop is also different. Some vegetable crops have fibrous root systems that form a web of small roots that use nutrients from the upper portion of the soil, while others have a taproot system that pulls nutrients from deep within the soil profile.

When gardeners grow a diverse set of plants, they can use more of the nutrients already within soil and reduce competition for soil space between their crops. This leads to more productivity, but it can also enrich the soil. When plant roots grow, they create pores of different sizes and at different depths. When plant roots die, they add organic matter to the soil and encourage a diversity of soil life to multiply within the soil. This can create a more porous soil texture and a deeper topsoil over time.

## INTERSPERSING ROOT TYPES

Alternating a row of fibrous roots followed by a row of taproots or bulbs (repeated across the bed) can use different zones within the soil.



# 3. How to restore degraded soils back to health

## INTERACTIVE DISCUSSION

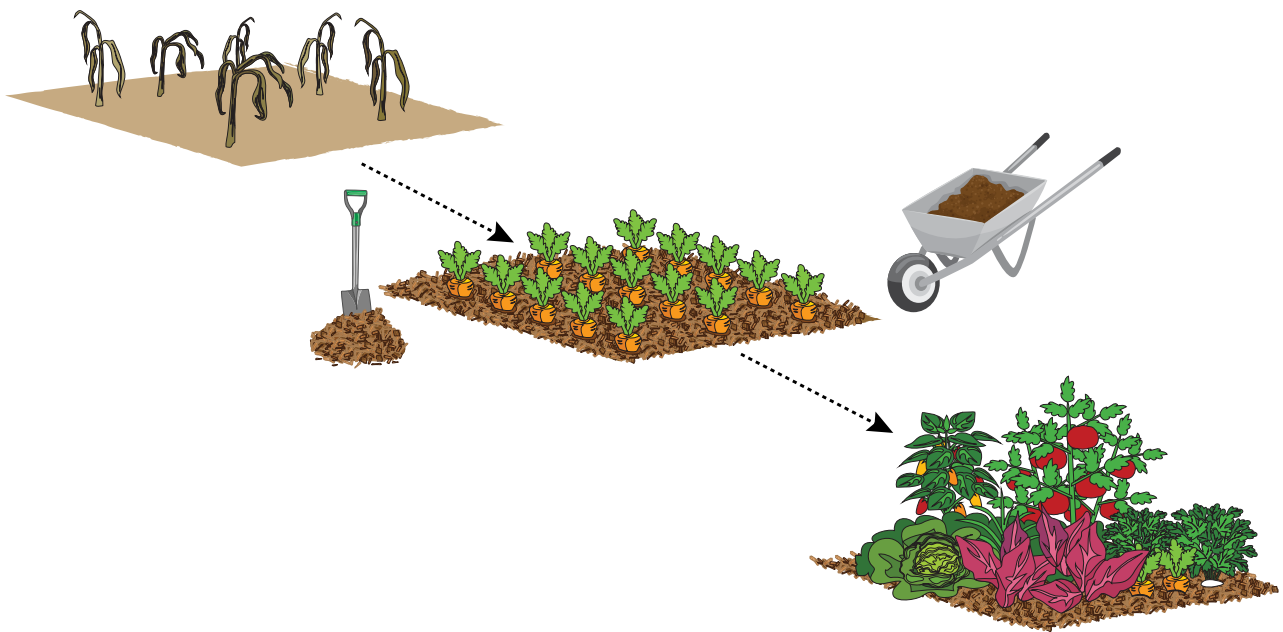
**GOAL OF DISCUSSION:** Gardeners will discuss how these soil improvement methods can be used over the long term on degraded soils if needed.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners to share their opinions: have they ever seen soil health improve over time or have they only seen it get worse? Ask gardeners to raise their hands to show how many think that poor soils only become worse over time. How many think that poor soils can improve over time? Why?
2. Tell gardeners that even poor soils can improve if they are taken care of. A household that lives on a plot of land that has very poor soil might want to invest time and energy into improving the health of the soil in a spot where they intend to garden long term.
3. Discuss the steps of "nurturing" poor soils back to good health. Why is it important to carefully pick a small plot of land to improve?

## KEY MESSAGES

Even severely degraded soils can be restored to good health by adding lots of organic matter in the form of compost or well-rotted manure and keeping soils covered and moist. It will take many years of consistent effort to rebuild the health of degraded soils, but it might be very beneficial for gardeners who do not have easy access to good soil. Gardeners should start by picking a small plot of land that will be their garden bed for many years to come. Starting small is important! Multiple wheelbarrows of compost or manure can be used in a 1m x 1m plot each year. The more compost or well-rotted manure they can apply to the same plot of land, the better. They may wish to apply compost several times a year. The soil surface should be covered all year with either crops, mulch, or cover crops and extra water applied periodically to help decomposers. Gardeners will see yield benefits during the first season. After several years of effort, they will be able to see a clear difference in the soil's color and structure. This can be a very productive place to have a continuous supply of vegetables for household consumption.



# 4. Understanding inorganic fertilizer

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will have a better understanding of inorganic fertilizers and how to apply them correctly in combination with organic methods.

**MATERIALS NEEDED:**

- Flipchart and markers
- 1 small bucket of finished compost
- Small bag of water-soluble inorganic fertilizer, like urea
- 2 cups or empty water bottles
- Water

1. Ask participants to share any experiences they have using inorganic fertilizer for vegetable or other crops. Have participants explain what steps they took in as much detail as possible. Gardeners may have a mix of positive and negative stories to share.
2. Explain to gardeners that inorganic fertilizers can be beneficial for their gardens, but only if they are used properly. Gardeners should decide for themselves if they want to use them or not. They may choose to first buy a very small amount of fertilizer so they can experiment with applying what they learned in this lesson. It is possible that participants will want to join together to purchase fertilizer and share the cost between them. If it is their first time using inorganic fertilizer, recommend that they start small so they can learn as they go.
3. Give gardeners a definition for inorganic fertilizers and ask gardeners to name some locally available inorganic fertilizer products. Write these names down on your flipchart. If gardeners name other products, such as pesticides or herbicides, write these down in another list so gardeners can see the difference.
4. Draw two columns on your flipchart. At the top of one column, write "Organic fertilizers" and at the top of the other write "Inorganic fertilizers." Discuss with gardeners how organic and inorganic fertilizers are different.
5. As you discuss the characteristics of organic and inorganic fertilizers, do some demonstrations to further gardeners' understanding of the differences between fertilizers.
6. Ask gardeners to discuss why they think using organic and inorganic fertilizers together can achieve good results.
7. Write the six steps to properly apply inorganic fertilizer on your flipchart and discuss with gardeners.
8. Revisit some of the negative stories that gardeners shared in the beginning of the session. Do gardeners have any ideas for why they might have seen negative results when using inorganic fertilizer in the past?

## KEY MESSAGES

Inorganic fertilizers are concentrated sources of nutrients that plants need to grow. The macronutrients provided by inorganic fertilizer are nitrogen, phosphorus, and potassium and are often abbreviated as N (nitrogen), P (phosphorus), and K (potassium). Inorganic fertilizers can also contain micronutrients, which are essential to plant growth but only used in small amounts. Some micronutrients that can be found in inorganic fertilizers include calcium (Ca), magnesium (Mg), sulphur (S), boron (B), zinc (Zn), copper (Cu), manganese (Mn), iron (Fe), chloride (Cl), and molybdenum (Mo). These nutrients are also found naturally in soils, compost, and manure. Inorganic fertilizers provide these nutrients in high doses and in forms that are easily taken up by plants. When used appropriately, inorganic fertilizers can help make sure that plants stay healthy by ensuring they receive enough of these important nutrients. Like people, plants also require a diverse diet to make sure they get all the nutrients their bodies need. Inorganic fertilizers can provide some of these nutrients, but a gardener will need to provide other sources of nutrients to make sure plants are getting everything they need.

**MACRO**

<b>N</b> NITROGEN	<b>P</b> PHOSPHORUS	<b>K</b> POTASSIUM
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**MICRO**

<b>Ca</b> CALCIUM	<b>Mg</b> MAGNESIUM	<b>S</b> SULPHUR	<b>B</b> BORON	<b>Zn</b> ZINC	<b>Cu</b> COPPER	<b>Mn</b> MANGANESE	<b>Fe</b> IRON	<b>Cl</b> CHLORIDE	<b>Mo</b> MOLYBDENUM
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## Common Inorganic Fertilizers

Fertilizer Name	Nutrients
Urea	Nitrogen (46%)
Diammonium phosphate (DAP)	Nitrogen (18%) and Phosphorus (46%)
Rock phosphate	Phosphorus (34%)
Single Superphosphate (SSP)	Phosphorus (7-9%), Calcium (18-21%), Sulphur (11-12%)
NPK	Look at the bag to see the percentages of NPK for that fertilizer blend. The three numbers are listed in the order of N-P-K, so if you see 45-16-16, then that bag contains 45% N, 16% P, and 16% K.
Agricultural lime (often called gypsum)	Calcium (30%), Sulphur (24%). Agricultural lime also can improve acidic soils, which can make many nutrients more available to plants.

## What are some differences between organic and inorganic fertilizer?

	Organic fertilizers	Inorganic fertilizers	Demonstration
<b>What nutrients are provided?</b>	A mixture of nutrients, but the amount of each individual nutrient can vary dramatically depending on the quality of the compost. This is why it is important to include nutrient-rich material in your compost, such as kitchen waste and animal waste, so that the nutrient content of your compost is as high as possible.	Contain a specific blend of macro-nutrients (nitrogen, phosphorus, and potassium) and/or micro-nutrients (calcium, sulphur, magnesium, zinc, and so on). If a plant is deficient in one or more of these nutrients, it will benefit from the application of an inorganic fertilizer.	Show gardeners the illustration of fertilizer labels and discuss how to tell which nutrients are contained in each fertilizer type.
<b>How are nutrients released?</b>	Nutrients are released slowly and consistently.	The nutrients in inorganic fertilizers can easily dissolve in water. This makes them very accessible to plant roots right after they are applied, but rain or irrigation water will keep leaching, or pushing, them further down in the soil until eventually they are beyond the root zone.	Take two cups or water bottles. In one, insert some compost and, in the other, insert some water-soluble inorganic fertilizer like urea. Add water to each cup or water bottle and show gardeners how the inorganic fertilizer will dissolve very quickly in the water, but the compost will not. Talk about what might happen to inorganic fertilizer when it rains or gardeners irrigate their fields.
<b>Do they help soils develop good structure?</b>	Organic fertilizers are essential to improving soil structure and water holding capacity. As organic material decomposes, it adds a "stickiness" to the soil that traps water and nutrients.	Adding inorganic fertilizer to the soil can help plants and their roots grow better. If this material is returned to the soil, it can help build soil structure. But adding inorganic fertilizer without reincorporating plants into soil will not build soil structure. In fact, if inorganic fertilizer is used in sandy or degraded soils, it will easily wash away.	Have gardeners each squeeze a sample of compost in their hands and discuss how this "stickiness" might benefit soils over time.
<b>Does it matter how I apply the fertilizer?</b>	Organic material should be fully decomposed so that the nutrients are available to plants. Applying raw manure to soils can injure plant roots and kill plants.	Over-applying inorganic fertilizer can injure plants and kill microorganisms in the soil. Avoid direct contact between inorganic fertilizers and seeds. Inorganic fertilizers can be harmful to human health, so avoid touching fertilizer with uncovered skin and keep them away from children.	Show gardeners in the palm of your hand the amount of inorganic fertilizer that should be used per plant (half a bottle cap) and discuss how inorganic fertilizer needs to be applied so that nutrients can reach plant roots when dissolved. Contrast this with how it is common to find young plants growing right in finished compost piles.



## Why do organic and inorganic fertilizers work best when used in combination?

Plants need a combination of the right environment to grow in and nutrients that help them build healthy tissue. Organic materials help soils develop good structure and maintain water so that nutrients can be slowly released to plants, but they may not contain enough nutrients for continuously high yields. Inorganic fertilizers can supply these nutrients, but do not build soil structure in the same way that organic fertilizers do. When used together, plants can really flourish because they have everything they need in abundance. Inorganic fertilizer can also compensate for removal of harvested produce from the farm. When gardeners are harvesting and then eating large amounts of produce, many of the nutrients from the soil leave with the harvest. These nutrients need to be returned to the soil through compost and inorganic fertilizers.

## How do we properly apply inorganic fertilizer to our home gardens?

1. It is challenging for home gardeners to know what nutrients their soil needs most. For this reason, it is recommended that gardeners choose NPK if it is available because it supplies all three major nutrients. If NPK is not available, they should choose a fertilizer that contains nitrogen. They should confirm that the label says "nitrogen" or "N" in the nutrient ratio before buying.
2. Prepare your garden bed with organic material as recommended. Organic materials can be used without inorganic fertilizer, but inorganic fertilizers should preferably be used in combination with organic fertilizer.
3. If direct seeding, draw two lines 7–10 cm away from the planting line on either side. Sprinkle inorganic fertilizer in the lines at the same rate as you would apply seeds. Pinch the line to cover the fertilizer with soil.
4. If transplanting seedlings, draw a ring that is 7–10 cm away from the transplant. Sprinkle half a bottle cap (around 3–4 grams) of fertilizer in the ring and pinch the ring closed with your fingers to cover the fertilizer.
5. It is very easy to apply too much fertilizer, so do not 'top-up' your application. If you are concerned about soil fertility, apply more organic fertilizer instead.
6. It is very important that the seeds or young roots not directly touch inorganic fertilizer to avoid being "burned."

## 5. Closing discussion

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1. Ask gardeners to discuss in pairs the key points about how to build and maintain long term soil health.
2. Ask each pair to share with the group.

10 min

# Planting Your Garden



Photo by Sheena Shah

# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will be able to think through important planting decisions and plant a nutritious, diverse home garden.

## DURATION



## MATERIALS NEEDED








- Flipchart and markers
- Large sheets of paper. Bring at least a few sheets for each gardener.
- Extra pens or pencils
- Locally available seeds
- Transplants
- String
- Jerry can or watering can
- Mulch
- Inorganic fertilizer (optional)



## KEY CONCEPTS

- There is no one way to plan your garden! Garden plans are flexible and meant to guide gardeners.
- Transplanting crops from a nursery into a garden bed can help gardeners make the best use of their garden beds.
- If crops are properly spaced in garden beds, then competition for light and root space is reduced.
- Staggered plantings allow crops to mature at slightly different times and extend the harvest season.
- Intercropping beds with two to three different crops may help gardeners use the bare space in their beds to grow more nutritious vegetables.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	Developing a garden plan	 DISCUSSION	30 min
3	Transplanting and direct seeding	 DISCUSSION	45 min
4	Spacing and staggering vegetables	 DISCUSSION	30 min
5	Intercropping a garden bed	 DISCUSSION	30 min
6	Planting a nutritious home garden	 PRACTICAL ACTIVITY	1 hour
7	Closing discussion	 DISCUSSION	10 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. Developing a garden plan

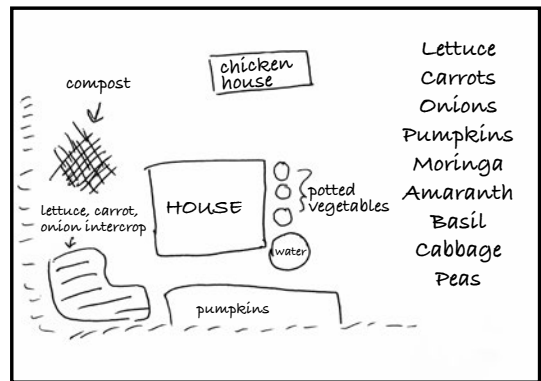
## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Participants are introduced to the idea of a gardening plan and how it may benefit them.

**MATERIALS NEEDED:**

- Large sheets of paper. Bring at least a few sheets for each gardener.
- Extra pens or pencils.

1. Ask gardeners why we would want to plan out what goes in our gardens before we plant them. With gardeners, list some of the reasons why we want to think through what we will plant before planting.
2. Tell gardeners that they are going to build a garden plan for themselves. Have gardeners draw a quick map of their garden space either on a large piece of paper or in their notebooks. They should include all the spaces they have available for planting in their map. They can even include spaces they intend to fallow this season because these can be planted with cover crops, covered with cardboard, or left weedy (cut weeds before seeds are produced though).
3. Write out some questions gardeners can ask themselves on your board or flipchart.
  - What does my household like to eat?
  - What do I like to sell?
  - What have I had success growing in the past?
  - What crops grow best during the upcoming season?
4. Split gardeners into groups of two or three and have them discuss the questions, writing down the list of vegetables they brainstormed on one side of their paper. Tell them to decide what they will plant from this list in each bed. They may decide to intercrop multiple vegetables within the same bed, or plant beds with one type of vegetable. They will probably need to make many versions of the map as their ideas change. Each gardener will produce their own map, although they will discuss ideas as a group.



## KEY MESSAGES

### Benefits of developing a garden plan

- Have all your resources (seeds, compost) together ahead of time or know where you will get them from.
- You can plant your garden in a way that helps you and your household always have foods you like to eat around. For example, you can plant some leafy greens at the beginning of the season and again in the middle of the season to ensure they are always available.
- You can know when you will have extra vegetables ready for harvesting so you can make a plan for how you will use them.
- You can make sure all garden beds are used in the best way possible.







## 3. Transplanting and direct seeding

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Review with gardeners best practices for transferring seedlings from nurseries to garden beds and direct seeding crops.

**MATERIALS NEEDED:** Flipchart and markers

1. Write "Direct Seeded," "Transplanted," and "Both" at the top of your flipchart and ask gardeners to name crops and place them in the proper column. Root crops should all appear in the "direct seeded" column, but other crops can appear in either the "transplanted" or "both" columns.
2. Focusing first on transplanting, discuss the reasons why a gardener would want to transplant seedlings from a nursery to a garden rather than direct seed.
3. Ask gardeners to share their past experiences transplanting seedlings from nurseries to garden beds. Write down the best practices and recommendations they share and add any best practices that were not mentioned.
4. Next discuss reasons for direct seeding crops.
5. Ask gardeners to share their past experiences with direct seeding crops, first focusing on large seeds like beans and then focusing on small seeds, such as carrots. Write down their best practices and recommendations and add any that were not mentioned.
6. Discuss the importance of thinning small-seeded crops with gardeners. Show gardeners the **Plant Competition Training Aid** and tell them that spacing plants too close together will cause competition, but spacing them too far apart will allow more weeds to grow and waste space in their garden bed.

	❌ INCORRECT	❌ INCORRECT	✅ CORRECT
Seedlings			
Mature plants			
	<i>Plants are too close - competing for resources</i>	<i>Plants are too far apart - wasting space and allowing room for weeds</i>	<i>Plants spaced correctly - small space between mature foliage</i>

## Why are some crops transplanted and others direct seeded?

**“Transplanting”** is when a gardener moves plants from the nursery to a garden bed to finish growing. Seedlings are first grown in a protected, fertile, and well-watered nursery or seed trays. This practice protects young seedlings from being eaten by pests (chickens, slugs, caterpillars) or damaged by heavy rains or wind. The gardener can choose to put the healthy seedlings in the best garden beds in order to improve their yields. The gardener will save on the cost of seeds and not waste garden bed space on seeds that never germinated.

Seven to 8 week-old seedlings, or plants with 4 to 5 leaves, are ready to be transplanted to the garden. Before moving plants, harden them off if they are in containers. **“Hardening off”** is when a gardener prepares a plant for moving to a different environment. Plants need to slowly adapt to an environment that has more sunshine or harsher winds or temperature, or they will suffer. Tender plants can be burned by the sun, the shock of cold or heat, or the wind. If plants change environments too quickly, some may die and others will have their growth set back by a few weeks while they recover and adjust.

The best way to harden plants is to put them outside for just a few hours and then bring them in at night. Each day, increase the number of hours they are exposed to sunshine. After 3 or 4 days, they will be ready for transplanting.

When transplanting, dig up roots with as little disturbance as possible. Keep soil around roots and break up any roots that have started to circle around each other so that roots can easily move vertically downwards. Move seedlings into garden beds as quickly as possible to avoid roots from drying out. Dig a small hole where the seedling will be placed and insert seedling so that it is again covered by soil up to where it was last covered. Gently push down on soil so that roots have good contact with soil and large air pockets are removed. Water transplanted seedlings so that soil settles around roots and roots stay moist.

**“Direct seeding”** is planting seeds directly into the soil. Some crops, like root crops such as carrots or short-duration crops such as kang kong, should be direct seeded because they do not do well when moved. A gardener may also wish to direct seed into a garden bed because they do not have time to build a nursery and transplant crops.

A rough rule is that seeds should be planted twice as deep as the seed’s width. That means that larger seeds, such as beans, will be covered by around 1 cm of soil, but very small seeds will only need a light dusting of soil to cover them. When planting very small seeds, it helps to mix the seeds with sand in a 1:3 ratio (1 part seed to 3 parts sand) to spread the seeds more evenly. This ratio can be modified after trial and error with different crops. Alternatively, farmers can broadcast very small seeds into a soil covered in 2–4 cm of mulch, such as paddy rice straw, to help distribute seeds evenly.

For garden beds, it is best if seeds are sown in rows rather than broadcast into the soil. This helps to remove weeds more easily, use mulch, and space vegetables so that all available bed space is used. The distance between rows should just allow plants to touch but not crowd each other. If gardeners are intercropping, they may choose to plant a different vegetable in between rows.

In order to reduce competition for each individual plant, the crops need to be thinned once seedlings have established. **“Thinning”** is when a gardener removes some of the baby plants from direct seeded rows to free up space for the remaining plants to mature without crowding each other. To thin, hold the plant between your forefinger and thumb at the soil level. Pull firmly to dislodge the entire plant from the soil by the root. Replace any soil that was removed from the roots of the remaining plants.

Begin thinning when plants are 10 cm tall. Remove the smallest and scrawniest plants from the garden, or those that are growing very close together, so that individual plants are at least a thumb’s-width apart from other plants.

