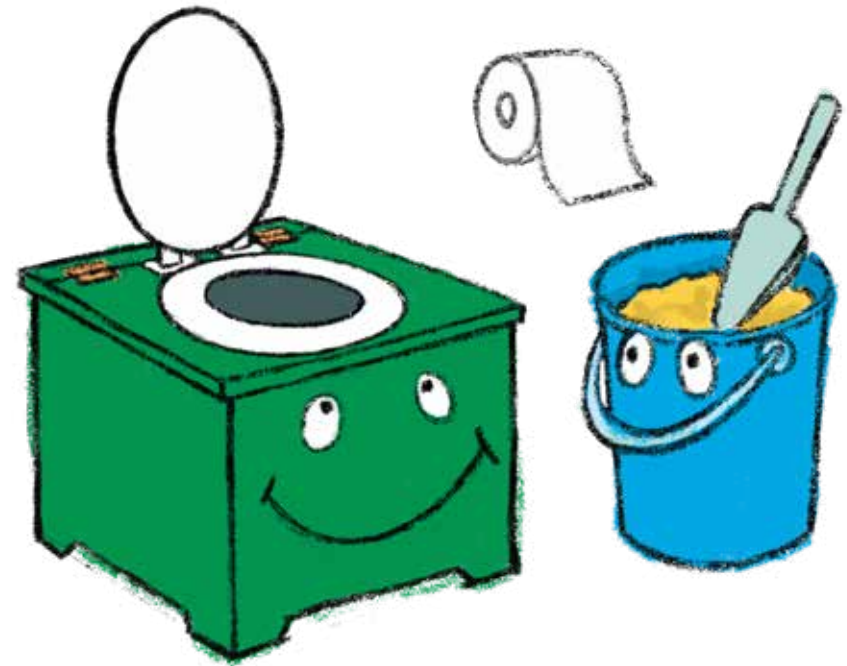


Learning About Compost Toilets

A guide for humanure
composting in schools & homesteads



Acknowledgments

With open minds and big hearts, teachers, parents, students, and homesteads have embraced compost toilets.

This program and learning guide were made possible by the generous support of the **Gupta Family Foundation**. We are grateful that the Gupta Family shares our vision for a more sustainable future.

Compost toilets improve public health and protect water resources by reducing environmental pollution. By learning how to compost, you can improve soil fertility without using chemical fertilizer. All of these actions can help your community take care of the environment, and become more resilient to climate change.

During a school training, a young girl named Mwendé told us that “compost is magic.” We agree, so let’s start learning about the magic of composting!

Asante Sana,
GiveLove & Kenya Connect



Introduction

Congratulations on your new compost toilets!

Composting is an easy way to improve sanitation and recycle organic material.

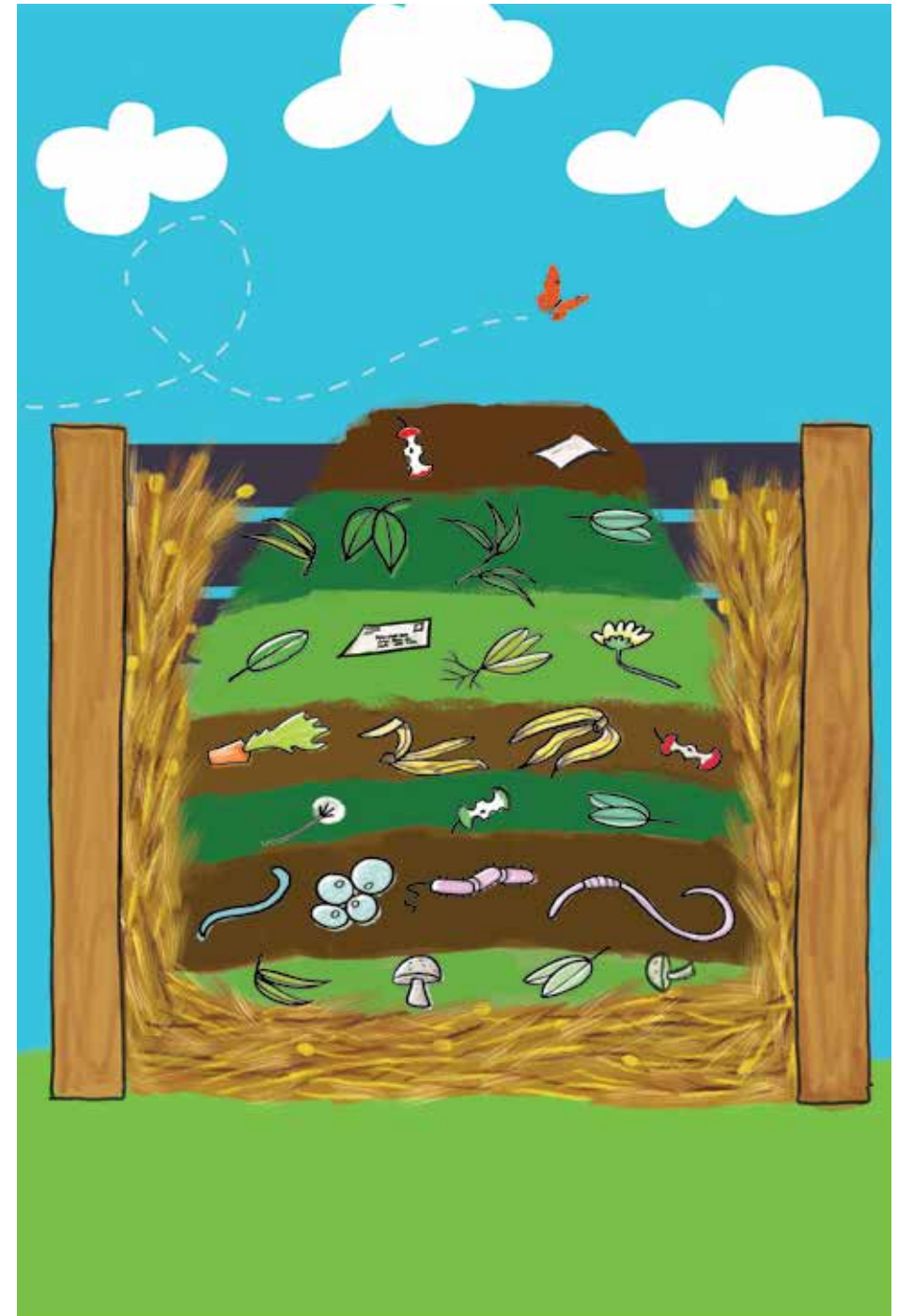
That's why we believe that **Poop Belongs in the Loop!**

