

Composting to Healthy Soil



This is the descriptive version of the composting workshop we provide from Polyculture worm farm. If you have any questions please contact us.

WELCOME

HAVE A PURPOSE IN LIFE!

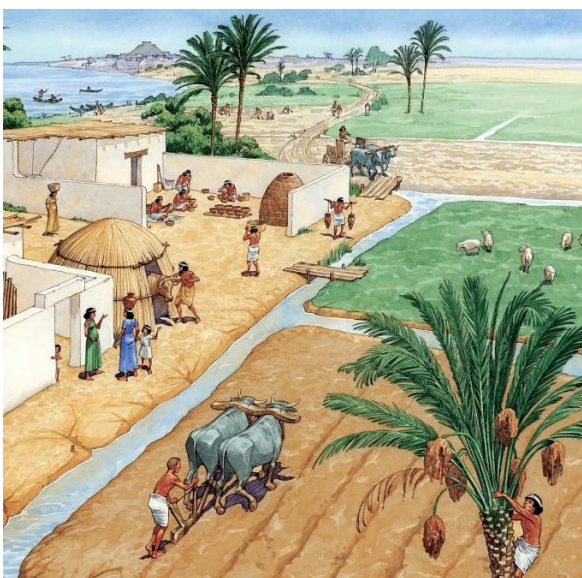
Nature has taught me that real knowledge begins when we allow the truth to change the way we think.

HISTORY OF COMPOST

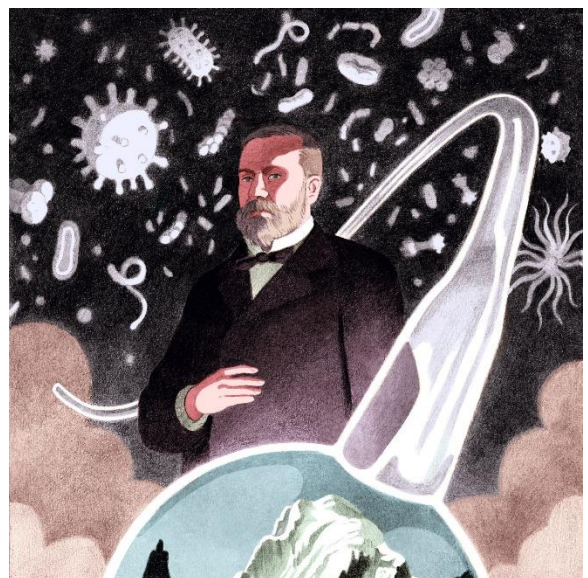
Records show compost being used throughout Asia and in Babylon around 4000 years ago.

Thomas Jefferson realised crops produced higher yields each year when compost was added to the soil.

In 1856, Louis Pasteur, armed with a microscope, discovered that certain bacteria caused beer to go sour and often caused severe illness in consumers, and the right microbes made good beer!



Village Composting



Louis Pasteur

EARTH WORMS

There are 6000 species made up into 20 families worldwide; we have 8 of those families in Australia. Global research continues into these amazing creatures, which means species and families will continue to evolve.

<https://australian.museum/learn/animals/worms/australian-earthworms/>

COMPOST WORMS

Eisenia fetida, *Lumbricus rubellus*, *Eisenia andrei*, are mulch dwellers staying in the top few centimetres of top soil. *L. rubellus* has been found digging deeper into the soil profile. Larger earth worms go deeper into the soil. All worms are underrated.



Composting worms



Breeding worms

Vermicompost (Compost worm) Research:

<https://link.springer.com/article/10.1007/s43621-024-00245-y>

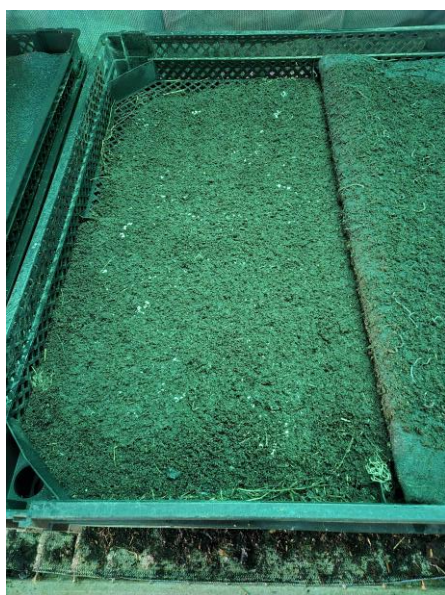
<https://www.researchgate.net/topic/Vermicomposting/publications>

FEEDING WORMS

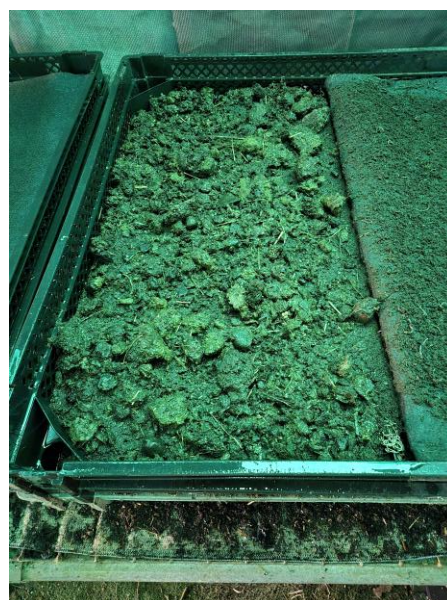
Keep it light and more frequent, always wet the feed in, keep the brown and green at least equal, more brown is always better.

Worms consume about 30% of their weight in a day during summer and less in the colder months. 1000 worms = 250 grams, approximately.

Measure how much feed you have for each day and size your farm accordingly. 30% of 250gms= 75gms/1000 worms/day during warm days!



Before feed



After feed

The key to successful worm farming is to not overfeed while keeping the bedding moist and covered with a porous blanket out of direct sunlight!

