Small-scale Food Growing

(Second Edition)

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Note: This is a revised and updated version of the eBook 'Small Scale Fruit and Vegetable Growing (Balcony – 2 Backyard), which it replaces.

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0.0 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 actually 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. Fruit trees are a larger investment but can pay back for many years once they are established and with the right care.

2. **Growing your own provides fresher produce, improving your family's nutrition** – Once a fruit or 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! Fresher fruit equals sweeter fruit - it has not been harvested unripe then stored for months before getting to the retailer.

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 and lemons come from a tree, 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 fruit and veg from retailers, you can only buy the types and varieties of fruit and 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 and 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.

We have been growing our own fruit and veg for over 30 years and doing it seriously enough to provide up to 80% of our needs for over 10 years in our medium sized backyard. You do need to know stuff but the information in this book will help you, whether you have a balcony, a back yard or no outside area at all, you can grow some of your own food. The time to start is now!

1.0 Vegetables

1.1 How we Grow our Annual Veggies, an Overview

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. Information to help you develop your own sowing plan is provided in Chapter 5 - Succession Planning and Planting.

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.

Detail on how to put your own plan together may be found in Chapter 5

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 our Perennial Vegetables, an Overview

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 – 25mm to 30mm 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!

1.3 Assessing a balcony for Edible Gardening

The family living in a house on a quarter acre block is becoming the exception rather than the rule for suburbia, if you only have a balcony on which to grow your food, this chapter will help you do the pre-work to make your balcony growing a success.

Why grow food on your balcony?

Growing your own food is a great way to increase the sustainability of your lifestyle, and is worth doing on its own, for a whole stack of reasons, all of the reasons in Chapter 1 plus -

- Aesthetics – it looks good! If you can look out a window or set of glass doors onto your balcony and see beautiful, productive, tasty vegetables rather than just another building, as is often the case, why not?
- Cools things down – The effect of the hot sun on bare brick and concrete means that the cities tend to be hotter than the surrounding land, which is referred to as the heat island effect. By growing your own on your balcony you are giving the sunshine a better job than just heating up the surrounding air, it will be producing food.
- Reduce noise – depending on how you structure things, vegetation between you and the outside world can provide a barrier to outside noise. Bare flat surfaces tend to reflect noise without reducing its volume much whereas vegetation absorbs and reduces the noise level.
- Reduce pressure on drains – Stormwater drains in the city can easily be overwhelmed by a sudden rain because all of the rain is runoff. Vegetation, even if it is pots, will slow the journey of the rainwater so that the drains find it easier to cope and flooding is reduced

Assessing your balcony

Before rushing straight out and starting, or even making any big decisions on what goes where, spending a bit of time to assess what you have and what your options are is a good thing. To help you out I have developed a Balcony Assessment Form (See Appendix 2) to walk you through the process and prompt the things you need to look at. If you are doing the assessment for someone else (eg family member or friend), it will also make the process much easier and result in a better outcome.
Here are some notes on how to use the form to assess your balcony -

Context – these are the bits and pieces that makes sure you remember which property it was that you assessed. This is no problem if it is your own property but if you are assessing a few balconies it can get confusing very quickly

Date: this draws the line in the sand so you know when you did your assessment, you may wish to look back on it or amend it in the future so having an idea of when it was done can be handy.

Address: Not so important if you only intend to ever do one assessment but if you do more than one, all of a sudden the address can become veryyyyy important!

Floor No: In other words, is the balcony on the ground floor or the 10th floor? See "Address" above. If you are doing multiple assessments however it is handy to know how far off the ground the balcony is for wind effects as well as helping you find it again if you need to!

Construction details

Dimensions and area of balcony: one of the critical limiting dimensions of the design will be the area which you have to work with. The overall shape may be important to, if it is long and narrow may require a different approach than if it were square so having the dimensions as well as the overall area will be useful.

Wall and railing type and height: the railing or wall type which prevents falls from the open end of the balcony will also affect the impact of the sun, wind and rain on features on the balcony. Whether it is glass, brick or steel, whether it is solid or has areas where sun and rain can get in may be important to the finished design and so is important to record.

Materials of construction and condition: if the balcony made of steel, wood, concrete, brick or a combination it may affect what goes where in the finished design. The overall condition may have an impact on the weight which the balcony can support as well. Is there rot in the wood, cracks in the brickwork or rust on the steel? A review at this stage will point out any structural issues which will need to be resolved before the design is implemented. If there is any doubt at all, secure the services of a structural engineer.

Drainage and Fall: Does the balcony have any form of drain? How big is it? Where does it lead? Do all points on the balcony fall towards the drain or are there areas where a build-up of water may occur? This may be a critical factor on how irrigation water will be treated in the finished design and where drainage water should be directed.

Climate

Direction faced: the direction the balcony faces is probably the most critical non-alterable characteristic of the balcony. Here in the southern hemisphere a south facing balcony may mean no direct sunlight at all which will severely limit options for growing anything. Almost anything other than a due south aspect will allow some form of food production.

Water Access: if there is a tap right there on the balcony you have it made! But even if you do, what other opportunities to gather water are there? Is there a downpipe from

the roof which you can tap into or maybe an overhead structure which can be used to harvest rainwater. If there is no direct access to water of any description on the balcony itself, where is the nearest tap? You may have to fill watering cans and lug them from inside, which can be a pain. If there is a suitable tap inside would it be better to run a hose and fill a water drum on the balcony and then run water out as required.

Shade – shade may come from local trees, overhanging projections or other buildings in the vicinity such that even with a good aspect the hours of sunlight may be reduced. The amount of shade will also vary with the seasons and this should be taken into account.

Prevailing Wind: some history of wind in the area will be important to the design, especially for balconies on the higher levels of a building. Surrounding buildings may also modify the direction a wind comes from. High winds will be hard on the more delicate plants causing both physical damage as well as drying plants out quickly and may necessitate designing in a wind break of some description.

Microclimate issues: by looking at the balcony and its environment as a whole it may be possible to identify particular microclimates such as warm and sunny or cool shady spots, a damp are which seems to catch the rain or an exposed area more subject to the wind than other parts. Identifying these issues at the start can allow the design to make the most of any existing microclimates.

Nearby Roads: While the effect of roads on the balcony will be reduced the higher the balcony is up on the building, lower down there can be a number of effects. Traffic noise can reduce the amenity of the balcony my keeping up an annoying hum, air pollution from passing traffic can affect both the garden and the gardener and the heat island effect can mean warmer winters but also hotter summers.

Other stuff

Existing Materials, plants and structures: The stuff which is already there will have an effect on what new stuff you can introduce. If some of the existing stuff can be removed that is worth recording because it will give you more space but before finalising your plan it is important to know what can be moved and what can't.

Owner's Vision: if you are doing this for yourself, this is the part where you can record what you want to get out of your balcony edible garden. Once you can articulate what you want it is possible to work backwards from that and develop a plan to deliver as much as you can of your vision. In a similar way, if you are doing this for someone else it is important to understand what they hope to get out of the finished product so that can be delivered as much as possible too.

Conducting the Assessment

OK so you now have a printout of the blank assessment form on your clip board, and are ready to go!.....maybe. At this point it is a good idea to collect the following things to help you record your data during the assessment –

A compass – an orienteering compass is good but in a pinch anything that shows you where north is, even if it is an app on your iPhone. Don't guess which way you think the balcony faces, check it with a compass and make sure to note it down on the form. This will save lots of hassles later.

A tape measure – You will need to take the measurements of everything! The length and breadth of the balcony itself but also the dimensions of everything on it, where things are in relation to each other and especially the bits that won't move. Whatever you can find. If you measure everything on your first trip, even the stuff you think you will never need, it will reduce the need for a return visit and save you time in the long run.

Digital Camera – As above, photograph everything! That will help you when you are working out where everything is and what space you have to work with. They will act as a supplement to your measurements and assist you to work out where everything is now, and where the new stuff will fit.

Spirit Level – It may be obvious where the "fall" of the balcony is, towards the edge or towards the drain, but a spirit level can be handy to identify which way the balcony slopes and therefore which way the water will run.

Stationery – A selection of pens, pencils, plain, lined and graph paper is a great support for taking notes and sketches and drawing out ideas when talking with the owner about their vision for the balcony.

Small electronic voice recorder – to record conversations with the owner assuming that is not you, and if they are comfortable with you doing so.

To conduct the assessment, first do a quick look over the balcony to get the lay of the land, as it were, or at least the lay of the balcony. Then set to and take photos from as many angles as you can manage, with separate photos of any features which are to remain after the plan is put in place. Once things have been photographed within an inch of their life, take as many measurements as you can and draw up a mud map of the balcony and what is on it.

Once all that is done, make notes on construction details and talk to the owner about any climate data they can give you. The final thing is to go through with the owner what their vision for the space is – what is to go, what is to stay, what sort of fruit, vegetables and herbs they wish to produce, what they want to see in the space. Some ideas from you around possibilities – pond, vertical growing, self-watering containers, worm farm, fruit trees – will help to stimulate their thoughts around what they are after. As always, take copious notes or, if they are comfortable with it, record the conversation.
With all the data recorded you can starting putting together the plan.

Drafting the Plan

With all of the information in place it's now time to review it and come up with a plan for the balcony area which will allow the best and most productive use of the space which is available.

The construction details of the balcony will give you an idea of how much stuff you can cram into it and where it will go. Weight will always be a concern unless your balcony is on the ground floor and will probably set an upper limit to how much you can grow, but the size and how well it is constructed will give you an idea how far you can go. If in doubt, keep things close to the building where the balcony is attached as this will reduce the leverage effect of a weight placed on the edge of a balcony.

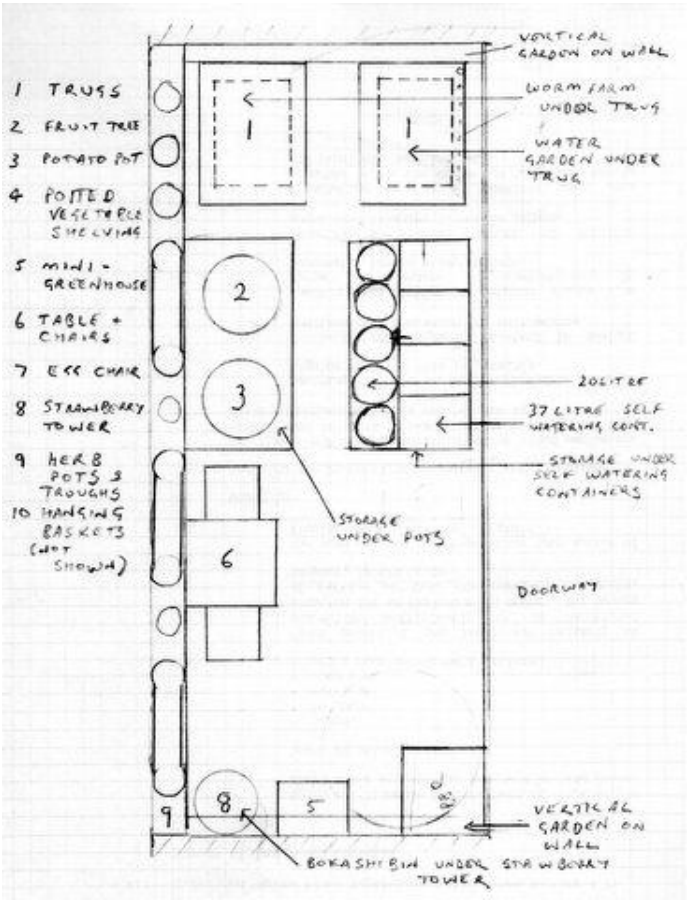
The climate data will inform you of the types of plants which you will be able to grow. Lots of sun and you will be able to grow most things whereas lots of shade giving somewhat less sun may mean leaf crops only. Remember, fruiting crops will require 4 to 6 hours of sunlight a day, leaf crops requiring much less while root crops will be somewhere in between in their daylight hour requirements.