This book will explain how to use and manage your compost toilets, and some basic principles of compost science.

At the most basic level, composting involves making the right mix of organic materials inside of a compost pile, and creating the right conditions for nature to take its course.

Compost (noun)

A type of organic fertilizer made by layering mixtures of organic matter in a compost bin. The material is transformed over time by the activity of microorganisms and insects, and the heat they generate in the compost pile.



Let's Start Learning About Compost...

Waste is only waste when we waste it!

People compost to reduce waste and make organic fertilizer. Composting turns organic matter into rich, dark **humus** that can build healthy soil, and improve plant growth and crop yields.

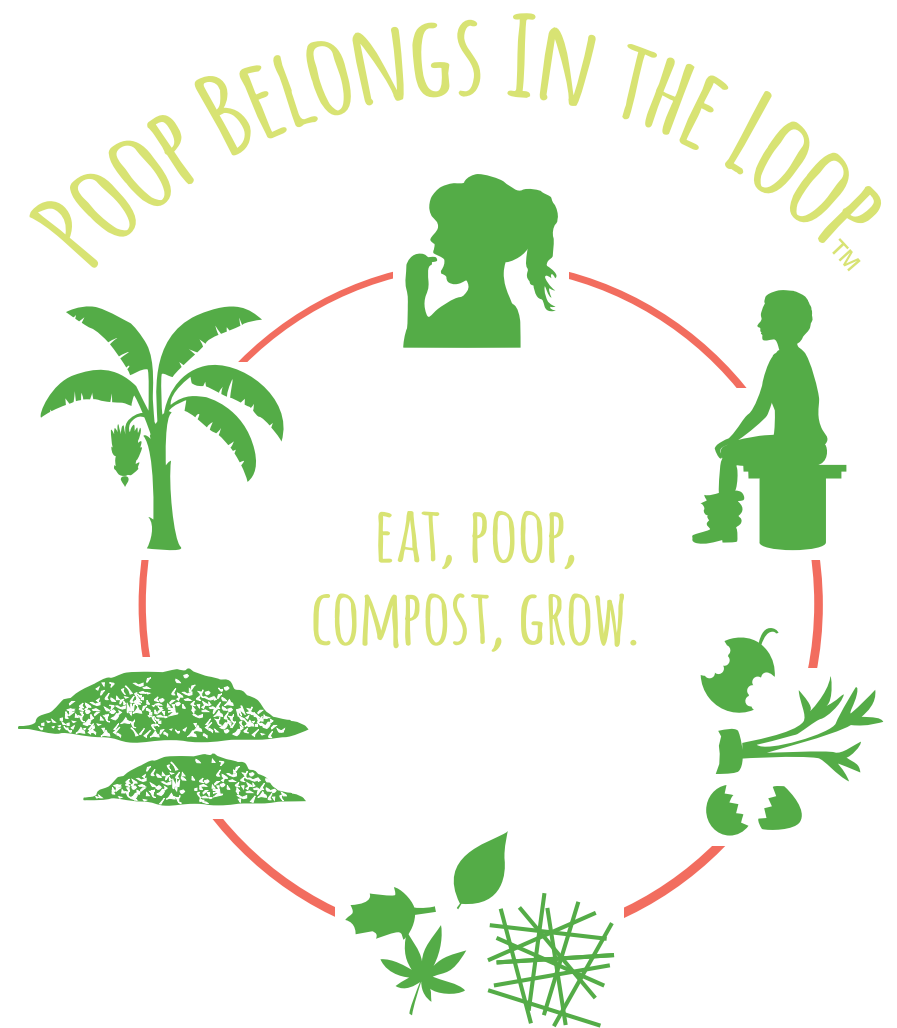
All organisms and plant materials break down and decompose. This is nature's way of recycling essential nutrients and organic material back to the earth.