Consider a second thinning when plants look like they will start to crowd each other, but before they actually do. For crops like leafy vegetables and carrots, the removed plants may be large enough to eat even if they are not full size yet.

## 4. Spacing and staggering vegetables in your garden bed

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn about how to space and stagger vegetables in a garden bed.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Discuss that proper plant spacing is important to reduce competition for light, water, and soil nutrients. Referring to the **Plant Competition Training Aid**, show gardeners that plants spaced too closely together can compete both above and below ground.
2. Ask gardeners how they would reduce competition for transplanted crops. How do they know how far apart to put seedlings?
3. Ask gardeners how they would reduce competition for direct-seeded crops. Discuss the strategies they would use for both large and small seeds.
4. Introduce the concept of triangle spacing and show gardeners the **Triangle Spacing Training Aid**.
5. Ask how many gardeners have ever sowed their vegetables slowly throughout the season to extend their harvest season and avoid situations where everything is ready for harvest at the same time. This strategy is known as "staggered planting." Encourage gardeners that have successfully extended their harvest season to discuss the strategy they used. Discuss specific examples of staggered planting, such as sowing half your cabbage seeds early in the season and half around two weeks later.

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### KEY MESSAGES

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#### Competition between plants

Plants all need light, water, air, and nutrients from the soil. When plants are growing too close together, they can block each other from freely accessing these elements. When plants are competing with each other for light, water, air, and nutrients, their growth will be slowed down and plants will be stunted. However, if plants are placed too far apart from each other, weeds will grow in the spaces between plants and wind may blow plants over more easily. Bed space is also wasted. Our goal is to have a full canopy: no empty space between fully mature crops, but also no crowding or overlap.

Competition between plants can be reduced by carefully selecting the right **distance between rows** and **distance between plants within a row** so that each bed has a full canopy.

To determine the distance between rows and plants within a row, gardeners should draw a loose circle in the dirt around a healthy, fully grown crop. Be sure to include the full plant and add some additional space so the circle is not drawn too tightly. Measure the diameter of the circle with a stick, string, or measuring tape. If you are triangle planting, this will also be the "between-plant" spacing.

#### The benefits of triangle planting

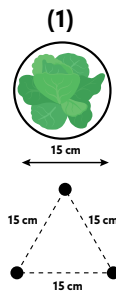
Triangle planting fully fills both the above-ground and below-ground space in the garden bed. Above ground, plant leaves and branches will fill all the available space, capturing more light and filling the canopy more quickly. As the canopy fills, weed pressure will be reduced and yields will increase. Below ground, plant roots will fill all the available space in the soil, capturing more water and nutrients.



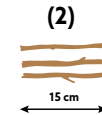
## HOW TO

# TRIANGLE PLANT A GARDEN BED

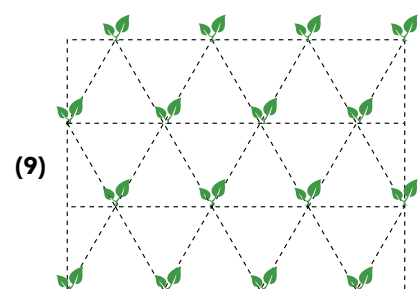
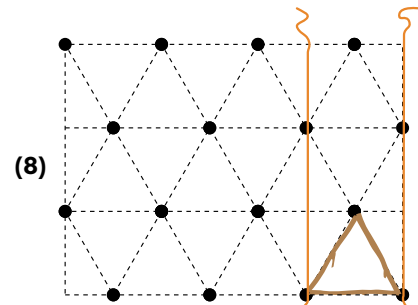
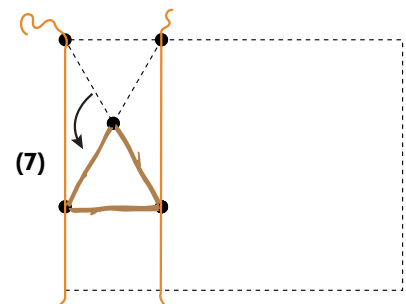
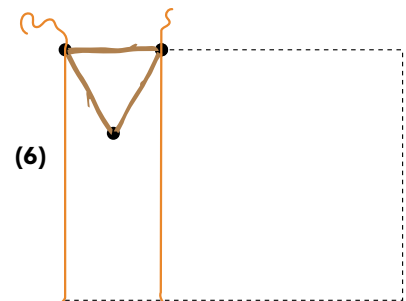
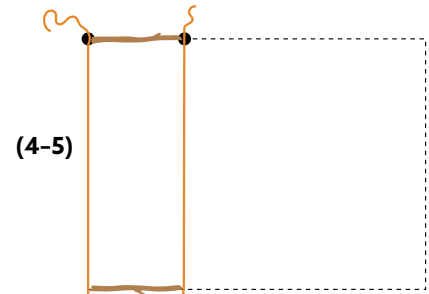
1. Determine the correct between-plant spacing for your crop. To determine the distance between rows and plants within a row, gardeners should draw a loose circle in the dirt around a healthy, fully grown crop. Be sure to include the full plant and add some additional space so the circle is not drawn too tightly. Measure the diameter of the circle with a stick, string, or measuring tape.



2. Cut a straight stick into three smaller sticks that are all the length of the between-plant spacing.



3. Place one stick along the narrow end of the planting bed to mark starting points of the first two rows.
4. Use two strings to mark out the lines for these rows. Confirm that the lines are straight by placing a second stick in between the strings at the other end of the bed.
5. At the first stick, push your thumb into the soil at either end of the stick to mark two planting holes.
6. Use the two other sticks to form a triangle between these two holes and a point further into the bed. Push your thumb into the soil at that point to form a new hole. Confirm with the sticks that all three sides of the triangle are the same length.
7. Flip two sticks outward so that they touch the two strings. Place the third stick at the ends of these sticks so that it forms a new triangle further into the bed. Push your thumb into the soil to mark the new planting holes formed by this triangle.
8. Continue moving the sticks until you reach the end of the bed. Start new rows and repeat the process until all holes have been dug. After the whole bed is marked, the pattern should appear as many small triangles.
9. Transplanted seedlings or large-seeded crops can be directly sown into these planting holes.



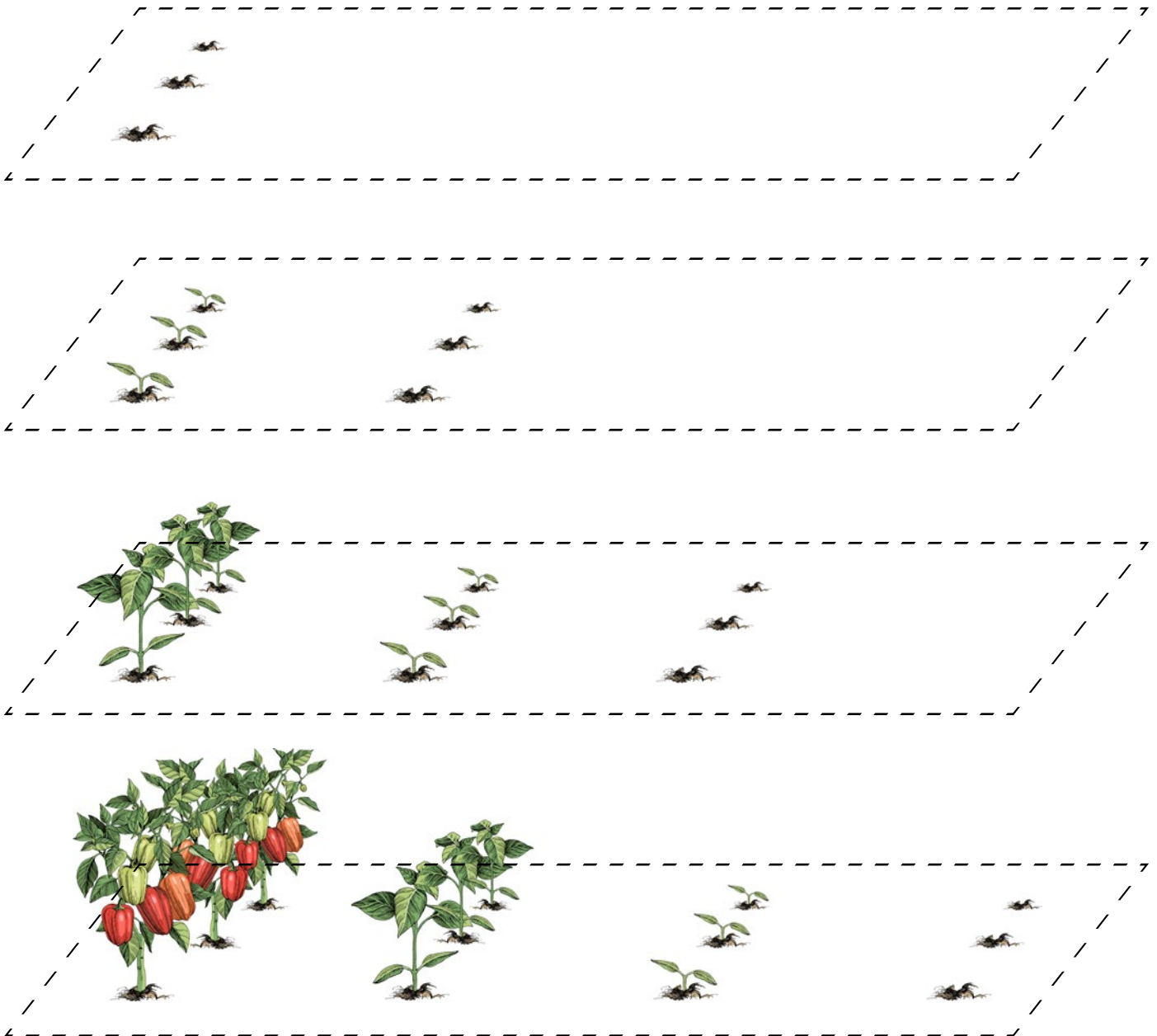


## Using staggered planting techniques to lengthen harvest seasons

It is easy at the beginning of the season to plant a full garden and imagine all the beautiful produce you will have in the future. But too often this produce cannot be used by the household and surplus vegetables go to waste.

One method of lengthening the harvest season is to continuously plant new seeds and transplants so that crops are maturing at slightly different times. Encourage gardeners to only experiment with staggering the planting of 1-2 crops if it is their first time. This may mean planting only one row of a vegetable during the first planting, with the expectation that the second row will be planted 1-2 weeks later. Or it could mean starting seedlings in a nursery on two different occasions so that crops are moved to the field at different times. While beds are waiting for a second planting, be sure to keep them moist and covered with mulch.

It is best to try this technique with quick-growing vegetables first to ensure that plantings mature within the growing season.



## 5. Intercropping a garden bed

### INTERACTIVE DISCUSSION (30 MINS)

**GOAL OF DISCUSSION:** Gardeners will think about how vegetables can be effectively intercropped into a garden bed.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners to discuss the pros and cons of planting multiple vegetables in one bed versus only one type of vegetable per bed.
2. Explain to gardeners that a well-selected combination of vegetables can be used to grow more vegetables from the same garden bed.
3. Draw a vertical line on your flipchart and write "Quick" at the top of one column and "Slow" at the top of the other column. Create a list of quick- and slow-growing vegetables with gardeners.
4. Ask gardeners to name combinations of quick and slow growing vegetables that they think would work well together. Have gardeners explain why they think this is a good combination and identify any points in the season when the two crops could be competing with each other for root or canopy space. How could they prevent this competition?
5. Repeat the exercise with "tall and thin" and "short and bushy" vegetables.
6. Have gardeners vote on the top three crop combinations they wish to try.

### KEY MESSAGES

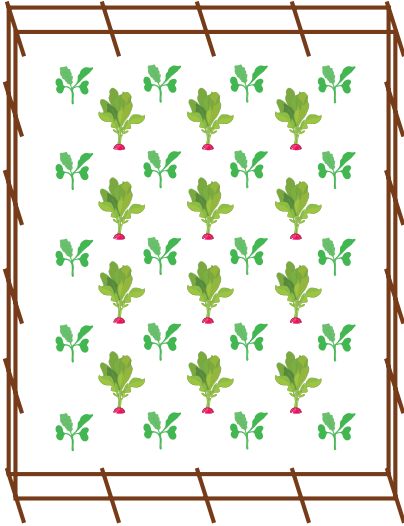
**Intercropping** means growing two or more vegetables in the same bed at the same time. It is a great way to use garden space more effectively and keep garden beds full of vegetables. There is no one way to intercrop! Gardeners should be creative and use trial and error to find combinations that work for them.

	Intercropping	One vegetable per bed
<b>Benefits</b>	<ul style="list-style-type: none"> <li>• Allows gardeners to make use of empty bed space as slow-growing crops mature</li> <li>• Allows gardeners to harvest a diversity of vegetables</li> <li>• Can reduce the need for weeding or mulch because beds are covered with crops</li> <li>• Can confuse insect pests who are looking food</li> <li>• Older plants can help younger plants who may need some shade to get established</li> </ul>	<ul style="list-style-type: none"> <li>• Requires less planning</li> <li>• Easy to do triangle planting</li> </ul>
<b>Challenges</b>	<ul style="list-style-type: none"> <li>• Requires more planning</li> <li>• Takes trial and error until good combinations are found. If done poorly, both crops can suffer because they are crowding each other out.</li> </ul>	<ul style="list-style-type: none"> <li>• Can have bare space in garden beds as slow-growing crops mature</li> </ul>

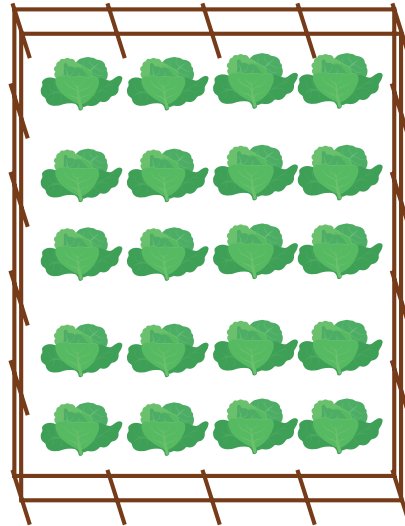
## What vegetables can be intercropped together in a bed?

### QUICK-GROWING VEGETABLES TOGETHER WITH SLOW-GROWING VEGETABLES

Quick-growing vegetables (lettuces and radishes) can be planted in between rows of a slow-growing vegetable (cabbage, tomatoes, leeks, beets, onions, or garlic) and harvested before slow-growing vegetables mature and fill the canopy.



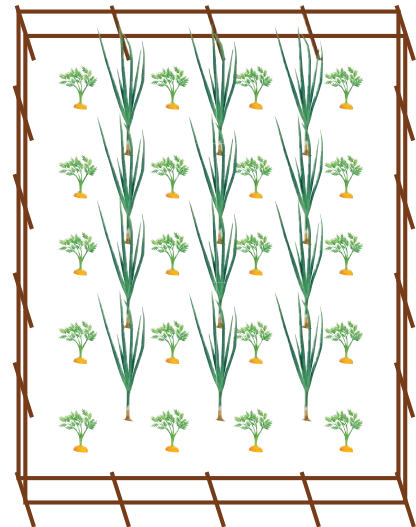
*Slow-growing cabbage intercropped with quick-growing radishes. Radishes fill bed space between cabbages as they grow.*



*Radishes harvested before cabbages mature and fill bed space.*

### VEGETABLES OF DIFFERENT HEIGHTS AND BUSHINESS

Combine tall, thin crops (leeks, onions, garlic, climbing beans) with short, bushy crops (radishes, lettuce, carrots, beets, spinach, parsley). Plants that grow to be the same height and bushiness do not intercrop well because they will compete for sunlight and root space.



*Tall, thin onions intercropped with bushy carrots. Taproots of carrots will reach soil nutrients below onion bulbs.*

## Companion Planting

Bad companion planting is two crops planted close together that lower the yields of each other. For example, the two crops may have the same pest so both crops are easily infested. If a gardener recognizes that two crops are negatively affecting each other, they should plant other crops in between these two crops or separate the two garden beds by at least 50 cm.

Good companion planting is planting two crops together who help each other grow. For example, some plants may attract beneficial insects when they flower, such as cilantro, and these insects feed on the pests that harm a neighboring crop, such as aphids that are attracted to kale and other cruciferous plants.

## 6. Planting a nutritious home garden

### PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will apply their knowledge of direct seeding and transplanting to plant a garden with single-vegetable beds and intercropped beds.

#### MATERIALS NEEDED:

- Flipchart and markers
- Locally available seeds
- Transplants
- String
- Jerry can or watering can
- Mulch
- Inorganic fertilizer (optional)

1. Explain to gardeners which garden beds will be intercropped and which will be planted with a single vegetable.
2. Gather gardeners around a bed that will be intercropped. Use your flipchart and markers to draw a picture of the garden at maturity. Explain your reasoning for why you selected these plants and this way of intercropping. Use a stick to show gardeners where plants will go.
3. Have gardeners sow seeds and plant transplants in the intercropped beds.
4. Have gardeners decide together what will be planted in the remaining beds. Use triangle spacing to determine the width between beds and between planting holes for each vegetable type.
5. Have gardeners discuss if they will use staggered planting for any of the beds so that they can prolong their harvest period. They may also wish to discuss what crops would be best to plant in the following season to practice crop rotation principles.
6. Water garden and cover with mulch before leaving.

### KEY MESSAGES

If using inorganic fertilizer, be sure to apply it correctly. It is very important that the seeds or young roots not directly touch the fertilizer. It is very easy to apply too much fertilizer, so do not 'top-up' your application. Inorganic fertilizer should always be applied into beds that have been enriched organic material, such as compost, and fertilizer should be covered with soil after application.

If direct seeding, draw two lines 7-10 cm away from the planting line on either side. Sprinkle inorganic fertilizer in the lines at the same rate as you would apply seeds. Pinch the line to cover the fertilizer with soil.

If transplanting seedlings, draw a ring that is 7-10 cm away from the transplant. Sprinkle half a bottle cap of fertilizer in the ring and cover with soil.

## 7. Closing discussion

Review the variety of vegetables that were planted in the garden, discuss when they can be expected to be harvested, and note how a diverse garden will provide households with a steady supply of vegetables to harvest.

# Planting Your Nursery



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will learn about and practice planting a nursery.

## DURATION



## MATERIALS NEEDED





- Flipchart and markers
- Sand, coconut coir, or rice hulls for mixing with nursery soil
- 3 buckets good quality soil or well-prepared compost
- Seeds
- Fencing material
- Netting to protect seeds and young seedlings
- Tools for digging a garden bed
- Small containers with drainage holes in the bottom where gardeners can start seedlings (can also be fashioned from large leaves)



## KEY CONCEPTS

- Plant nurseries are well-protected small beds or containers to grow young seedlings before transferring them to our garden beds.
- Nurseries can be used with almost any vegetable crop except root vegetables.
- Nurseries should always be well watered, protected from pests, and have loose, sandy soil so it is easy for roots to grow.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	How do we build a nursery?	 DISCUSSION	40 min
3	Build a nursery	 PRACTICAL ACTIVITY	40 min
7	Closing discussion	 DISCUSSION	10 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. How do we build a nursery?

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** To share with participants the key components of an effective nursery and how to build one.

**FACILITATOR PREPARATION:** Select a training site where gardeners can have a discussion and then move to a site where gardeners can establish a plant nursery.

**MATERIALS NEEDED:** Flipchart and markers

1. Tell gardeners that plant nurseries are places where we can grow young seedlings and keep them protected before we move them into our garden beds.
2. Review the reasons why we would want to use a nursery with gardeners.
3. Ask gardeners to share their past experiences of using a nursery. Write down on your flipchart or board the recommendations gardeners have for creating and using a nursery.
4. Discuss the best practices for building a nursery with gardeners.



## KEY MESSAGES

### Plant nurseries can help us...

- ... protect young seedlings from being eaten by pests.
- ...protect young seedlings from being damaged by heavy rains or wind.
- ... select strong, healthy seedlings to grow in our garden beds.
- ... not waste garden bed space on seeds that do not germinate.
- ... not waste expensive seeds.
- ...quickly replant garden beds with mature plants after a harvest. This helps us always have vegetables available to eat!

## How should we build a good nursery?

<p><b>If using containers or seed trays...</b></p> <ul style="list-style-type: none"><li>• Select plastic or wood containers with good drainage holes in the bottom. These can also be made from large leaves. Select larger containers for large seeds or seedlings that will be in containers &gt;20 days. Select small containers for small seeds or seedlings that will be in containers for &lt;20 days.</li><li>• Fill containers with light, fluffy soil or compost that is mixed with some sand because the soil in containers can easily become compacted.</li><li>• Sprinkle enough seeds in the container so that 2-3 will germinate. The number of seeds you use will vary depending on how many seeds you expect to germinate and the price of the seed.</li><li>• Cover seeds with the appropriate amount of soil.</li><li>• Find a site to keep containers where it is sunny most of the day and it will be easy to water plants 1-2 times a day depending on how hot it is. The surface of the soil should always be moist to the touch.</li><li>• Keep containers protected from pests and weather.</li></ul>	<p><b>If using a fertile place close to your household...</b></p> <ul style="list-style-type: none"><li>• Select a site that has loose, fluffy soil. If possible, mix sand into the top layer of the soil. A banana stem, stones, or wooden boards can be used to make a raised plot.</li><li>• The nursery site should be sunny most of the day and protected with a small fence or net so that seedlings are safe from pests, birds, and farm animals.</li><li>• Mark out which sections of the site will be planted with which vegetable seeds.</li><li>• Sow seeds</li><li>• Cover seeds with the appropriate amount of soil.</li><li>• Keep seeds well-watered and protected. This may involve watering seeds 1-2 times a day depending on how hot it is. The surface of the soil should always be moist to the touch.</li></ul>
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### Soil media for the nursery

- Seeds already contain all the nutrients they need to start growing. Many vegetables do not start using nutrients from the soil until one week after they germinate when they start using a very small amount. It is more important for young plants to grow big, strong root systems that will feed them later on in life than it is for them to receive nutrients now. For this reason, our nurseries should have loose, airy soil that does not inhibit roots from growing. Mixing fertile soil with sand in a 1:1 ratio is ideal.
- A raised bed can be created to keep the sandy soil contained to one area.



