Growing Vegetables in Suburbia

www.underthechokotree.com
Sustainable Living in the Suburbs

By Nev Sweeney

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1.0 Introduction

One of the cornerstones of living more sustainably is using whatever capacity we have, to produce at least some of our own fruit and veg. This is generally recognised as a good thing for a whole stack of reasons, but what actually are those reasons? Ten are listed below -

1. It will save you money – you can save money by growing your own produce and the more of the process you do yourself, the more you save. Growing from seed (rather than buying in seedlings), saving and using your own seed, making and using your own compost and making your own seed raising mix can all help keep your costs down.

2. Growing your own provides fresher produce, improving your family's nutrition – Once a vegetable has been picked the vitamin content starts to decrease so that the older they are the poorer nutrition they provide. While we like to think that we buy only the freshest produce, there is no real way to tell how old it is at the time of sale. If you pick it from your backyard or balcony and cook it straight away or even eat it raw, you are giving yourself and your family the best nutrition available.

3. Taste - Also, there is nothing that beats the taste of fresh, home-grown produce!

4. Lower food miles – it has been calculated that a typical Australian food basket, including fruit and veg, has travelled 70,000 miles to get to you. Each of those miles consumes fossil fuels and pumps greenhouse gases into the atmosphere (and travel by air generates 177 times more greenhouse gases than shipping). If you only have to step into your backyard or onto your balcony to gather the ingredients for a feed, the travel is measured in food feet not food miles, and no fossil fuels are consumed at all!

5. No chemical residues: you know where your food comes from and that it is not contaminated by pesticides – If you grow your food organically you can be sure that there are no residual nasties waiting for you. You know what has and what hasn't been using to grow your produce so you can eat it with confidence.

6. It shows kids where their food comes from – If you have kids, it can be a real eye opener for them to see that carrots, onions and potatoes actually come out of the ground not a supermarket. Also, getting them involved with growing the food they are going to eat is a great motivator for them to develop healthy eating choices. Years ago my kids would love it when I brought carrots in with the foliage still attached, that they could eat raw (we used to call them Bugs Bunny carrots).

7. It enables you to eat a greater variety of foods – If you source your veg from retailers, you can only buy the types and varieties of veg that they are prepared to sell you. Take tomatoes for instance, if you are lucky you may find 3 - 4 varieties in the supermarket, but there are over 200 different varieties available from heritage seed companies which you can grow. Think of all the taste treats awaiting you out there that you don't even know about, growing your own can open up a world of taste!

8. The satisfaction which comes from growing and eating your own produce is amazing. It may be only one of two ingredients but it can transform a whole meal, and it really is special when you make a meal mainly from ingredients you have produced yourself.

9. No packaging to try to recycle or send to landfill – Even organic produce can come packed in layers of plastic film, on a polystyrene foam tray, in a plastic bag and all of that packaging will wind up polluting the environment sooner or later. A big difference I noted when we started to get serious about producing our own food was that the amount of garbage we generated reduced significantly and the amount in our worm food/compostable bucket increased significantly.

10. Reduced environmental impact of fertiliser and pesticide use – The chemicals used in industrial agriculture have a detrimental effect on the soil, ground and surface water, biodiversity and the environment in general. By opting out of that system and growing your own (as well as buying organically grown what you can't produce yourself) you don't encourage the continued use of these damaging chemicals.

You can grow some of your own food. The time to start is now!

2.0 Overview

2.1 How we Grow Annual Vegetables

Providing our own local, organically grown food using Permaculture principles is not only intensely satisfying it also makes great economic and environmental sense. We live on 600m2 in Sydney's greater west and for years I would contribute to the family larder by growing vegetables but what this meant generally was –

1. Cultivating like mad each spring using a petrol powered rotary hoe
2. Buy in lots of manure (primarily chook and horse), spread it around and dig in
3. Buy in a load of straw and mulch everything in sight
4. Buy in a load of seedlings and plant everything in sight.

The result of this fevered action was trickle of vegetables into summer, a glut of just about everything in mid to late summer and then little else from then through to the next spring when the whole thing started again. There had to be a better way!

This current system was not only expensive it was also not particularly environmentally friendly either, so over time I developed a series of processes that has made us much more self-reliant and reduced our outgo and environmental impact at the same time. This is how we did it, using seven innovations developed by others or ourselves –

The Seven processes

1. *Develop a sowing plan*
2. *Put in the Plots*
3. *Raise our own seedlings*
4. *Install chooks*
5. *Save our own seed*
6. *Installing veggie bed covers*
7. *Low tech, high efficiency irrigation*

Process 1 - Developing a sowing Plan

I needed to be able to provide a mix of veggies for us throughout the year and to do that I needed to develop a sowing plan that showed me how much of what veggies to plant when. Seeing as nothing like that existed that I could find, I developed my own.

I got hold of seed catalogues from producers of open pollinated heritage seeds and scoured them to work out what varieties suit our climate and when to sow them. Over the years we have experimented with different varieties of some of the vegetables to spread your growing season. I then worked out (guessed really) how much of each vegetable we wanted to plant at each time, mind you the plan is always evolving and some things we discovered we wanted to grow more of over time, others we reduced because we didn't like them as much or as often as I thought we might.

Then, to develop a sowing plan, I worked out how often we needed to sow/plant out your veggies, based on twice monthly sowings. I then drew up a matrix with the name and variety of each veggie we wanted to grow down one side and the interval of sowing across the top. To make it easy for me to develop and keep up-to-date I use an Excel® spreadsheet on our computer.

Vegetable	Variety	July		August		September	
		Week 1	Week 3	Week 1	Week 3	Week 1	Week 3
Asparagus	Mary Washington			6 plants			
Basil	Sweet	4 plants		4 plants		4 plants	
Beans					1 row	1 row	1 row
Beetroot	Crimson Globe						1 row
Bok Choi					4 plants	4 plants	4 plants
Broccoli	Summer Green	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Broccoli	Royal Dome	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Broad beans	Coles Dwarf	1 Row					
Cabbage	Sugarloaf	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Cabbage	Golden Acre	1 plant		1 plant		1 plant	
Cabbage - Chinese	Wong Bok	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Calendula	Pot marigold		4 plants			4 plants	
Capsicum	California Wonder	4 plants			4 plants		
Chilli	Cayenne	2 plants			2 plants		
Carrots	All year round				Half Bed		
Carrots	Chantenay				Half Bed		
Cauliflower	Phenomenal Early	2 plants					
Cauliflower	Snowball			2 plants			

Fig 1 - An example section taken from my sowing plan, the full plan can be viewed in Appendix 1.

Process 2 - Putting in the Plots

We have seven 1.2 metre x 2 metre veggie plots and seven 1.2 metre x 3 metre veggie plots that are divided by 100mm square wooden borders. Over the last 10 years these borders have started to rot away so I am replacing them with half-width besser blocks.

The plan that I developed allows us to plant one plot out every two weeks, so that if you were to come to visit at any time of the year you would find plots producing veggies, plots growing up getting ready to produce, plots freshly planted out and plots ready to be dug over.

Originally I double dug the plots and even used a small rotary hoe but now we don't dig the plots over at all, we put the chook tractor on them to dig over from above and then mulch to attract worms that come in and dig from below.

Process 3 - Raising Our Own Seedlings

We make our own seed raising mixture based on one part coarse sand, two parts worm castings (from our worm bath) and three parts cocopeat, this is placed into eight cell punnets, one type of veggie sown into each compartment. I fill up the punnets with our

seed raising mix and then use my finger to press down each compartment. I then place the seeds in each compartment then cover the seeds with seed raising mix right to the top of each cell, which aids air drainage (and prevents damping off) and it also shows me which compartments are yet to be sown with seeds. A label finishes the process off.

For large seeds like corn or beans where we need a quite a few they get sown in several (6 or 8) punnets of their own and of course root crops like carrots are sown directly into the plot where they will grow. The full punnets are placed in a cat litter tray almost full with damp coarse sand with an upturned soft drink bottle as a reservoir, to keep them moist. They are left in the greenhouse for about two weeks. Once the seedlings are up and at the four leaf stage they are potted on into rolled newspaper pots filled with the same seed raising mix. They stay in the greenhouse for two to four weeks, that way they get a good start ahead of the pests, and they can be left a bit longer if you get busy or the weather turns bad!

Process 4 - Installing the Chooks

For many years we had chooks in a dedicated chook pen, but after reading about the Permaculture way of doing things we decided to put a chook tractor together so that the chooks could dig over and manure the plots for us, while still providing wonderful eggs. I built the tractor from scratch; it is A-frame in shape and has the same footprint as the 2 metre veggie patches with the bottom surrounded by chook wire and the enclosed top housing laying and roosting areas.

As mentioned earlier, the chook tractor spends two weeks on each bed cleaning and manuring prior to replanting. When it comes time to move to the next bed all I do is cut down the taller stuff with an old machete and then we get on each end of the tractor and carry it to the next bed to be dug over. The chooks love getting onto a new bed and line up along the side of the tractor to watch me cut down the next bed, clucking with excitement.

While the chooks in the tractor dig and manure the plots, we have a “retirement village” for those chooks getting a bit long in the tooth (or is that beak?) to produce eggs. The retirement village is a deep litter system based on locally produced grass hay which they dig over, break down and eat any weed seeds from. The result is used as mulch on the veggie plots and calls more willing workers (lotsa worms) to help break down and cultivate the soil once the chooks have moved on so I no longer need to cultivate at all beyond a light hoeing to break up any compaction due to the chooks, particularly in wet weather.

Process 5 - Saving Our Own Seed

This closes the loop and means that we can develop our own seed varieties over time that are adapted to our climatic conditions. I started out with the bigger easier seed like peas, beans and corn but then graduated to the biennials like carrots and onions and the promiscuous ones like brassicas.

To do it properly we needed to allow room in the beds for veggies to complete their life cycle and of course we needed to start with open pollinated varieties but that was not a problem as we had only been using open pollinated varieties for years. It is then a case of identifying our best examples of the types of veggies we wanted to plant then saving the seed from them.

With a bit of time and effort and some land it IS possible to provide most of your veggie needs, I know because for the past 15 years we have been doing it!

Large Seeds like corn are an easy start to seed saving at home

Process 6 – Installing Veggie bed covers – I noticed the increasing difficulty of getting a decent harvest during January and February some years ago and started fooling around with shade covers for the veggie bed. We have had covers for when I put the seedlings in during the hotter parts of the year for upwards of 15 years, but this was new. The shade covers use 50% shade cloth to knock the intensity of the sun back, allowing the plants to grow and reducing their need for water in the hot weather.

I have tried different types but it appears to me that the best design is to get 50mm irrigation pipe and put it over star pickets, then run a bit of timber along to support the shade cloth. The shade cloth usually goes on mid-spring and comes off mid-autumn, so that we are covered for the hotter parts of the year, but full sun can get through in the cooler parts. Without the shade cloth, getting any harvest at all during summer would be difficult, and our water consumption with be greatly increased.

Process 7 – Installing Low Tech, High Efficiency Irrigation – We have experimented with a number of different types of low tech, high efficiency irrigation but in the veggie patches, ollas are the most widely used. ollas are unglazed terracotta pots, buried in the ground up to their neck, and kept full of water. The water seeps slowly into the ground keeping the veggies moist easily and efficiently. They can either be made from scratch using pottery techniques, then fired or built up using bought in commercial terracotta pots. We have a mix of both. Again, over the years, we have tried a number of low tech, high efficiency irrigation techniques but we keep coming back to the ollas.

1.2 How we Grow Perennial Vegetables

The difference between annual and perennial Vegetables is a fairly simple one, annual vegetables complete their lifecycle (seed sown, plants grow, flower and then seed) in one year. Perennial vegetables complete their lifecycle in more than two years. In between there are vegetables which complete their lifecycles in two years, referred to as biennials. There are quite a lot of biennial vegetables such as beetroot, carrot, kale and onions that are grown as annuals, being harvested before they can complete their lifecycles.
There are a number of advantages that perennial vegetables have –

- Once they are in and productive, they can remain that way for many years and don't need replanting annually.
- They are hardy and look after themselves, requiring less water and fertilising than many annual vegetables.
- They tend to be more resistant to pests and diseases that cause problems for annual crops.
- They can extend the harvest season – around here autumn can be a reduced produce time when the summer stuff has died off but the winter veg is not yet producing and Jerusalem artichokes and chokos are great contributors to our diet.
- They work well with no-till systems, you don't need to dig em up and replant them every year.
- Some like rhubarb and walking onions do well in full shade.

Taking into account the above, why would you grow anything else? Well they do have disadvantages, some, like asparagus, can take years to establish before you get a crop. Others, like Jerusalem artichoke, can take over if you don't watch them and some of the perennial greens can become very strongly flavoured over time. The reality is that we enjoy our annual veg, but growing perennial vegetables complements our harvest of annuals, increasing the variety of foods we grow.

Arrowroot (*Canna indica*)

I originally placed some donated arrowroot them at the south end of our water garden where excess water drains out and while they grow fairly well there, the bananas are encroaching on their space these days. I harvested some of these roots previously and inadvertently put them down on the northern (asparagus) wicking bed in the front yard. It appears they like this area and have competed rather effectively with the asparagus. Some time ago I decided to try them out as food and harvested and peeled the roots and tried them boiled and baked. I was underwhelmed by their flavour. They would be OK if that was all there was to eat. I also extracted the starch from the tubers for use as a thickener in food, and it works well.

Homemade arrowroot starch thickener

Asparagus *(Asparagus officinalis)*

We have been growing asparagus in our front yard in a wicking bed for over ten years. It was so successful that we added a second one slightly north of the first one, but this has not been as successful because the mulberry tree has gradually encroached on it, reducing the amount of light it gets and some accidental arrowroot took over….. I add a bit of soil and mulch each year and not much else, the wicking bed ensures they gets plenty of water. As the spears come up in early spring, I harvest them and then after a couple of months of regular production I let them grow up into fronds. They will then sit there, sending up the odd spear until winter hits and they die back and I cut them off, ready for the process to start again in early spring.

Early spring and the asparagus spears are making their way to the surface

After harvesting is complete, they grow up and return energy to the roots

Broad Leaf Arrowhead (*Sagittaria latifolia*)

Also known as 'Duck Potato', Broad Leaf Arrowhead is a north American food plant which grows in water and produces an edible tuber that can look disconcertingly like an eyeball. It is quite productive but can be invasive so it needs to be isolated from the natural

environment. I got hold of some when buying water chestnuts by mail and bought some arrowhead at the same time. I planted them at the same time and in the same manner as the water chestnuts (see below). We have also eaten them cut up in a stir fry like water chestnuts but find the water chestnuts to have a better texture. They also die back in winter, but sprout more quickly than the water chestnuts in spring.

Arrowhead corm on the left

Choko (*Sechium edule*)

The choko is the mascot (for want of a better word) of our website and we have been growing them for over 25 years. We primarily grow it over an old orange tree (now dubbed the choko tree) in our back yard. We have also grown it over the western wall of the chook retirement village to provide shade as well as chokoes. They grow up over the tree and onto the roof of the garage, and in a wet year they can go so far as to obstruct the solar panels and have to be pruned. They produce chokoes in autumn then die back in winter, providing lots of organic matter for composting system. They are easy to grow and you can start with a single sprouting choko. The young leaves and tendrils are edible and go well in a stir fry, although the older leaves are a bit tough to be palatable. The roots are also edible and have a water chestnut-like texture (At least that's what they seem like to me) We find that while the fruit is edible at almost any size, when harvest small – 25cm to 30cm long –and stir fried, they taste best, with a nutty flavour and crunchy texture.

The choko tree

Choko - Over the Chook Shed

Dandelion (*Taraxacum officinale*)
We don't grow dandelion in the sense that we cultivate it, but we do allow it to grow throughout the back yard and eat it ourselves as well as feeding it to the chooks. For the most part we just eat the leaves, generally in a soy sauce based stir fry with other leaf crops, the salt in the soy sauce reduces the bitterness. The roots are edible as well but we have yet to do anything with them.

Jerusalem artichoke (*Helianthus tuberosus)*

This is another vegetable that is ridiculously easy to grow and is hugely productive, although you do need to keep an eye on it because it can become invasive. Many years ago I bought some tubers from the local supermarket in autumn, then kept them in the fridge and planted them out the next spring. Being aware that they can take over, I planted them in a triangular bed next to the northern fence and at the side of the worm shed. To make watering easier I installed three ollas, also in a triangular pattern. I cover the bed with some mulch from the banana trees and trimmings from other plants once they have died back. They have been there for many years and are still productive, but recently they have started mounting an expeditionary force towards the wood pile. They die back in autumn and we harvest and use them from then to early spring when they start to resprout. They are great roasted or in soups, just be aware they are fairly flatulogenic.

Ollas and partial harvest

The main bed

Making a break for it!

Okinawa Spinach (*Gynura crepioides*)

I was given some Okinawa spinach cuttings by one of the ladies at Permaculture Sydney West and I placed the cuttings in water for a few days so they could grow roots. Okinawa spinach is tolerant of heat and shade, but needs regular watering, is frost tender and if it gets away it can also become invasive. We decided to circumvent any of these potential problems by growing it in a large pot with a central olla, near the front brick wall of the house. It grows well and provides the occasional harvest, while being largely unaffected by the cold and/or dry weather we can experience here. It slows down but does not die back in winter due to the warmer microclimate being close to the thermal mass of the house.

Rhubarb (*Rheum rhabarbarum*)

We grow rhubarb in the front yard in a bed that was originally designed to be a shallow wicking bed, but it didn't really work like that and was converted to a conventional raised bed. About three years ago I decided to convert it to a hugelkulture bed, pulling the rhubarb and all the soil out, placing in a whole stack of tree trimmings and then refilling it with soil. I cut the rhubarb back pretty savagely and replanted it and it has since continued to thrive.

Sweet potato (*Ipomoea batatas*)

Sweet potatoes come in various hues, but from experience I have found that we only like the orange ones, so that is what we grow. While I have tried growing sweet potato in 20 litre buckets, they seem to do best straight in the ground. I originally grew them just by planting out commercial tubers but about 5 years ago I let a tuber grow slips (sprouts) cut them off and placed them in water to grow roots, then planted them out. It worked very well. We grow them in the front yard, in the LUFFA (Longitudinal understory food forest area) where the vines climb around the other trees and shrubs. They also die back in winter somewhat and then come back up in spring. They seem to taste best if they are harvested and then cured for a week or two in a warm dry place. We use them in curries, soups, cut up and fried as chips or just as a steamed vegetable. The leaves are also edible and are included in some of the recipes using greens that we cook.

