



**AVRDC**

The World Vegetable Center

# How to conduct a compost-making workshop

## A course for trainers

Suzanne Neave





AVRDC – The World Vegetable Center is an international nonprofit research institute committed to alleviating poverty and malnutrition in the developing world through the increased production and consumption of nutritious, health-promoting vegetables.

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## **A course for trainers**

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# Introduction

The two-day 'training-of-trainers' course presented in this manual covers both theory and practical skills in composting. The assumption is that trainers will use this manual to teach composting to householders and farmers with varying levels of literacy. Therefore, the manual does not attempt to comprehensively cover the subject of composting, but rather to provide trainers with useful information to competently transfer the practical skill.

Teaching people to make compost cannot be achieved in one session. Many farmers need to be convinced that their time and effort in making compost will have some tangible reward. This reward often is realized only when the benefit also can be demonstrated—a point to consider when scheduling a composting course. One way to quickly convince participants is to have a working compost heap near a nursery where the material can be used for nursery mix. The benefits can then be seen in the quality of the seedlings. Field applications of compost take longer to show the benefits.

At the end of this training course the participants will take away an understanding of composting principles, composting methods, and basic training techniques to affectively transfer this practical skill to others.

***"My seedling quality has greatly improved since I started using compost in my nursery mix. I mainly use it for my cucumber and tomato seedlings. It gives them a good start when I transplant them."***

-- Rose Sese  
Areatakiki, Solomon Islands



The term "participant" is used throughout the document to represent the individuals that are being trained to be trainers. This is to avoid confusion later in the document when they become the "trainers" and have to prepare information for "trainees."

A sample program for this course is presented in Annex 1.



# **CHAPTER 1**

## **What is compost?**

## Introduction

The purpose of this chapter is to give the participant a detailed background on composting. Much of the theory of composting is not necessary for teaching purposes, but it is important for the participant to have a full understanding of the concepts and science behind the subject.

## Objectives

After completing this chapter, the participant will be able to:

- understand the importance of soil
- understand what compost is and what the benefits are

## Materials required

- PowerPoint presentation (Annex 3)
- Handouts (Annex 2.1)
- Flip chart
- Paper and pens
- Samples of soil in bowls (for participants to see, touch, smell)
- Samples of compost in bowls



**Figure 1. Healthy soil supports life at many levels.**

# LESSON 1 The living soil

|                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Living soils introduction                                                                                                | LECTURE                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <div><p><b>Suggested Idea</b></p></div> | <p>To introduce the subject, present the participants with bowls of soil and let them look at the soil and feel it. Explain that soil is a substance that is all around us; we plant things in it, it makes things dirty, it gets stuck on our boots in the rain.</p> <p>Alternatively, if the organization allows, suggest that participants bring a sample of soil with them, and comment on the diversity of the soils.</p> |

## What is soil?

Soil is the most diverse ecosystem on the planet. An ecosystem in its own right, soil also connects and is the life support for all other ecosystems. Soil is home to billions of microorganisms whose function ranges from breaking down dead material to immobilizing nutrients for other organisms like plants. There are more organisms in one teaspoon of soil than there are humans on the planet. All work behind the scenes to ensure our planet functions.

Fredrich Fallan said in 1862:

“ . . . it is the soil which nourishes and provides for the whole of nature, the whole of creation depends upon soils, which is the ultimate foundation of our existence.”

Our soils have borne the cost of feeding the world’s increasing population. In a study conducted by the Food and Agriculture Organization in the 1980s, 15% of the soil in Solomon Islands was

classified as being moderately degraded (FAO, 2010). Natural waste is the material that feeds the planet's life support system. Burning natural waste or mixing it with other waste to be taken to the dumpsite prevents nutrients and energy from reaching the soil.

## Food webs and ecosystems

### What is an ecosystem?

An **ecosystem** is a biological community of interacting organisms and their physical environment

An ecosystem is like any system—a group of parts working together to form a larger whole. For example, our digestive system is made up of a mouth, esophagus, stomach, intestines, etc. A computer system consists of software and hardware. The 'eco' stands for **ecology**, so it is an ecological (or environmental) system.



Figure 2. Rainforest ecosystem.

Organisms in an ecosystem interact through **food webs**.

Every organism needs a source of nutrients and a source of energy to survive. Energy comes in the form of the element carbon. Organisms also need nitrogen to make proteins and other molecules. Humans are made up of round 3% nitrogen.

Some organisms feed on other organisms to get what they need to survive. These types of organisms are called **Consumers**. Some organisms are able to harness energy from the sun and are known as **Producers**.

In a forest environment, trees and other plants are the **Producers**. These are eaten by plant-eating organisms called **Herbivores**. Herbivores are eaten by organisms that eat both plants and animals (like humans) called **Omnivores**, or by organisms that eat only animals, known as **Carnivores**.

Disturbance at any level of the food web affects the whole system, with disturbances at the bottom (Producers) having the greatest effect. Although disturbances can occur naturally, humans play a huge role in disturbing the balance. We need to recognize that what we do can have a major impact on the Earth—starting with the soil.

|                                                                                    |                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Understanding food webs                                                            | GROUP ACTIVITY                                                                                                                                                                                                                       |
|  | <p><b>Activity:</b> Split participants into groups and ask them to list examples of organisms that are Producers, Herbivores, Omnivores and Carnivores, in a forest environment. Draw a food web including the organisms listed.</p> |

## What’s in the world beneath our feet?

|                |         |
|----------------|---------|
| Soil ecosystem | LECTURE |
|----------------|---------|

### What organisms are most important to our survival?

The general perception is that the world is driven by photosynthesis. However, virtually all primary production ends up as soil organic matter, and soils contain more carbon and more life than above the ground (Wall, 2005).

The life beneath our feet is largely microscopic. The soil is home to an incredible diversity of organisms make up a complex soil food web (Figure 3).

