

Artemis & Angel Co. Ltd.

99/296 President Park, Sukhumvit 24, Klongtoey,
Bangkok 10110, Thailand

Tel.: (President) +66-86-329-6038; (Sales): +66-993377866

E-mail: artemisandangelcoltd@gmail.com **Website:** www.artemisthai.com

**How to Make Rich Compost
With the 100% Organic, Liquid Bio-fertilisers,
Bio-Plant and Pro-Plant.**



Introduction to the Guidelines

These guidelines assume that the farmer has had little experience with making rich compost piles. Please refer to the section(s), which will help you to make rich compost for your crops.

A. The Sections

1.	How to Make a Layered Compost Pile	3
2.	What to Do During the Compost-Making Process	8
3.	Turning the Compost Pile	10
4.	When is the Compost Finished?	11

B. The Contents of Each Section

1. How to Make a Layered Compost Pile

- This section explains how to make a compost pile, namely:
 - Where to make the pile; what materials to use to make compost; and how to layer the different organic materials.

2. What to Do During the Compost-Making Process

- This section explains what you should do while the compost is being made, namely:
 - How to measure the temperature of the pile; what to do if the temperature is too high or too low; and how to correct problems in the compost pile.

3. Turning the Compost Pile

- This section explains how and why you should turn over the materials in the compost pile, namely:
 - How to turn over the materials in the pile; why you should do so; and the benefits of turning over the pile.