Many different kinds of organic material can be composted together, including food scraps, crop residues, dry grass, leaves, and animal manure.

Most people don't know that we can also compost our own pee and poop — which, when recycled, is called Humanure.

Humus (noun)

The word Humus means earth or ground in Latin. Humus refers to the organic component of soil that is formed by the decomposition of plant and animal matter by soil microorganisms. Minerals, water, and gases make up the other components in soil.



The compost toilet system turns wastes into resources.

Compost Food Web:

WHAT'S GOING ON IN THE COMPOST PILE?

As organic matter decomposes, the material becomes a food feast for trillions of microorganisms and insects. Scientists call this natural cycle of life the FOOD WEB. Every environment has its own food chain, including the compost pile. This is called the **Compost Food Web**.

There are thousands of different kinds of organisms and creatures at work in the compost pile. The list includes bacteria, protozoa, nematodes, fungi, algae, worms, sow bugs, and centipedes.

When making a compost pile, we are trying to create the ideal conditions for the microorganisms to live in — just like taking care of a goat or chicken.

Food Chain

(noun)

A food chain refers to linked organisms interconnected by energy transfers and feeding relationships — or **what-eats-what**. Food chains intertwine locally into food webs because most organisms consume more than one type of animal or plant.



Food Web

(noun)

A food web is made of interconnected and interdependent food chains. Food webs are simplified models of **what-eats-what** in a specific ecological community. The compost food web helps us understand **what-eats-what** in the compost pile, which is its own tiny ecosystem.



View of microorganisms under a magnifying hand lens

The Food Web

The base of the compost food web is made of organic matter. The variety of food inside of the compost pile attracts larger communities of bacteria, microbes, and insects because these organisms eat different things.

Microbes are picky eaters that share their leftovers with other organisms. As these compost organisms digest, excrete, and die more food is continuously added to the food web.

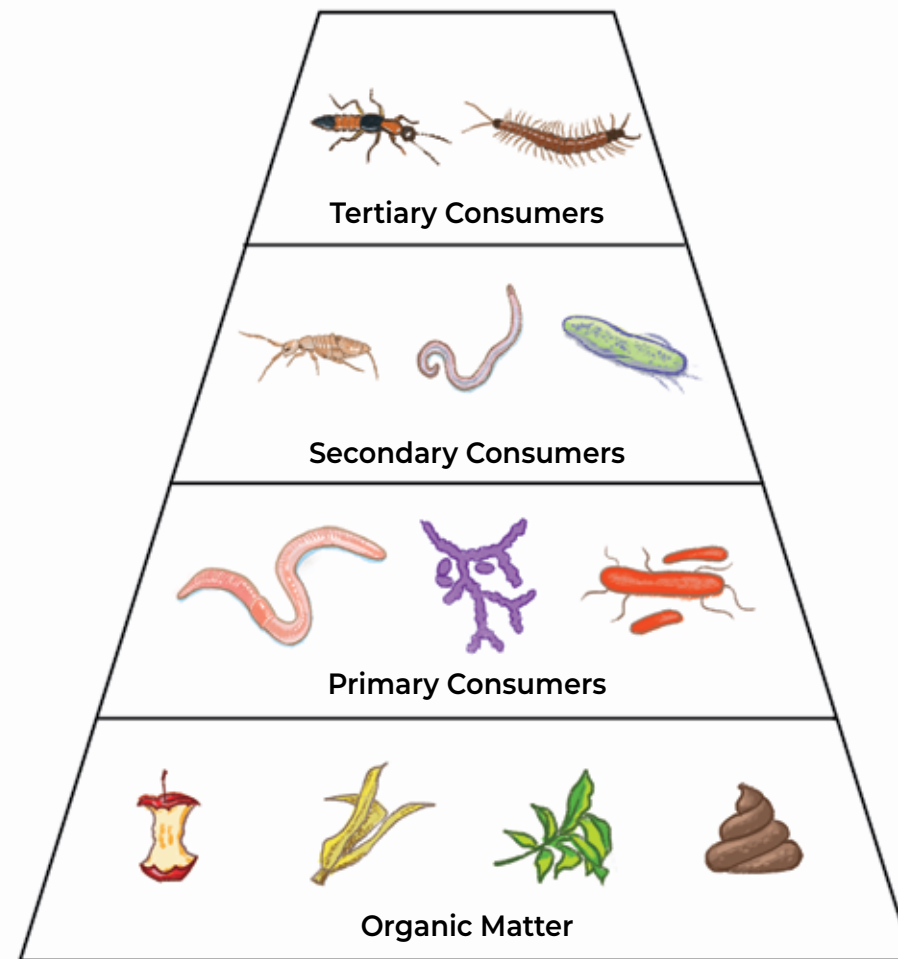
All of this incredible biological activity starts to heat up the compost pile.

WHAT-EATS-WHAT IN THE COMPOST PILE:

Primary Consumers are the first organisms to feast on the organic matter. These include bacteria, fungi, nematodes, mites, snails, slugs, earthworms, millipedes, sow bugs, and worms.