Taro (*Colocasia esculenta)*

We do grow taro in the constructed wetland in the back yard and, along with some of the other perennials, they die back partially in winter, but not completely – they always retain some leaves which I think is due to the warmer microclimate near the back of the house.

While the root is edible, we do not eat it because it is part of our greywater treatment system and so not suitable for consumption.

Water chestnut (*Eleocharis dulcis*)

Having enjoyed the delights of water chestnuts in Chinese restaurants and later used the tinned ones in our own home made Chinese food, I wanted to try growing them. Initially I tried in plastic pots sunk in a large concrete pot shaped like a half barrel filled with water, but for whatever reason they were never happy and certainly not productive. I decided to try a different tack and got hold of an old metal bath, sunk it in the ground and then put gravel in the bottom. I filled it with water then got hold of some 200mm plastic pots and cut 6mm holes in the side with a small wad punch. I filled them with potting mix, planted the tubers about half way down the pot, filled them up and put a layer of gravel on top to keep everything in place and sunk them into the filled bathtub. They have been growing there ever since. The die down in autumn and I harvest and use them until they start to sprout back up again the following spring. The water chestnut plant is easily distinguishable from the Broadleaf Arrowhead by their thin reedy leaf as opposed to the large arrow shaped leaf of the arrowhead.

Water chestnut on the right

Try Before You buy

Growing perennial vegetables has worked out well for us and I would recommend that anyone interested should give them a go. I have found when considering a new vegetable to grow, and this is especially applicable to perennial vegetables, get hold of some and cook them up for yourself or your family. This can save lots of frustration in the long run from spending all the time and effort growing them, only to have them rejected by the family because they don't like the taste or texture. Good luck!

3.0 Growing Annual Vegetables from seed

3.1 Sowing seed into punnets

Planting seedlings rather than seeds means you can get a jump on the weather by raising the seedlings under plastic early in the season and then planting out when the weather is warmer. Planting well grown seedlings also gives them a jump on pests set to devour frail little plants, and when you plant a seedling you don't waste time and garden space waiting on seeds that are not going to germinate.

The following method also allows you to hold seedlings for a while if you get inclement weather, don't have the beds prepared or life happens and you are short on time. It also minimises transplanting shock on the seedlings too.

Generally speaking, the seeds of root crops like carrots, parsnips and beetroot etc, need to be sown directly into the soil where they are to be grown. If they are started in punnets and transplanted they will not grow well. Large seeds like those of peas, beans, corn etc can also be direct sown but will also work if the following process is used. All other vegetable crops will thrive using the process of sowing into punnets, potting on into newspaper pots and then planting out.

These are some punnets in my collection

I have a world class collection of plastic punnets! They are all left over from when I used to buy seedlings from the nursery and before I realised how easy they are to grow yourself. I use the punnets with eight divisions or cells in them although for larger seeds like pumpkin I can still use the older style with no divisions.

If you are re-using your seedling punnets you should wash them in disinfectant and dry them off before you use them. This is to prevent a build-up of diseases like damping off, I usually use Dettol® or one of the "el cheapo" quaternary ammonium disinfectants

available from the supermarket. Another way is to wash them with soap and water, then put them out in the sun to be dried and disinfected by the sun's rays.

This is the style of punnet I use mostly today

To fill the punnets I make a seed raising mixture that it composed of -.

- 1 Part by volume coarse sand (not brickies sand or the sand that goes in a child's sand pit, that is too fine)
- 2 Parts by volume of sieved (and preferably home produced) compost or worm castings*
- 3 Parts by volume of cocopeat or horticultural coir

Sieved compost (L) Vs Raw compost (R)

*When I started out, I was using compost exclusively, and while being stored in the greenhouse it got a bit of heat treatment which may have killed off any pathogens, I make a cool compost. I started to get problems with the seedlings keeling over from damping off and changed over to the worm castings. That was over 15 years ago and the damping off has not returned so you may take what you will from that.

This is what the mix looks like

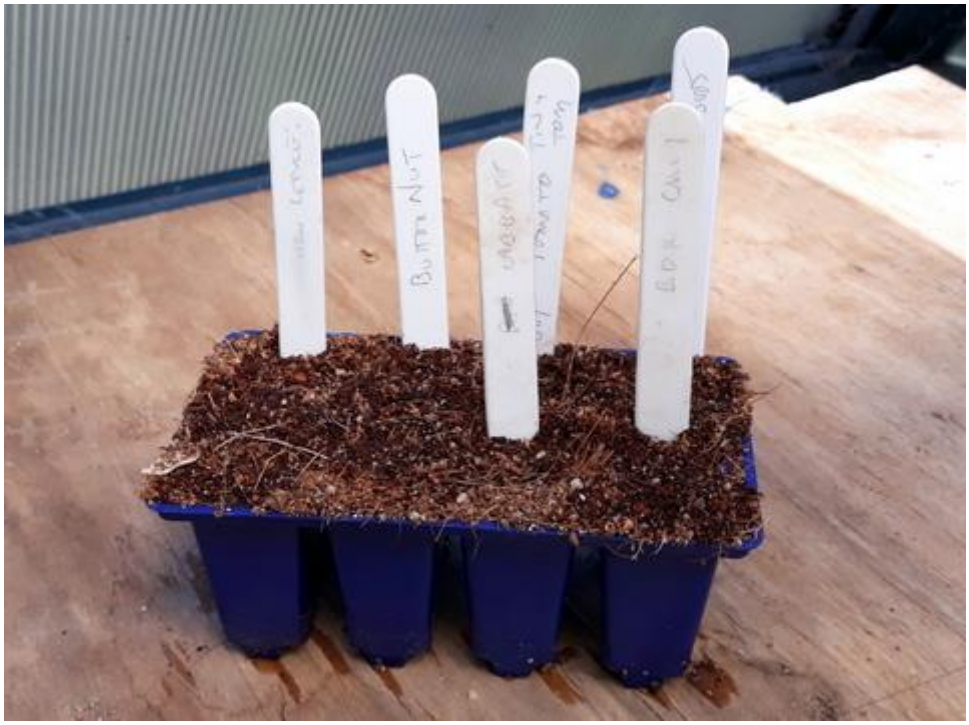
The compost/worm castings give some nutrition and body to the mix, the cocopeat ensures water retention and the sand ensures drainage. I was adding one part of perlite to the mix and also tried vermiculite, but both were expensive so I left them out and it did not seem to make any difference. I use a 500ml plastic Chinese food container as a measure. All of this is placed that wonderful product, the cat litter tray – cheap, available and mind bogglingly useful, more on them later. Mix by hand and voila! Homemade seed raising mixture.

Vermiculite (L) and Perlite (R)

A Quiet Warning

I don't know the technicalities, but some people have gotten sick with Legionella infections after working with commercial potting mixes, when they inhaled the dust. If you keep all your raw materials moist that should keep the dust down and mixing outdoors where there is plenty of ventilation will also reduce the risk. If you are still concerned, purchase an Australian Standards approved dust mask to wear while doing this work.

One of the things about buying commercial seedlings in punnets is that you get a load of the same veggie seedling at one time, meaning that they will all get planted out together and then be ready to harvest together. This means that some will bolt to seed or become over ripe before you can consume them. To avoid this eventuality, I use eight cell punnets and then sow a few seeds of each type or variety of veg in each cell. This is the way our system is designed to work by providing a continuous small harvest which is consumed quickly rather than a large harvest at once which then needs to be preserved. There are some exceptions to this such as corn and onions but this is the system we have been running successfully for over fifteen years.



A punnet sown and labelled

To sow your seeds in these punnets, place your homemade seed raising mix in the punnet and firm it down with a finger, leaving a small depression in the centre of each cell. Place a few seeds into the depression and add a light cover of potting mix over the top and press down gently to give good seed raising mix to seed contact. As a rule of thumb, seeds should be sown a maximum of two to three times their diameter deep into the soil or seed raising mix. Some seeds, such as lettuce, will germinate better if they have access to light and so should be sown more shallowly.

The veggies have sprouted!

The surface of the seed raising mix should be flush with the surface of the punnet so that there is good air drainage, otherwise still, moist air can favour damping off, a fungus which causes the new seedling to look pinched where they emerge from the soil, killing them. Label the division with a tag (These can be cut from an ice cream carton with scissors) showing the vegetable type and variety, plus sowing date if required. Follow this process for the rest of the punnet divisions.

Once the punnet is full it needs to be kept warm and moist until the seeds germinate, but watering from the top can wash the seeds out of the seed raising mix so they need to be watered from underneath. The easiest way to do this is to make a capillary bed by getting one of the aforementioned cat litter trays and half filling it with coarse sand (fine sand will crust over) I use the same sand I add to the seed raising mix. Add a couple of bottles as water reservoirs and you are good to go!

Capillary bed in action

Place the punnet(s) on the sand and then water the sand until there is just a little free water over the top of the sand. The seed raising mixture in the punnet will absorb the water through the bottom by capillary action eliminating the need to water the punnets directly. Also, the sand will form a reservoir of water reducing the amount of the attention needed by the seedlings. In hot weather place the capillary set up under some shade cloth and in cold weather make a small plastic house, green house or cold frame to keep the seedlings warm. More detail on making a capillary bed is available in Section 3.0 of this eBook.

To ensure a continuing harvest of veggies, I sow a mix of veggies into punnets twice a month. They are then potted on into newspaper pots somewhere between two and four weeks after sowing (depending on time of year) and then planted out two to four weeks after that (depending on time of year). The seeds will take longer to germinate and are slower to grow after potting on in the colder parts of the year.

3.2 Potting On

Once the seedling has grown to the four leaf stage, it can be potted on into a larger single container to grow further until you are ready to plant it out into the veggie bed. Originally, I used to do this by making up a potting mix that is a bit richer than the seed raising mix –

1 part by volume of coarse sand
2 parts by volume cocopeat
3 parts by volume sieved compost
But I found the original seed raising mix worked just as well so I now use that mix alone for both operations.

I used to pot the seedlings on into 100mm lengths of cardboard tube that I was getting from where I was working at the time (They are the spool around which paper for the plotter is wound) which were thrown out. To start off with I coated them in wax and the used a wooden slug to push the seedling out so that the tubes were re-useable, but I found that the transplanting shock for the seedling was considerable and after 2 or 3 uses the tubes carried all sorts of bugs that caused damping off etc. so I gave up on that idea and used them uncoated as a single use only, allowing them to rot down and allow the roots out into the soil over time.

The old system

However, I left that place of employment and after 12 months my stock of tubes had depleted, so I moved over to making newspaper pots to do the same job. The seedlings did much better in the newspaper pots and the newspaper pots rot down much more quickly than the cardboard tubes did anyway!

To pot the seedlings on I fill a newspaper pot with seed raising mix then push a hole down the centre of the mix in the pot with my finger. I then dig the seedling(s) out of the punnet with my space age technical potting on tool (a paddle pop stick). I push the stick down into a cell of the punnet and then push it back while lifting, levering the seedlings, their root mass and the seed raising mix out of the punnet. This minimises damage to the seedlings.

My potting on tool!

I tease the mass of roots and seed raising mix apart and choose the largest and most well grown seedling(s) to pot on, keeping as much of the seed raising mixture around the roots as possible. I place the seedling gently into the newspaper pot, then top the newspaper pot up to level with the edge and place it in a plastic flat (designed for holding punnets) which holds 20 newspaper pots. I carry the freshly filled newspaper pots out to the greenhouse then place them directly onto a capillary bed to keep moist until they are ready for planting out.

3.3 Direct Sowing

As mentioned previously, the seeds of root crops need to be sowed directly where they are going to grow if they are to thrive, and large seeds can be direct sown into veggie beds rather than raised as seedlings first. This requires no specialised equipment or training (although a trowel can help to loosen any compacted soil) just some appropriate seeds and a place to grow them. However, each veggie has their own requirements in terms or sun, water, nutrients, soil pH, planting time and so on, so before sowing it is worth doing a bit of research to make sure that will do OK where you are intending to sow them.

Loosening up the seed bed

When it is time to direct sow, check the soil to make sure it is level, moist and has a fine tilth, especially when sowing small seeds like carrot, and that there are no sticks or rocks to inhibit the seedling's growth. This is also a great time to check for and remove any weeds growing in the area.

Seed bed ready to go

Sowing depth is two to three times the seed diameter. For larger seeds you can dig a furrow at the correct depth, sow the seeds the correct distance apart and then cover them over with the surrounding soil, or push them into the damp soil with your finger as I do with our peas and bean seeds. Smaller seed like carrot needs a bit more care and can be sown onto the surface of the bed and then covered with a light dusting of soil, sand or cocopeat.

Pushing in the bean seeds

Once sown, larger seeds can be given a light layer of mulch (1 -2 cm) to maintain soil moisture, but smaller seeds may find it difficult to make their way through a mulch so the soil should be left bare until the seeds have sprouted. In any case, it is important to ensure that the soil stays moist until the veggies are poking their heads through the soil, as this will also prevent a crust forming on the soil that inhibits sprouting.

3.4 Planting out

When the seedlings have grown enough, this is usually 4 to 6 weeks from sowing, they can be transplanted directly into the bed newspaper pot and all, the pot rots away and allowing the seedling roots to push through into the soil. Generally, seedlings should be transplanted in the late afternoon or early morning to minimise transplanting shock due to drying out of the seedling by the sun, but when using the newspaper pot method this can be less of a problem. More on this later.

The chook tractor doing its job

The bed that the seedlings in newspaper pots are to be planted out into will have had the chook tractor on it for a period of two weeks, during which time they will have dug it over, removed any weeds or leftover crops and thoroughly manured it. Once the chook tractor moves on, the patch will be mulched with 4cm to 6cm of straw mulch which has been dug over and thoroughly gone through and any remaining wheat seeds eaten by the chooks in the retirement village. During this process they will have broken the straw stalks down and added their quota of high nitrogen manure to the straw.

A mulched bed

Only once these processes are completed is the bed ready to receive the veggie seedlings and depending on the time of year, the time between the chook tractor moving on and the seedlings being planted may be a week or two or up to a month.

The usual process of potting on is simple enough, a narrow trowel is used to move the mulch aside and dig down into the soil until a hole in the soil is produced a bit larger than the newspaper pot. The newspaper pot is lowered down into the hole and the surrounding soil scraped in to ensure the seedling is stable and well covered with soil. For plants that send out adventitious roots like tomatoes, the hole will be a bit deeper and the soil heaped up around the seedling to provide extra room for the roots.

Mulched bed, planted out

Each of the seedlings will be planted into a pattern, starting with four seedlings across the width of the bed, followed by three in the next line, then four, then three and so on until the bed is filled. The resulting pattern allows the veggies to be roughly 30cm away from their nearest neighbour, maximising space while allowing room for the veggies to spread out as they grow. As well as planting out the seedlings using this pattern, the seedlings are interplanted, that is to say (as much as possible) the seedlings of the same vegetable family are not planted next to each other. This can reduce issues due to pests, diseases and can increase yields by allowing closer plantings.

Corn grown in a block

There are some exceptions to these planting rules, such as corn, which needs to be grown in a block to ensure cobs are wind fertilised and onions which we grow, harvest and process as a single crop.

3.5 Sun Protection

Originally I found, that while the late afternoon planting works in spring and autumn, planting seedlings in the full heat of a western Sydney summer causes a certain mortality rate anyway, so I developed a movable shade cloth frame. I used it when planting out during the hottest times of the year. Since I operate with standard size beds, I had two half size and two full size covers and they did the trick. By the time the next bed needed it, the original seedlings were strong enough to take the full sun.

Seedling sun shade

Unfortunately, with the effect of climate change, the western Sydney summers are getting hotter and it seems as if the sun is getting more intense, so about ten years ago I came up with the idea of installing semi-permanent veggie bed covers. The framework stays in position all year, but sometime around mid-spring, 50% shade cloth covers get installed and stay in place usually until sometime around mid-autumn at which point they are removed and placed in the shed. More details on the veggie patch covers can be found in Section 8of this eBook.

Semi-permanent cover for three veggie beds

4.0 Veg Growing for the Time Poor Gardener

We never seem to have enough time these days, to do all the things we want to do. We understand all the benefits that accrue by growing our own food, but who has the time? Food growing can be a time consuming (if wonderful and productive) pastime, but it doesn't have to be. Here are some tips on growing your own food that won't leave you starved for time.

4.1 Soaks

The idea behind 'soaks' is that you take a nut or seed and soak them for a few hours so that they swell and start to germinate. The process is a quick one and you can eat some, such as pumpkin, in as little as 4 hours. Nuts and sunflower seeds are usually soaked overnight.

To grow your soaks, measure out 4 cups of raw, unsalted, nuts/seeds into a medium sized bowl and cover with filtered water so that nuts are fully submerged and have at least an inch of water above them. Allow to stand covered on the counter for about 7-8 hours, or overnight (check below for more specific times), rinse nuts to remove the enzyme inhibitor residue, enjoy!

Soaking Times
Almonds – 12 hrs; cashews – 2 hrs; chia seeds – 2hrs; flax (linseed) seeds 2hrs; hazelnuts – 8hrs; macadamia nuts – 2hrs; Peanuts – 12 hrs; pecan nuts – 8hrs; pine nuts – 2hrs; pumpkin seeds – 6hrs; sesame seeds- 6hrs; sunflower seeds – 4 hrs

4.2 Sprouts

Sprouting seeds is still a very quick process that can produce a harvest of fresh vegetables in less than a week, requiring only minutes a day. It can accomplish this miracle with little more than water, seeds and a sprouter of some description, such as a recycled glass jar with a mesh top. There are also a whole stack of commercial sprouters out there if you don't want to bother throwing together one of your own (even though it is easy and cheap).

Sprouts using the jar method

The process is simple; place the seeds you wish to sprout in your sprouter of choice, soak them for a few hours to overnight, drain the water out through the mesh top, and leave it sitting on its side, top down, to continue draining. Then rinse twice a day, morning and night until they reach your desired state of maturity. Then eat them cooked or raw, they are full of vitamins and minerals; a quick, easy nutritious feed! They will generally be ready in a few days to a week. If you like mung bean sprouts, there is a process just as quick and easy, but uses a kid's lunchbox.

