



## Organic waste to Compost - Cycling Nutrients in the Garden

### **So firstly what are our wastes and what can we compost?**

Yep its Mindmap time again, with "What wastes do I produce?" in the middle. This could be followed by "Waste recycling options" in the middle, and that will help us draw connections between what composting options are more likely to suit our lifestyle. For today realising we are mostly interested in what was once living so it can be recycled back into nutrients but as a Permaculture Designer we should look at why we have all this waste and if we can avoid (refuse/reduce) getting it in the first place.

### **1. Self Audit your lifestyle and your rubbish**

Planning to Refuse, Reduce, Reuse, Recycle, Repurpose all things (not just food waste) in that priority. What do you throw out, most people will always have food waste, paper waste and plastic waste. By auditing your lifestyle and avoiding plastic (plastic free July is coming up if you want to take on that excellent challenge) the carbon and food waste you are left with will decide what is the most useful waste composting system for you.

- Shop at home first. Use up what you have rather than buy more food. Learn to cook food to taste rather than strictly following a recipe. Use the internet, get a recipe for what food you do have in the pantry and the garden, list your ingredients and search recipes.
- Plan weekly meals (including quick and easy ones) so you only buy what you need and are less reliant on packaging intensive takeaways
- Take reusable produce bags and reusable grocery bags when food shopping to reduce plastic consumption. Unpack your food and pop the reusable bags straight back in the car then.
- Buy unprocessed food with minimal or no packaging - Nude your Food ! - <http://www.earthcarers.org.au/library/file/Fact%20Sheets/Factsheet%20-%20Nude%20food.pdf>
- Reuse leftovers rather than throwing them out.

**Organic 'waste' is a part of healthy wholefood diet so while we dont want to waste good food (leftovers, expired used by dates etc) we will always have paper bags and boxes, apple cores, potato peels, outside cabbage leaves and other less desirable fruit and veggie 'packaging' to recycle.**

**Weeds and other garden wastes will also be part of a healthy lifestyle so these can be part of our nutrient cycling also.**

According to Foodwise, Australians discard up to 20% of the food they purchase and up to 40% of the average rubbish bin is food. The average Australian household throws away over \$1,000 worth of food each year. Even before this food gets to us 40% of the food the farm grows will be discarded as it is not perfect enough to reach the supermarket shelves.

Choose what wastes you want, if you can go plastic free nearly everything you buy is recyclable (council bins system) or compostable (at home) so you can be zero waste, it's your choice, feel empowered.

## 2. Add Minerals, and Trace Elements to the Cycle

Composting our waste is essential but we also need to realise that WA's soils are ancient and worn out and thus most things grown in our soils are mineral and trace element deficient. We have no volcanoes or remineraliation happening naturally.

This means that compost made from them (while well worth doing) is also low in minerals and trace elements. To address this you need to add the organic rock dust, rock phosphates, kelp and other remineralising amendments.

They are common found at farm supplies warehouses in bulk as 'farm fertilizers and stock feed supplements' or in smaller more expensive amounts in organic gardening stores as soil amendments. The cheapest place is to purchase them through stockfeed stores like City Livestock on Gnangara Rd, MicroBros, Elders, Green Life Soils. You might also find them closer at Absolutely Organic and other small organic shops and nurseries

A well managed composting system should cycle minerals once they are added. We need to add the minerals in the establishment of a healthy complete system, and need to understand the mineral requirements of the soil and where they are being lost.

Where possible introduce remineralisation to your animal element rather than directly to the soil as this both balances the livestock health and adds biology to the excess nutrients that are then processed with the manure in your normal systems.

## 3. Composting Systems

Different composting systems suit different wastes and lifestyles, so what are the options and which should you choose after your self audit?

Remember you can and should use multiple techniques to recycle your waste, as each one is suited to different wastes, volumes and frequencies. We should aim for diversity in our systems, and be looking to integrate the composting into our lifestyle, animals and garden systems.

### 3.1 Bokashi

The smallest and most compact food waste recycling system is a bokashi bucket or container.

Bokashi composting is an anaerobic waste preserving system (it does not need oxygen) designed to be used in the kitchen. Food waste is layered with Bokashi mix (a pickling bacteria and it's bedding) in a Bokashi bucket. Due to the air-tight bucket and the micro-organisms present in the mix, the waste ferments (not composts).

The Bokashi juice produced is alive with micro-organisms and can be used in the garden and around the home. When the bucket is full, the waste is transferred outside and buried beneath the soil to complete the composting process. Avoid putting this concentrated nutrient in the same place each time.

This technique suits lower waste volumes or should be part of a combined system for larger homes. If you live in an apartment without an outdoor area for keeping a compost bin or worm farm a bokashi bucket may be the answer for you.

## 3.2 Garden Pruning, Chop And Drop, "Lazy Compost" and Mulch

Nature's way of recycling organic matter is to let the leaf and plant matter fall on the ground, pile up and reach a depth and concentration such that it holds moisture and supports bugs and biology which internally break down the organic matter into humus and thus soil.

A quick and simple way of recycling your plant waste/pruning's is via insitu cold composting, basically chop and drop, you grow plants that produce lots of growth (organic matter) and you prune it heavily letting the plant matter drop around the plant on the soil. This is slow and ineffective at making usable compost but simple and quick to get done and in the long run the soil building effects are similar.

Just to recap from our Soil workshop Mulch is great for:

- Retaining moisture at the soil/mulch interface for a longer period of time, preventing 'crusting' of the soil surface and providing a rich environment for worm and microbe activity which, in turn, aids the fertility of the soil and supplies nutrients to the soil for plants to use.
- Regulating soil temperature and protecting the root system from the extremes of summer and winter.
- Increasing the water penetrability of the soil.
- Controlling soil erosion by reducing water run-off.
- Controlling competing and unwanted self-seeding species.

