



## Composting (Humus) the Aerobic way

Typically, constant mechanical, fertiliser, chemical activity in agriculture are eroding **(Depleting)** the diversity and density of beneficial soil life in your agricultural soils, which is degenerating and hardening soil structures as well.

A healthy natural soil can have literally millions of Bacteria in 1 teaspoon of soil, this representing more than 15,000 species.

In a healthy, balanced and cropped land, **aerobic conditions dominate**

The greater the microbial diversity and balance, the healthier the soil/plant relationship with increased soil organic matter and cation exchange capacity.

- Cation-exchange capacity (CEC) is a measure of how many cations can be retained on soil particle surfaces. ... CEC affects many aspects of soil chemistry, and is used as a measure of soil fertility, as it indicates the capacity of the soil to retain several nutrients (e.g.  $K^+$ ,  $NH_4^+$ ,  $Ca^{2+}$ ) **in plant-available form.**

In **depleted soils**, surviving microbes are generally detrimental to plant health and more often assist in the proliferation of disease. These soils tend to compact easily, locking up various nutrients. Earthworm activity is low if at all. Plants often show symptoms of stress and/or deficiency.

**There are two methods of making aerobic compost:**

1. The old fashion “static pile” method – ideal for small scale compost production, taking 3 to 6 months requiring the normal temperature and fresh air management, expelling of  $CO_2$  and high temperatures by turning, water application etc.
2. The compost turner method that reduces maturation time to 7 - 12 weeks and makes commercial compost production possible.



Turner thoroughly turns and mixes row at a speed which is most friendly to resident microbes, expels high temperatures, expels  $CO_2$ , breaks up anaerobic clusters, mixes moisture, replaces expelled gasses with fresh air (Oxygen) and fluffs compost to allow easier flow of fresh air through row.

**There is “good compost” and there is “bad compost”. Good compost is made aerobically.**

Simply stated:-

*The first way to think of composting and the microbial and fungal life within composting are aerobic and anaerobic.*

**Aerobic (Air)** need oxygen (fresh air). Built up CO<sub>2</sub> levels to be expelled and in this process reducing compost row temperatures as well as the ability to mix in water from affixed drag line when needed.

- Aerobic Microbes and Fungi are our friends!
- Aerobic compost (oxygen rich) does not smell foul or attract flies.

In general, row composting is a well-managed process involving microorganisms and fungi

Its' all about keeping the temperature, water, pH, oxygen, energy source (carbon) and protein source (nitrogen) in a good balance

Another benefit of a healthy bacteria population in your pile is that they produce enzymes to aid in their digestion of complex carbohydrates. Some of the materials most resistant to rot, cellulose and lignin are attacked by enzymes.

**Anaerobic (No Air)** microbes will decompose your organic matter without oxygen, without turning and allow high temperatures. These are the "bad neighbours" of decomposition.

Anaerobic compost harbours microbes that dominate under low oxygen conditions. Sulphur (rotten Egg, alcohol smells etc.) and such foul smells are produced.

A **"good compost"** requires:

1. Aeration - aerobic microbes require Oxygen to function, producing CO<sub>2</sub> as buy product, microbial activity slows down as the oxygen is depleted. The more active the microbes the more the temperature of the compost pile increases.

- a. This contributes favourably towards controlling plant pathogens and weed seed viability.

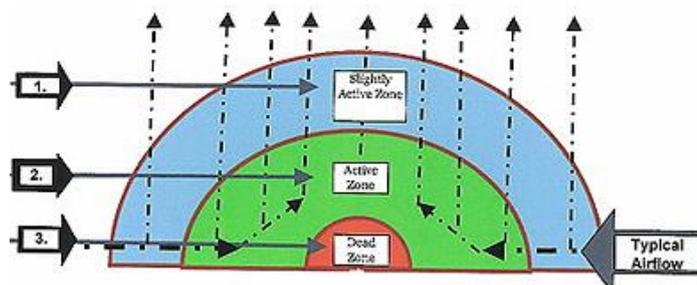
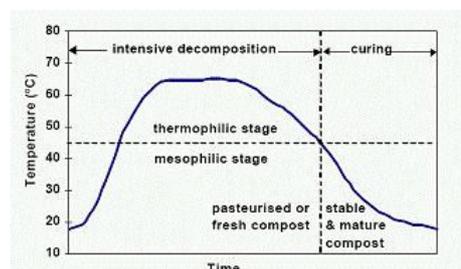
2. Moisture (Too little moisture - microbes struggle to function - too much moisture results in anaerobic conditions. As a rule, a handful of compost should hold its form when squeezed and released, but no water should drip through fingers on squeezing.

3. Temperature control – managed by turning (releasing CO<sub>2</sub> and adding moisture)

4. Microbial diversity – don't forget clay component in your mix—full of resident microbes around your farm.

5. Correct Nitrogen: Carbon ratio - Google www... Dependent on the material you are wanting to compost!

6. Correct pile dynamics – to assist in aeration, compaction, even moisture distribution, surface drying etc. see diagram.



7. When handling a “good compost” a fine coffee coloured residue can be noticed on one’s hands (not dirty, muddy or dry and sandy)– this residue is generally associated with the humate component.
- The intention of a good compost is to increase the humus content of the soil.

**Humus is :**

A dark-brown or black organic substance made up of decayed plant, tree or animal matter full of microbial and fungal life. *Humus* provides nutrients for plants and increases the ability of soil to retain water.