Seeds that fit well with the sprouting methods - alfalfa (lucerne); adzuki beans; barley; chick peas; wheat; millet; buckwheat; lentils; sunflower; fenugreek; sesame; cannellini beans; kidney beans; soy beans; most brassica seeds (cabbage, broccoli, cauliflower).

4.3 Microgreens

Microgreens are sort of the next process along from sprouting in terms of timing. They require some seeds and soil in a tray, access to light and of course, water. More details about several ways of growing your microgreens are available here and here. In general terms you get some seed raising mix, press it into a container, sow seed quite thickly on top, cover with more mix and press down. Water and watch! When the microgreens get their first lot of true leaves (ie at the four leaf stage), harvest them with a pair of scissors and eat! They will mostly be ready in a week to 10 days.

Seeds which work with microgreen methods - Herbs such as – rocket, basil, coriander, mustard, fenugreek; Vegetables such as – Asian greens (mizuna, mibuna, tatsoi, pack

choi) Beets, brassicas (broccoli, cabbage, kale), celery, garden cress, endive, lettuce, peas, radish; Grains such as – barley, oats, wheat, linseed, buckwheat and sunflower.

4.4 Soil Sprouts

This is kind of a cross between sprouts and microgreens. Seeds are soaked and used to cover a soil filled container (without drain holes) and left in the dark for 4 days. The container and the sprouted seed is then transferred to a windowsill to green up for a few days. The windowsill does not need to get full sun. The soil sprouts are then harvested by cutting just above the seed with scissors and used in salads etc.

4.5 The Veggie Patch

While it can take a bit of time and preparation if you grow the right types of veg, you can still have a feed with the minimum of fuss and effort if you use one (or more) of the techniques listed below.

Fast growing veg

A fast game is a good game and fast growing veg need attention over a shorter time before you get the payoff, ie you get a feed. Green leafy veg are generally quick growing, giving you a yield between 30 and 60 days depending on the variety, but radish is the poster child for quick yields, giving you an edible harvest within a month. If you can leave things for two months before you need to harvest you get a much better range including dwarf beans, beetroot, cucumber (just!), kale, some lettuces and more leafy Japanese greens, spinach, turnips and even zucchini.

Cut & come again

Use cut-and-come-again veggies – If you grow a cauliflower, as nice as it will be to eat, once you have harvested it the growing space will be non-productive, require replanting and it will take some time before it is harvestable again. If you plant

vegetables which can provide an extended harvest period by re-growing after partial harvest this will increase your overall productivity. Cut and come again veggies include Asian greens (mizuna, mibuna, tatsoi) non-heading lettuce eg oakleaf, celery, silver beet and spinach will allow multiple harvest if you only cut side shoots and leave the growing head intact. Sprouting broccoli will also produce side shoots after the main head is harvested.

Silver Beet is a quick grower and a good cut-and-come-again veg

Perennials

Consider perennial vegetable beds – Perennial veggies are the parts of plants which are harvested and eaten like vegetables but where the parent plant lives for more than two years eg asparagus, Jerusalem artichokes, chokoes, Malabar spinach and taro. Generally we tend to eat rather more annual vegetables than perennials and so annual vegetables are the type that make up the bulk of our veggie patches but it is worth growing and trying perennials for an easy feed and to broaden our tastes. While some perennials like asparagus and artichokes are available only for a short season, others like shallots and rhubarb crop for extended periods.

There should be a place in everyone's veggie growing efforts for perennials, if for no other reason than they are easy to care for. They do not require much time other than to apply a bit of organic fertiliser every so often, and the occasional bit of water, not to

forget the harvest (yum) but they are generally resistant to the attacks of pests and diseases and content to sit there and grow, requiring little beyond the minimum intervention from the gardener.

An easy to grow perennial? The redoubtable choko of course!

Start Small

It may sound stupid to say, but if you don't have a lot of time to commit to food growing, start small. A one metre by one metre patch is a great start. Your enthusiasm can get the better of you, and cause you to start a patch you can't maintain which will only result in burnout, disillusionment and tossing the whole thing in. So start small and then when you are confident you can handle your initial veg patch with the time you have available, only then consider expanding your veggie growing enterprise.

Mulch

Mulch works in a number of ways to help the time poor gardener. It provides nutrients as it rots down, reduces evaporation so you need to water less, when it does rain, rather than the rain compacting the soil and running off, the energy is expended by hitting the mulch and the water infiltrates into the soil. One down side is the need to get water under the mulch, but the time saving watering techniques below will accomplish that once in place.

Watering

If you are time poor, then the last thing you will be able to do is spend hours watering your precious veggies to ensure a good crop, and you also don't want to waste water. Following are a couple of ideas which, although they may take a bit of time to set up, will save you lots of time once they are in place.

– Wicking bed – These are generally raised beds, although they can be constructed as in-ground beds as well, the idea being that there is a reservoir of water constructed below the growing medium. This keeps the plants hydrated, means less frequent watering and more efficient watering because the water is not going onto the surface so none is lost to runoff or evaporation.

Wicking bed partially filled, with asparagus crowns in place

- Self watering pots – in a similar way these pots/growing containers are constructed with an open space under the growing medium to hold water. There is a central tube/pot extending down into the water to allow the water in the reservoir to keep the growing medium damp by capillary action. Commercial types are available but most have very small reservoirs and so are a gimmick more than anything, Details on how to construct your own are available **here**.

- buried pipe – while this is designed for in-ground/raised bed applications it can be used in large (OK very large) containers. The basic idea is to wrap some drain matting (non-woven fabric) around slotted pipe (referred to as agricultural or ag pipe) and then bury it 50mm to 100mm below the soil surface. Water is fed into a filler pipe and moves around the pipe, slowly making its way into the soil. There are limits to the size of the system and a series of filler pipes along the buried pipe may be required. More details are available **here**.

Ready to go in the ground

- leaky pipe – this is made from recycled rubber and is buried in much the same way as the above buried pipe but needs more pressure to operate. A series of smaller runs is better than one long one, because in a long pipe the pressure drop would be too fast to keep the furthest parts of the area watered. More details are available **here**.

Fertility

There are also a few techniques you can use to help maintain fertility that don't take too long to implement, but it is easiest if you set up your growing area to be fertile and organic first using such techniques as sheet mulching or no-dig gardening. It takes some time but it is worth it in the end.

- **Worm tower** – the idea behind a worm tower is that you install one (or a number, depending on the size of your beds) centrally, install worms and then on a regular basis top it up with organic materials like veggie scraps and such. You're going to need to toss your veggies scraps anyway, so why not toss them into a worm tower? More details here. (note: the worm tower in the article was put together for fruit trees, but I have used them in a number of veggie beds and the principles still apply).

- **Fertiliser sausages** – these were originally designed as a slow release feed for fruit trees, but could also be adapted to veggies by running them down the centre of a bed. The idea is to get some fabric, hessian bags (free from coffee roasters) and then put manures, wood ash, blood and bone, rock dust, seaweed or whatever in them, roll them up, tie them and put them in place. They will slowly break down over time, keeping those veggies fertilised.

- **chook tractor** – the idea of a chook tractor is that it is a chook hutch with no bottom that sits over your veggie patch(es). The chooks dig up and manure your veggie growing area while providing you with tasty eggs. We have operated this system for over 12 years and it works a treat. More information on how we made and use our chook tractors is available here.

Got a few minutes?

If you find some time during the day, be it only a few minutes, you might want to invest it in one or more of the calming and rewarding activities listed below, so that you can make the most of your time in your garden –

 Harvest vegetables, herbs and fruit, whatever you have available that is ripe.
 Check the health of the plants (ie look for pests and diseases).
 Monitor weed growth – and pull a few out.
 Check soil moisture (ie stick your finger under the mulch and see if your beds need water).
 Enjoy the fresh air, sunshine, the hum of insects and the songs of birds!

5.0 Leaf Crops, sustainability and resilience

There is a wonderful quote at the start of the Happen Films Documentary **"Degrowth in the Suburbs"**, from Sam, one of the owners of the property. He says – "It's interesting how much overlap there is between the practices of Sustainability and the practices of resilience, in this context almost 100% overlap". Of course one of the practices to which he refers is growing food at home, and it is my contention that a substantial contribution to both greater sustainability and greater resilience can be gained by growing leaf crops.
Leaf crops (AKA 'greens') are crops which are grown primarily so we can eat……..their leaves (a revelation I know!). They have peculiarities in the way which they grow (eg shallow root systems, short time to harvest and shade tolerance) and a variety of ways in which to grow them (eg catch cropping, cut-&-come-again or the "Eat all" technique), and then consume them (eg smoothies, braised or steamed). They can greatly facilitate our efforts to live more sustainably and increase our food resilience.

Silver Beet - A staple we grow all year 'round

While this article deals mainly with cultivated leaf crops, it should also be noted that they do come in three major varieties –

Cultivated ie they are grown commercially or in the back yard to provide leaves for us to eat - eg, amaranth, bok choi, cabbage, collards, chicory, coriander, endive, kale, lettuce,

Malabar spinach, mibuna, mizuna, Okinawa spinach, rocket, silver beet, spinach, sorrel and tatsoi.

Wild (AKA weeds or wild herbs) which are naturalised in many countries around the world and are generally regarded as weeds (ie a plant out of place) and despatched summarily, but which can also be foraged and eaten eg catsears, (flatweed), chickweed, dandelion, dock, fathen, mallow, plantain, prickly lettuce, purslane, sow thistle and stinging nettle.

Accessory – These are attached to productive plants we grow for other reasons but which are edible in their own right eg, beetroot, cauliflower, choko, peas & beans, radish, sweet potato and turnip.

(Note: While not every point listed below applies to every leaf crop mentioned above, they will apply to the majority of them.)

5.1 Advantages

Leaf crops have a number of aspects which can be turned to our advantage when growing them for food, either by themselves or in combination with other plants –

They have comparatively **shallow root systems** –while this means that they require regular watering, (but not to water so deeply as to waste water) it also means that they can be grown amongst other species which have deeper root systems with little or no root competition between the species. For example interplanting a leaf crop such as lettuce with deeper rooted tomatoes will allow both plants to coexist happily.

Short Time to harvest – some slow growing popular crops like cauliflower, celery or eggplant can take 100 to 120 days from sowing to providing an edible crop, but the majority of leaf crops produce worthwhile food in half that time, 50 to 60 days. Cabbage is an exception, taking 105 to 120 days to producing a harvestable head. Short time to harvest leaf crops include: amaranth (50 days), bok choi (60 days), collards (40 days), coriander (30 days), kale (50 to 60 days), lettuce (40 to 50 days), Malabar spinach (70 days), mizuna (40 to 60 days), mustard (30 to 50 days), rocket (60 days), silver beet (40 to 60 days), spinach (40 to 50 days) and tatsoi (40 to 50 days).

Nutritional requirements – leaf crops particularly use nitrogen so a high nitrogen fertiliser like bird manure (chook, pigeon etc), liquid manure, diluted urine (in a pinch) or following legumes in your crop rotation program. If you can get hold of them, lucerne chaff, cottonseed meal and soy meal provide a slower release nitrogen along with small amounts of phosphorus and potassium, when incorporated into the soil or used as mulch.

Shade Tolerance – leaf crops can get by with three hours of direct sunlight per day or less so they are an ideal crop where shading is an issue. This can be particularly handy when the shading is provided by things which are difficult to move such as buildings, tall trees or solid fencing.

Curly Kale is another popular leaf crop

They can be **grown all year** and replanted into a single plot if required, provided that correct crop rotation protocol is followed. It is counterproductive to grow the same crops in the same ground year by year due to depletion of nutrients and build-up of pests and diseases. One way to prevent this is to develop a crop rotation plan.

There are various schemes for developing a crop rotation plan but one of the easiest is to make sure that you don't sow plants from the same family, in the same plot, two seasons running. Leaf crops make this easy for you because they belong to half a dozen different plant families, allowing the same growing area to support a number leaf crops over time, provided to make sure to choose plants from different families.

Plant families of common cultivated leaf crops:

Apiaceae – Coriander, parsley
Amaranthaceae – amaranth, spinach
Asteraceae – chicory, endive lettuce
Basellaceae – Malabar spinach
Brassicaceae – cabbage, collards, kale, mibuna, mizuna, bok choi, mustard, rocket, tatsoi
Chenopodiaceae – silver beet,
Polygonaceae - sorrel

5.2 Techniques of Growing

Interplanting – Due to their shallow root systems, and their shade tolerance, leaf crops can be planted in the same bed as deeper rooted, crops such as corn or tomatoes and still provide a reasonable harvest. This practice increases the yield on a given piece land and can also deter pests.

Catch cropping – This is the practice of planting a quick growing crop between main crops of vegetables. So that if you have some space after your winter vegetables have been harvested but the summer vegetables are not quite ready to go in, a quick leaf crop can provide a yield for an area which otherwise would not be able to.

Growing in Containers – Leaf crops being shallow rooted comes to the fore again, making it easy to grow them in containers. This has a number of advantages, particularly if you are in rented accommodation and/or only have a small space in which to grow things, like a balcony. Growing leaf crops in containers will allow you to take your food with you if you have to move and also to "follow the sun" and move them around make the best of available light if that is a restriction on where you are growing.

Cut-and-come-again Croppping – most leaf crops will allow you to spread the harvest by continuing to grow after you cut off and eat the outside leaves if you don't remove the central growing point, rather than harvesting the plant as a whole. You can start early, when the plant is just beginning to mature, and cut the leaves cleanly off at the base of the leaf stem. The plant will continue to produce new leaves from the central growing point as the older leaves become available for harvest from around the outer base of the plant. In that way, a few leaf crop plants can keep you in nutritious greens for months.

The 'eat-all' method - This method of leaf crop production was developed by Carol Deppe, and described in her book "The Tao of Vegetable Gardening". The idea is to sow seed for an "eat all" leaf crop thickly into a well prepared and fertile growing bed or even a 15cm bed of compost over concrete or whatever. Then use a grass rake to lightly cover the seed and water well. The plants are kept watered and grown quickly until they reach about 25cm high, at which point they are harvested by using a sharp knife to cut off the top 18cm or so, which can then be cooked and eaten, frozen, or dried. It might require a bit of fooling around with timing and varieties to suit a particular region, she says that 'green wave' mustard works well for her area.

Dandelion - a multipurpose plant and wild green which almost grows itself

Sowing thickly then thin out – The idea is again, to sow a leaf crop thickly onto a prepared seed and water it well to assist germination. When the seedlings come up it is just a case of harvesting the greens by pulling them out to thin the crop. This allows some to grow longer and achieve a bigger size, while the thinnings are eaten immediately as a salad crop or included in stir fries or whatever. This will spread the harvest so that while some of the crop will reach maturity, the majority will have been eaten regularly along the way as a delectable young leaf crop, while still allowing a reasonable harvest at the end of the growing period.

Sprouts – some leaf crops can be prolific seeders, (such as almost any of the brassicas) but may also cross pollinate with other crops of the same family which happen to be flowering at the same time. It makes sense to keep only your best seed which has been gathered so that it is guaranteed to remain true to the parent variety, but what if you have seed of unknown or suspect quality? They can still be eaten as sprouts or microgreens because in either case the plant is harvested at a juvenile stage. In terms of sprouts, the easiest way to grow them is to get a large glass jar and cover the open end with mesh (such as discarded panty hose) and secure it with a rubber band. Remove the mesh and pour in one or two dessertspoons full of seed and re-attach the mesh. Half fill the jar with water and leave it overnight. Pour off the water the next morning, then refill and empty the jar with water (by pouring straight through the mesh) morning and night until the sprouts are well grown enough to harvest, say 7 to 10 days depending on the type and variety of leaf crop and the time of year.

Microgreens in a similar way the seed is sown thickly in a seedling flat, kept watered and allowed to grow to the four leaf stage or a bit larger, then harvested at the soil surface with a pair of scissors. In both cases all that is needed is to produce some edible leafage and stems, so whether the crop is true to the parent stock is immaterial.

As a component in a Guild – According to Bill Mollison, a guild is - "a harmonious assembly of species clustered around a central element (plant or animal) that acts in relation to this element to assist its health, aid our work in management, or buffer adverse environmental effects." This can translate into a design around a central tree such as a fruit or nut tree with a whole lot of productive species planted around it, to support the central tree, but also increase the yield of the area as well. Leaf crops, with their ability to grow quickly, not compete with deeper rooted species and tolerate shade are ideal to include in the species being grown.

Use as a component in green manure – while this does not allow for direct harvest and consumption, it promotes healthy fertile soil allowing subsequent crops to be more abundant. Green manures are used to improve the fertility of vegetable areas by growing suitable plants, quite often grains and legumes but leaf crops area also valuable, and then cutting them down before they flower. The resulting organic matter can be either left on the surface of the soil as a mulch or dug in to increase soil organic matter. Either way the fertility of the soil is increased for the next crop.

5.3 Eating/Drinking

Nutrition
Leafy vegetables contain significant amounts of the vitamins A, C, E and K as well as folate and the minerals calcium, magnesium, potassium and iron. Some are also valuable sources of omega-3 fatty acids. They also contain fibre, with each cup of leaves contributing to around a gram of fibre to our diets but are low in calories and carbohydrates.. Leafy greens are also rich in phytonutrients and chlorophyll.

Smoothies
There have been many scientific studies which have shown a link between a reduced risk of illness and increased consumption of fruit and veg, and while I personally am not a fan (to be good for you, you have to be able to keep the smoothie down) many people consume leafy veg in the form of smoothies.

Cooking Leaf Crops
- Wilted or steamed greens – leaf crops can be wilted by first washing them, then placing them in a pot and cover then cook for one to three minutes until they are wilted and bright green in colour. Remove them from the heat and serve with salt and pepper or a drizzle of soy sauce. Steaming them requires putting the leaves in a pot with 5mm of water in the bottom, covering and cooking for a couple of minutes.

- Sautéed Leaves – heat some oil in a large pan or wok to medium heat, then add the leaves in batches and stir gently until they are all in the pan.

- Blanching (should be done before freezing leaf crops to preserve them) – remove the stems and wash the leaves well. Bring a large pot of water to the boil and plunge the leaves in, allowing them to cook for a minute or two, then remove them from the boiling water, drain and chop. They can then be frozen, or added to soups and stews.

The humble choko – grown for its fruit but we can eat the leaves!

- Braising – start out as for sauté as above then sprinkle some salt over the leaves and add a small amount of liquid (water, stock etc) to keep the pan moist, think about 12mm of liquid in the pan, then continue to cook the leaves until they are just tender.

