File 2 - Compost Production

Definition:

Composting is an aerobic (requiring oxygen) biological process for the conversion and recycling of organic materials (biomass by-products, organic bio-waste) into a stabilised, hygienic, soil-like product rich in humic compounds, which is called compost [1].

Advantages:

In addition to providing the necessary elements for plant growth, the addition of compost improves soil structure. It increases the humus rate and stimulates soil microbial life.

It deodorises animal manure and destroys certain microbial pathogens and weed seeds by a combination of temperature rise and biochemical degradation factors. It's a very important asset for organic farming.

A study in Senegal showed that adding compost to *Artemisia annua* plants reduced pest attacks (mainly soil fungi such as Rhizoctonia and termites) by half compared to the use of chemical fertilisers. It was also shown that the biomass yield is as good with compost (in particular compost made with nitrogen-rich poultry manure) as with the optimal chemical fertiliser in the study area [2].

Soil should be treated with well-fermented organic compost either before planting or immediately after the first harvest [3].

1. Composting site

- Choose an easily accessible location, if possible sheltered from the sun, wind and water.
- It may be useful to erect a shelter to protect the compost from excess water and/or sunlight.

- In wet areas, compost can be heaped in a pile 1m high x 1.5m diameter, in an air-permeable wooden crate (1m³), or in a windrow 1m high x 1m wide (length as needed) [4].
- In wet areas, dig water drainage channels around the compost heap.
- In arid areas, it is advisable to compost in pits to conserve moisture.
- Planting quickset hedging around the composter helps to maintain moisture and provides plant materials.
- Compost must always be in contact with the soil, which is the natural reservoir of organisms that allow materials to decompose.
- 4 spaces are generally necessary to turn the compost 3 times during maintenance.

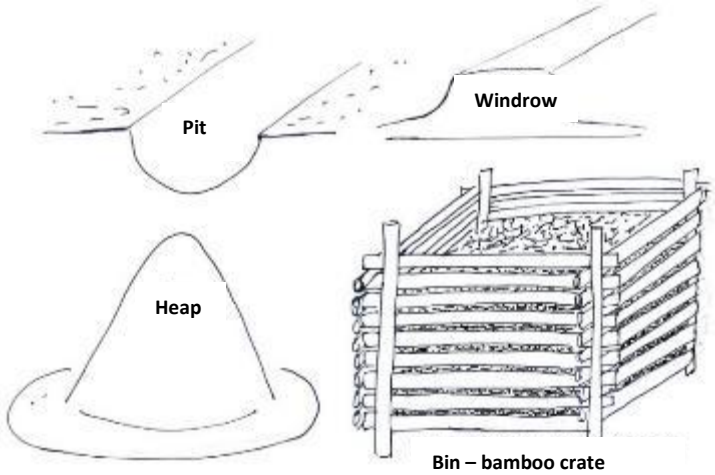

Figure 1: different types of composting (Agathe Cornet-Vernet)

2. Preparation

- Make successive layers- see figure 2 : (indicative measurements) [4]
  - **Dry organic materials** (10 cm approx depending on size and density of material) : straw (recommended for mulching), grass, husks, dry leaves (except eucalyptus), peanut or palm kernels (in a thin layer because it takes longer to break down), cocoa waste, coconut waste and other dry plants. Cut/chop as necessary to speed up rotting process.
  - **Fresh organic materials** (5 cm) : vegetable matter, haulms, palms, tree leaves, peelings, ... either not too big or chopped. Do not use branches larger than 1 cm in diameter as they take too long decompose! NB: Consider also using plants rich in nitrogen (N) such as titonia or leguminous plants.
  - **Animal manure** : accelerate the rotting process with chicken droppings (2 cm), cattle, pig, donkey or horse dung, liquid manure, ... (2 to 5 cm). Increase the depth of fresh materials and animal manure if these are mixed with litter. NB: Chicken droppings are 3 times richer in nitrogen (N) than other types of manure.
  - Optional: thin layer of bone powder rich in phosphorus (P).
  - Optional: thin layer of ashes rich in potash (K).