The Worm Farm page has multiple documents you can download for more detailed information.

<https://polyculture.com.au/worms/>

MOISTURE - pH

Worms and microbes need about 75% consistent moisture.

Keeping cover mats moist also regulates the bedding temperature. Up to 80% moisture is far better than 50%. Consistent moisture helps worms and microbes with their movement, feeding and breeding. Ideally, when you

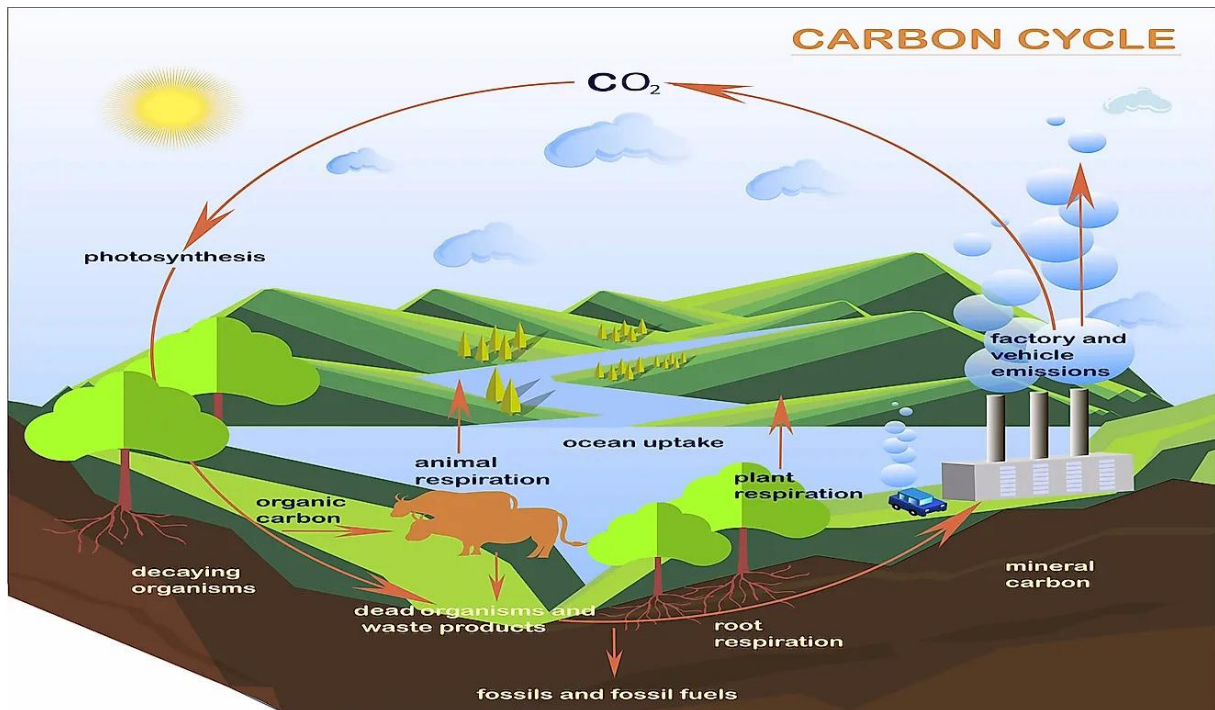
squeeze the bedding, you will feel the water pushing out between your fingers. The moisture also helps balance pH. Managing pH is not a major task in any type of composting as long as the brown and green materials are in balance, check in with us if in doubt! Too much green increases the nitrogen which will push pH out of balance and can also start to heat up.

We do not recommend using town water, as it contains chemicals designed to kill bacteria, which over time will have a detrimental effect on the microbe population in your worm farm. Remembering that microbes are the real worm food! Positioning your worm farm out of direct sunlight is good for many reasons including, temperature, smell and moisture.

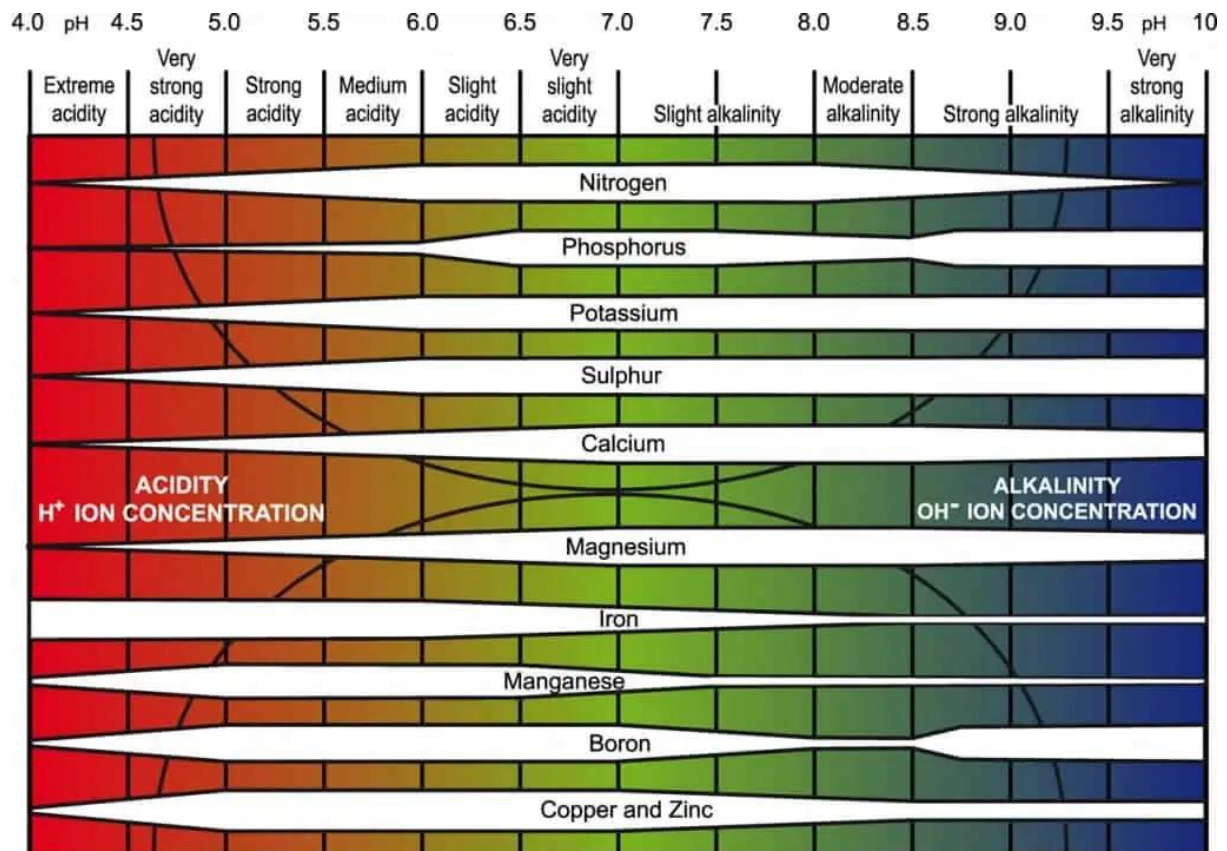
This is where you can find the same [analogue pH meter](#) we use.



