Farming Zone Zero

By Nev Sweeney

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1.1 Introduction

When I first came up with the idea for this eBook it sounded to me like the title for an 'end-of-the-world' science fiction movie rather than being about permaculture and small-scale food growing. (maybe I was confusing Zone Zero with Ground Zero, who knows?)

It doesn't matter how big your yard is, there are always those of us who want more space to grow our own food and at this point I will put my hand in the air, but the issues we are facing these days are that –

- Australia is one of the most urbanised countries in the world – more than 96% of the Australian population (around 24.5 million) live in urban areas and 68% live within the greater metropolitan areas of Australia's 8 capital cities. (**Livability | Australia state of the environment 2021**)
- The average size of housing blocks for new houses in Australian capital cities has decreased by 13% (64 square metres) over the last ten years, from 496 square metres in 2012 to 432 square metres in 2021.(**New houses being built on smaller blocks | Australian Bureau of Statistics**)
- The average new house size has risen to 239m2 in 2022 (**Average house size in Australia | Compare the Market**)

Knock down/rebuild also has an effect, some months ago this block had a single-story dwelling on it and lots of growing room, it now has two two-story dwellings and very little growing room

When we bought our house and land some back in the late 70's, I considered our 600m^2 block of land to be quite small, but now it seems that it is comparatively large. By contrast our house at 120m2 is almost exactly half the size of new builds today. So, if you do the math, between increasing house sizes and decreasing block sizes, our yard area where we can grow stuff is 480m2 (minus space for the garage and a couple of sheds) but a new build today would have on average a little under 200m2. That means that our block that I thought was too small is now almost two and half times bigger than growing area for a newbuild today!

High rise living is becoming more and more common

Also, add to that, a bit over 10% of the Aussie population (which equates to over 2.5 million people) live in apartments, without access to land where they live at all.
It seems to me that if we want to have the benefits of growing our own food, (and there are many) we need to look seriously at how to grow food in our Zone Zero.

The Permaculture Zone Tool

If you are not familiar with the concept of Zones in permaculture, it was developed by Bill Mollison and David Holmgren as a tool to allow areas of similar use, activities and frequency of visitation to be grouped together when developing a permaculture design. The idea for permaculture zones was laid out in the original book about permaculture - 'Permaculture One' and was conceived as a series of concentric circles (Zones 1 to 5) starting at the area around the house (zone 1) and moving towards untouched wilderness areas (Zone 5). Each zone may be described as below –

Zone 1: Nearest to the house, for elements that require frequent attention, or be visited often
Zone 2: Farther from house the place for perennial plants or self-maintaining plants and elements needing infrequent work.
Zone 3: Occasionally visited areas where main crops are grown, for domestic and for trade use. After establishment, care and maintenance is minimal

Zone 4: Semi - Wild food gathering (e.g. nuts, native fruits, mushrooms) wood for Fuel, Self-seeding trees, soil microbes semi-wild.
Zone 5: Wilderness area: a rarely visited area often linked with neighbouring wildlife corridors.

In the original "Permaculture one" and "Permaculture Two" there was no mention of a Zone 0, this came later and is referred to in Bill's seminal work "Permaculture: A Designers' Manual". Zone 0 may be described as –

Zone Zero: Home: indoor production (sprouts/ferments), processing food, waste, water & energy collection, repairs and education, relax, work and where you practise reduced consumption and re-cycling.

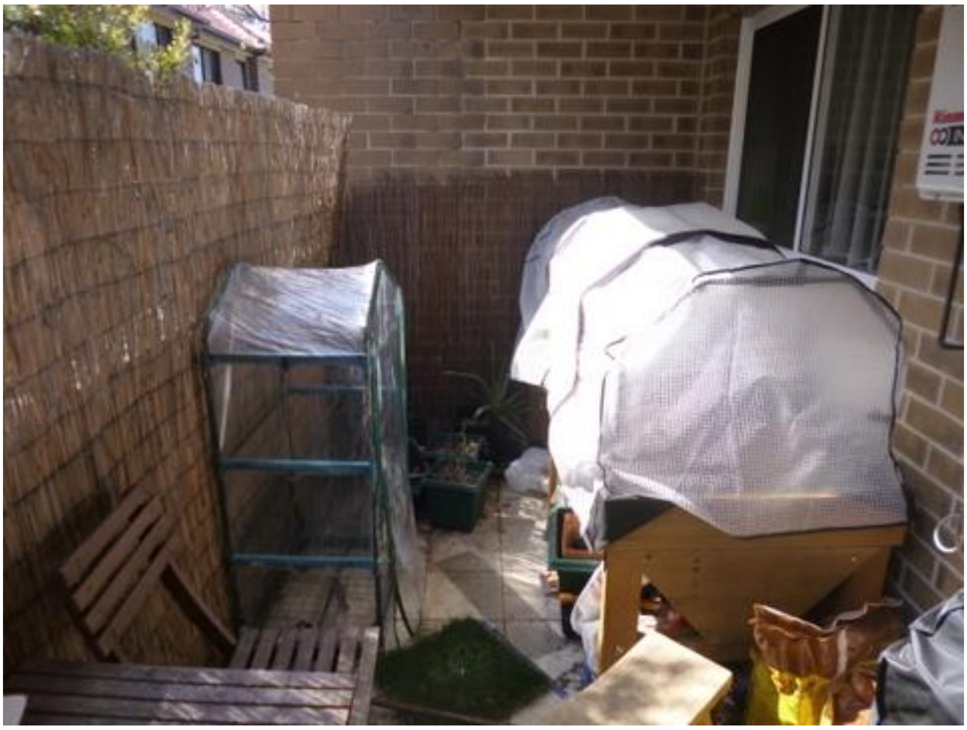
Mung bean sprouts: easy to grow, nutritious and you don't even need light to grow them!

Zone Zero – My Terms of Reference

After some reading, I have been unable to find a comprehensive description of what is entailed in Zone 0, perhaps the best is from the Permaculture Research Institute – "Zone 0: the centre of human activity, for example, the house."

For the purposes of this series of articles on growing food in Zone Zero, I have included in the following areas to be covered by the term ‘zone Zero’ –

• The dwelling place eg house, apartment, flat, townhouse, unit or tiny house.
• Patios, decking and verandas attached to the house and balconies attached to flats, units and apartments
• The garage, as it is quite often integral with the house.



You can grow food on a small 5.6m x 2.1m balcony if you are creative

Growing Food in Zone 0 – Pros and Cons

Wherever you grow it, growing your own food has several advantages to it, including –

- It will save you money
- The produce is fresher, improving your family’s nutrition
- Improved flavour
- Lower food miles
- No chemical residues:

Growing soil sprouts on a west-facing windowsill

- It shows kids where their food comes from
- It enables you to eat a greater variety of foods
- The satisfaction which comes from growing and eating your own produce is amazing.
- No packaging to try and recycle or send to landfill
- Reduced environmental impact of fertiliser and pesticide use
- Improved resilience if supply chains are interrupted.

Having said that, there are a number of pros and cons specifically associated with growing your food within your own Zone Zero (a Zone Zero Farm, if you will), and while they do line up pretty well with growing food in containers, because that's how you do it for the most part in Zone Zero, there are also some variations –

Pros

Perfect for small urban spaces – Like the various spaces in our Zone Zero, you don't need a huge area to grow your own food if you make the most of what space you have.

They can be moved easily – This pro has a number of points in its favour, because you can move your plants around to find the microclimate that suits them best, in and out of the sun (depending on temperatures and time of day), or to a damp or dry area. Growing your zone 0 food in containers also means that you can take them with you when you move to a new zone 0. This can be a huge advantage if you are renting.

It expands the range of plants you can grow – You are not limited by your soil type, or soil pH etc, you can alter your growing medium to suit the plants you want to grow, whether they need good drainage, or a more solid clay soil, neutral pH (as most veg does) or a bit more alkaline or acid (like blueberries). You can grow what you want by tailoring things to your plant’s needs.

Great idea where there is no access to soil – If all you have to grow on is a balcony, patio, deck or inside your dwelling place, you don’t need access to soil to be able to grow food!

Part of a Small balcony garden

They look nice and can be arranged artistically – If you want to grow food but also want the aesthetics to be right for your zone 0, growing in containers gives you the flexibility to arrange your crops so they look nice as well as being productive, then rearrange them if you are still not satisfied.

Plants with different needs can be grown side by side – Thirsty tomatoes can be grown beside drought tolerant Mediterranean herbs, carrots can be grown in fine soil next to shallow rooted crops like lettuce or silver beet do well in a soil that retains moisture.

When plants finish cropping, they can be removed and replaced easily – there is no need to spend time and effort digging them out, just remove them from the pot, replace your potting medium and you are ready to go again.

Growing food indoors – In the right situation (plenty of light) some crops do very well when grown indoors in containers. Using grow lights means you can grow your food crops anywhere indoors – on top of tables, cupboards, in bookshelves, closets or garages.

Crops in Zone Zero are kept close to you where you can keep an eye on them - checking regularly to see if they need watering or have developed any pest of disease issues is much easier, remember - ‘the best fertiliser is the gardener’s shadow’

They are easy to access – If you are, how shall I put this, more mature in years (like me), having easy access to your crops by growing them in containers with an elevated situation such as on benches, shelves, tables or in a planter box on legs. This means you can plant out, harvest, water, check for pests and diseases all without bending over. That must be a win!

Weeds are a thing of the past – if your growing medium is free of weed seeds, wind blown weed seeds will not be able to access your Zone Zero crops so no more weeds!

It is a protected environment – your Zone Zero food plants will be isolated from extremes of temperature, high winds, hail and most other vegetation hazards that nature can throw at them.

Stress Reduction - Plants in your Zone Zero may help to reduce psychological and physiological stress when times are tough.

Mushrooms are a great Zone Zero crop that also don't need light

Cons

There are not many, and for the most part they are easily dealt with, but it is good to understand what you are getting into before starting.

Frequent Watering - Probably the biggest 'con' of growing food in containers is the need for frequent watering as they dry out more quickly than when grown in the soil. This is made worse if unglazed terracotta pots are used, because they are porous and can wick moisture from the soil and allow it to evaporate. Some fixes for this are mulch, self-watering pots, and putting small ollas in pots.

small ollas in pots can reduce the need for frequent watering

The Growing medium can become hydrophobic – If the dryness is allowed to continue for some time, the soil can get to the point where it repels water, becoming hydrophobic. What this means is that when the container is watered the soil will not absorb the water but allow it to run straight through and out the bottom of the pot. This makes you think that it is well watered, but it is, in fact, still dry. There are fixes for this, like totally soaking the pots in water, watering with an appropriate surfactant or growing in self-watering containers.

There is a need to keep a closer eye on the plants – Because the containers don't contain the soil volume you would get from growing in the ground, their circumstances can change quickly, like drying out or running out of fertility. For these reasons they do require more attention than crops grown in the ground.

Insect pollinators may not make it to your pots – Depending on where you are growing, such as indoors or on a high balcony, insect pollinators may have trouble pollinating any of your crops that need insect pollination. A way around this is to hand pollinate or grow crops that don't need pollinators to be productive.

Hand pollinating a cucumber

Yields can be smaller – without a large mass of soil to draw water and nutrients from, plus other environmental factors like overheating, the yield from each plant may be reduced, so you might need to plant more of each one to make up for it.

A hungry Family – They may harvest your zone 0 goodies before you intended to, reducing yield, but at least the kids will be getting a taste for (very) fresh organic veg.

Whether you already have a productive yard associated with your Zone Zero or your Zone Zero is the only place you can grow food, there are a whole stack of great reasons for growing some of your own food. With a bit of planning, time and effort you can have a very productive Zone Zero.

1.2 Assessing Zone Zero for Growing Food

Soil sprouts growing on a west-facing windowsill

Growing food in Zone Zero can be fun and productive, but it is a good idea to have a plan in mind of what you want to achieve and then look at your house to see how it can support your plan to grow some food indoors. What this article covers is an approach to finding the best place to grow food in your Zone Zero and then putting a plan in place to achieve it.

Growing spaces in your Zone Zero can be grouped into one of three functional areas where food growing can take place.

- Close to windows (including skylights)
- Other Indoor spaces (requiring artificial lighting) including the garage.
- Outdoors in Zone Zero attached areas (eg patio, deck, balcony)

Tiny balcony growing herbs in recycled containers

As noted previously in the article introducing Zone Zero Farming, for the purposes of this series of articles, I have included the following areas to be covered under the term 'Zone Zero' –

- The dwelling place eg house, apartment, flat, townhouse, unit or tiny house.
- Patios, decking and verandas attached to the house and balconies attached to flats, units and apartments
- The garage, as it is quite often integral with the house.