This Soil Cover Mulching, is highly recommended, if you don't have enough of your own to start with get hold of street tree mulch and mulch all of your exposed soil. Hopefully once that has broken down you might be creating enough of your own prunings to not need to get in more outside mulch.

## 3.3 Composting

The organisms that make our compost need food, carbon, nitrogen, air, and water. When provided with a favourable balance, they will produce compost quickly. Other factors affecting the speed of composting include surface area/particle size, volume, and temperature.

Our organic wastes provide food for organisms in the form of carbon and nitrogen. Bacteria use carbon for energy and protein to grow and reproduce. Carbon and nitrogen levels vary with each organic material. **Carbon-rich materials tend to be dry and brown** such as leaves, straw, and wood chips. **Nitrogen materials tend to be wet and green** such as fresh grass clippings and food waste.

Almost all composting methods are considered to be either hot or cold; here is a brief look at the main differences.

### Hot composting

This involves building and maintaining a high temperature at the centre of your compost pile, which is done by turning your compost regularly, keeping it moist and adding enough high-nitrogen materials. The heat generated breaks down organic matter extremely quickly and can even kill seeds from weeds.

### Cold composting

To cold compost, simply pile your organic waste and let nature take its course! While virtually no effort is required, this method takes a lot longer to create compost and won't kill seeds.

### 3.3.1 The Ingredients

A C:N ratio ranging between 25:1 and 30:1 is the optimum combination for rapid decomposition. If ratio is more than 30:1 carbon, heat production drops and decomposition slows. You may have noticed that a pile of leaves or wood chips will sit for a year or more without much apparent decay. When there is too much nitrogen, your pile will likely release the excess as smelly ammonia gas. That said, the C:N ratio does not need to be exact. Values in table below are calculated on a dry-weight basis. Blending materials to achieve a satisfactory C:N ratio is part of the art of composting.

MATERIAL	C:N RATIO	MATERIAL	C:N RATIO
Woody Vege stalks	50-100:1	Manure, horse and cow	20-25:1
Fruit waste	35:1	Paper	170-200:1
Grass clippings	12-25:1	Sawdust	200-500:1
Hay, green	25:1	Seaweed	19:1
Leaves, deciduous	21-28:1	Straw	40-100:2
Leaves, pine	60-100:1	Vegetable waste/Weeds	12-25:1
Leaves, other	30-80:1	Wood chips	500-700:1

- **Nitrogen– Green**, newly cut – 1 pile of fine (eg fresh lawn clippings), one pile of coarse (eg freshly chopped up weed/tree stalks), a bucket of wet food scraps.
- **Carbon– Brown**, dry - one pile of fine carbon(eg old sawdust out the chookhouse), one pile of course carbon (Bail of Straw)
- **Activators**– molasses (diluted), kelp (diluted), liquid worm castings (diluted to the colour of weak tea), (mix up in a couple of watering cans and have ready to go on nitrogen layers), sour milk, old compost, herbs (comfrey, yarrow, stinging nettles) Try 1 kg of rock phosphate, 1 lts of molasses, and 1 lts of kelp powder .
- **Minerals** - Rockdust– to increase the mineralisation of your soil at least 1 kg.
- **Water**– have a hose ready to water in the carbon layers or watering can with water and molasses in it..
- **This stuff in a pile 1.5m high x 1.5m wide will start to compost if you look after it. See Below.**

### 3.3.2 The Factors Controlling Compost

**Air** - Proper aeration is a key environmental factor. Many microorganisms, including aerobic bacteria, need oxygen. They need oxygen to produce energy, grow quickly, and consume more materials. Aeration involves the replacement of oxygen deficient air in a compost pile with fresh air containing oxygen. Natural aeration occurs when air warmed by the composting process rises through the pile, bringing in fresh air from the surroundings. Air flow can be negatively affected if large quantities of finely sized materials such as pine needles, grass clippings, or sawdust are used, or if materials become water saturated.

The easiest way to aerate a pile is to regularly turn it with a pitchfork or shovel. Turning will fluff up the pile and increase its porosity. To aid turning make compost pile out in wire wrapped in a circle, or light welded mesh.

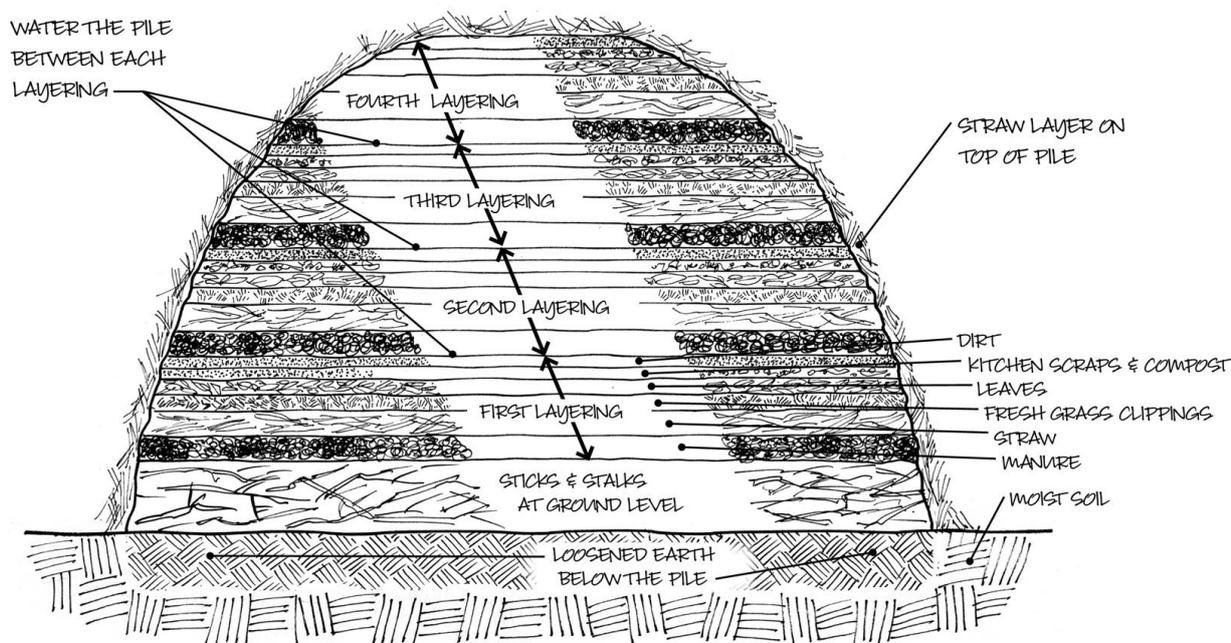
**Moisture** - Decomposer organisms need water to live. Microbial activity occurs most rapidly in thin water films on the surface of organic materials. A general rule of thumb is to wet and mix materials so they are about as moist as a wrung-out sponge.