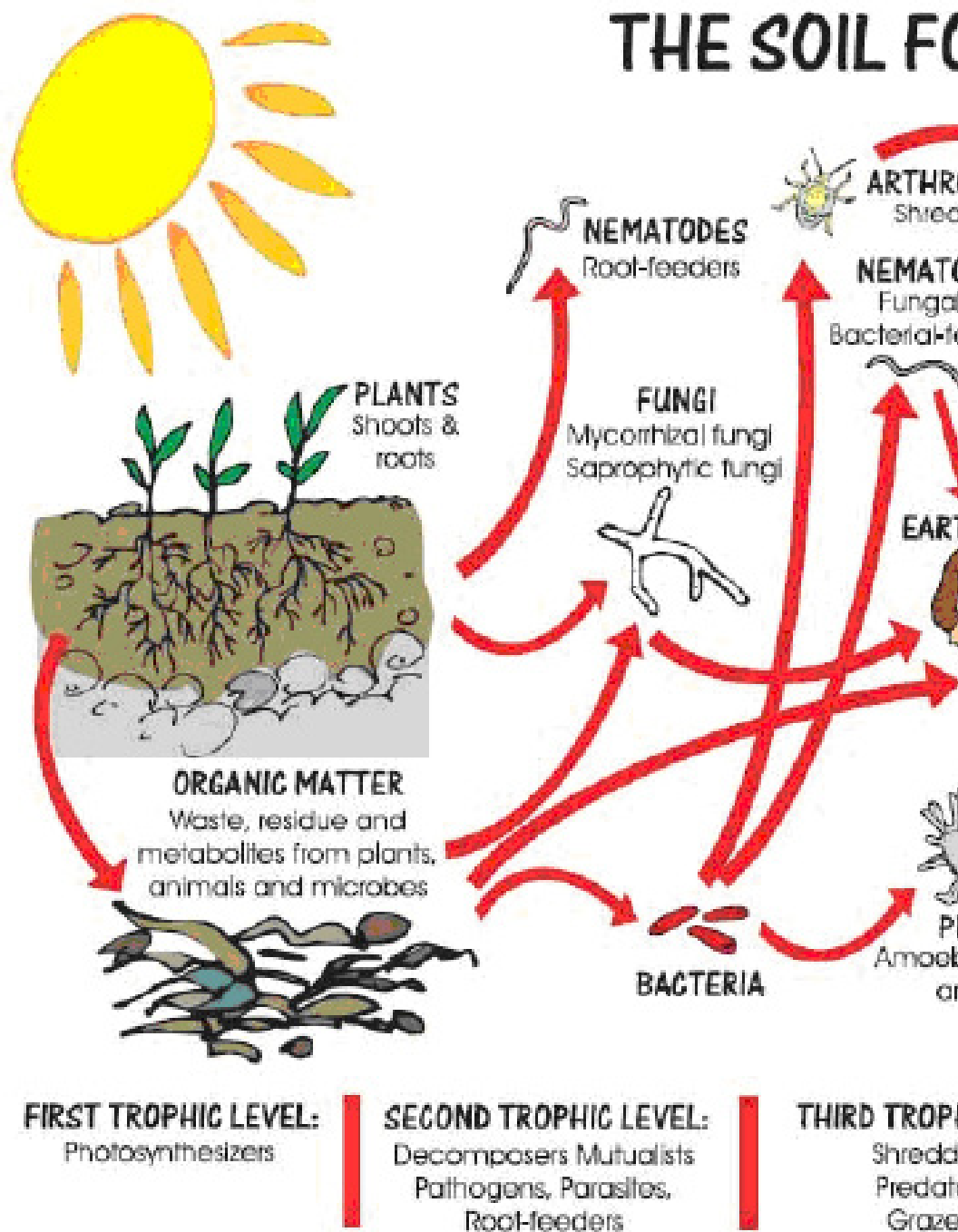
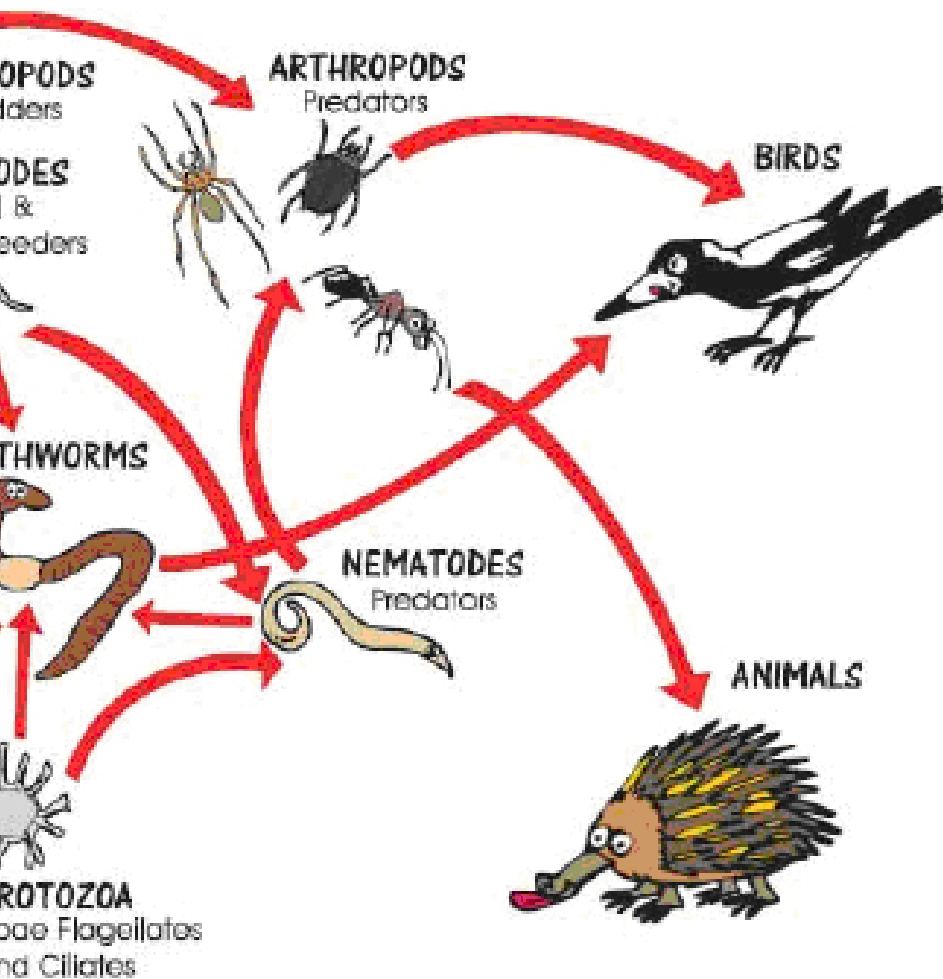


Figure 3. Soil Food Web

# FOOD WEB



**FIRST TROPHIC LEVEL:**

Producers  
Autotrophs  
Plants

**FOURTH TROPHIC LEVEL:**

Higher level predators

**FIFTH & HIGHER**

**TROPHIC LEVELS:**

Higher level predators

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Source: Sustainable Liquid Technology, <http://www.sltec.com.au/sltec/index.html>

Soil organisms decompose organic compounds, sequester nitrogen and other nutrients that might otherwise enter groundwater, fix nitrogen from the atmosphere, enhance soil aggregation and porosity, and thus increase infiltration and reduce runoff. Other soil organisms prey on crop pests and are food for above-ground animals.

HANDOUT: Soils food web and function of soil organisms (Annex 2.1)

## Organic matter

Organic matter is the material that fuels the food web, storing nutrients and energy for plants and other organisms.

In general, soil organic matter is made of roughly equal parts humus and active organic matter. Active organic matter is the portion available to soil organisms. Bacteria tend to use simpler organic compounds, such as root exudates or fresh plant residue. Fungi tend to use more complex compounds, such as fibrous plant residues, wood and soil humus (USDA, 2010).

**Humus** is a dark crumbly material with an “earthy” smell formed by the decomposition of leaves and other plant material by soil microorganisms.

### Why is organic matter important?

Soil organic matter helps to build up a loose and soft soil structure. This allows air into the soil, helps water soak into the soil, and makes it easier for roots to grow.

The visible parts of organic matter act like tiny sponges that can hold up to 5 times their own weight in water. In dry periods more water is available for the plants for a longer time.

The non-visible parts act like glue, sticking soil particles together to form stable crumbs (aggregates).

Beneficial microorganisms and other soil organisms such as earthworms feed on organic matter, helping to decompose it.

Organic matter retains nutrients and releases them continuously, increasing the capacity of the soil to supply nutrients to the plant. Organic matter reduces leaching, or the draining away of nutrients by rain or irrigation water.

Organic matter improves soil buffering capacity, which prevents soil from becoming too acidic by retaining alkaline cations.

## LESSON 2 What is composting?

Composting is a way of using organic waste and turning it into something useful: Compost. Compost benefits the environment and helps to improve the structure of soil as well as providing the nutrients and energy the living soil needs to stay healthy and support healthy plants. The purpose of this LESSON is to explain what composting is and the benefits of using compost.

|                   |         |
|-------------------|---------|
| Why make compost? | LECTURE |
|-------------------|---------|

|                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <div><p><b>Suggested Idea</b></p></div> | <p>To introduce the subject, present the participants with bowls of compost. Ask the participants to comment how different it is compared with the soil samples.</p> <p>At the end of the session, suggest that the participants mix the two together. Ask them what they notice about the sample now. Let participants touch the samples. Pour some water on the samples and observe the differences.</p> |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## What is compost?

Compost is a form of organic matter and can be made from a range of organic materials usually considered to be waste.

**Composting** is a natural process that involves the decomposition of organic matter. Millions of microorganisms drive the compost process by breaking organic matter down to its original nutrient form (Hawkesbury City Council, 1997)

You can simply heap material in a corner of your garden or farm and over a period of time it will naturally break down. This is known as **Passive Composting**.

However, what is more commonly practiced is known as **Hot Composting**. Materials are heaped together in a specific way to maximize the biological activity. As bacteria multiply and “feed” on the material, they respire, generating heat. This heat encourages more bacteria to increase. The heat can also kill weed seeds and human pathogens. This process breaks down the material quickly. Composts can be completed in 3 weeks to 3 months, depending on the waste materials used.