### 3. Build a nursery

#### PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will apply their knowledge of starting a plant nursery by building a small nursery using both a garden bed and containers.

**MATERIALS NEEDED:**

- Sand, coconut coir, or rice hulls for mixing with nursery soil
- 3 buckets good quality soil or well-prepared compost
- Seeds
- Fencing material
- Netting to protect seeds and young seedlings
- Tools for digging a garden bed
- Small containers with drainage holes in the bottom where gardeners can start seedlings

1. Have gardeners select a site to prepare as a nursery. Discuss with gardeners how they will keep the seedlings protected from pests and harsh weather and how they will access the water they need for the nursery.
2. Prepare a small garden bed as the nursery site, making sure to create a very fine soil tilth in the top 20 cm of soil. Use your hands to break up any large clumps of soil. Mix sand or other media into the top 10 cm of the soil. The bed can be raised by adding rocks, banana stems, or wooden boards to the bed borders.
3. Sow seeds and erect fence and/or netting around the planted area.
4. Have gardeners also prepare containers to grow seedlings so they experience both methods.
5. Make sure all seeds are well watered and protected from pests and heavy weather before leaving the site.



### 4. Closing discussion

Ask gardeners to summarize their key insights around building a nursery.

# Understanding and Making Compost



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will have a good understanding of the importance of composting for soil health and the environment. Gardeners will discuss different methods for composting and how to troubleshoot common problems with compost making. They will also practice building a hot compost pile.

## DURATION



## MATERIALS NEEDED









- Flipchart and markers
- 6 large sacks of brown, dry organic material
- 3 large sacks of green, wet organic material
- A pile of large, coarse sticks
- One 20 L bucket/jerrycan of manure or good topsoil
- Three or four 20 L buckets/jerrycans of water
- A machete or hoe to chop the material into small pieces
- Several shovels



## KEY CONCEPTS

- Compost can improve soil health by providing food for soil life and improving soil structure, texture, and ability to hold water.
- Composting is an excellent way to use organic waste products in the homestead and return nutrients to the soil for plants to use.
- Produce a rich compost by adding the right balance of brown and green materials to the pile and then maintaining the right moisture and air levels.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	What is composting and how does it help our soils?	 DISCUSSION	30 min
3	Selecting a good site for our compost	 DISCUSSION	15 min
4	How does composting work?	 DISCUSSION	1 hour
5	Different types of composting	 DISCUSSION	30 min
6	Dealing with common compost problems	 DISCUSSION	30 min
7	Demonstration of hot compost technique	 PRACTICAL ACTIVITY	1 hour
8	Closing discussion	 DISCUSSION	10 min

10 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

30 min

# 2. What is composting and how does it help our soils?

## INTERACTIVE DISCUSSION

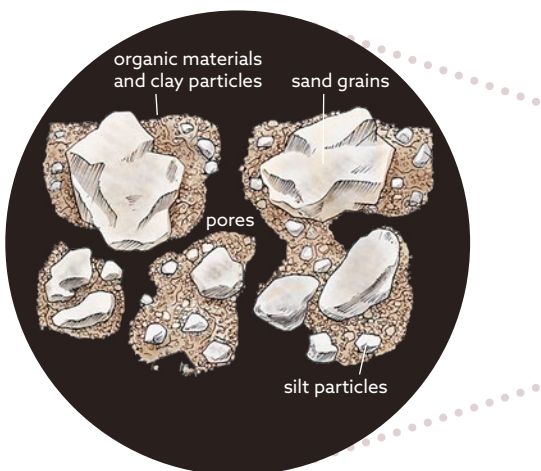
**GOAL OF THE DISCUSSION:** Gardeners will understand how composting can help our soils and our broader environment.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners what composting is and how it helps the soil.
2. Ask gardeners why practicing composting helps not only our gardens but also our environment.
3. Have gardeners share their experiences composting with the rest of the group. What methods worked well for participants? What challenges did they have?

## KEY MESSAGES

- Compost adds soil organic matter to the garden, which provides nutrients to plants, supports microorganisms in the soil, and improves soil texture and water holding capacity.
- Compost can trap the nutrients from inorganic fertilizers so they do not leach away.
- Compost helps to keep clay soil from compacting and adds structure to both clay and sandy soils.
- Compost recycles organic waste and turns waste into useful materials to improve soil health.
- When kitchen scraps are not composted properly, they produce gases that give a bad smell (and can harm the environment).



# 3. Selecting a good site for our compost

## INTERACTIVE DISCUSSION

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**GOAL OF THE DISCUSSION:** Gardeners will understand how to select the best site for their compost pile.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask gardeners to have a brief discussion with their neighbor on the key considerations for choosing a site for a compost pile.
2. After five minutes, ask gardeners to share what they have discussed. Write the main messages on the flipchart and add anything that was not said.

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## KEY MESSAGES

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Consider...

- ...finding an upland site where compost piles can drain away from water bodies.
- ...wind direction to avoid odors bothering you or your neighbors.
- ...avoiding high water tables that have the potential to flood your compost pile.
- ...avoiding areas that are tough to access and difficult to carry materials in and out of.
- ...placing compost piles in many strategic locations so that it is easy to gather organic materials together and then use that compost in nearby fields.

# 4. How does composting work?

## INTERACTIVE DISCUSSION

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**GOAL OF THE DISCUSSION:** Gardeners will understand how soil organisms recycle organic wastes through decomposition and what materials to use—and not use—in compost.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask gardeners if they know what decomposition is and how to tell if decomposition is happening in your compost.
2. Ask gardeners if they know what decomposers are and if they can name or describe some of them.
3. Tell gardeners that there are two broad categories of materials that should be used for composting: 'brown' and 'green.'
4. Have gardeners work in pairs to make a list of locally available 'brown' and 'green' materials. When the pairs are done working, ask one pair to start by writing their list on a flipchart. Ask the next pair to share any new materials they have listed. Continue until all pairs have shared their lists.
5. Ask the group why we add both brown and green materials to a compost pile. Discuss the right balance of brown to green (2 buckets of brown for every 1 bucket of green) and why we want to diversify the materials we add as much as possible.
6. Ask gardeners if they can think of any material that is brown or green, but CANNOT go into a compost. List what they share on your flipchart and discuss why not.

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## KEY MESSAGES

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### What is decomposition?

**Decomposition** is the breakdown of any organic material (leaves, branches, roots, grass, manure, or food waste for example) into smaller and smaller pieces until they are ready to be reincorporated into the soil. As materials break down, the nutrients in them are released and become available to plants. Decomposition is already happening all over the natural environment. When we build compost piles, we are creating conditions that encourage this natural process to occur quickly and in a controlled fashion so that we can reap the benefits more easily. Decomposition speeds up when water levels are right (not too dry and not too wet) and the right mixture of "food" is available (a balanced mix of brown and green material).

**Decomposers** are the organisms living in the compost pile that break down organic materials when they consume them. This includes organisms that are too small for us to see, such as bacteria, fungi, and very small insects. It also includes larger organisms like worms, ants, millipedes, and other bugs. As decomposers eat the material in your compost pile, they will transform it into an earthy, sweet-smelling material that is full of nutrients and a gummy substance that improves soil structure and water holding capacity.

When the materials in our compost pile are decomposing rapidly, our compost pile is very hot. Use a spade or a stick to investigate if your compost is hot towards the center of the pile.

### What 'brown' and 'green' materials are good for composting?

**Green materials for composting are fresh and contain moisture:** freshly pulled weeds or crop residue, fruit peels, kitchen scraps, raw manure, or other wet materials. Green materials are oftentimes green in color, but not always. Green materials will supply most of the nutrients that will make your compost good for your garden.

**Brown materials for composting are dry or woody:** dried leaves, sawdust, rice husks, bean coats, small sticks, and dried manure are all considered brown materials. Often, these materials are brown, which is why we call them brown material. Brown materials absorb the moisture from the wet materials, create air pockets in the pile, and add body to the compost pile.

The same material can start out as a green material (freshly cut corn stalks) and change to a brown material (dried corn stalks) depending on if it is wet or dry when added to a compost pile.



## Examples of Brown and Green Compost Materials

Brown		Green	
 Dried leaves	 Small dried sticks	 Fresh garden waste	 Grass clippings
 Wood chips	 Dried corn stalks	 Weeds that have not yet set seed	 Fresh animal manures (cow, pig, chicken, rabbit, sheep, goat, horse)
 Newspaper, shredded	 Very dried animal manures (cow, pig, chicken, rabbit, sheep, goat, horse)	 Clover	 Human and animal urine
 Sawdust and wood shavings	 Peanut shells, rice and wheat husks	 Green wood	 Coffee grounds
 Pine needles	 Kitchen ash	 Fresh corn stalks or other fresh crop residues	 Egg shells
 Straw and hay	 Dried weeds	 Kitchen and food waste (peels, skins, pits, stalks, rotting vegetables and fruits, uneaten cooked food)	
 Cardboard, shredded	 Good topsoil, leaf litter, or soils from termite nests		

## Balancing brown to green material



The right balance of brown to green material is **2 buckets or sacks of brown material to 1 bucket or sack of green**. This balance of browns to greens helps to create a pile that decomposes quickly and is not too wet or too dry. Brown and green material work together to create the right environment for decomposition. It is important to start with the right balance of materials and then continue managing the pile's moisture level and exposure to air. It is also important to chop materials into smaller pieces so they decompose faster.

A good practice is to add as many different kinds of brown and green materials to your pile as are available. A compost pile made with a diversity of materials will be richer in nutrients since every material will contain something different.

## What materials should NOT be added to compost piles?

- Residues from crops known to be diseased or under severe insect attack. Composting can kill some types of insects and diseases, but not all. It is best to remove these materials from the garden site so that they cannot affect other plants.
- Weeds that have set seed; adding these plants to your compost may distribute weed seeds throughout your garden beds.
- Perennial, invasive weeds and their root systems, such as grasses. These plants can easily grow again from only a tiny stem or root, so gardeners should avoid chopping these plants up. Perennial weeds should be dried and burned.
- Plants that are toxic to other plants and microbial life, such as hemlock, juniper, citrus, castor bean, and eucalyptus. If gardeners notice that other plants do not grow around the base of a particular species, they should not use material from that species in their compost piles.
- Soap, which can kill microorganisms
- Oil, which makes it difficult for air to freely circulate
- Meat or animal bones, bread, cooked rice or other cooked food. These can attract rodent pests and do not decompose well.
- **Manure from meat-eating animals, like cats and dogs, and human excrement. These contain pathogens that can make you sick.**



## 5. Different types of composting

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Introduce gardeners to different forms of composting.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask gardeners what different types of composting they know. List their suggestions on a flipchart. When gardeners have given their input, suggest types of composting that may be missing.
2. Explain the basics of each type of composting. Assist gardeners' understanding by drawing pictures and discussing how to build each type of compost.

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### KEY MESSAGES

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**Organic waste can be composted in many different ways:**

- Cold composting
- Hot composting
- Pit composting
- Container composting
- Vermi-composting
- Dig-and-drop composting

**COLD COMPOSTING** is an 'add as you have it' approach. You simply keep layering on browns and greens as you keep producing them and then wait. This takes longer to produce compost than hot composting, but requires minimal effort.

**HOT COMPOSTING** is a way to produce compost quicker. Hot composting builds up heat quickly because an optimal balance of brown to green material is used. The center of the compost pile will be the hottest because that is where decomposition is happening the most. The edges of the pile will decompose slower and not get as hot since they are exposed to lots of air and light. Because the center and the edges of the pile are decomposing at different speeds, a gardener will have to periodically mix the materials so that material from the outside edge of the pile find their way into the center of the pile and can also decompose.

**PIT COMPOSTING** is good for arid climates. Simply dig a pit and put the compost waste in the pit, taking care to still balance browns and greens. In areas with heavy rainy seasons this method is not advisable as there is no way to control moisture levels within the pit.

**CONTAINER COMPOSTING** is good for making small amounts of compost. Mix 1 part green material with 3 parts brown material inside a container, such as a bucket or barrel. Turn the compost once per day and keep the compost damp, but do not allow water to pool at the bottom of the container. Container compost will be ready in 30 days.

**VERMI-COMPOSTING** uses worms to decompose organic materials. Composting materials are placed in a container along with worms. This type of composting requires extra attention and care, but produces a highly nutritious compost and liquid that can be used as a foliar fertilizer.

**DIG-AND-DROP COMPOSTING** involves digging a hole, dropping the organic material into the hole, and replacing the soil. It is simple and requires no further attention or care as the organic materials decompose underground. Try dig-and-drop composting on a fallow field or area where you intend to plant in the future.

## 6. Dealing with compost problems

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will understand how to identify and address common problems with compost.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners what problems they may have experienced with composting in the past. Make a column on the flipchart for each challenge identified.
2. Ask gardeners how each problem can be remedied. Write down their suggestions in the appropriate column on the flipchart. When gardeners have finished giving their input, add key things that may be missing.

### KEY MESSAGES

#### Why does my compost pile have flies?

Flies are attracted to the food, such as kitchen scraps, in compost piles. When flies recognize a good food source, they lay their eggs in the same area to try and guarantee a food supply for their young. This means the fly population will grow and grow until the problem is fixed.

To reduce flies in a compost pile, try:

- Burying green, or wet, materials that flies like to eat underneath a layer of brown material or soil. If manure and rotting vegetables are not on the top of the pile, the flies cannot reach them and lay their eggs in them.
- Turn the pile on a regular basis. This will encourage decomposition faster and keep the pile hotter than flies like.
- Keep the pile level and do not let it get taller in the middle. An un-level pile will have incomplete decomposition towards the edges of the pile, so more rotting food will be available for flies to eat and lay eggs in. Use a rake or shovel on the top of the pile to even it out after turning.

#### Why does my compost pile smell bad?

A compost pile can occasionally get a little smelly. This can happen if a pile is too wet or too compacted. When there is too much water, or too little air, the materials inside will get slimy and smelly instead of decomposing into an earthy, sweet smelling substance.

To reduce the odor of your compost pile, try:

- Reflecting on the balance of brown and green material in your pile. Too much green material will make your pile too wet and prone to compaction. The next time you turn your pile, add dried brown material, like leaves or straw. Try to add brown material that is “fluffy” to create air pockets in the pile.
- Protecting the pile from rainwater. If it is frequently rainy and you see more than one drop of water from a handful of squeezed material, cover your compost pile with an old plastic sheet, banana leaves, or other water-resistant leaves to protect it from rain. Turn the pile and add more brown material to correct the moisture level before covering it.
- Reflect on the size of your green and brown layers. If your green layers are too big, they will not properly mix with brown materials and create pockets of slimy material that smells. Turn the pile to properly mix material and check the moisture level of the pile.
- Burying rotting food. Rotting food will smell, so make sure it is buried under dry brown material or soil rather than on the top of the pile.

### **Why is my compost pile not decomposing?**

Since decomposers need water to work, too little water can stop decomposition from happening. Gardeners will not see compost piles reduce in size or materials transform to an earthy substance.

- Make sure the moisture level is correct in your pile. You should see some moisture between your fingers when a handful of compost is squeezed, and the handful should slightly stick together instead of falling apart.
- Add more green material, such as fresh grass clippings or manure.
- It can also be helpful to add some handfuls of already decomposed compost to the pile to add microbes.
- Keep the pile in a shady place or put big leaves over the pile to reduce exposure to the hot sun or wind.

### **Why are there snakes, rodents, scorpions, or centipedes in my compost pile?**

These critters are attracted to the food supplies and heat within your pile.

- Avoid putting cooked food or rice in the compost pile as this will attract rodents. Instead, bury food waste underground using dig-and-drop composting.
- If you suspect snakes or scorpions will be a problem in your area, always use a pitchfork or shovel to turn the pile or check its temperature.
- Consider container composting in a container with a tight lid and small air holes if snakes are a serious problem.
- Centipedes can be attracted to the moisture and other insects, spiders, slugs, and worms in compost piles. Large numbers of centipedes indicate that the pile is too wet. Turn the pile well and leave it exposed for an afternoon to encourage birds to prey on the centipedes and dry out the pile.

# 7. Demonstration of hot compost technique

## PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will learn how to make a hot compost pile that will be ready in around 18 days.

**FACILITATOR PREPARATION:** Identify a suitable location to make a compost pile with gardeners. Instruct gardeners before the training to come with the right number of sacks of brown and green material to make the compost pile.

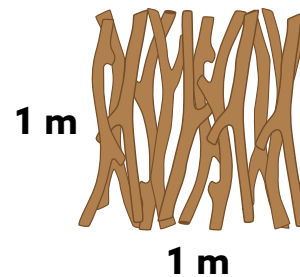
**MATERIALS REQUIRED:**

- 6 large sacks of brown, dry organic material
- 3 large sacks of green, wet organic material
- A pile of large, coarse sticks
- One 20 L bucket/ jerrycan of manure or good topsoil
- Three or four 20 L buckets/jerrycans of water
- A machete or hoe to chop the material into small pieces
- Several shovels

**STEP 1.** Ask group to mix the brown materials together into one pile and the green materials into another. The pile of brown material should be twice as big as the pile of green material. As a group, chop up the large pieces of organic material into smaller pieces to speed up the decomposition process, release moisture and nutrients faster, and create smooth layers within the pile.



**STEP 2.** Ask two members of the group to lay down an initial 1m x 1m layer of coarse sticks. Explain that in order for compost to reach adequate temperature for decomposition, the size needs to be roughly 1m x 1m and that sticks placed at the bottom will help keep air flowing into all sides of the pile.



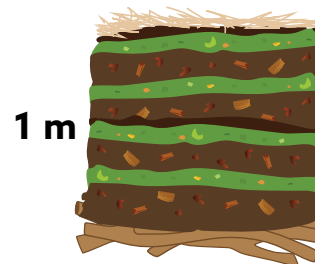
**STEP 3.** Ask two volunteers to add one layer of brown material on top of the 1m x 1m layer of sticks. Follow this with a layer of green materials that is half as tall as the brown layer.



**STEP 4.** After adding a few more layers of green and brown material, add a layer of topsoil, manure, or finished compost to the top (approximately 4 large handfuls).

**STEP 5.** Add water to moisten well.

**STEP 6.** Continue adding layers of green and brown, followed by a layer of topsoil, manure, or finished compost, until the pile is 1 m wide by 1 m deep by 1 m high.



**STEP 7.** Cover the top of the pile with a layer of topsoil and a layer of dry grass to keep moisture in the pile.

**STEP 8.** Ask the gardeners to share their observations and experience.

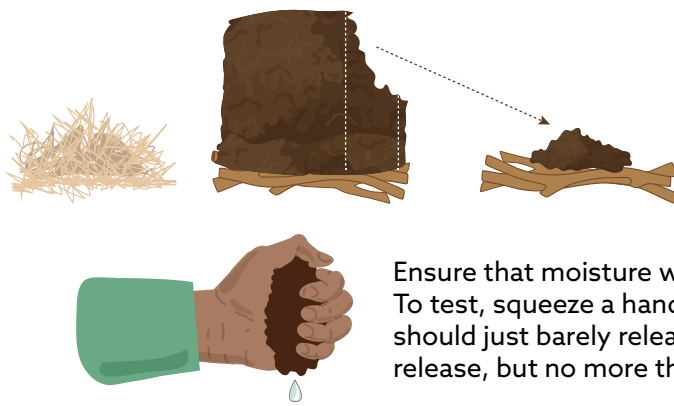
**STEP 9.** Ask a volunteer from the group to summarize the process to the whole group.

**STEP 10.** Explain next steps in the process by drawing on a flipchart:

**Day 1-4** Let the compost sit for 4 days without turning it.



**Day 5**



Mix the compost pile so that the material on the outside is now inside the pile and the inner material is now on the outside. To do this, remove the outer layer of dry grass and place to one side. Place new sticks on a spot on the ground next to the old pile. Use a spade to transfer the pile to the new location, taking care that the outer material goes into the center of the new pile.

Ensure that moisture within the pile is enough, but not too much. To test, squeeze a handful of the compost materials. The handful should just barely release any water. You might see some water release, but no more than one drop.

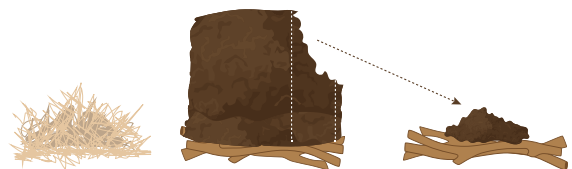
**Day 7**

The compost pile should reach its maximum temperature around this day. Measure the temperature of the compost pile by removing material with a spade and carefully inserting your arm. If you can put your arm into the compost up to the elbow – it is not hot enough! The middle of the compost should feel hot when the compost pile is most active. Take note: does the pile need more water? Less water? Do you see decomposition starting to happen?



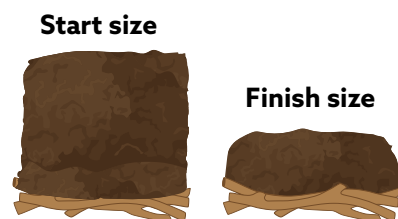
**Following days**

**Turn the compost pile every two days** and check the temperature on the days the compost is resting.



**Around day 18: finished compost**

Finished compost looks like rich brown soil and smells earthy. The original ingredients cannot be identified, and the pile will be about one-third the original size.