Material should feel damp to the touch, with just a drop or two of liquid expelled when squeezed in your hand. If a compost pile is too dry, it should be watered as the pile is being turned or with a trickling hose.

**Temperature** - Temperature is another important factor in the composting process and is related to proper air and moisture levels. As the microorganisms work to decompose the compost, they give off heat which in turn increases pile temperatures. Temperatures between around 55°C indicate rapid decomposition, and kill off pathogenic bacteria and fungi like Ecoli, but to temperatures greater than 70°C reduce the activity of most organisms. Lower temperatures signal a slowing in the composting process. This is detailed later in the notes.

**Volume** - In order to become self insulating and retain heat, piles should ideally be about 3m<sup>3</sup>. The larger size retains heat and moisture, but is not too large that the material will become unwieldy for turning. Smaller compost piles will still decompose material, but they may not heat up as well, and decomposition is likely to take longer. The more “surface area” available, the easier it is for microorganisms to work, because activity occurs at the interface of particle surfaces and air. Don't “powder” materials, because they will compact and impede air movement in the pile.

REPEAT LAYERING UNTIL THE PILE IS ABOUT 6 FEET HIGH  
AS IT CURES, THE PILE WILL SHRINK TO ABOUT TWO-THIRDS  
OF ITS ORIGINAL HEIGHT



### 3.4 Cold Composting

Cold composting is slower at creating usable fine compost but it is a lot less effort and you can put this 'compost' near a plant you wish to feed with the slow release of fertility as it breaks down.

Depending on what you compost there can be issues with mice and cockroaches when you cold compost. Cold compost piles suit large and rough garden pruning waste, leaves, grass clipping and other dryer food waste. If we have lots of wet food scraps we should use a container or go for an animal based 'composting' option.

**Pile or Heap** - If you have all the ingredients but no wire, you can make a heap/pile.

**Bays** - Compost bays are popular, 3 bays allows you to run two lots of compost on the outer bays and use inner bay to 'turn' the compost in between. Bays are also good and neat way to accumulate/store ingredients for a big Hot compost batch.

**Pit Composting (Scraps in holes)** - Pit composting is not recommended in Perth's coastal sandy soils, nutrients rapidly leach away and contaminate rivers and ground water. If you pit compost be sure to add 30-1 carbon to nitrogen rich food waste.

**Containers** - Gedeyes Bins and other Compost bins either above soil or partially buried can keep pests out and allow ongoing addition of scraps until full. Having more than one allows you to leave the full bin to compost over 3-4 months. Place these bins near a fruit tree and feed the tree without even needing to 'harvest' the compost.

Over the page there is a part of the great EarthCarers Compost Flyer - check out the rest of their info sheets online.

# COMPOST



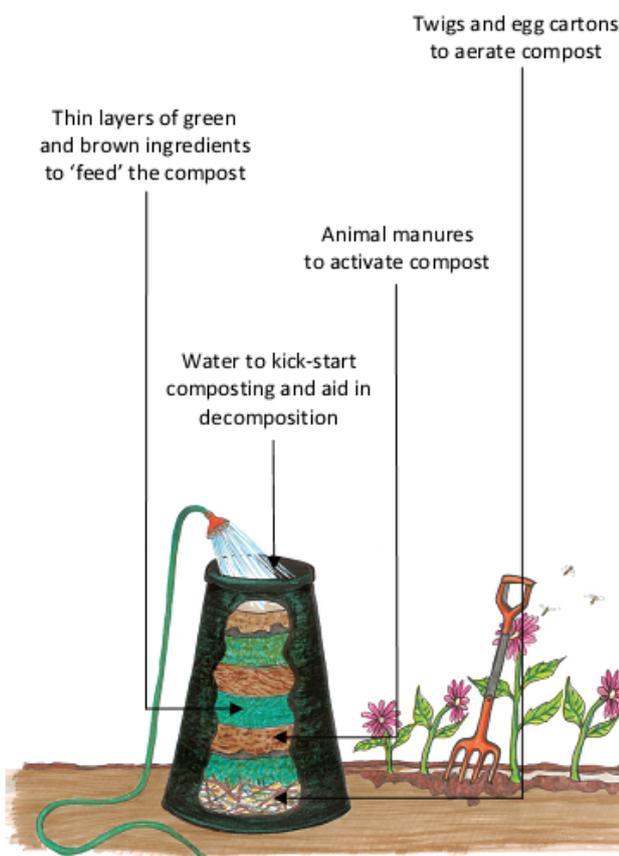
*There are many ways to make successful compost. You can use bins, tumblers or covered heaps. These instructions focus on bin systems. Earth Carers favorite tip is to monitor your compost system - get intimate with it!*

Compost bins can be purchased from gardening stores. Some Councils offer composting bins at a discounted rate.