4. When is the Compost Finished?

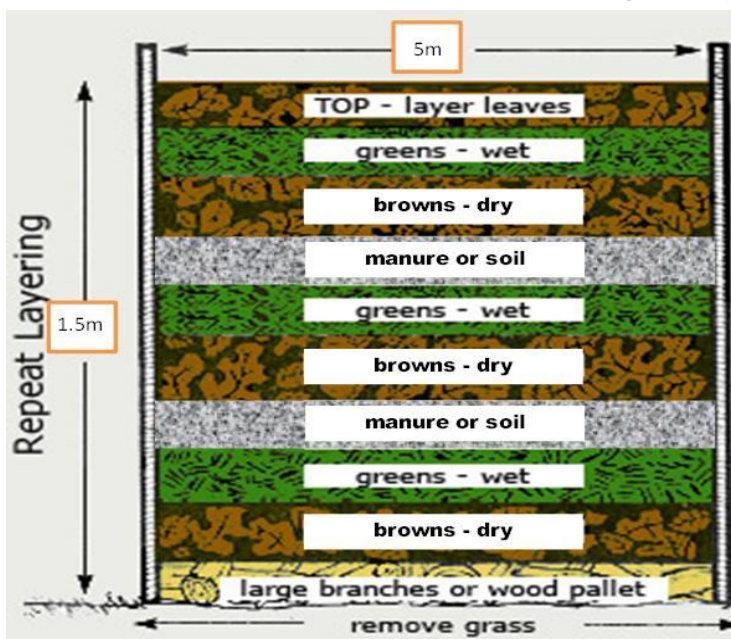
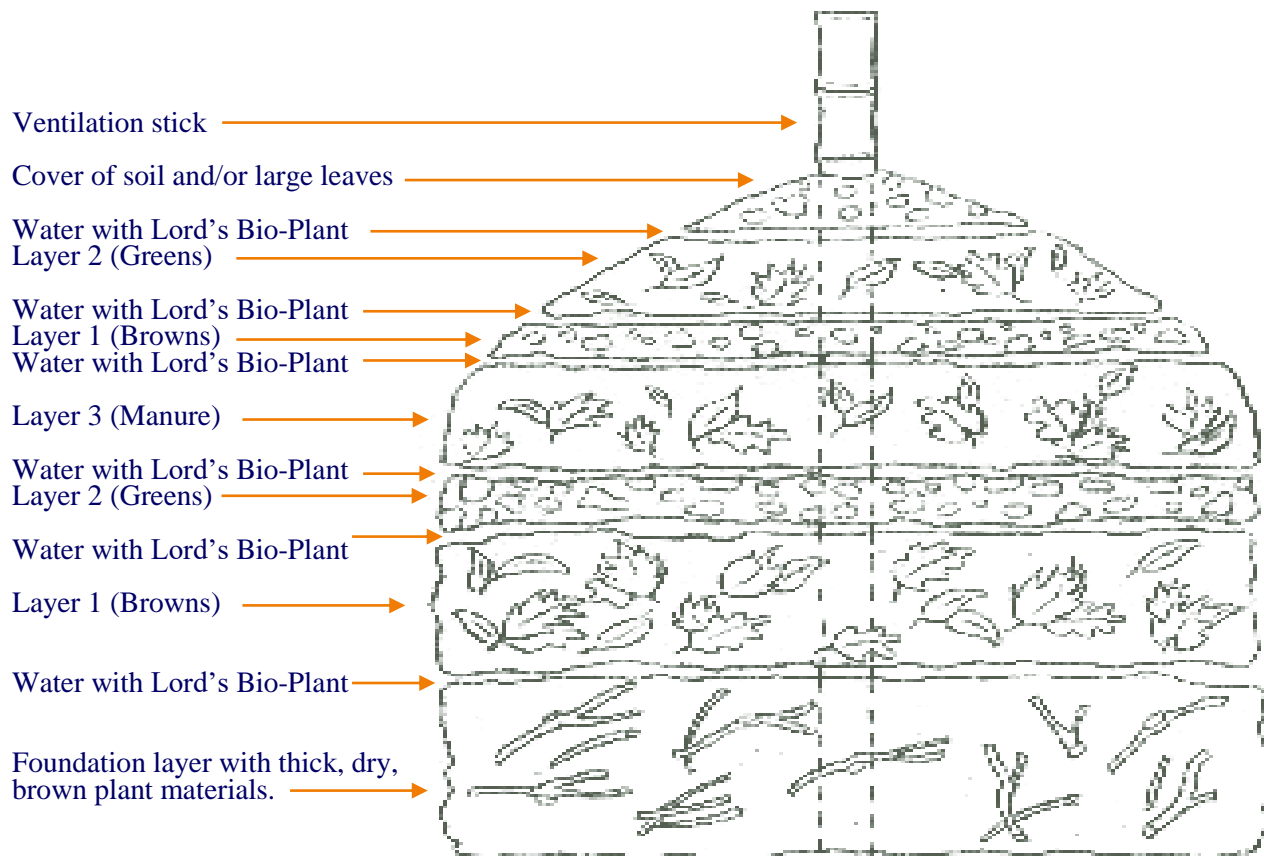
- This section explains how and why you should turn over the materials in the compost pile, namely:
 - Why you should wait for the compost process to finish; how to know when the compost is ready; and what to do with uncomposted organic matter in the pile.

How to Make Rich Compost Using Bio-Plant and Pro-Plant.

1. How to Make a Layered Compost Pile

- Collect the residues left after the crop has been harvested, such as stems and leaves from rice, maize, pumpkins, potatoes, tomatoes, chili peppers, zucchini, cabbage, banana trees, etc., and any damaged crops that cannot be sold or eaten. You will use these materials to make compost.

1.1 Diagram Showing the Layers in a Compost Heap (See p. 5 for details of each layer.)



This diagram shows the different layers and the normal size of a compost pile.

1.2 Select the Site

- The following factors need to be considered:
 1. The site should be accessible for receiving the materials, including water and/or urine, and for frequent watching/monitoring and follow-up.



2. The site should be protected from strong sunlight and wind, e.g. it should be in the shade of a tree, or on the west or north side of a building or wall.
3. The site should be protected from high rainfall and flooding.
4. Make sure there is plenty of compost-making space. You will never have too much compost.

1.3 Prepare the Site

- Clear the site of stones, weeds and grasses. Set up the site in the shade of trees. The trees will grow, provide shade and protect the compost heaps.

