KALRO
Kenya Agricultural & Livestock Research Organization

NAVCDP

LOW COST COMPOSTING TECHNOLOGIES

Introduction

Concerns about soil health, biodiversity, air pollution, land degradation, incorrect use of inorganic fertilizers, and sanitation have led to a boom in interest in organic recycling techniques in Kenya. Composting is a useful technique for recovering agricultural waste because it allows plant material and food waste to naturally decay via the action of worms and fungal microbes, producing a partially digested humus.

For local markets, organic fertilizer is insufficient and therefore agricultural biological waste provides an option for improving the soil. A decrease in soil fertility in smallholder systems reduces the growth of agriculture. Composting organic waste, such as vegetable cuttings and leaf twigs, improves soil quality and promotes plant growth. Composting is an effective method for recycling agricultural waste (rice husk, straw, and cow dung) into organic fertilizer. Vermicomposting/ vermiculture is an enzymatic degradation through earthworms' digestive system, which produces high-quality compost in 6 -12 weeks without physical turning. It is especially useful for small-holder farmers who have easily accessible trash.

The benefits of composting

The benefits of composting include:

- Reduction of methane /greenhouse gas emissions.
- Compost reduces and in some cases eliminates the need for chemical fertilizers.
- Higher agricultural crop yields are promoted by compost.
- By enhancing polluted, compacted, and marginal soils, compost can support efforts to restore wetlands, reforest, and revitalize habitats.
- A cheap and efficient way to clean up soil damaged by hazardous waste is to use compost.
- Compost helps soils hold onto more water.
- Composting helps to sequester carbon.

Rearing worms

Materials needed:

i. A wooden box or an open plastic drum about 60 cm deep, 180 cm long, and 120 cm wide. Topsoil with some red worms.

ii. Fresh manure or animal waste from pigs, sheep, goats, cattle, or rabbits.
iii. Dry substances, like grass.
iv. An appropriate covering, such as a sisal bag.
v. Water.

Method

Step 1: In an open drum or box, mix thoroughly all the topsoil, grass, dung/ droppings, and water. Use just enough water to prevent over wetting the growth medium, which would make it unsuitable for raising worms.

Step 2: Put the drum or box in the shade and cover the mixture, etc. with a sisal bag. Ensure that the growth medium is consistently moist.

Step 3: The worms will be multiplied in just two weeks. Harvest the large worms by sieving through a wire mesh. To utilize them for the intended purpose, put them in a different container.

Making vermicompost with earthworms

Using earthworms to turn organic waste into rich, organic fertilizer is known as vermicomposting. They hasten the composting process, and when the compost is added to the soil, the chemical, biological, and physical qualities are enhanced, creating ideal growing conditions for plants. The production of vermicompost requires three to six months.

Common earthworm species used in vermiculture include the tiger worm (Eisenia foetida), Kenyan highland forest pigmented earthworm, African night crawler (Eudrilus eugeniae), Perionyx excavatus, and others. The tiger worm is commonly used in Kenya, while the Kenyan highland forest pigmented earthworm produces finer vermicomposts.

Vermicomposting method: Bed Technique

Step 1: Bed construction

Make a bed with a bottom made of concrete, wood, or plastic sheeting, and build walls 20 to 30 cm high out of wood, logs, or stone. For improved handling and aeration, lay a wooden board over the bottom and cover it with chicken

wire.

Step 2: Addition of coarse material

On top of the chicken wire, spread a layer of coarse organic debris (10 to 15 cm) such as banana trash, maize stover, coffee husks, and other agricultural wastes. Poultry dung is not allowed in the material since it is bad for worms.

Step 3: Addition of fine material and water

On top of the coarse debris, spread a layer of coarse manure, such as that from cattle, pigs, sheep, or goats. Green manure could be used instead of grass clippings or tree leaves. Combine fine materials, such as grass clippings, threshed beans, maize bran, and brewery waste, with the coarse layer. Before adding the earthworms, wet the organic materials well, making sure there are no dry areas.

Step 4: Releasing of worms.

Allow the earthworms to settle into the damp bed. Instead of handling individual worms, fill holes approximately 0.5 meters apart with tiny handfuls of earthworm-rich material (clusters).

Step 5: Covering the bed.

Banana leaves or dark polyethene sheets can be used to cover a bed. Add new layers of banana leaves occasionally as the worms consume older leaves. Regularly inspect and add new layers to help maintain the bed's moisture. Violently and repeatedly shake the underlying chicken wire to prevent predators.

