A simplified guide on compost making

FANGSOTO FARMER FEDERATION.
Mandinaba Village, Kombo East District,
West Coast Region, The Gambia.
Tel: (220) 7246168 / 6563678
Email: 3158285@gmail.com

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ORGANIC FARMING

A. Introduction

Organic farming has been described as a system that include the use of natural (non-chemical) fertilizer, pesticides, herbicides and growth regulators in agriculture. In organic farming, the farmer relies on cultural practices such as crop rotation, crop residues management, use of animal manures, and inclusion of legumes for nitrogen fixation in soils among practices to enhance agricultural productivity. Organic farming is generally recognized as an ecological production system that enhances biodiversity, protects the environment, builds resilience of agro-systems, enhances food security and increases farm incomes on a sustainable basis. It is based on minimum use of external inputs and relies more on management practices that restore, maintain and enhance ecological harmony.

The primary goal of organic farming is to optimize the health and productivity of the soil, plants, animals and humans.

The guiding principles for organic farming seek to promote the use of materials and practices that enhance the ecological balance of natural systems and that integrate the parts of farming system into an ecological process.

Among the many advantages of organic farming, the following benefits stand out:

- Can earn somewhere between 10 – 30% of the market value compared to conventional produce.
- Organic farming leads to reduce inputs costs.
- Greatly improves soil health.
- Reduces conventional impacts.
- Contributes to better functioning of agro-ecosystems.

Organic farming has many characteristics but the main elements include the following practices:

- Integrating livestock,
- Maintaining on farm tree diversity,
- Using own seed and compost,
- Applying bio-pesticides for pest and disease control and;
- Working out suitable cropping system.

One practical aspect of example of organic farming involves the use of compost for improving soil fertility. This simplified guide on compost making targets small scale farmers, particularly women vegetable growers who utilize considerable amounts of chemical fertilizers, pesticides and herbicides in their farming operations and all of which have significant side effects.

B. Compost preparation

Before the advent of chemical fertilizers and pesticides, farmers of that era relied on the use of organic materials for improving crop growth. Of recent due to the many issues associated with chemical fertilizers, there has been a resurgence of organic farming all over the world.

This simplified guide outlines the steps involved in making a compost using locally available materials.

C. Materials required

Wheelbarrow, garden fork, watering can, spade, plastic sheets, rake, compost material (plant materials, organic waste, crop residues animal litter), soil and water.

D. Site selection

It is best to compost materials in a compost hut to prevent leaching losses of nutrients during heavy rain. However, if that is not available, then composting can be carried out outdoors under a tree, to avoid direct sunlight or at any other place where the topography provides good drainage.

E. Preparation for composting

Materials commonly utilized for composting may be divided into two groups, carbonaceous wastes and nitrogenous waste. The carbonaceous wastes most often used include rice and wheat straw, sawdust, rice hull, sugarcane leaves, peanut stalks, fallen leaves, chopped cornstalks, corncobs, hay etc. Some useful organic materials containing microbes may be added to the composting material to accelerate the decomposition process.

(Saw dust)

(Small ruminant droppings)

(Rice husk)

(Poultry droppings)

Before composting, carbonaceous material such as rice and wheat straw should be sprayed with water (about 30kg of water per 100kg of material) and covered with a polyethylene sheet for 1 or 2 days. The straw is then cut into lengths of about 2- 4 cm for making into compost. Corn and sorghum stalks should be cut into smaller pieces. Generally, the compost will be ready for use in about 3 months if this method is used. If the compost is needed for use within a shorter period, then the material should be shredded into smaller pieces.

F. Turning up the compost pile

Turning up the compost pile is an important part of the process. After 2 – 3 weeks of piling the compost, a large proportion of the material would have rotted, but some of it would still be intact. It is therefore necessary to turn and mix the composting material every 2 – 3 weeks, repeating this 2 – 3 times during the whole period of composting. Additional water is necessary if the composting material becomes too dry.

(Turning up the compost after 2 – 3 weeks)

G. Moisture content

The optimum moisture level of the compost should be between 50 - 60%. If the moisture content of the compost is below 40%, decomposition will be slow. If on the other hand the moisture content is above 60%, then total decomposition of the material will not be achieved.