The material that is left after the heap has cooled down is compost. It is a ready source of nutrients and a good soil conditioner. Compost can be used in vegetable boxes, placed around fruit trees, mixed with coconut husk for nursery beds, or applied to farmers’ fields.

### **What’s so great about compost?**

Making compost turns what would normally be considered as waste into something useful. By incorporating compost back into soil, we help maintain our soil for the future.

The benefits of compost are similar to those of organic waste produced by nature:

- Directly supplies macro- and micronutrients to plants.

- Improves soil structure and soil aggregate stability, resulting in better drainage, aeration, and erosion resistance. Microbes secrete glue-like compounds that help bind soil particles together.
- Increases moisture retention (50 kg of humus can hold 95 kg of water).
- Slow release nutrients and increased Cation Exchange Capacity (CEC) thus increasing the availability of nutrients such as Calcium (Ca), Magnesium (Mg) and Potassium (K), reducing the need to buy fertilizers.
- Increases the population of microbes in soil that continually make nutrients for plants.
- Helps buffer soil pH.
- Promotes disease suppression.
- Reduces the amount of waste that goes into landfills.
- Can be sold to farmers and nurseries.
- Improves the quality of produce grown.





**Figure 4. Building a compost heap is a good group activity.**

## **LESSON 3 How compost is used**

There are many ways to use compost:

- When planting seeds in seed trays, use compost as part of the planting mixture. For example: 3 parts soil, 1 part compost, 1-2 parts coconut husk. Sieve the material first and mix thoroughly.
- Incorporate into the soil before planting, or mix with soil in a planting hole if planting fruit trees as a basal fertilizer.
- Sprinkle a thin layer over the soil after crop establishment as a top dressing.
- Use as mulch around plants. Ensure the compost does not make contact with the plant, as this will encourage stem rot.

## Summary

In this chapter, the world that is beneath our feet has been revealed along with the complexity of the natural world.

Composting helps recycle nutrients to provide food for plants and to maintain the soil ecosystem. Participants learned what compost is, and the benefits of using compost.

The next chapter will explain how the composting process works and will demonstrate how to build and monitor a compost heap.

## References

Food and Agriculture Organization (FAO). 2010. National soil degradation maps. <http://www.fao.org/landandwater/agll/glasod/glasodmaps.jsp>

Ingham ER. 2000. Soil Biology Primer. Chapter 1: Soil Food Web.

Rutherford P, Lamonda M. 1997. Composting and worm farming workshop manual, Hawkesbury City Council.

United States Department of Agriculture (USDA). 2010. Soil organic matter. [http://soils.usda.gov/sqi/concepts/soil\\_organic\\_matter/som.html](http://soils.usda.gov/sqi/concepts/soil_organic_matter/som.html)

Wall DH. 2005. Biological Diversity and Function in Soils. Bardgett RD et al. (eds.) Cambridge University Press. p 3-27.

## NOTES

# **CHAPTER 2**

## **Building a compost heap**

## Introduction

There are many different ways in which compost can be made. Composting methods may differ, but it is important that appropriate materials are used and conditions in the heap are favorable for the process to work efficiently. In this LESSON, participants will learn how to make compost.

## Objectives

After completing this chapter, the participant will be able to:

- select appropriate materials for composting
- build a compost heap

## Preparation and materials needed

Prepare the site where you will be conducting the demonstration:

- Make sure all the materials you will need to make a complete heap are available
- PowerPoint presentation
- Sample of compost

# LESSON 1 The composting process

## The compost recipe

|                        |         |
|------------------------|---------|
| What goes into a heap? | LECTURE |
|------------------------|---------|

A successful compost heap requires creating the right conditions for the microorganisms to function properly. These conditions include:

| Condition                       | Notes                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------|
| Carbon to Nitrogen ratio (C:N)  | Optimal situation is a combined ratio of 25:1 – 30:1                                             |
| Moisture                        | 50 - 60% moisture (should feel like a wet sponge)                                                |
| Aeration                        | Microbes are aerobic, so sufficient air spaces are needed to allow the heap to “breathe”         |
| pH                              | 6 – 8.5                                                                                          |
| Temperature                     | The heating phase: 60 – 65°C<br>The cooling phase: 25 – 40°C<br>The maturing phase               |
| Surface area and volume of heap | Chop materials to increase surface area.<br>Minimum size of heap:<br>1.2 m H x 1.5 m W x 1.5 m L |
| Turning                         | Turn heap every month                                                                            |
| Troubleshooting                 | Check heap temperature regularly                                                                 |

## Carbon to Nitrogen Ratio – selecting the right materials

The best materials for a compost heap are those that are near the place where you are going to make the heap.

However, it is important when selecting materials that you end up with a good Carbon:Nitrogen ratio. Nitrogen provides microorganisms with food; carbon provides energy. Carbon is used by microorganisms for growth and energy, but some of the carbon is lost in the process due to respiration, so more carbon is needed than nitrogen. The optimum ratio in a new heap is between 25:1 and 30:1. Compost heaps ideally start within this range, but finish between 14:1 and 17:1. This is because

much of the carbon is released as CO<sub>2</sub> as the decomposers metabolize the material.

Different types of organic materials have different C:N ratios. For example wood chips have a high carbon content, and have a ratio of 500:1. Grass cuttings are higher in nitrogen, with a C:N ratio of 17:1. Generally, materials with a high C:N ratio tend to be dry/brown materials. Materials with a low C:N ratio tend to be green or nitrogenous.

To ensure that we have a nice balance of materials, the heap is usually built up in layers, alternating between brown and green (see Page 26).

Green manures (plants) are added to compost heaps and are usually considered nitrogenous material, but they can have a wide range of C:N, depending on the source.

Other additions to compost heaps, if available, can add to the quality of the finish product:

- Clay soil – helps reduce nitrogen loss.
- Rock phosphate – increases usable phosphate and helps reduce volatilization of ammonia (NH<sub>3</sub>).
- Inoculants – purchased compost activators, but old compost works in the same way.
- Wood ash – for additional potassium

HANDOUT: Common materials used in a compost heap (Annex 2.2)

## **Moisture and air**

Composting microorganisms need moisture and air around them to survive. The moisture content of the heap should be between 50 – 60%. Some of this moisture will come from the material that you have put in the heap, but water also will need to be added on a regular basis. If the heap becomes too dry, the composting process will slow down. Water

can be added as the heap is being made, particularly on each dry layer. If there is too much water, the air is pushed out of the heap and it becomes anaerobic.

To test to see whether there is enough water, squeeze some material in your hand; your hand should be damp but not have water running from it.



**Figure 5. Adding water to dry layers during construction.**

## **Temperature and pH: The composting process**

The process of composting has 3 main phases: **heating, cooling** and **maturing**.

## The heating phase

This is the most important phase of the compost process. If a compost heap has been made correctly, you should start to notice a rise in temperature after 3 days. The temperatures rises to 60 – 70 °C and usually stays at that level for 2 - 3 weeks. Most of the decomposition occurs during this phase.

|                               |                                                                                                                                                                  |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| What's happening in the heap? | <ul style="list-style-type: none"><li>• Bacteria are active</li><li>• Heat increases</li><li>• pH rises</li><li>• Most of the fine material decomposes</li></ul> |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## The cooling phase

Once the material easily digested by the bacteria has been converted, the temperature in the compost heap declines slowly and will remain at 25 – 45 °C. This phase lasts for 4 - 6 weeks.

|                               |                                                                                                                                           |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| What's happening in the heap? | <ul style="list-style-type: none"><li>• Fungi become active</li><li>• Temperature decreases</li><li>• Woody material decomposes</li></ul> |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|

## The maturing phase

During this phase, nutrients are mineralized and humic acids are built up. The heap now becomes inhabited by larger organisms, such as earthworms. The heap will be dark brown in color and is now ready to use.

|                               |                                                                                                                                                      |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| What's happening in the heap? | <ul style="list-style-type: none"><li>• Nutrients are being mineralized</li><li>• Earthworms and other larger organisms move into the heap</li></ul> |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|

## Surface area and volume

Microorganisms work on the outside of material. If materials are chopped into small pieces, this increases the surface area available for them to work on and allows the material be broken down quicker.