1.4 How to Start to Make the Compost Heap

1. Mark out the area for the compost heap. An area to make a minimum amount of compost for a hectare (5 MT) is 1 m x 5 m x 1.5 m. Including the covering layer the height will probably be nearly 1.5 m. If you want to make more than 5 MT, make separate compost piles (*see the photograph on p.2*), or make the length longer than 5 metres, but not taller.
2. Dig a shallow trench in the ground the same dimensions as the compost heap. Make the trench about 25 cms. deep. The bottom and sides of the trench should be smeared with water (which will combine with the earth to create mud) or a mixture of cow dung and water. This seals the pit so that moisture with nutrients do not leak out of the base of the compost heap.
3. Place the foundation layer of compost-making materials in the trench. (*See 1.5.1 below.*)
4. The trench will hold moisture during the dry season.
5. You will add the organic materials in layers to make the heap as shown in diagram on page 2, and described in more detail below.

1.5 The Layers in the Compost Heap

1.5.1 The Foundation Layer



Dig the trench for the foundation layer.	Add twigs, straw, or crop stalks to make the foundation layer.	Sprinkle water + Bio-Plant over each layer in the compost heap.	The finished compost heap.
--	--	---	----------------------------

1. The foundation layer provides ventilation for air to circulate, and for excess water to drain out of the upper layers.
2. Use dry and thick plant materials for the foundation, e.g. twigs, thick straw, and stalks of maize and/or sorghum. *Break these into short lengths (about 10–15 cms. long)* so that they decompose more quickly. The stalks can be crushed and then chopped. If possible, let cattle lie down or sleep on them for one night, or walk on them.
3. Spread the dry materials evenly over the bottom of the trench to make a layer about 25 cms. thick. Then sprinkle water mixed with Lord's Bio-Plant with a watering can at the ratio of 20 cc in 20 litres of water, or scatter water evenly by hand over the dry plant materials so that they are moist, but not soaking wet.

1.5.2 The Three Basic Layers

Layer 1 (Carbon - Brown Material) – Fungal Food

- Place a layer of **brown**, dry plant materials, such as dry leaves, crushed sugarcane waste, cocoa pods, straw, dried grass, dried weeds, stalky crop residues such as rice and maize stems, bran and rice husks, pruned material, and dry hay. Cut up the material into small pieces or grind it up.
- It is important to make compost which is rich in fungi because then the weeds will grow less and less. Fungal foods for the compost pile have a high Carbon to Nitrogen (C:N) ratio, such as 60:1. (*See 1.5.5 below.*) The fungal component will change the nitrate side of the soil to ammonium (NH₄), which weeds cannot use. Weeds love the nitrates of chemical fertilisers. The layer should be 25 cms. thick.

Layer 2 (Nitrogen - Green Material) – Bacteria Food

- Add a layer of moist (but not wet), **green**, plant materials, either fresh or wilted, e.g. weeds, cut green grass, green stems and leaves left over from harvested vegetables, damaged fruits and vegetables, waste fruit from a fruit processing factory; chopped- up leafy branches from woody plants; and chopped-up green banana tree leaves and banana trees.
- The Greens are food for bacteria at the idea Carbon to Nitrogen ratio of 30:1. The layer should be 25 cms. thick. Cut up the material into small pieces or grind it up.