The stuff already on the balcony which cannot be moved/removed will also set some limits on what new stuff you can install and of course the owner's vision will be the best indication of the sorts of features to put in place.

Recycled containers on even a small balcony gives you a herb garden

Sketching the Layout

One of the permaculture design principles is to work from patterns to details. This means the very first part of your design is to sketch out where everything will go and once you get that right, you can start working out the details.



Make a scale sketch floor plan of the balcony (based on the one which you drew at the time you did the inspection) with nothing on it. If you do it on graph paper it will also make it easier to draw in the features you want to include in the balcony. If the features are also drawn to scale it will give you an idea of how much you can cram in, in reality. One way is to draw the features on a separate piece of paper, then cut them out and use them as models to move around within the balcony space to get the best fit, but drawing them on the diagram in pencil works too, just have a good art rubber handy!

Once you have a layout which looks like it will work you should consult the balcony owner to get a reality check on your ideas, you can then include any of the changes they require. Obviously if you are doing the plan for yourself you should be already happy with it, you drew it up!

The Written Plan

To provide the detail on how the design drawing is to be implemented It is worth developing a written plan which will back up the drawn arrangement of what will go where on the balcony. The written plan may cover –

- Introduction covering what the plan is to achieve, including the owners vision.
- Any limits to production discovered during the assessment.
- Types of herbs, vegetables and fruit trees to be planted.
- A succession plan of when annuals veggies and herbs need to be planted to keep up a continuous supply.
- A list of the features and a description of how they are to be made or where they are to be sourced from.
- Expected costs and other resources required.
- Action plan of who is to do what, by when

The way I do it is to cover the basics at the start, like what the objective is and what the assessment turned up, then devote a fair bit of space to the systems which are to be implemented as part of the plan. I give a general description of the element, what the features of the element are, a more detailed analysis of what is to be done and a list of plants which could be used in the particular element, where this is applicable.

1.4 Strategies for a Productive Small Veggie Garden

As the amount of land available to both urban and suburban dwellers alike shrinks, we need to develop strategies for maximising the use of what growing area we do have. The following strategies have been developed to help you to get the most out of your growing area, so have a tip-toe through the information below and select a couple of things to try, then give it a go!

- **Develop a plan** – Assess the resources you have for food growing and compare them to the strategies listed here. Some will work for you, some won't and some you may need to trial to find out. Develop a plan which helps you get your head around what you are trying to do and makes sense to you, Such a plan may include –
    - A sketch of your growing area showing what structures/plants are there now and what you intend to change to increase your productivity.
    - A succession plan of what to sow/plant out to keep production up.
    - Designs or sketches for things you need to build (cold frame, mini-greenhouse, trellises or compost bin etc).
    - An action plan of who is responsible for doing what, when

  By recording your plan on paper or electronically you will be able to keep track of your progress and record your successes and failures.

- **Aspect** – The way your veggie growing area faces can have a great bearing on how much you produce. The best aspect is north around to north east and if your growing area faces south and gets no sun you will have problems. If you have a choice go for the best aspect that you can. It is possible to grow crops which can cope with a lower amount of light (generally leaf crops) or use mirrors to deflect sunlight towards your plants but the better your aspect is to start, the easier your veggie growing adventures will be.

- **Think Vertical** – many varieties of vegetables and fruits can climb such as beans, cucumber, chokoes, peas, or be trained upward such as tomatoes or even pumpkins. In the 2011 season we got the best harvest of huge pumpkins ever by growing them across the back fence. So maximise your horizontal space by growing vertically against any vertical surface you can, by building free standing trellises, by growing up established trees or even using growing veggies as a living trellis eg by growing beans up corn stems. You can even put some growing medium in a large pot next to a structure and grow fruiting vines like squash or pumpkin up over the roof.

- **Use succession planting** – This doesn't give you more growing space, but allows you to get more out of the growing space you have and is, simply put, replacing any vegetable harvested with another one straight away. To make this work you have to be right on top of maintaining your fertility, have a great plan and be constantly sowing so you have seedlings ready. More detailed information on succession planting is available in section 5.0.

- **Don't plant too much of one thing** – getting the most out of your growing area means only planting just enough of any one vegetable for day to day consumption. Otherwise you get a whole stack of one crop and need to reserve it somehow, but still have to buy in the rest of your veggies. A good plan will make sure that this doesn't happen.

- **Interplant where possible** – rather than growing long rows of the same crop with blank space in between, plant out the whole bed with all sorts of different veggies grown together. You can plant so that all the veggies ripen over a period of time so that the beds are producing for a longer period and, again, a good plan will support this and make it easier for you. Intercropping can confuse pests, reduce the amount of bare ground and increase the amount of produce per square metre of garden. This will require ignoring the spacing recommendations on the seed packets and some of the gardening books but a

well maintained organic garden will have the fertility to cope with it. We plant so that the veggies grow within about 30cm of each other. Note: This will not work for corn, which needs to be planted in a block to pollinate correctly.

- **Be prepared to experiment with unusual vegetables or varieties** – One of the fun bits of growing your own is growing and trying new veggies and new varieties. Get hold of as many seed catalogues as you can manager and spend some time reading through and taking note of what will grow in your climate, how long it takes to get a harvest and how early or late in the year each variety grows. This can spread the harvest and perhaps by trying some new types of veggies, allow you to exploit slow times in the veggie growing year when you may otherwise strike a "hungry gap". We have tried new stuff that we have not been used to eating like Jerusalem artichokes, Asian greens, leeks and broad beans and found the greater variety is good for the garden and good for the cook. There is hardly a day when we can't go out to the garden and harvest something. Try a small amount at a time and then if they are good, add them to your plan if not at least you tried.

Our Jerusalem artichoke patch

- **Consider perennial vegetable beds** – Perennial veggies are the parts of plants which are harvested and eaten like vegetables and 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. 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.

- **Try medium/small varieties of vegetables** – during your seed catalogue research keep your eye out for dwarf varieties and small types of vegetables that allow you to get more vegetable from the same space, like planting bush cucumbers or pumpkins rather than runners, sugarloaf cabbage rather than drumhead types or Cherrytime capsicum rather than the larger Californian wonder.

- **Make a place for containers** – There will always be some extra space where you can fit in the odd veggie box or self-watering container so if your do take advantage of some unused space don't forget to add that into your plan so you can manage the extra space effectively. They can also be built to be self-watering, making them water efficient and reducing the time require to keep them watered.

- **Make initial thick sowings** – work especially well for root crops like carrot or beetroot seeing as these need to be sown where they are going to grow (they don't take well to transplanting) sow thickly and then thin out as they grow, eating the thinning as baby vegetables. Some leaf crops like lettuce can be used in a similar way.

- **Indeterminate vs determinate veggies** - 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. Determinate plants are more likely to give you a single major harvest then little or nothing while the indeterminates will spread the harvest out providing less at any one time but spreading the harvest out to give you more produce over the growing season.

- **Stacking in space** – Rather than growing a single crop at one level, “stacking” your veggies allows you to maximise your productivity for a given area of land by growing productive species at several levels. A great example of this is the “3 sisters” guild of the Native Americans. They would grow corn (an upright crop) and once it was underway plant climbing beans to grow up the corn (providing nitrogen to the other plants) and squash to grow over the ground and act as a living mulch. So rather than just harvest corn from a plot of land they got three crops: Corn, beans and squash, thus tripling their productivity for no increase in growing space.

- **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 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, spinach and broccoli will produce side shoots after the main head is harvested.

Pak Choi is a great cut-and-come-again veggie for your rotation

- **Use fruiting veggies** – In the same way as cut-and-come-again veggies extend your harvest, some veggies which produce fruit such as solanum (capsicum, tomato and eggplant) and cucurbits (squash, cucumber, zucchini) continue to produce throughout the growing season. A zucchini planted in early spring and another in mid-summer can keep you in zucchinis for most of the frost-free part of your growing season.

- **Consider sprouts and/or microgreens** – these two techniques are a no-land, low cost, high yield way to grow veggies. To grow sprouts the simplest way is to soak some suitable seeds in a container, drain. Rinse and drain again. Then rinse and drain twice a day for a week or so after which your sprouts are ready to harvest. Microgreens are a bit more complicated but basically, the seeds are germinated in a container of potting mix, then grown up to the four leaf stage at which point they are harvested with scissors. Detailed instructions about producing sprouts and microgreens are available in section 8.1**.**

- **Install a Straw Bale Garden** – This is a quick and easy method to start a raised veggie garden and works by putting chook manure on hay or straw bales resting on the ground then watering them well and keeping them wet. Let them breakdown for a couple of weeks and then plant veggies into compost on the top of the bale. As the bale breaks down it supplies nutrients to the veggies and keeps them growing well.

Strawbale garden (photo taken at Floriade, Canberra 2013)

- **Install wicking bed** – wicking beds can be built in all shapes and sizes. These consist of a lower water reservoir filled with gravel to support an upper layer of growing medium. The bed works by keeping the reservoir filled with water (through filler tubes put in during construction) which then “wicks” up into the growing medium by capillary action. The wicking process ensures that the plant always has access to water but as little is lost via evaporation as possible.

- **Exploit non-traditional growing spaces** – If you are thinking of growing vegetables in your back yard, but don't have much room, there are other places which can be used to grow food which you may not have considered –
    - Front yard and road verge at the front of your house
    - Front yard/back yard of friends, neighbours or relatives (with or without produce sharing)
    - Suitably reinforced flat roofs of sheds etc.
    - Local community gardens
    - Local schools or other institutions (with permission of course)
    - Guerrilla gardening of local vacant lots or other waste ground

- **Extend the season** – by the construction of microclimates (where this is feasible) you can sometimes extend the growing season so that you can plant somewhat earlier and harvest somewhat later than is usually possible. Covering crops with a lightweight fabric (so-called floating row cover) can keep temperatures up and ward off frost also avoid planting frost sensitive crops so that they will run into a time when frost is likely.