Zone Zero Functional Areas

Close to Windows and skylights

The amount of light available from windows may depend on shade from fences, other buildings, trees etc and the aspect of your particular Zone Zero, but they are most likely to be useful for growing food indoors without having to include artificial lighting. These areas can generally be divided into four distinct spaces –

- **North facing windows** – These will generally give you the most hours of sunlight, although in high summer the sun will be passing almost directly overhead, reducing the amount of sunlight at this time of the year. I would love to have a discussion about north facing windows with the idiots who designed our house – we have none!
- **Skylights** – If you have a skylight, plants grown directly below it should get a reasonable amount of light and grow well. We don't have one, but I would like to get one in our hall which is dark most of the time. I could then grow something on top of the bookshelves in the hall! I had a theory, that if you have a single skin roof (maybe on a shed or garage, you could install a drink bottle skylight and see how that went, but maximum light level I got when I checked was 300 lux at midday, not enough to grow food plants.
- **East/West facing windows** – This depends on the aspect of the rest of the house, but windows with some eastern and western exposure may provide enough natural light to grow food crops. The front of our house faces a little south of east so due to that and added trees in our front yard we would not get enough light to grow anything but the slightly north western exposure of the back of the house means that my office window and the dining room window get enough to do some food growing. The rest of the back of the house is protected from the sun by foliage and the back deck.
- **South facing windows** – Seeing as these will get the least direct light, they are likely not going to be the best choice for growing food in Zone Zero without having to use grow lights of some description.

This window faces slightly north of west

Other Indoor Spaces

These are legion and can be anywhere in the house or garage where you can find room, on top of cupboards, shelves, and chests of drawers, bookshelves, on tables, benches and desks, on a bedside table. Basically, any flat space, that is not in the way, and where you can set up artificial lighting (so power of some description will be required). There are some other factors to consider but the limiting factor is light – the right frequencies, intensely enough and for long enough to allow your food plants to grow to maturity for harvest. This will be covered in more detail in the next article on Zone Zero microclimates. I have seen it written that with grow lights it is possible to set up to grow inside cupboards or other furniture, but it seems to me that it would be difficult to provide the air movement required to grow healthy food plants in these situations. This will also be discussed under the following section on Zone Zero Microclimates.

Outdoors (patio, deck, veranda, balcony)

Areas attached to zone zero that can be used to grow food crops have a greater likelihood of getting at least some sun, although this is not a given. We have a front patio (1800mm x 1500mm) that has a southerly aspect and is lucky to get an hour of sunshine early in the morning. By contrast, the back deck gets full sun from midday to sunset.

There are other things that these outdoor areas should be assessed for as well as aspect, things that include its dimensions, material of construction and ability to support the weight of growing containers, drainage and fall, water access, prevailing wind and existing materials, plants and structures. This has been covered in more detail in the next section

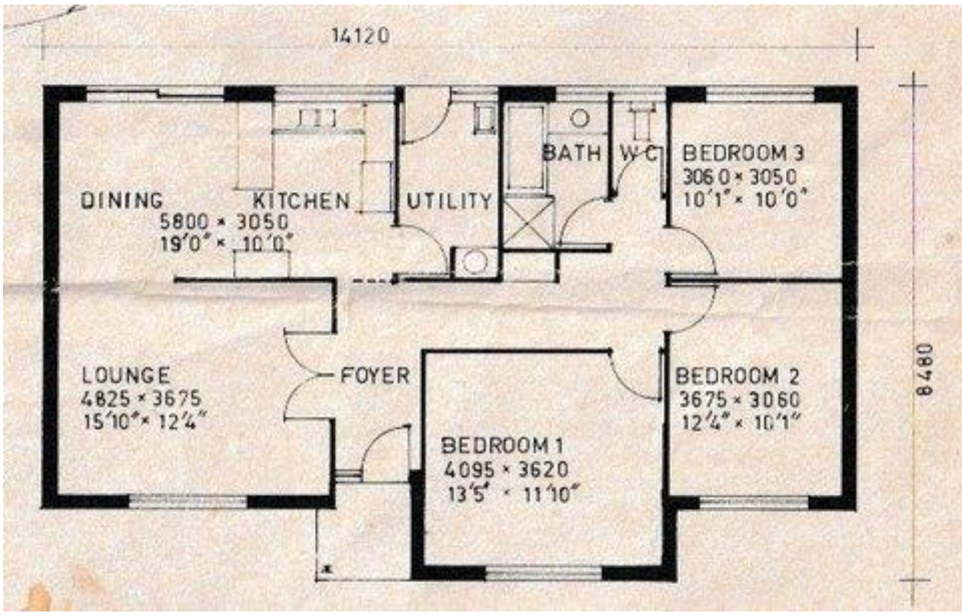
Even a small 5.6m x 2.1m balcony can produce food!

With Zone Zero divided up into functional areas, each can be assessed.

Assessing Zone Zero

Draw a diagram

To kick off the assessment, planning and documenting the process, obtain an A4 grid book, this will make drawing out your Zone Zero easier. Draft of the layout of your zone zero on a grid page. Include the loungeroom, kitchen dining area, bedrooms, closets then mark all windows and skylights on the diagram and also include any patios, decks, balconies and the garage if that is to be used as a growing area.



While it does not have to be strictly to scale, if the sizes of the areas are a rough approximation this will help when designing the growing areas. The diagram should be used to show the areas which are most likely to be used for Zone Zero growing. It will also be helpful to mark the direction of north to one side of the diagram.

Identify specific growing areas

This is best done by doing a walkthrough of each area with the Zone Zero diagram, pencil in hand. As areas are identified, they can be noted on the diagram and any area specific observations recorded.

Windowsills and skylights

Check each of the windowsills to determine their aspect, which will then indicate the amount of light they will be able to provide. Each windowsill should also be assessed for: ease of access (do you have to crawl across a bed or move around a cupboard or chest of drawers to get to it?), whether the windows open and how they do (ie are they sliding, sash, casement, bi-fold, louvre windows or whatever) and are there insect screens or other obstructions in place to prevent accessing the area outside the window. Also, it should be noted if they have any other impediments inside the rooms such as drapes, curtains, venetian blinds or plantation shutters in place hampering access to the inside of the window. Note the results on your diagram.

Plantation shutters (from the inside) great for keeping out the heat, not so great for Zone Zero Growing

When Inspecting areas around the windows look out for space where shelves can be constructed across windows, or where a pre-constructed 'Windowsill Farm' can be fitted in; room where hanging containers can be hung in windows, windowsills with enough room that they can be widened to 150mm to 200mm and large windows where a floor-to-ceiling vertical growing unit could be installed. Also consider if a window box/window box greenhouse could be installed.

Sash windows on an older house

Other Indoor areas

Go for a walk through each room/potential growing area, including the garage and identify any unused space that can be pressed into service growing vegetables under lights such as on cupboards, empty bookshelves and or on chests of drawers, on tables, benches or desks as mentioned above. There may also be open areas where a freestanding vertical growing structure with grow lights could be constructed, such as against a wall where there is currently no existing furniture. Make any notes on the diagram to mark out potential growing areas.

Outdoor spaces

Checkout the outdoor spaces attached to Zone Zero. Make sure to identify areas that need to be kept free of obstructions to maintain access to doors, stairs or existing outdoor furniture. It will not make you popular if these are designated as growing areas, which will interfere with the daily operation of these areas.

Places to look for when conducting your walk through the outdoor area include places to hang containers from eaves or pergolas, open areas against walls where a vertical container garden could be constructed, open areas where freestanding growing structures could be placed or areas outside windows where an external window box could be installed.

Hooks at the edge of the back deck supporting productive hanging baskets

Zone Zero Microclimates

Overlaid on the Zone Zero functional areas are microclimates that can impact on them and change what we can grow and/or how we can grow it. Before a plan can be developed, the existing microclimates need to be identified. That information can then be included in the plan, along with any actions required to modify existing microclimates and/or develop new ones. This will be discussed more fully in Section 1.4.

1.3 Specific Case: Assessing a Balcony for Food Growing

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 reason most of which have been covered in section 1.1 of this eBook, but there are some reasons for growing food specifically on balconies -

- 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 the 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 One) to walk you through the process and prompt the things you need to look at. If you are doing the assessment for someone else, 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 critical.

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.

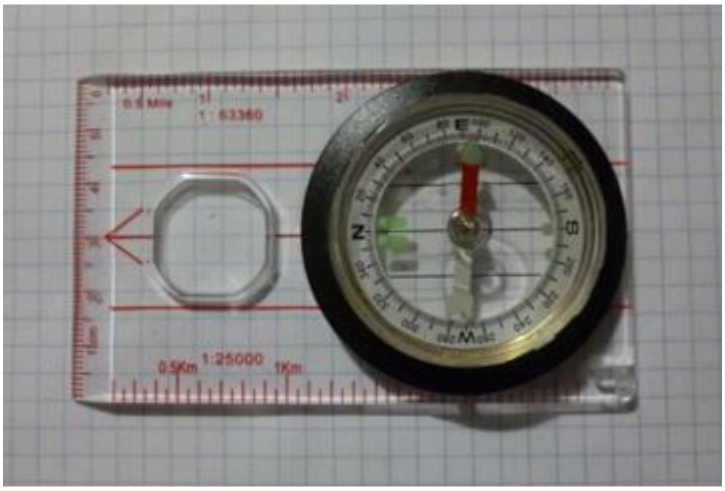
Wall and railing type and height: the railing or wall type which prevents falls from the open end of the balcony will also affect the impact of the sun, wind and rain on features on the balcony. Whether it is glass, brick or steel, whether it is solid or has areas where sun and rain can get in may be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

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.

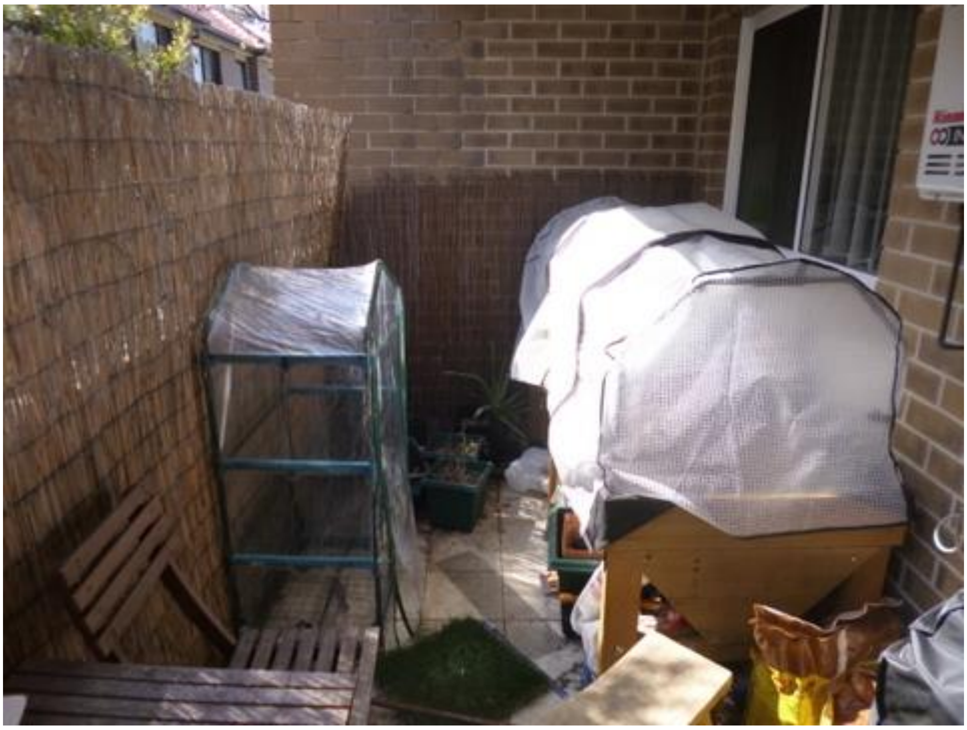
Conducting the Assessment

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 your 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.

1.4 Microclimates in Zone Zero

The definition of the term 'microclimate' at least according to Wikipedia is "A microclimate (or micro-climate) is a local set of atmospheric conditions that differ from those in the surrounding areas, often with a slight difference but sometimes with a substantial one." But I also like the definition according to Dictionary.com which is "the climate of a small area, as of confined spaces such as caves or houses (cryptoclimate), of plant communities, wooded areas, etc. (Phytoclimate), or of urban communities, which may be different from that in the general region."

So, in reality, what I will be discussing in this article may be more correctly described as the cryptoclimate of our Zone Zero, but I had never heard the term before and figured neither would have anybody else, so I decided to continue with 'microclimate' instead!

Microclimate Aspects

Microclimates are characterised by five environmental factors in general, and also in terms of the microclimates in Zone Zero, that is to say Light, Air circulation, Temperature, Water and Soil. Of these, the most important for the Zone Zero Farm is light so that is where we will start!

1. Light

Plants need light to be able to photosynthesise and make oxygen and energy rich organic compounds that allow them to grow. If you have ever seen the impact of low light levels on seedlings as they grow, you will know it causes them to be long and spindly (referred to as 'leggy') and they can't thrive.

When we grow plants in sunlight, things work pretty well, although sometimes there needs to be adjustments to ensure the microclimate works for the particular plants you want to grow. When we grow in Zone Zero, it is a case of making sure the light microclimate works for our target crops but there is much more detail that needs to be considered to get things right!

While the light hitting the crops not only needs to be of the correct intensity, and the appropriate wavelengths for the plants you are trying to grow they also need to get enough light during each day (although not too much), or in other words, the Daily Light Integral is correct.

There are whole books written about getting this right. I won’t get too technical but give enough detail that you'll have some idea of what you are up against.