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## KEY MESSAGES

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- A properly made compost pile contains the right balance of brown to green material: two buckets or sacks of brown for every bucket or sack of green.
- Make sure all materials are chopped up and shredded well. This provides more surface area for the decomposers to do their work. This is the same principle we use when we chop up vegetables to cook a meal: if we cook using evenly chopped vegetables, everything will finish cooking at the same time. However, if some pieces are big and some are small, the cooking process will be uneven and the big pieces will cook much slower than the small pieces.
- Sticks placed at the bottom help aerate the pile from below. Keeping the pile roughly 1m x 1m helps ensure the compost pile gets hot enough for full decomposition and is easy enough for gardeners to mix using hand tools. If the pile is smaller than 1m x 1m, it may not decompose properly.

10 min

## 7. Closing discussion

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Ask gardeners to summarize their key insights around composting.

# Seed Saving for Home Gardeners



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will review seed saving techniques for home garden use. Gardeners will also gain practical experience in seed processing, grading, and storage.

## DURATION



## MATERIALS NEEDED







- Flipchart and markers
- Examples of imperfect or perfect flowers (optional)
- Fleshy fruits, such as tomatoes, eggplant, cucumber, or bitter melon (no hybrid varieties)
- Dried seed pods from either beans, cowpeas, kale, broccoli, cabbage, cauliflower, mung bean, dried okras, or dried chilies (no hybrid varieties)
- Jars and plastic bottles that can be tightly sealed
- Dried rice and/or charcoal
- Filter, old cloth, or colander
- Water
- Knife and spoon
- Examples of airtight containers containing properly stored seeds



## KEY CONCEPTS

- Saving your own seed allows gardeners to reproduce the best growing and best tasting plants season after season.
- Saving seeds, particularly from culturally important and locally adapted varieties, helps preserve plant diversity and food traditions.
- Seeds must be carefully selected, processed, dried, and stored so that quality is preserved until planting.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	Why save seeds?	 DISCUSSION	20 min
3	Pollination and what it means for seed saving	 DISCUSSION	30 min
4	Start saving your own seed	 DISCUSSION	1 hour
5	Seed extraction, processing, and storage	 PRACTICAL ACTIVITY	45 min
6	Closing	 DISCUSSION	10 min



# 1. Introduction and warm-up

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Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

## 2. Why save seeds?

### INTERACTIVE DISCUSSION

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**GOAL OF THE DISCUSSION:** Gardeners will share thoughts and experiences on the benefits of seed saving.

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1. Ask gardeners if any of them have saved seeds from their gardens in the past. Invite them to share their experiences.
2. Ask gardeners if any of them have ever received garden seeds saved by neighbors or family members. What was good or bad about the experience? What was helpful or unhelpful about the experience?
3. Encourage a discussion among gardeners about why seed saving is important and how it can help them and their community. Why is it important to learn about and teach others how to save seeds?

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### KEY MESSAGES

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- Seed can be saved for species whose seed is not available for sale locally or seed has known quality issues.
- By choosing seeds from the plants that perform the best in your specific landscape you can also be sure to have locally adapted varieties that are well suited to your context and needs.
- Choosing seeds from your best tasting plants also means that you can keep planting that variety and have good quality vegetables available in the future.
- By allowing more plants to go to seed, rather than harvesting them or tilling them into the soil, you are also helping important pollinators who love the flowers. These pollinators help keep our gardens healthy.
- Saving seeds from culturally important varieties that are disappearing over time ensures that these species continue to be part of the dishes and food culture of your region. This means that your children will be able to taste and feel connected to them as well.
- Exchanging your seeds with others in your community is also a wonderful way to connect with your neighbors, gain their trust, and show your support of them. Our community is stronger if we all have a diverse diet and enough to eat. Excess seed can also potentially be sold to generate additional income.
- Learning about and teaching others to save seeds helps maintain cultural heritage and seed security. Seed saving can help prevent local varieties from disappearing. Learning how effectively save seed will also build the quality of seed available locally.

# 3. Pollination and what it means for seed saving

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will have an understanding of the different ways plants pollinate their flowers and how this knowledge can help them save better seed for their gardens.

**MATERIALS NEEDED:**

- Flipchart and markers
- Examples of imperfect or perfect flowers (optional)

1. Ask gardeners how pollination happens. Discuss and identify the parts of male flowers and female flowers. Identify pollen and stigma from the flowers.
2. Discuss with gardeners that plants pollinate in different ways, which makes it easier or harder to save their seed. Draw pictures of perfect and imperfect flowers to illustrate how pollination can change depending on the crop.
3. Build a list of self-pollinated, cross-pollinated, or mixed pollination crops on your flipchart.
4. Ask gardeners to discuss in pairs the difference between hybrid and open pollinated seeds. Share answers in the whole group. Write down any key points and add any that they missed.
5. Ask gardeners to share any experiences they have planting seeds saved from a plant grown using hybrid seed and compare these to their experiences planting seeds saved from open pollinated plants. Discuss why saving seed from a plant grown from hybrid seed may give disappointing results.

## KEY MESSAGES

**Vegetables are pollinated in one of three ways:**

Pollination Type	What happens?	Example crops
Self-Pollination	Self-pollinating plants can fertilize themselves because the plant's flowers are "complete," meaning they contain both male and female parts. Pollination occurs when the pollen of one flower fertilizes the same flower on the same plant.	Beans, peas, tomatoes, lettuce
Cross-Pollination	Cross-pollinating plants need either a pollinator or wind to get the pollen to another flower of the same species. Pollen can be transferred to another flower on the same plant or another plant in the field.	Pumpkin, squashes, cucumbers, melons, broccoli, radish, carrot
Mixed Pollination	Sometimes mixed pollination occurs. A single plant may either self-pollinate or cross-pollinate, depending on environmental conditions.	Eggplant, okra, pigeon pea, amaranth

## What is the difference between hybrid seeds and open pollinated seeds?

Hybrid seeds can be purchased from shops (often indicated as "F1" on the package), but these seeds cannot be saved or created by gardeners. Seed producers develop hybrid seeds by crossing two distinct varieties of a crop. A male plant from one variety is planted close to a female plant of another variety in controlled environment that does not allow for other cross pollination to occur. Skilled workers manage the pollination process to produce the desired crossing. Hybrids are often higher yielding, more resistant to diseases, and mature more uniformly than other varieties. However, seed produced from hybrid plants will not produce offspring with the same characteristics as the parent plant. Hybrid seeds should therefore not be saved.

Open pollinated seed refers to seed that is produced by pollination done by insects, wind, birds, or even humans. Seeds that have been handed down generation to generation are open pollinated seeds. Open pollinated seed includes seed that is self-pollinated (and therefore will produce plants identical to the parent plant) and seed that is cross-pollinated (and therefore is a combination of the two parent plants and may show some small variations generation to generation).

## 4. Starting saving your own seed

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn how to start saving their own seed.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Explain to gardeners that the easiest crops to save seeds from are self-pollinated annuals. Have gardeners brainstorm a list of local vegetables that are self-pollinated annuals and write them on your flipchart.
2. Explain to gardeners that the next easiest crops to save seeds from are cross-pollinated annuals. Review the reasons why cross-pollinated crops require more time and attention from gardeners. Have gardeners brainstorm a list of local vegetables that are cross-pollinated annuals and write them on your flipchart.
3. Split gardeners into groups to discuss how to grow plants in your garden that you will save seeds. Groups should also think about how these practices result in better seed. Have each group report back to the larger group. Write the recommended practices on the left side of your flipchart and, on the right, list how this practice helps us save better seed. Ask the group to contribute and add anything they might have missed.
4. Mix the gardeners up into different small groups and now discuss how to select and harvest seed from the garden. Again, have the groups think about how these practices will result in better seed. Bring the groups back together and again write down their recommended practices on the left side of your flipchart and how this practice helps us on the right. Add anything they might have missed.

## KEY MESSAGES

### Self-pollinated crops

An easy way to start seed saving is to start with self-pollinated annuals. This means flowers can fertilize even before they open and there is less likelihood of failed pollination. Self-pollinated annuals normally produce an abundance of seeds, but it is possible to gently shake the plant when you see pollen to encourage pollen to fall onto the stigma.

### Cross-pollinated crops

Cross-pollinated crops rely on wind, insects, or birds for pollination. These plants usually have male and female flowers, such as a pumpkin plant. You need enough plants to ensure that there are male and female flowers open and ready to pollinate on the same day. This means that you need at least four plants near each other that will be used for seed saving. Also, weather conditions need to be favorable for pollination to occur—there needs to be wind—or there needs to be enough pollinators, such as flies or bees, to visit every flower. Without favorable conditions, some flowers will not pollinate and may not produce viable seeds. Crops from closely related families, for example squashes and pumpkins, could cross-pollinate if they are planted close together, so it is typically advised to leave large distances between closely related crops if you are intending to save their seed. Gardeners can manually pollinate pumpkins and other plants by using a soft brush, cotton swab, or soft cloth. Swab some pollen from the male flower with the brush and then touch the centre of the female flower to manually pollinate your crops.



### Best practices for growing and harvesting seed from a home garden

How to grow plants in a home garden for seed	
Practice	How does this help us save better seed?
Leave some distance between two different varieties or crops from the same family	Prevents cross-pollination by insects or wind-blown pollen.
Select a plot of land that was not cultivated with the same crop last season or year	Seeds will not be contaminated with any soil-borne diseases and carry this contamination into the field again next year.
Selecting and harvesting seed for saving	
Practice	How does this help us save better seed?
Pick seeds only when mature.	Immature seeds may not germinate.
Keep the seeds from only the best plants and best fruits/pods. These should be large, vigorous, and free from disease.	Make sure only the best plants are replanted.
Collect seeds in the dry season rather than the wet season.	Helps to prevent potential problems with moisture, diseases and helps seeds dry thoroughly.
Collect seeds on a dry, sunny day	Helps to prevent seeds from getting moldy.

## 5. Seed extraction, processing and storage

### PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will learn wet and dry seed processing and how to do grading and quality control of collected seeds.

#### MATERIALS NEEDED:

- Flipchart and markers
- Fleshy fruits, such as tomatoes, eggplant, cucumber, or bitter melon (no hybrid varieties)
- Dried seed pods from either beans, cowpeas, kale, broccoli, cabbage, cauliflower, mung bean, dried okras, or dried chilies (no hybrid varieties)
- Jars and plastic bottles that can be tightly sealed
- Dried rice and/or charcoal
- Filter, old cloth, or colander
- Water
- Knife and spoon
- Examples of airtight containers containing properly stored seeds

**STEP 1.** Write 'wet seed processing' and 'dry seed processing' on the flipchart and ask gardeners to give examples of crops where you harvest the seeds wet and crops where you harvest the seeds dry.

**STEP 2.** Demonstrate how to process wet seeds by cutting open a fleshy fruit and placing it in a jar with water. Explain the process of leaving the fruit and seeds in the jar for 12-24 hours and then separating out the good seeds.

**STEP 3.** Demonstrate how to process dried seeds.

**STEP 4.** Ask gardeners how to clean and grade the seeds collected from the wet and the dry process. What materials must be removed? Which seeds should be removed?

**STEP 5:** Ask participants to work in pairs to list the key considerations for how to store seeds to ensure quality seeds. Share in group and list key considerations on flipchart.

**STEP 6:** Ask participants to share materials used locally to store seeds. Write these materials on a flipchart.

**STEP 7:** Show gardeners some examples you have made of properly stored seeds. Discuss how these packages help protect seeds from light, heat, and moisture.

**STEP 8:** Discuss with gardeners how they can test the viability of their stored seed before they plant it in their gardens.

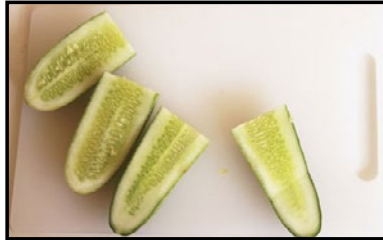


## KEY MESSAGES

### Wet seed processing

'Wet seeds' can be found in vegetables such as tomato, eggplant, cucumber and bitter melon. Wet seeds are usually firmly attached to the flesh of the fruit. There are three major steps (and one optional step) in wet seed processing:

1. **Extraction:** Cut the fruit open and scrape the seed and attached pulp out with a knife, spoon, or your hands.



2. **Soaking:** Soak the extracted seeds and pulp in water. After 12-24 hours of soaking, separate the seeds from the flesh and throw away the flesh and seeds that float in the water. Seeds that float in water are not viable.



*Seeds that float should be discarded*



*Bubbles form in the water when seeds are fermenting*

3. **Fermenting (for certain crops):** Soaking seeds can also be left for up to two days to ferment the seeds. Cucumber, melon, tomatoes, and eggplant seeds require fermentation.

4. **Drying:** Good seeds sink in water. Collect the sunken seeds, rinse them in clean water two or three times, remove water from the seeds with a filter, dry them in a towel, and then spread them out on a plastic sheet to finish drying. The seeds should be dried quickly in a well-ventilated area to avoid sprouting and the growth of mold. However, avoid drying seeds in harsh sun or at temperatures over 35°C. When drying the seeds, spread them out in a single thin layer and break apart any clumps. Avoid drying on newspapers or cardboards.



*Seeds stored in a glass jar with paper insert to block light*

## Dry seed processing

Dry seeds are extracted from dried pods or fruit. For pods, allow the pods to dry on the plant until they are light brown but not yet open. When extracting seeds from 'fruits,' like chilies or okras, pick the fruits when they are ripe and dry them in the sun before extracting the seeds.

Complete the drying process by laying the pods or fruits on a tarpaulin in the sun until they are hard and dry. Place seeds from small pods, like kale or cauliflower, inside a bag with good airflow to finish drying. The bag will collect the small seeds that drop from the drying pods. When the pod shells are beginning to open, extract the seeds by hand or thresh the pods inside a bag.

## Cleaning and grading seed

Cleaning and grading are important for maintaining seed quality. In the cleaning process, materials that are not seeds for storage are removed (such as dirt, plant parts, and seeds of other crops or weeds). The process of cleaning should also remove lightly damaged or deteriorated seeds.

Grading is the process of separating undesirable materials from desired ones. Gardeners can have higher quality seeds if they grade them.

## Seed drying

It is necessary to dry seeds properly before treating and storing. Seeds with high moisture content are easily attacked by pests and diseases, are susceptible to damage, and lose viability quickly.

It is important to avoid extremely high temperatures when drying seed. High temperatures can reduce the germination capacity of the seeds. Instead, dry seeds in a well ventilated, dry area during the morning or late afternoon to avoid mid-day sun. Spread seed out in thin layers when drying and use plastic sheets or jute mats rather than drying seeds on the ground or on newspaper/cardboard. Turn seeds over gently 4-5 times a day to ensure they dry evenly.

To check that the seed has dried properly, try to bend it with your finger. If it bends, it needs more drying. A properly dried seed will not bend. You can also put a few seeds in a dry, airtight bottle and let the seed stay for a day or two in a warm and sunny place. If no moisture forms inside the bottle, then the seed is dry enough for long-term storage.

## Seed storage

After cleaning and drying, seeds should be stored carefully so that they remain dry and safe from insect attacks. Seeds for different crops can be stored in different bottles or plastics for easy identification. It is important that the seed is labelled when storing. When storing seeds with sharp points or appendages, double bags can be used to reduce the problem of damage to the storage bag.

Traditionally seed has been treated with ash to reduce insect damage, but seeds treated with ash tend to have lower viability after six months. Charcoal and well-dried rice can also be added to the bottom of the storage containers to draw moisture away from the seeds.

Good storage should:

- Provide maximum possible protection from moisture, high temperatures, light, and pests:
  - **Moisture:** Storage containers should be completely dry before seeds stored in them. Containers should be airtight to not allow moisture to enter, and seeds should be properly dried before put into storage. Do not use paper, leaves or grass to plug a bottle, as these will allow moisture to enter.
  - **Temperature:** Seeds should be kept as close to 4°C as possible. Keep seeds in the coolest place within the house if refrigeration is not possible. Do not keep seeds over a fire or in the kitchen.
  - **Light:** Choose dark colored storage containers or wrap inside of containers with newspaper to block light. Do not keep seeds in the direct sunlight.
  - **Insect and other pests:** Storage containers should be airtight and protect seeds from insects, molds, rodents, and birds. Containers should allow gardeners to frequently inspect, clean, and repackage seed to remove insects or moldy seeds.

- Contain proper labeling and separation of seeds from different crops. Do not mix seeds collected from different seasons so that older seed can be used first.
- Be economical and suitable for a particular situation. Good containers for storing seed are: glass jars with lids, metal containers with lids, sealable plastic bags with no air space, earthen pots that are well sealed (for short term storage).
- Be appropriate in size for the amount of seed to be saved. Do not put a small amount of seed in a large container as it will expose the seed to a lot of air. Instead, small quantities of seed can be placed in separate, sealable plastic bags and then placed all together into large tins or glass jars.

### Testing seed viability

Seed that is stored for a long time may lose its viability (ability to germinate), even if seed is kept in good storage conditions. Gardeners should test the germination of their seeds before planting them in a garden bed—this is a good practice for all seeds gardeners wish to plant, not just seed saved by them!

Plant a small sample of seeds in a container or tray prior to sowing in the garden. Keep the seeds moist and well protected until they germinate. Keep track of how many seeds you planted so you can know how many germinated out of the total; ten seeds is a good number to test because it does not waste too much seed, but it is enough to know how well the seeds will do in a garden bed. If you find that the number of seeds that germinated during your test is low, you can increase your seeding rate or find a new source of seed. Seed quality can be tested at any time so that old seed is not stored unnecessarily.



10 min

## 7. Closing

Ask gardeners to share their plans to save seed, teach others to save seed, or anything else they have found particularly interesting from this session.



# Identifying Pests and Diseases



# OVERVIEW

## LEARNING OBJECTIVE

Participants will be able to identify common pests and diseases in their home gardens.

## MATERIALS NEEDED

- Flipchart
- Many colors of markers, especially yellows, browns, greens, for drawing insects
- Paper for participants
- Tape
- Insect pests collected by gardeners (optional)
- Insect-damaged leaves and other plant parts (optional)








## DURATION



## KEY CONCEPTS

- When plants are sick or in distress, they express symptoms that help gardeners understand what is wrong.
- Different kinds of pests create different kinds of damage. Learn which pests are affecting your garden!
- Through early control of pests and diseases, gardeners can promote good garden health and prevent future attacks.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	What is wrong with my plants?	 DISCUSSION	30 min
3	Understanding insect pests	 DISCUSSION	45 min
4	Beneficial insects and plants that attract them	 DISCUSSION	30 min
5	Insect pest life cycles	 DISCUSSION	30 min
6	Understanding and managing plant diseases	 DISCUSSION	45 min
7	Closing discussion	 DISCUSSION	15 min

# 1. Introduction and warm-up

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Welcome gardeners to the training. Do a brief introduction to today’s topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator’s Guide: Encouraging Learning through Participant Engagement.

# 2. What is wrong with my plants?

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn how to observe plant “symptoms” to determine if plants are suffering from nutrient deficiencies, water stress, insect damage, or a disease.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Explain to gardeners that when something is wrong with plants, they will start to show “symptoms,” or signs of a problem. Have gardeners list symptoms they commonly observe in plants. Start with the most common symptoms and move to the rarer ones.
2. Divide your flipchart paper or board up into four sections for nutrient deficiency, water stress, insect damage, and diseases. Discuss with gardeners which symptoms are most commonly associated with what problem.

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## KEY MESSAGES

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Although it is not always easy to determine exactly what is wrong with a plant, gardeners can look for these common symptoms to better understand how to fix a problem.

When plants remain untreated, a small problem may cause other more serious problems to develop. For example, a plant that has just a few whiteflies on it will appear fine at first, but, if left untreated, the whiteflies will reproduce very rapidly until they cover the plant’s leaves. When whiteflies suck on plant tissue, they can transmit certain viral diseases that cause leaves to become yellowish and distorted. In addition, whiteflies excrete a sugary substance known as honeydew, which serves as food for a fungus called “sooty mold.” Sooty mold creates a black film over leaves and prevents plants from photosynthesizing. If a gardener finds a plant after it has developed symptoms from the whiteflies, viral diseases, and sooty mold, it will be hard for them to figure out how to treat this plant. Encourage gardeners to frequently check their gardens to catch pest problems before they progress. Keep in mind that some insects like to hide on the underside of leaves, such as whiteflies, but others prefer to sit around the veins and new/unfurled leaves, such as aphids.

### Water stress

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**Symptoms:** leaves wilting, plant limp.

## Nutrient deficiencies

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**Symptoms:** The most common symptom of lack of nutrients is yellow leaves, but plants can also turn reddish or purplish hues if they do not have enough nutrients. Ask yourself if your plant is a different color than it should be.

## Insect infestation

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**Symptoms:** Look for “bites” taken out of leaves, skeletonized leaves, holes in stems and fruits. Also look for the insects themselves, webbing created by insects, their droppings, and chewed up plant parts.

## Plant disease

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**Symptoms:** Diseases make plants do “funny” things: wilt even if they are well watered, develop sooty black spots or a white fungus, or grow distorted leaves. Plant diseases tend to affect the whole plant, while insect pests attack individual fruit or leaves.

# 3. Understanding insect pests

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn about three categories of insect pests frequently seen in home gardens and connect the pest category to the type of damage they do.

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**FACILITATOR PREPARATION:** Consider asking gardeners to come to the session with a collection of leaves or other plant parts that have insect damage. Gardeners can also collect the insect pests themselves and bring them to the session.