For correct decomposition, a **good C/N ratio** (carbon/nitrogen) of materials used is important.

Animal manure
Fresh organic materials
Dry organic materials

Figure 2: compost layers (Agathe Cornet-Vernet)

- It is also possible to alternately layer dry organic materials (DM) with fresh organic materials (FM) or animal manure (AM): (DM-FM-DM-AM-DM-FM-DM-AM-DM…)
- **Water well between each layer** to start the decomposition process!
- Repeat successive layers to reach minimum **height 1 m**.
- Protect the surface from sun and wind and keep the compost moist by covering with straw, palm leaves, soil (in dry areas) or other local materials.

This is a standardised global method, but there are many ways to compost. For more information on the use of leguminous plants, manure and the different types of composting, see the AGRISUD Guide [4] p 89 to 114.

In Burundi, underground composting with E.M. technology (Effective Micro-organism by Prof. Jap. Teruo Higa) gives very good results. The compost is enriched with bacteria, molasses, sugar, water, but without the vinegar or alcohol (as provided for in the initial formula).

In Cameroon, Biochar is used successfully. For more information on this recognised soil improvement technique to improve water and nutrient retention and improve soil life, see the AGRISUD Guide [4] p 115 to 116.

In Burkina Faso, liquid fertiliser has been used successfully. For more information on this technique, which provides rich nutrients to crops at no cost. See the AGRISUD Guide [4] p 177 to 188.

IMPORTANT: To ensure the biological quality of the Artemisia crop, care must be taken to **use only ORGANIC materials**, free of any trace of chemicals. Animal manure must also come from an organic farm, which does not use antibiotics or feed with chemical additives because these would then transfer into the compost and ultimately into the Artemisia plants and consumed in herbal tea.

NB: *Artemisia annua* and *afra* appear to be very effective in treating coccidiosis in hens and parasitaemia in sheep (strongyles, strongyloids, coccidia and cestodes). Dried and ground Artemisia leaves and stems can be incorporated into feed in place of conventional medication. Studies report a dosage of 150mg of *Artemisia afra*/kg per day for 5 days for hens and 30g of *Artemisia afra* for sheep weighing 39kg on average for at least 8 days [5-7].

3. Maintenance

- 2 weeks after assembling the layers, check that the rotting process is well underway by inserting a stick for 5-10 minutes into the middle of the compost. The stick must be warm (60 -70°C). [8]
  If it is not the case:
  - Wet any dry areas of the compost;
  - Add fresh materials or animal manure as necessary (to redress the carbon/nitrogen ratio) [8].
- Water once a week in dry areas so the compost remains moist OR in case of drying out in wet areas.
- Monitor moisture regularly by checking a handful of compost from the middle of the heap and squeeze hard:
  - If liquid trickles from the compost when squeezed it is too moist, so water less frequently;
  - If no liquid trickles from the compost when squeezed and it crumbles when opening the fist, it is too dry and requires increased watering;
  - If no liquid trickles when squeezed, or only a few drops, and the compost remains compact when opening the fist, then moisture levels are correct.
- Monitor compost temperature regularly with stick method.
  Turn the compost to another space (or pit) when it drops in temperature (stick method), generally every 2 - 4 weeks. This will maintain good aeration. After turning, the compost must be as homogenous as possible, with layers mixed and the edges turned into the middle.
- Water at each step to relaunch the rotting process with correct moisture levels (squeezed handful test).
- If the compost smells bad or if there are midges, poor aeration, excess water or excess of nitrogen rich materials (low C/N ratio) have caused fermentation and anaerobic moist areas.
  To correct this, turn the compost and add carbon rich materials.

4. Completion

- The compost is ready when it is homogeneous (the original materials can no longer be distinguished) and does not heat up, 2 to 4 months in dry areas, 3 weeks in wet areas.
  It should be light, moist and aerated, dark brown in color and smell like forest soil.
- Sieve coarsely before use to remove any un-decomposed material (wood, stems, ...) which can be recycled in the initial preparation of the next compost.

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