Secondary Consumers feed on the Primary Consumers. These include nematodes, protozoa, rotifera, soil flatworms, springtails, mites, and beetles.

Tertiary Consumers eat the Secondary Consumers. These include centipedes, predatory mites, ants, and beetles.



The base of the compost food web is made of organic matter.

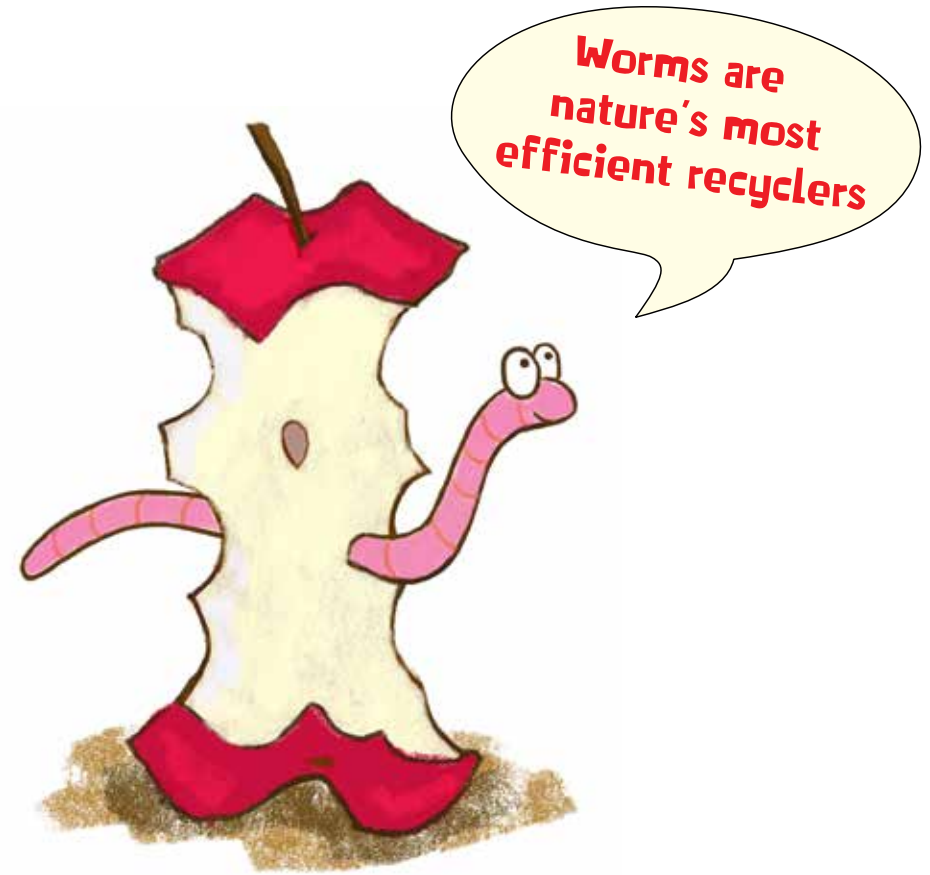


Fun Facts:

A single rotting apple can contain over 90,000 nematodes. Worms eat nematodes and can eat their body weight in a day!

DID YOU KNOW?

- Humans have been making compost piles for over 10,000 years.
- One teaspoon of soil can contain over **100 million bacteria**.
- Aristotle, the ancient Greek philosopher, called worms, **“the intestines of the earth.”**
- Cleopatra, the Queen of Egypt, officially declared worms a sacred animal for their role of maintaining soil fertility in the Nile Valley Basin.



Worm castings, also known as worm poop, enrich soil and improve soil structure.



The Composting Process:

Getting the Right Mix

Proper composting requires mixing enough dry carbon-based materials to balance all of the wet nitrogen-rich materials. This is called the carbon-to-nitrogen ratio.

Getting the right balance of materials and moisture is important to keep the microbes “happy,” and aid in the natural composting process.

Organic materials decompose at different rates. Some tough plant materials can take a very long time to break down.

Learning how to compost properly usually requires some hands-on experience and practice to find the right mix.

Organic Matter

(noun)

Any substance derived from formerly living animal or plant matter.



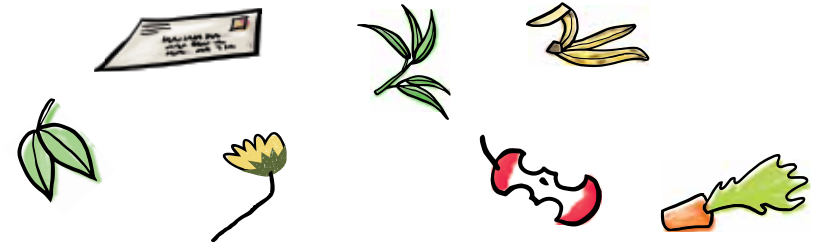
Commonly composted organic materials

Carbon-based Materials

- Dry grass
- Sawdust
- Rice hulls
- Straw
- Dry leaves
- Groundnut shells
- Some crop residues
- Paper & cardboard

Nitrogen-rich Materials

- Humanure
- Animal manure
- Food scraps
- Vegetable & fruit peels
- Egg shells
- Coffee grounds
- Chicken feathers
- Green grass clippings



Good Composting Practices:

Without proper management, the compost pile will begin to smell bad, leak, and attract flies.