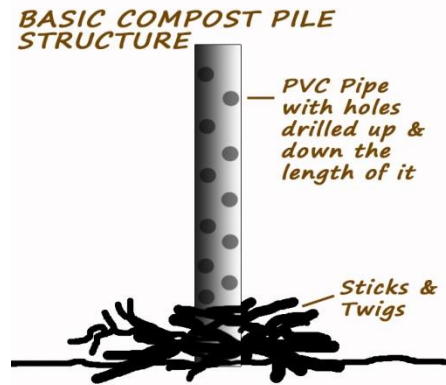
Layer 3 (Manure) – High Nitrogen

- Add a layer of **animal manure** collected from *dried and crushed* cow dung, horse, mule or donkey manure, sheep, goat or chicken droppings. Sprinkle water or urine mixed with Bio-Plant at the ratio of 20 cc in 20 litres of water with a watering can or scatter water evenly by hand over the manure so that it is wet. The animal manure can be mixed with soil, clay, old compost, some wood fire ash, and/or some rock phosphate to make a layer 5–10 cms. thick.
- If there is only a small quantity of animal manure available, it is best to mix it with water or urine to make slurry, and then spread it over the pile as a thin layer 1–2 cms. thick. This serves to make the bacteria and fungi grow rapidly so as to get the heat up and thereby kill the pathogens.

Notes:

- Add layers to the heap in the sequence Layer 1, Layer 2, and Layer 3 until the heap is about 1 to 1.5 metres tall. The layers should be thicker in the middle than at the sides so the heap becomes dome-shaped like in **1.1 above**. If the heap is taller than 1.5 metres, the microbes at the bottom of the heap will not be able to multiply well.
- Water or slurry (animal manure mixed with water or urine) mixed with Bio-Plant at the ratio of 20 cc of Bio-Plant in 20 litres of water should be sprayed or sprinkled with a watering can evenly over each layer, making it moist but not soaking wet.
- Layers 1 and 2 are essential to make good compost. Make sure that the pieces are small or ground up. In Layer 3, if there is a shortage or absence of animal manure, use good soil instead.

- Place vertically one or more thick ventilation poles and testing sticks every 1 metre in the compost heap, remembering to have the stick long enough to stick out of the top of the heap. Ventilation and testing sticks are used to check if the decomposition process is going well, or not. A hollow stick of bamboo or a PVC pipe with holes in it makes a good ventilation stick as it allows Carbon Dioxide to diffuse out of the heap and Oxygen to diffuse into the heap.
- A testing stick is needed as it can be taken out at regular intervals to check to see the progress of decomposition in the heap. If the stick is hot, then the process is going well.



1.5.3 Suggestions When Making the Compost Pile

1. Moisten straw before using it.
2. Use no more than 30% of any one individual material when making the compost pile. The best composts are made with a wide diversity of materials.
3. Add a few shovels of good compost, or add a variety of other composts in Layer 3. This adds micro-organisms to the pile.
4. Add clay or a clay soil to the pile when constructing it. Clay will assist with moisture control during composting; greatly extend the life of your compost; and most importantly, promote the growth of mycorrhizal fungi when the mature compost is added to soil. Up to 10% of the pile can be clay. Add it on top of any layer.
5. If it is available, add crushed basalt dust on the layers in the compost because it has a high paramagnetic property which means the Earth's magnetic field is increased in the soil. This is said to be beneficial to soil life. The paramagnetic effect can have a massive impact upon compost quality and has been shown to increase microbial activity by up to 400%. The compost will be more bioactive as a result, and the paramagnetic effect of the rock dust will be transferred to your soil. Trace minerals in the rock dust are released more rapidly as a result of the enhanced bioactivity.
6. When building the pile, add humic acid to the compost when you turn it. Spray it over a few layers. It will supply around 70 trace minerals and ensure the growth of beneficial microorganisms. To make humic acid take 2 or 3 handfuls of already-made compost, put it on a thin cloth, and run a litre of water through it slowly. The fungi in the compost will grow rapidly.