But surfaces and volumes are also important when building a heap. The outside of the heap is exposed to heat and drying out from the sun as well as changes in temperature. The environment inside the heap is more stable. The microorganism works better in a stable environment, so when building a compost heap, the aim is to minimize the surface area (unstable environment).

If the heap is too small, it simply won't heat up—bigger is better. However, if the heap is too big, it is difficult to manage, air circulation is poor and water will not reach the center of the heap. This makes the heap become anaerobic. High temperature bacteria can not survive and the heap will go into anaerobic decomposition, resulting in poor quality compost.

The minimum size for a heap is 1.2 m x 1.5 m x 1.5 m. It should be no wider than 2.5 m and no taller than 1.5 m. But it can be as long as you like! An example of this is a **windrow compost heap**.

## Particle size

The smaller the pieces of material, the quicker the material will break down, as the surface area to volume ratio is increased. The decomposers have a larger area to work on, and can do more work in less time. However, if particles are too small, the heap can become compact, squeeze out the air, and result in anaerobic conditions. Particles 2 - 3 cm in size should be considered the minimum.



**Figure 6. Chopping compost materials using a motorized shredder.**

## **Turning a compost heap**

Turning is not necessary (for instance, when making “passive” compost) but it does have many advantages:

- Speeds up the process by aerating the heap
- Moves materials from the outside into the center
- Allows for inspection of the heap and to make adjustments if required (more material, water management, physically breakdown materials into smaller pieces)

Turning does take time and requires more space.

If you do turn a heap, it is useful to do it twice during the entire composting process. Turn the heap once a month, when the heap starts to go through the cooling phase. The material on the outside of the heap should be placed in the middle of the heap at this stage.

# What can go wrong?

An indication that the compost is not “working” properly is to take its temperature. This can be done with a special compost thermometer, or by pushing a big stick into the center of the heap and leaving it for a few minutes. During the heating phase, the stick should be too hot to hold.

The most common problems with a compost heap: either too much or too little water.

| Problem                                   | Indication                                                                                | Solution                                                                               |
|-------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Too dry<br>(see Figure 7)                 | Look for white fungal growth in the heap<br>(when outside materials of the heap look dry) | Add water (spray some water from outside of the heap every 2-3 days during dry season) |
| Too wet                                   | Material will be slimy and have a strong smell                                            | Turn the heap and add more dry material                                                |
| Lack of oxygen                            | Material becomes compacted, forming tightly packed clumps                                 | Turn heap and break up material                                                        |
| Low quantity of material rich in nitrogen | Temperature too low                                                                       | Add more nitrogen-rich materials                                                       |
| Lack of microorganisms                    | None of the other conditions apply                                                        | Add old compost, manure or soil to the heap                                            |



**Figure 7. White fungi indicate the heap is too dry.**

## LESSON 2 Building a compost heap

This lesson is a practical activity and it is important that each stage in the process is explained clearly. The participant will learn how to build a compost heap and see how a training session is conducted. The key points covered in the exercise will include the information that the participants will teach their target group. This will also give the trainer an opportunity to get feedback from the participants through a series of Q & A sessions.

Building a compost heap

PRACTICAL DEMONSTRATION

**Activity:** Demonstrate to the group how to build a compost heap.



Figure 8. Farmers in Malaita, Solomon Islands learn how to build a compost heap.

## **Preparation**

Select a site that is close to a water source and under shade (if possible) to conduct the demonstration. Other important considerations: whether the site becomes waterlogged, if it is located away and downwind from houses, if it is located downwind from fields, if old crop residue is going to be collected and used in the heap.

Decide which method of composting you are going to demonstrate.

Decide how big you are going to make your heap, and bring all the materials that you will need to make the heap to the site.

Have tools ready for participants to assist with building up the layers. Bring along ready-made compost so that participants can see what the end product will look like.

The demonstration will take place in 5 steps:

- Step 1 – Introduction
- Step 2 – Planning a compost heap
- Step 3 – Types of materials
- Step 4 – Building up layers
- Step 5 – Turning and monitoring the heap

## **Step 1 – Introduction**

**Q & A** Ask the group what the benefits of making compost are.

## **Step 2 – Planning a compost heap**

Explain why you have selected the site that you have chosen to make the heap. Include the important considerations in choosing a site.

## **Step 3 – Types of materials**

**Q & A** Ask the group what types of materials collected would go in the “green” layer and “brown” layer.

## Step 4 – Building up layers

Build the heap, starting with a base of dry woody material. This will help to provide aeration at the bottom of the heap.

Layers are built up in the following way:

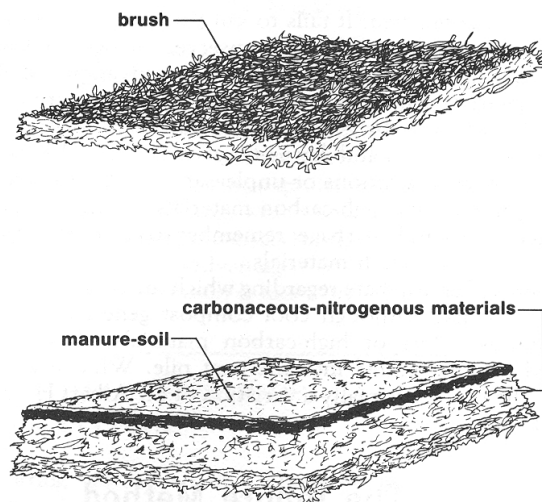
- Dry material – 20 cm deep
- Green material – 20 cm deep
- Old compost, manure or soil – thin layer about 2-3 cm
- Add water to each dry layer (let dry materials soak up the water, but not overflow)
- This sequence is repeated until the heap is 1.5 m high.

**Q & A** Ask the group:

Why the heap is put into layers?

What other materials could be included in each layer?

What should not be added to the compost heap?



**Figure 9. Compost layers.**

Source: Martin DL (1992)

## **Step 5 – Turning and monitoring the heap**

**Q & A** Ask the group how they will turn the compost and monitor the quality of the heap:

How frequently should you turn the heap?

What do you check for when turning the heap?

How do you know if the heap is too dry or too wet?

What do you do if the conditions are not right in the heap?

## **Additional information**

A heap can either be made gradually if not much material is available, or made all at once. If you have space, it is better to pile up the materials until you have enough to make a complete heap.

When a heap is ready for turning, start a new heap close by so that you will have a continuous supply of compost. In time you will end up with a new heap, a heap in process, and a mature heap ready for use.

## **Summary**

This chapter has explained the science and practice of building a compost heap. The participants learned:

- How composting works.
- How to create and maintain the conditions needed to make good compost.
- How to build a compost heap.

Using the practical demonstration as a reference, the next chapter will illustrate keys points about conducting a course in compost making.

## **References**

Rutherford P, Lamonda M. 1997. Composting and worm farming workshop manual. Hawkesbury City Council, New South Wales, Australia.

Martin DL. 1992. The Rodale Book of Composting: Easy methods for any gardener. Rodale Press, Inc. Emmaus, Pennsylvania USA.

## **CHAPTER 3**

# **Help others learn how to compost**

## **Introduction**

Many people believe composting is time-consuming and requires a lot of effort, for very little benefit. It is important to ensure participants have a clear idea of what is involved in composting. In this chapter the participants will discuss the basics of training and do general training exercises. They will learn how to run a training session and demonstrate the skills they have learned by conducting a training course to “trainees.”

## **Objectives**

After completing this chapter, the participant will be able to:

- Plan a training course on how to build a compost heap.
- Prepare a site for conducting a training session.
- Teach a group of trainees how to build a compost heap.

## **Preparation and materials**

The first exercise involves the participants sitting in a semicircle. Prepare the chairs in this configuration before the session.