Don't panic! the finished product will not look homogenous like commercial compost. Each item will compost at a different rate, some chunks in your compost is fine - your garden won't mind!

## Getting Started

1. Choose a site that is shady in summer and has good drainage. Bury the bin 10cm into the soil.  
*Tip:* Cover base with a layer of mouse mesh.
2. Add a layer of small twigs, egg cartons dry leaves and/or torn up newspaper. This acts to aerate the compost.
3. Add activators such as animal manures, compost from an old heap, blood and bone and/or rich soil.
4. Add water.
5. Add a variety of materials in thin brown and green layers adding water and activators occasionally. Continue to add these items over time until your bin is full.
6. To aerate your compost and to speed up the process, turn your compost with a compost mate or pitch fork every couple of weeks or more if necessary.
7. Monitor the compost to make sure it is still active, not too dry or wet or attracting pests - see over for troubleshooting.



### 3.5 Hot - Thermal Compost

Hot composting is tricky and hard work, if you are going to do it do it properly.

**Tumblers** - Compost tumblers can make hot composting 'turning' much easier. These systems can be purchased or home made out of drums with holes drilled. The benefits of thermophilic composts (killing pathogens, weeds seeds and composting meat and bones) can be produced in these systems but the risk is as always that you are not successful and end up with a contaminated mess. Compost rolling with simple ingredients like grass clippings and other fine food waste is recommended as a starting point.

#### Wire mesh - 'Pile'

**Thermal Compost Recipe** - Driving Principal: 'A diversity of materials ensures a diversity of microbes'

- 2 m3 of 'brown waste' which can include a mixture of straw, old weeds, sawdust, wood chip, paper and cardboard.
- 1 m3 of 'green waste' which can include a mixture of hay, fresh cut grass, fresh cut weeds, etc.
- 1 m3 of high Nitrogen materials such as a mixture of manures, old wool, food scraps, etc

To the above we will add the following to build up minerals and trace elements and to make a best case compost we can to 'inoculate' the Aerobic Tea (Probiotic) Solution. You dont need these additions but its worth the expense to put in at least 1/3 the amount if you want remineralising compost.

- 10 kg of rock dust,
- 10 kg of rock phosphate,
- 10 lts of molasses,
- 10 lts of kelp powder
- Tarp to cover the compost usually about 5 mts x 5 mts.

### 3.6 Wire Cage Thermal Composting Technique

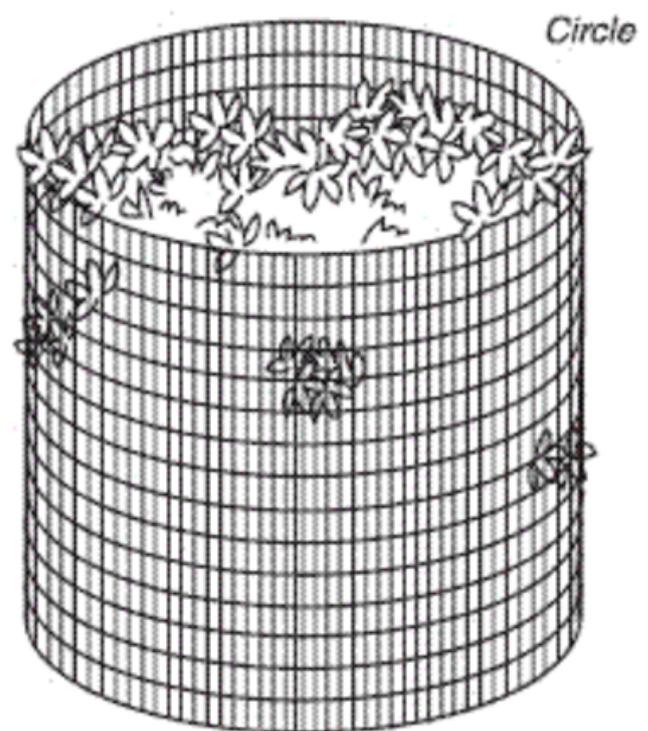
- Make the compost in a circular wire cage, use welded wire fence, 6 mt length. Mesh size is 50 mm x 75 mm and ideally about 1 mt height, if available get the 'heavy duty' wire. To turn pile, undo wire, relocate within a fork throw, rejoin wire.
- A tarp to cover the compost usually about 5 mts x 5 mts.
- Compost materials. Principal: 'A diversity of materials ensures a diversity of microbes' What we would like to have is a large diversity of materials, so some of everything you can find.
- Create a base of coarse carbon to allow under ventilation, then stack as per 4 brown, 3 green, 2 nitrogen, using a wheel barrow to portion it. Having coarse brown material allows air in so avoid too much paper, grass clipping and other fine carbon that will mat down and form "paper mache".
- Layering via the 4 brown (carbon)-3 green (carbon and nitrogen) -2 Nitrogen ratios with a wheel barrow allows good control and with coarse material allows good oxygen flow. This is why these compost piles should only need to be turned every 10 days, about 5 times and it should be done. Over the course of the pile keep an eye on the moisture levels- it must be kept moist to allow the pile to 'cook' properly.
- As the centre of the pile is the hottest part ,ensure that when turning, the cooler outer edges of the pile gets turned in to the centre to ensure the correct temperature for killing weed seeds and possible pathogens
- Turn compost when it approaches 68 to 70 °C or to hot to keep hand in middle.
- Compost cooked 14-20 days, keep turning, done once composition is fine, earthy brown and cool.