Water and oxygen are essential for the composting process because the compost pile is alive with microorganisms and insects. Balancing all of this moisture can be challenging.

Composting requires a lot of cover material to balance all of the wet and dry ingredients. **The most important requirement for successful composting is having enough cover material.**

- Compost bins should be strong and constructed out of wire mesh, wood pallets, or bricks.
- The bottom and sides of the bin should be lined with a thick layer of dry grass to prevent leakage.
- All fresh material should be kept in the center of the bin.
- The compost pile should always be covered with a thick layer of grass after adding any fresh material.

During the rainy season:

- Cover bins with a tarpaulin (chandarua) or waterproof cover.
- When using a wire compost bin, add a thick layer of grass around the exterior of the bin to prevent leakage.



Always practice proper composting methods to make safe and high-quality compost.

Hot Composting:

How composting kills germs

With the right mix of ingredients, the biological activity inside of the compost pile will start to generate very high heat levels—typically between 40-60 degrees Celsius. This method of composting is called Hot Composting.

In scientific terms, this process is called **Thermophilic Composting**, or Thermophilic Digestion. This is why people sometimes call the compost pile a digester.

Rotting organic matter and humanure may contain many germs that can cause serious illness and spread diseases. The hot composting phase is very important because the high heat levels and microbes will kill-off any detectable pathogens, bacteria, and viruses inside of the compost pile. Disease-causing organisms cannot survive very long in the hot and hostile compost environment.

Thermophilic Composting

(adjective)

The word thermophilic means “Heat Loving” in Latin. The term refers to the heat-loving bacteria that thrive in hot compost. High heat levels in the compost pile kill most pathogens.



Record compost temperatures weekly to make sure the compost is active and reaching high heat levels.

Keep track of when you start and close the compost pile.



When is the Compost Finished?

After the compost pile is closed, the composting process for humanure takes one year for the original material to transform into humus. New material is never added to a closed pile because this would add more time to the treatment and composting process.

The composted material goes through **three phases** of composting before it is mature enough to use in agriculture or seed starting.

THREE PHASES OF COMPOSTING:

- 1. The Mesophilic Phase** means middle temperature phase. This phase lasts between a few days to 2 weeks. Organisms that live in cooler environments are active in the pile. This activity starts to heat up the pile.
- 2. The Thermophilic Phase** can last between 2-4 months. Harmful pathogens are destroyed by microorganisms and high heat. This is the hottest and most active phase.
- 3. The Maturation Phase** lasts 8 months. As the compost cools down, worms and insects digest the fibrous material in the pile. Mesophilic organisms also return to pile to consume other microbes. During this final phase, remaining pathogens are destroyed and nutrients become available for plants.



HAPPY BIRTHDAY TO YOU COMPOST



Be sure that the compost is mature before using it to start seeds, because unfinished compost can harm plants.

Benefits of Using Compost

Compost has many unique benefits compared to synthetic fertilizers.

The nutrients in compost come from organic sources, so they are better for the environment. Nitrogen, potassium and phosphorus are released slowly as the compost decomposes in the soil — this helps support plant growth.

Farming with compost also adds trillions of beneficial microorganisms to the soil, which attracts even larger microbe communities. These microbe communities create living soil rich in organic matter and biodiversity.

COMPOST ALSO:

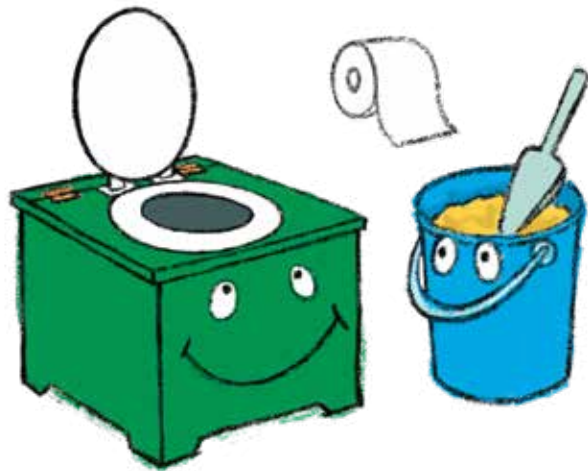
- Acts as a sponge for water by improving soil's water-holding capacity.
- Improves soil structure by adding organic matter.
- Reduces soil erosion.
- Balances soil pH.
- Reduces pests naturally through predation by microbes.
- Provides minerals & micro-nutrients for depleted soils.



Compost creates living soil rich in organic matter and microorganisms.

PART TWO

Using and Managing Your Compost Toilet



Cover material is used as a dry flush after using the toilet.

How Compost Toilets Work

The compost toilet is a type of **dry toilet** system. This system is also considered a type of **Container-based Sanitation** because humanure needs to be collected in the containers before the composting can start. The treatment process happens inside of the compost pile, not inside of the toilet.