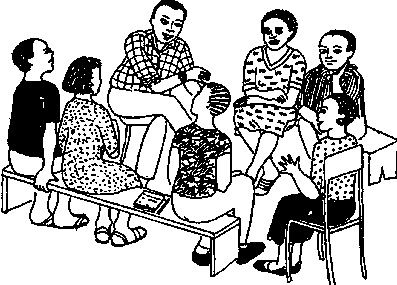
Make sure material for setting up sites for training are readily available for the groups to use. Select a location where there is enough space for groups to not disrupt each other during their sessions. If time allows, materials can be collected by the groups during the preparation stage.

Materials needed: Scissors and paper, flip chart paper and pen to write down ideas generated in the group.

# LESSON 1 Training skills

## Communication

Communication is a very important training skill. Often people will try to give too much information on a subject or make it too complicated for their target group. The exercise below is designed to illustrate how a complicated message can get distorted and misinterpreted.

| "Telephone"                                                                       | GROUP ACTIVITY                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Activity:</b> Ask the group to sit in a semicircle. Whisper a long sentence to the person at the beginning of the line and ask them to pass the message onto their neighbor. When the message gets to the end ask the last person to say what the message was.</p> |

### Example of message

"Peter Phiri plans to transport his tall trees from Harrogate to High Wickham tomorrow on a 2-ton truck."

or

"Ask Phil to fly three treated tree tops back to Hannah's haven."

## Discussion

Ask the group why they think the message is completely different and what could be done to ensure that the message is correctly passed on.

## Possible answers

- The exact message was not clarified before it was passed on.
- Unfamiliar place names were used, which made it difficult to pick up the full detail.
- The message was too long.
- The message was not heard properly and so the next person made up something else.

## Possible solutions

- Shorter chain for the message to travel along; possibly put people into groups to transfer the information.
- If new vocabulary is being used make sure it is explained clearly.
- Don't use such long messages.
- Make sure the person that receives the message has understood the message. It is the responsibility of the trainer to make sure the message is clear, but participants should feel comfortable enough to ask to have something repeated if it is not understood.

## Being a trainer

Being a trainer

LECTURE/Q&A

### Suggested Idea



This can be given as a lecture, or generate the list by asking participants what the important things are to consider when teaching.

What makes a good trainer and what qualities do trainers need regardless of what they may be teaching?

- Good communicator – verbally, non verbally, in writing
- Patient
- Well-organized – outlines structure of training to the group
- Flexible
- Good people skills
- Sense of humor
- Enthusiasm for learning
- Open to feedback
- Good research and problem-solving skills
- Good time management skills
- Have respect for those they are teaching
- Desire to share what they know
- Help to make everyone feel comfortable

When giving a training session there are some key points to remember:

- Plan your session properly.
- Think about what materials you will need.
- Introduce the training by explaining what the program will be for the whole course. At the beginning of each session, explain to the participants what they are going to learn.
- Bear in mind that people learn in different ways. Some learn visually, some audibly, some prefer movement. Include a range of activities and tools to cover these styles. Also, people's hearing/eyesight vary, so you need to make sure learning is not inhibited by using only one teaching style.

- Ask questions throughout your session. When teaching adults a lot of knowledge already is in the room. Ask people to share their experiences; their knowledge will enhance the information you are presenting. Ask questions to ensuring that the right message is getting across.

When giving presentations, whether out in the field or inside the classroom, consider body language and vocal projection:

- Body posture – how we stand and sit
- Gestures – hands, head and body movements
- Eye contact – how we look, how long we look at a person
- Proximity – distance from the participants
- Orientation – whether we face the other person or turn away
- Voice projection – which direction we face when we talk, whether we whisper, mumble, shout
- Voice speed – talk too slow or too fast
- Language – use of local language may allow for better understanding, but sometimes technical detail may be lost. Use of technical terms shows knowledge, but often a point may be lost if participants do not understand the words used.

## **Transferring practical skills**

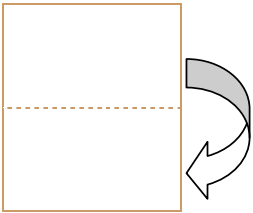
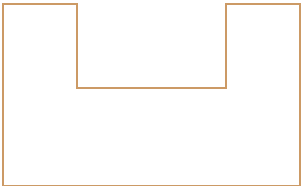
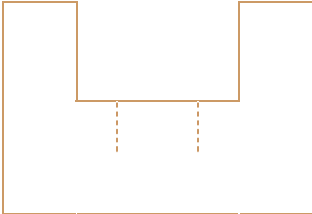
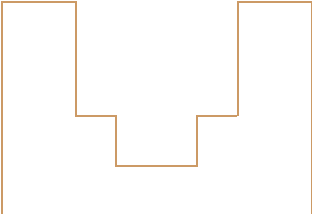
The following activity—making a fraction card—shows how explaining and demonstrating can be useful tools to help transfer a skill to the target group. The activity is done in stages:

- Show the finished product
- Participants watch the process
- The process is explained step-by-step, along with participants carrying out the steps

|                       |                |
|-----------------------|----------------|
| Demonstrating a skill | GROUP ACTIVITY |
|-----------------------|----------------|

|                                                                                                                |                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Suggested Idea</b></p>  | <p>This activity can be done with any simple practical skill such as tying a knot, making origami, etc.</p> <p>The example used below is to make a fraction card.</p> |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Making a fraction card

|                                                                                                                                                                                                                 |                                                                                                                                                                                                                  |                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
|  <p>Fold the paper in half</p>                                                                                                |  <p>Cut on the fold exactly <math>\frac{1}{4}</math> the way in on both sides, <math>\frac{1}{2}</math> way down the page.</p> |  <p>Fold the cut piece inside</p> |
|  <p>Cut on the folds in <math>\frac{1}{4}</math> the way in from both sides, <math>\frac{1}{2}</math> way down the page.</p> |  <p>You now have two cut pieces, fold each piece in the same way as you did the first one.</p>                                | <p>You can repeat the action as many times as possible.</p> <p>When finished carefully open out...</p>               |

**Activity:** First, show the group the finished fraction card. Then, give all the participants a piece of paper and a pair of scissors and ask them to make their own card. When they have finished, give them another piece of paper. This time, let them watch you make the fraction card, then ask them to do it.

Finally, explain each step to the group, and make sure everyone has followed each step before moving onto the next.



**Figure 10. Making fraction cards to demonstrate transferring a practical skill.**

**Discussion:** What was happening at each stage of the exercise? What does the exercise teach us about teaching someone a skill?

# LESSON 2 How to prepare for teaching composting

When planning a composting session the following points need to be considered:

| TRAINING       |                                                                                           |
|----------------|-------------------------------------------------------------------------------------------|
| 1. Who?        | Who will you train?                                                                       |
| 2. Need?       | What training do they need? What do they want to be able to do?                           |
| 3. Content?    | What information and skills will you have to include in the training?                     |
| 4. Planning?   | Bring it all together – content, timing sequencing, preparation.                          |
| 5. Method?     | What are the most suitable training methods to use?                                       |
| 6. Evaluation? | Can they do what you set out to train them to do?<br>Check on the impact of the training. |

## STEP 1. WHO?

In the case of compost-making, this may be farmers, or women's groups, schools, or church groups. All these groups will have a different degree of knowledge about science and farming.

## STEP 2. NEEDS?

We need to answer two questions:

1. What can our target group **do** now? (before training).
2. What it is we want **our** target group to **do**? (after training).

Filling in the gaps is like doing a jigsaw puzzle.

### **STEP 3. CONTENT?**

When we have specified the target group and clarified the new abilities you want them to develop, you can then work on identifying what new knowledge, skills and attitudes they will have to develop to achieve these new abilities. In this case we want to be able to teach people how to make compost.

We refer to this as OBJECTIVES.