Worm farm moisture & pH test



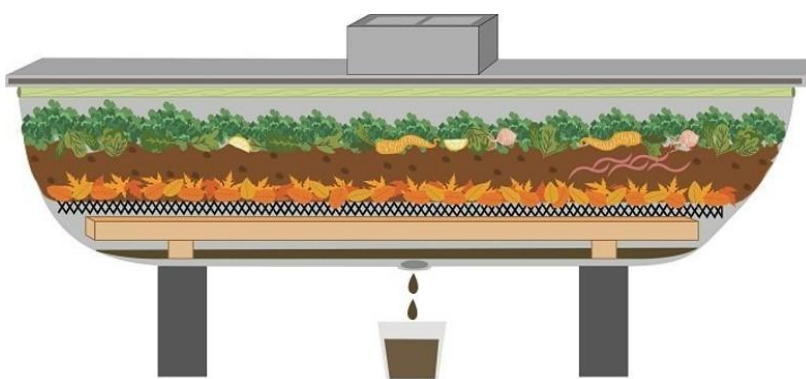
Worms and soil microbes help keep the carbon cycling as it is needed.



pH scale – 6.8 – 7.5 high mineral availability in balance

LEACHATE (worm juice, worm tea)

The liquid draining out the bottom of a worm farm has no microbes, only some minerals, you need both for healthy soil and plants. We reuse that leachate to pour over the cover mats to maintain moisture. You can learn how easy it is to make your own worm extract liquid (WEL) from worm castings. Download the “How to use” document from the [worm farm page](#) and watch the educational videos on [The Soil School](#)



WEL is far better for soil and plants than any leachate!

WORM CASTINGS

A recent research project showed worm castings improved tomato yield by 74% while increasing vitamin C content by 47% and soluble sugar by 71%. Now that is a healthy pest and disease resistant plant!

There really is nothing else like high-quality worm castings, full of beneficial microbes, minerals and carbon, all in balance. It takes time to make really good castings, so be patient when you start. Don't try and take the first load before 6 months of aging. After that you should have the same amount every couple of months. The castings should look and feel like dark coloured mud!



Well-aged castings



WEL Concentrate



Adding kitchen scraps

You can make worm extract liquid (WEL) and dilute in water for the absolute best soil coverage. The link below has many downloads including “how to use worm castings”. <https://polyculture.com.au/soil-services/>

There is more research on the benefits of worm farming in this link:

<https://projects.sare.org/project-reports/ow20-357/>

BOOSTER

The Booster is a precise blend of rock dust and biochar which helps manage pH, keeping the system neutral, while adding long term microbe food in the form of soluble minerals, all in balance for excellent worm health. The mineralised grit also helps the worms process their food efficiently and faster.

Other wonderful outcomes from the booster are that it increases microbe diversity and activity, while raising the microbe population by up to 40%. You can also feed booster into your garden beds, around trees and your lawn a couple of times a year for healthy soil, boosting all plants immunity to pests and disease. More information is available at this link.

<https://polyculture.com.au/soil-worm-farm-booster/>

WORM FARM VISITORS

PESTS:

Bandicoots cannot climb so we do not recommend worm farms on the ground. **Crickets** are another worm loving carnivore which will leave channels in the bedding that makes them easier to find. Catch them then feed them to the chooks or a bird of choice! **Ants** will nest in the bedding and destroy your worm population and feed. Avoid this silent hidden invertebrate by placing legs of the worm farm in water containers. **Rats** will eat anything so figure out how to protect your worms and keep a weight on the lid of stackable home worm farms! A moist cover mat appears to be too heavy for rats to lift, so keep it moist! Australian native bush rats are carnivores, so the same protection for compost worms applies.