Any of the above techniques may be improved by cooking some onions and garlic in the pan prior to adding the greens, or the greens can then be added to soups, stews or casseroles towards the end of the cooking time.

There is a wonderful Greek dish called horta which will work with cultivated or wild greens, that involves wilting the leaves as above and then adding some olive oil and/or lemon juice

at the end. I am a bit Anglo for that so I add in onion and garlic and fry it up, then add in a jar of our diced tomatoes, then toss in the leaves and braise until tender. Other recipes for your well grown leaf crops can be downloaded **here**.

5.4 Preserving

There is no doubt that the best tasting leaf crops you will ever enjoy are the ones you harvest directly from your backyard, cook and then eat within half an hour of harvest, and if you plan it out you can grow leaf crops most of the year to facilitate this. You may, however, also want to put some aside if you grow a big batch or for when the weather becomes inclement in your area.

- Fermentation
Think cabbage and sauerkraut, but many wild and cultivated leaf crops will introduce a very strong flavour to the ferment. If you find you like this flavour that is a good thing but if you find it to be a turn off after preserving 500 litres of the stuff, then that could be a problem. So, the hint is – if you are planning of growing large batches of a particular leaf crop and want to preserve it by fermenting, try a small batch of the ferment first. If you like it all well and good, if you find it to be a very effective emetic, you haven't lost much. If you are already into fermenting, try adding some leaf crops in small amounts to other vegetable ferments which you are comfortable with.

- Freezing
This is probably the most effective way of preserving leaf crops. Process the leaves to be frozen by washing them, cutting out the stems and then chopping them. Bring a large pot of water to the boil and prepare large a bowl of ice water. When the water is boiling, immerse the chopped leaves and cook them until they are bright green and barely tender. This should take somewhere between 30 seconds up to a couple of minutes for the tougher leaves. Drain the leaves once the time is up and plunge them into the cold water and stir around to cool them down quickly. Remove and dry as well as possible, force down into containers to remove as much air as possible, label and freeze.

- Dehydration
This may not be the best method for preserving your excess greens but can work with the tougher leaves like kale, collards and spinach. Wash and dry the leaves thoroughly and cut into roughly 2.5cm squares. Dehydrate spinach for 6 to 8 hours at 45°C, kale and collards for 8 to 10 hours at 55°C. Store in a sealed container.

Leafy vegetables (or 'greens') are easy to grow and healthy to eat, and with little effort can be grown year 'round. What more do you need to make it worth adding leaf crops to your sowing plan and your eating plan?

6.0 Irrigation

6.1 Ollas

Ollas, big and small

Ollas (Spanish: pronounced oyyas) are unglazed terracotta pots, filled with water and then buried so that the water moves out of the pot over time and into the soil, thus irrigating plants. I was making them from scratch, moulding and firing them as part of a pottery group, and while I had made almost half of the number I needed, it was a slow process and was getting expensive. I was also second guessing myself, did they really work that well?

That was until one day towards the end of last summer at the tail end of a 4 month dry spell. I was inspecting a couple of veggie patches, one was lush and quite productive, and the other one just wasn't happy, with the plants growing in it looking decidedly wilty. When I worked it out the difference between the two veggie plots was that the lush one had ollas and the wilty one had no installed irrigation, just watering with the hose. Time to go full steam ahead on the olla project!

Sanding the top rim

To reduce costs and improve the turnaround time I decided to buy in traditional terracotta pots (unglazed of course) and use them to make the ollas. A word of caution, though if you intend to do a similar thing – having identified youy supplier of pots, buy two, make an olla, and then fill it full of water ie test the pots out before committing cash to buy a stack of them. Make sure the water will move through the terracotta that makes up the pots. If you are making them from scratch then you have some control over firing temperatures but you will have no idea about ones which you buy premade. If the firing temperature is too high they might not be porous enough so try before you buy.

Water is moving through the terracotta, she's good!

Assuming you have sampled and tested the pots and found them to be acceptable, the process for turning them into ollas is fairly simple –

1. You will need 2 pots to make an olla, take the one which will become the bottom one, cut a piece of thick plastic (I use thick polythene bags used as packaging), sit it on your working surface and place the hole in the pot on top of it. Fill the hole in with waterproof silicone material, dispensed from a cartridge gun is easiest. Allow 24 hours for the silicone plug to cure.

2. Get hold of some sheets of 200 grit sandpaper. Tack a sheet down abrasive side up to a piece of plywood, pyneboard etc larger than the sheet of sandpaper using drawing pins or similar.

3. Turn both halves of the olla (pots) so the rim is down and rub them on the sandpaper in a circular manner so that the normally rounded rim is worn down to a flat profile, this will allow the silicone joining each half to form a better seal. Warning – the dust generated by this operation will contain crystalline silica and should not be inhaled. Do the sanding outside with good ventilation but if you are still concerned wear a P1 dust mask.

4. Wipe off any dust left over from the sanding operation from each rim. Using the cartridge gun loaded with a silicone cartridge, run a bead of silicone around the rim of the bottom pot (the one with the drainage hole plugged) the width of the pot rim. Then invert the top pot and place it rim down on the siliconed rim of the bottom pot. To ensure a good seal, run your finger around the join to smooth the surface off and make sure all parts of the join are sealed with silicone.

5. Allow the silicone to cure for at least 24 hours, then test fill each olla to ensure they will allow water to seep through their surface. (I know you checked out the original one before starting but this is a final quality assurance test). If you want you can install a cork or rubber plug in the filling hole in the top of the olla to reduce evaporation and keep dirt and insects, lizards etc from getting into the olla and taking up space.

Ready for installation

Once they pass the final test they will be ready for installation

Installed!

6.2 Buried Pipe

The original concept of buried pipe irrigation was getting hold of, or making, a whole stack of unglazed terracotta pipes which you would then bury beneath your veggie patch, leaving one end open at ground level so you could pump water into it. In the same way ollas work, the water in the pipe would diffuse out into the ground, thereby irrigating any vegetables etc planted above it very efficiently. The pipe would have been put in either directly under or to the side of veggies planted in rows.

Terracotta pipes seem to be fairly difficult to come by these days and are expensive when you do find them, but there is a modern alternative – ag pipe! Agricultural pipe (or Ag pipe for short) is a flexible corrugated pipe, usually with slots in it, the larger sizes (100mm+) are covered with a non-woven sleeve or sock. The idea is you bury it in an area that is poorly drained so that the excess ground water drains to stormwater or local watercourses etc, thus removing unwanted excess water. But…….

Ag pipe, sock and tee piece configured for buried pipe irrigation

It can also be used to do the opposite, supply irrigation water underground to the roots of your precious plants. I find the best of the sizes to use is the 50mm diameter stuff, but it does not come with a sleeve or sock covering it. The idea of the sock in this instance is it keeps roots and debris out of the pipe so it doesn't get blocked up, but it also acts as a wick, allowing the water run into the pipe to be wicked up so that it is available to the plants from the full diameter of the pipe.

Making the Sock

To make a sock for your 50mm pipe, get hold of a pack of 60cm x 6m drain matting, this is a non-woven fabric used as a filter in drainage trenches etc to keep them clear. I have used drain matting from RELN and from Everhard, and found the Everhard product to be a bit thicker, so I would use theirs again.

Drain Matting

Remove it from the package and unfold it so it is sitting on the floor in a single layer, then start from one end and roll it up tightly to form a cylinder 600mm wide by about 150mm in diameter. Make sure you have a good solid leather glove on your non-dominant hand (which holds the straight edge used to guide the knife). Then place a metal straight edge across the role 200mm from the edge, (ie 1/3 the way in) and then cut through the drain matting with a sharp Stanley knife or similar, it will take a number of strokes. Measure in the middle of the remaining 400mm width roll and do the same again. This will result in you now having 3 x 200mm wide by 6 metre long strips of drain matting.

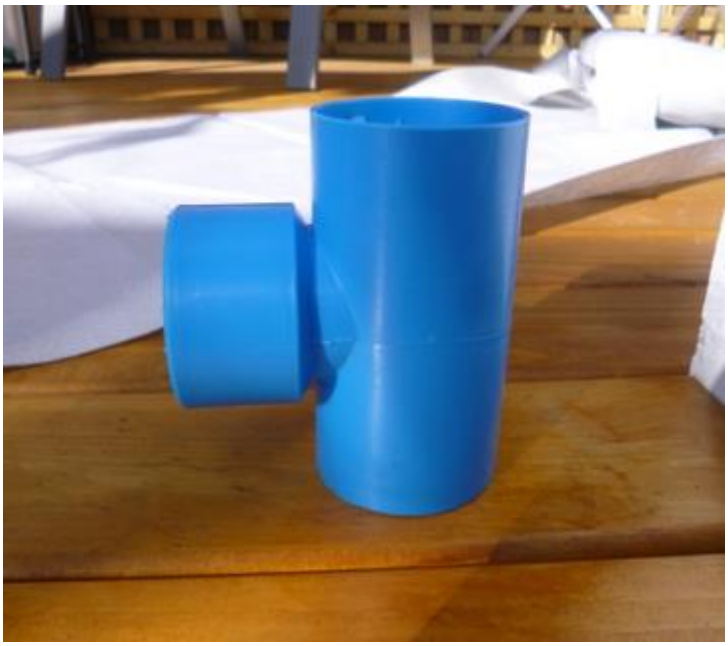
Drain Matting rolled out

Drain matting rolled and cut

The next trick is to find someone whose super-power is sewing (mine isn't but thankfully Linda's is, among other things!). Fold the matting over so that it is 100mm wide and then sew down the open edge so that you then have a 6 metre long tube in effect. Slide the sock over the ag pipe slowly and carefully until it is fully covering the designed length of ag pipe. Your buried pipe irrigator is now almost ready to be installed.

The Filling Point

With most of the buried pipe……well, buried, there still needs to be an aboveground section where we can put the water in, it ain't gonna irrigate itself. With the pipe needing to be in a circuit I had to find some way to join the two free ends anyway, so it was very easy to use a Tee fitting, bought where I got the original ag pipe from. I made sure the sock covered up to the solid plastic part of the tee piece, then I fitted a short length of ag pipe into the upturned section of the tee to form the filling point. All I had to do then was add an end cap to keep out dirt and prevent critters like snails from using it as a base of operations for raiding parties.



Tee piece

Installation

I have run this type of irrigation in two beds, one 2.1 metres wide x 2 metres long and one 2.1 metres wide by 3 metres long. The general process was to dig out a 50mm – 100mm wide ditch down into the bed using a trowel and hand-hoe following a not quite square, not quite oval path, with a few wiggles along its length to increase surface area. Once I got below the level of cultivation I hit good old hard Sydney clay subsoil so I didn't get as far down as I wanted but 50mm to 100mm seems to work OK.

Trench dug

I placed the sock covered ag pipe onto the bed, formed it so it ran where I wanted it to go and then traced around it in the dirt. I then dug out the channel using the trowel and hand hoe, getting the bottom as level as I could. If the pipe runs uphill away from the filler point it could cause problems getting the water distributed evenly along the pipe so use a spirit level to make sure it is roughly level. To get that much soil out of the bed meant it kept falling back into the ditch rather than sitting on the top of the bed, so I had my wheelbarrow nearby and was able to put some of the soil in there. Once the pipe was installed and covered I distributed the soil in the wheel barrow over the top of the bed.

Pipe in place

Covered, mulched and planted out

I ran some water into it to make sure it worked and then mulched and planted out the bed. Finished! (almost!)

Testing the System (or - A trap for young players!)

When I installed the buried pipe in the 2 metre long bed, I left the furthest end from the filling point uncovered so I could check that sticking a hose in the filling point and turning it on watered the entire length of the pipe. This was a good test but I forgot to do that with the 3 metre bed so I decided to get technical, and inserted a cheapie moisture meter (you know shows dry-moist-wet soil) at the furthest end from the filling point.

Filling Point

I turned the hose on and waited, and waited and waited. The needle did not move off the "dry" setting at all. Bugger! I figured I would need to install another tee fitting so I could fill from both ends. Just for the hell of it, I inserted the moisture meter half way along the buried pipe. Still no reading, this was not looking good. I had obviously screwed up something monumental. So I removed the meter and the inserted it right beside where the water was going in – still no movement. Hang on a minute!

Moisture Meters (Good and bad)

Yes, the (newly bought) moisture meter was faulty, I could dip it in water with no response at all. I rummaged around and found an old one and it worked, and confirmed that my design was OK!

7.0 Succession Planning and Planting

Succession planting means “following one plant with another” so that you can ensure a regular supply of veggies throughout the year. A succession planting allows you to maximise the vegetable production in volume and variety for a given area by obtaining a yield all year round. A succession plan allows you to achieve that aim by setting up a framework which you can use sow and plant out the veggies which will meet the needs of your family.
I created my succession plan about 10 years ago and have been using it ever since. Here is process to help you develop your own succession planting plan.

7.1 Creating the plan

1. **List what veggies you want to eat each year** – There is a list to help you out here, but this will work out best if you do your own research. Start out with the veggie you are eating now and list the type and variety (if you know it). If you are only eating commercial veggies from Woolies this can be difficult. If you buy your veggies from a fruit and veg shop, organic shop or growers market ask the proprietors if they can help you find out. Mind you it would be a waste to grow some commercial veggie varieties, bred for transportability rather than flavour or nutrition but you have to start somewhere.

   At this point it is also worth doing some research. Hit the books, the seed catalogues and the net and see what varieties are produced in or near your area/climate zone. Local growers, especially backyard growers can also provide a mine of information on what varieties do well in your area and are worth eating (notice I did NOT say to hit the local growers!).

2. **Find out when in the year each food likes to grow** – The seed catalogues and veggie books come into their own here by providing general information on when individual vegetable should be planted to get the best out of them. Individual varieties will vary within these general figures (more on that later) but at this point the information you glean will enable you to work out which vegetables can be sown or harvested during which months of the year. Obviously the climate will have a considerable impact on these dates so you really should only look at information generated as locally as you can find. We live in the temperate zone here in Aus and so looking at recommendations for outside that zone will only be misleading.

3. **Guess how much of each food you want to eat** – This can be as complex or simple as you like. The numbers can be arrived at by keeping a food diary for year and entering what you eat each day in that, doing it for a month or two then extrapolating for a year (not as accurate due to seasonal supply issues) just sit down with the family and guesstimate how much veggies you will need.

4. **Work out how much growing area you have** – to get the most out of the plan you will need to factor in how much land you intend to put down to growing veggies. We found that a number of smaller (1.2m x 2.0m) beds worked out better for us, being easier to manage and rotate producing smaller crops more regularly. When you work

out your growing area don't neglect some less conventional growing spaces you may have access to –

a. The front yard
b. Spare space in friends, relatives or neighbours yards
c. Community garden plots
d. Pots/containers on patios, roofs, driveways or other unused spaces

By having an idea of the area of land you have to work with you can estimate how much food you can be growing at any one time. We work on a spacing of about 30cm between each plant and interplant rather than waste space with row plantings.

5. **Create a plan** – with all the homework done you can now draw up your plan. One of the things that amazed me when we convened a "Year Round Growing" group at Permaculture Sydney West to develop succession plans with people was the variety of plans developed. Everyone's plans, while accomplishing the same thing, looked and functioned differently. So while I include here a couple of examples to get you started, don't be afraid to have a go at developing your own from scratch.

6. **Follow your plan** – As stupid as it sounds, you really need to do this! I found by putting aside a Sunday morning twice a month to sow, pot on and plant out I got into a rhythm after a while and everything just flowed. What I did find was that if I did forget or didn't bother, the effect was not immediate but a couple of months down the track yields began to suffer and plants which I should be starting to harvest were just not there.

7. **Record your harvest, to plan for next year** – It is very rare to get anything right first time around, so record any successes and failures and review your plan once you have been following it for 12 months. Even if you adjust your plan on-the-run during the year an end of year review of what worked, and what didn't, can help you improve your plan year on year. Until you find you are the envy of your neighbours and they will be breaking down your door wanting to know your secret!

7.2 Choosing Your Vegetable Varieties – Points to Ponder

From your review of the seed catalogues and other data it will become obvious fairly early that some veggies such as tomatoes will have hundreds of varieties whereas others such as Brussels sprouts may only have a one or two. Having a large number of varieties is good because it means you have some choice over what you grow and eat within the broad heading of each vegetable. It also increases the likelihood of finding a variety or two which fits your particular soil and climatic circumstances and using different varieties can allow you to spread your harvest (see below).

However the large number of varieties can make it difficult decide on which ones to grow and while it is very much a personal decision, here is some information that may help you decide –

Early, main crop or late? –Some vegetables have been bred to be harvested early in the season and so have a shorter time between sowing and harvest. Some even have the word 'early" in their name which is a dead giveaway, eg Early Jersey Wakefield cabbage, Early Scarlet Horn carrot or Phenomenal Early cauliflower but mostly the data from the seed catalogues will point you in the right direction. More often than not the more common varieties tend to be main crop, ie they have a growing time which allows them to be harvested at the height of the growing season. Others have even longer growing times and linger on being harvested late in the season without a drop in crop quality. It is even possible to plant an early, main crop and late variety of the same vegetable all at once and harvest each one as it becomes ready, thereby spreading the harvest.

Growing Habit: Determinate vs indeterminate – a few vegetables, such as tomatoes, peas and beans contain varieties within their ranks that will grow, mature and be harvested within a specified time and a defined plant size. These are referred to as having a determinate growth habit, also referred to as "bush" or "dwarf" varieties whereas other varieties of the same plant may continue to grow throughout the season. These varieties are referred to as indeterminate, also referred to as "climbing" or "staking" varieties and these will produce for as long as the soil and climatic conditions will allow.

Needless to say, determinate varieties will need to feature in your succession plan for regular replanting while the indeterminate varieties will occupy space in the garden for longer and may interfere with your rotation if you are rotating your plots. Determinate plants are also more likely to give you a single major harvest then little or nothing while the indeterminates will broaden the harvest period, providing less at any one time but spreading the harvest to give you more produce over the growing season. Thus if your process calls for regularly planting determinates, this will provide more produce over the year (per unit of ground) than only planting indeterminates at the start of the growing season.