(Adding water to the composition)

H. Changes in temperature

When the compost is well aerated, the temperature during composting usually rises to more than 60° C. If the air supply is insufficient however, the temperature does not rise this high. A rise in temperature is therefore a useful index for assessing whether composting is proceeding well. The rise in temperature is necessary not only to accelerate the decomposition of organic constituents, but also to inactivate noxious organisms. Pathogens, parasites, fly larvae and weed seeds are all generally killed during composting at temperatures of 60° C and above.

(Covering up the compost to generate heat)

I. Aeration and Oxygen supply

A good supply of oxygen is essential in composting because the process is an aerobic one. Oxygen can be incorporated into the compost by turning it, and or by forced aeration in order to maintain aerobic conditions. The oxygen requirement of compost material varies according to the kind of waste material, the organic matter content, the moisture content, the temperature and the microbiological population. In addition, particles in the compost materials should be of a size suitable for aeration. Aeration efficiency is usually improved by improving the moisture content, and by the addition of bulky materials such as bark, sawdust, rice hull, rice straw etc.

J. Carbon – Nitrogen ration

The Carbon- Nitrogen ratio (C/N) of the waste material is an important factor in composting. During the composting process, microorganisms require carbon as an energy source and nitrogen to maintain and build body cells. A suitable C/N ratio should between 20:1 and 30:1. A higher C/N ratio slows down the composting process, because there will be insufficient microorganisms due to lack of nitrogen sources. A low C/N ratio, on the other hand, results in nitrogen loss as ammonia volatilizes from the composting material. As composting proceeds, the C/N ratio of the waste material decreases gradually to around 15:1.

K. Microorganisms as additives

Many aerobic mesospheric bacteria are initially present in the compost and proceed to multiply, but after the temperature has risen due to their increased activity, they decompose the protein and non cellulose carbohydrate component in compost. These bacteria may also attack the lipid and hemicelluloses fractions, but cellulose and lignin appear to be able to resist their attack. Imported microbes such as Bacillus TF may be added to a mixture of swine manure and rice straw to increase the rate of composting. The effects of inoculated bacteria and Actinomycetes could also could contribute to the decomposition process of compost.

L. Humus and finished compost

Polymeric reactions which produce humic acid and humus occur after the compost has cooled down to the ambient temperature. Compost should be "ripened "before it is applied to the soil, otherwise decomposition will continue at the expense of soil Nitrogen which crops will be deprived of.

M. Estimation of maturity

A compost should be fully matured before it is utilized in farming. Otherwise the application of immature compost to soil may cause severe damage to the plant growth. Therefore, a method of estimating the degree of maturity of compost is essential.

(Matured compost)

N. Decomposition of organic matter

The organic matter is decomposed and becomes stabilized during composting. As organic matter decomposes, there is a relative increase in the ash content. The content of total carbon decreases while total nitrogen increases so that the CN ratio falls. Marked changes in chemical composition level off after about five weeks, and thereafter constituents change only gradually.

O. Germination test

Immature compost and aerobically piled compost may contain phototoxic substances such as phenol acids volatile fatty acids. The existence of such phototoxic substances can be detected by a germination test. Twenty to 50 seeds are placed on a filter paper 10ml of water extract from compost is added, and the seeds are then incubated at 25^{o}C under dark conditions. The germination rate is measured after one week. The germination rate is low when samples of raw material or those from anaerobic portions of the pile are used, and increase as the material matures.

P. Estimating the maturity of the compost

The maturity of compost may be estimated simply according to the way it looks and feels.

Q. Immature compost

In an immature compost, the original color and shape of the composting material, such as rice straw and sugarcane leaves, are easily identifiable. At this stage, the material must be allowed to undergo further decomposition by covering it up and watering and turning it periodically.

(Immature compost)

R. Partially matured compost

At this stage, the composting material would turn to a brownish colour, but would still retain its original shape. The material cannot be easily crushed between the fingers at this stage because some solid particles are still present.

S. Mature compost

In a mature compost, most of the material will become moist, soft in texture and develop a deep brown colour and is readily crushed between the fingers.

T. Useful properties of compost

Composting is an effective method for promoting the utilization of organic wastes. However no organic material can provide the full range of benefits by themselves. In addition to providing essential plant nutrients, some carbonaceous organic materials, such as rice straw, corn stalks, rice hull, sawdust etc. are very useful in improving the physical and biological properties of the soil.

Composting offers many opportunities to poor farmers who lack resources to buy fertilizers and other farm inputs. Compost provide a readily heap source of plant nutrients. It also address the many risks associated with chemical fertilizers which are not only expensive but harmful to the environment and human health.