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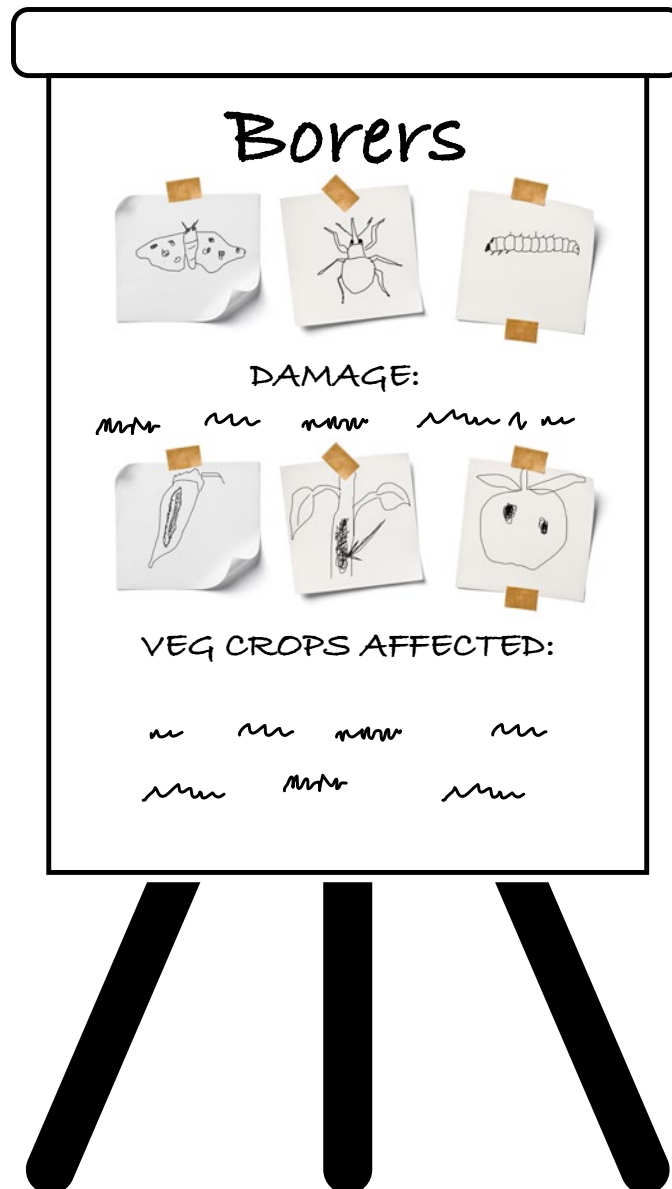
### MATERIALS NEEDED:

- Flipchart
  - Paper for participants
  - Many colors of markers, especially yellows, browns, greens, for drawing insects
  - Tape
  - Insect pests collected by gardeners (optional)
  - Insect-damaged leaves and other plant parts (optional)
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1. Ask gardeners to name insect pests they have seen in their gardens. Write these names on your flipchart. Be sure to include all local names in your list and note when there are duplicate names to describe the same pest or when a local name describes a broad group of pests rather than a single kind. If gardeners have collected insect pests from their gardens, review these as a group and write down their names as well.
2. Pass around the paper and markers you have brought and assign each participant some insects to draw. Participants should draw one insect per piece of paper. Encourage them to use correct color combinations and focus on the insects’ mouthpieces to the best of their ability. If a gardener knows what the insect looks like at different life stages, they should draw these life stages together on the same paper.
3. Write ‘piercing/sucking pests’, ‘defoliators/chewing pests,’ and ‘borers’ as titles on three different flipchart papers or areas of the board. Put the flipchart papers up on the wall or on the ground if needed. Explain to gardeners that these categories describe how different kinds of insects feed on plants.

45 min

4. Pick one picture to represent each insect category and stick this picture on the appropriate paper or area of the board. Then:
  - a. Ask participants to describe the damage caused by this insect. Write down the descriptive words they use and draw pictures of the damage it creates.
  - b. If gardeners have brought samples of leaves or other plant parts with insect damage, tape these in the appropriate space.
  - c. List the vegetable crops that are most commonly affected by this pest.
5. Ask gardeners to continue placing the pictures of the insects they drew in the appropriate category, adding descriptive words and drawings as needed. If there is disagreement among gardeners about what insects cause what damage, ask them to make a mental note of the disagreement and bring it up later in the garden monitoring session.
6. When the pictures are all categorized, ask one volunteer per category to summarize the results for the rest of the participants.



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## KEY MESSAGES

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### Piercing and sucking insects/sap feeders

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Sucking insects have a mouthpiece that can pierce and suck leaves and other plant tissues. These insects do not take a "bite" of the fruit or leaves, but instead suck juices from plant tissues or, in some cases, inject a toxin. This will deform the leaves and make them brown or yellow. If there are many insects, then the whole plant can wilt or die. Sucking insects can be common during early growth stages when plant tissues are full of sap. Sucking insects are important to control because they can transmit viruses that cannot be treated. These viruses cause distorted leaves and fruit and uneven ripening.

**CONTROL MEASURES:** Hand remove insects with a tissue or blast insects off plants with a hose, remove broadleaf weeds and waste piles that harbor sucking insects, remove highly infected plants early and bury in a deep pit or burn.

**COMMON EXAMPLES:** Aphids, leafhoppers, whiteflies, thrips, scale insects, mealybugs, true bugs, spider mites (not technically an insect, but still an important crop pest).

### Defoliators/chewing insects

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Defoliators are leaf eaters and make visible "bites" in the leaves or consume entire leaves off a stem. Leaf eaters can consume leaves at different rates, with some, like the tobacco hornworm, capable of consuming enough leaves in a day that it will profoundly harm the plant.

**CONTROL MEASURES:** Remove defoliators by hand. Look at every angle of the plant to find defoliators that are hiding. Some defoliators will hide in the soil during the day and feed at night. Look in the soil around the base of the plant to find any insects hiding there.

**COMMON EXAMPLES:** Caterpillars (army worms), cutworms, grasshoppers, maggots, spotted beetles, flea beetles, hornworms, leafminers, and other beetles.

### Borers

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Borers drill and tunnel into fruit, bean pods and shoots of plants as they eat. They mostly attack during the flowering, fruiting and ripening stages and leave their eggs and larvae inside the hole they have created. Look for evidence of small holes in fruits or pods. Shoots will look weak and droop due to internal damage from these feeding pests. Fruits, pods and shoots can be discolored or grow abnormally, e.g. be small and irregularly shaped.

**CONTROL MEASURES:** It is very important to control borers early in their life cycle. Larvae of borers may be found briefly on the outside of plants and can be removed by hand before they begin boring. Remove infected fruit, stems, pods from the garden and bury or burn them in a place away from the garden.

**COMMON EXAMPLES:** Weevils, cutworms, pod borers, fruit and shoot borers, stem/bean flies, moths.

# 4. Beneficial insects and plants that attract them

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners learn to identify the insects that are beneficial to their garden, how they are beneficial, and which plants attract them.

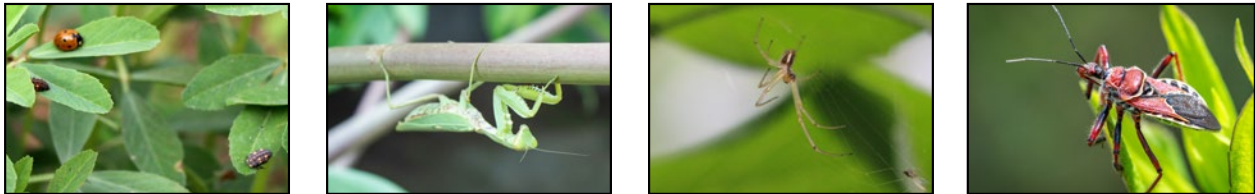
**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners if there any insects that can be beneficial to our gardens. How do these insects help us?
2. Divide your flipchart or board into two columns. Write "Pollinators" in one column and "Natural Enemies" in the other column. Ask gardeners for examples of each. Prompt them if needed.
3. Split gardeners up into small groups and ask them to discuss which plants can be planted in a garden to attract beneficial insects and where in their gardens they would put these plants. Why is it important that these plants be flowering for them to have a "pest control" effect?
4. Bring gardeners back together and ask each group to share their ideas with the larger group.

## KEY MESSAGES

Not all insects do damage to our plants. Lots of insects are actually beneficial!

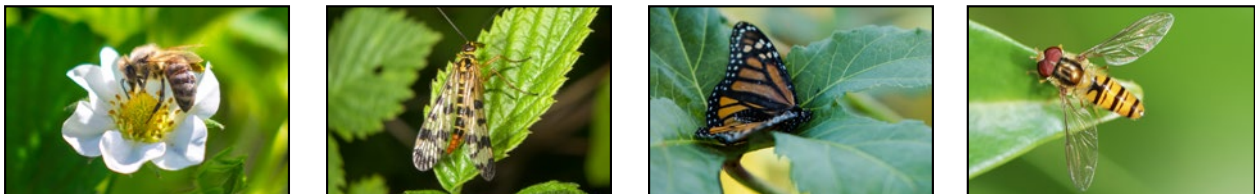
### Natural enemies



Some insects eat other insects or lay their eggs inside of them (killing them when the young hatch and start to feed) and can therefore help control their populations.

**EXAMPLES OF NATURAL ENEMIES:** ladybugs, praying mantises, centipedes, small wasps, spiders, lacewings, hoverflies, dragon flies, assassin bugs, earthworms, and pirate bugs.

### Pollinators



Other insects help spread pollen from flower to flower as they fly. You will often see pollinators "busy" around flowers as they collect food for themselves - they are simultaneously helping your flowers develop into fruits.

**EXAMPLES OF POLLINATORS:** bees, bumble bees, flies, hover flies, butterflies, and moths

## Attracting beneficial insects with flowering plants

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One way to attract the beneficial insects to our garden is to plant flowering plants around the margins of our gardens. Not only does this look good, the insects also come to feed on these flowers and stay to feed on the insect pests in your garden.

Some good flowering plants include:

- Herbs like parsley, dill, lavender, lemon balm, coriander, basil, celery, fennel, chives, mint
- Flowers like marigolds, sunflowers, corn flowers, calendula.
- Stinging nettles and wild mustards
- Brassicas (kale, cauliflower, broccoli) that you are leaving to develop seed

## 5. Insect pest life cycles

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will learn about insect life cycles and how this information can help them better identify insect pests and beneficial insects.

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**FACILITATOR PREPARATION:** Facilitator should familiarize themselves with common and/or most destructive local insects and their life cycles if these life cycles are missing from the material provided in this module.

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#### MATERIALS NEEDED:

- Flipchart
  - Paper for participants
  - Many colors of markers, especially yellows, browns, greens, for drawing insects
  - Tape
- 

1. Use the **Insect Life Cycles Training Aid** to review the different life stages of insects.
2. Split participants up into 'piercing and sucking,' 'defoliators/chewing,' 'borers,' and 'beneficials' small groups. Have each group pick one insect from their category and draw a picture of its life cycle. Rotate the groups so every group draws a picture from each category. Provide some guidance into what are the common life cycle phases for each insect category to help guide gardeners.

### KEY MESSAGES

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Understanding an insect's life cycle can help gardeners search for and eliminate insect pests before they become a problem. Eggs can be removed before they turn into leaf-eating larvae and winged insects can be prevented from laying eggs on crops with a net. Additionally, gardeners may be able to more easily identify their main pest problem if they see the same insect at various life stages on their crops rather than mistakenly thinking they have two or three different pests damaging their crops.



## 6. Understanding and managing plant diseases

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will learn what plant diseases are and how to manage them in a home garden.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners how plant diseases can affect their gardens.
2. Give participants five minutes to quickly discuss with their neighbors *the symptoms plants have when they are sick*. After five minutes, ask participants to share and write their ideas on your flipchart or board. Encourage them to be as specific as possible. If gardeners mention symptoms that could be due to other reasons, such as water stress, nutrient deficiencies or insects, note this by reviewing the list from the earlier discussion on 'What is wrong with my plants.'
3. Give gardeners another five minutes to quickly discuss with their neighbors *how diseases in humans spread* (for example, bacteria in water or food or viruses by sneezing, coughing and physical contact). After five minutes, ask participants to share with the larger group and write their ideas on your flipchart or board.
4. Now ask gardeners to discuss with their neighbors *how plant diseases spread*. After five minutes, have the participants share their thoughts with the larger group. Elicit the main ways plant diseases spread (insects, soil, seeds, water, wind, and physical contact with other infected plants).
5. Draw three columns on a flipchart and write the main ways plant diseases can spread in the column to the left. On top of the middle column write "What NOT to do" (or just an **X**) and on top of the right column write "What TO DO" (or just a tick **✓**).
6. Work through each category, asking gardeners what NOT to do and what TO DO to manage diseases.
7. Finish the session by asking gardeners to develop one sentence with their neighbors that summarizes how to keep a garden free of disease (for example, "Keep your soil, plants and seeds healthy and your water clean"). Give participants two minutes to come up with their summary sentence.

### KEY MESSAGES

- Plants can get sick just like people! A plant infection can be very mild—and the plant will still yield produce that can be eaten—or an infection can kill the plant. Plant diseases cannot harm humans, but they can dramatically lower yields and make produce unsuitable for eating.
- Plant diseases express themselves differently depending on the crop and how badly the plant is infected. This makes it difficult for gardeners to know for certain what disease is affecting their crops. Nonetheless, gardeners should always work to stop the disease from spreading within their gardens and their neighbors' gardens. It is very hard to manage plant diseases once they are present, so the best strategy is to prevent them from occurring or from getting out of control.
- Some disease symptoms can be similar to the symptoms plants have when they lack water or nutrients. Taking good care of the plants will therefore make it easier to diagnose a diseased plant since you know it is not underfed or under watered. If the garden on a whole is healthy, but an individual plant or part of a plant is showing signs of being sick, this is an indication that the plant is suffering from a disease and should be removed from the garden.

## What symptoms do plants have when they are sick?

Some common signs and symptoms of plant diseases include:

- White, brown, or black fungal growth
- Angular brown leaf spots where plant tissue may have died with a yellow “halo” around it
- Leaf spots that have a “bull’s eye” appearance
- Concentric yellow ring spots
- Reddish or orange fuzzy “rust” on leaves
- Yellowing leaves
- Galls on plant roots
- Entire plant or branches wilting
- Water-soaked lesions on plants
- Fruits that have soft, rotting spots and potentially mold
- Fruits that are abnormally colored
- Mosaic leaf patterns or irregular patchworks of green and yellow areas over the surface of a leaf
- Yellow bands along the main veins of leaves
- Crinkled or distorted leaves
- Plants remain small and stunted despite good bed preparation
- A thick, gummy substance emerging from an infected stem or canker.

Diseases can spread through...	What NOT to do?	What to do?
<b>Insects</b>	✗ Do not let insect pests get out of control.	✓ Monitor crops regularly for insects and practice prevention and control measures.
<b>Soil</b>	✗ Do not put infected plants in compost piles and then spread this compost in your fields.	<ul style="list-style-type: none"> <li>✓ Practice crop rotation.</li> <li>✓ Pull up infected plants and burn them right away.</li> <li>✓ Add disease-free organic material to your garden beds to build up soil fertility and “healthy” microorganisms.</li> </ul>
<b>Seeds</b>	<ul style="list-style-type: none"> <li>✗ Do not harvest seeds from infected plants.</li> <li>✗ Do not plant seeds that are moldy.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Know the source of your seeds as much as possible. Harvest seeds from healthy and productive plants.</li> <li>✓ Keep seeds dry and clean in an airtight container.</li> </ul>
<b>Water</b>	✗ Avoid splashing water as much as possible if diseases are a major problem in your garden.	<ul style="list-style-type: none"> <li>✓ Intercrop to reduce the spread of diseases from an infected plant to its neighbors and to reduce rain or irrigation water from splashing soil on plants.</li> <li>✓ Stake plants to improve air circulation between leaves and help plants get dry.</li> </ul>
<b>Wind</b>		✓ Plant a windbreak to protect plants.
<b>Infected plant tissue</b>	✗ Do not put infected plants in the compost pile.	<ul style="list-style-type: none"> <li>✓ Prune away any infected plant leaves, stems, and fruits and burn them.</li> <li>✓ Pull up any very infected plants completely and burn them.</li> </ul>

## 7. Closing discussion

Ask participants to share with the group:

- Something they learned in the session
- How they could support each other in helping identify pests and diseases

# Managing Pests and Diseases



# OVERVIEW

## LEARNING OBJECTIVE

Participants will learn techniques for preventing and controlling pests and diseases.

## MATERIALS NEEDED

- Flipchart and markers
- Paper and pencils to distribute to participants
- Yellow, blue or both colored cards or objects that contain these colors
- Oil, grease, or another sticky substance
- String, poles, or another material to fix the colored cards to in the garden
- Water bottles or other plastic containers to place as pit traps
- Knife to cut water bottle tops
- Water and vinegar or salt to place in pit traps

## DURATION



## KEY CONCEPTS

- A strong, healthy garden is more capable of resisting an attack from pests and diseases than an unhealthy garden. Our goal is to shift our energy away from fighting pests and diseases to actions that will prevent them from happening in the first place.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	Preventing insect pests and diseases	 DISCUSSION	40 min
3	Rotating crops to prevent disease	 DISCUSSION	30 min
4	Managing pests and diseases	 DISCUSSION	40 min
5	Monitoring our gardens for pests and diseases	 PRACTICAL ACTIVITY	30 min
6	Closing discussion	 DISCUSSION	10 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

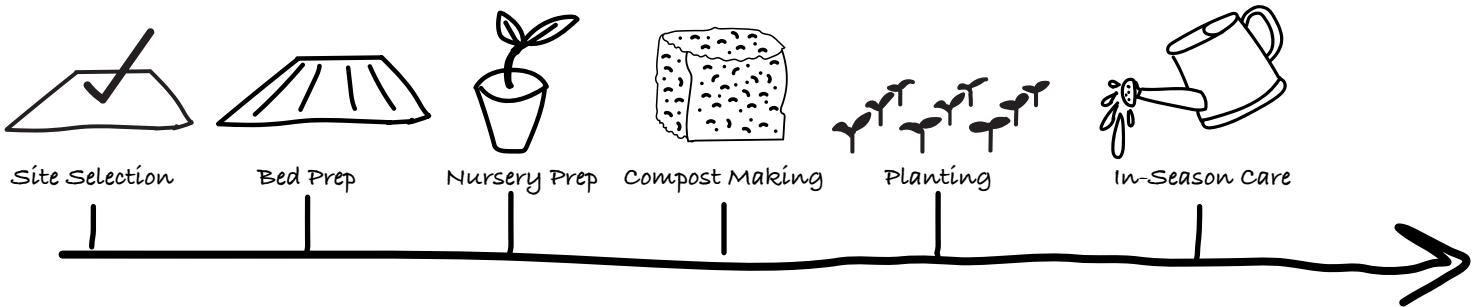
# 2. Preventing insect pests and diseases

## INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners see how pest and disease management can start even before pests and diseases are present.

**MATERIALS NEEDED:** Flipchart and markers

1. Ask gardeners when is the best time in the season to start pest and disease management. Have gardeners give their answers and explanations.
2. Explain to gardeners that we can start to manage pests and diseases even before we plant our first seed.
3. Draw a horizontal line on your flipchart to represent a timeline of the season. Have gardeners list the steps they take from preparing to plant a crop up until pests and diseases appear in their gardens. Include steps that take place outside of the garden too, like building a nursery or compost pile. Use pictures and words to depict these steps on the timeline.
4. Starting at the beginning of the timeline, ask gardeners to list all the actions they can take to prevent pests and diseases from entering and spreading in their gardens. Write these preventative actions below each gardening step and add others that gardeners may have missed.
5. Emphasize to gardeners that all the actions they have listed are considered pest and disease control, even though they have done them before they saw a single pest.



## KEY MESSAGES

Pest and disease management does not start when we see the symptoms! It starts even before we plant our first seed. Gardeners can reduce the amount of insect pests and diseases in their gardens by carefully preparing their garden space, practicing crop rotation, and cleaning their equipment and tools prior to use.

Gardening steps	Preventative Action
<b>Site selection</b>	<ul style="list-style-type: none"> <li>• Pick a site where crops have done well in the past. If you see, for example, that tomatoes continuously seem to have a disease in certain sites, do not plant tomatoes there, but plant a different crop in its place (crop rotation).</li> </ul>
<b>Bed preparation</b>	<ul style="list-style-type: none"> <li>• Enrich garden bed soil with disease-free compost or rotted manure to build healthy soil capable of fighting diseases.</li> <li>• Be aware that mulch can also provide habitat for slugs and other pests. Reduce level of mulch if necessary.</li> <li>• Trim away overhanging branches so that sunlight can dry moisture in the garden during the day.</li> <li>• Plant flowering plants around garden perimeter to attract beneficial insects to the garden. Parsley, sunflowers, marigolds, and holy basil are plants that attract beneficial insects.</li> <li>• Clean tools and boots before preparing beds. Diseases can spread from an infected bed to an uninfected one through soil on tools and boots.</li> </ul>
<b>Nursery preparation</b>	<ul style="list-style-type: none"> <li>• Plan for a diversity of vegetables in your garden.</li> <li>• Use clean equipment, containers, and hands for planting.</li> <li>• Check seeds for mold before planting. Do not plant moldy seeds.</li> <li>• Place seeds in a hot water bath for 20 minutes. Place seeds in a water-permeable cloth and tie securely. Boil water and then let cool for 10 minutes. Pour water in a bowl and submerge seeds for 20 minutes. Place seeds in a bowl of not-hot water afterwards to stop treatment. Dry seeds before planting so they can be evenly spread in the soil.</li> <li>• Observe if seedlings are experiencing "damping off." Symptoms can include: seedlings fail to emerge; first leaves are water soaked, mushy or discolored; stems are water soaked and very thin; young leaves wilt and turn brown; roots are absent or stunted; or fluffy white growth appears. "Damping off" diseases spread in cool, wet conditions. In the future, allow more sun to reach seedlings, improve water drainage, and use clean soil, tools, and containers.</li> <li>• Plant disease-resistant varieties of vegetables if available.</li> </ul>
<b>Compost preparation</b>	<ul style="list-style-type: none"> <li>• Use only disease- and insect-free material in compost piles.</li> <li>• Clean tools regularly.</li> </ul>
<b>Direct seeding and transplanting</b>	<ul style="list-style-type: none"> <li>• Check seeds for mold before planting. Do not plant moldy seeds.</li> <li>• Place seeds in a hot water bath for 20 minutes. Place seeds in a water-permeable cloth and tie securely. Boil water and then let cool for 10 minutes. Pour water in a bowl and submerge seeds for 20 minutes. Place seeds in a bowl of not-hot water afterwards to stop treatment. Dry seeds before planting so they can be evenly spread in the soil.</li> <li>• Practice crop rotation.</li> <li>• Use netting to protect young seedlings.</li> <li>• Plant disease-resistant varieties of vegetables if available.</li> <li>• Intercrop beds or plant a diversity of species within the garden to "confuse" pests and reduce the amount of food available for each species of insect pest. Insects are often specialists; if gardeners plant a diversity of crops, then that species has less to eat and has to look harder to find it.</li> </ul>
<b>In season care</b>	<ul style="list-style-type: none"> <li>• Monitor crops daily for pests and diseases.</li> <li>• Use colored sticky traps (yellow, blue) for pest monitoring.</li> <li>• Manage weeds that may harbor pests.</li> <li>• Use a "pest prevention spray" on crops (see below).</li> <li>• Use netting to protect plants from insect pests.</li> <li>• Sprinkle wood ash around garden.</li> <li>• Stake or trellis plants to improve air flow between leaves.</li> <li>• Prevent waterlogging of soil, which creates damp conditions favored by many pests and diseases.</li> </ul>

A strong, healthy garden is more capable of resisting an attack from pests and diseases than an unhealthy garden. Our goal is to gradually shift our energy away from fighting pests and diseases to actions that will prevent them from happening in the first place.