Flavour (and other attributes) will vary between varieties – back when I first started growing our own veggies and the kids were a lot younger, I was getting a good response from everyone for the dwarf stringless beans I was growing. I wanted to increase my production so I went from dwarf to climbing beans. The kids HATED them, and refused to eat them so it was back to the drawing board. You may want to try out a few varieties of each veggie before you settle on which ones you want to grow, or even try before you buy if possible, but keep the family involved!

Ask what varieties are grown in your area – Again, talking to other backyard growers about what varieties they grow and why, what varieties do well in the area, what ones are particularly tasty, or keep well or both. Don't lose heart if there are no backyard growers in you immediate area. See if there are any community gardens in the area and talk to growers there, contact your local permaculture or seed savers group for advice too.

7.3 Crop Rotation

It is bad cultural practice to grow the same veggies in the same ground season after season, year after year. Over time you get a reduction in soil fertility (the same plants take out the same nutrients each time they are grown) and you get a build-up of pests and diseases. I have seen a number of rotation plans - one three crop rotation starts off with roots and bulbs, then goes to fruit and seed crops then finishes with leaf and stem crops. Another four crop rotation starts with legumes the goes to roots, followed by fruit and finally leaf crops. Of course at the end of each of these the cycle starts again.

The crop rotation plan which makes the most sense to me and which I have used in the past is implemented as follows –

Rotation 1 – Roots (potatoes, carrots, parsnips beetroots etc.)– starting out with root vegetables opens up the soil allowing air and moisture in, which is followed by,

Rotation 2 – Legumes – in other words, peas and beans, these crops are nitrogen fixers which fertilise the soil and they build the soil up for the next crop.

Rotation 3 – leaf crops (cabbage, broccoli, lettuce, spinach, silver beet) – These crops require abundant nitrogen to produce and they make use of the nitrogen fixed by the previous crop of legumes.

Rotation 4 –Fruits and others (tomatoes, capsicum, eggplant, corn) – These make use of residual fertility in preparation for starting the rotation again.

Another type of crop rotation plan uses plant families, the idea being that you don't grow plants from the same family, in the same ground, two years running. Plant families to take into account include –

- *Nightshade Family (Solanaceae)* – tomatoes, eggplant, capsicums, chillies, potatoes, tomatillos.
- *Gourd Family (Curcurbitaceae)* - cucumbers, zucchini, melons, pumpkins, squash
- *Pea Family (Fabaceae)* – alfalfa, clover, beans, peas, fenugreek.
- *Beet Family (Chenopodiaceae or Amaranthaceae)* – beetroot, quinoa, spinach, Swiss chard/silver beet.
- *Daisy Family (Asteraceae)* – chicory, endive, lettuce, radicchio, Salsify.
- *Mustard Family (Brassicaceae)* - Asian greens, broccoli, Brussels sprouts, cabbages, collard greens, kale, kohlrabi, mustard greens, radishes, rocket, turnips.
- *Onion Family (Alliacaeae)*- onions, chives, garlic, leeks, shallots.
- *Carrot Family (Apiaceae)* – carrots, celery, coriander, dill, fennel, parsley, parsnips

Yet another system of crop rotation starts off with
Legumes – beans, clover, cow pea, lucerne, lupins, peas, and is followed by:
Light feeders – beetroot, carrot, celeriac, leek, onion, parsnip, potato, radish, shallot, swede, turnip, which are then followed by:

Heavy feeders – brassicas, capsicum, corn, cucumber, eggplant, endive, lettuce, okra, pumpkin, spinach, tomato, zucchini, which then followed by legumes again.

When you are developing your plan, keep in the back of your mind that you will need to be moving each class or family of crop around so that you don't plant the same type of plant in the same ground two seasons in succession.

7.4 Good Companions Bad Companions

I don't know what your thoughts are on companion planting, in my experience it doesn't seem to do much either way, but here are some common-sense suggestions on plants that do and don't go together well -

- Plant short, shade-tolerant plants beneath taller, bushy plants.
- When you mix sun-loving plants, put tall ones at the south end of the plot and small ones at the north end (to reduce issues with shading)
- Plant herbs throughout the garden, especially basil, mint, sage, and dill but keep dill away from carrots.
- Plant marigolds here and there around the garden to repel pests and encourage the predators that prey on them.
- Do the same with chives, garlic, leeks or onions EXCEPT near or amongst legumes, they will inhibit the nitrogen fixing bacteria living in nodules on the legumes' root system.
- Exploit the different maturation rates of different crops: plant lettuce, spinach, or silver beet early where you plan to set out squash and melons later, so that weeds don't have a chance to move in, and you get two crops instead of just one.

7.5 Rats and Mice

It doesn't matter how good a gardener you are or how fertile your soil is, yields will vary from year to year. The best thing to do is get used to it and ensure that your plan contains enough variety so that even if it is a crap year for one vegetable or one family of vegetables, other vegetables will find the conditions for growth more to their liking.

Don't be afraid to experiment, there are a whole stack of vegetables out there that you may not have heard of or tried, which may be ideal for your situation. I grew Jerusalem artichokes for some years before I actually tried them and no, as mentioned earlier, they are a big part of our diet. (but they do cause life threatening flatulence) Try unfamiliar veggies, a bit at a time, get from the veggie shop & try first if possible

Note: If the variety is called "All Year Round" – don't believe it! In most cases it was wishful thinking by the plant breeder!

This is an example of a sowing plan put together by a friend of mine –

What to Plant	When to plant it	Amount	Sowing	Where?
Basil	Sep, Oct, Nov, Dec	5 / 1st & 3rd month	S or P or G	P 2 I & B3M
Asian Greens	Mar, Apr, May (then,) Sep, Oct	5 /month	S or G	B 1 I
Beans – Climbing	Jan, (then not until) Sept, Oct, Nov, Dec	10 / month	G	B4 I
Beetroot	Jan, Feb, Mar, Apr (then) Aug, Sept, Oct, Nov, Dec	10 /month	S or G	B4 M B1 I
Broccoli	Jan, Feb, Mar, Apr (then, not until) Sept, Oct, Nov, Dec	5 /month	S then, G	B2 M
Cabbage	Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec	5/month	S then, G	B2 M
Capsicum	Sep, Oct, Nov, Dec	10 /month	S then, G	B3 M
Carrots	Jan, Feb, Mar, Apr, May (then,) Sep, Oct, Nov, Dec	20/month	G	P M & I & E
Celery	Sep, Oct, Nov, Dec	5 /month	S then, G	B2 I
Chillies	Sep, Oct, Nov, Dec	5/ season	S then, G	P M
Corn	Jan , Feb (then, not until) Oct, Nov, Dec	15/month	G	B5 I & M
Coriander	Jan, Feb, Mar (then, not until) Sep, Oct, Nov, Dec	10 /month	S or G	P 3 E & I & M
Cucumber	Jan, Feb (then, not until) Sep, Oct, Nov, Dec	5/ month	S or G	B3 M
Eggplant	Jan (then, not until) Sept, Oct, Nov, Dec	5/ month	S then, G	B 4 M
Garlic	Apr, May, Jun, Jul, Aug, Sep, Oct	20 /month	G	B4 I
Kale	Jan, Feb, Mar, Apr, (then not until) Sep, Oct, Nov, Dec,	10 / month	S then, G	B4 E
Leeks	Jan, Feb, Mar, Apr, (then) Aug, Sep, Oct, Nov, Dec	5/ month	S then, G	B3 I
Lettuce	Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec	10/ month	S or G	B2 I
Onion	Feb, Mar, Apr, Jun, Jul, Aug	20/ month	S or	B 1 I
Peas	Apr, May, Jun, Jul, Aug, Sep	5/month	S or G	B1 M
Potatoes	Aug, Sep, Oct Nov, Dec	10 tubers/month	G	B 5 M or P3 M
Pumpkins	Jan (then, not until) Sep, Oct, Nov, Dec	5 once	G	B 6 M
Spinach	Mar, Apr, May (then,) Aug, Sept	5 / month	S then, G	B4 E
Tomato	Jan, Feb Mar (then, not until) Aug, Sep, Oct, Nov, Dec,	10/month	S then, G	B4 M
Zucchini	Sep, Oct, Nov, Dec	5/month	5/month	P2 M

8.0 Keeping up your Fertility Organically

8.1 Adding Nutrients

Just like animals (including us) plants need the right sort of nutrients in the right amounts to be happy healthy and productive and when we remove crops from the soil and consume them, the nutrients must be replaced. Originally this was done with naturally occurring materials such as manures, ash and compost but with the invention of inorganic fertilisers (originally called artificial manure) we went away from naturally occurring materials and, as usual, stuffed things up. The inorganic nutrients don't take into account the importance of soil micro-life and as the yields reduce more fertiliser is needed to keep pace. They also tend to be very soluble being easily leached into our waterways and ground water causing pollution and some are oil based and come with all the problems that entails.

However, the wheel is turning and organic farming and gardening is making a very strong comeback and you can be part of that comeback in your own backyard veggie patch.
The theory at the start may be a bit heavy but it will give you a good basis on which to make decisions on how to use the materials available to you to keep your little patch of heaven producing the food you love.

A little Bit of chemistry

While it does not tell the whole story, a measure of the usefulness and effects that a fertiliser will have, for both chemical and organic fertiliser is the NPK ratio. The NPK ratio gives an indication of how much of the three major nutrients a given fertility increasing material contains, but perhaps I am getting ahead of myself because we need to talk a little bit about the chemical elements that a plant needs and these are generally divided up into three major nutrients, three secondary nutrients and six minor or trace nutrients. What follows is a summary of what each nutrient does, what the effects are when the plant is suffering from a deficiency of that particular nutrient what you can add to the soil to bring the nutrient level back to scratch.

The Major Nutrients

The major nutrients are nitrogen (chemical symbol "N"); phosphorous (chemical Symbol P) and potassium (chemical symbol K) hence the three together are referred to as NPK.

Nitrogen (N) – is important for leaf growth – deficiency results in pale or yellowing leaves - The best way of correcting a nitrogen deficiency in an existing crop is to add a well rotted high nitrogen manure such as chook or pigeon or to dilute human urine 1:10 with water and apply with a watering can.

Phosphorous (P) – is important for healthy plant growth, the formation of flowers and setting of fruit and seeds – deficiency results in poor root growth and stunted and sometimes purplish leaves – To correct this deficiency add bone meal if you can get it or blood and bone or apply human urine as above.

Potassium (K) - is important for strong support cells in plants and to ensure plants are healthy and resistant to disease – deficiency causes weak stems with limp yellowish leaves that may have scorched looking edges. Fruit set will also be reduced on fruiting plants – to correct potassium deficiency wood ash is the best additive or seaweed as mulch or made into a tea as set out under Trace Nutrients.

The Secondary Nutrients

These are the "tweens", being required in relatively larger quantities than the trace nutrients but not so much as the major nutrients.

Calcium (Ca) –is important for strong cell walls and growing tissue like root tips – deficiency results in new growth being stunted and distorted and growing tips curling/dying, can cause blossom end rot in tomatoes – Correcting calcium deficiency is usually done with agricultural lime although dolomite or gypsum (both made of ground rock) will not affect pH but still add calcium. Ground eggshells or sea shells can be used if you can get enough and blood and bone will also contribute calcium as will most manures.

Magnesium (Mg) – is important in photosynthesis for the plant – deficiency causes leaves to get yellow stripes, the older leaves being affected first – to correct a magnesium deficiency the classic thing is to dissolve 1 tablespoon of Epsom salts (magnesium sulphate) in 4 litres of water and apply with a watering can but dolomite (a mixture of calcium and magnesium carbonates) will also work.

Sulphur (S) – sulphur is a component of plant proteins and is associated with the formation of chlorophyll – Deficiency results in the older leaves going pale, followed by the whole plant. To correct a sulphur deficiency adding composted brassica leaves (cabbage, cauliflower, broccoli etc) or garlic to the soil will help. The classic fix was to apply a dusting of elemental sulphur or Epsom salts.

The Minor or Trace Nutrients – also referred to as "trace elements".

While these nutrients are required in very small quantities, some can be toxic to plants when present in excess, they also make their presence felt when they are lacking, sometimes presenting strange symptoms as a clue to the deficiency disease you may be dealing with.

Boron (B) – is important for growing tissue in young plants – deficiency results in stunting of growth with yellowing stripes on the leaves and pale green tips of leaves, it can also result in breakdown of internal tissues in vegetables such as celery stems and broccoli flower buds.

Copper (Cu) – Is an enzyme activator and important in photosynthesis – deficiency results in "burning" of the leaf margins and yellowing with resetting or multiple bud formation in flowering plants. It may cause dieback in citrus and some other fruit trees.

Iron (Fe) – is also important for formation of chlorophyll in plants and is an enzyme co-factor – deficiency results in yellowing between the veins of young leaves but no initial stunting of growth, later older leaves become affected and growth becomes stunted.

Manganese (Mn) – is similar to iron – deficiency results in yellowing similar to iron leading to a striped or spotted appearance of the leaves.

Molybdenum (Mo) – is important to allow the plant to convert nitrogen into plant proteins – deficiency shows similar symptoms to nitrogen deficiency leaves turning pale green then stunting of the whole plant and leaves bleaching and withering.

Zinc (Zn) – is an enzyme activator similar to copper – deficiency results in growth stunting and the formation of "little leaf".

The easiest way to provide trace elements for the veggie patch is to add wood ash, compost, well-rotted sawdust, horse manure or seaweed tea made by washing the salt of seaweed in fresh water then steeping in fresh water for three to four weeks and dilute to the colour of weak tea and add with watering can or spray onto affected plants.

So now you hopefully understand a bit more about what nutrients plants need to be healthy and productive, consult Appendix 4, which is a list of commonly available organic materials which are available in or close to urban/suburban areas. They can be added to the soil to increase fertility and what the NPK levels are for each.

8.2 What about pH?

What is pH?

The pH value represents how acid or alkaline a soil is it is expressed as a number between 1 and 14 where a pH of 1 is extremely acid, like battery acid and a pH of 14 is extremely alkaline like a soapmaking lye solution. A pH of 7 is neutral ie neither alkaline nor acid like pure water. The pH of soil can vary between 3 and 9 but in Australia most of our soils are acid and it is rare to see a soil pH outside the range of 4 to 7. The ideal pH range for most plants we want to grow – veggies etc – is 6 to 6.5 although some plants such as rice and potatoes do well down to a pH of 5 and barley and apples can tolerate a mildly alkaline pH ie 7.5 -8.0.

Why is pH important?

As mentioned in the previous paragraph a soil pH of 6 to 6.5 is required to get the best out of our fruit and veggies, but as the good professor said – "Why is it so?". To answer this we need to understand what plants require from soil to help them grow, because plants need certain essential nutrients to grow just as we do. Plants absorb water from the soil through their roots and dissolved in the water are chemical nutrients which the plant uses to build up its tissues. Refer to the major, minor and trace plant nutrients discussed in the previous section.

Now what has all this got to do with pH you may ask? The “availability” of a plant nutrient in the soil is tied up with pH. The soil may have all the good nutrients in sufficient amounts but the wrong pH may cause them to be in a form that is insoluble in water. If the nutrients are not soluble in the soil water the plant cannot take them up and use them; so far as the plant is concerned they don’t exist and it starves to death. At the optimum pH of 6 to 6.5 all the nutrients are in available form, but as you move away from that pH either way, some are locked up in the soil and others become available in excess eg iron and aluminium at low pH to the point where plant may be poisoned.

The soil pH can also affect the types of micro-and macro-organisms which can survive in the soil. Earthworms are usually absent from very acid soils but fungi prefer acidic conditions and bacteria prefer a neutral soil. This last point can be very important when growing peas and beans (legumes) because if the soil is too acid the rhizobium bacteria which fix nitrogen for the legumes will not be able to thrive, so neither will the legumes, so that a vital part of the crop rotation may be lost. Another example of pH affecting plants through soil microorganisms is the slime-mould which causes club root, a disease of crucifers, because it only thrives in acid soils and raising the soil pH can reduce or eliminate this problem.

How is pH Measured?

Given that pH can have a marked effect on what we are trying to grow, the next step is to measure it and see what the pH of or particular soil is so any problems can be corrected. There are two main methods of measuring pH, electronically and chemically.

Electronically

This requires buying a small pH meter consisting of a probe which is inserted into the soil to be tested and the dial or meter which shows the pH reading. The two parts may be connected by a flexible wire or rigid tube so that the entire meter is an integral unit. The procedure for use is very simple: push the probe into the soil a few centimetres and then the reading can be taken directly from the meter a minute or two later. The important considerations are the soil be wet, or at least damp, and enough readings are taken over the entire planting area so that an accurate picture of the whole area can be gained.. The pH of the soil will vary over a given area so don’t just check the south-eastern corner of your 500 square metre veggie patch and say “looks OK here, she’ll be apples!” and leave it at that. Take readings at regular spacings to be sure.

The advantage of the meters is that they are reasonably cheap and once you have paid for it there is nothing else to buy, not even batteries. However, the manufacturer’s assurances notwithstanding, I am still not convinced they are as accurate as the second method.

Chemical or "Wet" Method

This involves buying a test kit containing a dye which changes colour with pH (called a universal indicator), a contrast medium which is a white powder that makes the colour change stand out and a colour chart to translate the colour change into a pH reading. There are several kits available, with one you mix the soil to be tested with water to form a paste then sprinkle on the white powder followed by the universal indicator and compare the resulting colour with the colour chart to read off the pH. With another the soil is diluted in water, the solids filtered out and the universal indicator added directly to the solution; the colour of the solution is read against the colour chart to find out the pH.

The test kits are more expensive than the meters but they contain enough chemicals to do many tests and in my experience are more accurate. Both the meters and the chemical test kits are available from hardware stores and plant nurseries.

How can pH be changed?

Now that you know that pH is important and can be measured the next questions is how to alter it to suit the crops we want to grow if it isn't right. Fortunately it is possible to alter soil pH by adding various minerals. As previously mentioned, the soils in Australia tend towards the acid side of the scale. They may be that way naturally, be acidified by the use of chemical fertilisers or they may become that way over time due to the build up of humic acids from use of organic fertiliser and mulch. For this reason we will concentrate on neutralising acid soils rather than alkaline ones as this is the situation you are most likely to come across.

The magic ingredient for "sweetening" sour or acid soil is lime. Unfortunately the word "lime" can indicate a number of different chemical compounds –

Quicklime - Chemically this is calcium oxide which is VERY alkaline and can burn your hands. It will reduce soil acidity very rapidly but is rough on the soil organisms, the plants and you!