Bandicoots



Cricket

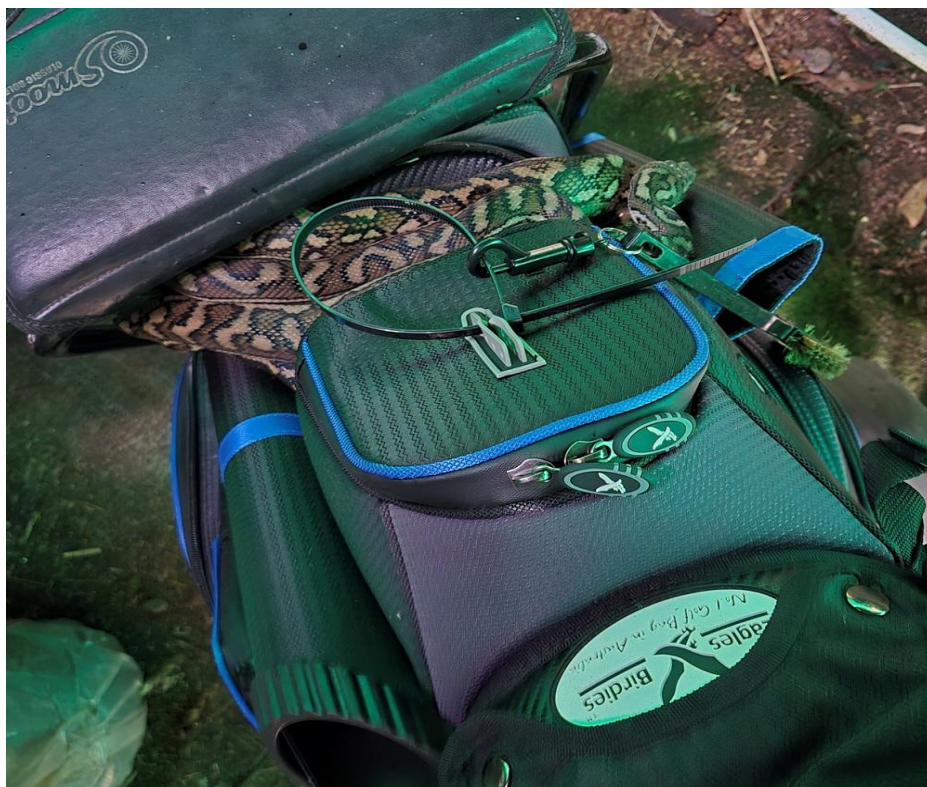
BENEFICIALS:

Springtails are a sign of a healthy ecosystem and a worm farm will become its own micro-ecosystem. They do the same job as worms, so leave them to it. They come in a variety of sizes and colours, so it is best to identify them with accuracy. Using the [iNaturalistAU](https://www.inaturalist.org/) website is much easier and more detailed than the smart phone App. Simply type in at the search box what you are looking for. Wait until you see how many Springtails there are, along with all the other insect and plant searches you can do.



Different Springtails

We see quite a few **spiders** in our worm farm, mostly [huntsmen](#) hanging around our trays. It appears they keep the cockroaches under control. The other major worm farm friends are **pythons** who manage rodents better than any traps or poisons ever will. They sleep most of the day and only occasionally get in the way. Try not to handle them too often as they are very good at letting you know when the “do not disturb” sign is hidden!



Monty

MONITORING

It is important to monitor your worm farm (WF) and any compost!

You don't want any "bad smells", that normally means something is rotten and has attracted anaerobic bacteria which release elements that attract flies, rats and many other pests. The bedding should always smell earthy when you lift the moist WF cover mat. Checking the worm farm every few days will help you take care of any issues before they become problems!

KITCHEN SCRAPS

Kitchen scraps are a fantastic resource to help build soil. If you have the time and resources, blitzing the scraps into smaller pieces will help the worms convert into castings much faster!

Another option is to bury frozen scrap parcels soaked in worm extract liquid. This changes the enzymes while thawing out and sends bacteria into a feeding frenzy.

Too much green material is high in nitrogen which can slowly poison the worms over the long term, it stops them from breeding which causes population collapse. They can also get protein poisoning, e.g. Too much brassicas, kale, spinach, seeds. Avocado skin and seeds should never go into worm farms! All of these high protein items and mould will attract flies.

Check out the videos [@thesoilschool](#) for more details

MULCH PILES

Multiple uses while decomposing: Mix in manures so they can be used in garden beds after they smell like the earth (about 3months), bury frozen kitchen scraps, also add carbon to garden beds and trees. This is the simplest rule to remember for using mulch. Hard mulch for hard trunks, soft mulch (grass and straw) for soft trunks and green stems.

This link is some recent research on mulch versus herbicides.

<https://research-repository.griffith.edu.au/items/e8057d9f-49bf-4fa2-943e-4abd3682b86f>

If a compost or mulch pile is greater than 1 cubic metre, it is possible for it to start fermenting into alcohol and self-combust under the right conditions.

Thermophilic (HOT) composting is a delicate system that needs constant monitoring. Hotter temperatures require more frequent turning. Please contact us for more details on this potentially volatile process!

COMPOST TUMBLER

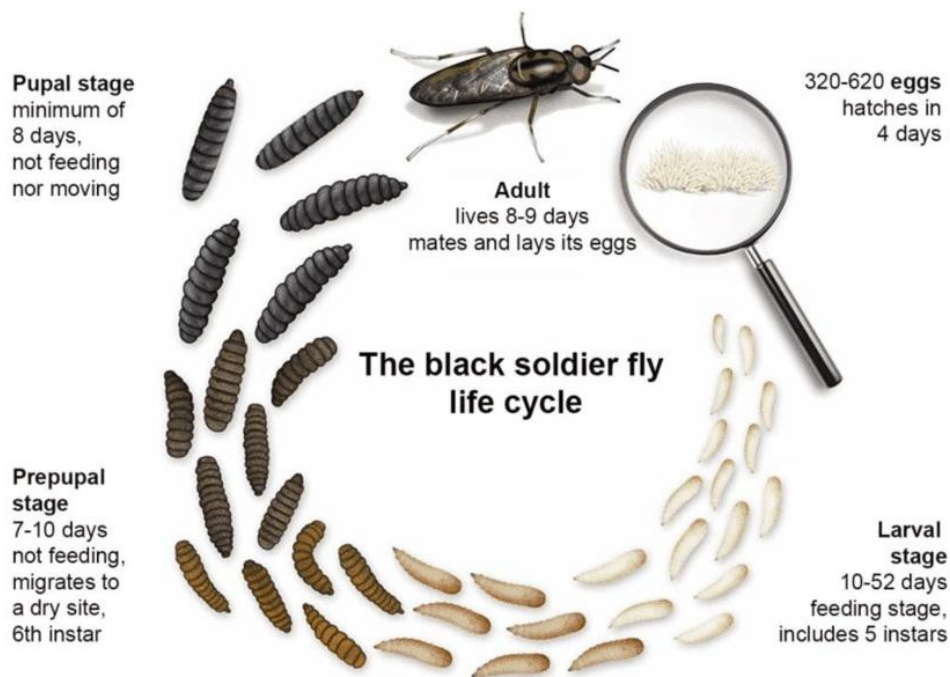
Keep green and brown equal + moisture rotating at least every second day, every day is ok. Adding worm castings speeds up decomposition because of beneficial microbes. We have been pleasantly surprised with the efficiency of this unit. From blitzed kitchen scraps and mulch mix to organic matter you can dig into your garden in 3 months. In fact, we have tested the finished material with nothing added and plants grow strong and healthy with no other additives. Check out the videos [@thesoilsschool](#) for updates.