### What is a pest prevention spray?

A pest prevention spray is a spray that coats a crop's leaves and stems with a substance that is unattractive to insects that come to feed on it, such as aphids, mealybugs, or white flies. Garlic bulbs, onion leaves and onion bulbs, chilies, neem leaves, and many herbs (mint, basil, rosemary, dill, cilantro) have substances in them that make them unattractive to certain pests. These ingredients can be crushed or finely chopped and then soaked in water overnight. One or more ingredients can be used together in the same spray. Small amounts of soap can be added to help the liquid spray cling to the plant. Only add enough soap to cause small bubbles to form when the liquid is shaken or vigorously stirred; too much soap will "burn" the crops. Test the spray on one plant first before applying it on a broader scale. The liquid is sprayed on crops using a sprayer or dabbed on plants using a small branch with dried leaves. Special attention should be paid to the underside of leaves where pests like to hide. The spray should be applied late in the day to avoid burning leaves in the hot sun and can be applied a few times a week if needed.



*Ingredients for making pest prevention spray*

### How can we use wood ash to repel pests?

Sprinkle wood ash from a fire around the base of plants to repel surface-feeding insects such as slugs and snails. Wood ash dehydrates soft-bodied insects. When dusted on crops, it will deter chewing insects that do not like the gritty texture. However, wood ash loses its deterring properties when it gets wet and must be reapplied. It therefore needs to be applied regularly. Wood ash should be used selectively since continuous use may increase the soil pH or accumulate salts to levels harmful to plants.

### How does a colored sticky trap help gardeners monitor their insect pests?

Whiteflies, leafminers, fungus gnats, and aphids are attracted to the color yellow. Thrips are attracted to both yellow and bright blue color. Since these insects can be very small and hard for gardeners to see, colored sticky traps can be used to "trap" them so that gardeners can monitor their presence.

Purchase yellow or blue colored cards, or look around your environment to find objects that have large blocks of these colors in them. You can also use yellow or blue paint to coat metal, plastic, or another reusable item in this color. Make the traps sticky by applying oil or grease over the yellow or blue color. Fasten the traps to posts or use string to hang the traps within the garden. The traps should be placed on or between the crops at crop level where pests can be a problem - if the traps are too far away from the pests' food source (your crop!) or too high above crops, then pests may not encounter the traps. Try laying traps both vertically and horizontally to see which direction is best at capturing pests and adjust your traps as needed. The traps themselves may not control the pests, but will help to reveal what insect pests are present and to what extent. Traps that fill up quickly indicate a serious pest problem that should be controlled through another management strategy as soon as possible.



*Homemade yellow cup sticky trap*



*Hanging sticky trap*

## 3. Rotating crops to prevent disease

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners learn the benefits of crop rotation for pest and disease control, as well as other aspects of a healthy garden.

**MATERIALS NEEDED:** Paper and pencils to distribute to participants

1. Distribute pieces of paper torn into palm-sized squares to the gardeners. Working in small groups, ask them to quickly draw locally available vegetables that they like to eat and put the names of the vegetables below the picture. Give gardeners a few minutes to complete their drawings.
2. Draw four columns on your board or flipchart and write "Seeds/Seed Pods - Leaves - Fruits - Roots" in that order at the top of the columns. Ask each group to come to the flipchart or board and tape their drawings in the column that best describes the part of the plant that is best to eat.
3. Draw a square on your flipchart or board to represent a garden bed. Move one drawing from the Seeds/Seed Pods column to the square and explain to gardeners that they can pick one crop from this group to plant in the garden bed first. Move this drawing back to the Seeds/Seed Pods column and select one from the Leaves column, followed by a drawing from the Fruits and then the Roots column. Explain that a new season is starting each time you move a drawing to the square. Show the **Crop Rotation Training Aid** to gardeners to help explain this idea.
4. Explain to gardeners that switching what type of crop is planted in a garden bed season after season helps control pests and diseases by removing their food source for multiple seasons. Have gardeners share additional thoughts on how practicing crop rotation can reduce pests and diseases.
5. Explain that rotating crops also benefits the soil as each crop uses different combinations of nutrients pulled from different parts of the soil. Draw examples of typical root structures for each crop type at the bottom of each column and discuss how following the sequence of Seeds/Seed Pods → Leaves → Fruits → Roots can help build healthy soils.
6. Emphasize that rotating crops seasonally helps build a healthy garden, but is also important for their and their families' health. Eating a diversity of vegetables helps your body get all the nutrients it needs to stay strong.

### KEY MESSAGES

Crop rotation is the practice of moving crops from one bed to another, or from one place in a bed to another place in the same bed, from season to season.

#### Why do we rotate crops?

**Lower pest and disease impact:** Insects and diseases specialize in attacking vegetables that are within the same plant family. To keep insects and diseases from making a big impact on your garden, alternate between plant families to make it more difficult for insects and diseases to spread throughout the garden. When you remove crops from a particular plant family from the garden, the insect pests that live and feed on it will no longer be able to reproduce in the garden.

**Healthy soils:** By having a diversity of crops in your garden, you will be encouraging plants to use different nutrients from different parts of the soil. Some plants can also help the health of soil. Legumes, for example, add nitrogen to the soil that can later on be used by plants that require a lot of nitrogen, such as brassicas.

**Better yields:** With better soil health and fewer pests, you will have more vegetables. Having a diversity of crops within your garden will also limit the yield losses you have from any one pest or disease.



**By rotating from Seeds/Seed Pods → Leaves → Fruits → Roots, we will rotate what plant families we are planting in the same garden bed season after season.**

Plants grown for their **seeds or seed pods** include beans, groundnuts, and peas.

- Seed crops help rebuild soil fertility by adding back nutrients.
- Even though some vegetables, like cowpeas, are grown for their edible leaves, they should be classified as a 'seed' vegetable for crop rotation purposes.

Plants grown for **leaves** include amaranth, lettuce, and cabbage.

- Leaf plants require a lot of soil nutrients, so can be planted in a freshly prepared, well-fertilized garden bed or directly after a seed plant.

Plants grown for their **fruits** include cucumber, eggplant, gourd, Irish potato, melon, pepper, pumpkin, squash, and tomato.

- Fruit crops can manage more nutrient stress than leaf plants, but still require well-fertilized soil. Many fruit crops are also highly susceptible to soil-borne diseases, such as blights and wilts, so it is especially important to follow fruit crops with crops from different categories in a garden bed to break the cycle of disease. Some diseases can be very persistent in soil, even lasting twenty or thirty years in the soil, but planting other crops in between fruit crops can reduce the level of disease in the soil and allow fruit crops to survive.
- Even though some fruit vegetables, like pumpkins, are grown for their edible leaves, they should be classified as a 'fruit' vegetable for crop rotation purposes.

Plants grown for their **roots** include beets, carrots, garlic, onions, radishes, sweet potatoes, turnips, and radishes.

- Root crops can help break the cycle of disease while accessing nutrients from different places in the soil profile than leaf or fruit vegetables.

40 min

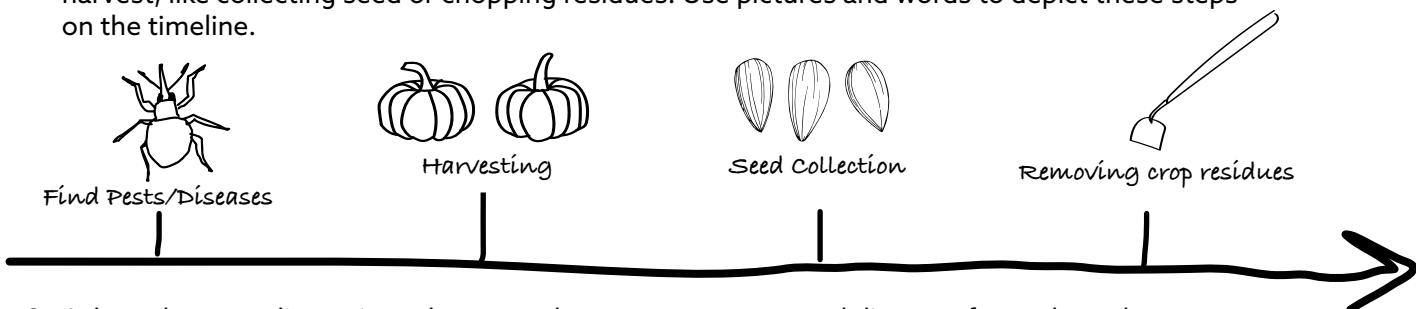
## 4. Managing pests and diseases

### INTERACTIVE DISCUSSION

**GOAL OF DISCUSSION:** Gardeners will learn how to manage pests and disease outbreaks.

**MATERIALS NEEDED:** Flipchart and markers

1. Draw another horizontal line on your flipchart to represent a timeline of the season. Now have gardeners list the steps they take from observing pests and diseases in their garden up until the end of the season. Include steps that take place outside of the garden and steps that occur after harvest, like collecting seed or chopping residues. Use pictures and words to depict these steps on the timeline.



2. Ask gardeners to list actions they can take to manage pests and diseases for each garden step. Write these management actions below each gardening step and add others that gardeners may have missed.
3. Emphasize to gardeners that managing pests and diseases appropriately now is also helping reduce the severity of future outbreaks.

## KEY MESSAGES

Timely pest and disease management can prevent outbreaks that are more serious if diseases are controlled and insect pests cannot reproduce. Timely management can also help reduce the severity of future attacks.

Gardening step	Management actions
<b>In season care</b>	<ul style="list-style-type: none"> <li>• Monitor crops daily for pests and diseases.</li> <li>• Hand remove small infestations of insects.</li> <li>• Use colored sticky traps (yellow, blue) for pest monitoring.</li> <li>• Manage weeds that may harbor pests.</li> <li>• Use a “pest prevention spray” on crops.</li> <li>• Use netting to protect plants from insect pests.</li> <li>• Sprinkle wood ash around garden.</li> <li>• Stake or trellis plants to improve air flow between leaves.</li> <li>• Allow chickens to search for insects in nearby shrubs or woody areas to eat insects before they enter the garden. If insects that are favored by chickens are observed in the garden, allow chickens to enter to consume these insects. Observe carefully to make sure chickens are not damaging plants in the process and wash any produce thoroughly before consuming to remove chicken poop.</li> <li>• Prune away disease-infected leaves, branches, or entire plants and bury them in a deep pit away from the garden or burn them if possible.</li> <li>• Reduce mulch levels if insects are hiding there.</li> <li>• Avoid overwatering and creating a moist environment where diseases can grow.</li> <li>• Prevent waterlogging of soil, which creates damp conditions favored by many pests and diseases.</li> <li>• Avoid overhead watering that allows water to splash from plant to plant and potentially spread disease. Water plants at the base instead.</li> </ul>
<b>Harvesting</b>	<ul style="list-style-type: none"> <li>• Remove inedible, old fruits that might be harboring insects. If fruits are found to contain insects, bury them in a deep pit away from the garden or burn them rather than compost them.</li> </ul>
<b>Seed collection</b>	<ul style="list-style-type: none"> <li>• Only collect seeds from healthy, disease-free plants.</li> <li>• Make sure seeds are mature and properly dried before harvesting.</li> </ul>
<b>Removing crop residue</b>	<ul style="list-style-type: none"> <li>• Bury every insect and disease-infested residue in a deep pit away from the garden or burn it rather than compost it.</li> </ul>

### How can we use pit traps in our garden?

Pit traps are used to catch crawling insects, such as slugs and snails, as they approach crops. Cut the top off a water bottle or other plastic container. Bury it in the garden so that the top of the plastic is level with the soil. Fill the container with a few centimeters of water and add something toxic to the pests, such as vinegar or salt. The water should be deep enough that the insects cannot crawl out again. Place as many pit traps as desired around crops.



*Photo Credit: EatTheSeason.com*

## 5. Monitoring for pests and diseases

### PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Gardeners will spend time looking for evidence of insects and diseases in a garden and discuss what actions they would take to manage those pests. Gardeners will also place colored sticky traps and pit traps for pest monitoring.

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**FACILITATOR PREPARATION:** Identify a garden, or gardens, in advance where participants can observe symptoms of pest and disease damage.

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#### MATERIALS NEEDED:

- Yellow, blue or both colored cards or objects that contain these colors
  - Oil, grease, or another sticky substance
  - String, poles, or another material to fix the colored cards to in the garden
  - Water bottles or other plastic containers to place as pit traps
  - Knife to cut water bottle tops
  - Water and vinegar or salt to place in pit traps
- 

**STEP 1.** Bring gardeners to a garden where they can look for evidence of pests and diseases.

**STEP 2.** Explain to gardeners the importance of monitoring for pests and diseases early and often. Also explain the importance of visiting the garden at different times of day and night to catch pests when they are active.

**STEP 3.** Let gardeners find plants expressing symptoms of pest and disease damage, as well as the pests themselves.

**STEP 4.** Discuss the symptoms found by gardeners, what could be the cause of these symptoms, and what could be done to control any pest and disease outbreaks found in the garden. Ask gardeners what steps could be taken next season to prevent these pests and diseases from entering the garden again.

**STEP 5.** Build sticky traps and pit traps with gardeners and place them in the garden.

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## KEY MESSAGES

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### Why should we monitor our gardens for insect pests?

By regularly checking our gardens for insect pests, we can quickly identify if there are any problem insects and stop them before they spread to other plants or crops. It is much easier to control a small pest outbreak than it is to try and save a crop from failing because of a severe outbreak.

### How do we monitor our gardens?

Insects are generally good at hiding. This means we have to be very thorough and creative when we look for them.

- Get down on your hands and knees when observing the crop and soil
- Examine the undersides of leaves, nodes of plants, and inside flowers
- Dig in the soil or mulch looking for insects
- Leave a plastic bag in the soil near plants overnight and check it in the morning to see if any insects are hiding under it.
- Place pit traps on the ground to catch slugs and snails
- Take a plant and shake it while catching the insects that fall with a white piece of paper
- Use colored sticky traps to observe small flying insects like whiteflies or thrips
- If you need to pull up any individual plant, shake it in a bucket to observe the insects that were on it.
- Come to the garden at different times of day and night to observe if insects are feeding.

When monitoring pests, it is important to take note of the type of insects you find, the number of plants affected, the severity of damage to individual crop plants, and area of crop affected by the pest. It is also important to keep monitoring your garden even when you are treating the pest problem to see if what you are doing is successful.

## 6. Closing discussion

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Ask participants to share with the group:

- Something they learned in the session
- How they could support each other in helping identify pests and diseases

10 min

# Water for Home Gardening



# OVERVIEW

## LEARNING OBJECTIVE

Gardeners will learn how to water their gardens more effectively and think through how to prevent problems with excess water or a lack of water.

## DURATION



## MATERIALS NEEDED






- Flipchart and markers
- Spades
- Sticks
- Stones
- Bits of banana leaf
- Half a bucket of mulching material
- Water bottle full of water



## KEY CONCEPTS

- Water is key to a successful garden!
- There are effective and low-cost strategies to either avoid excess water or conserve water that are easily implemented in a home garden. Many of these solutions require gardeners to design their gardens thinking about how water flows across their landscape.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	Irrigating smartly	 DISCUSSION	45 min
3	Strategies to deal with excess water	 PRACTICAL ACTIVITY	45 min
4	Strategies to conserve water	 PRACTICAL ACTIVITY	45 min
5	Closing discussion	 DISCUSSION	15 min

# 1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

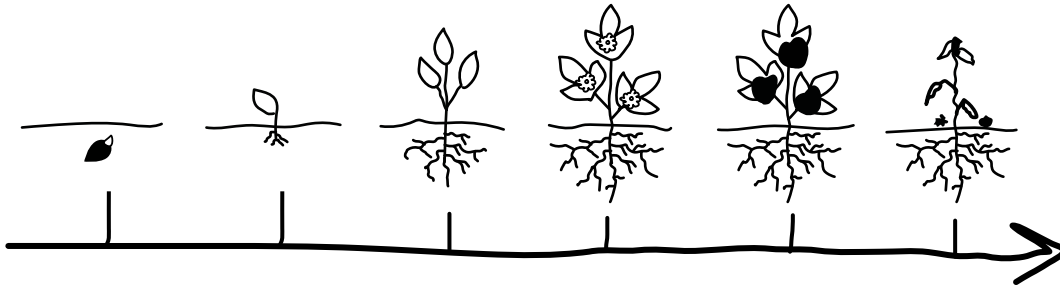
# 2. Irrigating smartly

## INTERACTIVE DISCUSSION

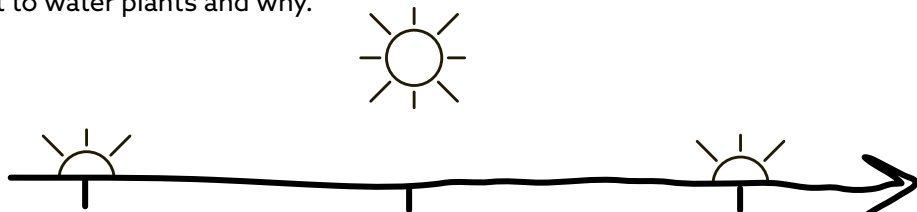
**GOAL OF DISCUSSION:** Gardeners will have a deeper understanding of the watering requirements for different crops in their home garden.

**MATERIALS NEEDED:** Flipchart and markers

1. On your flipchart or board, draw a timeline of the different growth stages of a plant (germination, young seedling, leaf and root growth, flowering and fruiting, fruit ripening and drying). Draw pictures along your timeline so the growth stages are easily understood by gardeners. Note that not all plants go through every growth stage, for example, leafy greens do not produce fruits (seed pods) when we grow them for their leaves. Ask gardeners why crops may have different water requirements depending on what stage of growth they are at.



2. Divide gardeners into five groups. Have each group discuss the watering needs of a group of plants:
  - a. Cole crops (*broccoli, cabbage, cauliflower, collards, mustards, kale, etc.*)
  - b. Root and tuber crops (*carrot, sweet potato, onion, beetroot, ginger etc.*)
  - c. Lettuce and leaf crops (*lettuce, spinach, amaranth, etc.*)
  - d. Beans and peas (*county bean, yardlong bean, garden peas, etc.*)
  - e. Nightshades/tomato family (*tomato, pepper, potato, eggplant, etc.*)
3. Have each group share their findings with the larger group. Note these findings on your flipchart or board.
4. On the next page of your flipchart, draw a timeline representing a full day. At the start of the line draw a rising sun, in the middle a full sun, and at the end a setting sun. Ask gardeners when in the day is best to water plants and why.



### When do plants need to most water?

Healthy plants are full of water all the time. Every time a plant wants to grow a new part—such as a root, a stem, a leaf, or a fruit—it needs water to do so. If we want our plants to grow, we must provide them with enough water, especially during critical growing periods when plants want to grow very rapidly. This means that water is especially critical during: seed germination, the first few weeks of development, immediately after transplanting, and flowering and fruit production. Water is less important as plants age because they are not growing as many new roots and leaves as they were before. In fact, sometimes it is desirable to stop or slow watering so that the flavors in fruits (such as tomatoes) can develop and fruits do not absorb so much water that the skin cracks.

Water evaporates off the soil surface faster when temperatures are high. The best time to water your crops is early morning or late afternoon so water can sink into the soil instead of evaporate.

### Different crop groups have different watering needs

**Cole crops** (broccoli, cabbage, cauliflower, collards, mustards, kale, etc.) need consistent soil moisture throughout their life span. These crops have shallow roots; they need frequent watering since water can quickly evaporate from their root zone. For cole crops that develop a head, water use is highest and most critical during head development.

**Root crops** (carrot, sweet potato, beetroot, onion, ginger etc.) also need consistent soil moisture throughout their life span. Root and tuber crops have shallow roots; they need frequent watering since water can quickly evaporate from their root zone. Without sufficient water, root crops will be irregularly shaped or cracked and may develop unusual flavors.

**Lettuce and other leaf vegetables** need water at every stage of growth to make sure they are continuously growing the leaves we eat. For lettuces that form a head, water is especially critical during the heading stage.

**Beans and peas** have the highest water use of any common garden vegetable. Blossoms drop with inadequate moisture levels and pods fail to fill, therefore water is especially critical during flowering and pod development. On hot, windy days, blossom drop is common. When moisture levels are enough, the bean plant is a bright, dark green. The leaves of bean plants may become slightly gray under water stress.

