COMPOSTING

What is Compost?

Compost is the aerobic decomposition by bacteria and fungi of a mix of organic material.

Composting Methods

There are three methods of composting, namely thermal, vermi and static. All three of these methods are suitable for the small-scale farmer. There are pros and cons for all:

- **Thermal Compost**: This is the most reliable to guarantee a product that is weed and pathogen free. It is also very fast (7 to 8 weeks).
- **Worm or Vermicompost** (Cold Composting): This provides an excellent product as is contains worm casts which are higher in plant available nutrients, but it requires large numbers of worms and does not eliminate weed seeds.
- **Static Compost**: This is the easiest but most unreliable method due to the uncontrolled environment leaving risk of pathogens and surviving weed seeds. It is also very slow and can take up to a year.

Thus thermal compost is the most suitable method, but it requires diligence and training to achieve the required results.

The minimum size of a thermal compost heap is about 1.5m cubed. Thus we have developed a 2x2x2m pile, which will ensure the required volume for the required temperatures that must be attained.

It is also small enough for a single person to work in a few hours. In a small-scale or garden situation it is also not too difficult to accumulate or gather enough raw material to build a heap of this size. This volume of compost, if made correctly and the right quality attained, should easily be able to sustain a hectare of maize.

Required Ingredients

- High Nitrogen – legumes, manures
- Green – anything cut green, even if it has dried. Diversity is good.
- Woody/Dry – At least 5% should be greater than 3cm in size.

Ratios

For a **bacterial dominant** compost (preferred by most annuals such as vegetables):

25% High Nitrogen
45% Green
30% Woody/Dry

For a **fungal dominant** compost (preferred by most perennials and maize):

25% High Nitrogen
30% Green
45% Woody/Dry

Method

1. Building the Pile

It may take an extended period for enough material to be gathered to build a pile of the desired size. This is not a problem. The materials should be piled separately until such a time as enough of each material has been accumulated.

When the pile is to be constructed it is important that the right ratios are attained. The most simple way to achieve this is to divide the height of the pile into 10 x 20cm layers. Then alternate the materials in the desired proportions. 30% equates to three separate layers. An example follows:

WOODY 10cm
HIGH N 10cm
WOODY 20cm
GREEN 20cm
WOODY 20cm
HIGH N 20cm
GREEN 20cm
WOODY 20cm
HIGH N 20cm
GREEN 20cm
WOODY 20cm

2. Activating the Pile

Once the pile has been built it needs to be mixed. The best way to do this is to begin slicing away at the heap. Mix the different materials thoroughly and wet them at the same time. Now begin to rebuild the 2x2x2 pile next to the original (layered) pile. The objective of this initial turning process is to thoroughly mix the entire pile and to wet it to at least 50% moisture.

The Squeeze Test – Pick up a handful of compost and squeeze it in your hand.
It is **too wet** if some moisture drips out.
It is **too dry** if no water drips out, but the material does not hold its shape when you open your hand.
It is close to the desired **50% moisture** content when no extra moisture drips out and the material holds its form when you open your hand.

The composting process has now begun.

3. Temperatures and Turning

The compost will begin to get hot very quickly. Under ideal conditions the temperature can reach 70°C within 48 hours. This is undesirable. If the temperature in the pile reaches 70°C, it becomes too hot for the microbes, which are creating the heat to exist. Carbon also begins to be burnt and this is wasteful. This heat is created by the reproduction of thermophilic bacteria and will only occur if there is

adequate water and oxygen. Heat is however essential to kill all seeds in the compost and all undesirable pathogens.

This is achieved in the temperature range from 55°C to 68°C. The temperature needs to be maintained in this range for at least 3 days. All parts of the pile need to be exposed to this heat. This heat however only exists on the inside of the pile (the outer 40cm is much cooler). This is one of the reasons why turning is important. Each time you turn the pile you should attempt to move material from the outside to the inside, and visa versa.

If the temperature of the pile is too high (approaching 70°C) then the only way to reduce it is to turn the pile. When turning the pile guage whether the moisture content is still adequate. A lot of moisture is lost as steam and this needs to be replaced. The adding of water can also cause cooling.

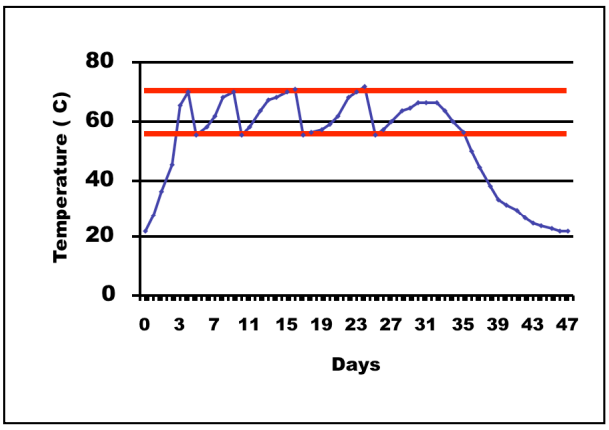
The simplest way to determine what the termperature within the pile is, is by using a temperature probe. For rural folk this would be difficult to obtain or purchase, thus some simple method of ascertaining the approximate temperature by touch needs to be devised.

The turning process has thus achieved three things:

1. Exposed new material to the required heat
2. Aerated the pile with oxygen which is essential for the heat process
3. Allowed for the lost moisture to be replaced

At this point it is important to note that if the pile is not turned it will become anaerobic. This means that it will run out of oxygen. If this happens the desirable bacteria will die off or go dormant and undesirable anaerobic bacteria will become dominant. If this happens the temperature will drop and often a bad smell will be noticed.

Compost Temperature Cycle



The temperature cycle of the compost heap will follow a similar trend to that displayed in the graph. The temperature will continue to rise until the pile is turned, when it temporarily drops. It then slowly begins to rise again. This will continue until all the nitrogen in the pile has been utilized. If your compost does not get hot it generally indicates that there is not enough nitrogen present.

Be careful not to add too much nitrogen. This will prevent the compost from maturing within the 7 to 8 week period as desired. The temperature can continue rising for many more weeks depending on how much nitrogen there is. In this situation it also means that after the 7-8week period, when the compost should have matured, you would have to continue tending it. The temperature would need to be continually checked and the pile turned when the temperature reached close to 70°C. If however the correct ratios are achieved at the start of the process and the compost begins to cool after 5-6 weeks then the conditions are ideal. After the compost has matured it can then be stored in situ for long periods without further turning. The mature compost will also not degrade nor will nutrients leach out of it. It will be in the form of a stable organic fertilizer and inoculum.

Indicators of Good Compost

Smell	If it smells bad, it is bad! This is due to the presence of alcohols, acetic acid, butyric acid, valeric acid and putrescine. All of which are produced in anaerobic conditions.
Colour	Deep, rich brown indicates humics. Tan, honey colours means fulvics. NOT BLACK.
Texture	Crumbs, air passages, aggregates visible
Fungal Strands	Visible thick threads in compost, not aerial, not fuzz