- Finished compost can be kept for 3-6 months in a dark, moist environment. The bugs hibernate and can be reenergized. However as with everything the sooner the better.

### Detailed Temperature Management for Pathogen free material

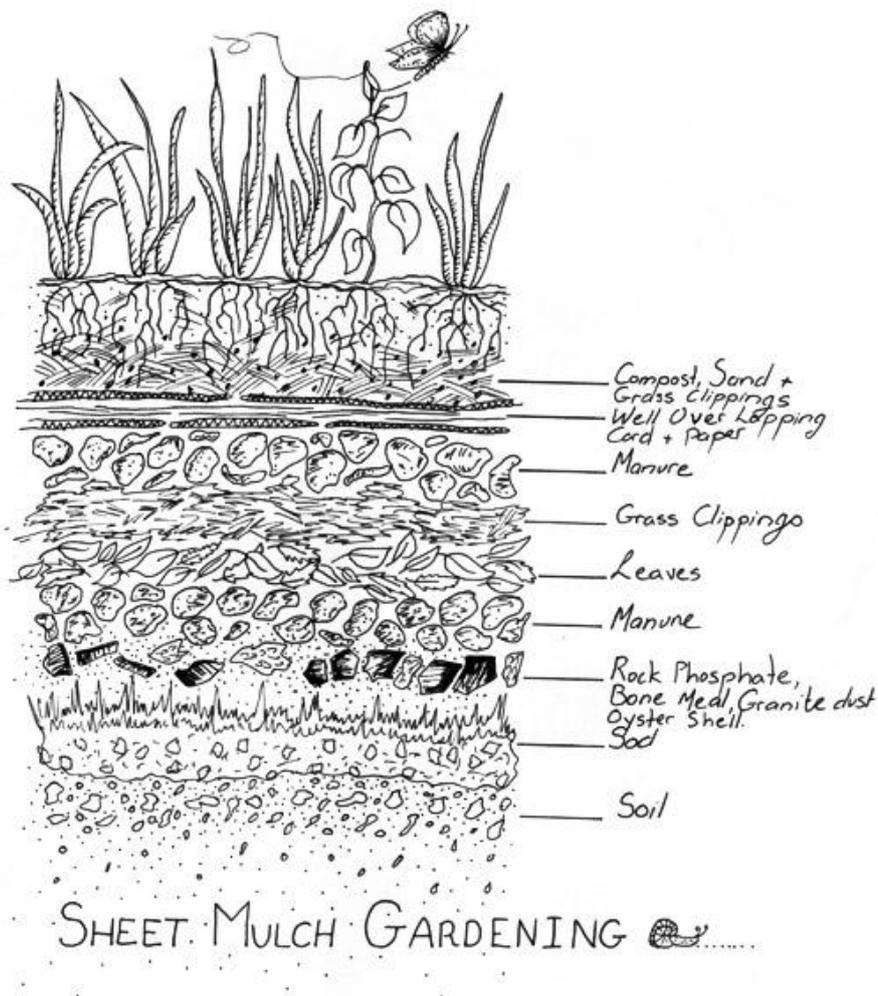
Below is a suggested guide for the turning temperature in your pile and the accompanying turning schedule. If the pile is turned in a way that maintains the correct temperature and moisture in the pile, you can be confident your oxygen levels are appropriate also.

- Day 1 temperature: 20°C, similar to air temperature
- Day 2 temperature: 10°C increase in temperature to 30°C-40°C
- Day 3 temperature: Optimally you have achieved 50°C-65°C in the core of the stack
- Day 3-10 temperature: Maintained between 50°C-65°C (with proper moisture levels maintained)
- Day 11 temperature, 1st turn: Turn the stack and temperature may drop to 40°C, moisten with fine spray if needed whilst turning and mixing the stack.
- Day 12 temperature: Returned to 50°C-65°C and maintained until 2nd turn at day 20.
- Day 20 temperature, 2nd turn: Turn the stack and it should be turned every 10 days to maintain moisture and for aeration, once stack is turned, temperatures should be in the 40s°C.
- Day 22-24 temperature: Similar to day 12. May be slighter cooler, temperatures in the 50s and maintain temperatures in the 50°C-60°C range for 10 days until the next turn.
- Day 30 temperature, 3rd turn: Materials should show signs of decomposition
- Day 30-35: Temperatures return to the 50s°C and maintain temperatures in the 50s for an additional 10 days with good moisture management.
- Day 40 temperature, 4th turn: Temperatures drop when turned, and increase to 45°C-55°C over the next 5 days. There should be significant signs of decomposition.
- Day 40-45 temperature: Temperatures in the high 40s – 50°C and maintained for the next 10 days until turned on day 50.
- Day 50 temperature, 5th turn: Temperatures dropping with increased signs of decomposition. Stack may now be about half its original size. (Note: you might reduce the diameter of the wire cage to increase height of the stack or combine two stacks into a single stack if making multiple stacks).
- Day 50-55 temperatures: Dropping to 30°C to 40°C with extensive decomposition once temperatures are 10°C above air temperatures, compost is ready to be used.



### 3.7 Sheet Mulching

Sheet mulching is a technique we can use to cover the top soil (smother) to control weeds or garden above the generally deep poor sandy soil. Sheet mulching is often suggested to smother lawns to start a garden instead, and while this does work you need to be very careful to use lots of cardboard/paper, overlap it well, avoid too many edges and tree holes, and be prompt about removing or treating runner grass that finds its way through. Feeding the grass under the mulch will actually make it rot faster, but you are not to plant trees below the cardboard layer (in the old soil) for 6 months.