**Nightshades/tomato family** (tomatoes, peppers, potatoes, and eggplant) have higher water requirements when they are establishing and—most critically—during flowering and fruiting. Flowers can drop and fruits remain small if plants are water stressed. After fruits have developed, irrigation should be reduced so that fruit skins do not crack. Potatoes also require a dry period before harvest to harden their skin. Blossom end rot is a symptom of both too little and too much water. Blossom end rot spots look like a dark bruise on a fruit at first. As the spots enlarge, they become sunken and turn black or dark leathery brown in color. Overall, this crop family has a smaller water requirement than many other vegetables because of their deep roots. Gardeners should be wary of overwatering.

Adjust your watering schedule to fit your soil type; sandy soils need more frequent watering, but loamy and clay soils do better with longer, less frequent watering because these soil types can retain water for longer.



## 3. Strategies to deal with excess water

### PRACTICAL ACTIVITY

**GOAL OF ACTIVITY:** Gardeners will identify why water floods or pools in their gardens and devise strategies to avoid excess water.

#### MATERIALS NEEDED:

- Flipchart and markers
- Spades
- Sticks
- Stones
- Bits of banana leaf
- Half a bucket of mulching material
- Water bottle full of water

**STEP 1.** Ask gardeners if too much water can be a problem in their gardens. Have gardeners share experiences of floods or pooling water in their gardens. When does this happen? Where does the water come from? What is the result? Write the reasons why gardens flood or have pooled water in them on your flipchart or board.

**STEP 2.** Draw a large square, minimum 1m x 1m, on the ground using a stick. Tell gardeners this represents a homestead. Draw a square or circle for a house and a rectangle for the home garden and put a couple of sticks in the ground to represent trees. .

**STEP 3.** Ask gardeners what strategies can be put in place to address flooding or pooling water in their gardens. As they give suggestions, discuss them and have the gardeners model them within the square. Elicit the following strategies if they are not mentioned, explaining as you model them:

- a. Mulching and digging in organic material
- b. Diversion drains
- c. Holes for storing water and/or mulch pits
- d. Small ditches dug on contour above gardens to slow, sink and spread water
- e. Soil cover (mulches or living plants)

**STEP 4.** Ask a couple of gardeners to share which strategies they want to use in their own home garden and why. Encourage them to draw or mold the strategy in a new square representing their homestead.



### Why do gardens flood?

- Gardens experience flooding or pooling of water when water is applied, either from irrigation or natural sources, faster than it can be absorbed into the soil. When soils are compacted or have a crust on top of them, water can only enter the soil very slowly. The majority of the water will pool on the surface or run down the slope.
- Gardens can also be located in a flood plain or low-lying area that is seasonally inundated with water.
- Gardens can be located at the bottom of a slope that does not have any means of slowing down water as it moves from the top to the bottom.

### Why is too much water a problem?

- Too much water can wash away topsoil and seeds. Heavy rains can damage plants and create waterlogged conditions that suffocate plant roots.
- Excess water can allow fungi to grow within the soil or make plant roots rot because they are sitting in water. It also reduces their access to air.
- Poorly drained soils allow moisture-loving diseases to spread.
- Water flowing over beds can move seeds out of position, damage young seedlings, and erode topsoil.

### Where does excess water come from?

- Rain
- Irrigation/watering
- Overland flow from areas close to the garden
- High water table under garden beds
- Water from nearby areas draining into garden
- Flood water from channels or nearby rivers

### What strategies can address too much water in a garden?

- Improve your soil's ability to absorb water by regularly **digging in organic material**.
- **Build diversion drains** around gardens to redirect water flowing in from strong storms. Observe where water tends to pool in your garden and then build a drainage system around the garden that collects water before it hits garden beds and diverts it around the beds. Ideally the drainage system will collect water in a place where it can be stored for later use (like a deep hole or a mulch pit).
- **Divert water into deep holes** in the corners of your garden to collect water and store it for later use or plant bananas or fruit trees around it. The holes will collect water and allow it to slowly seep into the ground. This can be a useful strategy for soils that can alternate rapidly between too wet and too dry. If soils are permanently too wet, then it is better to divert excess water out of the garden rather than store it in holes.
- **Divert water into mulch pits** and plant bananas or fruit trees around it. A mulch pit is a deep hole filled with mulch. As the mulch decomposes, it adds nutrients to the soil that can be used by the bananas or fruit trees.
- **Dig small ditches along the land's contour above your garden** if your garden is located on a slope or at the bottom of a hill. The ditches will slow, spread, and sink water so your garden is not hit with water running down the hill.
- **Keep the soil covered with mulches or living plants.** Mulches and living plants help slow water down so that it can absorb into the soil instead of run off. If water is entering the garden from areas up slope, then keep areas outside the garden covered as well.

## 4. Strategies to conserve water

### PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Gardeners will identify how their gardens are affected by too little water and devise strategies to conserve water.

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#### MATERIALS NEEDED:

- Flipchart and markers
  - Spades
  - Sticks
  - Stones
  - Bits of banana leaf
  - Half a bucket of mulching material
  - Water bottle full of water
- 

**STEP 1.** Have gardeners take five minutes to discuss with their neighbor if they tend to have problems with too little water for gardens in their area. Have them describe what happens and when, such as a delayed start to planting or mid-season droughts. What is the result of having too little water for gardens? Bring the group back together and collectively summarize how gardens experience drought. Write key points down on your flipchart or board.

**STEP 2.** Draw a large square, minimum 1m x 1m, on the ground using a stick. Tell gardeners this represents a homestead. Draw a square or circle for a house and a rectangle for the home garden and put a couple of sticks in the ground to represent trees..

**STEP 3.** Ask gardeners to share strategies that they have implemented or seen implemented for water conservation. Ask them to model the strategy in the dirt as they explain it, explaining how it is done and why. For example, draw a line for water-harvesting ditches or a half-moon berm or draw a circle for a rainwater harvesting tank. Elicit the following strategies if they are not mentioned, explaining as you model them:

- a. Mulching
- b. Sunken beds
- c. Recycling household wastewater
- d. Grouping crops with similar water requirements together in the garden
- e. Irrigating slowly and deeply
- f. Organic materials and manures
- g. Weed control
- h. Windbreaks
- i. Swales, berms, holes, and half moons

**STEP 4.** Ask a couple of gardeners to share which strategies they want to use in their own home garden and why. Encourage them to draw or mold the strategy in a new square representing their homestead.

### Why do gardens not have enough water?

- Very little water may be available because of low rainfall and infrequent storms. This means it is important to use the available water wisely!
- Sometimes gardeners are located in areas where it is difficult to access the available water (especially in mountainous areas), which means some people will have more difficulty watering their gardens than others.
- Irrigation equipment could be expensive or unavailable.
- Soils do not retain water when it is applied, so gardens quickly dry out even if there is frequent rainfall.

### What strategies can conserve water in a garden?

- Reduce the amount of water you need to apply by **mulching**. Mulching reduces the soil's exposure to sunlight, which reduces evaporation so water stays in the soil for longer.
- Use a **sunken bed design**. Sunken beds are cut into the ground rather than raised. This means the bed forms a basin to capture any rain or irrigation that falls, rather than having it run off the surface. Sunken beds can also be covered by large leaves or palm fronds to reduce evaporation when plants are small.
- **Recycle household wastewater** as much as possible. Water used for bathing or with large amounts of soap or washing powder can be applied to bananas or fruit trees, but water used for food preparation (such as rinsing rice or vegetables) can be used to water plants in the garden.
- **Irrigate slowly and deeply** so that water does not run off the surface or evaporate from the soil too quickly. This means irrigate for longer, but less often, to fill the root zone with water.
- **Dig in composted organic material and manures** to increase the soil's ability to retain water.
- **Control weeds** that compete with vegetables for water.
- Protect plants and soil from wind with **windbreaks** to reduce evaporation.
- Make **swales, berms, holes, and half-moons** in your landscape (see below).

#### Swales:

Swales are an important rainwater harvesting tool. A swale is a shallow trench dug along the land's contour, with a berm on the downhill side created with soil from the trench. This trench follows the contour of the landscape and captures water running down a slope, which slows it down and spreads it across the contour line.

#### Berms:

A berm is a raised earthen structure, which is often placed downhill from a swale. As berms are stopping runoff water from entering a garden too fast, they are also collecting and storing water. This water can be used if perennial plants are planted on them. Perennial plants will keep the berm from eroding over time and can be useful to households if they have a nutritious, cultural, practical, or medicinal purpose. Berms are constructed by mounding soil in a line along the contour or into small half circles to form a "half-moon."

## Holes:

Rainwater catchment holes are deep holes in strategic locations around a garden that harvest and store rainwater. If holes are positioned at the end of a swale, they can also catch overflow from the swales. The catchment holes should be dug at least 50 cm deep (deeper for areas with greater rainfall) and 50–100 cm wide. As with a berm, the downhill edges of the hole can be amended with compost and planted with useful plants. In dryland climates, gardeners can plant their crops in shallow and narrow holes spread across their garden instead of a traditional garden bed. When amended with compost or manure, these planting holes can conserve more water than if crops are planted on level ground or raised beds.

## Half-moons:

Half-moons are another strategy to harvest and retain rainwater. Half-moons are generally 2–3 m wide, curved berms or ridges in the shape of a semi-circle. The end tips of the half-moon are located along the contour of the slope, pointing uphill. Multiple half-moons can be placed in a row at the top of the planting area to trap rainwater as it flows down the slope. A second row is then placed below the first row, staggered in a way to catch any overflow that continues down the slope. The area within the half-moon, and even the berm itself, is often amended with compost or manure and planted with annual or perennial crops.

# 5. Closing discussion

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15 min

1. Ask gardeners to discuss in pairs a technique they learned that they want to implement in their gardens to either reduce excess water or conserve water.
2. Ask each pair to share with the group as a whole.

# Building a Productive Mulch Pit for Recycling Wastewater



# OVERVIEW

## LEARNING OBJECTIVE

Participants will learn how to productively reuse household wastewater with a mulch pit.

## MATERIALS NEEDED

- Spades or other local digging tools
- 4 banana suckers
- 5-10 banana leaves
- Planting material for crops that provide ground cover (watermelon, sweet potato, cassava, pumpkin, taro)
- Mulching material
- Cardboard or old paper (optional)


## DURATION



## KEY CONCEPTS

- Household wastewater can be used in a low maintenance way to grow extra fruits and vegetable crops by building a mulch pit.
- Mulch pits should be located close to the homestead so that household water can easily be thrown into the pit.

## TRAINING AGENDA

1	Building a productive mulch pit or banana circle for recycling wastewater	 PRACTICAL ACTIVITY	1 hour
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# 1. Building a productive mulch pit or banana circle for recycling wastewater

## PRACTICAL ACTIVITY

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**GOAL OF ACTIVITY:** Gardeners will make a mulch pit, also known as a banana circle, to productively use wastewater.

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### MATERIALS NEEDED:

- Spades or other local digging tools
  - 4 banana suckers
  - 5-10 banana leaves
  - Planting material for crops that provide ground cover (watermelon, sweet potato, cassava, pumpkin, taro)
  - Mulching material
  - Cardboard or old paper (optional)
- 

**STEP 1.** Explain to gardeners what types of household wastewater should or should not be reused. Explain that a productive mulch pit, also known as a banana circle, is a way to use wastewater to grow more crops.

**STEP 2.** Identify a good location for the mulch pit. This could be near where the dishes are washed or kitchen water is thrown.

**STEP 3.** Ask one of the gardeners to mark out a circle two meters in diameter. Another bigger circle can be marked around it as a guide for the mounded garden bed.

**STEP 4:** Using the two-meter circle, ask a different gardener to dig out a dish-shaped pit to a depth of one meter.

**STEP 5.** Ask the gardeners to put the excavated soil around the edge of the pit so that a mounded, circular garden bed is created. At this point, you can create an opening in the mound and a trench for rainwater runoff to enter the mulch pit. If you anticipate water running into the pit from a household source, such as the kitchen, dig a trench from the water source to the opening in the mound so that the water can enter the mulch pit.

**STEP 6.** Ask one of the gardeners to line the bottom of the pit with old paper, cardboard, or a few layers of banana leaves to slow down the infiltration of the water once the pit is functional. This will make sure that water stays in the pit long enough to be taken up by the plants that will surround it.

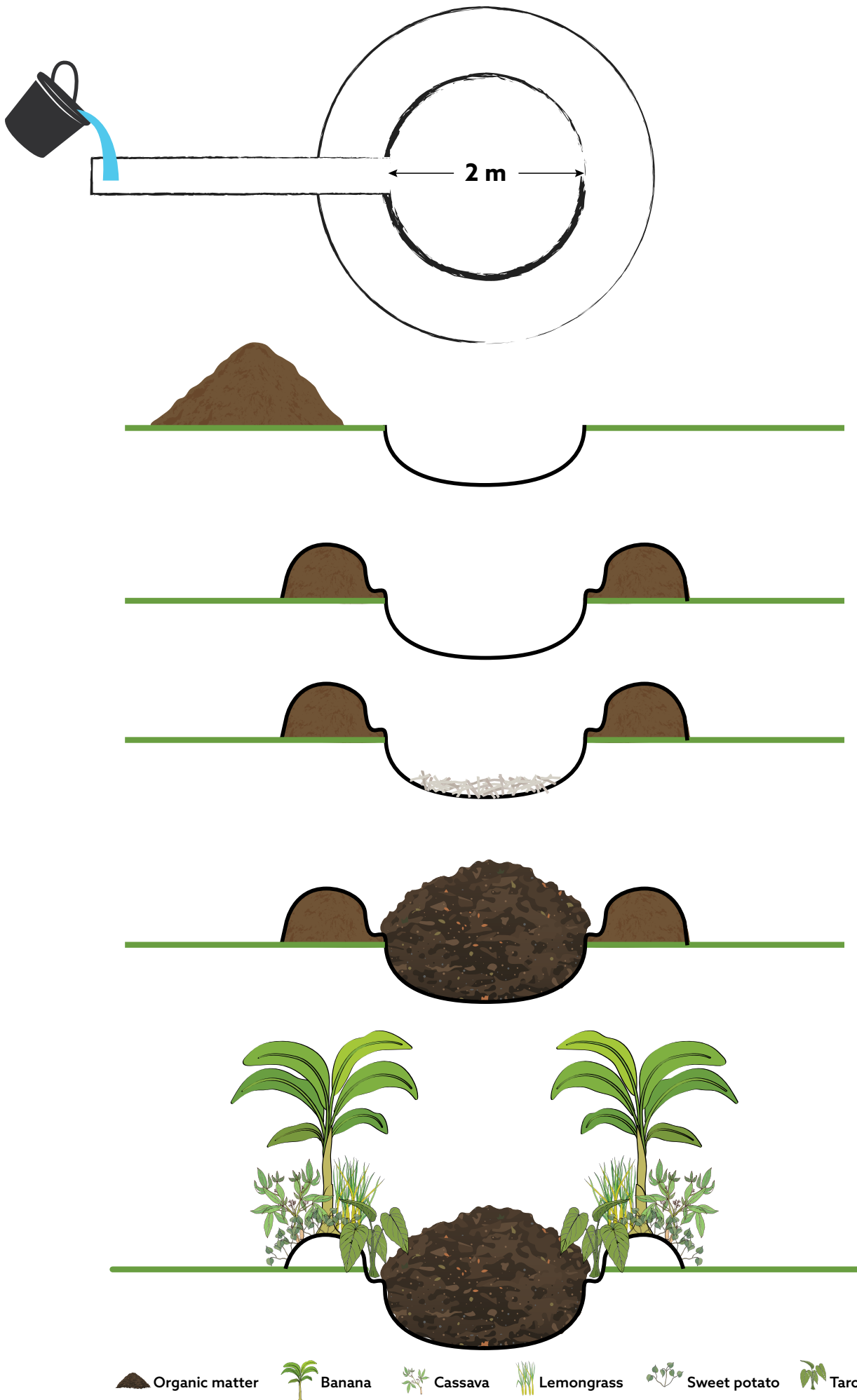
**STEP 7:** Fill the pit with mulch. You can also treat the pit as a space for a compost pile and layer in green and brown organic materials the same way you would for a compost pile. The mulch or organic materials can be slightly mounded over the pit because they will reduce in size over time.

**STEP 8:** Together with gardeners, plant banana suckers around the rim of the mound. Normally, four banana suckers can be planted around a two-meter mulch pit. Papayas can also be planted. Gardeners can also add crops that provide ground cover for the mound, like watermelon, taro, cassava, pumpkin, sweet potato, and cowpeas. Plant water-loving crops towards the inner rim of the mound and more drought tolerant plants on the outer rim.

**STEP 9.** Cover the bare soil with mulch to protect the soil and minimize evaporation.

**STEP 10.** Ask gardeners to share a key insight and how they may implement this in their own homestead. What other crops would they plant around the mulch pit?





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## KEY MESSAGES

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When households use water, some of it can be recycled into gardens rather than thrown away. Water that has been used for washing dishes or preparing food can be recycled, but water that is potentially contaminated with human and animal feces should not be used in the garden.

A mulch pit is a deep hole that is filled with mulch. As the mulch decomposes, it will add nutrients to the soil. Together with the household wastewater that is thrown in the pit, this will create a rich and low maintenance environment for growing fruit trees and vegetables. The mulch in the pit will need to be refilled as it decomposes.

### **What to plant around a mulch pit?**

Bananas are excellent for mulch pits because their shallow roots can easily access the water that is maintained in the pit. When bananas mature, they can provide structural support for vines or climbing plants, such as passion fruit or beans, which can be planted around them.

Water-loving crops should be planted along the inside rim of the circle and drought tolerant crops should be planted on the outer rim.

Lemongrass or other thick grasses can provide erosion control for the mound so it does not collapse.

# Healthy Diets for a Healthy Life



# OVERVIEW

## LEARNING OBJECTIVE

Participants will learn what a healthy diet is and how it benefits them.

## MATERIALS NEEDED

- Flipchart
- Different color markers, especially brown and colors that will represent a variety of foods
- Pre-prepared game cards
- A device that can be used as a timer






## DURATION



## KEY CONCEPTS

- Foods can be divided into three broad color groups: Rainbow, Brown, and White. A well-balanced diet contains food from all three groups on a regular basis.
- Young children and women especially need to eat a well-balanced diet.
- Our gardens can help us have healthy diets by providing a diversity of foods all year long.

## TRAINING AGENDA

1	Introduction and warm-up	 DISCUSSION	10 min
2	What does a healthy diet look like?	 DISCUSSION	1 hour
3	Diets for young children and women	 DISCUSSION	45 min
4	How can my garden help me eat a healthy diet?	 DISCUSSION	20 min
5	Closing discussion	 DISCUSSION	10 min

# 1. Introduction and warm-up

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Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

# 2. What does a healthy diet look like?

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will see how a healthy diet contributes to good health and will learn to group foods according to color so they can easily prepare a healthy meal.

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**FACILITATOR PREPARATION:** In advance, prepare 20–30 cards or slips of paper with the name of a common food item on each card. Make sure you have included a good mix of Rainbow, Brown, and White foods.

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### MATERIALS NEEDED:

- Flipchart
  - Different color markers, especially brown and colors that will represent a variety of foods
  - Pre-prepared game cards
  - A device that can be used as a timer
- 

1. Pair up gardeners and ask them to finish this sentence "A healthy diet is important because..." Encourage each pair to come up with as many ways to finish the sentence as they can in five minutes. After five minutes, have some pairs share what they discussed with the larger group.
2. Tell gardeners that a healthy diet is consistently eating **enough Rainbow, White, and Brown foods** and **not too many packaged, fatty, salty, or sugary foods**.
3. Introduce gardeners to the three Food Color Groups. Use the **Food Color Groups Training Aid** to show food items in each group. Demonstrate to gardeners the motions associated with each color group.
4. Put away the training aid and play the game with participants. Aim to complete the game in 15 minutes or less.
5. After the game, draw a large circle representing a plate on your flipchart or board. If it is not common in your area for an individual to eat from their own plate or bowl, draw circles to represent the serving bowls or a communal serving tray used at a meal. Have one volunteer shade the plate/serving bowls/serving tray with the appropriate colors or draw circles within it to represent the portion sizes of Rainbow, Brown, and White foods as they are typically consumed. Rainbow foods can be represented by two colors on top of one another. Ask the group if the drawings depict what is consumed in their households as well. This exercise can be repeated for breakfast, lunch, and dinner.
6. Review what a healthy meal looks like (half Rainbow, one quarter Brown, and one quarter White foods) and discuss how this may differ from the meals that participants drew. Ask if any meals could be modified and discuss how.
7. Discuss with participants why packaged, fatty, salty, or sugary foods should be consumed in moderation.
8. Ask participants if they can think of any other characteristics of a healthy diet. Write their suggestions on your flipchart or board, adding any suggestions that they missed and discussing them as needed.

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## KEY MESSAGES

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Healthy diets are the foundation of healthy bodies. If our bodies do not get enough to eat, then it is much easier for us to get sick, feel fatigue, be irritable or emotional, and not think clearly. It is important to eat enough food, but it is also important to get the right balance of nutrients from our diet. If we do not get all the nutrients we need from food, our bodies begin to slowly break down. We get sick a lot. Our hair, skin, and fingernails become brittle and break. We may lose our eyesight at night. We may feel fatigued. Our bodies work best when we have enough of the right kinds of foods.

Although it is easy to know if you are eating enough food (you are either hungry or not!), it is harder to know if you are eating the right balance of foods so your body stays well nourished. Assigning foods to a color group and then eating something from each color group at every meal is one way of making sure you are eating a balanced diet.

Assigning food to Food Color Groups is not a perfect system and there are many examples of individual foods that are difficult to classify correctly. Are bananas in the White group or Rainbow group? Are eggs Brown or White? It is ok if some food colors are a little misleading. The main goal of grouping food by color is to help people balance their meals over time. Each time we eat a healthy meal, we are building towards an overall healthy diet.