- **Consider Irrigation** – one of the limiting factors, particularly for growing food in containers is to ensure that the plants get enough water to grow well, particularly in hot weather. This can be especially important where growing in containers is concerned. At the planning stage it is worth including in some plans for getting water to your plants. Self-watering containers and wicking beds are good, and clay pot irrigation works well when beds in the ground are used but consideration to a low cost irrigation system may be worthwhile also.

It is unlikely that all of these techniques will suit your particular circumstances but you can just about guarantee that at least a few will. Some, like starting out with a plan, will

be good advice for anyone wanting to grow their own food in a small area. As part of your planning process, decide on a couple of these techniques which you consider most likely to work for you, put your plan together, then get out there and PLANT! Oh, and good luck!

1.5 Succession Planning and Planting

As mentioned previously, when we would grow our own vegetables this used to mean –

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. I needed to be able to provide a mix of veggies for us throughout the year and to do that I needed to succession plan and plant.

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.

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!

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.

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)* - *c*ucumbers, 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, *e*ndive, 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) – c*arrots, 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.

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.

Don't Forget Perennials!

Perennial veggies are the parts of plants which are harvested and eaten like vegetables and 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. 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.

We have a process where the beds are planted and then 5-6months later have the chook tractor put over them to clean them out and fertilise them, after which the beds are replanted. However because perennials need a long term bed they don't integrate well with this system so we have dedicated beds for them. We have Jerusalem artichokes growing in a triangular bed near the worm bath, rhubarb and asparagus growing in wicking beds in the front yard as well as (of course) the choko growing over the choko tree.

Asparagus wicking bed in our front yard

Perennials certainly Increase the volume and variety of available foods, we find that Jerusalem artichokes and chokoes make a considerable contribution to our diet in autumn and early winter, whereas the asparagus are a very tasty addition to our plates in spring. Some familiar perennials can be bought from the fruit and veg shop in season and tried before you make a commitment to growing them (see the previously mentioned chokoes, Jerusalem artichokes and asparagus). Other less common ones (like oca, yacon, arrowroot or yam bean) may need to be grown in a limited fashion to give you a taste test so you can work out if they are worth growing more extensively.

Another important factor is that many perennial vegetables are set and forget, they require much less maintenance than annual vegetables. One good example is the Jerusalem artichoke, you plant the tubers in a prepared bed wait for the stems to grow, flower and die. Once the stems have died the tubers can be methodically dug whenever you require them for a meal until spring rolls around. Then there are usually enough missed tubers or broken off bits of tubers to sprout and grow a crop for the new year with very little intervention from the gardener.

They also seem to require less intervention to stay healthy and pest free. The perennials I have grown including chokoes, asparagus, rhubarb, Jerusalem artichokes, shallots, ginger, galangal, turmeric, water chestnuts, arrowroot, sweet potato are all very hardy. They do not attract the attention of pests with the notable exception of a few aphids on the shallots and they do not seem to suffer much from diseases

If you make room in your plan for some perennial vegetables, they will make sure it is well worth your while. .

Bits and Pieces

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

1.6 Growing Vegetables in Containers

Why Grow Vegetables in Containers

If space in your yard is limited or if you live in a flat, it is still possible to produce some food by growing vegetables in containers. My brother grew tomatoes, onions, lettuce, silver beet, broccoli and cabbage on the balcony of a one bedroom flat in Cabramatta (a Sydney suburb). His main problem was lack of sunlight due to the position of his flat on the block. If you have any reasonable access to direct sunlight you can grow vegies.

My daughter and son-in-law also grow veggies in the miniscule back yard of their town house in Emu Plains. They grow lettuce, tomatoes, herbs, onions and even watermelon, all in homemade containers. But there are other reasons why you might want ti grow food in containers too –

It's a good way to start out if you don't have a lot of experience, you can start small and work up in size without a great amount of investment or labour, gaining more experience and learning as you go.

The crops are moveable and this can be a great advantage to help you make the most of any microclimates in your yard, cool or warm, wet or dry, depending on what the plants require for example they can be moved to catch the sun or out of the frost as needed. They can also move with you if you move around, rather than getting the area productive in time for the next tenant to get the benefits.

If your soil is one of the three C's – crap, contaminated or concrete – you can still grow useful plants on top of the ground level without having to try and sort out the problems (again, particularly if you are renting). Grow on top of the soil with containers.

It is also a great project for kids. Provide them with some second hand containers, a bit of potting soil and some seeds or seedlings, show them what to do then let them have a go. They not only learn responsibility from having to look after the plants on a regular basis but they also learn that tomatoes come from a bush, not a punnet in the supermarket.

The Containers

There are many containers that can be used to grow vegies, the main considerations in their design are –

1. The container should be deep enough for the crop to be grown, preferably 20 centimetres minimum.
2. It should be strong enough to hold the mass of soil, water and vegetables and not fall apart. Needless to say it must also withstand being regularly watered so waxed veggie cartons won't work but polystyrene foam ones will.
3. There should be holes in the bottom to allow drainage. Although self-watering containers called Earth Boxes can be made that will allow water to be added to a reservoir which keeps the soil moist and the veggies happy.

Some examples of potential veggie planters (some requiring drainage holes to be drilled) are –

Plant pots, preferably 14 cm in diameter or larger.

- 20 litre steel or plastic drums.
- Homemade wooden boxes, or any other wooden boxes for that matter.
- Empty food tins.
- Garbage bins, plastic ones are lighter, cheaper, won't rust and will absorb some heat from the sun (Good in winter, bad in summer).
- Buckets
- Recycled polystyrene veggie boxes

Planter box homemade from formply

The Soil

The soil used for container growing must retain moisture while being well drained and be fertile, if you don't want to have to keep feeding your plants with fertilizer. To obtain the best results any old soil is not good enough. Rich, friable garden soil is a good base though, to which coarse sand and compost can be added. Try mixing together one part each but experiment to find the best mix for your situation. Other additives available from nurseries such as perlite for drainage and aeration or vermiculite for water retention can be incorporated as required. Cocopeat (horticultural coir) also helps with water retention and keeps the soil friable and free draining too.

If after all this effort, you do need to feed your vegies to get the best out of them, the best way is with small regular additions of liquid manure. Liquid manure is made by soaking chook, sheep, horse or cow manure (or a mixture)in a hessian bag in water for a couple of weeks in a closed container (think of it as an enormous tea bag!). The resulting brew is then diluted to the colour of weak tea, and then applied to the plants in your container garden and watered in. The rule is: a little and often.

The Vegies

Most vegies can be grown in containers and half a dozen two metre high corn stalks on your balcony could look very decorative, but some varieties put up with it better than others. As far as possible only open pollinated (ie non-hybrid) varieties should be used otherwise you cannot grow from your own seed. Following are vegetables and varieties suitable to container growing.

CABBAGE - Earliball; Sugar Loaf; Golden Acre
CAPSICUM - Most varieties can be grown in containers and are non-hybrid.
CARROT - Baby carrots are most suitable eg. Baby Pak, Baby, Amsterdam Forcing or Thumbelina.
CHILLI - As for capsicum.
CUCUMBER - Bush varieties eg. Spacemaster
EGG PLANT - Most varieties eg. Short Tom or Long Purple.

LETTUCE - Cos eg Romaine or Cos Green

- Butter Head eg Buttercrunch or Green Mignonette

ONION - Any spring onion (shallot) variety.

PUMPKIN - Bush pumpkin eg Golden Nugget or Bush Butternut.

RADISH - All varieties are OK.

SILVERBEET - Fordhook Giant

SUMMER SQUASH - Bush varieties such as Early White Bush or Marrow , long white

TOMATOES - Small bush varieties eg Tiny Tim or Small Fry and "Egg" Tomatoes eg Roma.

ASIAN VEGETABLES - Many of these also lend themselves to container gardening for example Adzuki Beans; Pak Choi; Chinese mustard; Mizuna; Mibuna and Chinese Broccoli.

1.7 Veg Growing for Time Poor Gardeners (Growing a Feed Fast)

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.

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

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).

For more details on sprouting (and microgreens - see below), check out **here.**

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.

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.

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.

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.

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. More detail is **here** and **here**.

- 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**.

- 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!

2.0 Fruit

2.1 Strategies for a productive small fruit garden

Growing fruit, particularly if you take the traditional “orchard” approach with full sized trees in rows 7 metres apart containing trees 5 metres apart within the rows needs a lot of room. However this extensive type of culture can be replaced in the back yard by a more intensive (and efficient) production method. There is no substitute for being able to walk out your back door and pick fruit off your own trees to eat fresh or process into jam, cordial or other home-made goody. It is certainly worth thinking about but before I talk you into replanting your backyard with orange trees there is a potential downside to consider (isn’t there always?)

Fruit trees are a long term commitment; you can generally bank on a five years between first planting your trees and getting a reasonable fruit harvest. In fact if your trees seem to be producing early the fruit should be removed to allow the tree to put as much of its energy as possible into growing strong and healthy limbs which will support later crops. Good work early means better harvests later.

Some trees, particularly stone and pome fruit, are not self-fertile and require a pollinator of the same fruit type, but a compatible variety or you may get little or no crop at all. This may be especially true for urban areas where other fruit trees may be few and far between. They are also difficult to relocate unless grown in a pot and this can make things difficult if you are renting. I did relocate a well grown mandarine tree from one side of the yard to the other years ago but it was a lot of work and the tree took three or four years to recover. Also, if you are in a fruit fly area this pest can be difficult and time consuming to deal with using organic methods (and let’s face it, one of the reasons we do this is to get pesticide free fruit). Stone fruit are particularly susceptible but other fruit types can also be affected.
If you still can’t wait for that first crisp bite of home grown apple or the sweetness of your very own oranges, here are some strategies to help you get the most out of the space you have.

Planning – If anything, it is more important to plan out a fruit garden than it is a veggie garden (and planning your veggie garden is pretty durn important!). Trees will get big, and it is important to understand what shade they will cast throughout the year. I made the beginners mistake of planting two fruit trees (an orange and an apple) north of the (then) main veggie patch. The apple tree grew well and shaded out everything else so it is long gone and the orange tree is now the choko tree and is regularly pruned to reduce its shading potential. When you are planning your orchard think about the profile of the mature tree, rather than the stick you are planting now, think about the fruit and where any windfalls will go and think about where the leaves will end up if any of the trees are deciduous. It is also important to research and find out what fruits grow well in your area, what their growth habit is, whether they need a pollinator or not and if they are dioecious (separate male and female trees).

Years ago we were offered a cheap carob tree so we got it and planted it in the front yard, full of enthusiasm that we would soon be making our own “chocolate”. It grew pretty slowly in our temperate climate (being originally from the tropics) and we waited 10 years for it to flower. When it did flower, something didn’t look right so I did some research and it turned out that carobs were dioecious and yup, we had a male tree. It would never produce pods for us. We wasted time and space on the damn thing, but that year it did keep us warm over winter. Needless to say, I should have done my research during the planning phase to reduce the possibility of such mistakes.