Radiant Intensity

This is important to get right if you are growing in a window farm using natural light or inside using artificial light. My original thought after doing some reading was to get hold of a Lux Meter,

- one Lux being one Lumen per square metre,
- a Lumen being ‘unit of luminous flux, equal to the amount of light emitted per second in a unit solid angle of one steradian from a uniform source of one candela’

Man, things got complicated quickly! I just wanted to get an idea of the light coming into the windows and onto the plants using an app on my phone to measure lux! Anyway, it turns out that measuring lux for this purpose isn’t the best way to do it. The correct way is to measure something called PPFD (Photosynthetic Photon Flux Density) and the unit of measurement of PPFD is micromoles per square metre per second (umol/m2/s). It is measured between the wavelengths of 400nm to 700nm, we talk about wavelengths in the next section. While this does seem (and is) somewhat more complex than Lux, what surprised me is that the app which I downloaded onto my phone to measure Lux, also measures PPFD! The app I use is called Photone and I have included a link at the end of the article, but check out what is out there, you’re probably much more computer literate than I am!

Measuring Lux and PPFD on the phone

I don’t want to lead you down a rabbit hole but just needed you to know how I got where I am with things. While the figure is built around plants under artificial light, I believe it should work for natural light as well. It seems that “around 1200 umol/m2/s is a reasonably safe absolute maximum that we should expose our plants to for a 12 hour lights-on period. Even at this level, it is a good idea to keep an eye on leaf temperature.” According to a gentleman at One Stop Grow Shop UK website.

Now that we know how much radiant intensity of light to allow for, let’s move on to the spectrum we should be looking at.

Spectrum (Wavelengths)

The visible spectrum is comprised of the wavelengths between 400nm and 700nm. These wavelengths also correspond to the PAR (photosynthetically Active Radiation) spectrum. Wavelengths just outside the visible spectrum below 400nm are called ultraviolet (UV), and wavelengths just above 700nm are called infrared (IR). Blue light (450nm to 495nm) stimulates vegetative growth in vegetables and while red light (625nm to 750nm) also does this but it also stimulates flowering and fruiting, which is why you will see blue and red LED lights used in indoor growing situation. It is also said that plants reflect green light (hence they appear green to our eyes) and don't use it, but this is not correct, and some green light is required for vegetables grown indoors to thrive. This is why a full spectrum grow light is best when growing vegetables indoors.

Daily Light Integral (DLI) and photoperiod

Photoperiod is the length of time a plant is exposed to light in a day, Daily light Integral is the total amount of light a plant receives in a day, measured in $mol/m^2/d$. DLI is calculated by multiplying the photosynthetic photon flux density (PPFD) by the photoperiod. (Just so you know)

This is also a most important concept when using grow lights, because when you are working with sunlight coming in your window, unless you are in somewhere like Svalbard in the middle of summer, you will not approach 24 hours of sunlight. Grow lights can be left on 24 hours a day, but is that a good idea?

Measuring the Daily Light Integral (DLI) on the phone

Well, as usual, it depends! It turns out that there are two types of plants in terms of how long they need light – short day plants and long day plants. This concept is important when you want to stimulate plants to flower, or to avoid flowering. For example, if you want your tomatoes or capsicums to flower under lights it is important to provide what they need, but if want your veg such as lettuce or herbs to avoid flowering, it is also important.

In general terms, grow lights should be left off for 8 to 10 hours for mature plants (6 hours+ for seedlings) with an absolute limit of 14 to 16 hours of light per day. Leafy vegetables and root vegetables require lights to be on for 12 to 14 hours per day, fruiting plants for 16 hours per day.

2. Air circulation

Outdoors, there is almost always air movement of some description but within our Zone Zero, there can be areas with no air movement for long periods. Air circulation is important for plant growth for in the Zone Zero farm, but also to help maintain our Zone Zero itself.

In terms of the veggies, plants need some air movement for the following reasons –

- Gas exchange – Plants need carbon dioxide to photosynthesise and produce oxygen as a waste product (lucky for us!) so air movement is required to provide a supply of fresh CO_2 and carry away the oxygen waste product.
- Temperature regulation – air movement removes water vapour transpired by plants through their leaves, allowing them to reduce their temperature by evaporation. The plants can also be heated up if using grow lights and removal of hot air while introducing cooler air will reduce temperature stress on plants.
- Disease prevention – still areas around growing vegetables that are high in humidity favour the spread of fungal and bacterial diseases.
- Stronger plants – plants exposed to air movement release hormones that stimulate cell growth, making them stronger.

Lack of air movement when growing our food plants in Zone Zero can result in still, humid air causing mould growth on surfaces within Zone Zero such as walls, fabrics such as curtains, books and other areas.

Zone Zero crops grown on balconies, patios or decks, depending on their aspect, are likely to have access to air movement from the macroenvironment. Modification of the air movement microclimate may be necessary for an upper floor balcony. Excess wind can damage and dry out crops growing there. Consideration should be given to staking and tying taller crops like tomatoes, fixing pots shelves or trellises to walls for support and/or attaching pot hangers to ceiling or walls.

So, it can be seen that providing air movement is important for not only our Zone Zero crops to survive but to prevent damage to our Zone Zero Itself. There are a number of ways that air movement can be improved in our Zone Zero microclimate –

- Cross ventilation – by growing our Zone Zero crops near open windows, the natural air movement of wind from outdoors can work for us, and this is improved if we have windows or vents open on both sides of our Zone Zero.

A box fan is cheap to buy and run (consuming only 45 watts) and can introduce air circulation to an otherwise still room

- Fans – Making use of the wind to increase air movement is not always practical so fans can be used in a number of ways –
  o A fan set up on the inside of an open window to draw air in during times when there is low or no wind
  o Ceiling fans can circulate air within a room.
  o Extractor fans can draw fresh air into a room from other parts of Zone Zero while expelling stale air outdoors or into the roof area. Obviously not all rooms will have extractor fans built in but bathrooms/toilets, kitchens and possibly laundry areas can be taken advantage of in this manner.

o Portable fans – can be set up in any number of configurations to keep the air around our crops moving.

- Air conditioners – these will aid air circulation as well as helping to modify the temperature microclimate but will also impact on humidity.

An aircon can be set to just reduce humidity and provide air movement but not impact temperature

3. Temperature

When working with temperature microclimates outdoors, generally we are looking to keep the hot places cooler and cool places warmer. The thing is, we generally do this within out Zone Zero anyway, to ensure our own thermal comfort, let alone that of any food plants we are growing.

At temperature extremes which we would want to avoid in our zone zero ie below 15°C and above 35°C, photosynthesis slows down and can come to a halt, meaning the plants will grow very slowly, if at all.

There are a couple of considerations to be borne in mind when designing or modifying a microclimate based around temperature:

Warm season vegetables vs cool season vegetables

Some vegetables referred to as ‘warm season’ crops prefer higher temperatures, meaning a soil temperature above 21°C and an air temperature between 18°C and 30°C. Examples of warm season crops include tomatoes, capsicum, eggplants, cucumber and beans. In contrast, ‘cool season’ crops prefer soil temperatures between 10°C and 21°C and an air temperature of 15°C and 29°C but the optimum air temperature for cool season crops is 21°C. Examples of cool season crops include baby pak choi, lettuce, onions, parsley, radishes and spinach.

Thermoperiod

In their natural environment, plants are used to cooler temperatures at night and warmer temperatures during the day. Most plants do best when the nighttime temperature is 2°C to 6°C cooler than the daytime temperatures. This may vary for specific plants, but it is worth keeping in mind as a general rule.

With a bit of luck, modifying the temperature microclimate to avoid temperature extremes and thus improve our own comfort, (eg using heaters or air conditioning) will also create a microclimate that is beneficial for growing food plants. It is worth investing in a maximum/minimum thermometer or two to provide hard data on what temperatures we are achieving in our zone zero, therefore removing any guesswork. This is especially useful if we are growing plants in bedrooms which may not be visited as regularly as other parts of the house and closed off to make more efficient use of heating and cooling.

If the temperature of your plants is a bit low for them, it can be tickled up by use of gear such as a heat pad, and if they are getting a bit warm, increasing air movement by using fans may increase evaporation, helping the plants drop their temperature that way.

Zone Zero crops grown on balconies, patios or decks, that is to say close to the thermal mass of the dwelling, will already have a more crop friendly microclimate. It the structures face north or west there may be a need to modify the microclimate further by providing 50% shade cloth covers to take the sting out of high summer temperatures.

4. Water & Humidity

Unlike growing crops outdoors where areas of damp soil due to accumulation of rainwater are possible, there is unlikely to be a damp area in your Zone Zero growing areas (if there is you have a real problem!) but there will be areas of low and high humidity. The bathroom, laundry and kitchen are the areas of your Zone Zero that are most likely to have high humidity, depending on the time of day and activities being carried out. Areas that are air conditioned will most likely be areas of low humidity.

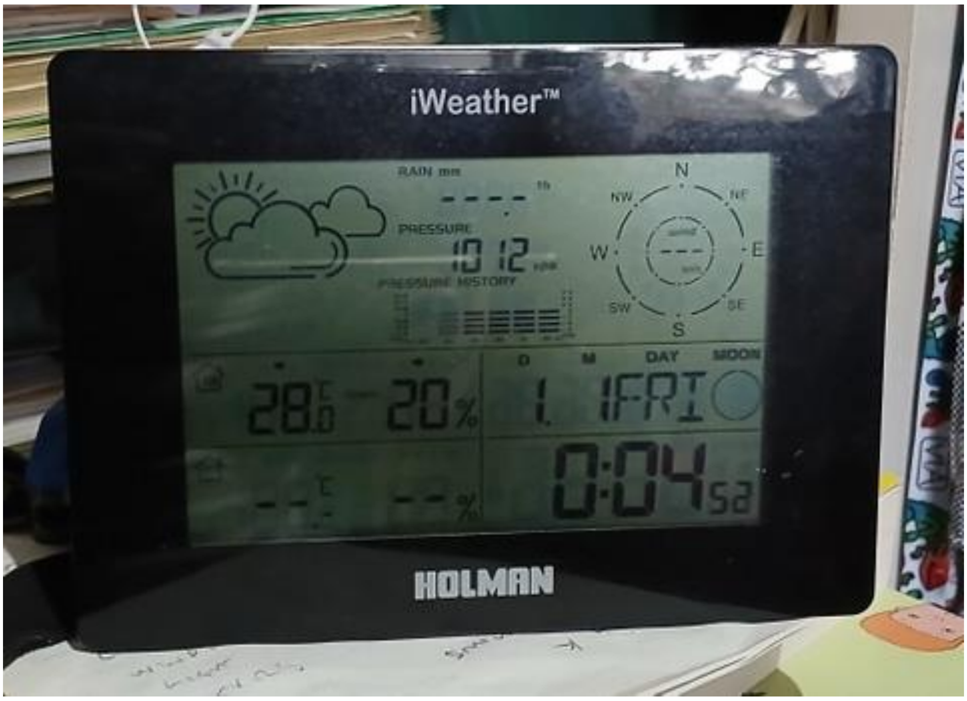
If you want to go old school on measuring humidity, get a sling psychrometer

Just to be clear, when I use the term ‘humidity’ I am referring to relative humidity, which may be defined as the ratio of the amount of water vapor in the air to the maximum amount of water vapor the air can hold at a given temperature, expressed as a percentage. The air can hold more water at higher temperatures so that if the temperature decreases and the amount of water vapour in the air remains the same, the relative humidity will increase.

In general terms, plants will do best in a microclimate of 50% humidity although mushrooms prefer a much higher humidity of 85% to 95%, whereas we humans prefer a humidity of 30% to 50%.

Mushroom fruiting chamber to maintain required humidity

Having a means of measuring humidity such as a hygrometer, either digital or analogue will make keeping track of the humidity in your growing areas much easier so that it will be obvious if changes to the microclimate are required.



A cheap weather station can show you humidity inside and outside your Zone Zero

Increasing humidity either to help plants like mushrooms be more productive or to reduce the impact of air conditioners, particularly on young plants like seedlings or microgreens, it is a case of isolating them from the dry environment and increasing the humidity in the plants growing area.

Home grown mushroom with fruiting chamber in the background

We did this when we built a fruiting chamber to grow mushrooms in. We used a small, commercially available mini-greenhouse, installed a fogger in a cat litter tray of water on the top shelf, and then punched some holes through the sides and covered them with micropore tape to allow CO2 to diffuse out while retaining the water vapour and thereby maintaining humidity. It worked very well. Details on how I put it together are available here.

Zone Zero crops grown on balconies, patios or decks, depending on how things are put together, may have direct access to rainwater or can be placed in trays where rainwater is allowed to collect and keep pots watered by capillary action.

Harvesting water direct from the downpipe

While we are discussing water, it is worthwhile giving some consideration to harvesting and re-using water in the Zone Zero microfarm, to reduce the environmental impact of Zone Zero farming even further. If you have access to downpipes, you can harvest rainwater directly from them to be stored in a container for later use or just leaving containers out in the rain. Also, gathering water from the shower or taps while waiting for it to warm up, or saving water from the kitchen such as that used to wash veggies prior to cooking can be used to water Zone Zero crop plants.

There are other ways to make the most of water while keeping the crops hydrated. These include mulching pots and other growing containers, using self-watering containers either bought in or homemade, installing small to medium ollas as water reservoirs in growing containers or installing bottle and wick irrigation in pots which also provide a water reservoir. For microgreens or shoots, a capillary bed installed underneath the growing tray, with or without a bottle reservoir will ensure that they stay hydrated.