Slaked Lime - Also called slacked or builder's lime, it is quicklime that has been "slaked" by adding water to it to form calcium hydroxide. It is not as rugged as quicklime but it is still very alkaline. It won't burn your hands but it will burn the plants and give the soil organisms a hard time. Slaked lime will reduce soil acidity quickly.

Agricultural Lime - You guessed it! This is the one for you. It is ground up limestone and chemically speaking is calcium carbonate. Its effect on pH is slow but it is safer all round for use than quick or slaked lime. It won't burn your hands or rub out your soil organisms either.

Dolomite Lime - This can also be referred to as lime although it is actually a mix of calcium and magnesium carbonates. It acts in much the same way as agricultural lime but it can be particularly valuable in soils with a magnesium deficiency.

When lime is mentioned from now on you know I mean agricultural lime.

Applying Lime

Lime is best added by broadcasting by hand over small areas or by a spreader over larger areas, then digging it as deeply as required for it to be distributed throughout the plants' root zone. It is best to apply it in autumn or early spring and left for as long as possible before planting to allow enough time for it to react and raise the pH. If you use a green manure crop as part of your rotation the lime should be applied when the green manure is turned under. It is also possible to top-dress with lime at other times of the year without damaging any growing crops, but it will take much longer for the lime to raise the pH.

How much lime you need to add to your soil to achieve the desired pH depends on a number of factors, the starting pH being an obvious one. A less obvious one is the "buffering capacity" of the soil, which is the ability of a soil to resist a change in its pH due to the nature of the soil. In practice, what this means is that a soil high in organic matter and/or clay content will require more lime to achieve a desired pH than will a sandy soil under the same conditions. As a guide a soil which is rich in clay may require 300 to 450 grams of lime per square metre to raise it's pH from 5.5 to 6.5, while a sandy soil would require 150 to 200 grams of lime per square metre for the same pH change. Rainfall must also be considered as the lime will be washed through the soil profile more quickly in a high rainfall area.

Lowering pH

It may be that due to a previous land owner's overuse of lime that your soil has an alkaline (high) pH and you wish to lower it. In this case the easiest method to acidify your soil is to apply and dig in elemental sulphur which is available from hardware and garden supply shops. The same rules apply here as for lime, a clay soil requiring more than a sandy soil. As a guide, to reduce soil pH from 7.5 to 6.5 a clay soil needs 90 to 100 grams of sulphur per square metre whereas a sandy soil needs only 30 to 60 grams of sulphur per square metre.

8.3 Materials Added to Soil to Improve/Maintain Fertility

Here are a number of materials which can be used to improve or maintain soil fertility either by home production/gathering or which will may be bought in from a commercial supplier.

Home produced/Gathered

- Compost – is a good all-purpose fertility improver and by composting leftover food waste some of the nutrients removed in harvesting can be returned to the soil.
- Wood ash – if you have a wood burning stove or have friends with one, rather than throwing out the ash, add a light dusting next time you are preparing a veggie bed for planting. It is alkaline and so may raise the pH of your soil but a small amount added to

healthy organic soil is unlikely to have a huge effect. Wood ash is great for adding potassium to your soil.

- Seaweed/kelp – seaweed is a great addition to the veggie patch if you can get hold of it, gather it and bring home a bag full next time you take the kids to the beach. As well as contributing major nutrients it is a good source of the trace nutrients as well, but make sure you wash the salt off before you use it. You can dry it out, crumble it up and add it to the bed before planting, wash off the salt and place it over the top of an existing bed as a mulch or steep it in a bucket of water for three to four weeks and apply the resulting juice with a watering can as a general tonic.
- Worm castings – In an urban/suburban area you are most likely going to be producing this in smaller amounts, but it is very rich in beneficial soil bacteria as well as chemical nutrients. You can use it to make seed raising mixture, spread it around growing plants under the mulch or add it into the hole before planting your veggies to give the plant a boost when the roots find it.
- Poultry manure – Even in the city most people can find room for a few chooks and while their manure is a bit rich to add fresh to growing plants it will give the soil a boost if added when preparing the bed or composted first. Rather than haul the stuff around, we use a chook tractor which means that the chooks apply it direct to the bed, and then when the bed is watered and mulched before planting, it attracts worms into the bed. If you have to buy it in, check that it has not been sprayed with insecticide to keep the flies down.
- Urine- There is talk about “peak phosphorus” because we currently get our phosphate fertiliser supplies from deposits of ancient guano which are then mined, and it is starting to run out. The answer is to recycle nutrients by diluting our pee ten to one with water and applying to the veggie bed. Contrary to popular belief urine is not sterile so if you are not well, particularly due to bladder infection, don’t use it. I wouldn’t broadcast about this fertilising practice too much either, the neighbours might not understand your good intentions.
- Liquid manure – In general terms liquid manure is made by steeping a nutrient rich material in water for a time to extract the nutrients and then diluting the resultant “tea” until it looks like weak tea and then applying directly to the plants. The nutrient rich material can be seaweed as mentioned above, manure or better yet a mix of manures, comfrey or nettle leaves or even just a mixture of weeds steeped in water.

Bought In Commercially

- Blood and bone – This is a great way to add phosphorous and potassium to your veggie patch although if you are vegetarian or vegan you may have some ethical problems using it. You should keep it in a sealed container away from pets; years ago my father’s dog broke into his garden shed and ate his entire blood and bone supply. It didn’t hurt the dog but sure crapped off my father.
- Rock dust – Rock dust adds trace nutrients to the soil in an insoluble form that is only accessible slowly as the dusts is broken down by the enzymes released by soil microorganisms. Rock dust also is good for and attracts worms to your soil. You might not see it in your local nursery or hardware store but it is available from supplies on the net such as remin.com.au who are on the south coast of NSW.

- Horse/Cow manures – If you don't know what the worming history of the horse is it is better to compost horse manure before applying it to the veggie bed but well rotted or composted horse or cow manure is a great way to add organic matter to your soil.
- Dolomite & gypsum – These materials are ground rock containing calcium and, in the case of dolomite, magnesium as well. If you struggle with clay soils as we do around here adding a calcium containing material will improve soil structure. The clay is sodium clay and has very fine pores, adding the calcium material allowing it to react with the clay replaces the sodium with calcium and calcium clays have a much more open structure, so the soil becomes much more free draining. Gypsum is often sold as "clay breaker".

Maintaining soil fertility is basic to producing our own fruit and veggies, and keeping our plants happy and healthy so that they have the same effect on us when we eat them. By returning nutrients to the soil using organic production principles you will make sure that your veggie production is maintained in a sustainable manner.

8.4 Techniques for Maintaining Fertility

While there are materials which can be added to maintain soil fertility there are also growing techniques which can be used to maintain soil fertility as well –

Crop Rotation

Crop rotation is an important technique for maintaining soil fertility it can be summarised as not planting the same plant in the same soil, year after year. For detailed instructions on crop rotation see Chapter 7 – succession planting and planning.

Mulching

Mulching is the practice of placing a layer of material on top of the soil around our plants, even over the entire vegie patch. This layer has a number of effects on the soil and plants in the surrounding area:

1. It keeps the soil surface cool in summer allowing micro-organisms to function at the soil surface and continue to breakdown organic matter and release nutrients.

2. It conserves moisture - A very important point in times when water may be in very limited supply. As well as reducing evaporation from the soil surface a mulch also increases the proportion of the soil water present in the plant root zone , where it counts .

3. Weeds are suppressed - This reduces or eliminates the need for cultivation or worse yet, pulling out the little buggers by hand. This is an important point because weeds will compete with your crop for light, nutrients, water and space and in so doing can seriously reduce crop yields.

4. Nutrients are released by the breakdown of the mulch if it is organic in nature, so that the vegies are have a built in time release food source. The organic matter when incorporated into the soil will also improve soil structure and therefore fertility.

5. The surface of the soil under the mulch is not compacted by rain drops so water runoff is reduced and infiltration of rain correspondingly increases. By the same token if rainfall is high and drainage not what it should be, mulching can contribute to waterlogging of the soil so keep an eye out for this effect.

Materials which may be used for mulching -
a) Compost - Ideal.
b) Hay or straw - Ideal.
c) Grass Clippings - Can tend to form a water impermeable layer so they should be mixed with sawdust of compost prior to use.
d) Dry leaves - Can also form an impermeable layer so should be shredded or mixed with other material prior to use.
e) Sawdust and wood shavings - Radiata pine material is not suitable as a mulch.
f) Animal manures - should be old and well-rotted down before use or they can burn the plants.
g) Rocks – A rock mulch (strange as it seems) will provide all the advantages of an organic mulch except that it won't break down. When used in arid areas they can allow moisture to condense on the cool rock and contribute to the water needs of the plants.

Green Manuring

This is the process of growing a crop on your vegie patch and then digging it in to provide organic matter. This is a good idea when you are opening up a new area or as part of a crop rotation. The most value is obtained by using a legume eg peas, beans, clover, or lucerne which fixes nitrogen at the same time, releasing it to the plants as it breaks down. At least two weeks should be allowed between turning in the green manure and planting vegies to allow the green manure some time to break down. The green manure should also be turned in before it flowers so it is at a succulent stage of growth and will break down earlier and no seed is set to come up as a "weed" later.

9.0 Controlling Pests Organically

Introduction

If you are going to grow your own food, you are going to attract pests to a greater or lesser degree and as much as you don't want to share with them you are bound to lose some and the trick is to contain your losses to an acceptable level. The current agricultural practice of wholesale chemical use is unsustainable and in the long term counterproductive for the following reasons –

- 98% of even the best applied pesticide spray damages non-target organisms ie pest predators, fish, bees, humans – you get the idea.
- The pests have the ability to evolve almost as fast as we can make new pesticides so in the end we lose.
- Pesticides in use are oil based so as the oil becomes more expensive so too do the pesticides.
- They are made by big business/big chemistry and can't be home produced.
- They can build up in the environment – organochlorine compounds like DDT, Chlordane etc. are a case in point

So, there must be a better way and indeed there is, looking after your fruit and veggies organically! Unfortunately over the years we have all been brainwashed by too many pesticide ads on TV, you know the type – "if you have problems with this type of bug just grab your can of BugBeGone, spray to your heart's content and your bug problem will be gone!". The organic method of protecting your crops is more holistic than the spray-em-dead approach and while the use of environmentally friendly pest control is part of the process, it is only part of the process. There are some things to think about before reaching for the spray.

Which Bug?

There are a wide number of both good and bad bugs out there," good" bugs include –

> ladybirds (most species), ground beetles, rove beetles, dragonflies, earwigs, (Australian), lacewings, predatory flies, praying mantis, springtails, predatory wasps, hover flies, assassin bugs, centipedes and millipedes, spiders

While "bad" bugs you might see in your garden could be –

> ants, aphids, ladybird (26 & 28 spotted), weevils, shield bugs, cabbage moth, cabbage white butterfly, loopers, budworms, cockroaches, crickets, locusts, grasshoppers, earwig (European), flies (inc fruit flies), scales, snails and slugs, thrips

The moral of the story is that there are a huge number of types of bugs out there, good, bad or indifferent and you need to know which ones you have and you can do this by a combination of observation and research. Get hold of some books from you library, join an online organic growing forum or get hold of leaflets from your local Dept of Agriculture

/Dept of Primary Industry, often available free on line and identify the ones, both good and bad, that you need to look out for.

The Organic Approach

Rather than go for short term bandaids in the form of pesticides (no matter how enviro-friendly) we need to look at our backyard crops as being part of our backyard ecosystem and then try to keep the ecosystem in balance. We can also be smart and avoid pest problems before they get to the point where a spray is necessary by using some or all of the following strategies.

- Observe your back yard and make notes about what you find. Take the time to look at the types of pests and the types of predators already existing in your garden, and do it regularly because things change over time. This summer alone I have identified three or four new types of insects that I haven't seen before in our back yard. So take the time and really observe what is happening in your garden so you will know what you are up against, action early on can prevent a major infestation later in the year.

- Start with a healthy soil – healthy soil means healthy plants and healthy plants means they are less likely to become a target for pests. If you follow organic principles and use organic manures and fertilisers, if you mulch well, use green manures and maintain soil organic matter and avoid cultivating and exposing your soil to the sun you are much more likely to have healthy soil. Check and adjust your soil pH if necessary as well, as soil that is too acid or alkaline can be rough on the microbes in your soil as well as your fruit and veggies.

- Attract predators to your back yard – We alter the natural ratio of predator to prey when we use pesticides because we kill of both but the pest bugs make a quicker comeback so we need to attract predators to our growing are and keep them there. Providing a source of water in the form of a pond or birdbath is one way, so is allowing some of the veggies we grow to go to seed, because the adult forms of many predators are attracted to the nectar in the flowers. Not using pesticides will obviously help as will allowing some weeds to grow and flower to provide predator habitat.

A so-called "Bug Hotel" can provide accommodation for beneficial species like pest predators

- Practice companion planting and interplant – Nothing is more like ringing the dinner bell for pests than monoculture – a large block of one sort of crop. So grow some strong scented herbs and flowers in your veggie beds to confuse pests and grow differed crop plants interspersed with each other like basil with tomatoes and onions

with carrots. My personal experience with companion planting has been mixed and in practice no amount of companion planting I've tried has ever confused the cabbage white butterfly but give it a go and see how it works for you.

- Plant resistant varieties – The varieties of vegetables available today is very small in comparison to years gone by, even in plant nurseries the variety of seedlings is only slightly better than the stuff we can get in the supermarket. Fortunately there are specialised seed suppliers like Eden Seeds, Phoenix seeds, Greenpatch seeds and Green Harvest who can supply a broader number of varieties and some will be more resistant to than others to the pests in your back yard eg Roma tomatoes and cherry type tomatoes are more resistant to fruit fly than many main crop varieties. A little research can pay off big dividends in the war against pests.

- Time plantings to avoid pests – sometimes, if a troublesome pest has a short season you can avoid planting susceptible crops for that time and this is where your time and trouble in observation will pay off. We have a problem with one of the brassica pests – Cabbage Moth (not to be confused with cabbage white butterfly) which forms webs on the plants and can denude and kill a seedling in a matter of days. Around here though they are a problem only for a month or so in late summer so not planting brassicas at that time can head off any hassles with them.

Non Chemical Pest Controls

If after you have put the above strategies in place that make sense for you and your situation you still have pest problems it might be time to set up a more targeted pest control plan like the ones suggested below.

- Manual removal – In other words, picking the pests off by hand and squishing them, drowning them or feeding them to the chooks. This works best on the bigger but slow moving stuff like snails and slugs (ewww!), caterpillars, shield bugs or cockroaches (may be a bit fast...). The shield bugs are also called stink bugs for very good reason and the can eject a foul smelling and very irritating liquid when threatened so wear gloves and safety glasses if you are going after these buggers. I wouldn't feed them to the chooks either, drown them in water with a bit of soap or dishwashing liquid.

- Catch and hold – These are traps that attract and hold pests such as the slug and snail beer trap, made by getting a glass jar and burying it until the lip is level with the ground, then pouring in some beer diluted 50:50 with water, the snails and slugs are attracted, fall in and drown, but at least they die happy. There is also a bottle trap used with fruit flies that is described in another article on this site. Flying insect pests are attracted to red and yellow colours so a trap can be made by coating red or yellow cardboard with non-drying glue or molasses and then hanging them up where the pests are evident.

- Barriers – by placing an obstacle between the pest and its target you can reduce the damage considerably. The barrier can take the form of a ring of irritant substance around a plant or plants to keep out slugs and snails such as wood ash, sawdust, lime, diatomaceous earth or alum. Care must be taken because some of these materials are soluble and can alter the pH of your soil, obviously they won't work to well in rainy weather either. Panty hose or paper bags can be placed around fruit including tomatoes and capsicums to deter fruit fly and fine nets can be erected against flying pests including birds.

Environmentally Friendly Chemical Pest controls

The following chemical controls can be used in moderation and in association with the other techniques covered in this article to treat infestation of specific pests.

- Pyrethrum spray (commercial or home produced) can be used on most flying and crawling insects. The pyrethrum daisy can be home grown and the active constituent pyrethrum extracted using water or alcohol. The addition of a small amount of sesame oil or sassafras oil will improve the effectiveness of the pyrethrum spray.

- Derris dust – can be applied as a spray or a dust and acts as a stomach poison for chewing insects. There is some toxicity to humans although Derris will not build up in the environment so when applying use a dust mask or respirator.

- Oil – either light mineral oil or vegetable oil can be sprayed onto plants for scale and other bugs, it clogs up their air holes and suffocates them. Spraying needs to be done in the early morning or late afternoon and spraying in the middle of a hot day can result in burned leaves.

- Bug juice – Yep, tastes as good as it sounds! Gather some of your target pest manually, mulch them up and place them in water, shake them around and then strain out the bits and spray onto the affected plants. For some reason bugs will keep away from plants sprayed with the innards of their relatives.....mind you, so would I.

- Chilli and garlic spray – See box below

Chilli and Garlic Bug Spray

Ingredients

2 level tsp of medium hot chilli flakes
3 crushed garlic cloves
1 tsp of dishwashing liquid
1litre of water

Instructions

Add the chilli, garlic and dishwashing liquid in a slightly larger than 1litre container or bottle, add 1 litre of water to the mixture, close lid and shake well. Put it somewhere dark and for the next three days shake the container or bottle once a day, and on the fourth day strain the liquid into a sprayer and go forth and spray, within a day or two notice the lack of buggies.

Insects do not like the taste of garlic, while the chilli burns their stomachs, the dishwashing liquid is used to keep it sticking on the veggies, once dried it will last for several days even through watering. This formula will also not degrade your soil like chemical pesticides as it is natural.

- Nicotine – soak a quarter of a cup of cigarette butts in a litre of warm water overnight, filter out the butts and add a bit of liquid soap or dishwashing liquid to help the spray wet out and bottle. WARNING: this is a nasty so use gloves when handling and don't inhale the spray.

10.0 Controlling Diseases Organically

In a similar way to dealing with pests, if you grow fruit or veggies of any description it is likely that you will have to deal with disease in those plants at some stage. Dealing with diseases is different to dealing with pests in that diseases tend to be very specific to each plant and while some general rules can be formulated about preventing disease and dealing with the various causes of disease it is important to research and make sure the disease is correctly diagnosed before acting. It is not possible to cover all the possibilities in a short article like this one, so this is more an overview to help you gain an understanding of plant disease so you can then move on to further research.

