The Federal Environmental Protection Authority

Draft Guidelines on Composting

NOT FOR CITATION

This guidelines is still under development and shall be binding after consensus is reached between the Environmental Protection Authority and the Environmental Units of Competent Sectoral Agencies

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These guidelines explain the process of composting and techniques for using it in solid waste management. The guidelines describe some of the benefits of composting and characteristics of that waste which can be composted. Composting methods are briefly outlined and discussed herein under.

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1. Introduction

1.1.What is compost?

Compost is the product of natural degradation of organic material by the action of bacteria, fungi and other organisms usually in the presence of an adequate air supply. Compost is a humus-like material, which is relatively stable, odour free and not attractive to flies.

1.2.What is compost used for?

Compost is mainly used as a soil conditioner. It is used to increase the organic content of soils and also improve the soil structure. The addition of compost makes the soil take the form of crumbs rather than fine powder, so that the soil is more resistant to wind and water erosion, able to retain more water and easier to till. Compost also provides trace nutrients and small quantities of the basic plant nutrients-nitrate and phosphates. It improves the usefulness of artificial fertilizers by holding them in the soil enabling the plants to benefit from them over a longer period.

2. Composting for recycling and disposing of waste

2.1 When is composting a suitable option?

Composting is a suitable option when three important criteria are met.

- The waste itself is suitable (see below).
- The organic portion of waste can be collected separate from non-organic material at source, or easily/economically sorted from a mixed stream.
- There is a market, or potential for a market, for compost.

2.2 What constitutes suitable waste for compost?

- Most organic (of plant or animal origin) materials that will decay easily are suitable for compost.

- Garden wastes: grass cuttings, non-woody garden pruning, leaves, flowers, and vegetable remains.

- Kitchen wastes: vegetable peelings and leaves, fruit peelings and cores, cooked table scraps, tea leaves and bags, egg shells, stale bread.

- General: paper and cardboards, sawdust and wood shavings, animal manure, wood fire ash, seaweed.

- Materials which you should not add to a compost heap: kikuyu grass, woody garden clippings, pine needles, rose cuttings and other cuttings with thorns, seeds, bulbs, runners, garden wastes sprayed with pesticides, toilet waste or septic tank sludge, diseased animal carcasses and diseased plants, anything that does not decompose, e.g. metals, glass, plastics.

  The carbon: nitrogen ration is critical in deciding the suitability of waste for composting. Ideally the C: N ration will be 30: 1 to 35:1, to give a ratio in the final compost of between 15:1 and 20:1 some typical values are:

Vegetable matter	24:1
Organic fraction of domestic waste	20:1
Night soil sludge	6:1

Higher final C: N rations can result in nitrogen levels in the soil being reduced as the carbonaceous substrate continues to decompose.

3. Composting methods

3.1 The composting process

Composting can take place aerobically (in the presence of oxygen) or an aerobically (in its absence). Aerobic decomposition is generally preferred as the process is faster, produces an end product containing more nutrients and does not

produce bad odours. Anaerobic decomposition will naturally take place when waste is left covered or in a ditch where little or no air can reach it. Among others methane is produced that can be used as energy source.

3.1.1 Aerobic composting

Most organic materials are broken down by bacteria and fungi, which rely on most conditions and oxygen. Cellulose is broken down by actinomycetes and this is a slower process. This process generates heat that can lead to the temperature as high as 70 ^{0}c, which also serves to destroy unwanted things including weeds, flies, larvae and some pathogens and parasites.

The composting process requires some moisture (ideally 40%). If waste is too dry, decomposition will not take place, and if waste is too wet, insufficient air will permeate through the waste and anaerobic decomposition will prevail. For this reason night soil and other sludge require the addition of a bulking agent (e.g. woodchips, sawdust or straw) to allow access for air and to reduce water content.

3.1.2 Windrow composting

The simplest method of aerobic composting involves arranging waste in elongated heaps up to 2m high, called windrows. These are periodically turned (every other day initially) to ensure it is well aerated and that all the waste spends some time in the middle at the higher temperatures. The windrows must be sufficient in size to insulate themselves. This process can be performed on a small scale manually or mechanised on a larger scale. Moisture levels must be monitored and controlled in all situations.

3.1.3 Other options

Aerated static pile

In some composting plants, air is blown (or drawn) through the composting material using blowers or vacuum pumps. Forced aeration systems often have higher capital costs, and lower operation costs than windrow systems.

Dano cylinder

In this large digester, composting material is rotated in large cylinders for aeration.

Tower digester

In a tower digester, waste is aerated and turned as it progressively falls down one floor of many each day from the top of a tower.

Enclosed reactor systems

These systems allow close control over temperature, moisture, aeration and mixture rates. They require high investment capital but can be useful for complex waste mixtures and where space is limited.

3.1.4 Vermicompostion

Vermicomposting is the production of compost using worms and microorganisms. Worms pass organic material through their gut and excrete digested matter in 'castings' that are rich in plant nutrients. Certain worms are particularly suited to digesting different wastes. *Eisenia foetida* or *lumbricus rubella* worms are generally used for digesting organic waste as these thrive in pure organic material.

Vermicomposting plants can be any size handling just a few kg per day up to many tones. Large plants can contain may millions of worms. It is important to recognize that vermicompost plants constitute small ecosystems, and as such moisture and temperature levels need to be controlled, and the worms need a steady supply of 'food'.

4. Assessing the quality of compost

A good compost shall meet the following criteria:

- contain no glass fragments or other visible foreign material
- have no objectionable odour
- contain at least 25% organic matter
- be stable-all microbiological processes should be complete
- contain low levels of heavy metal (Cu, Zn, Cd, Hg, and Pb)
- be able to pass through an 18mm mesh (course compost through 40mm mesh)
- have a moisture content below 35%
- have a final C:N ration of 29:1 or less.

Compost that satisfies the above stated criteria is more marketable. It is also equally important that market creation for such compost is likely to be one of the main determinants of the success and sustainability of this method of solid waste management.