Compost toilets need enough cover material to work properly. Instead of flushing with water, we cover the pee and poop with sawdust or other fine material. This is called a **dry flush** system. The fine cover material creates a barrier to prevent bad smells and flies.

Without enough cover material, the compost toilet would not be pleasant to use: however adding too much cover material is wasteful and costly.

Cover Material (noun)

Compost toilets require fine cover material to absorb moisture and prevent flies. Cover materials can include sawdust, rice hulls, sugarcane bagasse, or other fine particle organic matter.

Why Shift from Pit Latrines to Compost Toilets?

Compost toilets have many benefits. They allow nutrients to be recycled, and help prevent water pollution, because unlined pit latrines can often pollute underground water.

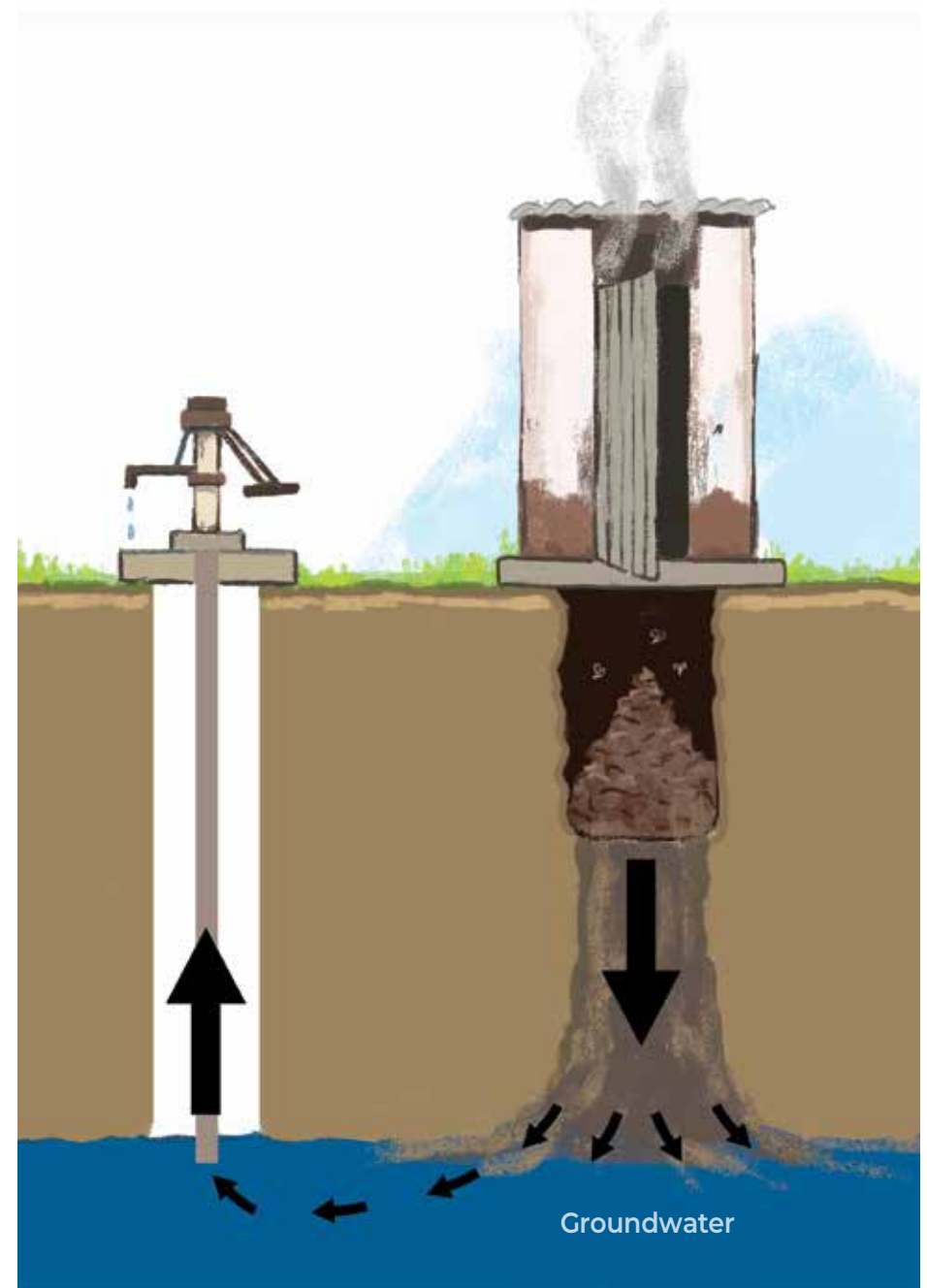
Compost toilets also provide a safe, comfortable, and clean toilet experience — especially for women and girls.

BENEFITS OF USING COMPOST TOILETS:

- Compost toilets can be used by everyone. They are comfortable and easier to use by the elderly, and sick or disabled people.
- Unlike pit latrines, compost toilets do not smell bad.
- Lined pit latrines are expensive to build and maintain.
- Pit latrines can collapse during the heavy rainy season.
- Most rural areas lack pit latrine emptying services.