Having said all that my experience with disease in backyard grown vegetables is fairly limited and while we have had the odd outbreak of blossom end rot in tomatoes mostly our disease profile is restricted to mildew of cucumber and zucchini and the odd occurrence of damping off. It's good to keep an eye out on what is going on but don't obsess about infected veggies, life's too short.

The Cause of Disease in Plants

In general terms plant disease is caused by viruses, bacteria or fungi and the most common cause of disease in your veggie crop is likely to be a fungus. Some plant diseases or disorders can also be caused by a lack of one or more nutrient elements or by excess of a particular nutrient to the point where they become toxic to the plant, usually due to incorrect soil pH. These nutritional disorders are touched on in the article on keeping up fertility organically by adding nutrients while this article will focus more on the biological causes of disease.

The Organic Approach (Prevention Rather than Cure)

Rather than go for short term bandaids in the form of disease control chemicals like fungicides (no matter how enviro-friendly) we need to look at our backyard crops as being part of our backyard ecosystem and then try to keep the ecosystem in balance. We can also be smart and avoid disease problems before they get to the point where a chemical control is necessary by using some or all of the following strategies.

- Observe your back yard veggie crops regularly for signs of disease and if you do, diagnose as best you can or get advice from other gardeners, books or the 'net and once the disease is diagnosed act accordingly. By identifying and acting quickly a minor irritation can be prevented from becoming a major headache.

- Start with a healthy soil – healthy soil means healthy plants and healthy plants means they are less likely to become a target for diseases. If you follow organic principles and use organic manures and fertilisers, if you mulch well, use green manures and maintain soil organic matter and avoid cultivating and exposing your soil to the sun you are much more likely to have healthy soil. Check and adjust your soil pH if necessary as well, as soil that is too acid or alkaline can be rough on the microbes in your soil as well as your fruit and veggies.

- Mulching – As mentioned above mulching will help improve soil health but aside from this mulch will prevent soil and spores being splashed up onto the plant during rain and reduce the likelihood of infection, particularly fungal infection, by this route.

- Don't overcrowd your plants - allow room around them for good airflow although in my experience if you have healthy soil and are growing organically your veggies can be planted much more closely together without causing a problem than if your growing using chemical techniques. When planting the usual stuff in our backyard beds we generally use about 30cm spacing and that causes no problems, allowing separation of the plants and airflow when they are young and vulnerable but making good use of space when they are grown.

- Plant resistant varieties – The varieties of vegetables available today is very small in comparison to years gone by, even in plant nurseries the variety of seedlings is only slightly better than the stuff we can get in the supermarket. Fortunately there are specialised seed suppliers like Eden Seeds, Phoenix seeds, Greenpatch seeds and Green Harvest who can supply a broader number of varieties and some will be more resistant to than others to the diseases prevalent in your area.

- Keep your growing area clean and tidy – dying plants, rotting fruit and other organic material lying around and provide a place for disease to build up or even over-winter. Diseased plants should be removed from your site in the green waste bin or burned as the organisms may re-infect your veggies even if composted if unless your compost system is really hot. Don't take the chance.

- Hygiene – Maintain your hygiene levels when raising seeds, potting on and planting out. Regularly wash all your flats, punnets, labels, trowels etc in a disinfectant solution like Dettol or one of the quaternary ammonium disinfectants to prevent a build-up of disease organisms and get your seedlings off to a good start. Exposing your equipment to the sun will help to as the disease organisms generally don't like the ultraviolet light (they have never heard of sunscreen I guess....).

- Practice crop rotation –by not planting the same family of veggie in the same plot two years running which not only helps maintain fertility in the soil it prevents a build-up of crop specific diseases in the soil.

- Avoid overhead watering when possible – because this raises the humidity and can cause fungal problems when the leaves stay wet for an extended period of time. If you water in the morning so that any excess water is dried off by the sun the likelihood of this causing a problem is reduced.

- Don't water your veggies with greywater – apart from the possibility of passing on human pathogens to the crops you will later eat, you may also pass on plant pathogens. Use greywater for watering fruit trees and apply direct to the soil or subsurface.

- Plant at the correct time of year for the seed being grown – forcing a plant to grow outside its normal season can reduce its vigour and cause it to become prey to disease as well as pests.

Disease Transmission Routes

You may say, with justification, that your backyard crops are disease free and so they should remain disease free unless a disease is introduced from outside, but there are a number of ways that diseases can be transmitted onto your property which you need to be aware of – Infection from plant material brought in – this may be commercial seedlings or plant bought in by mail order or from surrounding nurseries or the likes of Bunnings. In general they should have enough of a handle on hygiene for infection due to this source to be possible but unlikely, however plant material provided by friends, neighbours or other backyard growers may be a different matter.

Infection from your neighbours – windblown spores can be blown in from your neighbours if they are growing veggies or other host plants. Spores like those produced by the powdery mildews are released in warm dry weather and may travel considerable distances on the wind.

Infection due to contaminated soil – again this may be soil brought in with purchased or donated seedlings but may also be carried into your backyard on dirt clinging to boots, garden tools such as spades or garden forks or even wheelbarrows that have been used off site.

Infection due to debris – imperfectly rotted compost or vegetable trash left around your backyard can act as a source of infection, particularly for fungal diseases.

Infection from seed – some diseases are able to infect the seed and in that way be transmitted to the next generation of vegetables. Again this is unlikely with commercially obtained seed but underscores the need to only save your own seed from only healthy plants and to make sure that any seed donated by friends is from healthy stock. If in doubt, don't use the suspect seed.

Infection by insects – while insect pests cause their own havoc, the small sucking insects like aphids and thrips can spread disease, particularly viruses between plants that are anywhere within their flying range.

General Symptoms of Disease

This is not a comprehensive list of symptoms but a rough guide for some things to look for if your fruit and veggies are failing to thrive.

Virus – Mosaic patterns of the foliage of the plant along with malformed or yellow foliage and stunted growth with the plant possibly assuming a strange shape'

Bacteria – soft foul smelling rot, black or brown spots or patches on leaves which may shrivel and die

Fungus – fall into four main groups; root and stem rots, mildews, rusts and leaf spots.

- Root and stem rots – Cause rotting of the stems, roots and a condition called collar rot, they attack the conducting tissues of the plant resulting in wilting and eventually collapse of the plant.
- Mildews – cause a white or ash grey powdery film over the surface of the leaf, usually older leaves which eventually wither and die.
- Rusts – cause orange or red pustules on leaves or stems.
- Leaf spots – as the name suggests result in black spots on the leaves of several types of vegetables.

Control Options

Virus – There are no real control options for virus infected plants but to "rogue" them ie pull out and remove them preferably by burning to destroy the virus. Do NOT compost them.
Bacteria – a double strength garlic spray may improve matters, Bordeaux mixture can be used on perennials
Fungus – seaweed foliar spray; milk, garlic and chilli spray, urine (use full strength and fresh!); chamomile tea; chive tea, sulphur or lime sulphur spray.

11. Controlling Weeds Organically – A Process summary

Part 0
What is a weed? A weed is a plant out of place.
Why remove them? They compete with target plants and can act as a host for pests and diseases; they can cause allergies, dermatitis or physical damage and in some cases, poisoning. They can inhibit germination or growth of other plant species, cross-pollinate with target species and they can look like crap. (umm, have poor aesthetics). **More detail here**

Part 1 – know your weeds
Follow this process to discover what weeds you will be dealing with. Of particular help later on is to find out which are annual and which are perennial weeds.
Divide your weedy spaces up into manageable areas and then download a plant identification app if you are going to use one or get hold of some weed identification books. Go out into your weedy area and systematically identify all weeds in the area using your app and/or weed identification books. Then record all information (common and scientific names) on all weeds present. Once the area is complete, transfer the information to weed spreadsheet. Once you know what weeds you have you can research more about them with confidence. **More detail here**.

Part 2 – Assess your weeds (optional)
Look at each weed in turn and rate them on their invasiveness and persistence from 1 to 5 then multiply the two figures together to get the PITA score, then record that on your

spreadsheet. This will help to identify which weeds will be a priority to treat first. **More detail here.**

Part 3 – Prevention is better than cure
Be aware that weed seeds and runners can be brought onto the property in materials bought in from off site, and by wind, water, animals or ourselves. They will also be some pre-existing weed seeds in the soil.

Strategies
To prevent weeds being brought in by materials imported from offsite – buy seeds from reputable suppliers, start seeds in punnets rather than direct sow. Consider buying shrubs and trees bare rooted, if not buying bare rooted, consider root washing. Consider using chooks to remove seeds from mulch, use mushroom compost rather than other amendments and/or compost amendments before using them. **More detail here**

In all cases research what you are bringing onto your property to identify problems first. Where existing seeds are being dealt with – avoid cultivating the soil, use mulch on bare soil, apply water directly to where it's needed rather than indiscriminate use of sprinklers, encourage ants which will feed on the weed seeds and keep an eye on bird roost areas. **More detail here.**

Part 4 – Weed control

General considerations – be knowledgeable about the weeds you are dealing with, and research the best ways of controlling each weed species. Apply controls when weeds are young and not established, or at least before they have had time to seed. Be aware of hazards and act appropriately, always keep an eye out for budding weed problems. Start from the edge of the weed patch and work inwards, and be realistic about what you can achieve and don't kill yourself, but be thorough and don't move on until the current patch completed. Don't let spaces remain empty and be responsible, don't let your weeds become your neighbours' or the local bush's problem. **More detail here.**

Physical control methods – These are broken down into a number of groups such as heat, barriers and physical removal. Heat includes solarisation or covering an area with plastic and killing weeds over an area with solar heat, or using targeted heat in the form of boiling water or a flame weeder. Barriers include plants used as a barrier, soil compaction or mulch to protect an area from weed invasion and physical removal is exactly what it sounds like – weeding, using various implements. **More detail here.**

Chemical control methods - I have tried a number of home made organic weedicide sprays and of all of them vinegar, with perhaps a small addition of dishwashing liquid to help it coat the leaves, is the most effective. Avoid all weed killers that contain salt as it will take a long time to wash through the soil and may inhibit plants growing where it is applied for a long time. There are others but most are not recommended. **More detail here**.

Cultural control methods - These techniques work by improving the ability of our target crops to compete more effectively with weed species. Cultural controls include using high quality seeds, planting well grown seedlings, planting them closely together. Where direct seeding is required using increased seeding rates. Maintaining good soil fertility and use techniques such as cover crops/green manures and crop rotation which are effective. The use of cleaning crops, animals such as chooks and interplanting are also good weed control techniques. While cultural techniques on their own will not control weeds they are effective techniques to include in weed control strategies and have many other side benefits as well. **More detail here.**

Part 5 – Maintenance

Weed management is a long term commitment and once they are under control, the system needs to be maintained to keep them under control. Maintenance activities include continuing to keep an eye out for potential weed infestations and remembering that prevention is still better than cure, making sure that activities to this end are continued. Also continue any cultural controls in place to reduce weed infestations in the long term. Recording your successes and failures is also worthwhile in the longer term so that if a problem weed raises its ugly head you will know what to do (and what not to do!). **More detail here.**

12.0 Resources

12.1 Suburban Vegetable Growing

Lawns into Lunch: Growing Food in the City – Jill Finnane – New Holland Publishers (AUS) 2005 ISBN 1 74110 209 X – This is a collection of stories about people growing their own in the cities, with an undercurrent of Permaculture and sprinkled with hints and recipes. Inspirational as well as practical, this is a good one.

Fresh food From Small Spaces – R. J. Ruppenthal – Chelsea Green Publishing Company (US) 2008 ISBN 978 1 60358 028 1 – Even taking into account this is from the US it has lots of good info about growing food in the city/suburban environment. Some unusual things like mushrooms and fermented foods like kefir are covered as well as bees, chooks and worms. Well worth having.

Urban Eden – Adam and James Caplin – Kyle Cathie Ltd (UK) 2004 ISBN 1 85626 501 3 – Not vast amounts of "How To" but a very inspirational book that has some great ideas for small spaces.

Fabulous Food From every Small Garden – Mary Horsfall – CSIRO Publishing (AUS) 2009 ISBN 978 0 643 09597 7 – A great book that really covers everything you need to know to get the best out of your urban/suburban space. Mary is the co-editor of Grass Roots magazine, how can it get better than that?

Grow Your Own Fruit and Veg in Pots, Plots or Growbags – Steve Ott, Emma Rawlings & Roxanne Warwick – Foulsham Books (UK) 2008 ISBN 978 0 572 03494 8 – This is set out as an A to Z guide to growing vegetables, fruit and herbs with 1 or 2 pages per plant including varieties, growing tips and recipes. Good for what it is bearing in mind it is written for the UK experience.

Successful Small Food Gardens – Louise Riotte – Garden Way Publishing (US) 1993 ISBN 0 88266 818 8 – Good for those with some land around them in the suburbs although it does contain a section on mini gardening for mobile homes. There is also a section on edible flowers and one on edible landscaping.

Grow Your Own Groceries (How to feed your family from your own back garden) – Linda Gray – Spring Hill (UK) 2009 ISBN 978 1 905862 31 3 – Good detail on growing and using veg, herbs, berries and edible flowers. Also covers egg production and use and some information on preserving the harvest.

Harvesting the Suburbs – Jeff Hodges – Nature & Health Books (AUS) 1986 ISBN 0 949099 02 3 – While not a lot of data on individual vegetables this book is inspirational and gives lots of good information on planning your productive backyard based around Permaculture principles.

The Complete Urban Farmer – David Wickers – Fontana/Collins (UK) 1977 ISBN 0 00 635096 8 – This book has good sections on planning you layout and improving your soil as well as

raising vegetables from seed, ideas for containers to grow in and storing, preserving and cooking the harvest.

Raise Bed Vegetable Gardening Made Simple – Raymond Nones – The Countryman Press (US) 2010 ISBN 978 0 88150 896 3 – everything you wanted to know about raising backyard vegetables based around a system consisting of three, four foot by eight foot raised bed modules.

Patio Produce – Paul Peacock – Spring Hill (UK) 2009 ISBN 978 1 905862 28 3 – Lots of good stuff about growing individual vegetables, fruit and herbs on your patio or small outdoor space as well as how to plan and get the best out of you patio farm. Obviously the section on the patio gardeners year needs to be adjusted to fit in with the seasons here in Aus.

The City Peoples Book of Raising Food – Helga and William Olkowski – Rodale Press (US) 1975 ISBN 0 87857 095 0 – This is a great little book that covers the usual stuff like planning your garden, raising plants from seed and keeping up the fertility but then goes into some more unusual stuff like integrated pest management, roof gardening and community gardening. Another one to grab if you can find it.

Square Foot Gardening – Mel Bartholomew – Rodale Press (US) 1981 ISBN 0 87857 341 0 – Ground breaking at the time of its release, this book covers a system of backyard vegetable raising based on squares rather than row cropping. It is a comprehensive and detailed manual on how to make the system work for you. There is a companion volume by the same author called “Cash from the Square Foot Gardening”.

How to Grow More Vegetables* (*than you ever thought possible on less land than you can imagine) – John Jeavons – Ten Speed Press (US) 1979 ISBN 0 913668 98 2 – This is a manual on how to implement the Biodynamic/French Intensive method of growing vegetables in your back yard. It goes through planning and preparing your beds, fertilisation and composting, seed propagation, companion planting and how to develop a natural backyard ecosystem. I had some difficulties with the process but maybe my understanding was faulty. This has recently been updated and republished. There is also a simplified edition by the same author called “Lazy-Bed Gardening”.

One Magic Square (grow your own food on one metre square) – Lolo Houbein – Wakefield Press (AUS) 2008 ISBN 978 1 86254 764 3 – This is a wonderful book for the backyard food grower. Written for Australian conditions the author sets out a process of growing compatible plants in one metre square combinations, with lots of detail on each combination and individual crops. She also covers the why’s and wherefore’s of food self sufficiency and a whole stack of tips to make the process easier.

The Complete Book of Edible Landscaping – Rosalind Creasy – Sierra Club Books (US) 1982 ISBN 0 87156 278 2 – This is THE book on edible landscaping, if you want your suburban place to look nice but be productive as well this is the book for you, it is designed for those which have some land to play with. It is an exhaustive manual for landscaping with productive species. The author has also realeased a series of smaller books on different aspects of edible landscaping, including “The Edible Flower Garden”; “The Edible Asian

Garden"; "The Edible Heirloom Garden"; "The Edible Italian Garden" and "The Edible Salad Garden".

Vasili's Garden: from the garden to the kitchen Mediterranean style – Vasili Kanidiadis – Wilkinson Publishing (AUS) 2008 ISBN 9781921332340 – This is a fun book, good to browse through, set out in a section for each season, it gives tips, hints and recipes for growing and using backyard veggies. It is very easy to read and was put together to support the TV series of the same name.

Vegetables for Small Gardens and Containers – Peter De Vaus – Hyland House Publishing (AUS) 1991 ISBN 0 947062 37 8 – This book covers location and planning of veggies, tools, crop rotation, preparation and planting, pest and disease control and harvesting and storage of your veggies. A good book for small scale growers and one of the first to cover container growing veggies seriously.

The Rurbanite – Alex Mitchell – Kyle Books (UK) 2013 ISBN 978 0 85783 072 2 – There are lots of ideas here on how to grow food in the city, from the soil up. Container growing is covered as well as seed saving, guerrilla gardening street gardening. Wild food and wildflower foraging is covered as well as raising chooks, quail, ducks and bees in the city. Lots of colour photos.

Paradise Lot (The making of an edible garden oasis in the city) – Eric Toensmeier - Chelsea Green Publishing (US) 2013 ISBN 978 1 60358 399 2 – This is the sort of book you read from cover to cover. It is the story of two guys who bought a duplex in the US city of Holyoke and proceeded to turn their shared backyard into a permaculture based, low maintenance edible garden. A great read! No drawings, but there are a dozen or so colour photos in the centre of the book.

The Quarter Acre Farm – Spring Warren (Yup, that's her name!) Seal Press (US) 2011 ISBN 978 1 58005 340 2 – This is another cover-to-cover read. The author wanted to grow 75% of their food on their suburban block. There is a fair bit of "this is how I did it" and recipes for your home grown produce are included. We have actually used a couple of the recipes. She also talks about preserving, animals and eating the weeds. No photos just a few line drawings.

