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Composting

A Series of Educational Manuals on Ecological Sanitation and Hygiene

Composting

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Content

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What is Composting?

COMPOSTING is the process of breaking down or decomposing organic material. It is carried out under controlled aerobic conditions (requires air), where various micro-organisms, including bacteria and fungi turn organic material such as bio waste (kitchen and garden waste) or human faecal material into a stable, fertile soil-product called compost.

To be effective, the composting process needs:

- The right environmental conditions
- Enough oxygen
- Correct temperature level
- Enough moisture
- The right ratio of nitrogen to carbon
- Rich microbial population.

Compost is also known as "black gold," and it is the most fertile soil material you can use for planting, fertilizing and amending soil. This is because it contains all the essential and necessary minerals and nutrients that plants need for flourishing growth and it also enhances the water-binding properties of the soil.

Composting Human Excreta

Human excreta can be composted just like any other organic matter. In fact, the composting process is even more rapid than when composting garden waste, because our digestive system has already done the majority of the breaking down for us. Most of the nutrients from human excreta are in urine but faeces are also an important source of potassium, phosphorus and organic matter. Urine is a very good nitrogen fertilizer and can be separated from the solid faecal material on the source with a urine diversion toilet seat or a squatting pan. Urine can also be composted together with solid faecal material but some of the fertilizing value is lost in the process due to nutrient evaporation. The composting dry toilet system can contain one or two chambers. In the double chamber system, one chamber is used at a time when the other is let to rest. If there is only one chamber, it is emptied when full and further composted elsewhere. See Figure 1.