Groundwater (noun)

Water held underground in the soil, or in pores and crevices in rock.



How to Use a Compost Toilet

FOR GIRLS:

Girls should always sit down on the toilet seat.



1. Lift the seat cover and wipe down the toilet seat.
2. Use the toilet.
3. After using the toilet, lift the toilet seat and cover everything (including tissue paper) with enough cover material.
4. Wipe away any spilled sawdust on the toilet surface.
5. Put down the toilet seat.
6. Wipe down for the next person, and lower the toilet lid.
7. Do not drop sanitary pads inside the toilet. Always put synthetic pads in the sanitary bin and cover with cover material.
8. Wash your hands!

FOR BOYS:



1. Before you pee: lift up the toilet seat and the cover.
2. Stand strategically to aim pee stream inside the receptacle.
3. Cover everything with enough cover material.
4. Clean up any spills or sawdust on the toilet surface. Then lower the seat and seat lid.
5. For a long call: lift up the seat cover and wipe seat before use. For going pee while on a long-call, aim stream down into the receptacle.
6. After using the toilet, lift the toilet seat and cover everything (including tissue paper) with enough cover material.
7. Wipe down the toilet seat. Lower the toilet lid for the next person.
8. Wash your hands!

AT SCHOOL TELL A TEACHER OR CUSTODIAN:

- If you run out of cover material or tissue paper.
- When the toilet needs cleaning or becomes soiled.
- When the receptacle is three-quarters full, so it can be replaced with a clean one.

Always wash your hands well with soap and clean running water for at least 20 seconds after using the toilet!



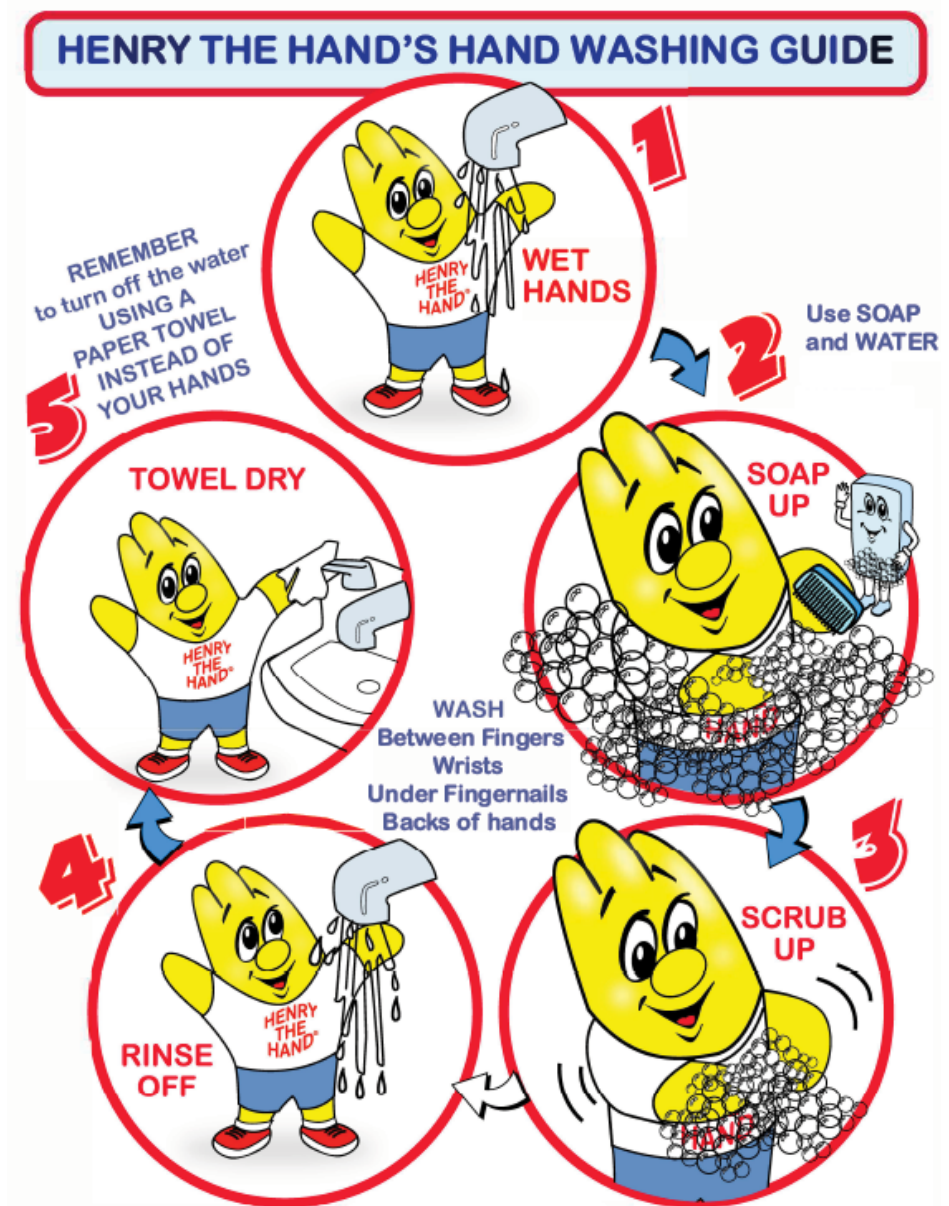
Handwashing = Good Health

If you're healthy and you know it,
wash your hands!