1.5.4 Things Not to Compost

- **Bread products:** This includes cakes, pasta and most baked goods.
- **Cooking oil:** Smells like food to animal and insect visitors. It can also upset the compost's moisture balance.
- **Diseased plants:** Trash them, instead. You don't want to transfer fungal or bacterial problems to whatever ends up growing in your finished compost.
- **Heavily coated or printed paper:** This is a long list, including magazines, catalogs, printed cards and most printed or metallic wrapping paper. Foils don't break down, and you do not need a bunch of exotic printing chemicals in your compost.
- **Human or animal feces:** Too much of a health risk.
- **Meat products:** This includes bones, blood, fish and animal fats. Another pest magnet.
- **Milk products:** Refrain from composting milk, cheese, yogurt and cream. While they will certainly degrade, they are attractive to pests.
- **Rice:** Cooked rice is unusually fertile breeding ground for the kinds of bacteria that you don't want in your pile. Raw rice attracts varmints.
- **Sawdust:** Unless you know the wood it came from was untreated, stay away from it.

- **Stubborn garden plants:** Dandelions, ivy, and kudzu are examples of plants or weeds which will probably regard your compost heap as a great place to grow, rather than decompose.
- **Used personal products:** Tampons, diapers, and items soiled in human blood or fluids are a health risk.
- **Walnuts:** These contain juglone, a natural aromatic compound toxic to some plants.

1.5.5 The Carbon to Nitrogen Ratio

- To keep it simple, aim for a ratio of 2 to 2.5 parts of Browns to 1 part of Greens in the pile. So, use 2 shovels of Browns, 1 shovel of Greens and ½ shovel of High Nitrogen (manure). Your Browns layers (Layer 1) should be thicker than your Greens layers (Layer 2).
- This is important because the right amount of Carbon and Nitrogen makes the microbes grow fast. Having fast-growing microbes means that the composting process happens quickly and the pile heats up to desirable temperatures. So, for fast compost it is important to feed the microbes the right ratio of Carbon to Nitrogen.
- If you use too much Browns, the pile will decompose slowly and the pile will not heat up enough. If you use too much Greens, the pile will smell unpleasant. You need Greens to make the pile hot. But not too much. If you do not have much Greens, add more chicken or cow manure or urine in Layer 3.

1.5.6 Make the Covering Layer

1. The finished heap needs to be protected from drying out, and also from animals pushing into it and disturbing it. The covering layer can be made of thick straw or wet mud mixed with grass or straw, with or without cow dung; or wide leaves of pumpkin, banana trees, fig trees, etc.; or plastic; or any combination of these materials, i.e. mud plaster covered with leaves or plastic, or leaves covered with plastic.
2. The cover layer should cover both the sides and the top of the heap with only the ventilation sticks and temperature testing sticks coming out of the top.
3. The Covering Layer:
 - a) Prevents rain water from getting into the heap and damaging the compost-making process;
 - b) Helps keep heat inside the compost making heap. (*See 2.2 below for how to check on the heat and moisture in the compost.*)
4. The compost heap is best left untouched until it is time to turn it over. (*See section 3. below on how to turn the compost pile.*) When the compost is turned over, water should be sprinkled over each layer to keep all the materials moist. It is not necessary to try and keep the original, different layers when turning over the compost. It is best, if all the materials can be mixed well together, then added in layers about 25 cms. in height. Sprinkle or splash water over each new layer.
5. A mature compost heap is about half the height of the original heap, and the inside is full of a dark brown or black earthy substance, namely humus, which smells good. When the compost is mature, it should be very difficult to see the original materials. This will take about 7 weeks.
6. This mature compost can be used immediately in the field or plantation after it has cooled down, or it can be covered and stored until the growing season. *When it is put in the field, it should be covered quickly by soil or mulched with leaves so that the sun and wind do not damage it, and the Nitrogen does not escape into the atmosphere.* Therefore, it is best to put compost on a field just before ploughing, or at the same time as sowing the crop. In the case of row-planted crops, it can be put in the furrows with the seeds. In the case of transplanted crops, it can be put in the holes with the seedlings.

2. What to Do During the Compost-Making Process

2.1 Using a Temperature Stick or Rod

- A long stick, length of bamboo, or a metal rod can be inserted vertically in the centre of the heap so it goes through all the layers, and left there for the whole composting period. The stick must be longer than the height of the heap so that it can be pulled out and examined by touching it.
- Alternatively, put a metal rod or stick in the compost pile for 10-15 minutes to test the temperature. Place it on the back of your hand. If you are not using a thermometer, you will have to feel the different temperatures so that you know when the temperature is too high.