Veg Street – Naomi Schillinger – Short Books (UK) 2013 ISBN 978 1 780 72112 5 – This one is a bit of a coffee table book, lots and lots of colour photos but not hugely information dense. It is set out with each chapter covering a month (starting with January) and each month giving information about which plants can be planted and which can be harvested that month (for the northern hemisphere of course). There is also a small section called Community Corner covering ways of revitalising your community around growing things, a page or two on potting various plants and also a "simple but Brilliant Ideas" page. Good if you want basic information.

The Small Edible Garden – Diana Anthony – David Bateman Ltd (NZ) 2008 ISBN 978 1 86953 705 0 – A very small book too! (64 pages) It gives good basic information on setting up and managing a small food garden, including containers as well. Details on soils, watering, sowing and planting are covered with information on growing fruit, veg and herbs as well as organic management principles. Lots of colour photos, good basic info.

Vertical Gardening – Derek Fell – Rodale Press (US) 2011 ISBN 978 1 60529 083 6 – The book opens with a discussion of what constitutes vertical gardening and its advantages, moving from there into choosing your site and preparing the soil. This is followed by several chapters discussing the vertical gardening options (arches, pergolas, trellises, hanging planters etc.). Composting, seed starting, pests and diseases, watering pruning and fertilising (all organic) are covered and there is a section on fruit and vegetables suitable for vertical gardening. The book has some line drawings and colour photos as well as a fair amount of black and white photos.

Vertical Vegetables and Fruit – Rhonda M. Hart – Storey Publishing (US) 2011 ISBN 978 1 60342 998 6 – The book is divided into 3 parts, the first part covers why you should garden vertically and the sorts of techniques used such as trellises, teepees, hanging, stacking, making towers etc. The second part goes into the details of growing annual vines vertically like beans, peas, cucumber and squash; and part three covers vertical growing of specific perennial fruit crops like berries, grapes and kiwifruit. There are no photos, but some coloured line drawings which work very well.

The Edible Front Yard – Ivette Soler – Timber Press (US) 2011 ISBN 978 1 60469 199 3 – First the author goes into lots of detail on the sorts of crops that look good in a front yard, gives you a couple of designs and then shows you how to assess your own front yard. She takes you through how to drag your front yard back to scratch, what infrastructure you will need to put in and once everything is in, how to maintain it using organic gardening principles. Lots of information about setting up an under-used space to grow food. Lots of colour photos, but lots of how-to as well.

Ground Breaking Food Gardens – Niki Jabour – Storey Publishing (US) 2014 ISBN 978 1 61212 061 4 – This is not an in-depth how-to book.It is a very good ideas book though. The book shows you 73 different garden designs with each design being described in two or three pages. Designs include edibles on a patio, vertical vegetables, an edible knot garden, 52 weeks of salad garden, an Elizabethan garden….the list goes on. No photos but lots of colour diagrams. If you want to grow food but have run out of ideas, this one is worth a look.

Little House in the Suburbs – Deanna Caswell and Daisy Siskin – Betterway Home (US) 2012 ISBN - This is a broad brush book that starts out with why you would want to live the productive lifestyle in the suburbs and moves through growing veggies, keeping chooks, mini goats and bees to preserving and making your own skin care and cleaning products. The authors also take you through improving community in your neighbourhood and finish off with a stack of appendices about planting plans and other resources. The authors also operate a blog of the same name. There are quite a few colour photos illustrating the how-to stuff.

12.2 Pests and Diseases

What Garden Pest or Disease is That? – Judy McMaugh – Lansdowne Press (AUS) 1985 ISBN 0 7018 1932 4 – for years this has been the standard text for pest and disease identification, it is a big book chock full of colour photographs and line drawings. It is NOT a book about treating pests and diseases organically but you will not find a better book on identification around.

Insect Pests of Fruit and Vegetables in NSW – P. C. Hely, G. Pasfield, J. G. Gellatley – Inkata Press (AUS) 1982 ISBN 0 909605 27 0 – This one isn't organic either but has good line drawings and black and white photos plus some colour photos to help you identify your pests (but you won't find photos of the next door neighbours kids in here.....)

What Pest is That? – Frances Hutchinson – Bay Books (AUS) 1982 – ISBN 0 85835 539 9 – similar to the above, colour photos and line drawings to aid in identification but chemical controls throughout, except for a couple of pages at the back on organic controls.

The Organic Garden Doctor – Jackie French – Angus & Robertson (AUS) 1988 ISBN 0 207 16039 2 – lots of information on organic control of pests, diseases and weeds of fruit and veg as well as some ornamentals. Anything by Jackie French is guaranteed to be good and based on sustainable principles. Some colour photos but if you team it up with one of the identification books above you will have a winner!

Natural Control of Garden Pests – Jackie French – Aird Books (AUS) 1990 ISBN0 947214 13 5 – Lots of info in a small book, a couple of colour plates but no other illustrations.

Bug – Tim Marshall – ABC Books (AUS) 2010 ISBN 978 0 7333 2501 4 – This is a companion volume to "Weed" listed below. It is a gold mine of information on the identification and control of garden pests using sustainable organic methods. There are a few line drawings so one of the more profusely illustrated books on identification is still needed but once you know your bug, this book will tell you how to deal with it.

12.3 Weeds

Weeds –Compiled by J. N. Whittet - NSW Department of Agriculture (AUS) 1968 (Second Edition) No ISBN – This imaginatively titled book is directed mainly at farmers but still has lots of good information about the identification of weeds, nothing remotely organic to be seen in the controls here though Chapter one talks about weed problems in agricultural and pastoral areas of NSW, chapter two covers weed legislation in NSW and considering how legislation will have changed in the last 50 years, will be well out of date. Chapter three discusses toxic weeds and their effect on livestock, chapter four covers control of weeds ecologically, biologically, mechanically and chemically and chapter five focuses on chemical control. Chapter six (almost half the book) is a description of individual weeds and appropriate control measures. There are a large number of line drawings and colour plates, especially in chapter six.

Field Guide to Weeds in Australia – C. Lamp & F. Collet – Inkata Press (AUS) 1989 ISBN 0 909605 53 X – The first three chapters cover What a weed is, reproduction and dispersal and plant identification in general terms. The rest of the book is a series of 331 monographs on individual weeds covering what they look like and where they grow as well as other snippets of information about each weed. Each monograph lists the Latin name, common name, family, a description of the plant and an indication of its status as a weed. There is a colour photograph attached to each monograph but no recommendations on control strategies.

The Weed Book – Mark A. Wolff – New Holland Publishers (AUS) 2012 ISBN 9781877069932 – The bulk of the book is a series of over 120 monographs on individual weeds each giving a description, origin of the weed, distribution around Australia and how the weed is dispersed, as well as a colour photo of each weed. There is a very interesting chapter on hand weeding that I haven't seen anywhere else but generally the main focus on weed control is chemical control.

Organic Control of common Weeds – Jackie French – Aird Books (AUS) 1989 ISBN 0 947214 06 2 – This is a great little book, just like you would expect from Jackie French. Chapter one covers living with weeds i.e., what to do with them, chapter two covers weed management including the twelve steps to weed control and weed control strategies for lawns, flower beds, orchards, pasture and vegetable gardens. Chapter three covers fighting weeds including biological control, natural herbicides, companion planting, green manuring and homemade herbicides. Chapter four covers using weeds and includes edible weeds, medicinal weeds, drinks and weeds that can be used as pesticides. Chapter five lists some common weeds, their identification and control. The book has no photos but lots of line drawings.

Weed – Tim Marshall – ABC Books (AUS) 2010 ISBN 9 780733 327742 – This small book is a gold mine of information on organic weed control and if you can only buy one book on weed control (in Aus) this should be it! There is a helpful section at the start detailing how best to use the book. Chapter one discusses what a weed is including how they propagate, annual vs perennial weeds and a working definition of the term 'weed'. Chapter two talks about taking control of weeds including intercropping, cover crops, crop rotation, barrier cropping, mechanical, thermal and chemical control. Chapter three lists common weeds and potential control strategies for each one. Chapter four covers 'good' weeds and how they can be used. Chapter five covers environmental weeds and their control, Chapter six is a quick reference guide listing a weed and then the options for various types of control (physical, chemical, thermal, cultural). The book has a small number of line drawings.

The Wondrous World of Weeds – Pat Collins – New Holland Publishers (AUS) 2017 ISBN 978 1 921517 79 2 – After a very short introduction on what a weed is, the majority of the book is made up of monographs on over 100 weeds present in Australia. Each monograph lists the common and Latin names, were it is distributed within Australia and what its preferred habitat is. The monograph then provides a general description of the plant and detailed descriptions of its leaves, flowers and fruit/seeds. This followed by the plants' uses as edible, medicinal or on the farm and in the environment. Finally is a reference for further

reading and any warnings regarding the use of the weed. There are several colour pictures of each weed covered in the monograph.

Weeding without chemicals – Bob Flowerdew – Skyhorse Publishing (US) 2012 ISBN 978 1 61608 647 3 – While this edition was published in the US, it was originally published in the UK and is written from a UK perspective. This is not a particularly information dense book, but has some interesting insights. The first part of the book covers what weeds are, why they appear and where they come from. The next part covers why we should weed and when, which weeds are worst and why herbicides should not be used. There is a one-page general approach to weed identification and the rest of the book is on weed control. This includes weeding by hand, while standing up and sitting down, solarisation, methods of excluding weeds like close growing and green manures and weed suppression using various mulches. This is followed by suggestions for organic weed killers (chemical and physical) and composting to finish off weeds. There are then a series of recommendations for weed control in psecif circumstances live veggie gardens or under fruit trees. The book has lots of colour photos.

Gardener's Companion to Weeds – Suzanne Ermet, Leigh Clapp (photographs) – New Holland Publishers (AUS) 2001 ISBN 978 1 87633 477 2 – While this book is mainly about identification of weeds, it starts off with a small section on how to use the book, what a weed is, and control methods: chemical (not organic), and non-chemical weed control. The book is then divided up into sections on aquatic weeds, lawn weeds, garden weeds, pasture and wasteland weeds and invasive plants. Each section is set out A to Z, based on the common name of each weed. Each weed monograph has a colour photo, general description, where they can be found, specific control methods and how the weeds multiply (Disperse). The book has lots of colour photos.

Weeds – An illustrated botanical guide to the weeds of Australia – B.A Auld & R.W. Medd – Inkata Press (AUS) 1992 ISBN 0 909605 37 8 – The book starts of with an introduction and guide to plant groups, then is composed of a series of monographs, broken down into three groups under the headings of Pteridophytes (ferns), monocotyledons and dicotyledons. Each group is set out A to Z based on the scientific name of each weed. Each monograph starts with the family of the weed, its latin name and common name, followed by the origin of the weed a description, the distribution of the weed and it's importance, and colour photo. This one is fairly technical! Lots of colour photos.

Controlling Weeds Without Using Chemicals – Jo Readman – HDRA/Search Press (UK) 2000 ISBN 0 85532 934 3 – I like this book, but it is little disappointing that almost half the book is taken up with weed identification rather than weed management as such. The first section of the book is on the ecology of weeds covering lifecycles of various types of plant, how weeds spread vegetatively and how they regenerate. The next section (Know Your Weeds) is about weed identification and contains a colour photo (mostly) and description of 95 common weeds (in the UK). The next section covers the benefits of weeds and how to use them, followed by a small section on why weeds are a problem. On page 44 (of a 61 page book) we get to the principles of organic weed control, which covers composting, presowing cultivations, planting effectively, mulches, green manures, crop rotation, raised beds and hygiene. The next section covers weed removal (hoeing, hand weeding, flame weeding,

followed by a sction on weed control in the lawn, and woody weeds. Lots of colour photos, but not a huge amount of detail in each section.

Weed Free Gardening – Tasha Greer – Cool Springs Press (US) 2022 ISBN 978 0 7603 7323 1 – This is a great book, that helped me think more holistically about weed management. I am not 100% sure that all of it is translatable to Aus but it is a great book to make you think. It is written in and introduction and four sections. The introduction covers why the war on weeds cannot be won and the origin of weeds. Section one covers how to prevent weeds being imported onto your property, Section two covers maintaining your property to make it less hospitable to weeds by looking at soil, drainage, adding organic matter and increasing mycorrhizal networks. Section three (reconciliation) covers various ideas to use weeds in weed control. Part four is entitled creating peace in the garden and covers various ways of growing (no dig, grow beds, grow bags) that are less affected by weeds. Throughout the book are a series of specific recommendations, one called ‘weed whack’ which talks about weed control strategies and the second one is ‘tool bar’ which is a series of discussions of the various tools that can be used to manage weeds. This is a great book, worth having. Lots of colour photos.

Appendix 1 – Sowing Plan

Vegetable	Variety	July		August		September		October		November		December		January		February		March		April		May		June	
		Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3	Week 1	Week 3
Asparagus	Mary Washington			6 plants																					
Basil	Sweet	4 plants		4 plants		4 plants		4 plants		4 plants		4 plants													
Beans					1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row							
Beetroot	Crimson Globe						1 row		1 row		1 row		1 row												
Bok Choi					4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Broccoli	Summer Green	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants								
Broccoli	Royal Dome	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants
Broad beans	Coles Dwarf	1 Row																		1 Row		1 Row		1 Row	
Cabbage	Sugarloaf	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Cabbage	Golden Acre	1 plant		1 plant		1 plant		1 plant		1 plant		1 plant		1 plant		1 plant									
Cabbage - Chinese	Wong Bok	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Calendula	Pot marigold		4 plants			4 plants																			
Capsicum	California Wonder	4 plants			4 plants			4 plants								4 plants									
Chilli	Cayenne	2 plants			2 plants			2 plants								4 plants									
Carrots	All year round				Half Bed																				
Carrots	Chantenay				Half Bed																				
Cauliflower	Phenomenal Early	2 plants												2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Cauliflower	Snowball			2 plants																					
Celery	Golden Self Blanching				2 plants		2 plants		2 plants				2 plants			2 plants		2 plants		2 plants		2 plants		2 plants	
Choko						3 fruit																			
Cucumber	Crystal Apple			1 plant		1 plant		1 plant		1 plant		1 plant		1 plant		1 plant									
Cucumber	Long Green			1 plant		1 plant		1 plant		1 plant		1 plant		1 plant		1 plant									
Garlic																									
Ginger						4 rhizomes																			
Jerusalem Artichokes					6 rhizomes	6 rhizomes																			
Kale	Scottish																	4 plants		4 plants		4 plants		4 plants	
Leek							12 plants			12 plants			12 plants			12 plants			12 plants		12 plants				
Lettuce	Mignionette - green	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Lettuce	Buttercrunch	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Lettuce	iceberg (all year round)	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Mustard	Zaar	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant								1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Mibuna		1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant								1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Mizuna		1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant								1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Onions - sets																				2 Boxes					
Onions - Spring	Evergreen bunching		1 punnet																						
Oregano																									
Nasturtiums				2 plants		2 plants		2 plants		2 plants		2 [plants													
Peas - Snow	Mamoth Melting															1 row	1 row	1 row	1 row	1 row	1 row				
Peas Climbing	Telephone	1 row	1 row														1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row	1 row
Potatoes	Nicola				12 plants									6 plants											
Parsley	Curled	4 plants				4 plants					4 plants														
Pumpkin	Queensland Blue		2 plants							2 plants															
Silverbeet	Fordhook Giant	2 plants			2 plants																				
Radish		4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants	4 plants
Rocket			2 plants		2 plants		2 plants																2 plants		2 plants
Spinach	Southern European		4 plants															4 plants		4 plants		4 plants		4 plants	
Squash (button)			2 plants				2 plants				2 plants			2 plants											
Sweetcorn				16 plants						16 plants															
Sweet Potatoes						4 plants																			
Tatsoi		1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Tomato	Stupice or Kotlas	4 plants																							
Tomato	Grosse Lisse		12 plants									12 plants													
Tomato	Roma					4 plants		4 plants		4 plants		4 plants													
Tomato	Red Cherry cocktail		4 plants								4 plants														
Turnips	SnowBall																Row								
Zucchinni	Black Jack	2 plants			2 plants							2 plants													

Appendix 2 - NPK of Materials available in or close to urban/suburban areas

These figures are rough and will vary from batch to batch

Material	N	P	K
Beans, Garden (seed & hull)	0.25	0.08	0.3
Blood & Bone	3.6	8	10-20
Cattle manure (fresh)	0.29	0.25	0.1
Chicken Manure (fresh)	1.6	1.0-1.5	0.6-1.0
Clover	2.0	0	0
Coffee Grounds	2.0	0.36	0.67
Corn cobs	0	0	2.0
Cornstalks	0.75	0	0.8
Compost	0.5	0.27	0.81
Couch Grass (green)	0.66	0.19	0.71
Cucumber skins (ash)	0	11.28	27.2
Eggs	2.25	0.4	0.15
Eggshells	1.19	0.38	0.14
Feathers	15.3	0	0
Grapefruit Skins (ash)	0	3.6	30.6
Grass clippings	1-2	0-0.5	1-2
Hair	14-15	0	0
Horse Manure (fresh)	0.44	0.35	0.3
Human Urine	15-19	3-5.4	1-2.5
Lemon Skins (ash)	0	6.33	1.0
Lucerne hay	2.45	0.05	2.1
Milk	0.5	0.3	0.18
Mud (fresh water)	1.37	0.26	0.22
Oat straw	0	0	1.5
Orange Skins	0	3.0	27.0
Peanut shells	3.6	0.15	0.5
Pea Pods (ash)	0	3.0	9.0
Pea (vines)	0.25	0	0.7
Pigeon manure (fresh)	4.19	2.24	1.41
Pine Needles	0.5	0.12	0.03
Potato Skins (ash)	0	5.18	27.5
Potato haulms (dried)	0.6	0.16	1.6
Rabbit manure	2.4	1.4	0.6
Seaweed (dried)	1.1-1.5	0.75	4.9
Sheep & Goat Manure (fresh)	0.55	0.6	0.3
Sorghum Straw	0	0	1.0
String Beans (strings & stems, ash)	0	4.99	18
Tea leaves (used)	4.15	0.62	0.4
Tomato leaves & stems	0.35	0.1	0.4
Wheat bran	2.4	2.9	1.6
Wheat Straw	0.5	0.15	0.8
White clover (green)	0.5	0.2	0.3
Wood ash	0	1.0-2.0	6.0-10.0
Worm castings	1.0	1.0	1.0