MAKING COMPOST

"All plant materials can be made into compost" but.....
different materials need different procedures to achieve worthwhile, soil- enriching and soil-improving compost. Bear with me while I mention the major ones. Note please that composting and worm farms are related but are not treated the same way although often talked about in the same breath as though they were the same thing.

Composting is achieved by two totally separate groups of Microbes. One group of microbes works without air in the pile (the anaerobic process); the other group needs air (oxygen) available all the time (aerobic process). The anaerobic group are what turns the scraps of whatever into sweet-smelling compost after six months or more, by them just sitting there in a pile. The aerobic group requires care and regular physical work to be done, but this sweet-smelling compost may be ready in a couple of weeks or so; take your pick.

The materials used are the same for each system. A mixture of ingredients with approximately correct proportions and moisture level is needed to ensure the microbes are 'happy' and working well. Details and examples of the calculations are at the end of these notes and would cover many 'mixtures'. For those who disliked sums at school may need a little help to start with. If so, come and ask.

The ratio of Carbon to Nitrogen is important. It needs to be between 25 and 30 to 1, **by weight**. Thus 30 times say as much carbon must be in the mix as nitrogen. If the ratio is too low ie too much nitrogen, the pile will smell of ammonia; if too high, the conversion to compost will be greatly slowed.

The materials, which can be anything really from wood to soft fruit, transforms most quickly if in fine-ish particles and mixed together. The wood should thus be sawdust or at least chips less than 3mm maximum thickness. Unfortunately the soft fruit may be attractive to various vermin, so will need protection from them. Other materials are less of a problem. I have heard of one composter who puts his materials through an old blender so that the mush is well mixed – for me that is fine for a worm farm but overkill for a heap. Also it is possible to compost meat products but the vermin problem is far worse I understand, also fly attracting and stinks. I have never used meat scraps.

Weeds can be composted provided they are not in seed or not able to grow from the nodes of little bits, ie not Wandering Jew, geranium, couch, Impatiens etc. If the pile reaches the required temperature of over 60 deg C. those weeds could be composted safely too, but too often domestically it does not get hot enough, so avoid them. One way to treat the seedy and noded weeds is to 'solarise' them ie put them in a plastic bag (preferably black), tie the neck, and lay it in full sun for a few weeks. The heat inside the bag will be enough to kill the seeds and the bits so that they can be added to the compost pile as an ingredient.

Aerobic composting requires that the microbes have air available to them all the time. The simple way of achieving this is to get a compost drum on a frame. The drum is rotated regularly (twice per week?) so that the ingredients are mixed and fully aerated. Commercial composters, like our Council's contractors, use front end loaders to turn the material over once it is hot and repeating the aeration every 3 or 4 days. The aerobic microbes heat the material up over a few days to the extent that the seeds etc are killed (we hope) and turn the mixture into beautiful compost in a couple of weeks. To achieve the same mixing and aerating without a compost drum, a system of bins or baths or similar is needed so that every four or five days the pile can be forked from one bin to the next and re-mixed ie. re-aired, by that process (see below).

Anaerobic composting relies on time to achieve the breakdown of the materials put into the pile. In simplest terms a bin of say 1 metre cube is ideal; much smaller will not heat up enough, larger requires far more material than can usually be collected together at one time. Even then a few low piles or drums of ingredients may need to be collected over a month or two before the pile can be built. The available ingredients are put in the compost pile as

layers. The bottom layer is frequently very coarse materials eg straw, twigs, bracken fern, etc. Layers are then added, bearing in mind the need to have carbon-rich (green and wet usually) and nitrogen-rich (brown and dry usually) materials in roughly the right proportions. Layer thicknesses of 50 to 100mm are fine. Water will probably need to be sprayed over each layer or two so that the pile is moist at the end of building it, but never wet. When all the materials (or room) have been used up, a cover should be added to prevent water-logging by rain and also as a heat blanket; old carpeting is fine, (if it is wool it will rot down nicely too over time). The ideal wetness is 50 to 60% for fast composting - a handful will almost drip when squeezed hard.

Leave the pile for three or four days, then make a small hole down into the centre of the pile and **carefully** check the temperature – it should be too hot for your fingers. This state is due to the aerobic microbes at work. If you feel keen, turn this heap sides to middle and top to bottom into another bin. Repeat in another few days (and again and again and again!) and the process will be aerobic all the way. Most of us are too busy (idle?) to do that regular work and tend to leave the pile to compost itself. A gentle fork-twisting to let air into the mix say once a fortnight will speed up the process considerably as the aerobic microbes will increase rapidly and take over for a short while. At six months, check the condition of the pile. Use it in the garden beds as much as possible, to increase the fertility and to improve the water absorption. If you need to use it when it is almost but not completely rotted down (see below), the process will continue after mixing into the garden bed, but some of the benefit will not be there as the microbes will be fewer. If your supply of compost-able material is small, so that a drum/baths/metre cubes system is not possible, soil improvement can still be achieved and your waste beneficially used by merely burying the scraps in the garden bed in the gaps between plants. With time, the scraps will break down or be digested by worms, adding nutrient, bacteria and fibre to the soil – well worth doing.