Step 6: Feeding the bed

The bed can be used to apply additional layers of organic materials, either in discrete locations or as a whole. A product that takes three to six months to produce, can be further enhanced by withholding feed for three weeks to yield a finer, more homogeneous product.

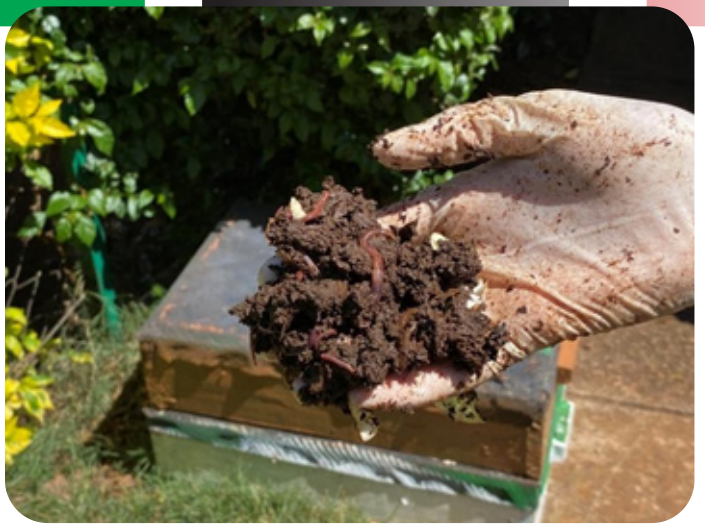
Step 7: Recovering the worms and vermicompost

Worms are collected and compost is treated once the vermicompost is ready. Before harvesting the vermicompost, add a fine feed material to the bed to make it easier to remove worms from later "batches." Good feeds to attract earthworms include wheat bran, brewer's waste, or fresh animal dung. Fish and poultry can also be fed collected worms. As the vermicompost dries, spread it

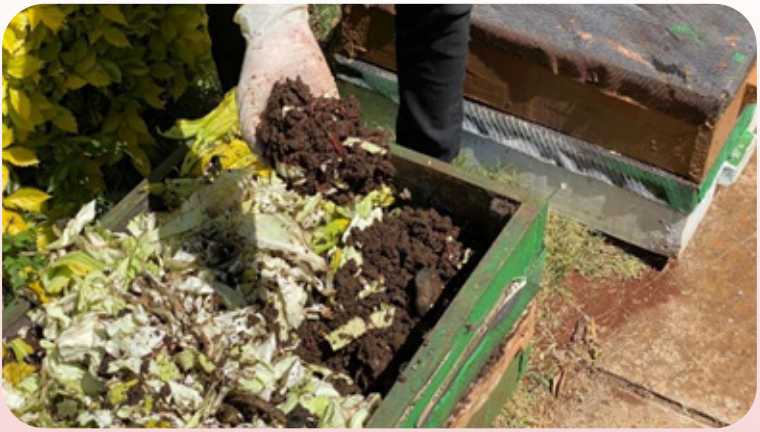
out in the sun and manually gather any more worm pockets. The process of vermicomposting can be repeated after the worms have been gathered. The final vermicompost has a fine texture, is black, and is consistent. It works best when filtered through a 5 or 10 mm mesh screen before being utilized as the primary component of a seedling or potting media. An average amount of nutrients found in vermicompost manure made using E. foetida is 1.9% N, 0.3% P and 2.7% K.

Vermicompost box. Design courtesy Agrey Mukoko. Photo credit: Peter Wanuthi, KALRO Science Centre)

Vermicomposting using kitchen waste (vegetables and other waste). Photo credit. Peter Wanuthi, KALRO Science Centre



Red worms used in the vermicomposting Photo credit: Peter Wanuthi, KALRO Science Centre



Red worms used in the vermicomposting showing partial decomposition of kitchen waste. Photo credit: Peter Wanuthi, KALRO Science Centre

Compiled by: Bramwel, W., Monjero, K.I., Wanuthi, P., Ochieng, V., Odhiambo, H., Kirigua, V. and Wasilwa, L.

Edited by: Nyabundi, K.W., Mukundi, K.T., Kinyua, Z. M., Maina, P., and Wanyama, H.N.

Design and Layaout by: Nogrecia N.Mnene

For further information, contact: The Center Director,
Kenya Agricultural & Livestock Research Organization,
Biotechnology Research Institute - Kabete
P.O. Box 57811, City Square, Nairobi, 00200, Kenya
Email: info@kalro.org

KALRO/NAV CDP/NR Pamphlet No. 102/2024