5. Soil

When looking at the impact of soil on microclimates outside our Zone Zero, there are four aspects to be considered: Thermal conductivity; Albedo (solar radiation reflectivity); Texture and structure and Water content. In our Zone Zero farm we have much more control over our growing medium so that these may be less of an issue. There are however still problems that can impact the microclimate of our growing medium.

Due to the relatively small amounts of soil used to grow crops in Zone Zero, thermal conductivity and albedo are unlikely to have much of an impact on the soil microclimate. Soil texture and structure, however, can still have impact in terms of the factors below –

Soil Compaction - The soil in our Zone Zero farm containers may become compacted due to several issues including overwatering, shallow watering or the pressure of the top growing medium on lower levels in larger containers. This is likely to reduce the amount of water in the growing medium, reduce gas exchange and make the roots work harder to grow down into the growing medium resulting in stunted, unhealthy plants and a poor harvest. In terms of the microclimate, compacted soil will impact soil structure and water content.

Compaction may be reduced by adding compost, vermiculite and/or perlite to your growing medium and mixing thoroughly. Other techniques to reduce soil compaction include repotting, watering correctly or installing any of the techniques mentioned under ‘water’ above such as ollas, bottle and wick or self-watering containers to ensure overwatering doesn’t occur.

A small olla installed in a pot can prevent overwatering

Soil becoming hydrophobic - When soil in containers dries out, the microbe population that breaks down the waxy compounds dies off, allowing the oils to build up resulting in the soil becoming hydrophobic or in other words, shedding water applied to the soil without allowing it to soak in. This can be dealt with in a number of ways including soaking the affected pots totally in water to rehydrate them, adding some surfactant designed for the purpose or prevented by using the watering techniques suggested above to prevent the growing medium from drying out. Hydrophobic soil will also impact the water content.

While any of these issues can affect the growing medium of Zone Zero crops grown on balconies, patios or decks, mulching crops with an organic mulch such as compost, hay, straw or sugarcane mulch will help to prevent problems occurring.

Conclusion

During the process of planning the Zone Zero farm it is worth considering and researching the aspects of microclimate that will have an impact in your particular farm. In that way your plan can be designed take advantage and maximise the positive microclimate aspects while mitigating and avoiding the negative aspects of existing microclimates.

Link

Photone App | Benefits, Accuracy, Reviews, Download

1.5 Succession Planting

Succession planting means "following one plant with another" or sowing seeds at different times to ensure a continuing harvest. Succession planting allows you to maximise your Zone Zero food 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 to sow and plant out the veggies which will meet the needs of your family.

While succession planning has been traditionally associated with growing vegetables in the ground, it is also applicable to all aspects of farming Zone Zero. Whether it is growing vegetables or herbs in pots or other containers, growing sprouts or microgreens or growing mushrooms, it is all about setting up a process to ensure that food is growing throughout the year.

Creating The Plan

Decide what you want the plan to cover – Are you going to plan out your container grown veggies or sprouts and microgreens or maybe mushrooms, perhaps your vertical garden, or all of it? It is important to set the context of the system first so you can make sure the plan that develops from then on covers everything you want.

You can include mushrooms in your succession planting plan

List what foods you want to eat each year. A good way to start out is with a list of what you are eating now with the type and variety (if you know it) for vegetables. 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/growers if they can help you find out. Do you currently eat other foods like sprouts, microgreens, shoots and mushrooms? If you want to grow something you have not tried before (such as the aforementioned sprouts, vegetables, mushrooms or whatever) I suggest buying some commercially produced examples and try them on yourself and your family. If they are accepted, you could include them in your plan, if not, better to know now than after growing a bumper crop! With crops like sprouts, they only take a week to produce so you can raise you own and give them a go to check them out for flavour etc.

At this point it may be worth doing some research. Hit the books, the seed catalogues and the net and see what varieties are grown 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. Your local permaculture group are also worth talking to, if you are not already a member.

Work out when in the year each vegetable grows - generally, this information will be far less important for growing in Zone zero that if you were growing outdoors in beds. It will be more important to determine if the veg are warm season or cool season growers so that microclimates can be taken advantage of (or developed) to provide the best growing environment. (Check out the article on Zone Zero microclimates). In contrast, sprouts, microgreens, shoots and mushrooms will grow all year round given the right conditions.

Estimate 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, or just sit down with the family and guesstimate how much veggies you will need.

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

One example of a succession sowing/planting plan

* Note – Abbreviations in the ‘Sow’ column are as follows, S = sow into seed tray; P = Plant into a small pot; G = Sow directly into the ground.

Work out how much growing area you have – If you have done an assessment of your Zone Zero, you will have some idea of the area you have to grow crops. Make sure to include areas near windows, especially north facing windows, plus patios, balconies and decks attached to the house plus any vacant flat spaces if you intend to grow under lights. Don't forget to allow areas for crops like sprouts and mushrooms that don't require light.
Draft the plan – now having an idea of how much you want to grow and how much area you can put aside for crop production, it is possible to draft a plan that allows you to grow what you want.

- Vegetables – this part of the plan will be a sowing guide that tells you how many seeds need to be sown when, to grow the number of seedlings required to keep up the supply for a year, taking into account the needs for cool and warm season crops.
- Sprouts, microgreens, shoots and soil sprouts – These are quick to go and quick to harvest so the plan can show the amount of sprouts and/or the area of microgreens and/or shoots will need to be sown and how often, to secure a regular supply.
- Mushrooms – These will take longer to grow than sprouts or microgreens but also less than most veggies, depending on the mushroom species grown and the substrate used, but they can crop in less than a month. Another aspect to be factored in is that mushrooms can provide four or five of flushes over a period of a few weeks.

The plan itself will look like your plan and make the most sense for your situation. See previous and following pages for two examples of vegetable sowing plans to help but don't be afraid to have a go at developing your own from scratch.

Follow your plan – Ensuring that you put aside some time to follow your succession plan is well worth the effort. What I did find was that if I did forget or got distracted, 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. Obviously, the effect of not setting up sprouts or microgreens according to your plan will have a much more immediate effect.

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.

Choose Your Varieties

By reviewing 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.

Vegetable	Variety	July		August		September	
		Week 1	Week 3	Week 1	Week 3	Week 1	Week 3
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	Green sprouting	4 plants	4 plants	4 plants	4 plants	4 plants	
Broad beans	Coles Dwarf	1 Row					
Black Turtle beans							
Cabbage	Sugarloaf	1 plant	1 plant	1 plant	1 plant	1 plant	1 plant
Capsicum	California Wonder	4 plants			4 plants		
Chilli	Cayenne	2 plants			2 plants		
Carrots	All year round				Half Bed		
Carrots	Chantenay				Half Bed		
Cauliflower		2 plants					
Celery	Golden Self Blanching				2 plants		2 plants
Cucamelon							
Cucumber	Lebanese			1 plant		1 plant	
Garlic							
Kale	Scottish						
Leek							12 plants
Lettuce	Mignionette - green	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Lettuce	Oakleaf	2 plants	2 plants	2 plants	2 plants	2 plants	2 plants
Luffa						3 plants	
Malabar spinach						3 plants	
Onions	Gladalan white or brown						

Another format for a succession sowing/planting plan

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. While this will have an impact on Zone Zero farming it will be somewhat less than outdoor farming.

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. Indeterminate is generally better for places like balconies or patios in the Zone Zero farm whereas determinate is better for indoor growing, unless you have plenty of room!

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. This is a bit less important for the Zone Zero farmer because of your ability to control the environment a bit more as compared to outdoor growing. Don't lose heart if there are no backyard/indoor growers in your 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 growing medium, season after season, year after year and especially so if you are using containers and pots rather than beds. Over time you get a reduction in soil fertility (the same plants take out the same nutrients each time they are grown) and may get a build-up of pests and diseases. I have seen a number of crop rotation plans, but the one that makes the most sense to me for use in the Zone Zero farm is simply not to plant from the same vegetable family, in the same containers, in successive crops.

Following is a list of the plant families and the major vegetables that come from each one. You can include this in your planning, but it is simple enough to carry out ad hoc at sowing time.

Family	Vegetables
Alliums	onions, garlic, leeks, shallots, spring onions, chives
Beets (also referred to a Chenopodiaceae)	Amaranth, beetroot, fat hen, silver beet, spinach
Brassicaceae (also referred to as crucifers)	Borecole, broccoli, brussels sprouts, cabbage, cauliflower, kale, kohlrabi, radishes, turnips
Compositae	Chicory, dandelion, endive, globe artichoke, lettuce, salsify
Cucurbitaceae (cucurbits)	Cucumbers, gourds, melons, pumpkins, squash,
Legumes	peas (dwarf and runner), beans (dwarf and runner), broad beans
Solanum	potatoes, tomatoes, egg plant, capsicum, chillies
Umbellifers	Carrot, celery, coriander, dill, fennel, parsley, parsnip,

Conclusion

Once a succession plan has been developed, it can be included with the information uncovered during the Zone Zero assessment, the balcony assessment (if needed) and the zone zero microclimate review and used to develop a wholistic Zone Zero plan for implementation.

1.6 Bringing it all together: Developing and Implementing the Plan

Developing a plan

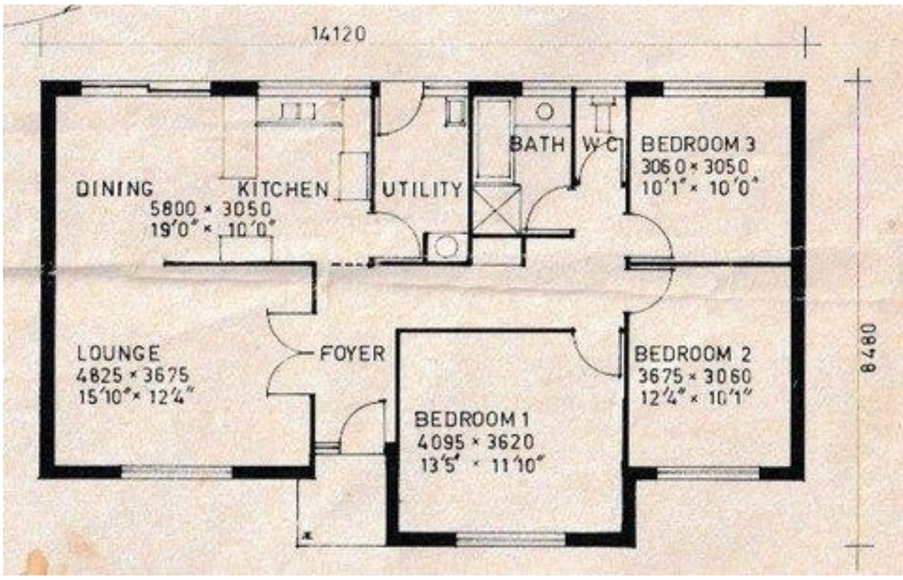
While a formal written plan is not necessary for you to be able to farm your Zone Zero there are a few advantages in having one!

- Process - I don't know about you, but I find if I write a plan down rather than just trying to keep it all chaotically in my head, it helps me make sense of what I am trying to do and helps me work out how I can achieve it!
- Resources – a written plan can help you make the most of scarce resources like time, money and people.
- Records – Things change, and it is good to have some documentation to refer back to check the current process with your original vision.
- Sequence – It makes it easier for things to happen in the right order or sequence, such as sowing the correct seed for the correct season.
- Goals – a plan makes it easier to set goals such as getting hold of seeds and equipment, learning how to grow from seed or experimenting with a new type or variety of food plant.

If you do decide on having a written plan, your plan should be your plan, reflecting your priorities, what you want to achieve and containing the level of detail that you are comfortable with. It can be as ad hoc as you want, or have all variables nailed down in the way described below. The main thing is that you are comfortable with it!
Now, on with the show!

There are lots of inspirational quotes about planning, the one below would be my favourite!

So, to draw up an effective plan any local dragons need to be identified and included. In order to help you identify your local dragons, there are a number of documents that currently exist in this section of the eBook –



- Assessing your Zone Zero – Helps work through Zone Zero to identify areas that can be used for growing food, based on the areas around windows, other inside areas and outside Zone Zero areas such as verandas, patios and balconies. (See Section 1.2 of this eBook)

- Zone Zero Microclimates – Helps to identify specific microclimates in your Zone Zero that can be taken advantage of for growing specific crops. These microclimates are characterised by five environmental factors: Light, Air circulation, Temperature, Water/humidity and Soil. (See Section 1.4 of this eBook)

- Zone Zero succession planning – This process looks at what you want to eat and how much you want to/can grow, based on the previous two documents, and helps to develop a plan that allows food crop planting to be staggered so that a yield can be harvested all year 'round. This may include annual vegetables, mushrooms, sprouts or microgreens. (See Section 1.5 of this eBook)

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

By using any or all of these documents you will be able to have an understanding of your particular dragon(s), and how to incorporate them into your planning process. If you do use all of the documents you would have an A4 grid book, with a layout of your zone zero on a grid page, Including the loungeroom, kitchen dining area, bedrooms, closets with all windows and skylights on the diagram. Also included should be any patios, decks, balconies plus the garage if that is to be used as a growing area. Overlayed on the diagram could be any specific microclimates that have been identified such as well-lit areas near a north facing window or humid areas in the laundry or bathroom.