When you are developing your own plan, look at the area you have, what else is there, where the sun shines in summer and winter (to get the best out of your trees they will need full sun!) and what your soil is like. Then draw up the plan, making use of any of the strategies outline here that make sense for you. Don’t forget to include an action plan which sets out how you intend to implement your plan, and review the plan regularly.
If you already have some fruiting species in place (or even if you don’t!) it can be helpful to put together a harvest calendar as part of developing your plan. The harvest calendar process will help you work out what fruiting trees, vines and bushes you need to add to your property to ensure a year-round supply of fruit from your home orchard.

Dwarf Varieties – Dwarf fruit trees are miniature versions of full size fruit trees and may be as small as 1 metre high, but the effectiveness of dwarfing techniques varies with the species and a “dwarf” cherry may still grow to 5- 6 metres. The fruit they produce is full size however and they can be quite prolific producers for their size.

Dwarf fruit trees are created by grafting standard scion wood onto a dwarfing (or semi-dwarfing) rootstock which stunts the growth of the tree, but there are also genetic dwarf trees that do not grow large due to their DNA. Genetic dwarfs are not larger varieties made small so the variety you are after may not be available. Fruit trees may also be dwarfed by root and branch pruning or growing the tree in a pot.

Our dwarf nectarine tree has only grown about 200mm in the last 5 years.

Vertical fruit gardening – Vertical fruit can be attained in the same way as vertical veggies. Grow passionfruit or grapes up a trellis or over a pergola, make an arbour and grow kiwifruit up it, make a strawberry tower or run berry canes up wire mesh secured between trees or on a fence. Established fruit trees can be used as a framework for climbing fruit vines as well. When developing your plan, don’t neglect vertical spaces or think that they are for veggies only but remember, for best production make sure they are in full sun as much as possible.

Fruit tree circle – A fruit tree circle allows the urban/suburban would-be orchardist to plant a number of productive trees in a comparatively small area. There are a couple of types of fruit tree circles, the classic being the banana circle, but they all basically consist of a circle of productive trees clustered around a source of fertility. In the case of a banana circle it is usually a hole in the ground filled with organic matter which breaks down and produces nutrients which the bananas can readily metabolise. In the case of the fruit tree circle (see pic) which I built in my front yard, the source of fertility is a worm tower into which veggie scraps and other organic matter is placed, which is then broken down by the worms so the trees can make use of the nutrients.

Fruit salad tree/fruit cocktail tree – There are fruit trees produced with multiple grafts ie scion wood from different (but related) trees is grafted onto the one rootstock, that way you can get a mix of fruit from one tree. They may be different varieties of the one fruit type say, 3 apple or pear varieties on the one rootstock or there may be different types within the one family eg stone fruit – cherry, peach and plum scions on one rootstock. You need to ensure that all varieties get enough sun, they can be tricky to prune and if one variety or type is extra vigorous it can grow larger at the expense of the other cultivars. They are also expensive, but they can provide a variety of fruit from a comparatively small area.

Multiple fruit trees in one hole – The idea here is that multiple trees grown together will compete for space, light and nutrients thus dwarfing each other, although pruning will still be needed to shape and balance the trees. To make this happen, dig one extra large hole and then plant 2-4 fruit trees into it then back fill with a mix of soil and compost or well rotted manure. It is important to ensure that all of the trees have similar rootstocks so that one tree does not become dominant and out-compete the others. While this approach has some of the advantages and disadvantages of the above fruit salad tree it is something you can put together yourself without needing specialist knowledge of budding and grafting.

Pruning – Fruit trees usually grow in a three dimensional space, taking up quite a bit of room in the process, but it is possible to prune them so that most of their growth is in two dimensions. The fruit trees or vines are grown against a structure, usually a wall or fence but something could be specially constructed if required and only trees on dwarfing rootstocks should pruned in this manner.

For the cordon form, all limbs are pruned off to leave a central stem which is planted at an angle to the ground (usually 45°) and fruiting spurs grow along this stem. This system allows lots of trees in a small area but obviously the yield of fruit from each tree is somewhat reduced. The espalier form is a central vertical trunk pruned to give three or four horizontal leaders on each side, which are trained onto horizontal wires. For the cordon, trees are spaced 0.5 to 1 metre apart and for the espalier they are spaced 3 to 6 metres apart.

Stacking – this is the process of maximising the yield of fruit from 3 a dimensional space by planting fruit bearing plants which grow at several different levels. For example, the framework would be full sized fruit trees, inter-planted with dwarf fruit trees which would yield at the next level down, followed by currants and berry canes making up the next lower level. Any remaining spaces could be planted out to low fruits like blueberries and strawberries are planted as a ground cover. Fruiting vines such as grape, passionfruit or kiwifruit are planted to make use of the full sized fruit trees as climbing support. This set up is also referred to as a food forest or when planted in a two dimensional edge planting as a hedgerow or longitudinal food forest.

Integrate Fruit Plantings – don't think that you have to isolate your ornamental and productive planting areas. To get more room you can plant productive species all through your land including flower beds and lawns, provided you can maintain full sun. You may even find it worthwhile to remove some ornamental plantings and totally replace them with fruiting plants. In any case, when planning your mini-orchard don't count any space you have available to you out before you give it some serious thought.

Containers – many fruit trees, bushes and shrubs do well in pots and by putting full size fruit trees into pots the restriction of the roots will also have a dwarfing effect. When fruit trees are grown in pots, care must be taken to ensure that they do not dry out and this can happen quickly in hot weather, especially when unglazed terracotta pots are used. If the trees are to be grown in a climate which can be hot and dry it is worth planning to grow them in self-watering pots or install a watering system to prevent moisture stress and subsequent reduction in fruit yield. Pots should also be mulched to help retain moisture.

In general terms, especially for fruit trees (as opposed to shrubs or bushes) get the biggest pot you can afford (20 litres and above) and use high quality potting mix. The potting mix should include some perlite to prevent compacting of the soil and ensure aeration and adding cocopeat will also aid in water retention. In any case fruit trees should be re-potted every two years, at which point root pruning can be carried out to keep the tree smaller and the potting mix replaced to ensure fertility is maintained.

With careful planning, the right construction and some maintenance you can have your own orchard in the city or suburbs to supply you with fresh fruit on a regular basis. What could be better than that?

2.2 How We Grow our Fruit – An Overview

Our most important fruit tree - the CHOKO tree!

We know that sustainable living is more than just about growing fruit and veggies, but providing our own local, organically grown food using Permaculture principles is not only intensely satisfying but also makes great economic and environmental sense. We live on 600m2 in Sydney's greater west and for many years I have contributed to the family larder by growing fruit and this is an overview of how we do it.

History

I wanted to grow fruit, from the time when we first moved into the house in the late '70s. The problem was that I knew even less about fruit growing than I did about growing veggies, and I knew absolutely nothing about that! Needless to say, I made plenty of mistakes during the learning process. Some of the mistakes I made include the following –

• Planting an orange, apple and mandarine on the northern side of the then main veggie patch, causing increasing shade problems as the trees grew. Only the orange is still in place and it masquerades as the Choko Tree.

• I imported a very sickly peach tree from my fathers' place, which then acted as a fruit fly magnet every spring. When, after a couple of years I removed it, my fruit fly problem reduced considerably.

Linda, inspecting said peach, back in the day

• Planting a lemon in the chook area, long before we had the chook tractor. The chooks compacted the clay soil and the excess manure resulted in anaerobic soil where the tree was, needless to say it died. I then compounded my error by replacing the dead lemon tree with another one which, surprisingly enough, also died.

• Persistently trying to grow berry fruits like gooseberry and red and black currants that do not do well in our Western Sydney Climate.

• Planting a couple of ‘Nelly Kelly’ grafted passionfruit beside the back deck. The rootstock is incredibly invasive. The productive parts are long dead but the rootstock continues to battle us for access to the house.

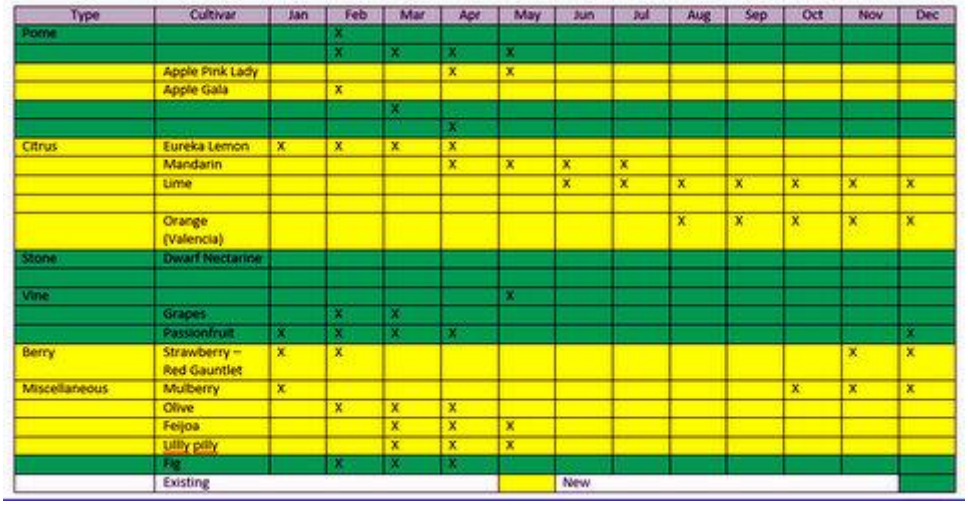
Nelly Kelly Passionsfruit - productive passionfruit on the left, invasive rootstock on the right

Fortunately, after buying a few good books and getting some training as part of the Farm Technology Certificate I did in the early ‘80s I no longer make such rookie mistakes. My mistakes are now much more subtle and harder to correct!

Planning

There are very good things that come from planning. I unfortunately didn’t figure that out until I discovered permaculture twenty odd years ago. When I did my PDC about 15 years ago, I was introduced to the idea of a Fruit Harvest Calendar which allows you to work out when your existing (and prospective) fruiting plants will produce, so you can arrange for year ‘round fruiting by varying the species and varieties of the fruit you grow. I did one

during the course and found it very educative, but I need to re-do it to reflect the fruiting plants that have come and gone in the intervening years.



Type	Cultivar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pome			X										
			X	X	X	X							
	Apple Pink Lady				X	X							
	Apple Gala		X										
				X									
					X								
Citrus	Eureka Lemon	X	X	X	X								
	Mandarin				X	X	X	X					
	Lime						X	X	X	X	X	X	X
	Orange (Valencia)								X	X	X	X	X
Stone	Dwarf Nectarine												
Vine						X							
	Grapes		X	X									
	Passionfruit	X	X	X	X								X
Berry	Strawberry – Red Gauntlet	X	X									X	X
Miscellaneous	Mulberry	X									X	X	X
	Olive		X	X	X								
	Feijoa			X	X	X							
	Lilly pilly			X	X	X							
	Fig		X	X	X								
	Existing						New						

How to set up your own fruit harvest calendar is covered in section 6.2 below.