You and your family can stay healthy and prevent common illnesses by practicing proper hand washing and hand awareness.

THE 5 PRINCIPLES OF HAND AWARENESS:

1. WASH your hands when they are dirty and BEFORE eating.
2. DO NOT cough into your hands.
3. DO NOT sneeze into your hands.
4. Above all, DO NOT put your fingers into your eyes, nose, or mouth.
5. Always wash your hands AFTER using the toilet.



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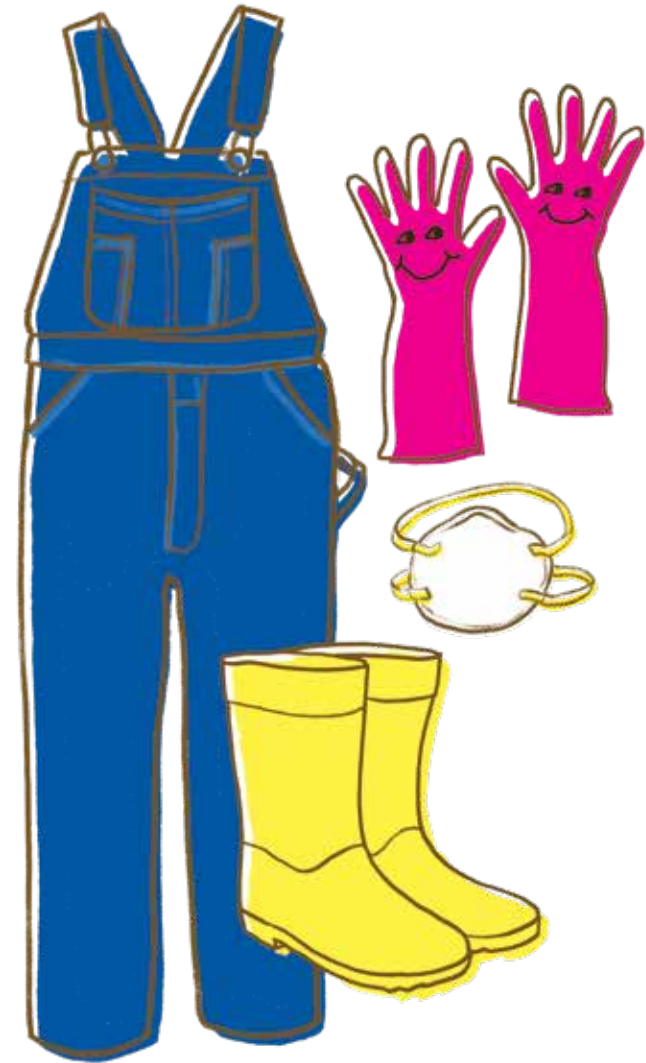


Safe Composting Practices

When the toilet receptacles become full, the school's compost manager will take them to the compost site to be emptied and cleaned. Only trained adults should manage the composting and cleaning activities.

BEST PRACTICES:

- Gloves, coveralls, rubber boots, and face masks should be worn to protect the compost manager from contact with disease-causing pathogens.
- All tools and supplies should be cleaned after each use.
- Coveralls should be washed regularly.
- Containers should be air dried in the sun after they are cleaned and disinfected.
- The compost site should be kept clean at all times.



**Personal Protective Equipment (PPE)
should always be worn when composting**



Small Changes Can Make a Big Difference!

Composting is one of the most important skills that you can learn to recycle nutrients, reduce waste, improve soil, and transition to regenerative farming practices.

We hope this book inspires you to learn more about composting! Small changes can make a big difference and we are inspired by the Kenyan environmentalists who have paved the way for change.

Wangari Maathai was the founder of the **Green Belt Movement** in Kenya, and the first African woman to receive the Nobel Peace Prize. She believed that tree-planting could lead to broader transformations in society and women's empowerment.

Over 30 million trees have been planted by women as the Green Belt Movement spread across Africa.



Moringa Tree seedlings



"It's the little things that citizens do. That's what will make a difference. My little thing is planting trees."

— Wangari Maathai

Special Thanks

This guide is designed as a training tool to complement Kenya Connect's skills training program. Please seek proper training before building a compost toilet system on your own.

The Compost Toilet Learning Guide was developed and authored by GiveLove and Alisa Keeseey. Joan Lintz-Thompson created the graphic design concept and layout. The concept art and original illustrations were created by Ron Salinas.

GiveLove would like to thank James Musyoka, Sharon Runge, and the entire Kenya Connect team for reading all of our drafts, editing support, and contributing many valuable suggestions. We would also like to thank the Henry The Hand Foundation for granting permission to feature their handwashing awareness materials.

Last, but not least, we extend our deepest gratitude to **Joseph Jenkins**, author of *The Humanure Handbook*, and creator of the Humanure Toilet System. This guide was inspired by his work.