Compost Tumbler

BSF

Black Soldier Fly are active in summer months in SEQLD, they have no mouth, live for a little more than 8 days to breed. The larvae create an anaerobic (low oxygen) sludge that has all minerals but should only go into compost to be further decomposed by beneficial microbes. The larvae are also about 40% protein which is very good chook feed or your bird of choice. Harvest and freeze during the warmer months for winter bird food. They will also devour meat scraps.



WEEDS

A black plastic bag will store enough heat to sterilise seeds so they don't sprout. All you need is enough green materials and moisture to maintain at least 55 degree C for 72 hours. The same can be achieved using hot composting in a controlled pile. Managing weeds in the soil is quite simple, they are sign posts. It is highly likely the "dirt" has little or no available calcium and phosphorous and is low in carbon, oxygen and hydrogen. If you reverse these issues, the weed seeds will not sprout.

Download the [Soil References file](#), scroll down to the biological weed control for more details.

MICROBES & FUNGI

Bacteria, fungi, protozoa, nematodes, arthropods, invertebrates and parasites all need to be in balance. Beneficial microbes' breakdown & consume pathogens that are harmful to humans like E-coli and Salmonella. Beneficial fungi feed plants, store carbon, water and can greatly increase plants nutrient uptake. If you would like to learn more about these wonderful free resources from nature, check out the links below. We hope it helps you realise how important it is to maintain soil health and structure. Beneficial fungal spores survive through all types of composting. That compost can then be added to your soil to continue the soil building process. There are also a few fascinating books in the [Soil references](#) file.

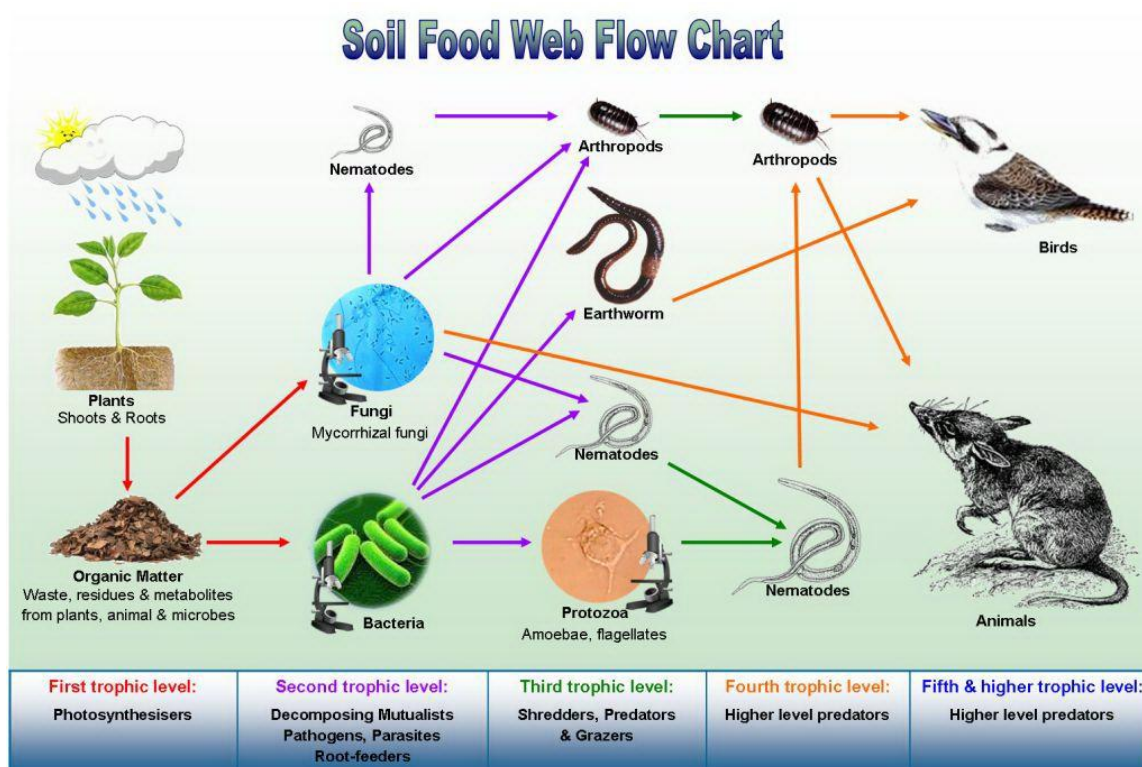
More research material on Fungi and Microbes

<https://www.nature.com/articles/s41467-025-64139-x>

<https://www.youtube.com/@soil-microbe>

<https://www.sciencedirect.com/science/article/pii/S001670612200074X#f0020>

When we selectively take parts of a system out, there are always consequences! The flow chart below displays how a simple eco-system functions, that is nature, all the parts that make up the whole rely on each other to be there always doing their job. Composting is nature within some type of confinement, so you have to be prepared to be a part of that system, working with all the parts to make up the whole. Looking at the Soil Food Web chart below, you can see which level you can fit in to, so becoming part of that whole, nature's system. All we need to do is monitor and observe where nature needs help to complete the cycles!