Layer 1 is the "bottom layer" and consists of 'Concentrated Compost' up to 15cm thick. This layer is made up of material that is high in nitrogen and **note it can/should be contaminated with weed seeds** - often you are placing it on very invasive couch/buffalo grasses anyway. It's the best use of these seedy weeds. This nitrogen boost works to stimulate soil life and jump-start the decomposition process. Manure, yard waste, food scraps all work well. If working with sandy top soil then add clay - Bentonite or whatever is available. Alternatively, if working with heavy clay soils, use a pitchfork or crowbar to break up and aerate them, and add gypsum instead. Consider any other necessary amendments, rock dust, trace elements, dynamic accumulator plant material, but the soil food web will evolve/create the new top soil issues so don't waste

time correcting pH's etc.

Layer 2 is the 'Weed Barrier' - 4 to 6 sheets of newspaper (non-glossy), a layer of cardboard, bur-lap bags, etc. all work well. The biggest cardboard boxes recycled from nearby industrial area bins is the best as it allows fast minimal penetration points and lots of space for over lapping - Fridge companies, bike stores, car parts retailers etc. Overlap sections along seams by at least 10cm to prevent weeds from penetrating. Thoroughly wet it down to speed up de-composition and prevent it from being blown away.

Layer 3 is the 'Compost Layer'. Generally 5-10cm thick, use fully-decomposed compost, straw, grass, leaves or any other **weed-free** organic material.

Layer 4 is the final 'Top Layer'. Again use a high carbon, **weed-free** material such as straw, leaves, wood chips, bark or sawdust. This layer will need to be repeatedly renewed as it decomposes. You are likely to plant in

seedlings with a little soil for roots or wait for this to rot down prior to planting. If doing this in summer, it is wise to apply a water saving mulch thickly as previously discussed.

### 3.8 Lasagna Beds or NO Dig Garden Beds

#### What to use

**All and Any organic matter.** Whatever you have that is organic available in bulk and cheap or free, we are after a decent ration of carbon to nitrogen as we are composting but otherwise anything will do. Composting needs a ratio of 30:1 Carbon to nitrogen, so you need lots of brown (dry leaves, straw, cardboard, street tree mulch) if your other main material is food waste, green lawn clippings and manure.

#### Why No Dig ? -

- Perth soils are very poor, the deep sand is hard/expensive to 'amend' to stop it losing ( via leaching and microbial activity) your fertility (compost/carbon) every year, when simply gardening and watering.
- Buying high quality garden soil or compost is expensive - \$100/m<sup>3</sup> so \$100-\$200 a Bed.
- **No Dig is 'cold composting' so you can grow in it, and it's easier than hot composting.**
- No Dig is also a worm farm (vermi-composting). Perth is hot, and nutrient rich, moist garden beds are a better place for worms than black plastic worm farms.
- No Dig automatically makes water and nutrient wise gardens, as your growing in a giant living sponge.

**Nature knows how to garden, so put in the 'food' and leave it up to the expert to grow your soil and veggies**

#### Technique and Tips

- ✓ Place cardboard/Newspaper down first to smother weeds and give a bit more of a barrier to nutrient leaching. You can 'No dig' on hard stand, but the bottom layer should be coarse to allow drainage, and surround with lots of woodchip mulch to sop up excess nitrogen/leachate.
- ✓ Soak the paper and all carbon/dry materials in a wheelbarrow as it's much easier and effective than hosing them.
- ✓ DONT 'No Dig' over runner grass (couch or buffalo) unless you are very careful as you risk filling your garden with grass and having to move everything to get it out.
- ✓ The base layers are a good place to put weeds with seeds. Never to see the sun again.
- ✓ Alternate 10 cm of brown, dry carbon material (straw, mulch, shredded cardboard) with 5cm green nitrogen rich material (manure, food scraps, fresh grass cuttings). This is the same as compost, so think 30-1 carbon to nitrogen.
- ✓ The bed will end up half its high. If you want 30cm of black soil in 3 months create 60cm of lasagne stacked material now.
- ✓ If you top/cap you 'No Dig' with compost or soil you can plant straight away but understand it will subside. The soil will get better after a few weeks/months.
- ✓ Put a course mulch over the top to reduce water loss and airborne weed seed germination.

# How to make a no-dig garden

## 1. BED PREPARATION

- If you want to grow vegetables, choose a location for your garden bed that is protected from strong wind and that receives a minimum of four to six hours of sunlight a day.
- Cut long grass and clear stones and other unwanted materials such as dried seeds and weeds, so they do not grow in the mulch. Cut grass can be left on the ground.
- Prepare the garden bed by marking it out. To deter grass from invading your garden, construct sturdy edges with material such as timber or bricks.

## 2. SOIL PREPARATION: THE NITROGEN LAYER – AND WATER

- If you are building a garden on sandy or low-fertility soil, add a fertiliser layer about 2cm thick; compost, worm castings, manure and/or a sprinkling of dynamic lifter or blood and bone will improve soil fertility.
- To allow these nutrients, water and air to penetrate to the rootzone, open the soil using a garden fork. Push the fork into the soil as far as it will go, then move it back and forth to open, but not turn, the soil. Water sufficiently to moisten the soil to the root zone.

## 3. LAY THE WEED BARRIER: THE CARBON LAYER

- Cover the garden with newspaper that has been well-moistened so that it will not blow away – about 10 pages thick. If you have invasive grasses such as kikuyu or couch that spread by stems that grow horizontally, lay a thicker layer of newspaper to block light and discourage growth.
- Overlap pages by one-third their size to discourage weeds.

## 4. ADD A FERTILISER LAYER: A NITROGEN LAYER

- Spread a fertiliser layer of compost/wormcastings/grass clippings/manure to cover the paper. This will act as a slow release fertiliser and will become available to the plants over time.