Fruit Growing Areas

We have a number of areas that are set aside for growing fruit, with or without other types of plants being integrated with them –

Fruit tree circle – a 3 metre, raise and wood chip mulched circle with a worm tower in the centre, topped by an insect watering station. The fruiting plants originally installed include two lime trees (Tahitian and Makrut) two apples (pink lady and gala both dwarves) and a dwarf lemon tree. There were also three red currant bushes planted in the centre of the circle between the trees and the worm tower. While not strictly fruit trees there are also a curry leaf tree and a macadamia nut tree. The gala apple has since passed on and was replaced some years ago by a multigrafted apple and the red currents also did not survive, refer mistakes above.

2012

2023

Mulberry tree – This deserves a section all to itself! It was a seedling gleaned from my father's next door neighbour about 30 years ago. It now has a canopy of 10 metre diameter, provides lots of fruit every year with no maintenance, shades our front yard park area, provides lots of sticks for starting the fire in winter or use in the rocket stove all year round and keeps the northern end of the house cooler in summer. The leaves are edible (I have read) but we have not tried them.

Summer

Winter

LUFFA (Longitudinal Edible Food Forest Area) – This forms fence of sorts at the front (east) of the property and is made up a number of fruiting species including – feijoa, lilly pilly,

thornless blackberry, midyin berry (still small and scrappy) and a coffee bush (coffee is a fruit!!!). Non fruit related plants in this area also include a large bay tree and three good sized melaleuca alternifolia trees and lots of sweet potatoes. The whole set up provides nice screening from the street and neighbours across the road. For more detail on the LUFFA, **click here**.

Olive tree (LHS) and LUFFA from the south

From the north east

Small Fruit Tree Area – At almost the southeast corner of the front yard that used to house a small, scrappy and very unhappy bottlebrush, which we removed and now have a small built up area that was originally home to a blood orange and a dwarf fig (that doesn't seem

very dwarf anymore) and that was recently expanded to include a dwarf lemon. It is watched over by ourselves and our lovely next door neighbours. For more detail on the small fruit tree area, **click here.**

Miscellaneous – There are two fruit trees in the front yard that do their thing year after year. One is an olive tree, no idea what type, it had sat for a long time in a tin at a friend of my fathers' place before we got it 30 or more years ago. It sits at the front of the property almost as a southerly extension of the LUFFA, but not really. While we do not eat olives (I have passed them on to friends) it is on my 'to do' list to try extracting their oil. One day! The second is a dwarf nectarine, which is our only stone fruit, due to the issues we have with fruit fly. It seems reasonably resistant and we get a bit of fruit each year.

Dwarf Nectarine

Banana circle – This has had a chequered past. Originally in the front yard for 10 years where it was crappy soil, too dry and too shaded, the bananas never fruited or made it over two metres in height. After an attack of smarts I transferred it to the backyard where it had good soil, full sun and all the water from the spa/shower in the bathroom piped to it. They are now up to 5 metres tall and fruit when they feel like it, which will make setting up a new fruit harvest calendar interesting. The banana circle also provides welcome shade on the back of the house from the western Sydney afternoon sun. For more details on the original banana circle, **click here**, and for more dtails on the move and how it developed since, **click here.**

Original position and growth 2011

New position 2023

Mandarine/passionfruit – Remember the mandarine I set up north of the veggie patch I mentioned above? It is now growing a metre from the western wall of the house and just north of the banana circle. I dug it up and moved it by hand about 15 years ago, and while it was not happy with me for 12 months, it recovered and produces lots of really nice fruit most years. It does sometimes go into biennial bearing after a particularly prolific year, but everyone deserves a rest. The passionfruit (a seedling, not grafted) sits below my office window, climbs up and provides shade, and then shows its affection for the mandarine tree, again, fruiting when it feels like it.

Passionfruit

Manderine Tree

The back deck – It was my intention to have ago at growing some fruit on the back deck. First was a grape which I planted in a large pot which has a buried capsule to keep it watered. It has not done as well as I would like, more research required. I also got a couple of allegedly self-watering pots and put in a two blueberries. These did well for a few years but then seemed to sicken and then expire. I suspect both sets of plants of plants have not dealt well with the ferocious western Sydney summer and as they are on the edge of the western facing deck, I fear they bear the brunt of it. Again – research opportunity! For more information on how I setting up the grape on the back deck, **click here.**

Grape, just after set up

The Strawberry tower – This was made out of a plastic 200litre drum with holes for the strawberries to grow out from. It was originally in the front yard under the mulberry tree, but I suspect it was too shaded to be truly happy. I transferred to the back yard but have not replanted it yet. For more detail, **click here.**

The Strawberry Tower

Watering

The mature trees such as the mulberry, olive and older citrus get watered when it rains. Simple as that.

The smaller and especially younger trees are watered using tank water and deep pipe waterers. These are 50mm diameter PVC tubes that are 500mm in length sunk into the ground near the root system with 3mm holes every 50mm down the length of the tube, facing the plant. Water directed into the deep pipe waterer goes directly underground, reducing losses due to evaporation and encouraging deep root growth. For details on construction and installation of deep pipe waterers in article form, **click here**, or for our Youtube videos on deep pipe waterer making, **click here**, and installing deep pipe waterers, **click here**.

What you see above ground

There is also a reservoir which I designed that goes on the top of the deep pipe waterer, buckets of grey water are tipped in, allowing the water to make its way into the soil without any losses.

The whole unit

The banana circle, of course is watered by greywater draining directly from the shower/spa into the centre depression of the banana circle. The mandarine is watered by greywater from the washing machine once it has passed through the constructed wetland.

Fertilising

There is some residual fertilisation from the breakdown of woodchip which most of the trees and shrubs have as mulch. Younger trees like those in the fruit tree circle and small fruit tree area have been provided with fertiliser sausages – which is a mixture of manures, wrapped up in hessian bags to form a sausage, and placed around the bottom of the trees. The sausages slowly rot down releasing nutrient for the trees. The fruit tree circle also derives some fertility from the worm tower at its centre. For an article on constructing fertiliser sausages, **click here**, for a youTube video on how to make fertiliser sausages, **click here**

Fertiliser sausage,

Fertiliser sausage, in place in the fruit tree circle

The citrus, due to their nitrogen requirements get diluted urine in spring and summer, with a tasteful white watering can in the toilet being contributed to by a donor or donors. This is then topped up with tank water at a ratio of about 1 part urine to 10 parts water. The resulting mix is then applied directly to the soil using the deep pipe waterer.
The banana circle is fertilised by adding organic matter to the central depression where the greywater goes. The damp organic matter then breaks down with nutrients being accessed directly by the bananas.

Pests and Diseases

By and large, our fruit plantation is pretty healthy with only the odd problem showing up. In terms of pests one of the more common things we get is the scale/ants/sooty mould trifecta, where we use a vegetable oil spray to control the scale, and maybe a collar on the trunk to prevent access by the ants. This is usually on the citrus but can show up on the lilly pilly and bay tree as well The sooty mould discolouration on the leaves is more cosmetic than anything else, caused by the scale secreting honey dew (which the ants want, so they

'farm' the scale) and encouraging the fungus sooty mould when it gets on the leaves. If the scale problem is resolved, so is the sooty mould.

Bronze Orange Bug

The main problem we tend to get is bronze orange bug on the citrus and in a bad year they can be in plague proportions and really kick the living daylights out of the citrus. I hand pick and drown them. I have found that if you get stuck into them early in the spring and keep on top of the numbers it will make life easy (for me, not them!).
Fruit fly can be an issue, and I have used paper bags around fruit to keep them out, but in recent years they seem to be less of a problem. We also get fruit bats, mainly to share the mulberry crop and occasionally some bananas but we generally let them have their share and they are happy.

Conclusion

Our fruit growing efforts have taken a while to set up, and even taking into account my previous mistakes, is quire productive. I think that given a bit time, effort and learning,

anybody can do what I have done. In the end I think it is really just a willingness to give it a go and see how things turn out. Good luck!

2.3 Designing a Fruit Harvest Calendar

If you have a small space you need to plan to get the most out of it and that's what we did when we developed the veggie planting guide, we developed a plan that allowed us to harvest veggies all year round. Using a slightly different process it is possible to develop a plan that allows you to harvest fruit all year round too.

As always the thing to do first is to work out the sorts of fruit that you want to eat and while we will be talking about fruit trees, don't neglect berry fruit like strawberries or blackberries or vine fruit such as kiwis, passionfruit and grapes as well. Once you have an idea of the sort of fruit you want to grow draw up a harvest calendar by drawing up a table with 14 columns and as many rows as you want, you can always add more. The very left hand column is for the type of fruit (apple, orange, grape, mango etc) and the second column is for the variety (for apples you might want a granny smith and a red delicious, or a beurre bosc pear etc). The next twelve columns are one per month so start where you want, January is as good a place as any and then work through for a full 12 months.

As you work out what fruit and varieties you want there are several aspects of fruit growing that will modify your choices –

- **Family tastes** – where possible actually try some fruit from your chosen type and variety and give your family a go at it too. It doesn't matter how pretty or productive the tree is, if nobody eats the fruit you have done your dough.

- **Climate** - There are very few areas that will allow you to grow any sort of fruit that you want so you do need to be aware of the types of fruit that grow well in your area and you can do this by hitting the books or the internet but if you have access to local fruit gardeners they will be your most reliable source. Don't make the mistake

of thinking that if Bunnings sell it in your area that it must grow well, they are in business to sell all sorts of stuff and if you buy it and it doesn't grow that is your bad luck. To prevent frustration, heartache and some financial loss do your research before putting a spade anywhere near your garden.

- **Pollinators** – some fruits like pome and stone fruits will need to have two compatible varieties that will act as pollinators for each other. Even if the variety you have chosen is regarded as self-fruitful under some conditions, a pollinator tree will ensure a better harvest. Pollinators will flower about the same time and provide pollen that fertilises the target plant. More research needed.

- **Sexuality** – no not your sexuality silly, the sexuality of the tree! Some trees have male and female flowers and so are self-fertile (mostly – see pollinators above) but some have male and female trees (these are called dioecious). After spending 15 years growing up a lovely Carob tree the thing finally flowered and it turned out to be a male and at the time I bought it I had no idea that the carob species was dioecious so I would never get fruit off it. It was a happy ending though and it kept us warm during a fair chunk of that winter. Again, do your research and find out if one tree will be fruitful or if you need a male and female to get fruit. I do believe these days that self-fruitful carobs are around.

So now you have a list of the species and varieties of fruit that you want, written down on the two left hand columns of your calendar. If you already have some fruit trees etc in place that is no problem, put them down on the calendar in a different colour so you can distinguish what you have from what you need to get.