All are needed in balance

CARBON : NITROGEN RATIO

This is one of the most important factors in achieving healthy soil, it is your balance point. The C:N Ratio needs to be at least 16:1 as a start for microbial activity in your soil, working towards 30:1. Hot compost is a completely different story, so finding that balance point from compost to your soil needs to be calculated in the favour of carbon!

Why do you think plants grow out of wood mulch piles? CARBON!

As the sand, silt, and clay particles fall out of the plant materials during decomposition it starts to create a “soil” type profile. Those particles are there because of the winds that have carried them from who knows where. Extra carbon will not slow down seed sprout or plant growth! And that mulch will always help if used as a soil rebuilding – weed suppressant tool on top of any soil.

You can download the C:N materials guideline from [The Soil School](#) page.

FUNGI : BACTERIA RATIO

The F:B ratio will balance itself out based on the plants that are growing in the soil and the type of mulch on top of the soil. Beneficial **Endophytic** fungi help plants grow, and will sprout when plant roots are growing and releasing exudates. That “exudate message” from the plant tells the fungal spore it has a home to attach to!

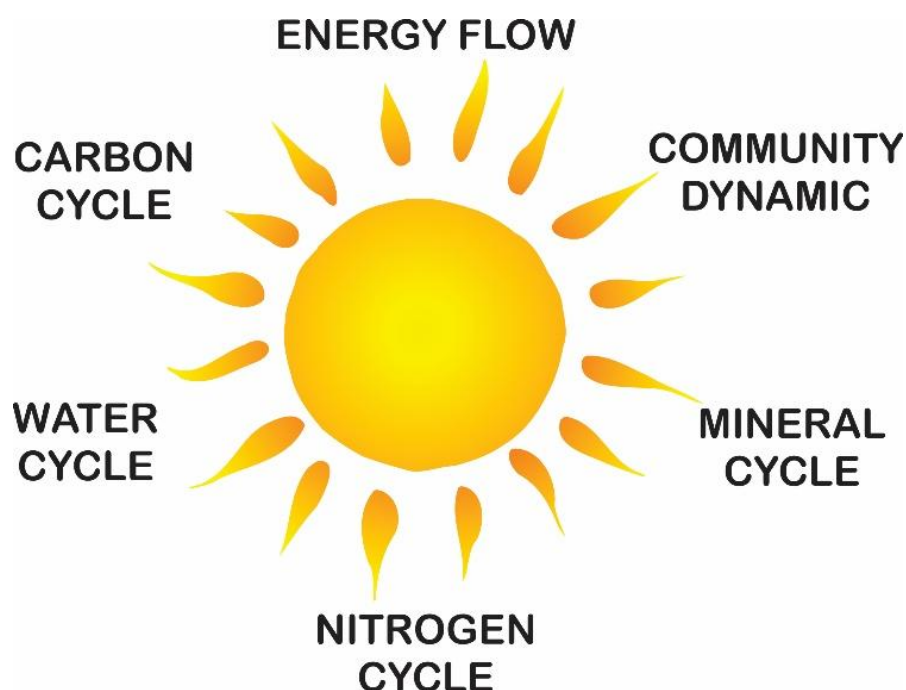
Saprophytic fungi decompose organic matter in unison with bacteria, termites and other micro-arthropods. Once again, the same principal applies in decomposition where the fungi and bacteria balance themselves out because of the type of organic matter present.

