

## **Composting for Small-scale Farmers – by Darryl & Hazel Edwards**

Compost is an exceptional alternative to fertiliser which builds up not only the organic nutrient levels in the soil but helps to restore the natural biotic balances which occur in the soil profile.

2Corinthians 9:8 And God is able to make all grace abound to you, that always having all sufficiency in everything, you may an abundance for every good deed.

God's Word is true, He has made a way even for the poorest of the poor to make the best quality soil supplement by making & utilising compost as a superior substitute for fertiliser. This makes possible the fulfilment of the Principle of "sowing bountifully & with joy" for the poor who can't afford fertiliser. By putting back into the soil good quality compost they can reap the same if not better yields in the long term as compared to fertiliser usage with the application of knowledge & faithfulness.

### **What is compost?**

It is the **Aerobic decomposition** by BACTERIA and FUNGI of a mix of organic material.

### **Composting Methods.**

- 1) Thermal compost
- 2) Worm or Vermi-compost (cold composting)
- 3) Static compost

All three of these methods are suitable for the small-scale farmer. There are pros and cons for all:

Thermal composting is the most reliable to guarantee a product that is weed and pathogen free, it also is very fast (7 to 8 weeks).

Worm composting provides excellent product (worm casts, which are higher in plant available nutrients), but requires large numbers of worms and does not eliminate weed seeds.

Static compost is the easiest but most unreliable due to the uncontrolled environment leaving risk of pathogens, seed and it is very slow. (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 1.5 m cubed. Thus I 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.

### **Ingredients Required.**

- 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 includes cobs & maize stalks).

### **Ratios.**

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

- 25% High N
- 45% Green
- 30% Woody/Dry.

For a fungal dominated compost (preferred by most perennials and maize)

- 25% High N
- 30% Green

45% Woody/Dry.

## **Method**

### a. 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 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 3 separate layers). An example follows:

Woody (10 cm)  
High N (10 cm)  
Woody (20cm)  
Green (20cm)  
Woody (20 cm)  
High N (20 cm)  
Green (20 cm)  
Woody (20 cm)  
High N (20 cm)  
Green (20 cm)  
Woody (20 cm)

### b. 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. If some of the mixed, wet material is squeezed in the hand and moisture drips out, it is too wet. If when squeezed and no water drips out, but on opening your hand the material does not hold its shape then it is too dry. Thus if squeezed, no extra moisture drips out and on opening the hand the material holds its form then it is close to the desired 50% moisture content.

The composting process has now begun.

### c. 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 verse.

If the temperature of the pile is too high (ie. Approaching 70°C) then the only way to reduce it is to turn the pile. When turning the pile gauge 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 temperature 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.

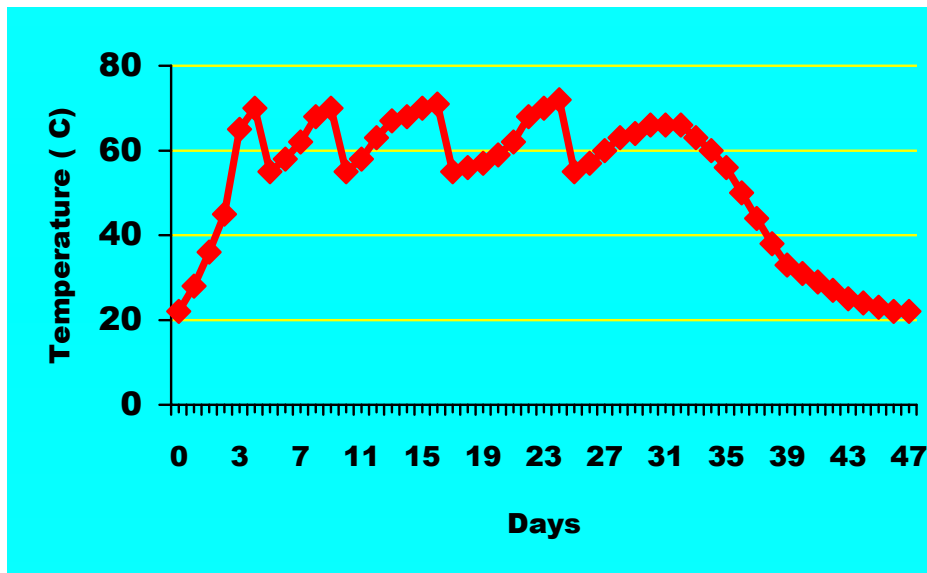
The turning process has thus achieved three things:

1. Exposed new material to the required heat,
2. Aerated the pile with oxygen, essential for the heat process and
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 below. 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 7-8 week 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.
- Color** NOT BLACK  
Deep, rich brown indicates humics  
Tan, honey color means fulvics
- Texture** Crumbs, air passages, aggregates visible
- Fungal Strands** Visible thick threads, in compost, not aerial, not fuzz

### Utilising the compost

The compost can be used by placing 90-100ml per planting station. This allows for holes to be dug at around 8cm as compared to the 15cm depth when using manure due to the fact that the seed can be placed on the compost without the necessity of a layer of soil separating seed from fertilizer & manure

as is usually the case. Both points taken into account the time saving in digging shallower planting stations & not having to cover the inputs are considerable over an expansive area.