Now for the fun bit, hit the books, net, local gardeners, botanic gardens or whatever and find out what months of the year each of your fruit varieties produces fruit. It is not enough to get some general idea of when oranges bear fruit, when does the variety you have selected bear fruit in your area? The more accurate your information, the better the likelihood will be of getting year 'round fruit out of your mini orchard. "The Complete Book of Growing Fruit in Australia" by Louis Glowinski is worth a look.

As you gather your information, from whatever source you can manage, make a mark (cross, tick, coloured square or whatever) in the columns for the months that the plant fruits along the line of each fruit/variety. Once you have completed this part of the process it will become immediately obvious if there are any blank spaces in the year when you won't have fruit available for harvest.

Hit the books again, but this time to look for fruits that you can harvest to fill in any "hungry gaps" in your fruit calendar. Remember to make sure it is something your family will eat and if they haven't tried it see if you can get hold of a sample fruit from your local greengrocer or wherever and try it out. You never know it might be the tastiest fruit you have ever tried, but if it is gross cross it off the list and move on.

Once all the spots in your calendar are filled you can buy the fruits you don't have and complete your mini-orchard. How many you buy of each tree, bush or vine will depend on how much space you have and how much you like each fruit. If you don't have lots of space you will have to get creative and try fruit in pots, pruning to get the best yield for space such as by espaliering some trees along a fence line or the edge of one of your buildings or going for genetic dwarf trees or trees grafted onto dwarfing rootstocks. If you have friends and family around you consider putting some on their land or even put some time into developing a community orchard.

However you manage to put it into practice, your fruit harvest calendar will help you set things up so that you and your family will have fresh, home produced, organic fruit all year round and what could be better than that?

For a blank harvest calendar check out appendix 3 and here is what mine looked like when it was finished –

Type	Cultivar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pome	Apple Akane		X										
	Apple Golden delicious		X	X	X	X							
	Apple Pink Lady				X	X							
	Apple Gala		X										
	Pear Packhams triumph			X									
	Pear Winter Nellis				X								
Citrus	Eureka Lemon	X	X	X	X								
	Mandarin				X	X	X	X					
	Lime						X	X	X	X	X	X	X
	Lemonade						X	X	X	X	X		
	Orange (Valencia)								X	X	X	X	X
Stone	Peach Anzac	X											X
	Peach Fragar		X	X									
Vine	Kiwi					X							
	Grapes		X	X									
	Passionfruit	X	X	X	X								X
Berry	Strawberry – Red Gauntlet	X	X									X	X
Misc.	Mulberry	X									X	X	X
	Olive		X	X	X								
	Feijoa			X	X	X							
	Lillly pilly			X	X	X							
	Fig		X	X	X								
	Existing						New						

3.0 Herbs & Spices

3.1 How We Grow Our Herbs & Spices, an Overview

Sustainable living is more than just about growing herbs and spices, but providing our own local, organically grown food and flavours using Permaculture principles is not only intensely satisfying but also makes great economic and environmental sense. We live on 600m2 in Sydney's greater west and for many years I have contributed to the family larder by growing herbs and spices and this is an overview of how we do it.

Herbs

When I started out growing our own food, I also wanted to start growing herbs as well. I didn't have a 'herb garden' as such, I just planted them in various areas around the place and with varying degrees of success. I planted mint under the tap because of its need for water, but it didn't do very well in our dry climate but rosemary on the other hand has prospered in a few places in the front yard and even today grows near the letterbox and at the apex of the herb spiral.

The Herb 'Spiral'

Back in 2009 as part of a permablitz at our place by Permaculture Sydney West, we constructed what was theoretically a herb spiral to expedite my herb growing objectives. A friend of mine who was a roof tiler turned up with some excess roof tiles which we could use to construct it. They worked well but due to their peculiarities the spiral became a two-tier 'wedding cake'.

2009

This has been home to many herbs over the years including –

Angelica, Basil, borage, calendula, chives, coriander, dill, feverfew, lavender, lemongrass, lemon verbena, nasturtiums, marjoram, oregano, mint, parsley, pennyroyal, rosemary, sage, sorrel, tarragon, thyme, wormwood and yarrow. Plus probably others I can remember. Obviously not everything at any one time, but over time all of them have had a place in the herb spiral.

2010

In 2013 we had a second blitz during which the original herb spiral was pretty much pulled down and rebuilt and a third tier was added to the top, which has housed our main rosemary plant ever since.

2013

Just recently, due to prolonged wet weather, the lemon balm tried to take over, but it has been cut back severely and the herb spiral is now home to – Basil (perennial), basil (spicy), chives, lemon balm, lemon verbena, lemongrass, marjoram, oregano, parsley, rosemary, sage, tarragon (French), and thyme. I will probably add to this when we are coming into spring, later in the year.

2023

Tree herbs (spices?)

2010 when the Makrut and Curry Leaf Tree were installed

We have three trees that we harvest leaves from to flavour our cooking and one medicinally

–

Bay Tree (Laurus nobilis) – This is a slow growing tree, which we have had hanging around for a very long time. It predates all our other herbs, being bought in over 35 years ago. It started out in a pot near our front door after I first bought it, but then about 30 years ago I transplanted it into the northeastern corner of our front garden. It is easily accessible to passers-by but I don't know how many would know what it is. It has become the lynchpin of our longitudinal food forest in the front yard and would probably be able to supply all of St Clair with by leaves!

Makrut Lime or Kaffir Lime (citrus Hystrix) – It was one of the original plantings of our so called 'fruit tree circle' that I put together in 2010 to replace the carob tree (which turned out to be a non-productive male tree). It is in the northernmost part of the circle, adjacent to the path, and continues to grow well, just requiring the odd prune to open it up and keeping it free of bronze orange bugs during the hotter months.

Curry Leaf Tree (murraya koenigii) – This also was part of the original 'fruit tree circle' plantings in 2010. It is pretty hardy and does not require much care, just a bit of water during really dry times. It is exceptionally handy when I am cooking a curry to be able to walk out my front door and three metres away is our own curry tree.

Tea tree (melaleuca alternifolia) – these were placed across the front of the front garden as tube stock we got from the Easter Show almost 40 years ago. They just about define the boundary of the front yard these days. They produce a wonderful medicinal oil (tea tree oil) and it has been on my 'to do' list to steam distil some of it from the foliage of my tea trees. They do drop twigs (and occasionally branches in high winds) which we use to start the fire in winter and power rocket stoves.

The Lavender Hedge

Back in 2012 I built a long but narrow raised bed, filled it with mushroom compost and installed a series of twelve lavender plants along it. I then set up a simple but effective watering system to keep them hydrated. In the intervening years we have had scorching hot, dry and then supremely wet conditions. Of the original twelve we still have six plants existing, but I need to redo the area and replace the lavender plants that have passed on.

2012 when they were first put in

2015

2023 - A bit sparse, needs a revamp!

Spices

In 2010 I came across the concept of the earth box, a self-watering container made from a rectangular plastic tub or bin, where the top was fitted half way down the tub, the growing medium being heaped on top and the water reservoir sitting below. I made four and grew a random series of veggies in them until it occurred to me that they could be used to grow spices of the Zingiberaceae family.

Turmeric, galangal and ginger

These plants are really tropical but because the containers are black and absorb the suns heat, and have their own water reservoir for those really hot days, I thought they would do the job, and in fact they have! First was ginger (zingiber officinale), being the spice I use the most, over 10 years ago and for the most part we have been able t get by with the ginger I grow since. Then over the years came turmeric (curcurma longa) and galangal (alpine galangal) and then finally cardamom (elletaria cardamomum).

Cardamom

Cardamom was only added to this gang of four within the last year. While of the same family as the others it is the fruit that is used not the rhizome, although the leaves can be used to give a cardamom-like flavour to dishes. I have been growing it for years near the back steps but it has not produced flowers or pods, I hoped that by transplanting some to the black box it would get enough heat/light to flower. The experiment continues!

Turmeric harvest

They all grow well during the hotter months but during winter (we get some frost) they will die back partially or fully back to the rhizome, to then come on again as the warm weather returns in late spring.

Winter takes its toll!

A new tree spice has just come in during the last couple of weeks – cinnamon (Cinnamomum verum). Cinnamon is a true tropical tree so it is really an experiment to see if I can grow it in a pot in my greenhouse to the point where it is big enough to actually harvest some cinnamon. At the moment it is only about 30cm high, so it remains to be seen how it will go.

Our brand new cinnamon tree!

I have also had some experimentation (in the herb spiral) in growing both coriander (Coriandrum sativum) for the seed/spice only not the leaves (yuk!) and cumin (Cuminum cyminum). I have had some slight success with the coriander and harvested about 10 grams of seed this year, but was hardly able to get the cumin to germinate so a lot more work is required.

Conclusion

While we do still buy spices (although we will be buying less if I am successful in the longer term) we don't buy that much in the way of herbs and I hope to continue that trend. As with lots of aspects of living more sustainably, the adventure continues!

4.0 Fertility, Pests and Diseases

4.1 Keeping up your Fertility Organically by 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.

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.

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.

4.2 Organic 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 5 – 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.

4.3 Organic Pest control

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.

- 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.

- 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.

Making a Fruit Fly Trap

The Queensland Fruit Fly (*Dacus Tryoni*) and the Mediterranean Fruit Fly (*Ceritits Capitata*) are significant pests of a wide range of fruits and fruits that generally get called vegetables (tomatoes, capsicums, chillies, eggplant). One home grown way of reducing the effect of their predations is to install fruit fly traps in the areas where you are growing fruits and vegetables likely to be affected.

To make the traps you will need a 1.25 litre or 2 litre PET soft drink bottle, a hobby knife or pair of scissors, some electrical tape, preferably red or yellow, some wire or string and an attractant/poison which will be discussed later.

Making the trap

Take the PET drink bottle and cut the top off about 1 centimetre down from where the shoulder meets the body of the bottle. Now invert the funnel shaped piece of plastic formed by this operation and insert it in the open end of the cut away bottle. Secure the funnel by placing red or yellow (or both) plastic take around the end of the bottle/funnel set up. Flying insects are attracted to red and yellow which is why these colours are used. Cut, drill or pierce two small holes, one on each side of the top and thread some wire or string through to hang the trap on the tree with. Pour the attractant/poison mix into the bottle and hang in the tree.

Inspect the trap regularly to see how successful you are and empty and replace the attractant every three weeks, the attractant and dead flies can go into the compost. The trap works by attracting the flies then sticking them up or poisoning them and either way making it difficult to get out of the bottle again. You can either make up the attractant into a sticky paste or add a poison that will finish the flies off once they contact or feed on the attractant mix.

Attractants include – molasses, fruit juice, vanilla essence, jam, vegemite, ammonia

Pesticides include – borax, pyrethrum or derris dust.

4.4 Organic Disease Control

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.