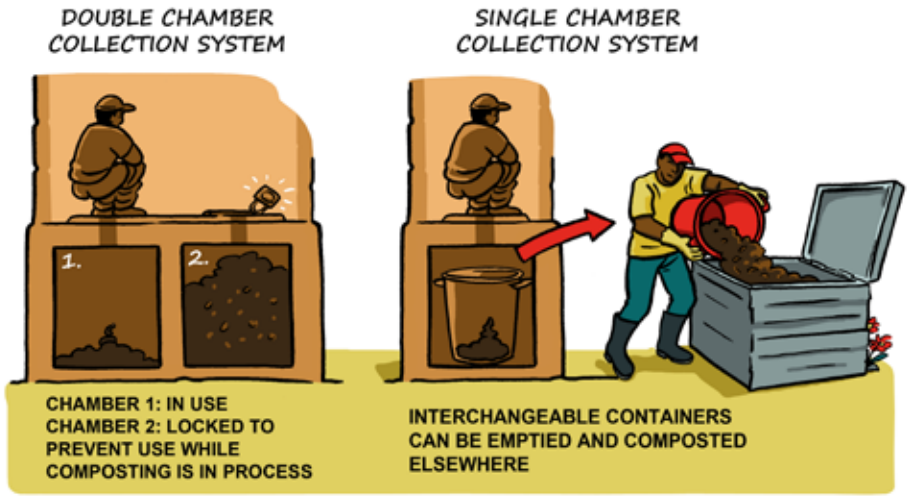
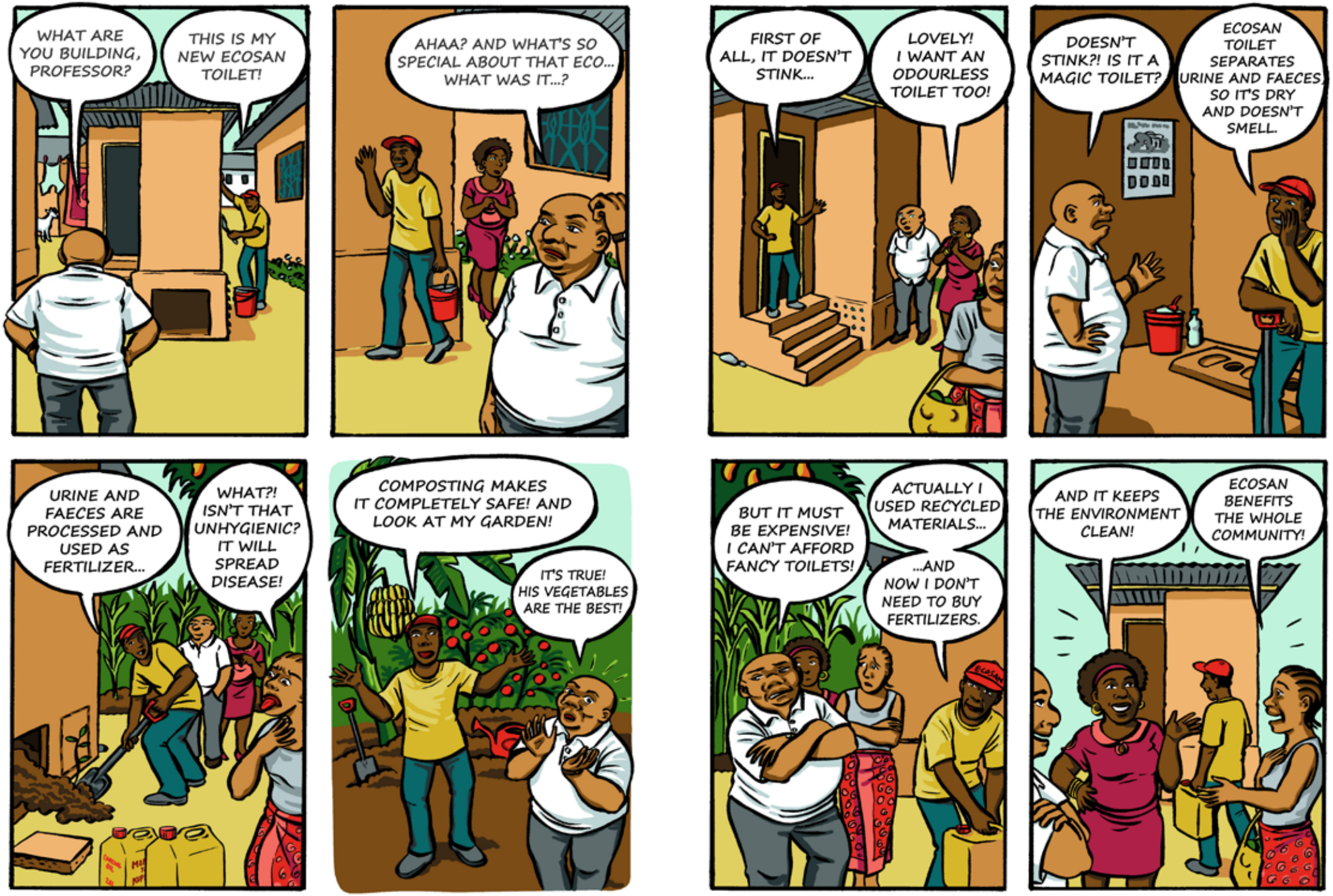


Figure 1. Single and double chamber collection systems.