Other food growing aspects to be considered for putting into the plan include –

- Where you want to grow your food plants? – this will require some research to consider what environment (microclimate) works best for each vegetable you want to grow, then matching them up with the growing areas that you have.

- How much of your available Zone Zero Area do you want to farm? All of it? Or just a part? This will depend on how much time you have to spare, coupled with how much you want to produce, from the space which you have available.

- Do you want it just for food, or do you want it to look nice as well? – Do you have a certain aesthetic in mind such as edible flowers perhaps, or are all veg beautiful in your eyes? If the aesthetics are important to you, consider researching 'edible landscaping' or 'edible interior design' where the look can be as important as the taste!

When considering all the variables mentioned above, I highly recommend that you also consult any friends or family that share your Zone Zero so you can take into account their likes, dislikes and most importantly, allergies. Giving them input makes it more likely that they will support and, dare I say, assist you in your Zone Zero farming endeavours.

Implementing the plan

The output of all this planning will hopefully be a series of actions that you wish to carry out so you can start farming your Zone Zero and get the benefit from all that healthy produce. One last thing that can be helpful to do before starting your Zone Zero Farm journey is to distill all those actions into an action plan.

To develop an action plan, the first thing is to write down all the actions (the 'what') in the correct sequence. For example, it makes sense to get hold of potting or seed raising mix, seeds and growing containers before having the action to sow those seeds.
With the list of actions set out, the next thing is to set down the 'who' is going to do each one. This maybe easy – it could be just you! However, if you are lucky enough to have help, it may take a bit longer to work out which helper volunteers to carry out which action.

With the 'What' and the 'Who' taken care of the next item is the 'When', or in other words the date by which the 'who' person commits to having completed the actions that they have volunteered for. Likewise, if Fred commits to obtaining the seeds for your Zone Zero Farm, it should be before the day set down in the plan to sow the seeds. Makes sense!

Depending on your mindset, you may wish to add a column for 'How Much' so you can allow for any costs associated with an action in your budget, such as the cost of the seeds to be sown referred to above.

Based on the actions discussed above, this is what this part of your action plan could look like –

What	Who	When	How Much
Get hold of or make seed raising mixture	Me	13/7	$10
Get hold of seeds	Fred	13/7	$20
Source some free/recycled planting containers	Me	13/7	-
Sow seeds	Fred + Me	15/7	-

Getting Started

Before getting started with vegetables it is worthwhile stating that it is easy to order a stack of seeds and plant out everything within reach including pots and pans, buckets, empty food tins and so on. It is easy to get carried away (I am speaking from experience here) and overcommit yourself. My suggestion is to work out the area with the best chance of success and start there. Perhaps a north facing window, deck or balcony and start small there, planting out a small number of veggies, preferably ones that are easy to grow (like radishes, lettuce or tomatoes) and maybe a herb or two and concentrate on getting a harvest from them, learning as you go.

If this seems to much you might want to start out with something simpler, like sprouts or microgreens. Take for example mung bean sprouts, they don't need light, can be grown in a child's school lunchbox almost anywhere. It only need you to find said lunchbox and to buy in some mung bean seeds, easily available for the nearest Asian grocery store, or if you prefer, online. Not only are they cheap and easy to grow, but you will also be able to harvest mung bean sprouts within a week of starting because they are quick to grow as well. Check out section two of this eBook (Sprouts, Shoots and Microgreens) for detailed instruction on how to get started.

2.0 Sprouts, Microgreens and Shoots

Sprouts, microgreens and shoots have a number of advantages for the Zone Zero Farmer, they –

- Don't take up much space,
- Don't need much water,
- Are quick, easy and cheap to set up,
- Can provide a harvest within days of commencing,
- Require only a minimum of kit, most of which you probably have hanging around already,
- Don't require a lot of light, with sprouts requiring no light at all,
- Are tasty, great nutrition and versatile

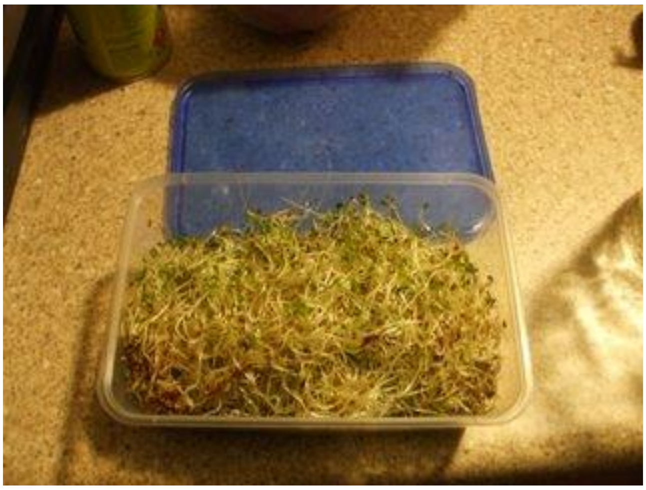
If you want to start growing food in your own Zone Zero farm, you could do a lot worse than starting out growing some mung bean sprouts in a kid's lunchbox. Starting out small is a great way to go, then as your enthusiasm builds and you learn more (particularly by reading this eBook) you can spread out and diversify, adding more and more Zone Zero crops to your repertoire.

Why not make a commitment and start tomorrow? (you could start today, but you need to soak the sprout seeds overnight!)

2.1 Sprouts and Sprouting – An Introduction

We all know that we are supposed to have at least five serves of veggies a day and that the fresher the veggie the more vitamins they contain. There is always a "but" though. But what if you don't have time, space or inclination to grow veggies? The obvious answer – get the hell off my website! Oops, sorry, forgot to take my medication today. The answer is sprouting seeds, beans and grains!

Sprouting seeds is one of those hugely good ideas that everyone should know about , it can provide lots of fresh, nutrient packed veggies in about 5 minutes per day once you are set up and the setup is so easy and simple even I can do it. If you have kids you can them involved in sprouting, if they are part of the process they will enjoy consuming the output even more.



Fresh Alfalfa Sprouts

The basic process is to get hold of some seed and then keep them moist, but not wet so that they germinate and put on some growth, during which increase their content of vitamins by as much as five fold, then we eat them. Mung bean sprouts and alfalfa sprouts are the most commonly available sprouts commercially, mung bean in Chinese food and alfalfa (also called lucerne, as in the hay!) from the sandwich shop. But all sorts of seeds, beans and grains can be sprouted – adzuki beans, barley, chick peas, wheat, millet, buckwheat, lentils, alfalfa, sunflower, fenugreek, sesame, cannellini beans, kidney beans, soy beans, most brassica seeds (cabbage; kale; broccoli etc.)

There is really only one absolute regarding sprouting – you must be absolutely sure that the seeds are not treated with a chemical such as a fungicide (added to stop damping off killing the seedlings) which could poison you. So either sprout your own seeds that you have saved or buy seeds from a reputable merchant who sell seeds that are OK for sprouting and direct consumption.

If you are a gardener, you know it is good to let the brassicas sprout and flower once you have harvested them or if they get away and run up to seed, they attract beneficial insects. If you have a number of varieties flowering at the same time, however, you might not have the confidence in using the seeds to replant your veggies, they may have crossed and so not breed true. Even if this is the case you can still sprout them and eat the sprouts, it won't make any difference to the flavour or nutrient levels.

2.2 Sprouting Using the Glass Jar Method

There are a number of ways that sprouts can be grown but probably the simplest and easiest is to use a glass jar, other methods will be covered in later articles. To do this you will need –

A glass jar (strangely enough) – I use an old fowlers Vacola bottling jar but any jar such as coffee, peanut butter or pickles (well decontaminated!) will do.

Some material to act as a filter – I use pantyhose liberated from the wife's stock of holey ones (they were too small to fit me anyway).

A rubber band – I had some old Vacola preserving rings but a normal rubber band the right size will do.

To grow your sprouts –

1. Check over your seeds and remove any broken or damaged ones.

2. Put a table spoon's worth of the good seed that you want to sprout into your glass jar, pull a piece of pantyhose across the mouth of the jar so it is fully covered by the material and secure it with a rubber band.

3. Half fill the jar with water and allow it to stand overnight so that the seeds take up the water and swell, starting the germination process.

Soaking the seeds

4. The next morning pour out the water (onto your pot plants, no sense wasting it!) and then leave the jar on its side with the rear elevated so the remaining water can drain out.

5. Leave the jar out of direct sunlight but in a warm area to promote germination. Check and rinse again after 12 hours.

6. Continue to rinse the sprouts twice or three times a day. As well as providing water to keep the sprouts germinating, the regular rinsing removes waste products and any stops the sprouts overheating.

Starting to sprout after a couple of days

7. After a few days or when the sprouts have reached the length you like, rinse them one last time and remove them from the jar. Pick over the sprouts and remove any seed skins, any seeds that haven't germinated and any sprouts that look a bit dodgy.

After a week - chock full of yummy sprouts

8. Transfer the sprouts to a container and keep them in the fridge, they are ready to eat!

Sprouts are great in sandwiches or wraps, to hold an omelette together or in stir fries or on top of your favourite soup. Sprouts are cheap and easy to grow, nutritious and you don't need 5 acres to grow fresh veggies. Why not give them a go today?

2.3 Sprouting using the fabric bag technique

It is easy to make a sprouting bag, my lovely partner in the sustainable lifestyle put one together in about 10 minutes, so it is an easy and quick project if to have a mind to make one. I used some unbleached calico, because it was what we had hanging around but any fabric that will let water through and that has no objectionable dyes that will contaminate your sprouts should do.

Making the bag

Bag showing the draw string

To make the bag cut a rectangle of cloth 500mm x 250mm,(I suppose any size will do but you have to start somewhere and this is what worked for us) fold the cloth over to make a 250mm x 250mm square and sew up two sides about a centimetre in from the edge giving a bag secured on three sides. Fold the material around the top over by about a centimetre and sew round the top, then make a vertical cut the width of your draw string – we used 6mm wide yellow ribbon (very pretty) in the sewn-over section. If you wanted to get techo you could sew this like a button hole but for our purposes we just left it as a cut. Tie or pin a safety pin to the end of your draw string material, feed it in and around and out the same hole again so that your draw string will close the top of the bag and then tie off the draw string ends to each other.

Now turn the bag inside out and you are ready to commence sprouting!

Using the bag

1. Place about a dessertspoon full of your sprouting seed into the bag.

2. Place the bag in a container that will hold water, we use an ice cream container, and run water into the bag so that the seeds are well covered. Leave overnight.

Soaking the seeds in the bag

3. The next morning, remove the bag and let it fully drain. We hang the bag up using the drawstring attached to any handy hook or knob. If you don’t want water all over the place, put the empty ice cream container back under the bag to catch the drips.

Seeds soaking in the bag

4. Rinse the bag and drain at least twice per day, once in the morning, once in the evening and then rehang to drain once the seeds/sprouts have been rinsed.

Bag hanging from the widow catch and draining

5. Repeat step 4 until the sprouts reach your desired level of maturity and then harvest and keep the sprouts in the fridge where they will last a week or so.

A bag fulla sprouts!

6. Turn the bag inside out and wash off any seed coat or other gunge and place it in with a white load in your washing machine or hand wash with soap, then dry on the line in the sun and the wind.

If you use a light coloured fabric like we did you will get some discolouration although this does not seem to affect the performance of either the bag or the sprouts. If it bends you out of shape to see your bag discoloured you could bleach it before washing as above.

Bag washed and drying on the line, ready for the next batch!

If you wish you can make a number of sprout bags up and rotate them, starting off a new bag every day or two, to give yourself a continuous supply of sprouts

2.4 The Seven-Day Sprouter

Do you like sprouts? I mean REALLY like sprouts? Then this little gadget is for you! It is cheap, quick and easy to build and of all the projects I have done this is the only one that actually worked too well, pumping out so many sprouts that we couldn't eat them all.

The dimensions for the sprouter are based on a starting charge of two dessertspoons full of fenugreek seeds, because they are the type of sprouts we like so if you like bigger sprouts, say soy beans or smaller like alfalfa then you might want to adjust the sizes accordingly. Likewise this is designed to provide lots of sprouts on a seven day cycle so if you use faster or slower growing sprouts you may need more or less trays. To start I suggest you make less than you need and then if the sprouts are not fully grown as planned add a few more.

Making the Sprouter

1. The base of the sprouter is formed by a cheap plastic tray that catches any water dripping through the fabric. The one I got is 250mm wide by 335mm long and 70mm deep, all of the sprouter trays will sit on top of it.

2. The sprouter trays are made by 42mm x 19mm DAR pine and cutting the ends on a mitre saw or with a hand saw using a mitre box. We have only had a mitre saw for a few months, I never saw the need for one but my wife was starting to do some wood work and wanted one so of course we got it. Now we have it I have found it to be very handy and it makes it easy to make fast accurate cuts in timber.

3. To make the sides I bought 900mm lengths, one per tray, so that they were easy to transport (smaller car) and there was very little waste. I used the following process –

- Using the mitre saw, with the timber in the flat position (ie 42mm side down) make a 45° angle cut right at the end of the timber then measure the back (long side) to 335mm and make another 45° cut so that it is angled back towards the already cut and of the timber.
- Turn the timber over and measure 335mm along the back side and repeat the cut so that the angle is sloped back towards the cut end again. This should give you two identical pieces of timber with an external length of 335mm and an internal length of300mm.
- Repeat the above process and make then ends with an external length of 250mm and an internal length of 215mm.