4.5 Sprays and Spraying

By and large when you grow your food organically you try and avoid using sprays of any description, even the homemade or shop bought organic approved ones. Using cultural techniques and managing your pests by encouraging predators and keeping your plant health is by far the most preferable way. Unfortunately there are times when you have no choice, circumstances dictate that it's either spray or face a crop wipe-out! It is like that at the moment here with the cabbage moth (not cabbage white butterfly), they usually turn up for a couple of weeks in February and are a pain but manageable. Last year they hung around a bit longer than usual due to the mild winter and they are here a bit early this year, I suspect due to the run of hot dry weather.

They were taking over and I was about to lose a whole stack of brassicas so I had to spray (as much as I didn't want to)! The spray I intended to use was an "approved" organic spray being a bacterial spray, that is to say it is bacteria (*bacillus thuringiensis*) suspended in water to form the spray which is applied to the plants. It is available commercially under the name Dipel®. It is a bacterium which only targets caterpillars and only if they eat the sprayed plants so it is very specific. It is important to spray in the late afternoon or early morning so that the bacteria can do their work before the UV of the sun kills them.

This of course raised a bigger question. What sort of sprayer should I get? The last one I had passed away over 10 years ago.

Which Sprayer?

There are whole stack of different sprayers on the market, if you only have a balcony sized area you might consider a bottom of the line “Household Multipurpose Sprayer” as shown on the right. One downside with this type of sprayer (apart from your hand getting tired pumping the trigger) is that the spray nozzle is very fine and particles can easily block it. Any commercial solutions to be sprayed such as pyrethrum spray would work out well but slurries such as sulphur or lime would block the nozzle very quickly. Also, while making and using homemade sprays is great some would need to be well filtered; milk or soap sprays would be fine, but any extract like the old standby chilli and garlic spray would need to be filtered through coffee filter papers before using or you may block the spray nozzle.

There is a slightly larger one available on the market which can be pumped up and so there is no tiresome trigger mechanism. It has a reservoir of about 2 litres and is designed for use with garden sprays. It doesn’t have a flexible nozzle so you need to angle it up under the leaves if required but they are readily available and quite inexpensive.

The ones above didn’t really do it for me though, I needed something bigger, with a reservoir of about 5 litres, which would hold enough spray to do a decent job on the amount of stuff I grow. It would be heavier when full so I wanted a strap so I could carry it over my shoulder. I wanted a hose between the sprayer nozzle and the reservoir to give greater flexibility to spray under the leaves and an easily operable trigger. Seeing as it was going to be a pump up, it should be easily pumped up and have an overpressure relief valve as well. Thankfully the sprayer I got ticked all the boxes.

If you have a market garden sized veggie patch or really want to go heavy duty, you could buy a backpack sprayer. They will hold up to 20 litres but are expensive and heavy to lug around. They most likely would be far too large for even the most extensive back yard.

To decide on the best sprayer for your needs you should consider –

- What sprays you will be using (soluble sprays or slurries).
- The sorts of plants you need to spray
- How often you will need to spray, and
- The area of vegetation you intend to spray.

Mixing Sprays

All sprays will need to be diluted for use, make sure this is done in containers reserved for this purpose and thoroughly washed out prior to use. In general terms a good technique is to full the sprayer half full of water, add in the required volume of spray concentrate, accurately measured, then top up with water. Replace the sprayer head and hive the sprayer a good shake it should then be ready for use. If using a slurry spray and you take a break, give it another shake before you continue spraying.

Spraying Technique

To get the best out the spraying which you have to do and to minimise the risk of unintended consequences there are a few rules which should be followed –

1. Early morning or late afternoon when wind conditions are low is the best time for spraying, if you must spray during light winds always start downwind and work upwind.
2. Spray only the bits you need to – if the bug is underneath the top leaves, spray there, although fungal spray will need to cover the whole plant.
3. Don’t drench the plant with spray, only spray until discrete droplets can be seen covering the leaf. Several light applications are better than one heavy one.

4. When using a commercial spray dilute it as required on the label, a higher concentration will only waste spray and increase the withholding period ie the minimum time between spraying and harvesting.
5. When using pyrethrum based formulations avoid spraying plants in flower to reduce the likelihood of injuring bees.
6. Due to their nature, organic pesticides will breakdown quickly and may need to be re-applied in the case of a re-infestation.

Cleaning the Equipment

Once you have completed spraying it is very important to clean out and decontaminate the apparatus to prevent accidental contamination if somebody uses the sprayer for something else and just in case the next spray to be used is incompatible with the previous one.
The easiest way to do this is to flush the whole system through with water several times, wash out with a mild soap or detergent solution and then give a final rinse with clean water. If a slurry or particulate spray has been used, it is good practice to disassemble and clean out the spray nozzle to make sure no powder is caught within the spray nozzle itself.

Safety Concerns

Assume all pesticides, even the organic ones, are toxic and make sure that they are kept away from children and locked away when not in use. Always decontaminate spray equipment as above, including any containers used to mix up the spray, before locking it away after use. NEVER, EVER put any kind of spray into a food or drink container.

Disposal

Don’t leave unused spray material in the sprayer. For most home-made sprays you can just pour it out on the ground or into a hole and cover with dirt, they will breakdown quite quickly, and decontaminate your sprayer.

5.0 Resources

5.1 Growing Fruit and Vegetables in a Small Area

Lawns into Lunch: Growing Food in the City – Jill Finnane – New Holland Publishers (AUS) 2005 ISBN 1 74110 209 X

Fresh food From Small Spaces – R. J. Ruppenthal – Chelsea Green Publishing Company (US) 2008 ISBN 978 1 60358 028 1

Urban Eden – Adam and James Caplin – Kyle Cathie Ltd (UK) 2004 ISBN 1 85626 501 3

Fabulous Food from every Small Garden – Mary Horsfall – CSIRO Publishing (AUS) 2009 ISBN 978 0 643 09597 7

The Apartment Farmer (The Hassle Free Way to Grow Vegetables Indoors, on Balconies, Patios, Roofs and in Small Yards) – Duane Newcombe – J.P. Archer Inc. (US) 1976 ISBN 0 87477 047 5

The Edible Container Garden (Fresh Food From Tiny Spaces) – Michael Guerra – Gaia Books Ltd (UK) 2000 ISBN 1 85675 089 2

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

Successful Small Food Gardens – Louise Riotte – Garden Way Publishing (US) 1993 ISBN 0 88266 818 8

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

Harvesting the Suburbs – Jeff Hodges – Nature & Health Books (AUS) 1986 ISBN 0 949099 02 3

The Complete Urban Farmer – David Wickers – Fontana/Collins (UK) 1977 ISBN 0 00 635096 8

Raise Bed Vegetable Gardening Made Simple – Raymond Nones – The Countryman Press (US) 2010 ISBN 978 0 88150 896 3

Patio Produce – Paul Peacock – Spring Hill (UK) 2009 ISBN 978 1 905862 28 3

A little Piece of Earth – Maria Finn – Universe Publishing (US) 2010 ISBN 978 0 7893 2027 8

The City Peoples Book of Raising Food – Helga and William Olkowski – Rodale Press (US) 1975 ISBN 0 87857 095 0

The After Dinner Gardening Book – Richard W. Langer – Collier Books (US) 1971 ISBN 0 89815 450 2

Don't Throw it, Grow it! – Deborah Peterson and Millicent Selsam – Storey Publishing (US) ISBN 978 1 60342 064 8

Square Foot Gardening – Mel Bartholomew – Rodale Press (US) 1981 ISBN 0 87857 341 0

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

Escarole in the Bedroom (Growing Food Plants Indoors) – Jack Kramer – Little, Brown and Co (US) 1977 ISBN 0 316 50314

One Magic Square (grow your own food on one metre square) – Lolo Houbein – Wakefield Press (AUS) 2008 ISBN 978 1 86254 764 3

Incredible Vegetables from Self Watering Containers – Edward C. Smith – Storey Publishing (US) 2006 ISBN 978 1 58017 556 2

More food from Your Garden – J.R. Mittleider – Woodbridge Pres (US) 1975 ISBN 0 912800 15 1

The Complete Book of Edible Landscaping – Rosalind Creasy – Sierra Club Books (US) 1982 ISBN 0 87156 278 2

Vegetables for Small Gardens and Containers – Peter De Vaus – Hyland House Publishing (AUS) 1991 ISBN 0 947062 37 8

Indoor Kitchen Gardening – Elizabeth Millard – Cool Springs Press (US) 2014 ISBN 978 1 59186593 3

The Rurbanite – Alex Mitchell – Kyle Books (UK) 2013 ISBN 978 0 85783 072 2

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

The Quarter Acre Farm – Spring Warren (Yup, that's her name!) Seal Press (US) 2011 ISBN 978 1 58005 340 2

Veg Street – Naomi Schillinger – Short Books (UK) 2013 ISBN 978 1 780 72112 5

The Small Edible Garden – Diana Anthony – David Bateman Ltd (NZ) 2008 ISBN 978 1 86953 705 0

Vertical Gardening – Derek Fell – Rodale Press (US) 2011 ISBN 978 1 60529 083 6

Vertical Vegetables and Fruit – Rhonda M. Hart – Storey Publishing (US) 2011 ISBN 978 1 60342 998 6

The Edible Balcony – Indira Naidoo – Penguin Group (AUS) 2011 ISBN 978 1 921382 53 6

The Edible Balcony – Alex Mitchell – Kyle Cathie Ltd (UK) 2011 ISBN 978 1 85626 946 9

The Edible Front Yard – Ivette Soler – Timber Press (US) 2011 ISBN 978 1 60469 199 3

Ground Breaking Food Gardens – Niki Jabour – Storey Publishing (US) 2014 ISBN 978 1 61212 061 4

Little House in the Suburbs – Deanna Caswell and Daisy Siskin – Betterway Home (US) 2012 ISBN 978 1 4403 1024 9

5.2 Growing Food in Containers

From Container to Kitchen – D.J.Herda- New Society Publishers (CAN) 2010 ISBN 978 0 86571 665 0

Grow Your Own Crops in Pots – Kay Maguire – Michael Beazley (Royal horticultural Society) UK 2013 ISBN 978 1 84533 686 8

Permaculture in Pots (how to grow food in small urban spaces) – Julie Kemp – Permanent Publications (UK) 2012 ISBN 978 1 85623 097 1

Crops in Pots (Part of the "Green Guides" series of books) – Rachelle Straus – Flame Tree Publishing (UK) 2011 ISBN 978 1 84786 719 3

Grow Your Own Vegetables in Containers (Also called "Organic Crops in Pots") – Deborah Schneebeli-Morrell – Cico Books (US) 2009 ISBN 978 1 907030 06 2

Backyard Self Sufficiency – Jackie French – Aird Books (AUS) 2009 ISBN 9780947214586 –

Fabulous Food From every Small Garden – Mary Horsfall – CSIRO Publishing (AUS) 2009 ISBN 978 0 643 09597 7

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

5.3 Fruit Growing

Fruit for the Home and Garden – Leslie Johns and violet Stevenson – Angus & Robertson Publishers (AUS) 1985 ISBN 0 207 15068 0

Growing fruit in Australia – Paul Baxter – Thomas Nelson (AUS) 1981 ISBN 0 17 006317 8 A later edition was released in 1990 with Glenn Tankard by Macmillan and co with an ISBN 0 7329 0305 X.