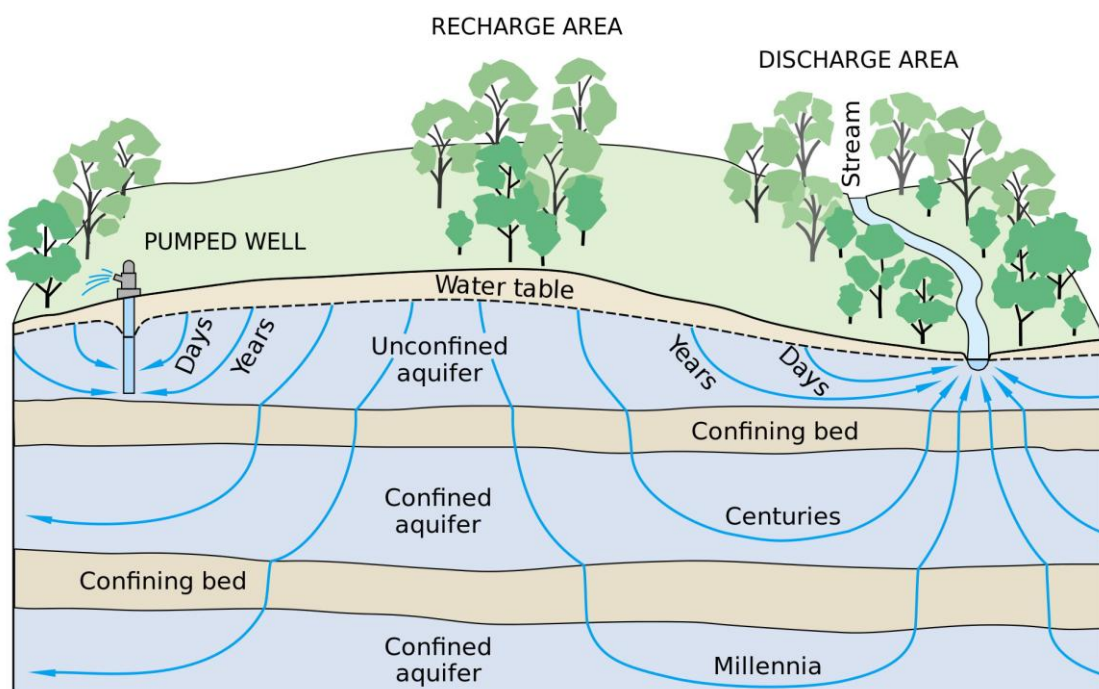
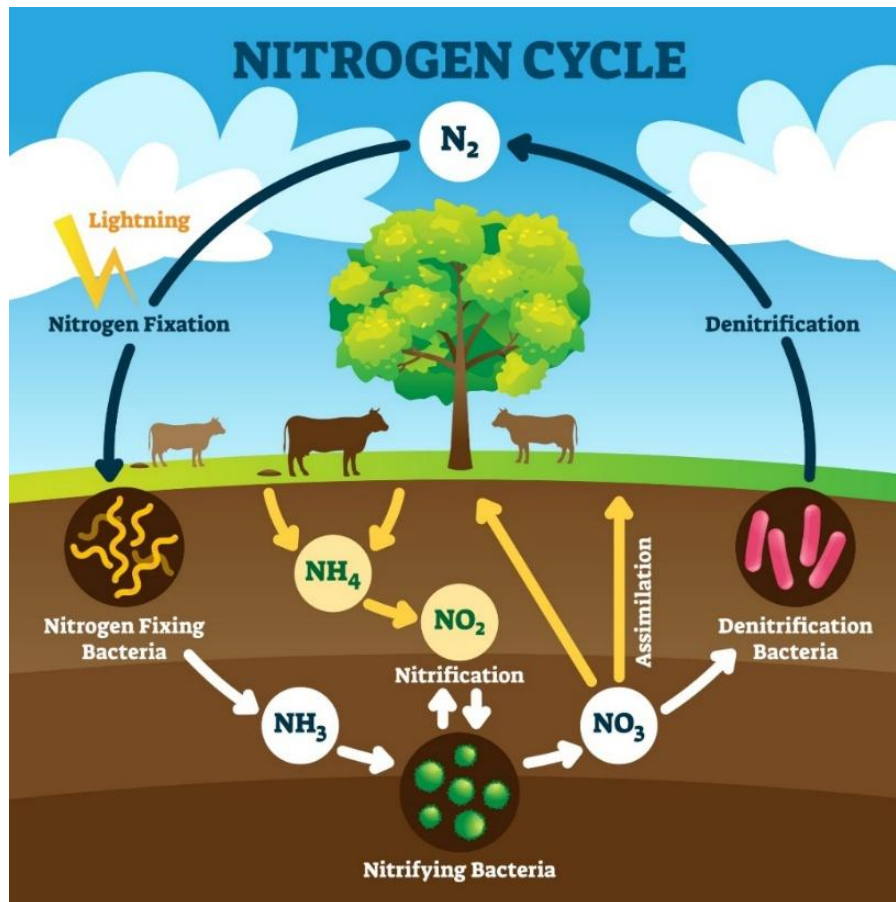
<https://nph.onlinelibrary.wiley.com/doi/10.1111/nph.20219>

<https://pmc.ncbi.nlm.nih.gov/articles/PMC10146397/>

NATURAL CYCLES

Greenhouse gases are forced in and out of healthy soil and compost because of weather systems e.g. High-and low-pressure systems! Plants are part of the energy highways for the natural cycles during photosynthesis.



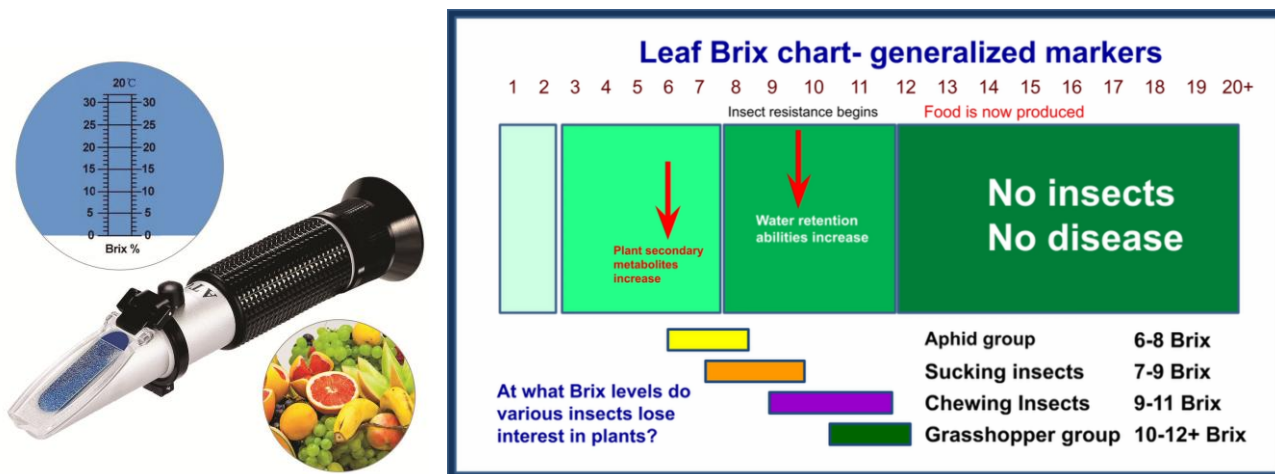


The Water cycle is the catalyst for all other cycles

MOISTURE IS YOUR MICROBE'S BEST FRIEND!

BUILDING HEALTHY SOIL

When we focus on feeding the soil for healthy plant growth, how do we know when the plant is healthy? We can use a Refractometer, Brix meter.