The first tray made, sitting on the catch tray

•Assemble all four sides into a box with external dimensions of 250mm x 335mm or whatever size you have calculated it should be.

•To hold the box together I went for cheap, quick and nasty and grabbed by staple gun, applying a staple each side of each mitred joint. If you wish you could glue (assuming the glue is food safe and water resistant), screw or nail your sides together.

The Stapler

4. Now to install the base of the box, which is what the sprouts will sit on as they.....well, sprout! You can do this by getting hold of some cheap calico and cut out a piece a bit bigger than the size of your box.

5. Grab your staple gun again and place the calico on the bottom of the box so you have some overhang all round, this is so you can grip the calico and keep it taught.

The Calico stapled onto a frame

6.Place the calico over the bottom of the box and put a staple into each corner to secure it then, while holding a bit of tension on each side, put staples through the calico into the wood about 25mm to 50mm apart. Then use a very sharp pair of scissors, your wife's sewing scissors would be ideal but don't drop or blunt them or your life won't be worth living, and cut off any overhanging calico to make the edge nice and neat.

7. Once this is done, on as many trays as you intend to use, you are ready to operate.

The completed sprouter

Operating the Sprouter

1. Get hold of some of the seeds you want to sprout and measure them out so you get used to making the same amount of sprouts each time, as mentioned above my sprouter is based on two dessertspoons of fenugreek seed. When the seed is measured out put the seed into a container, cover the seed with plenty of water and leave overnight.

2. The next morning pour off most of the water and then pour the wet seeds into the bottom tray and spread them out. You can tilt the tray so that any excess water can drain out the sides between the staples, some will be absorbed by the calico to keep the sprouts moist.

3. In the afternoon get hold of a spray bottle or sprinkler bottle or make one by punching small holes in the top of a PET drink bottle and gently sprinkle the seed with water and drain off the excess.

The sprinkler bottle I use

4. That evening, prepare another charge of sprouting seeds by soaking them in water.

5. Repeat steps 2 to 4 until all trays are full and your first sprouts are ready to harvest. Take them out of the tray, they are ready for immediate use or can be kept in a container in the fridge for a week or so.

6. Wash out the tray. If there is any sign of mould (black spots etc.) on the calico wash the area over with hydrogen peroxide (often just referred to as “Peroxide”)which acts like a bleach but breaks down to form oxygen and water so it leaves no residue, it is available from chemists and supermarkets. Leaving the tray out in the sun gives the mould a hard time too.

7. Recharge you tray the next morning and the cycle begins again. Don’t’ forget to regularly empty the catch tray at the bottom of any drain water.

What the trays look like in use

2.5 Producing Mung Bean Sprouts

My DIY mung bean Sprouter!

I like the beansprouts that you get in the Chinese restaurants. They are mung bean sprouts and over the years I have tried to replicate them at home so I can put them in my noodle and veggie stir fries or soup noodles or even salads. I have never been happy with the results using standard sprouting techniques, however. After some trial and research I have found a simple method of producing those long white crunchy sprouts just the way I like them. The trick is keeping them in the dark until they have gotten to the right stage.

First thing I needed was a container to raise them in, I have seen those wheeled storage containers used keep stuff in pressed into service as a sprouter but this was a much larger operation than I wanted. I looked through our plastic-ware cupboard but couldn't find what I wanted – a plastic lunchbox the kids has used years ago – unfortunately in the intervening years it had been tossed.

The next trick was to head for the salvation army second hand shop, where I was able to find what I wanted for a mere $2. For this princely sum I was able to get an opaque greenish plastic lunchbox (with lid!) which had the following dimensions - 215mm long x 140mm wide x 110mm deep (although the dimensions are not critical). To be honest I had intentions of drilling holes in the bottom to aid drainage and holes around the top to aid in ventilation but was in a hurry to try it out. The sprouter seems to work very well just as it was without the holes, although I may add them in in the future.

A word about mung beans – dried mung beans are available quite cheaply from Asian or Indian grocery shops. They are grown for eating so sprouting with them is OK (I'm still alive). Given the choice I buy Australian mung beans.

The Process

1. Pour some dried mung beans into your sprouting container, not so many as to cover the bottom of the container, leave some room for them to expand. About 70% - 75% coverage of the bottom seems to be about right. (a rule of thumb is

125ml of seeds per litre of sprouter volume, but if in doubt put less in rather than more.)

2. Pour them out of your sprouting container and into a glass jar (the why of the glass jar become obvious later!) and cover them in fresh cool water to twice the volume of the beans.
3. Soak the beans for at least 8 hours, overnight usually works out to be a convenient soaking time. Once the beans have been soaked, check them and see if they have all absorbed water and expanded. Occasionally I find some have not and are still small and hard. If this is the case, change the water and leave them for another 8hrs – 12 hrs. If they haven't expanded by then go on to stage 4 and pick them out once the sprouting is completed.
4. Once the beans are soaked, drain them well and place them into the sprouter. Place the lid on your sprouter but don't push it on so that it is secured, leave it up a bit for ventilation. Place the sprouter in an area which does not get direct sunlight, but where you will see it and not forget to rinse it out.
5. Speaking of not forgetting to rinse your sprouts out……. Don't forget to rinse them out morning and night with cool, clean water. The rinse water can go on your plants, don't waste it!
6. Do this for about 5 to 7 days depending on how long you like your sprouts, rinse and check them twice daily.
7. Once they have reached your preferred size, rinse them and drain as thoroughly as possible, then put them in a sealed container in the fridge where they will keep for about a week.

But wait, there's more!

Before you eat your sprouts you may wish to remove the green seed coat from them. The seed coat is not toxic or unpalatable but they have a 'plasticky' texture (or 'mouth feel') and make the sprouts look crappy and unfinished. Place the sprouts in a bowl large enough to fit them all and fill the bowl with water. Gently agitate the sprouts and most of the seed coats will float off or sink to the bottom where they can easily be removed. Some seed coats, however, will have the sprout growing through them and will need to be removed manually (which can be tedious if there are lots of sprouts).

Your sprouts are now ready to be consumed and can work well in such diverse dishes as Chinese omelettes, soups, stir fries, salads, spring rolls or in small amounts as a garnish on just about anything. They are cheap, nutritious and easy to grow with a minimum of gear as well as being versatile. So get sprouting!

Initially

A couple of days after soaking

Fully Grown

2.6 'My Sprouting Journey' by Fran

I have been trying to grow and like sprouts for many years now. I grew up in a "hippy town" in the South of Western Australia and so the desire to sprout things was high, however I never much appreciated the taste or texture of home-grown sprouts. I tried REALLY hard. Through the years I have bought expensive sprouters that electronically time a mist over the trays of sprouts, the old jar method etc. and each time, although I had great success growing the sprouts, I couldn't appreciate the strong grassy "green" taste of the results or the tough tailed root portions.

Closeup of the retrofitted lid

I used to work for a delicatessen, and they would get imported antipasti vegetables from Italy in huge glass jars. When the jars were empty, they would discard them and so I asked them if I could have the jars. They said "sure" and I amassed quite a collective of lovely jars. I ended up giving most of them away when we moved to Tasmania, however for some reason I kept one large jar that my husband had retrofitted for one of my sprouting attempts by cutting out a portion of the metal lid and siliconing in a round piece of metal screen door mesh. I have NO idea why I kept it because by that stage I knew I wasn't going to bother with home sprouting again, but I did.

Seeds soaking overnight prior to going into the sprouting jar

Fast forward to the "cost of living crisis" of 2023 and suddenly the price of fresh vegetables skyrocketed. We have a lot of possums on our 4 acre property but they are easily prevented from eating our crops, however the rats are proving to be a serious problem. We built 2 fully enclosed large cages over a series of water wicking raised garden beds that we made out of old fridges and freezers that we bought from the local tip shop and thought that would stop the rats but it hasn't sadly and so we get very little of what we grow here (until we can find a solution to our rat problem) and when the price of veggies skyrocketed I had to think smarter, not harder as we are a low income family who eat a LOT of vegetables.

Soaked seeds into the sprouting jar!

I saw a video on YouTube from a Vietnamese girl who's mum used to grow sprouts for her market stall in Vietnam and it completely revolutionised my sprout "experience". I tried out her method and it worked brilliantly. I now grow, and eat, 4 litres of sprouts every 5 or so days on rotation. I grow a mung bean and adzuki bean mix for the tastiest largest yield and I get my beans from my local health food shop. I soak the beans (130g adzuki and 170g of mung beans/300g total) overnight till they have swell up and then strain them off and rinse them (keeping the strained soaking water and rinsing water in a bucket for using on the garden) and put them into my husbands retrofitted 4 litre jar with the mesh in the lid. I then put the jar into a fitted wardrobe in my spare room and shut the door. The objective is to prevent the sprouts from seeing the light which causes them to form the tough roots and grassy tasting leaves early on. It works!

After 5 or so days, ready to go in the fridge

Every day I remove the sprouts (in the evening when it is dark) and soak the sprouts for about 10 minutes by covering them in water and then drain them (into my bucket) till they stop dripping and put them back into the wardrobe in the spare room. "done". After 5 or so days (differs with the seasons) I have a 4 litre jar full to the top with delicious sprouts that I absolutely love.

Yummy sprouts!

You end up with sprouts that are very similar to the mung bean sprouts that you can buy in the supermarkets but without the ridiculous price tag or environmentally destructive plastic bag. You can pretty much sprout any legume or seed this way but you would have to tweak the length of time for sprouting depending on the legume/seed. Things like buckwheat should only be sprouted till you see a tiny tail as they go slimy very quickly. Note, there are some larger beans that can be sprouted but should only be consumed cooked. Red kidney beans are one example. My advice would be to research anything carefully that you are planning to sprout just to make sure that you are aware of any extra steps needed in the process.

Sprouts transferred to storage jar and fridge-ready

I am an absolute sprout convert now and eat them every single day. Growing my own gave me back an affordable and most enjoyable highly nutritious vegetable that has a multitude of uses from raw through to cooked. I wholeheartedly recommend sprouting as a way to easily grow a crop without pests even getting a look in. Very satisfying when pretty much everything else is predated around here. It is also incredibly economical. 300g of sprouts growing in 5 days to 4 litres of sprouts is a brilliant return for the small outlay for the beans.

2.7 Experiments with soil sprouts

I picked up a book recently because it looked really interesting, and it turned out to be something I wanted to try. The book was called 'Year-Round Indoor Salad Gardening' by Peter Burke. He was growing sprouts using a process he calls 'soil sprouting', which appears to be a cross between regular sprouting and growing microgreens, but with some differences. His idea was to use the process to grow salad greens indoors during times in the US when gardening outdoors was not possible due to the low temperatures. I found it interesting because there was no need for direct light of any description, either from the sun or grow lights. Needless to say I had to give it a go!

Summary of the Process

The idea is to soak sprouting grade seeds (ie edible, no chemicals added) overnight, spread them onto a container filled with a specific seed raising mix, put a wad of moist newspaper on top, then place them into a warm, dark cupboard for 4 days. Once the sprouting and initial growth is started for the 4 days in the dark, remove them from the cupboard and place them on a windowsill and green them up and grow them on until they are the size you want, harvest and eat. Simples!

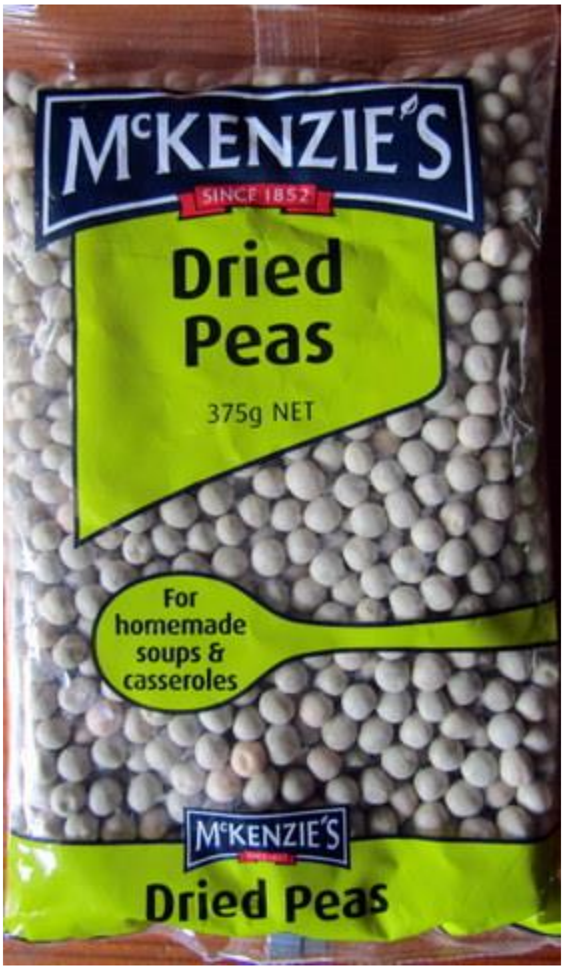
Another advantage (apart from the lack of need for light) of the process is that it lends itself to a continual rotation, or sow, grow, green, harvest and eat. By setting up one or more trays every day, you can ensure a continual harvest of salad greens without stepping outside your house.