Tropical Fruit – Glenn Tankard – Viking O'Neil (AUS) 1987 ISBN 0 670 90205 5

The Australian Home Orchard – Colin Hutchinson – Simon & Schuster (AUS) 1993 ISBN 0 7318 0406 6

Fruit for Australian Gardens – Paul Baxter – Sun Publishers (AUS) 1991 ISBN 0 7521 0634 4 Growing

Citrus Trees – Geoff Godden – Lothian Publishing co (AUS) 1988 ISBN 0 85091 286 5.

Fruit Growing in South Eastern Australia – The Caxton Press (AUS) 1983 ISBN 0 908563 09 4

Grow Fruit – Alan Buckingham – Dorling Kindersley (UK) 2010 ISBN976 1 74033 763 2 –

Landscaping with Fruit – Lee Reich – Storey Publishing (US) 2009 ISBN 978 1 60342 091 4

Success with Organic Fruit – Yvonne Cuthbertson – Guild of Master Craftsmen Publications (UK) 2006 ISBN 1 86108 483 8

5.4 Sprouts and Microgreens

Sprouts: The Miracle Food – Steve Meyerowitz – Self Published (US) 2010 ISBN 978 1 878736 04 8

Sprouts and Sprouting – Valerie Cupillard – Grub Street (UK) 2007 ISBN 978 1 904943 90 7 Regardless of what a fascinating subject sprouting is, there are very few books that cover sprouting alone, usually the stuff on sprouting is part of a larger work, so i have included a few of those that are worth following up.

Fresh food From Small Spaces – R. J. Ruppenthal – Chelsea Green Publishing Company (US) 2008 ISBN 978 1 60358 028 1 – Chapter 7 (pp79-95)

Making Your Own Home Proteins – Evelyn Findlater – Century Publishing (UK) 1985 ISBN 0 7126 0817 6 – Chapter 4 (pp113-134)

Sailing the Farm (a survival guide for homesteading on the ocean) – Ken Neumeyer – Ten Speed Press (US)1981 ISBN 0 89815 051 5 – (pp85-102)

How Can I be Prepared with Self-sufficiency and survival Foods? – Isabel Shipard – David Steward (AUS) 2008 ISBN 978 0 9758252 3 5 – (pp92-97)

Escarole in the Bedroom (Growing Food plants Indoors) – Jack Kramer – Little, Brown and Co. (US) 1977 ISBN 0 316 50314 2 – (pp52 -58)

Microgreens – Eric Franks and Jasmine Richardson – Gibbs Smith (US) 2009 ISBN978 1 4236 0364 8

How to Grow Microgreens – Fionna Hill – David Bateman (NZ) 2010 ISBN 978 186953 765 4

5.5 Pests and Diseases

What Garden Pest or Disease is That? – Judy McMaugh – Lansdowne Press (AUS) 1985 ISBN 0 7018 1932 4

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

What Pest is That? – Frances Hutchinson – Bay Books (AUS) 1982 – ISBN 0 85835 539

The Organic Garden Doctor – Jackie French – Angus & Robertson (AUS) 1988 ISBN 0 207 16039 2

Natural Control of Garden Pests – Jackie French – Aird Books (AUS) 1990 ISBN0 947214 13 5

Organic control of Household pests – Jackie French – Aird books (AUS) 1988 ISBN 0 947214 02 X

Bug – Tim Marshall – ABC Books (AUS) 2010 ISBN 978 0 7333 2501 4

Garden Pests, Diseases & Good Bugs – Denis Crawford – Harper Collins (AUS) 2015 ISBN 978 0 7333 3188 6

Appendices

Appendix 1 – Veggie 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																																				
Basil	Sweet	4 plants																																			
Beans			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants															
Beetroot	Crimson Globe				1 row			1 row			1 row			1 row			1 row			1 row			1 row													
Bok Choi						4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants												
Broccoli	Summer Green	2 plants	2 plants		4 plants	2 plants		4 plants	2 plants		4 plants	2 plants		4 plants	2 plants		4 plants	2 plants		4 plants	2 plants		4 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	4 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		2 plants	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		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			
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			
Calendula	Pot marigold	4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants				
Capsicum	California Wonder	4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants			4 plants				
Chilli	Cayenne	2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			2 plants				
Carrots	All year round				HalfBed																																
Carrots	Chantenay				HalfBed																																
Cauliflower	Phenomenal Early	2 plants																2 plants			2 plants			2 plants			2 plants			2 plants			2 plants			
Cauliflower	Snowball																																				
Celery	Golden Self Blanching		2 plants		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															
Cucumber	Long Green		1 plant			1 plant			1 plant						1 plant			1 plant			1 plant															
Garlic																																					
Ginger									4 rhizomes																												
Jerusalem Artichokes						6 rhizomes			6 rhizomes																												
Kale																																					
Scottish									12 plants																												
Leek												12 plants			12 plants						12 plants			4 plants												
Lettuce	Mignonette - 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	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	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	1 plant
Onions - sets																																					
Onions - Spring				1 punnet																						2 Boxes											
Oregano	Evergreen bunching																																				
Nasturtiums																																					
Peas - Snow	Mamoth Melting					2 plants			2 plants			2 plants			2 plants																						
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	1 row
Potatoes	Nicola				12 plants																			1 row	1 row		1 row	1 row		1 row	1 row		1 row	1 row		1 row	1 row
Parsley	Curled	4 plants						4 plants						4 plants			6 plants																			
Pumpkin	Queensland Blue		2 plants												2 plants																						
Silverbeet	Forthook Giant				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																													
Spinach	Southern European		4 plants																										4 plants			4 plants					
Squash (button)			2 plants						2 plants									2 plants																			
Sweetcorn						16 plants						16 plants			2 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 Kalas	4 plants																																			
Tomato	Grosse Lisse		12 plants																																		
Tomato	Roma					4 plants						4 plants			4 plants																						
Tomato	Red Cherry cocktail		4 plants						4 plants						4 plants																						
Tumips	Snow Ball																							Row													
Zucchinni	Black Jack	2 plants			2 plants													2 plants																			

Appendix 2 - Balcony Edible Gardening Assessment Form

Date:

Address

Floor no:

Dimensions and Area of Balcony (m^2):

Wall or railing type and height:

Materials of construction & condition:

Direction Faced (use compass):

Drainage and fall:

Water access:

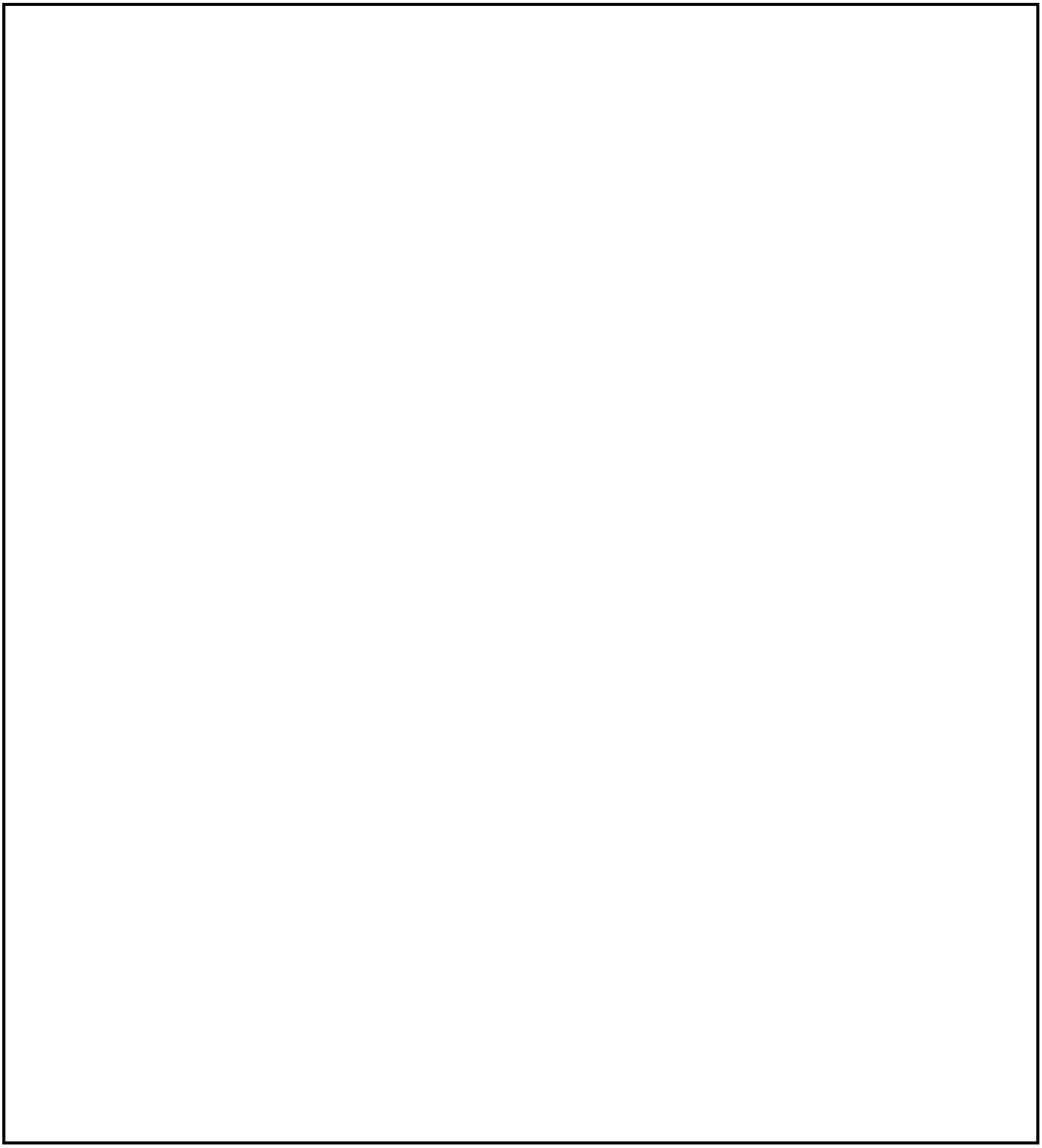
Shade:

Prevailing wind direction:

Microclimate issues:

Nearby roads:

Existing Materials/plants & structures on the balcony:
Owners' Vision:



Sketch of shape etc.

Appendix 3 - Blank Fruit Harvest Calendar

Type	Cultivar	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Existing						New						

Appendix 4 - 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