Our objective is to *Demonstrate how to build a compost heap.*

### **STEP 4. PLANNING?**

Planning is a central process in training. Planning allows us to bring together all the information gathered in Steps 1 to 3. The main purpose of planning is to decide how the training is to be structured and delivered. Usually this will mean:

- Deciding the overall time that can be allocated to training.
- Deciding how to allocate that time to the topics to be covered.
- Deciding where and when the training is to be carried out.
- Deciding what facilities and equipment are needed.
- Developing a detailed program that states the overall objective, and allocates objectives to each subsection or session in the training course.
- Specifying objectives to achieve the program.
- Ensuring that the program is logical and each session builds on the previous session.

Planning is often difficult. It is usually necessary to make compromises when there is not enough time to cover all topics, if there is a shortage of resources, if the participants come from very different backgrounds, and other similar restrictions.

All this information can be put together in a Training Session Plan.

HANDOUT: Training Session Plan for building a compost heap (Annex 2.3)



Figure 11. Preparing a training session.

## STEP 5. METHOD?

Selecting the correct training method is important. Although there is complicated science behind composting, in practice it is a simple activity.

When training farmers, the “how-to” is what they need to know about composting. Methods that should be used include demonstration and practical activities. Although the science is interesting and useful to understand, particularly when a compost heap is not working properly, not too much time should be spent on theory.

### STEP 6. EVALUATION?

As a trainer, it is important that you know how well your message has been received and whether your participants have understood the skill you have been teaching. Evaluating their knowledge can be done in several ways, but a simple question-and-answer session will confirm if your participants have understood everything. It is also useful to follow-up by visiting the participants when they are conducting a training course. You can even visit the recipients of their training to see how they carry out the activity and understand the principles of composting. Get feedback from the participants about how well you have trained and how you could improve the content or approach by asking questions or conducting a brief survey.

HANDOUT: Feedback Form (Annex 4)

## LESSON 3 Preparing to conduct a compost course

|                               |         |
|-------------------------------|---------|
| Preparing to teach composting | LECTURE |
|-------------------------------|---------|

### Preparation

It is important that you have all your materials ready and that you have selected and prepared a site. Visit the proposed training site a few days before the course begins. Organize people to collect the materials you will need to make the heap, or check to make sure there are plenty of

materials nearby that can be collected on the day. Materials such as manure or others that you would like to use in your demonstration may need to be brought in from somewhere else.

Always make sure you have enough material to make a complete compost heap.

Choose a location for building the heap near where it is likely to be used. For example if you want to encourage people to make compost for a nursery, build the heap close to the nursery during the training.

## **Demonstrating**

It is important to not only **tell** people what the heap should look like – you also need to **show** them. It may be difficult to visualize 20 cm, but if you show people 20 cm, it is easier to understand.

Get the participants involved! The best way to learn a skill is by doing it. Encourage people to ask questions about what they are doing. Ask people questions, such as “What is the next layer?” to check that they have understood the procedure you are teaching them.

## **Teaching composting as part of another course**

If compost training is planned as part of a bigger course, ensure that it follows logically with other planned activities. Plan for all practical activities to take place at the same time. It is usually better to do practical activities in the afternoon (to energize a sleepy classroom!), when people will not object to getting a bit dirty.

# LESSON 4 Conducting a training course

| Preparing for a training session                                                  | GROUP ACTIVITY                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>Activity:</b> Split the participants into 3 -4 groups and ask them to prepare a training session for compost-making. Afterward, the groups need to prepare the site for conducting a training course.</p> <p>Each group will present their course to a group of trainees.</p> |

## Feedback

|                                                                                                                  |                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Suggested Idea</b></p>  | <p>Contact a local school, social group, or training institute and ask if your participants can train some of their students. If people are not available, allow more time for the training so that groups can present their course to each other.</p> |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Ask the participants what they felt about the training. Have the participants ask the trainees about the training session. Also, give the participants an opportunity to comment on how they feel their training session went. Sample questions include:

- Was the information presented in a logical order?
- Was the information explained clearly? Was it easy to understand?
- Was the site well-prepared for the session?
- What could be used to improve the training?

## Summary

This chapter has focused on training skill development. The problems of communication and training were illustrated in two simple exercises and a list of things to consider when preparing and presenting a training course were given.



**Figure 12.**  
Farmers  
preparing  
compost  
heap in  
Munda,  
Solomon  
Islands.

## Glossary

|                        |                                                                                                                           |
|------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Aerobic:</b>        | requiring free oxygen                                                                                                     |
| <b>Anaerobic:</b>      | requiring the absence of free oxygen                                                                                      |
| <b>Carnivore:</b>      | an animal that feeds on other animals                                                                                     |
| <b>Ecosystem:</b>      | a biological community of interacting organisms and their physical environment                                            |
| <b>Herbivore:</b>      | an animal that feeds on plants                                                                                            |
| <b>Omnivore:</b>       | an animal that feeds on plants and animals                                                                                |
| <b>Organism:</b>       | a living individual animal, plant, or single-celled life form                                                             |
| <b>Organic matter:</b> | decomposed material derived from plants and animals                                                                       |
| <b>Photosynthesis:</b> | the process by which green plants and some other organisms use sunlight to synthesize foods from carbon dioxide and water |
| <b>Volatilization:</b> | cause (a substance) to evaporate or disperse in vapor                                                                     |

## **Annex 1: Sample of a Program**

### **Compost Making Training Course**

27<sup>th</sup> to 28<sup>th</sup> July 2011

SICHE College, Honiara, Solomon Islands

#### **DAY 1**

- 8:30 Registration
- 9:00 What is compost?
- 10:00 Break
- 10:30 Building a compost heap
- 12:00 Lunch
- 1:00 Field visits to composting activities – visits to Honiara Beautification project compost site and Zai na Tina organic farm.
- 4:30 Close