## 5. LAY THE WEED-FREE MULCH: THE CARBON LAYER

- Lay mulch such as composted stable sweepings/hay/straw/lucerne hay on top the nitrogen layer to at least 10cm thick. A thicker layer is alright. Repeat nitrogen and carbon layers if needed.

## 6. PLANT SEEDLINGS AND SEEDS

- Germinate small seeds in pots for transplanting into the garden. Large seeds such as peas and beans can be sown directly into the bed.
- To plant the seedling or large seed, make small holes in the mulch to the depth of the newspaper, fill with compost and plant the seedling or seed into this. Don't plant the seed too deep – just to double the size of the seed. Some gardeners slit the newspaper with a trowel or knife so that the seedlings roots can penetrate the soil below.

## 7. WATER WELL

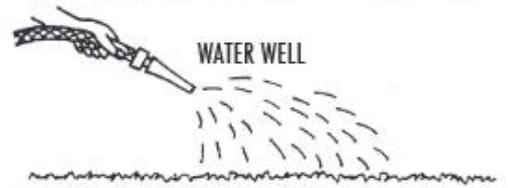
Give the garden a thorough watering to soak the mulch.

### STAY WELL, STAY HEALTHY...

Compost and stable sweepings may contain living organisms that, on rare occasions, could cause illness. Precautions include:

- moistening compost/ mulch to avoid micro-organisms becoming airborne
- wearing gloves to protect broken skin
- washing hands after handling materials
- wearing a dusk mask if you suffer from asthma or respiratory disorders
- if you handle animal manure, such as found in stable sweepings, consider vaccination against tetanus
- protect yourself from sunburn with suncream and hat
- drink plenty of water while gardening.

### CUT GRASS AND WEEDS



### OVERLAP NEWSPAPER BY A THIRD



### MARK OUT PATHS



### ADD NITROGEN LAYER



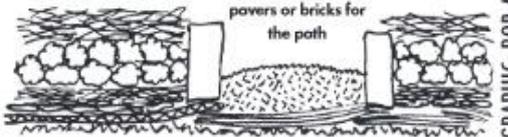
### ADD CARBON LAYER



### ADD NITROGEN LAYER



### ADD CARBON LAYER



GRAPHIC: ROB ALSOP ©

## REFERENCES

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### 3.9 Worm Farms and Vermicompost - Recycling using worms

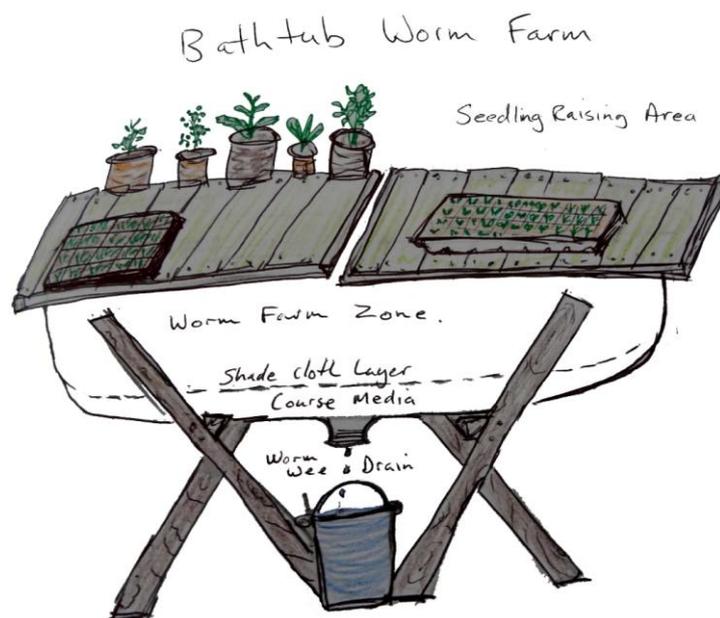
One of the easiest ways to recycle organic waste is to set up a worm farm. Particularly for urban environments or the novice composter, worm farming is the best. They recycle by digesting decomposing organic matter and converting it into a form that plants can assimilate as nutrients. They also till and aerate the soil, eating at the surface and eliminating lower down and by doing so, introduce organic matter to the deeper levels and increase the depth of the precious topsoil.

Worms eat their own body weight each day. Imagine if we did that! **HINT: Worms eat bacteria eating food scraps** the more you break up (blend) the scraps the more bacteria can access its surface area and the faster the worms can 'eat' the scraps. An whole apple will not be eaten by earthworms for months.

Under the right conditions they will breed approximately 20 new worms a month, that's about a million or more a year, and they'll be capable of eating through about a tonne of waste a day.

There are many models of worm farms on the market but it's too easy to make your own at home. Common worm houses can be bath tubs, concrete laundry troughs, foam boxes, de-commissioned fridges, plastic bins and even as simple as a perforated plastic pot half buried in the veggie bed that you put your kitchen scraps into.

Keep them in the shade; keep them moist, free draining and easily accessible for the best success. Harvest the friable castings as super rich fertiliser for the garden and the worm 'wee' as a gentle soil conditioner for all plants.



Worm towers. Can be buried in the ground

The fibreglass baths are built on trestle style legs with a gentle slope towards the plug hole which enables easy draining of the worm 'wee'. A slatted bench top in two sections gives access to a section at a time for feeding the worms & removing the rich castings.