Adding compost to planting holes.

1. If the stick feels hot and the smell is good, the temperature is normal for the compost and good decomposition has started. Turn the pile when the temperature starts to feel too hot.
2. If the stick feels cool or cold, the temperature is too low for good composition. This usually means that the materials are too dry, and some water and/or urine should be added. *(See 2.3 on how to correct this.)*
3. If the stick is warm and wet, and there is a bad smell like ammonia, this indicates that there is too little air and too much water in the compost. The materials will be rotting and not making good compost. *(See 2.3 on how to correct this.)*

2.2 Using Your Arm to Assess the Temperature

- If you can hold your arm in the pile up to your elbow for longer than a few seconds, the heap is not 55° Celcius and is not hot enough.
- If you can hold your arm in the pile up to your elbow for just a few seconds, the heap is probably hot enough.
- If, however, you cannot even hold your arm in at all, then the heap is over 65° Celcius and too hot. (An overly hot heap loses excessive amounts of nutrients and micro-organisms.)

2.3 Checking the Temperature

- The first 15 days are important. You have to reach the correct temperature of about 55 Celcius in order to kill all pathogens. Within 72 hours the compost pile should be hot at this temperature. If it is not, you have to add more High Nitrogen material inside.
- If the temperature continues to rise above this temperature and the pile is becoming very hot (65-70 degrees Celcius), then it is time to turn the pile as the organisms are growing so fast that they are using up all the oxygen in the pile.
- When it becomes too hot again, turn it. 2-3 days later it will be too hot again so you will have to turn it again. Do this every 2-3 days in the first days.
- A pile should be aerated by turning it at least 5 times during the 15 days.
- After 15 days the pile will heat up to close to the 55 Celcius level before cooling again. When you notice it is cooling, turn the pile again. This may be every 2-5 days. There is no exact day. Keep doing this until the temperature no longer increases and the compost has a beautiful earthy smell and a fine texture with little or no evidence of the original ingredients.
- If you start to smell bad smells, you should already have turned it. Every day smell the wooden stick you put into the centre of the pile.

- After one month, you should have turned the pile about 7 times, and probably every 3-5 days after the first 15 days. By then you will not be able to tell the Greens from the Browns as the organic matter will have broken down. The temperature testing stick or metal rod will gradually feel warm rather than hot, and as the compost pile cools it will sink more and more.

2.4 Correcting the Problems

- **If the materials are cool and dry:**
 1. Lift up the top layers and put them to the side of the pile.
 2. Sprinkle water or cattle urine diluted with water on the organic material at the bottom.
 3. Then put back the organic material in layers of about 25 cms. each. Sprinkle water or a mixture of water and urine over each layer.
 4. Put the testing stick back in the pile and cover the pile with soil, banana leaves, plastic, etc., as described earlier to help to keep the heat inside the compost pile.
- **If the materials are too wet:**
 1. Try to remove the wet organic material. Leave it to dry and use it in the next compost pile.
 2. Alternatively, collect some more dry plant materials and/or some old, dry compost. Mix the new and wet materials together. If old, dry compost is not available, use dry plant material.
 3. Lift off the top of the heap or take out the wet material and put it to one side. Mix the new dry materials with the wet compost materials. Then rebuild the compost pile.
 4. Make a new test of the moisture after another few days. (*See 2.5 below.*)
- **If the compost heap smells:**
 - Decomposition of organic materials must take place aerobically, i.e. with sufficient oxygen present. If the compost becomes smelly, it is a sure sign that anaerobic decomposition has taken place (i.e. insufficient oxygen is available).
 - "Smelly" probably means lost nutrients and the production of some nasty organic acids by anaerobic microbes. This is not desirable.
 - In severe anaerobic cases when it smells very bad, the compost may have become phytotoxic (kills plants). It is probably best to leave this pile for at least a year or use the failed compost in a later compost pile. (Use it as the "Browns" component in the next pile).