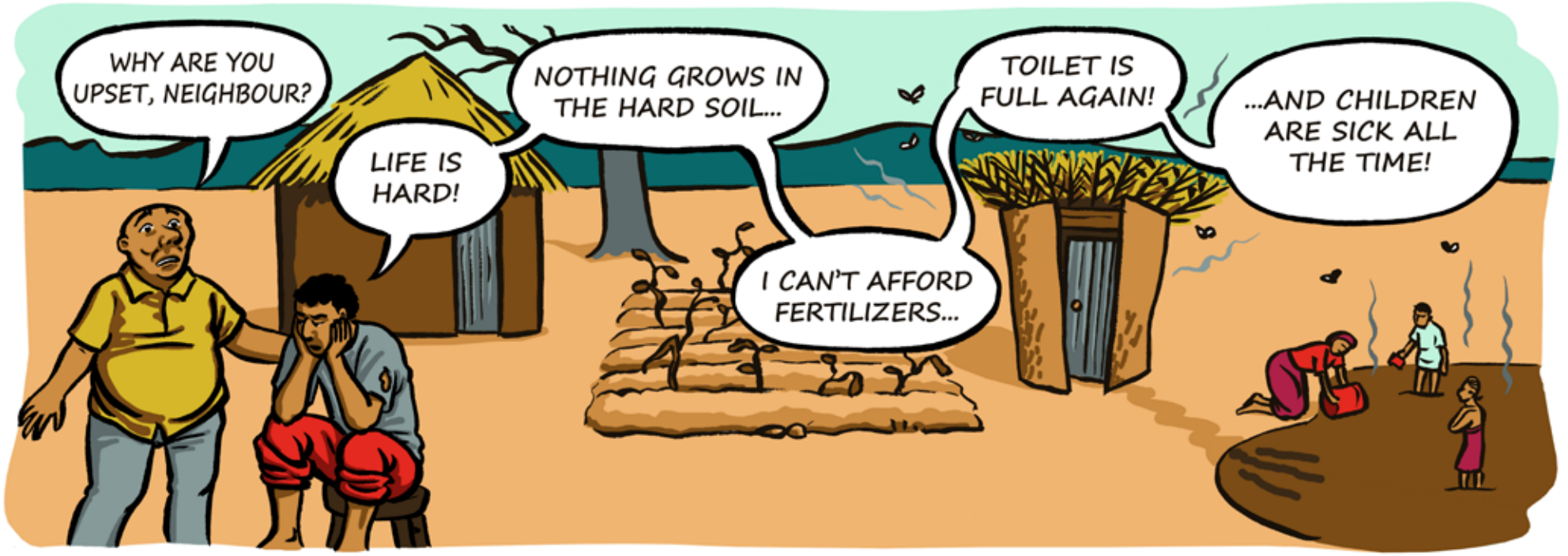

WHAT ARE YOU BUILDING, PROFESSOR?
THIS IS MY NEW ECOSAN TOILET!
AHAA? AND WHAT'S SO SPECIAL ABOUT THAT ECO... WHAT WAS IT...?
FIRST OF ALL, IT DOESN'T STINK...
LOVELY! I WANT AN ODOURLESS TOILET TOO!
DOESN'T STINK?! IS IT A MAGIC TOILET?
ECOSAN TOILET SEPARATES URINE AND FAECES, SO IT'S DRY AND DOESN'T SMELL.
URINE AND FAECES ARE PROCESSED AND USED AS FERTILIZER...
WHAT?! ISN'T THAT UNHYGIENIC? IT WILL SPREAD DISEASE!
COMPOSTING MAKES IT COMPLETELY SAFE! AND LOOK AT MY GARDEN!
IT'S TRUE! HIS VEGETABLES ARE THE BEST!
BUT IT MUST BE EXPENSIVE! I CAN'T AFFORD FANCY TOILETS!
ACTUALLY I USED RECYCLED MATERIALS...
...AND NOW I DON'T NEED TO BUY FERTILIZERS.
AND IT KEEPS THE ENVIRONMENT CLEAN!
ECOSAN BENEFITS THE WHOLE COMMUNITY!

What Are the Benefits of Compost?