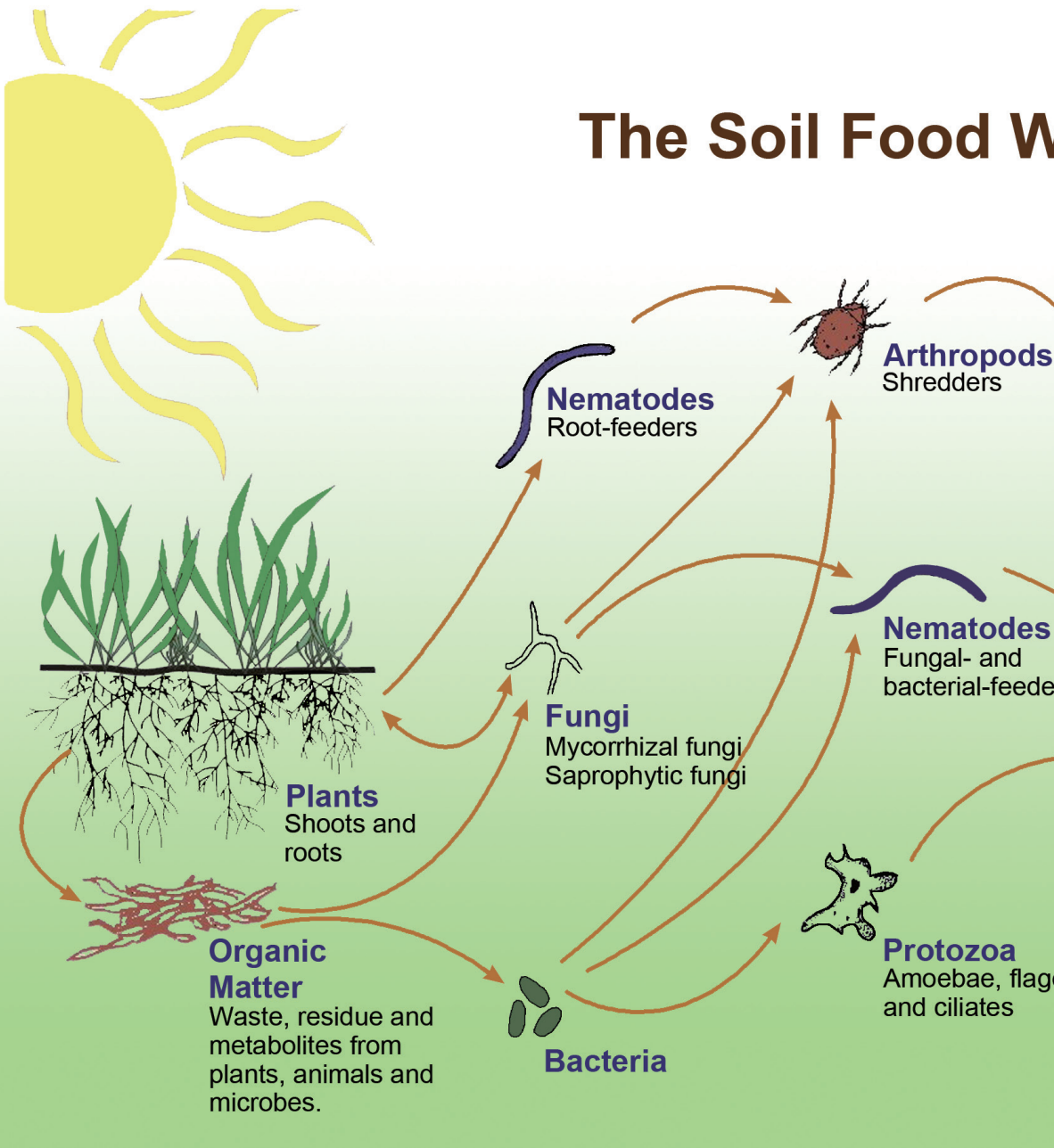
#### **DAY 2**

- 9:00 Help others learn how to compost
- 10:00 Break
- 10:30 Putting training in practice – planning session
- 12:00 Lunch
- 1:00 Presentation of training courses – present training to agricultural and environmental students from SICHE college
- 3:30 Feedback from students and participants
- 4:00 Course evaluation and close

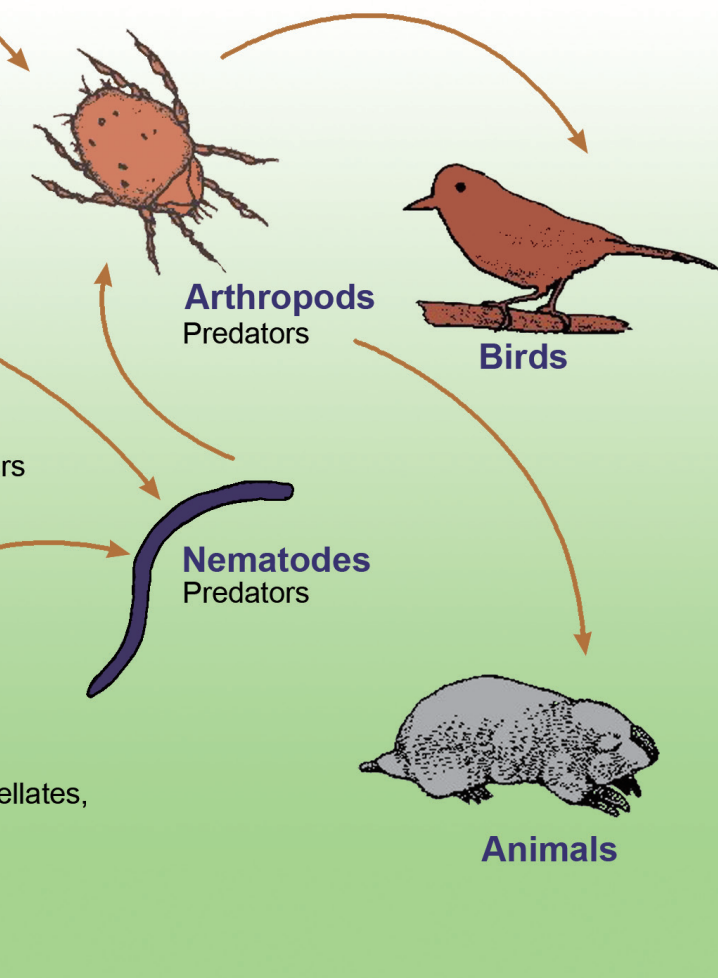
# Annex 2: Handouts

## Annex 2.1 Soil Food Web, Function of Soil Organisms

Source: Natural Resources Conservation Services, USDA.



Web



**First trophic Level:**  
Photosynthesizers

**Second trophic level:**  
Decomposers  
Mutualists  
Pathogens, parasites  
Root-feeders

**Third trophic level:**  
Shredders  
Predators  
Grazers

**Fourth trophic level:**  
Higher level predators

**Fifth and higher trophic levels:**  
Higher level predators

## Functions of Soil Organisms

| Type of Soil Organism                                                                                                    | Major Functions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Photosynthesizers</b> <ul style="list-style-type: none"> <li>• Plants</li> <li>• Algae</li> <li>• Bacteria</li> </ul> | <b>Capture energy</b> <ul style="list-style-type: none"> <li>• Immobilize (retain) nutrients in their biomass.</li> <li>• Use solar energy to fix CO<sub>2</sub></li> <li>• Add organic matter to soil (biomass such as dead cells, plant litter, and secondary metabolites).</li> </ul>                                                                                                                                                                                                                                               |
| <b>Decomposers</b> <ul style="list-style-type: none"> <li>• Bacteria</li> <li>• Fungi</li> </ul>                         | <b>Break down residue</b> <ul style="list-style-type: none"> <li>• Immobilize (retain) nutrients in their biomass.</li> <li>• Create new organic compounds (cell constituents, waste products) that are sources of energy and nutrients for other organisms.</li> <li>• Produce compounds that help bind soil into aggregates.</li> <li>• Bind soil aggregates with fungal hyphae.</li> <li>• Nitrifying and denitrifying bacteria convert forms of nitrogen.</li> <li>• Compete with or inhibit disease-causing organisms.</li> </ul> |
| <b>Mutualists</b> <ul style="list-style-type: none"> <li>• Bacteria</li> <li>• Fungi</li> </ul>                          | <b>Enhance plant growth</b> <ul style="list-style-type: none"> <li>• Protect plant roots from disease-causing organisms.</li> <li>• Some bacteria fix N<sub>2</sub></li> <li>• Some fungi form mycorrhizal associations with roots and deliver nutrients (such as P) and water to the plant.</li> </ul>                                                                                                                                                                                                                                |
| <b>Pathogens</b> <ul style="list-style-type: none"> <li>• Bacteria</li> <li>• Fungi</li> </ul>                           | <b>Promote disease</b> <ul style="list-style-type: none"> <li>• Consume roots and other plant parts, causing disease.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Parasites</b> <ul style="list-style-type: none"> <li>• Nematodes</li> <li>• Microarthropods</li> </ul>                | <ul style="list-style-type: none"> <li>• Parasitize nematodes or insects, including disease causing organisms.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                              |

|                               |                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Root-feeders</b>           | <ul style="list-style-type: none"> <li>• Nematodes</li> <li>• Macroarthropods</li> <li>• (e.g. cutworm, weevil larvae, &amp; symphylans)</li> </ul>                  | <b>Consume plant roots</b> <ul style="list-style-type: none"> <li>• Potentially cause significant crop yield losses.</li> </ul>                                                                                                                                                                                                   |
| <b>Bacterial-feeders</b>      | <ul style="list-style-type: none"> <li>• Protozoa</li> <li>• Nematodes</li> </ul>                                                                                    | <b>Graze</b> <ul style="list-style-type: none"> <li>• Release plant available nitrogen (<math>\text{NH}_4^+</math>) and other nutrients when feeding on bacteria.</li> <li>• Control many root-feeding or disease-causing pests.</li> <li>• Stimulate and control the activity of bacterial populations.</li> </ul>               |
| <b>Fungal-feeders</b>         | <ul style="list-style-type: none"> <li>• Nematodes</li> <li>• Microarthropods</li> </ul>                                                                             | <b>Graze</b> <ul style="list-style-type: none"> <li>• Release plant available nitrogen (<math>\text{NH}_4^+</math>) and other nutrients when feeding on fungi.</li> <li>• Control may root-feeding or disease-causing pests.</li> <li>• Stimulate and control the activity of fungal populations.</li> </ul>                      |
| <b>Shredders</b>              | <ul style="list-style-type: none"> <li>• Earthworms</li> <li>• Macroarthropods</li> </ul>                                                                            | <b>Break down residue and enhance soil structure</b> <ul style="list-style-type: none"> <li>• Shred plant litter as they feed on bacteria and fungi.</li> <li>• Provide habitat for bacteria in their guts and fecal pellets.</li> <li>• Enhance soil structure as they produce fecal pellets and burrow through soil.</li> </ul> |
| <b>Higher-level predators</b> | <ul style="list-style-type: none"> <li>• Nematode-feeding nematodes</li> <li>• Larger arthropods, mice, voles, shrews, birds, other above-ground animals.</li> </ul> | <b>Control populations</b> <ul style="list-style-type: none"> <li>• Control the populations of lower trophic-level predators.</li> <li>• Larger organisms improve soil structure by burrowing and by passing soil through their guts.</li> <li>• Larger organisms carry smaller organisms over long distances.</li> </ul>         |

## Annex 2.2 Common materials used in a compost heap

The list below by no means complete! Materials you recommend should be based on the availability of materials in the area where the training is being conducted.