Troubleshooting the Composting Process

SYMPTOM	PROBLEM	SOLUTION
The compost has a bad odor.	Not enough air	Turn the pile, add more PVC pipes.
The compost has a bad odor and is soggy.	Not enough air and too wet	Mix in dry ingredients like straw or shavings, add PVC pipes and cover with a tarp.
The inside of the pile is dry.	Not enough water	Add water when turning the pile. Should be as damp as a wrung-out sponge.
The compost is damp & warm in the middle, but nowhere else.	Pile is too small	Collect more raw material and mix it into the old ingredients. Piles smaller than 3-foot-square have trouble holding heat.
The pile is damp and smells fine, but is not heating up.	Too many shavings, wood chips or bedding (carbon source) and not enough manure (nitrogen source)	Mix in a nitrogen source—straight manure, fresh grass clippings, blood meal, or ammonium sulfate.

2.5 Checking the Moisture Level

- Moisture level is critical and should remain between 45% - 55% during the heat cycle. This is measured by taking a handful of compost from near the centre of the pile and squeezing it hard.
 - If water runs out: the compost is too wet and well in excess of 55% moisture.
 - If one drop comes out: the compost moisture is excellent at around 50-55%.
 - If no drop comes out and the compost stays in a tight lump, the moisture is between 45-50%. Adding water when turning the pile is not essential, but monitor the moisture level.
 - If no water comes out and the squeezed compost breaks apart: the moisture is less than 40%. Add moisture when you turn the pile. (Note: Finished compost will have a moisture content of around 40%).

3. Turning the Compost Pile

3.1 How to Turn the Pile

- Use a fork to build a fresh heap next to the original pile. Take the top off and put it on one side. Take the hot centre and place it on the ground around the edges of the new compost pile. Take the outside of the old pile and put it in the new centre. Place the old top of the pile in the new centre as well.
- Every time you turn the compost, make sure you bring the pile's exterior material into the interior. This enables all material to be broken down evenly. Water can be added to maintain the correct moisture levels, but be careful as the pile will cool if it is too moist.

3.2 Why You Should Turn the Pile

- Turning allows you to re-introduce oxygen that is being used rapidly by the aerobic microbes. It is also likely that additional moisture will be required at each turn of the pile. This is because air is travelling into and out of the pile and taking moisture out. This sometimes looks like steam coming from the pile.
- Air is important to the decomposition process. The mix of Carbon (BROWN) and Nitrogen (GREEN) organic material in your pile is like a fire because air is necessary to keep it going. Aerating your compost pile gets the bacteria all fired-up again.
- Aerating remixes the organic ingredients, exposing new surfaces for bacteria to work on. This aerobic form of composting heats up the pile once again.
- Turning creates new passageways for air and moisture before the pile compresses. As organic material decomposes, your pile will compress and shrink in size. This will naturally cool down the pile sooner than the material is fully decomposed. Turning the pile exposes more material to heat. It fluffs it all up, thereby allowing the mix of air, moisture, and heat to continue the decomposition process.

3.3 Turning Speeds up the Composting Process

- A cold pile breaks down very slowly, like a fire going out. Each time you turn your pile you create more surface area for the bacteria to work on; and the result is that the pile will reheat itself repeatedly after each turning.

3.4 Turning Eliminates Odours and Matting of Material

- A pile that stinks probably has too much Nitrogen (GREEN) materials and/or it is too moist. It is also probably compressed because of the weight of so much moisture in the green materials. Adding more Carbon (BROWN) materials to balance out the Greens is important. Turning the pile is critical to fluff up the organic material. Also, turning odourous or matted compost heaps exposes more surface area so that air and heat can move again through the pile.