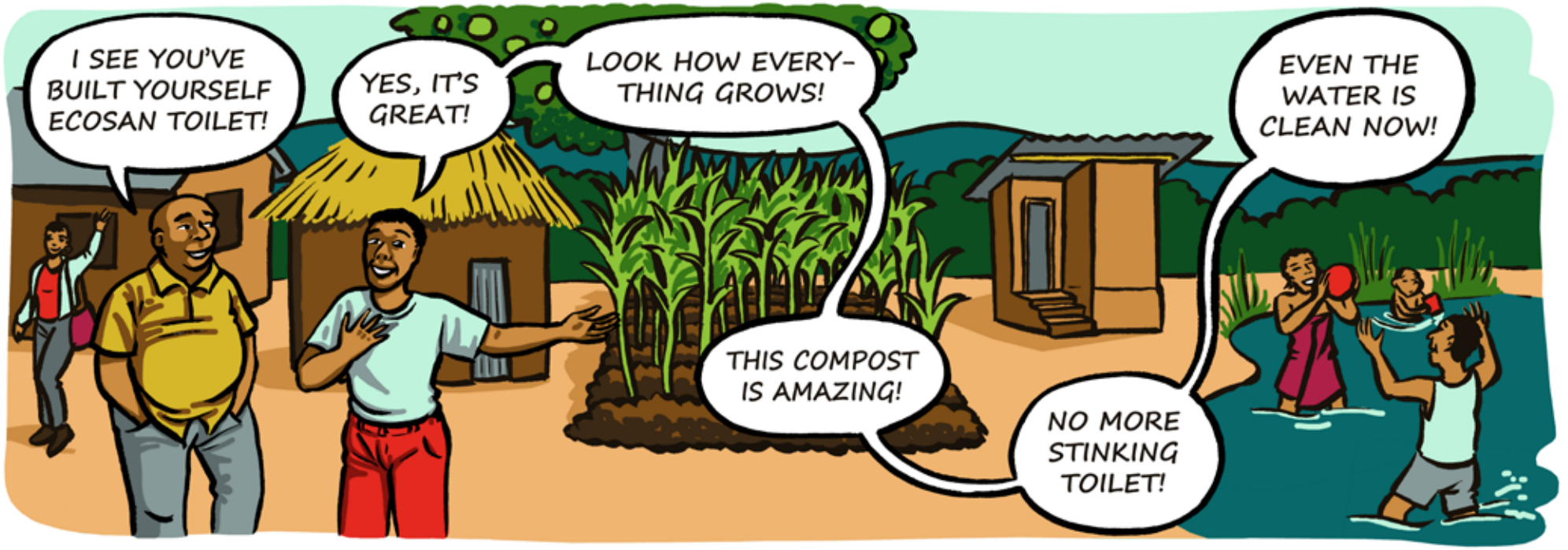
- Compost can be used as a fertilizer and to improve soil condition and structure
- Using compost as fertilizer saves money because the fertilizer is free and smaller amounts of chemical fertilizers are needed
- Using compost reduces the need to mine chemical fertilizers and people are not as dependent of the chemical fertilizer market prices
- Using compost helps to return organic materials and nutrients to the soil instead of wasting them (e.g. to landfills and water bodies). See Figure 2, page 9.
- Compost can be used on both ornamental/decorative plants and food plants.

Figure 2. The principle of closed human nutrient cycle.

BEFORE



AFTER



How to Compost?

Composting is a biological process where micro-organisms decompose organic matter into fertile soil. Composting can be done in a pile, separate container or in a composting toilet. The compost needs to be constructed in a correct way. It is important to make sure there are no runoffs from the container or pile to the environment.

Composting process can be divided in to three stages:

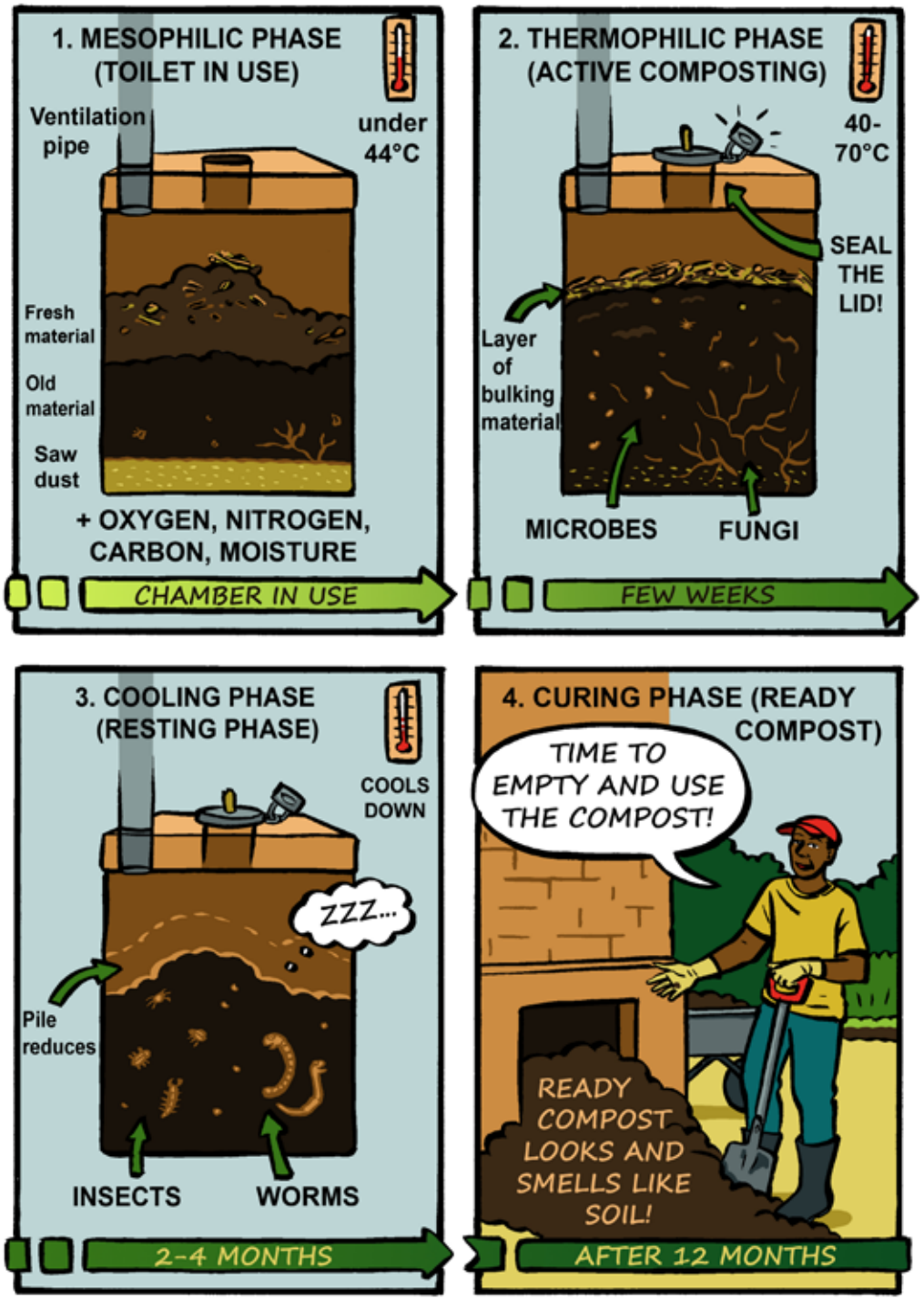
1. **Active composting**
   At the active composting stage, the pile, separate container or composting toilet is filled with bio waste (food waste), garden waste or latrine waste (urine, faeces and dry materials).
2. **Resting stage**
   At the resting stage, no new waste is added to the compost. Instead, the compost is left to decompose for example in the dry toilet chamber, covered with bulking material. Fresh waste should not be mixed with the old waste during the resting stage.
3. **Further composting**
   If the compost is not fully decomposed after resting stage, further composting can be done outside the toilet chamber. The compost is let to further develope and mature in a closed composting container or a pile, which is protected from the rain.

The composting conditions must be balanced for efficient decomposition.

To be effective, the composting process must include:

- **Plenty of air**
  Mix the composting material (human excreta, bio waste and/or garden waste) with bulking material such as sawdust, dry leaves, coconut coir and/or wood chips to create airiness to the compost.

  NB! Do not add ash or lime in the compost.
  If the pile is too dense it is advisable to turn it once in a while.
- **Adequate moisture conditions**
  Mixture should be moist, but not soaking wet, like a well squeezed out sponge.
- **Small pieces**
  Big pieces of composting material should be broken up, as smaller things break down more rapidly.
- **Proper mix of carbon (C) to nitrogen (N)**
  Composting requires enough carbon, meaning bulking material, such as sawdust and dry leaves, and nitrogen which already exists in urine. To get the perfect ratio, you need to add bulking material. This also binds excess moisture and keeps the compost light and airy.



How to Use Compost?

Compost is a valuable source of organic material and nutrients.

For the proper use of compost remember:

- It is advisable to add compost before planting. You can also use it as top soil. Stop adding compost one month before harvest
- Different amounts of compost should be applied to different plants. It is advisable to mix the compost with soil

  NB! Not all plants like compost which can have high pH value
- Compost is good for example for pumpkins, tomatoes, cabbages, corn, fruit trees and currants, cherry and lilacs. For potatoes, carrots etc. compost might be too alkaline
- If compost is used as substrate for potted plants it needs to be well matured and it is good to add some mineral soil in it. Good substrate can be made by mixing compost with sand and clay in the ratio of 1:1:1.