Generally materials with a high C:N ratio tend to be dry/brown materials. Low C:N ratio material tends to be green or nitrogenous.

*Source: Martin DL et al. 1992. The Rodale Book of Composting. Rodale Press Inc.*

| Material          | Type (Brown/Green) | Notes                                                                                                                                                                                                 |
|-------------------|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Banana residue    | Both               | Rich in phosphoric acid and potash; rich source of nitrogen for bacteria.                                                                                                                             |
| Citrus waste      | Green              | Skins are rich in phosphoric acid and potash.                                                                                                                                                         |
| Cocoa bean shells | Brown              | Rich in nutrients, particularly nitrogen.                                                                                                                                                             |
| Coffee waste      | Brown              | Earthworms love coffee grounds!                                                                                                                                                                       |
| Fish scraps       | Green              | Good source of nitrogen and phosphorus.<br>Do not use too much in a heap as it will attract rodents and flies. Use in a layer with plenty of dried material to stop the heap from becoming anaerobic. |
| Grass clippings   | Green              | Fresh grass is extremely high in nitrogen but also high in moisture; too much can make a heap turn slimy. Add in a thin layer.                                                                        |
| Kitchen waste     | Green              | Mix well with dry material; do not use meat scraps, fat, or bones.                                                                                                                                    |

| Material                           | Type<br>(Brown/Green) | Notes                                                                                                                                                                                                 |
|------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leaves                             | Brown                 | Tree leaves are rich in nutrients and high in carbon. Shred the leaves to make composting easier.                                                                                                     |
| Legume crop waste<br>(peas, beans) | Green                 | Rich source of nitrogen, as well as a good source of potash and phosphorus.                                                                                                                           |
| Maize cobs                         | Brown                 | Must be chopped up before adding to the heap.                                                                                                                                                         |
| Manure                             | Green                 | Chicken, pig, or cow manures are a rich source of nitrogen.                                                                                                                                           |
| Paper                              | Brown                 | Good source of carbon; must be shredded.                                                                                                                                                              |
| Phosphate rock<br>(powder)         | -                     | Approx 65% calcium phosphate, but needs to be broken down before the plant can absorb it. Sprinkle a thin layer onto each manure layer when making a heap if available.                               |
| Rice husks                         | Green                 | Rich source of potassium; breaks down readily.                                                                                                                                                        |
| Sawdust                            | Brown                 | Good source of carbon; breaks down slowly; allows good air penetration in the heap.                                                                                                                   |
| Seaweed                            | Green                 | Rich source of micronutrients. Higher potassium than manure, but less nitrogen and phosphorus. Mix well with other green layers deep in the heap, as it decomposes rapidly. Good for activating heap. |

| Material   | Type<br>(Brown/Green) | Notes                                                                                                           |
|------------|-----------------------|-----------------------------------------------------------------------------------------------------------------|
| Weeds      | Green                 | Weed seeds will be killed in the heap; any that grow can be turned back into the heap.                          |
| Wood ash   | -                     | Valuable source of potash. Apply only a thin dusting on each layer, as too much can cause a nutrient imbalance. |
| Wood chips | Brown                 | High nutrient content and a good source of carbon.                                                              |

## Annex 2.3 Sample Training Session Plan

| <b>Ref:</b>                                                                                | 1.0 | <b>Title</b>                                   | Building a compost heap | <b>Duration:</b> 40-70 minutes |
|--------------------------------------------------------------------------------------------|-----|------------------------------------------------|-------------------------|--------------------------------|
| <b>LESSONs to be learned (objective)</b>                                                   |     | Demonstrate how to build a compost heap        |                         |                                |
| <b>Materials required</b>                                                                  |     | Poles, compost raw materials (green and brown) |                         |                                |
| <b>Visual aids</b>                                                                         |     | Handout                                        |                         |                                |
| <b>Contents</b>                                                                            |     |                                                | <b>Method</b>           | <b>Timing</b>                  |
| <b>Introduction</b><br>What is composting and what are the benefits of making and using it |     |                                                | Talk                    | 10 minutes                     |
| <b>Development</b><br>Demonstration on how to build the compost heap                       |     |                                                | Demonstration           | 30 - 60 minutes                |
| <b>Useful reference material</b><br>Training notes presented during the course             |     |                                                |                         |                                |

**Training Session Plan Template**

|                                              |  |              |               |                  |  |
|----------------------------------------------|--|--------------|---------------|------------------|--|
| <b>Ref:</b>                                  |  | <b>Title</b> |               | <b>Duration:</b> |  |
| <b>LESSONs to be learned<br/>(objective)</b> |  |              |               |                  |  |
| <b>Materials required</b>                    |  |              |               |                  |  |
| <b>Visual aids</b>                           |  |              |               |                  |  |
| <b>Contents</b>                              |  |              | <b>Method</b> | <b>Timing</b>    |  |
| <b>Introduction</b>                          |  |              |               |                  |  |
| <b>Development</b>                           |  |              |               |                  |  |
| <b>Useful reference material</b>             |  |              |               |                  |  |

## Annex 3 Sample PowerPoint Presentation

Please visit the AVRDC - The World Vegetable Center website

[http://avrdc.org/download/publications/manuals/templates/Compost\\_Workshop.pptx](http://avrdc.org/download/publications/manuals/templates/Compost_Workshop.pptx)

to download a copy of the presentation.



**Figure 13. Compost making as part of AVRDC's Regional Training Course in Thailand.**

## **Annex 4 Sample Feedback Form**

It is useful to get feedback from the participants on how they felt the course was conducted; you can use the information to refine future courses.

Have feedback questionnaires prepared and give people time at the end of the training course to fill them in.

Read through the questions with the participants to make sure that everyone understands what they should be commenting on.

Feedback questions should guide participants in expressing opinions about different aspects of the course.

During the feedback session, it is important that the trainer does not wander around the participants, as they need to feel comfortable to make subjective comments anonymously and without risk of offending.

A sample feedback form is on the next page.

## FEEDBACK / EVALUATION

### Training Course: Compost – Train the Trainer

Date:

Trainer:

Location:

#### 1. Was the level of material presented (circle one answer)

Too simple      About right      Too complicated      Other (please specify)

Comments: \_\_\_\_\_

#### 2. Was the length of the training course (circle one answer)

Too short      About right      Too long      Other (please specify)

Comments: \_\_\_\_\_

#### 3. Overall how would you rate the trainer (circle one answer)

Poor      OK      Good      Excellent      Other (please specify)

Comments: \_\_\_\_\_

4. What did you enjoy most about the training? \_\_\_\_\_

\_\_\_\_\_

5. What would you suggest could be improved? \_\_\_\_\_

\_\_\_\_\_

6. What other training would you be interested in attending that you think AVRDC – The World Vegetable Center could plan? \_\_\_\_\_

\_\_\_\_\_

7. Please make any other comments/suggestions \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Thank you for your time and input!**



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