The Details

Seeds

Most seeds designed to be eaten as sprouts or microgreens will work for this process, but there are a couple of other options which can be followed rather than buying small amounts of expensive seeds specifically for sprouting. There are some seeds which are designed to be used as food directly available in the supermarket or similar shops. These include dried peas (designed for homemade soups and casseroles not the

‘Surprise’ style peas) or chickpeas in the supermarket or adzuki beans or mung beans in the Asian supermarkets. Bulk food shops also have grains which may be sproutable such as wheat, buckwheat, rye or millet which can also be used with this techniques. With a little experimentation and searching you can find palatable grains, seeds and legumes ideal for this process which are quite reasonably priced.



Soil

The soil mix advocated in the book is very specific, but is based around peat, which is not particularly sustainable, so (as usual) I thought I would try out my own. First cab off the rank was my standard potting mix/seed raising mixture: a mix of one part coarse sand, two parts worm castings and three parts cocopeat AKA horticultural coir, all by volume, and it worked! It seemed to do pretty well for me anyway.

The mix of soil and water is also quite specific, too much water and your get sludge, not enough and it affects the germination of the seeds. I let my soil mix dry out for a few days before adding any water at all so that the soil/water mix was reproducible. After a bit of fooling around I found that a ratio of 1.75 cups of water to 2.0 litres of soil works pretty well. I just put the soil and water together in a closed container and shook to distribute, then left it to soak overnight. I used a sealable plastic bag and kept it sealed so that the soil and water ratio remained the same ie no evaporation.

The other technique the book talks about is to put a small amount of a fertiliser, liquid sea kelp, in the bottom of the growing container before placing the soil in there, that way the seeds sprout and send down roots, which hit the fertiliser just as they need it. So I put together a little experiment with three trays of sprouts: one had a small spoon of eco seaweed concentrate **(S)**, one had a small spoonful of SwiftGrow **(F)** fish waste fertiliser (which is produced by a friend of mine) and a third one with nothing as a control or blank **(B)**.

In the end there didn't seem to be much in it, with the blank being as least as good as either of the other two. As a result, I elected not to add any extra fertiliser. I assume the difference is that his formulation for the soil had no added fertiliser (apart from the stuff in the bottom of the container) whereas mine has the worm castings. Anyway, take from that what you will!

Containers

These can be just about anything, and there is no need for drainage holes. In the book they use aluminium food trays, which made sense to me as they are light, cheap, recyclable and a good size to experiment with. I bought a couple of packs form our local El Cheapo shop for less than $10. There were a couple of sizes, but I bought the smallest at 20 cm by 11 cm by 5 cm deep.

Paper Cover

This is the cover of moist newspaper placed over the top of the seeds once they are applied to the top of the soil-filled container to keep them moist and aid in germination. To suit my containers I used one sheet of newspaper for each cover. I made the covers by taking a full newspaper sheet and folding it in half so that it was two thicknesses of normal newspaper size (ie 390mm x 280mm), folded it in half top to bottom so that it was now 195mm x 280mm, then folded it in thirds to form a newspaper pad roughly 90mm x 195mm. I then soaked the pads in the sink with warm water in it for 20 minutes to half an hour before they were ready for use.

Process

This is the process which I used, based on the components as detailed above.

1. Soak your seeds overnight, or at least 4 hours in water then drain. I used 2/3 of a tablespoon of mung beans, I tablespoon for chickpeas and green peas, and a teaspoon for smaller seeds like brassicas (broccoli, cabbage, Kale etc.). In the book they use plastic cups but I used recycled glass food jars.

2. Add 1.5 cups of the pre-soaked soil mix into the tray and smooth it out, and top with pre-soaked seeds and smooth them out so that they are in a single layer, and covering as much of the surface of the tray as possible.

3. Cover the seeds and soil with the pre-soaked newspaper cover, pushing it down where required so that it is in direct contact with the seeds being sprouted.

4. Place them in a dark space for 4 to 5 days. Check the periodically to make sure all is well and that they are not drying out. We have a couple of bookshelves with a closed in bottom cupboard in our lounge room, so I elected to clear out the top shelf in the cupboard of one of them and set up the filled containers in there.

5. Once the seeds have sprouted and come up 20mm – 30mm, you can remove the newspaper cover (which will be supported on top of the sprouts at this point) and place them on a windowsill to green up. I placed ours on the dining room windowsill which gets very little (if any) direct sunlight at this time of the year due to the cover over our back deck.

6. Leave them for a further 4 to 6 days, depending on the point at which you want to harvest, it is likely that you will need to water them during this time, which can be done with a small watering can, watering the soil rather than the sprouts, just to the point where the soil is damp, not wet or sludgy. This might not take as much water as you think, because due to the lack of drainage holes, all the water you put in will eventually be absorbed by the soil.

7. Then harvest with scissors by cutting the sprouts off above the soil surface. Discard the roots, soil etc. into the compost or a garden bed and start again.
The sprouts harvested can be combined with other sprouts and veggies to make a fresh salad every day, included in a stir fry or as a part of a Vietnamese rice paper roll. The sprouts are very versatile, full of vitamins and minerals, and just plain crunchy and tasty!

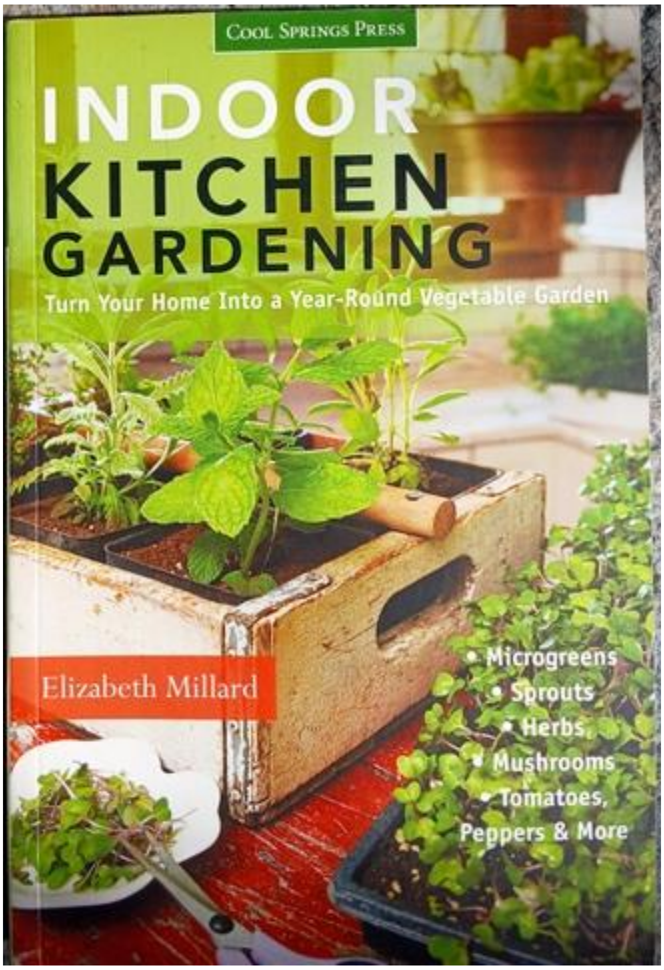
Results

In general I was very happy with the output of our little sprouting experiment, usually including the harvested sprouts with lunch, as part of a sandwich or wrap made with homemade tortillas. If there was one less than satisfactory element for me, it was that when sprouting peas, the cotyledons remain on the ground and when the sprout is harvested they are not included. This is as opposed to jar sprouting where they are part of what is eaten.

Apart from that it worked pretty well!

2.8 Growing Seed Shoots

I bought and read a book recently called 'Indoor Kitchen Gardening' by Elizabeth Millard and in it she describes growing 'shoots'. The idea is similar to 'Soil sprouts' (see above) but also with some differences. She suggests growing pea shoots, popcorn shoots and sunflower shoots. While I am not sure of how sunflower shoots would taste, I thought peas were worth a go and as for popcorn, that was a new one on me so 'Challenge accepted!'



The Process She Describes

The idea is to soak the seeds to be shooted (or is that shot?) overnight, then to layer them on top of a tray containing growing medium, quite closely together but not touching, it may delay germination. She says to cover them with another tray, to be removed once the seeds start to sprout. Once they start to sprout, remove the tray and expose them to light (artificial or natural) and let them grow up to about 150 to 200mm and then cut to harvest. Watering can be done by spray or placing the whole thing into a sink with a bit of water in it, and letting the water soak up from the bottom.

What I Did

The Seeds

Whatever you do the seeds you start with must be high quality and suitable for sprouting/shooting and therein hangs a tale!

I have previously bought, sprouted and eaten dried pea seeds available from the supermarket, but it had been a while, so I decided to pick up a new bag, to make sure they were fresh and giving me the best chance of success. The brand I use is an Aussie one – 'McKenzie's Dried Peas', designed to be used in homemade soups and casseroles so they obviously have no untoward chemical coatings like fungicides or whatever. I picked them up and brought them home and just happened to be looking the bag over when I spied a notice in very small print that said “Not Suitable for Sprouting”. What the?! I didn’t remember seeing this before, so I checked an old packet or two I had hanging around and sure enough, the same little sign! Needless to say, I sent off an email to their customer service department immediately but I received no reply. I have been eating these as sprouts for a while with no ill effect, but if you are going to use their product, you have been warned!

Anyway, also to have fresh seeds, when visiting a packaging free store, I picked up a glass jar full of organic popcorn, working on the idea that if the shoots didn’t work I could always pop them and eat them as homemade popcorn. Winner!

The Planters

To grow my seed shoots I used a couple of black plastic standard seedling trays which are 395mm long x 290mm wide x 50mm deep. I placed them in my agricultural cat litter trays which are 415mm long x 315mm wide x 70mm deep, which had about 20mm of coarse sand in the bottom. The idea was that the cat litter trays would allow me to water from the bottom (so not to displace anything) and prevent water spillage onto the furniture because I was growing them inside and the sand would act as a bit of a water reservoir.

The growing medium I used was my standard seed raising/potting mix which consists of (by volume) one part coarse sand, two parts sieved compost (worm castings can also be used) and three parts of cocopeat. This was filled into the seedling trays almost up to the top.

Seeding and Shooting

I measured out a half a cup of the peas and popcorn seeds and then soaked them in a container overnight. In the event, while the popcorn fitted well into the growing tray, due to the expansion of the pea seeds as they hydrated they took up a bit more room and I had some left over.

Once soaked I placed the peas and popcorn on top of the growing medium, distributing them as uniformly as I could, which in the end wasn't very, but what are ya gonna do? I then added water into the cat litter trays under the seedling trays until the water level was about a centimetre up the side of the seedling tray and then, just to be sure, I gave both trays a spray of water. They were both placed on the bookshelf nearest the window in my office.

The original book specified that the seedling trays should be covered until the seeds started to germinate. To be honest I didn’t see the point and didn’t bother, and things still worked fine!

They say that in a dry environment giving the seed trays an occasional spray with water helps to keep them hydrated and prevent drying out, so I did give the seeds a spray once or twice a day.

Peas germinating

Popcorn germinating

The peas started to germinate after a couple of days and the popcorn took a few days longer. Neither sets of seed germinated all at once, but slowly over time. This is a good thing! The early germinators can be harvested when they got to the right stage, allowing the slower ones to come through later, thus ensuring a second and possibly even a third harvest before needing to start again.

As the shoots grow, they will bend towards the light and since mine were sitting next to the window on top of a bookshelf they certainly did. To get a bit more even growth pattern I rotated the trays through 180° every day, and that seemed to help.

Harvesting and Eating

Harvesting is simply a matter of taking a pair of scissors and cutting the shoots off when they reach the desired height a centimetre or two above the growing medium, which for the peas works out to 150mm to 200mm for us, and the popcorn at about 150mm when they are nice and tender.

I find that both go well in a stir fry and some of my first harvest I stir fried both together and tossed in a bit of soy sauce and ate them just by themselves. I found them to be quite palatable. In combination with other veggies or whatever and they do add flavour and texture to the stir fry but also are good when stir fried with soy sauce and then put on top of a soup noodle. The pea shoots are not too bad as part of a salad sandwich and the popcorn shoots are also OK, but if they get too long they can get a bit 'grassy'.

Just for fun I tossed a few of each to the chooks. When I tossed in the pea shoots, they gave me a very sceptical look and didn't show much interest, but they knew what to do with the popcorn shoots!

2.9 Growing and Using Wheat Grass

Back in the '80s I had a bit of an interest in alternative medicine, and I came across a book called "The Wheatgrass Book: How to Grow and Use Wheatgrass to Maximize Your Health and Vitality" by a lady by the name of Ann Wigmore. I bought a copy but did not find the thought of actually swallowing wheatgrass juice to be all that attractive, so I never really got into it. Plus, it was touted as the cure for a long list of diseases, which sounded dodgy at best. (I went looking for the book recently but couldn't find it so I must have gotten rid of it in the intervening years.)

There are studies available on the net that allude to the possibility of good things coming from consuming it. From eliminating toxins and helping digestion to boosting the immune system and helping with diabetes and even cancer, but the reports are usually tempered with the word 'may' and end by saying that more research is needed. What seems clear cut is that wheat grass juice does contain calcium, iron, magnesium, phytonutrients, 17 amino acids and vitamins A, C, E, K, and B complex, plus some other bits and pieces. So it seems that it is a bit of a vitamin pill, contained in green sludge. Winner.