Figure 3. Four different composting stages in a composting toilet.

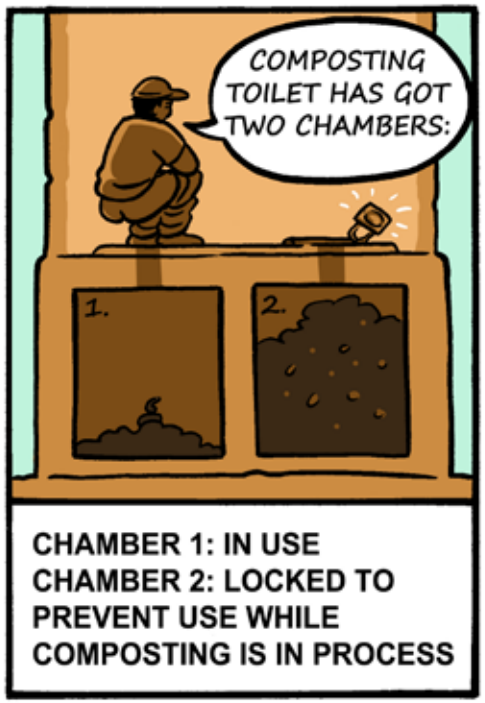
Tips to Making Good Quality Compost

- Collect the organic material (biowaste or excreta) to a pile, a separate container or a composting toilet
- Mix the composting material (biowaste or excreta) with bulking material such as sawdust, dry leaves, coconut coir or wood chips
- No trash (e.g. plastics, glass, metal etc.) should be mixed with the organic compost materials
- Check the level of decomposition, humidity and heat level and continue composting if needed
- It is best to let human excreta decompose for at least one full year (12 months) before use
- You can continue composting human excreta in the composting toilet chamber or a separate composting box
- If you want to mix garden and food waste with faecal matter, add them in separate layers: (1) layer of garden waste, (2) layer of food waste, (3) layer of faecal matter, etc.
- Ready compost is dark, relatively dry, light and smells like soil.

Safe Use of Compost

Human faeces may contain pathogens (bacteria, viruses, etc.) that can be harmful to humans and the environment. However, compost from toilets is hygienically harmless if compost will keep the temperatures of 55- 60°C for at least two weeks to one month (thermophilic composting stage). For safety reasons, the World Health Organization (WHO) also recommends a further maturation period of 2-4 months in order to ensure a satisfactory pathogen reduction. If temperature does not rise that high and/or it can't be monitored, it is better to leave the compost to maturate for at least 12 months. See Figure 3, page 14.

NB! DON'T FORGET TO USE GLOVES AND SHOES WHEN HANDLING COMPOST.


COMPOSTING TOILET HAS GOT TWO CHAMBERS:
1.
2.
CHAMBER 1: IN USE
CHAMBER 2: LOCKED TO PREVENT USE WHILE COMPOSTING IS IN PROCESS


AFTER EVERY USE:
ADD CHOPPED ORGANIC MATTER TO KEEP THE WASTE AIRY AND TO PREVENT SMELL.
1.
2.
3.


READY COMPOST IS DARK, QUITE DRY AND LIGHT. IT SMELLS LIKE SOIL.
COMPOST FURTHER
IF YOUR COMPOST IS NOT READY, COMPOST IT FURTHER, BUT DO NOT MIX IT WITH FRESH TOILET WASTE!


MIX READY COMPOST WITH SOIL BEFORE APPLYING TO FIELD.
COMPOST + SOIL


AFTER ONE YEAR OF COMPOSTING:
NOW THE COMPOST IS READY AND SAFE TO USE!


DON'T FORGET TO USE GLOVES AND SHOES WHEN HANDLING THE "BLACK GOLD"!


USE DIFFERENT AMOUNT OF COMPOST FOR DIFFERENT PLANTS, IT GIVES A HIGH PH VALUE.


REMEMBER!
WASH YOUR HANDS CAREFULLY AFTER HANDLING COMPOST!
SOAP

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