Odd notes. We use a four bath system. All baths have been collected outside homes having a bathroom renovation. I'm sure if you contact a Bathroom renovator he will happily give you as many as you want. When I need some I empty the 'oldest' bath and use the compost. Next I fork the next oldest pile into it (aerating and mixing the materials in the process), then the next oldest into that one and repeat again so I now have an empty one to fill with the new material when it is available. If I have that material ready, I leave some of the compost in the youngest bath so that a good supply of microbes is waiting to work.

Worms will appear in the pile and help with the break down but will be overwhelmed by the amount of material to consume and perhaps the heat generated. They seem not to survive when dug into the garden with the compost, although any worm eggs in it may hatch and some worms survive in the ground. Any worm I see when digging out the ready-to-use compost, I put back into the bath nearest to ready. Very old compost which has been kept damp can be a problem. Some toxic compounds form slowly plus many nutrients are lost with watering, so make it and use it.

Composting is faster in the summer of course. Insulation and full sun should speed up winter composting but may be too hot in summer. Under a deciduous tree may be a good location. Moisture must be present at all times; check the condition and water if necessary, making sure it goes into the pile and does not just run off it. Unless fully covered, too much rain will keep the pile cooler and so produce the compost more slowly, if at all.

Give it a go; don't give all your 'green waste' to the Council in your green bin; use it yourself and help your soil, your plants and the planet!

Approximate Make-up of Compost-able Ingredients

Ingredient	**gm/kg Carbon**	**gm/kg Nitrogen**	**%age moisture**
Mown grass/weeds	60	3	85
Raked leaves	240	4	40
Paper (shredded if poss.)	360	2	10
Straw	360	3.8	10

Sawdust/chainsaw chips	340	1	15
Cow manure	200	17	50
Chook poo	300	43	20
Fruit waste	80	2	80
General food waste	80	5	80
Urine	0	9	100

Sample Calculations.

For a C/N ratio of 25: NB. x is the unknown, (back to Algebra!)
Example: - mown grass and raked-up leaves.
1 kg of mown grass needs x kg of leaves to compost properly.
1 kg of mown grass has 60gm of C and 3 gm of N (see chart above)
1 kg of leaves has 240gm of C and 4gm of N, therefore
x kg of leaves must have 240x gm of C and 4x gm of N.
Total C = 60 + 240x, and total N = 3 + 4x.
Now for C / N = 25, then (60 + 240x) / (3 + 4x) = 25
thus 60 + 240x = 75 + 100x
thus 240x – 100x = 75 – 60
thus 140x = 15
thus x = 15/140 = 0.107
Thus with 1 kg of grass we need 107gm of leaves, say 9 to 1, by weight.
Please note that dry leaves are generally bulky and need a greater pile to weigh 1kg, than a 1 kg pile of grass mowings – a simple trial, once, will show the difference.

For C/N ratio of 30, the sum is (60 + 240x) / (3 + 4x) = 30
Thus x = 30/120 = 0.25
Thus 1kg of grass and 250gm of leaves are needed, (4 to 1 by weight).
With such a huge variation of anywhere between 107 and 250gm of leaves to satisfy the 'ideal' C/N ratio, the exact proportions can be seen to be not too critical for this combination. I tend to use '27' for my guides; some sample mixes are noted below.

Paper/chook poo	1 to 0.36	say	3 to 1
Grass/ paper	1 to 0.069	say	14 to 1
Grass/ sawdust	1 to 0.062	say	16 to 1
Straw/ cow manure	1 to 1	(remember ratios are by **Weight**)	

Horse manure is similar in constituents to cow manure and often comes with straw or wood chip mixed with it – you'll have to guess what is needed to modify the ratio.

If we have three ingredients, the sum is more complicated.
Example of how to do the sum.
We have 1 kg of grass and ½ kg of food scraps, how much wood chip is needed?
C is (60 + 80x1/2 + 340 x) and N is (3 + 5x1/2 + 1 x)
(100 + 340x) / (5.5 + x) = 27
thus 100 + 340x = 148.5 + 27 x
thus 340x - 27x = 148.5 - 100
thus 313x = 48.5
thus x = 48.5/313 = 155 gm

So ratios of **grass** to **food scraps** to **wood chip** of about 6 : 3 : 1 would be fine.

SUMMARY

I know it would be very tedious to do the sum every time but the approximate **weight** ratios of something like **eight** of soft, greenish, wettish materials to just **one** of brown, firm, dry materials will give an acceptable mix for our needs, most of the time.

NB. The material taken from the top of worm farms is even richer in microbes and 'goodness' than the compost. So if you run a worm farm too, you will get the benefits of water-retentive soils, rich in humus **and** a wonderful fertiliser. The only problem you will then have is – do I put this new material in the compost heap or do I feed it to the worms? If only life could be that easy!

John Carter December 2006