**Benefits of compost (Humus) on your farm:**

- ✓ *Moisture holding capacity increases (1% organic matter in soil increases water holding capacity by up to 170,000 litres per Ha) (80 to 90% of its composted weight)*
- ✓ *Leaching of nutrients is minimized and fertility storage maximized -- in this stored form easily available for plant uptake!*
- ✓ *While these nutrient cations are accessible to plants, they are held in the soil safe from being leached by rain or irrigation.*
- ✓ *Disease suppressing microbes (Actinomycetes etc) abound in manure (Aerobic verses Anaerobic processes)*
- ✓ *Aeration improves, nutrient storage capacity increases, Soil compaction decreases as soil structure improves.*
- ✓ *Plant diseases decrease--- many diseases are associated with anaerobic conditions*
- ✓ *Humus is a colloidal substance, and increases the soil's attraction exchange capacity, hence its ability to store nutrients by binding.*
- ✓ *The biochemical structure of humus enables it to moderate – or buffer – excessive acid or alkaline soil conditions.*
- ✓ *Soil ph. becomes more neutral--- Good compost has ph. of +/- 7*

Even in Saudi Arabia we have clients composting (Camel and goat waste, maize and vine waste)



The need to bring that natural microbial and fungal life back into your soils the way nature has done it for all the years before we interfered with manmade applications which has killed off a lot of this life and made us dependent on these applications to hopefully keep up our production figures.

Let's pay more attention the Microbiology under the soil. —Let's have healthy soils and in turn healthy productive crops.

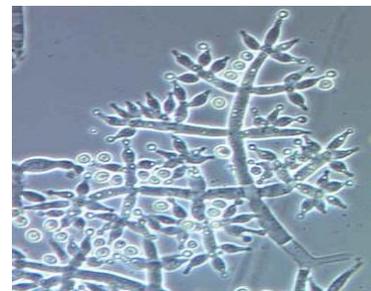
### **One example, and there are literally millions!**

#### One Benefit of Fungi

- The fungi that provide benefits, are the called mycorrhizal.
- A mycorrhiza is a symbiotic association between a fungus and the roots of a vascular host plant. The term mycorrhiza refers to the role of the fungi in the plants' rhizosphere, its root system. Mycorrhizae play important roles in soil biology and soil chemistry.
- Mycorrhizal fungi can absorb and transfer all the 15-major macro and micro nutrients necessary for plant growth.
- Mycorrhizal fungi release powerful chemicals into the soil that dissolve hard to capture nutrients such as phosphorous, iron and other "tightly bound" soil nutrients.

While composting occurs, there are a multitude of different microbes and fungi populating and propagating in your mix while also doing your required decomposition. In this mix there are massively beneficial species which are still active when transferred in the compost to your plantations, pastures crops etc

- *Bacillus amyloliquefaciens* GA1 as a source of potent antibiotics and other secondary metabolites for biocontrol of plant pathogens.
- ***Trichoderma*** is a soil dwelling genus of fungi it forms a physical bond with the root system of the plants, establishing itself in the rhizosphere (root zone) and thereby preventing other pathogens from colonizing the soil. This bond and continual growth of the ***Trichoderma harzianum*** throughout the root system forms a physical barrier to plant pathogens like for example phytophthora



During the humification process, microbes secrete sticky gum-like mucilage; these contribute to the crumb structure (tilth) of the soil by holding particles together, and allowing greater aeration of the soil.

I cannot stress enough the importance of composting the aerobic way and getting nature back into your soils!

#### Spreading of Compost in fields or orchards.

- Please—Just before rain or planned irrigation. —Not to lie for days in the sun!!!
- Field spreading can be done simply with lime spreader
- Orchard or vine spreading by bucket or directional calibratable dropper without any wastage—

- All clumpy material has been broken up by microbial and fungal action, as well as with the compost turner in the composting process.
- We know there are a vast range of microbial mixes on the market, but when the suppliers cannot tell you the species of microbes or fungi in the mix then we get worried. Some sterilise—No thanks!

Here is new row being prepared for composting—

- Note the white fungi already present.
- With managed turning this row will be ready in 8 to 12 weeks.
- If you are requiring specific microbes or fungi please send me a e-mail describing your mix, how you are turning and managing your row
  - I will source the product for you.
  - [marc@ritlee.co.za](mailto:marc@ritlee.co.za)



Over the last period Ritlee have sold a good number of our compost turners into the market with applications into vineyard, citrus, nut, tea tree, chicken, cattle, and commercial.

When asked how to get the composting process working in the rows, we always suggest that the row is reinforced (activated) with local resident microbes and fungi which are on or in the area of your farm by adding some 6 to 10% of the row a mix with a mix of clay and reeds from your river and river banks, some soil from a successful and productive area of your farm, and a truckload of either kraal or chicken manure. Which is high in Nitrogen and microbes.

Start your first turn with turner set at its highest position then set down to lower and then turn again. —keep it here for all future turns.

This is where your good management of the composting process of the row comes into play.

Please keep temperatures under control

Using the chart above, allowing a Max of 70 degrees and then immediately turning again.

Humidity wise, as shown in above illustration, 60%. – water is applied with your drag line and deposited above the row in the turning process.

While turning you will notice white clouds coming from the row. This is the stale CO2 and high temperatures being released and replaced with fresh air



**Ritlee TM3  
Tractor Mounted  
Compost Turner**

Depending on your mix, you will find that the row must be turned some 3 to 6 times in the first 2 weeks, some 2 to 4 times during the next 2 weeks and 1 to 3 times the third 2-week cycle. Temperature will dictate when you must turn.

Once you have made your first row successfully and you are happy with this compost, use some 80% where you are planning on your farm, then use the 20% balance to inoculate and start off the new row you have been preparing.