Brix Meter

This wonderful tool can tell us so much about soil health, mineral availability, soluble sugars and how resistant the plant is to pests and disease. In the chart above (developed by Dr Thomas Dykstra), you can see how the higher brix reading offers pest resistance, which means the sugars are flowing through the plant energy highways. As a guide, check the brix readings of plant sap early afternoon.

The key message from the meter is whether you have available calcium, the king of minerals! That should be a fuzzy line between blue and white. A clean straight line is no calcium availability, that's when it's time to find out why! Calcium is like the truck that pulls the trailer load of other soluble minerals. High soluble sugars in plants means that the microbes in the soil are being fed and supplying all nutrients in return to the plant roots.

All suppliers seem to be about the same price, so here are a couple to choose from.

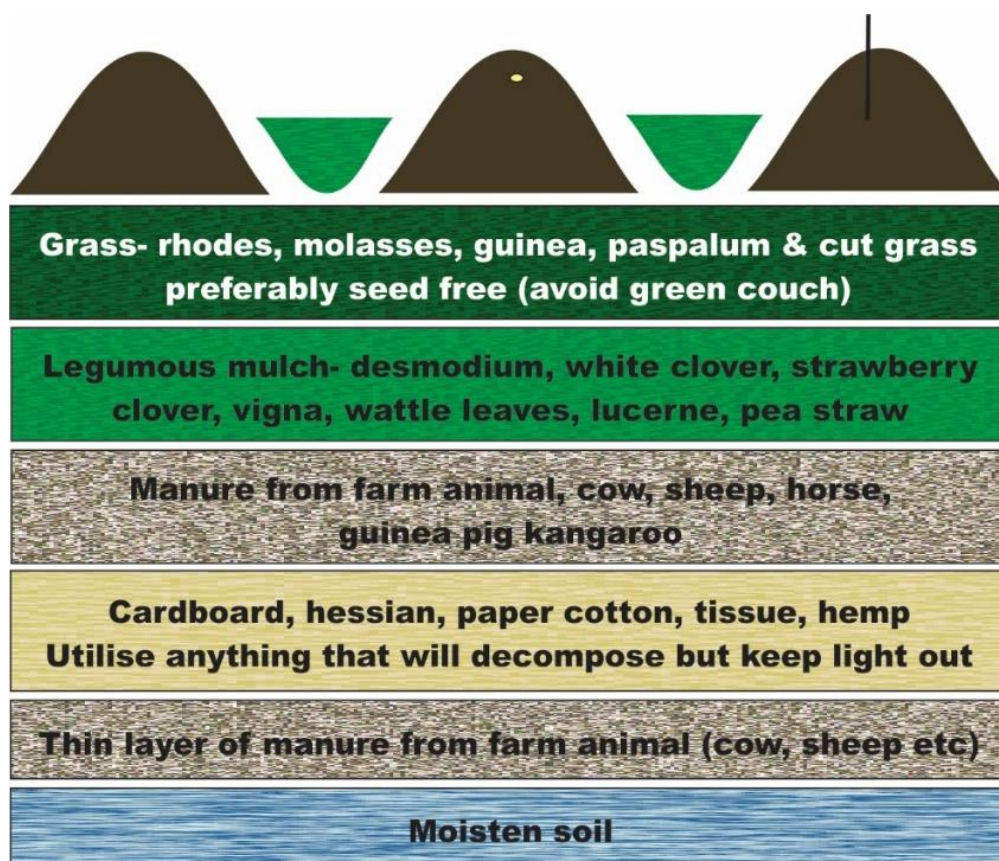
<https://www.themeterman.com.au/>

<https://biostim.com.au/shop/brix-meter/>

By all means shop around, you shouldn't need any special sap extraction tool for healthy grass, fruit or veg. If you find a stubborn plant use pliers to extract the sap instead of a garlic press.

Another soil building option is the No Dig Garden. For our No dig garden guide, check out the videos [@thesoilschool](#) for more details. There is also a pdf file you can download from our website, scroll down until you see the link [No Dig Garden](#)

Any comparable carbon – brown materials can be interchanged. We use compost above manures and add worm extract liquid to every layer to kickstart decomposition. Adding booster to the top green layers before adding appropriate mulch (normally grass-straw) will help microbial activity once plants are added. You can also set the underlayers in vertical sections to suit the type of plants in the bed, e.g. wood mulch for hard trunks, grass mulch for soft green trunks and stems.



No Dig Garden Guideline

As you can see, there are plenty of options to build your own soil. Keep topping up with an appropriate mulch as required, that suits the plants you are growing. You mix your mulch types together when growing different species and stem types e.g. coriander under a rosemary bush!

There are many opportunities to reduce kitchen waste from going to land fill. We are sure you will find multiple methods of composting that can fit into your lifestyle, from which you can grow healthy biologically active soil. From that soil your plants will remain vibrant and healthy for many years to come.

WHY SHOULD WE BOTHER – WE CAN HELP EACH OTHER!

We need to rebuild and conserve our top soil far better than we have in the past. What they “sell” us determines how we operate. What we really need to do is judge their sales pitch against natural alternatives, then decide what gives us the biggest bang for our \$\$\$\$. When we take the time to compare different methods, helping the natural systems will always give us superior outcomes (proven by [The Rodale Institute](#)) than any chemical or mechanical process.

Download our online documents for more info, guidelines and research. Share the knowledge you gain to improve your environment, family - community and future. Composting is the start of a healthy future!

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Cont'd

Social Media (educational content)



Downloads: <https://polyculture.com.au/soil-services/>

<https://polyculture.com.au/worms/>

Polyculture Services:

WORM FARM CASTINGS

SOIL & WORM FARM BOOSTER

COMPOST & SOIL KNOWLEDGE

HOLISTIC MANAGEMENT SUPPORT

REGEN LAND USE GUIDANCE

ONSITE CONSULTATIONS

-MEMBER OF SOIL SCIENCE AUSTRALIA