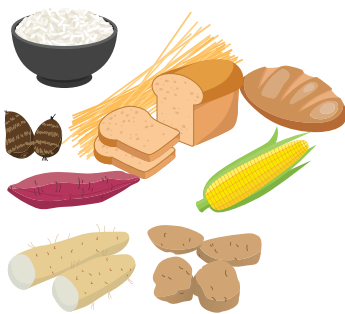
### The three Food Color Groups

**WHITE** foods provide us energy. White foods include staple foods like rice, potatoes, maize, sweet potatoes, cassava, yams, and wheat. White foods are important because they provide our bodies with the fuel they use every day. In the discussion activity, White foods are associated with a running motion.

**BROWN** foods provide us with proteins that build our muscles. Brown foods include beans, eggs, chicken, fish, meat, pork, and milk. Brown foods are important because they allow us to build and maintain muscles. In the discussion activity, Brown foods are associated with making a muscle with your arms.

**RAINBOW** foods (reds, oranges, yellows, greens, blues, purples) provide our bodies with the nutrients they need to fight disease and help our organs (eyes, heart, lungs, liver, and brain) function properly. Rainbow foods include all vegetables and fruits such as tomatoes, spinach, kales, peppers, bananas, citruses, avocados, watermelon, and papaya. In the discussion activity, Rainbow foods are associated with pointing to your eyes and heart and breathing deeply.

#### WHITES



#### BROWNS



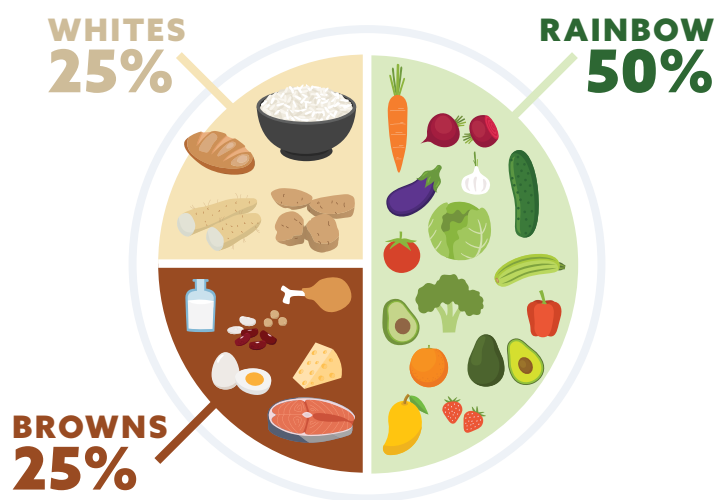
#### RAINBOW



## A healthy diet includes...

### ...enough Rainbow, Brown, and White foods

- Every meal should contain one food from each color group.
- Rotate the foods you consume within each color group whenever possible. For example, if someone had papaya for their Rainbow food at breakfast, they can eat leafy greens for lunch and beets for dinner. It is not always possible to rotate what is eaten daily, however making a habit of eating a large diversity of foods will ensure you are consuming all the nutrients your body needs.
- Eat the right portion of each color at every meal. A healthy meal is one-quarter White foods, one-quarter Brown foods, and half Rainbow foods.



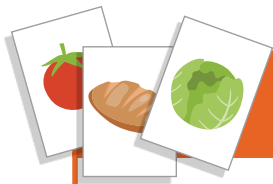
### ...and not too many packaged, fatty, salty, or sugary foods.

There are some foods that we should not eat too frequently. These foods are known to cause problems in our bodies if they are consumed regularly or in large amounts. These foods may taste good and are rising in popularity, but they often do not contain the nutrients that we need to maintain a healthy body. They may also contain ingredients that can be bad for our bodies if we consistently eat a lot of it. Healthy diets do not include a lot of:

- Packaged foods, such as biscuits, noodles, or crisps
- Fatty foods, such as foods fried in oil
- Salty foods. Small amounts of salt are often not harmful, but diets containing large amounts of salt can lead to health problems.
- Sugary foods and beverages

### Additional tips

- Drink lots of clean water.
- Cook meats and fishes thoroughly and at a high temperature to reduce the risk of getting sick.
- Wash hands with soap and water before food preparation and before eating. Do not forget to wash children's hands too!



## HOW TO

## PLAY THE FOOD COLOR GROUPS GAME

### Card preparation:

Aim to prepare about 20–30 cards in advance. Select healthy food items that are available in your area, such as local staples, beans, eggs, fish, vegetables, and fruits to include on the cards. Do not include packaged, fatty, salty, or sugary foods in the game. In the corner of each card, indicate the correct color group for each food item.

### Game instructions:

Split up the group into two smaller groups. Have each group choose a team name to make it easier to keep track of the points on your flipchart or board as you go. The goal of the game is to help participants connect each food to 1) the correct color group, so that they can eat a properly balanced meal, and 2) the correct motion, so they understand what each food does in their bodies.

1. Split the group into two smaller groups. Have each team choose a name and write it on your flipchart or board to keep score.
2. The stack of cards is placed face down on a table, chair, or the ground in front of the two groups. Flip a coin to see which team will go first.
3. One person from the first team stands next to the cards. A timer is set for three minutes. This person will draw cards one at a time and must describe the food item listed on the card to their teammates until time is over. The person describing the food is NOT allowed to say either the name of the food or any reference to a color. When a teammate thinks they know what food is being described, they must do the motion associated with that food so that the person in front knows to call on them (for example, if the teammate thinks the person in front is describing rice, they will make a running motion until they are called on). They can only guess the food being described after the person in front calls on them. If they guess correctly, their team gets one point.
4. If the teammate guesses incorrectly, the other team has a chance to “steal” the point and guess the food item. If the opposing team guesses correctly, they are awarded the point instead. The teams keep guessing back and forth until one gets it right, but must stop once time is over.
5. The person describing the food should try to go through as many cards as possible during their turn to gain the most points. Tally the points for each team when time is over.
6. The next team now chooses a person to come to the front. Cards that have already been used are put away, and the timer is reset to three minutes. Now the opposing team must guess first. If they guess incorrectly, the first team may “steal” the point by correctly guessing the food item.
7. Continue to switch teams until all the cards are used up.

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**0 POINTS:** The card is forfeited if the person accidentally says the name or color of the food and no points are awarded.

**1 POINT:** If someone on the team does the correct motion and correctly guesses the name of the food listed.

**1 POINT:** If one team does not guess correctly the first time, the other team may take a turn at guessing the food listed on the card.



## 3. Diets for young children and women

### INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will discuss how children and women can eat healthier diets and why this is important.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Explain to gardeners that healthy diets are important for everyone, but there are certain phases of life where it is especially important for your body to be well nourished. Just like when plants need more food and water when they are rapidly growing, humans also need more nourishment when they are growing. This is especially true for children under two years old and pregnant and breastfeeding women.
2. Label your flipchart paper or board "Foods Eaten by Children under Two" and make three columns for Rainbow, Brown, and White foods. Ask participants to name foods commonly consumed by young children in the community and have them say under which column the food should be listed. If participants name dishes that contain multiple ingredients, write the primary ingredients of the dish down in the correct columns.
3. Ask gardeners to reflect on the typical diets of children under two in their area. Is it well balanced between the three Food Color Groups? What colors are missing? Are there seasons or times of the year where children's diets are less diverse? Do all children in a household eat this diet or do some children eat a more diverse diet than others?
4. With gardeners, brainstorm ways that all children can eat a more nutritious diet. Do certain foods need to be grown during the dry season to supplement diets? Do children need to be given more access to the nutritious foods that are already around the household? Can nutritious foods be prepared in a way that young children can eat them? Write these ideas down on your flipchart or board.
5. Label your flipchart paper or board "Healthy Foods for Pregnant and Breastfeeding Women" and make three columns for Rainbow, Brown, and White foods. Ask participants to suggest foods that are good for women to eat during this phase of their lives and have them say under which column the food should be listed.
6. Ask gardeners why some pregnant or breastfeeding women may not eat enough of these foods. List these reasons on the left side of your flipchart or board. With participants, brainstorm potential solutions to each barrier and write ideas to the right of each reason.

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## KEY MESSAGES

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When plants are rapidly growing (building more roots, becoming taller and bushier, developing flowers or fruits), they need lots of water and nutrients so their growth is not stunted. This is also true for humans. When our bodies are busy (growing, healing from sickness, pregnant or lactating), we need nourishing food to help our bodies do this work. Nourishing food is always important, but there are two phases of life where it is especially important to be well nourished: when child is under two years old and when a woman is pregnant or breastfeeding.

### Children under six months

If children are younger than six months, it is recommended that they only consume breastmilk. Breastmilk is very nutritious and contains all the nutrients and fluids that a child needs. Babies should be breastfed whenever they express hunger to make sure they are consuming enough food. Because they have small stomachs and digest milk very quickly, babies will breastfeed many times a day.

### Children over six months

Although children over six months may continue to breastfeed, it is important that solid foods also be introduced around this time. Children's bodies continue to grow during this time and breastmilk does not contain all the nutrients little bodies need after the first six months of life. As children transition away from breastmilk, their diet should begin to resemble an adult's diet with all three Food Color Groups consumed.

Since children do not eat large amounts of food, it is even more important that the foods they eat are packed with nutrients. Rainbow and Brown foods are all highly nutritious. It is important to offer children little bits of these nutritious foods whenever possible—even if adults consider the flavors “too strong” for young children—so that children grow accustomed to eating them. A child may gravitate towards sweet or bland flavored foods, but if a child is offered strong-flavored, nutritious foods, like vegetables, repeatedly then they will develop a taste for them.

### Modifying foods for children over six months

Starting at six months, children should be introduced to solid foods. Even without teeth, children can use their strong gums to chew foods. Foods should be modified however so that they are not a choking hazard.

- Vegetables can be boiled until they are soft and then mashed
- Beans can be boiled until they are soft and then mashed
- Small dried fish can be pounded and incorporated into stews or porridges
- Fruits can be cut into spears so that young children can hold them comfortably in their hand

### Pregnant and breastfeeding women

When women are pregnant and breastfeeding, they should consume more food than normal and be extra careful to consume a good mix of all three Food Color Groups. Pregnancy and lactation require women's bodies to do a lot of work. As babies develop, they use nutrients from the woman's body that need to be replaced from the woman's diet.

Pregnant and breastfeeding women should eat when their bodies tell them that they are hungry. Rainbow and Brown foods will help women maintain their health while they are pregnant and will help their babies develop properly. Pregnant and breastfeeding women should also drink lots of water. Pregnant women need extra water because their bodies are making more blood and amniotic fluid. Breastfeeding women need extra water to produce milk.

20 min

# 4. How can my garden help me eat a healthy diet?

## INTERACTIVE DISCUSSION

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**GOAL OF DISCUSSION:** Gardeners will discuss how gardening can contribute to eating a healthy diet within their households.

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**MATERIALS NEEDED:** Flipchart and markers

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1. Ask participants if anyone has a story to share of how their garden, or perhaps a neighbor's or family member's garden, was helpful in eating the three Food Color Groups more frequently.
2. Brainstorm with gardeners ways that their gardens can produce vegetables and fruits all year long to contribute to a healthy diet.

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## KEY MESSAGES

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- Vegetables can be planted in a staggered manner to extend the harvest and prevent an over-supply of vegetables that could perish.
- Fruit trees and perennials can be planted on the edges of gardens or around the property to provide fruits at different times of the year.
- Container or sack gardens can be planted during the off-season and watered with household wastewater.

10 min

## Closing discussion

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Going around in a circle, ask each participant to share one thing they learned with the group.

# FACILITATOR'S GUIDE: Cooking Demonstrations to Encourage Healthy Eating



Cooking demonstrations require some advance planning and coordination, but can be a rewarding way to finish a training program or re-engage participants in the training material. Cooking demonstrations should be relaxed events with a festive attitude where participants can learn by doing and then stay to enjoy a delicious meal with their fellow cooks.

## Goals of a cooking demonstration

Cooking demonstrations have a variety of goals:

1. Demonstrate how to incorporate locally available vegetables into meals in new and exciting ways
2. Demonstrate how to cook a well-balanced, nutritious meal
3. Provide participants with a relaxing and fun way to build relationships with their fellow group members

## Preparing for a cooking demonstration

It is helpful to include participants in the organization of the event. Set aside time at the end of a training session to choose the time and location for the event and assign tasks in an equitable manner. You may need multiple planning sessions for the discussion.

There are many tasks that can be assigned to participants so that the event goes smoothly:

- Recipe preparation (see below)
- Food preparation – vegetables will need to be washed and chopped, potatoes peeled, or beans sifted through!
- Cooking – choose volunteer cooks who are comfortable and excited by the prospect of cooking for a large group of people
- Setting up chairs and tables
- Serving food
- Washing plates, bowls, pots, cooking implements, and utensils after eating
- Sweeping or cleaning up trash from the site

Many items will need to be organized in advance:

- A flipchart or board where you can write the recipes out for all to see and copy
- Sometimes multiple cooking stations are needed to prepare enough food for the group – there should be enough pots, pans, lids, spatulas, cooking fuel, etc. for each station
- Ingredients for cooking, including oil, cooking water, salt, and other spices
- Bowls or plates for everyone
- Utensils for everyone
- Rags or napkins for cleaning up
- Hand washing stations
- Refreshments to complement the meal (avoid sugary drinks)
- Fresh fruits to complement the meal
- Tables to cook on or display the finished dishes
- Chairs for everyone
- Music or entertainment for when participants are eating
- Shade or indoor space for eating

## Choosing what to cook during a cooking demonstration

Cooking demonstrations can feature either a single recipe or multiple recipes at a time. Engage participants in the selection of the recipes but collaborate with the recipe developers and cooks to make sure recipes include all three Food Color Groups, use vegetables appropriately, and can be cooked by participants at home.

- Brainstorm with participants a list of vegetables that they would be excited to learn how to cook or see new ways to cook.
- Ask participants if there are any traditional staple foods in their area that are not milled or processed that they want to use instead of heavily milled or processed staple foods.
- Ask participants if there are dishes they already know about and want to learn how to cook.
- Consider giving participants the challenge of preparing a nutritious meal that meets a budget set by participants (for example, the price of a meal could be lower than what someone would spend if they purchased a quick street meal). The meal should have all three Food Color Groups represented, and all ingredients should be purchased from local markets or collected from local gardens. Calculate the price of the meal by dividing the total amount spent on food by the number of people who eat the meal. The price should meet the budget set by participants.

### Regardless of the recipes selected, be sure to:

- Use only locally available cooking implements (spatulas and pots) and sources of heat (stoves or fires).
- Find out what staples (White foods) and proteins (Brown foods) are most widely consumed by participants and find recipes that can improve the nutritional content of dishes that use these foods as the base. Consider replacing heavily milled staples, such as white rice, noodles, or maize meal, with staple foods that are less processed, such as brown rice, millet, or sorghum.
- Do not use expensive ingredients that participants do not purchase regularly for household consumption. Although participants may want to eat special foods at the cooking demonstration, it is unlikely that they will be able to replicate these dishes often in their homes.
- Fruits are often not cooked as part of a recipe, but are part of a healthy meal when consumed on the side. Include a fruit as a side dish whenever possible.
- Feature recipes that do not cook vegetables for more than 5–10 minutes. In most recipes, vegetables can be added as the last step and cooked until they are just soft. Cooking heat can destroy many valuable vitamins and may make vegetables taste bitter, so it is best to limit their exposure to heat.
- Do not throw out cooking water once vegetables have been added. Many nutrients will leach from vegetables into the water, so add just enough water to cook vegetables and not throw any away.
- Feature recipes that use a minimal amount of oil, salt, and sugar and do not rely on packaged foods, such as instant noodles.

## Day of the event

- Be sure to allow yourself plenty of time at the start of the day to organize the materials needed for the demonstration.
- Set up the food preparation stations and cooking stations so that large groups can gather around them and many people can participate if needed. This might mean stations need to be slightly far away from each other.
- When food is being cooked, make sure someone is explaining what is happening and that everyone can see what is happening. It might be necessary to have people take turns coming close to the pots and pans so they can see inside.
- Small samples can be passed around in bowls if it is helpful for participants to see what the cooked food looks like when it is time to take it off the heat, add more water, add the sauce, etc.
- Food should be served by different people than the cooks to allow the cooks to rest and clean their hands before eating. Food should be served so that everyone can start eating at the same time.
- Allow children to join whenever possible. Although children may provide some distractions for participants during the demonstration, participants will see their children enjoying the prepared foods and this will further build their confidence that they can successfully prepare these foods at home to feed their family. Be sure to prepare enough food so that everyone, including children, is served a sufficient portion.

## Discussion points to raise with participants

Finish the event by asking participants to share their reflections. Encourage them to discuss variations they would make to the cooking process, ingredients they would add or omit, and how the dish could be adapted to seasonal shortages of any of the ingredients.

**FACILITATOR'S GUIDE:**

# Encouraging Peer-to-Peer Learning through Gardening Support Groups





# What are the benefits of gardening support groups?

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## **Peer-to-peer learning and innovation**

Gardening is a process of constant experimentation, observation, reflection, and learning. As gardeners, we are constantly using a process of 'trial and error' to learn what works best for our particular plot of land. This process is greatly enhanced by having a support group where gardeners can ask questions, exchange ideas, and share stories, a process known as peer-to-peer learning. Support groups allow both seasoned and new gardeners to continue to experiment with their garden practices in a safe and supported space.

## **Sharing the workload and physical resources**

Being part of a gardening group also means opportunities to share workloads and items like seeds or tools. Groups can organize 'work parties' to help one homestead at a time to complete a bigger job, for example preparing a double dug bed, building an A-frame, or digging a ditch on contour to harvest water. Such arduous tasks are more enjoyable and faster to complete with many hands helping. Work parties can also be valuable learning opportunities if participants help with a process that is new to them or if conditions are different from their own. Support groups also allow members to more easily share seeds, tools, and other useful resources for their gardens. By working together, gardeners can achieve much more than they would have on their own.

## **Morale boosts**

A gardener's morale can fall if she faces problems such as weather damage, theft, or an uncontrollable pest or disease. It can be helpful to discuss these disappointing events with other supportive individuals who can commiserate or offer assistance in regaining what was lost. This emotional support is important to regain the positive attitude needed to try again and support gardeners' overall mental health.

## **Empowerment of vulnerable individuals**

Support groups can be particularly important for individuals who do not have equal access to the resources available in their community, such as water or land, extension advice, or easy access to transportation. Support groups can help individuals access more resources than they could on their own and broaden their network beyond their household.

# How to set up a gardening support group

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A gardening support group can either be newly formed or opportunities can be found to add gardening to already existing groups with an active membership.

## Setting up a new group

The first step in setting up a new group is to identify interested individuals. A support group is a self-organizing structure that depends on the enthusiasm and commitment of its members for it to work. Ideally, the impetus for setting up a group should come from the potential members themselves. If there is not a strong desire for such a group, then the group will not last very long.

Once you have established that there is interest and need for a support group, then it is helpful to think about the following questions during the planning process.

1. What is the purpose of the group? Is the group for gardening only or will other needs arise? It is helpful to have early discussions with potential group members about this to avoid confusion later.
2. Who can participate in the group? For example, is the group exclusively for women or only for youth? Are group members allowed to invite others to join or do existing members need to agree first?
3. What should be the structure of the group? It is helpful to establish roles, such as facilitator and time keeper, early on to cover major responsibilities. Group members can take turns in some roles, like timekeeper, to keep everyone engaged equally.
4. What should be the structure of the meetings? Will meetings need an agenda or will they be free flowing discussions? Will certain topics be discussed every meeting or perhaps only once a month? Will meetings be focusing on a broad sharing of knowledge or will the group decide on specific topics to focus on?
5. What are the logistics of the meetings? How often will the group meet? At what time and for how long? Where? Are there any costs for holding meetings that need to be covered?

## Building on already existing groups

It can sometimes be beneficial to fold gardening into other areas of people's lives where they have strong relationships and responsibilities. For example, participants may already be engaged in a religious, school, savings, women, or youth group or farmers' association that meets regularly. These groups often have common goals of income generation, household wellness, and community engagement. If gardening is seen as a potential way to achieve these common goals, then members will see it as an advantage to learn from and support one another in gardening.

# Ensuring sustainability of a group

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All strong support groups have as their foundation the dedication and commitment from a core group of people. This core keeps the group going through times of strife and change. Group members continue to attend because they receive one or more of the benefits listed earlier, and they have satisfying social interactions with other members of the group.

## Establishing group agreements to create a supportive environment

It is important to have discussions in the very beginning within the group around what needs to be in place for all to feel welcomed, safe, and respected. These can be written into a group agreement or charter in the same way that ground rules are established at the beginning of the training program.

Some examples of what may be included in a group agreement include:

- Taking turns speaking
- Speaking without judgement of others
- Respecting others' choice not to speak
- Not using offensive language
- Respecting meeting times
- Turning off mobile phones and minimizing other disruptions during meetings
- What to do if there are difficulties that arise within the group

## Process and structure for growing the group

It is also important for the group to discuss in the beginning what the process should be when other people are interested in joining the group. It may be that there is a lot of interest and the group grows quickly.

Some considerations around growing the group:

- Review the core values and intentions for the group. Make sure these are shared in an open forum with the prospective new members, along with the group agreement or charter.
- Discuss collectively what is a good size for the support group to work well. It may be that, rather than taking on too many new members, the group instead encourages a new support group to be set up and provides support for the process.

## Dealing with difficulties

As the group grows it may also encounter difficulties. It is important to deal with difficulties as soon as possible. It can help to have a meeting where the group reconnects with the reasons they wanted to start the group in the first place. Identify the value that the group brings to their lives before trying to work out any difficulties. If the difficulties persist, it can be helpful to ask an outside mediator to come and facilitate discussions.

Support groups should be a rich and engaging way for gardeners to continue to innovate and learn while gardening. It may take someone a few attempts to find the right group, but individuals should be encouraged to learn from any failed attempts and continue to seek out the right support group for them.