4. When is the Compost Finished?

- Compost is ready when it looks, feels, and smells like rich, dark earth rather than rotting vegetables. In other words, it should be dark brown, crumbly and smell like earth. The compost might not heat up when it is turned, but this does not mean that it is ready to be used. Compost is not finished until it has been cured. Curing takes 1-2 months once the pile is cool.

4.1 The Importance of Curing Compost

- When the pile no longer heats up, mesophyllic micro-organisms move in to finish the compost. The extra time for curing allows the microbes that operate at lower-temperature to put their finishing touches on the pile. It also allows earthworms and other larger organisms which do not tolerate high heat, to move back into the compost. They improve the compost itself, and they improve the soil where the compost is added.
- Turn the pile one last time. Keep the pile damp by spraying water on it. These micro-organisms need moisture. Cover the pile so that the rain does not soak it.
- Curing assures that the compost will be of a much higher quality. For example:
 - The pH will become neutral.
 - Uncured compost may contain substances damaging to plants, including acids and pathogens. Soil micro-organisms will colonise the compost and impart disease-suppressing qualities to it.
 - If there is too much Carbon in the compost because you got the ratio of Carbon to Nitrogen wrong, this will cause a temporary Nitrogen deficiency in the soil. (*See 4.2 below.*) Why? Because the micro-organisms will take Nitrogen from the soil to break down the rest of the Carbon.
 - The micro-organisms will restore the balance of Carbon and Nitrogen to the compost during the curing process. Having said this, if there was too much Carbon in the pile, you would know because it would not become very hot and it would take a long time for the compost to develop. So you would have had to add green material.
 - Curing makes the compost optimum for plant growth.
- For all of these reasons, it is important that compost is thoroughly mature before it is used.

4.2 Rectifying a Nitrogen Deficiency

- The visual symptoms of Nitrogen deficiency include poor plant growth, and leaves that are pale green or yellow because they are unable to make sufficient chlorophyll. You can rectify this by adding cured compost around the plants or by soaking chicken dung in water mixed with Bio-Plant (20 cc in 20 litres of water) and applying this around the plants.

4.3 How to Know When the Compost is Ready

- If you have a hot pile that has been turned regularly, knowing when it is done is easy: it will not heat up any more, even after being turned.
- It will be reading after curing for 1-2 months.
- Check for a fine particle, dark-coloured, humus-like appearance and an earthy smell.
- In completely finished compost made from shredded materials, none of the original ingredients will be recognizable. If you did not shred the organic material ingredients, however, the decomposition will take a long time.
- The important test for whether cool compost is done is the look, feel, and smell of it. Mature compost does not contain slimy things, for instance. The ingredients should be unrecognizable, except for the occasional woody stem or autumn leaf. If many ingredients can still be picked out and named, the compost needs more time to cure.

4.4. Screen the Compost Before Using or Bagging It

- There are several ways to deal with *over-size* woody pieces in the compost, which will not fit through about a half-inch wire mesh.
- You can use the compost as it is with the over-sized pieces in it, pick the biggest pieces out by hand, or screen the entire batch, returning the bigger bits to the active compost pile for another round. If you do remove the oversized bits and return them to the pile, they will take with them the composting micro-organisms that adhere to them, and this will give a boost to the fresh compost.
- The first option is to ignore them. Just use the compost as it is, even with the occasional recognizable peanut or egg shell. These things will decay in your soil, though it is true that the process requires a certain amount of Nitrogen to decompose them. It is therefore not a good idea to add compost with a high proportion of uncomposted material to Nitrogen-poor soil.
- Alternatively, you can pick out the biggest pieces, e.g. the corn cobs and avocado seeds, from the finished compost and toss them back into the active pile for more decomposition. This can be done easily with things as large as corn cobs, but if you find yourself picking through the compost to find individual peanut shells, it is time to set up a screen.
- Screening compost takes time and a certain amount of energy, but it results in a gorgeous, light and uniform soil.



Compost Sifter
finished construction

2x2s provide added
frame support

make sure your finished
width is not larger than the
width of the screen