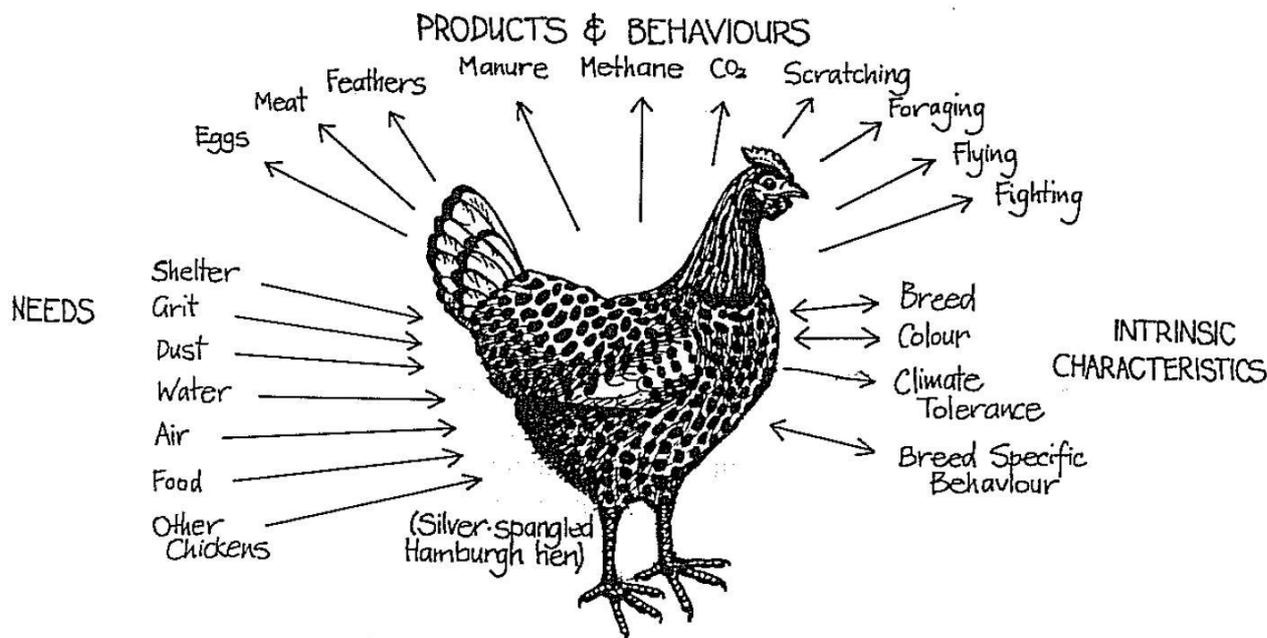
Worm juice, organic liquid fertiliser. I dilute it 10:1 for use on new plants, seedlings, fruit trees and vegetables. The worm castings generated also make an excellent organic fertiliser and soil conditioner. Some systems can harvest these some let nature do the harvesting.

### 3.10 Chickens - Compost large volumes of food waste.

Chickens make wonderful pets and are fun to observe plus they regularly produce eggs. But looking closer:

- you meet their easily homemade needs of shelter, food (kitchen waste), water and company (several chooks).
- they provide, eggs, meat, manure, features, soil cultivation, pest removal and weeding, and many hidden ecosystem diversity builders.

It amazes me that these animals seem to produce far more than they consume and are truly biology and food production catalysts for your system.



(Source - Permaculture, A Practical Guide to a Sustainable Future; Mollison, B.; 1990)

Managing chicken manure is perhaps the most off putting part for the lay person and thus an important part to get right. Much of the manure is produced while they are perched up in their coop, so (unless you want to be scraping out chicken poo on a weekly basis from your local council recommended cement floor chook house) we recommend an open bottom, deep litter, coop design. The chooks scratch out there own manure and compost it.

They eat all sorts of food scraps, including vegetable peelings (potato peel should be cooked first), leftover breakfast cereal, leftover school lunches, fruit scraps and any cooked vegetables.

Chooks also eat garden waste including vegetable leaves from the veggie patch, lawn clippings and most weeds

They turn the scraps they are given into wonderful fertiliser. Chicken runs can includes fruit trees, that mean the chooks get shade they need and fertilise the trees, eat any fallen fruit and control fruit fly and their insect pests pupating in the soil.

Other animals offer waste composting services, more waste ? Try Pigs. If you have lots of green waste you can use herbivores like rabbits or guinea pigs. Guinea pigs can mow your grass - no mower and no grass clippings.

### 3.11 Recycling Waste Water

Of the world's total water supply only 3% is fresh water, and of this amount 0.03% is available to us at anytime.

The rest is locked up in icecaps, clouds etc. This amount of water is finite and constantly cycling from solid to liquid to gas; from salty oceans to fresh rainwater, to soils & rivers and back to the ocean.

Perth is a dry place and our natural water supplies are reducing, much of our water now comes from expensive power intensive Desalination. So we should be looking to get more use of our 'waste water'. Greywater systems both commercial and home made allow us to capture slightly contaminated water to use in the garden. There are rules and sensible limitations to this so head to Grey Water website like <http://www.greywaterreuse.com.au/> to read up on it. OR look at Terra Permas website for the Reticulation and Water supply notes.

### 3.12 Composting Toilets - The Brown Elephant in the Room

Talking about recycling our garden nutrients would not be complete by at least thinking about what we flush down the toilet every day.

After today's chat about composting and zero waste I hope your starting to understand that we need to start crapping less in our water cycle and crapping more in our carbon cycle.

There are legal and very ecologically sensible composting toilets. Ecoflo see a few council approved models for WA. The main limiting factor is you need space under the toilet to store the composting system.



### 3.13 Scraps Digesters - Biogas Production

Biogas is a mixture of gasses that are produced as anaerobic bacteria break down organic matter. It is flammable, capable of producing a clean flame for cooking and heating, and it can be derived from as simple a feedstock as your kitchen rinse water.

A biogas digester is a container holding water and bacteria, which can be 'fed' organic matter to be broken down, and which collects the resultant biogas, to be tapped off either to a collector for storage, or directly for burning.

Its out of our scope today but check out Shaun's great website for more - <http://shaunsbackyard.com/category/diy-projects/biogas-digester/>