We keep organic wheat grain around which we use to grind for flour, so we have a ready supply of the wheat grass raw material and so wheat grass juice would be considerably cheaper than vitamin pills should we ever need them. That assumes I could stomach the stuff (it has long been an assertion of mine that these things are good for you only if you can keep them down) so a small-scale experiment was in order. I have seen a number of suggestions about growing the stuff, but here is what I did, and it appeared to work OK –

1. the container I used was a plastic takeaway container, the bottom of which I punched some holes in using a pad punch, to allow drainage. There was a depression running around the edge of the bottom of the container which I left intact so that it could retain a bit of water as a reservoir. Probably not critical, but that was my thinking at the time.

2. Into the container I filled my standard seed raising/potting mix which consists of (by volume): one part coarse sand, two parts sieved compost or worm castings and three parts cocopeat. Mixed all together and then placed in the container until it was almost full.

3. I soaked about a quarter cup of wheat grains (berries?) overnight, drained them, rinsed them again and placed them on top of the growing medium as evenly as I could, which wasn’t very! Once they were in place I gave the whole thing a water spray and placed it into my window farm.

4. After about six days the sprouts were up to about 150mm tall so I harvested them with a pair of scissors and then had to work out how to turn wheat grass into juice. There are specific juicers to do just that, but I don’t have one!

5. I decided to use the ‘bullet’ thing that came with our food processor. The harvest weighed 20grams, so I placed in the bullet with ¼ cup of water, assembled things and put it in place. When I turned it on there was plenty of whizzing, but nothing happened. I added another ¼ cup and this time it worked well, filling the bullet with green sludge (sounds appetising, doesn’t it?).


KENWOOD

6. I then filtered out the remaining wheatgrass juice from the residue by placing the output of the bullet onto a very fine mesh, home-made veggie bag which was placed in a glass. When the juice was strained out, I squeezed the bag to coax out the remainder of the juice, scoring me half a glass of the stuff, with the green fibrous residue going into the compost.

Filtering

Fibrous residue filtered from the sludge

Yum Yum!

7. The original wheatgrass plants continued to re-grow and were ready for another harvest within a week or so.

So, how did it taste?

Well, it wasn’t disgusting……….but it wasn’t the greatest thing I have ever tasted either. I think that over time, and maybe with the addition of ice, or some kind of flavouring agent, I could get used to it.

There are some other mild concerns which I read, that consuming wheatgrass juice can cause nausea and difficulty in swallowing (the wheatgrass juice) and contamination with ‘microbials’ is also possible. So just be aware that the consumption of wheatgrass juice, particularly at the start, is not going to be an unalloyed pleasure. The people who know suggest one way around this is to consume it in the morning, an hour or so before eating anything. Just sayin’!

But wait, there’s more!

If, by some chance, you grow your wheatgrass for juice but find you just can’t choke it down, all is not lost. An alternative name for wheatgrass is ‘cat grass’ so you can share the produce with your furry feline friend, particularly if that friend is an ‘indoors’ kind of cat.

There you have it, if you want to grow some wheatgrass, it is quick, easy and cheap to grow, so everybody (even your cat) wins!

2.10 Microgreens – an introduction

Have you ever grown sprouts? If you haven’t then I recommend you read the previous articles in this eBook, if you have you will know where I am coming from. Sprouts are seeds that have germinated and put in a bit of growth, then we eat them. Microgreens are the next step along the plant growth continuum, in that the seeds are planted into a growing medium, germinate, produce roots and a couple of leaves – then we eat them.

Why bother?

A reasonable question! If you are a flat or apartment dweller but still want to grow fresh veggies, if you want to include home grown fresh harvested veggies in your diet, if you want to improve (I resisted using the word “supercharge” here, otherwise I may give the impression I watch too much crappy TV) your diet by including the vitamins and minerals that fresh veggies provide; microgreens may be for you.

They don’t need lots of space, fertiliser or water and are easy to grow; if you put together your microgreen set up the way I describe below they will need even less care and you won’t have to worry about going away for a couple of days to a week and leaving your microgreens without water, you will still be producing fresh vegetables.

Microgreens can save you money as well as reduce your environmental impact by reducing those food miles (or kilometres) down to just feet, and if you can’t get to the shops for any reason, you will still have a supply of fresh greens for the table. Let’s face it; you would have to be utterly crazy NOT to get stuck into microgreens. OK, OK so I do get a bit carried away........read the article though and then give it a go, you won’t be sorry.

A Word of Caution

You just knew that there was a fly in the ointment somewhere, didn’t you? At least this one is a small one. In the same way as you would when getting seeds for sprouting, make sure that they are designed for sprouting and/or microgreen production or consumption directly by people in some form. This is to make sure that they have not been contaminated with fungicides or other pesticide to reduce losses when sown in the ground, because these chemicals could make you sick. Also with some vegetables such as tomatoes, the plant is actually toxic and so not suitable for rowing as a microgreen (although the fruit is fine obviously) but if you stick with the plants in this article you will be fine.

2.11 Growing Microgreens

Where do you get the seeds?

One obvious place to get your seeds are from a seed supplier that supplies sprouting seeds, preferably one that specialises in open pollinated, organic and/or heritage seeds because these are people worth dealing with. As mentioned in other articles, I tend to buy most of my seeds from Eden Seeds in Queensland, their website is in the links area. That is not the only avenue though, you can pick up packets of seeds that are destined for human consumption directly but that will still sprout; for example the old “blue boiler” dried peas that are used to make mushy peas with. The can be bought from the likes of Woolies and Coles in the soup section, quite cheaply and have a very good germination rates. Think about sunflower seeds in the same way, even if they do come from the bird seed section.

If you have Asian food shops near you, there are a number of seeds that are used to make curries and other dishes that can be bought quite cheaply and will germinate to give you wonderful microgreens. Examples of these seeds include onion, mustard, fenugreek and mung beans, available in comparatively large amounts for a few dollars, good value in anyone’s language.

If all else fails, or you want to be that much more sustainable/self-sufficient (self-sustainable?), you can save your own seed and grow microgreens from that. There are circumstances where you might have produced seed that you don’t want to use, say if you have a number of different varieties of brassicas flowering at the same time.

Brassicas are notoriously promiscuous and the seed you save from an individual plant may not breed true to the parent you harvested it from. With microgreens you are only going to grow it up to a few leaves before consuming it, it won't matter if was a cabbage or broccoli or a cabboli (a cross between cabbage and broccoli....), at that stage it will look (and taste) the same.

What plants are suitable for growing as microgreens?
The following plants can be grown as microgreens for human consumption –
Herbs such as – rocket, basil, coriander, mustard
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, sunflower

What do you need to be able grow microgreens?
A seedling flat - Seedling flats are available from nurseries and if you have bought lots of seedlings in the past you may have a couple floating around the house or garden, I sure did. Otherwise you can buy them new or make your own out of wood, the commercial ones are usually 350mm long (outside measurement) by 290mm wide (outside measurement) by 60mm deep and this is a handy size for lots of reasons.
A kitty litter tray - these are available very cheaply at junk shops and are usually around the following dimensions – 290mm wide (inside measurement) by 400mm long (inside measurement) by 75mm high, so they will fit your seedling flat inside them.
A piece of timber the same size as the flat, with a handle to act as a press.
Some **coarse river sand**.
Some growing medium – I use the same mix that I make for seed raising mixture basted on 3 parts cocopeat, two parts of worm castings and one part of coarse river sand.
Scissors for harvesting.
The **seeds** you want to grow into microgreens.

The process –

1. Take your kitty litter tray and put one to two centimetres of the coarse river sand into the bottom of it and smooth it over so that it is reasonably form and level, then put water in so that it sits a few millimetres above the surface of the sand.

Kitty litter tray complete with sharp sand

2. Take the seedling flat and fill it with your growing medium and tamp it down to a firm, flat surface in which to sow your seeds.

Seedling flat sitting in the kitty litter tray

3. Sow your seeds thickly but evenly over the top of the seedling flat, this will be easy with the big seeds but a bit more difficult with the smaller seeds. There will inevitably be some unevenness in your sowing and some of this can be evened out by spreading areas too thickly sown out with a finger or adding a bit more seed in areas too thinly sown.

4. Using your press or tamper, tamp down the surface of your flat to ensure good soil to seed contact and cover the seed with either a thin layer of growing medium or newspaper to reduce evaporation.

Growing medium added and being tamped down

5. Now place the sown flat into the pre-prepared kitty litter tray. The water in the kitty litter tray will wick up into the growing medium in the flat to keep the seeds moist without water logging them, the coarse sand will support the flat and act as a water reservoir so that there is less chance of your microgreens drying out. Also, by watering directly into the litter tray rather than the flat you won't be washing smaller seeds out when you water.

Seedling flat sown (too thinly) with blue boiler pea seeds

6. If you do elect to use the newspaper, lift it up every day and check on the germination of your seeds, remove it totally once they have germinated.

Harvesting the peas with scissors

7. Once the seeds have germinated and grown to the point where there first two true leaves as opposed to their cotyledons or seed leaves, they can be harvested. This is

done by cutting them off at just above soil level with a pair of scissors, then once they are harvested wash them and remove any soil, seed coats or rotten leaves before placing them into a container ready to go into the fridge.

The freshly harvested microgreens can be used in salads, sandwiches, on top of soup as a garnish or almost anywhere you would use salad leaves, but they will give you a much greater variety of flavours and textures. You could even develop your own microgreen mixes by combining different brassicas, different Asian greens or a mix of vegetables and herbs; whatever takes you fancy to make your own personal microgreen mix.

2.12 Another Take on Microgreens

If you have already read the previous microgreen article you will know what a wonderful, practical and tasty source of nutrition microgreens are as well as having a reasonable idea of how to produce them. If you haven't, go read it first, I'm not going to repeat it all, except the production bit!

A lovely container, found cheap at the Sallies!

Producing microgreens in large amounts can be a good thing if you are using them heaps but what if you like small amounts of variety? I was wandering through our local Salvation Army shop when I came upon a round, plastic microwave cooker that was divided up into three equal “wedges” (for want of a better term). It looked perfect for raising microgreens and for the vast price of $1.50 I was able to purchase it; and for another $1.50 I was able to get a plate to go under it to catch any water draining after irrigating them. It was big enough to produce three loads of microgreens neatly separated from each other and the lid was high enough to allow germination and some growth before it would need to be left off. It was also decorative enough not to look out of place in the kitchen. Perfect, reusing at its best.

Container with holes drilled in the bottom

The first trick when I got it home was to grab hold of a very sharp 6mm or so drill and drill a whole stack of drain holes in the bottom to stop the microgreens getting wet feet. The plastic is quite brittle and I figured could easily break up even though it was reasonable thick, so I used a very sharp drill bit and was comparatively restrained in the pressure I applied to the drill, letting the bit do the work. In the end all was well and I was able to drill in all the required holes without destroying the container.

Test fitting the plywood hand press

It appeared to me fairly obvious that, due to the shape of the container, a simple rectangular lump of wood to press down the growing medium, seeds etc was not going to work, so I fished out a piece of 10mm thick ply wood and sketched the shape of one of the wedges on it. After cutting it out using my small band saw (it could just as easily have been done by hand with a fret saw) and sanding it back to smooth of the rough edges I tried it in place. It fit! Not bad for someone almost without manual skills. I found an old knob off a cupboard door, screwed it on for use as a handle and we were away.

Growing medium in place and pressed

Using the same growing medium that I always do (1 measure of coarse river sand; 2 measures of worm castings and three measures of cocopeat) I filled up each of the wedges to the top and then pressed them down with the little wedgie press. I then sowed the seeds on top quite thickly, one type in each wedge – fenugreek, mung beans and lettuce – covered with another layer of growing medium and again pressed down to ensure good soil to seed contact. I then watered the whole shebang with a sprinkle nozzle on a PET drink bottle, replaced the clear lid and stood back to await the fire works!

3 types of seeds sown, mung bean, fenugreek and lettuce

And they weren't long in coming! Unfortunately the top layer of growing medium at about 5-6mm thick was a little too thick and well tamped down so that when the thickly sown seeds germinated, rather than push through the top layer as I expected they lifted it up in one solid layer. It looked a bit weird but in the end it was only a minor inconvenience and after being broken up with my fingers and watered in, all was well.

The seeds beginning to germinate

Things were moving along quite well and all of the microgreens were growing strongly but we had to go away for the weekend and, with nowhere else to put them, they stayed on the side of the sink in the kitchen with the curtains closed. This resulted in them not getting enough light so they became rather long and leggy, but this did not seem to interfere with their flavour. The lettuce did take the longest to recover, the other two being thicker with nicely flavoured stems.

A bit leggy, but good!

This was a great way to grow a variety of microgreens in a small area, right in the kitchen where they were going to be used. Sometimes it can be a pain to have to walk down to the greenhouse to harvest some microgreens for a meal, but my lovely partner in the sustainable life would not be enthused over numerous flats full of growing things cluttering up the kitchen either. This way we could have a happy household and microgreens too.

Mung bean microgreens as a garnish on homegrown veggie stir fry with beef

2.13 Experiments with baby spinach

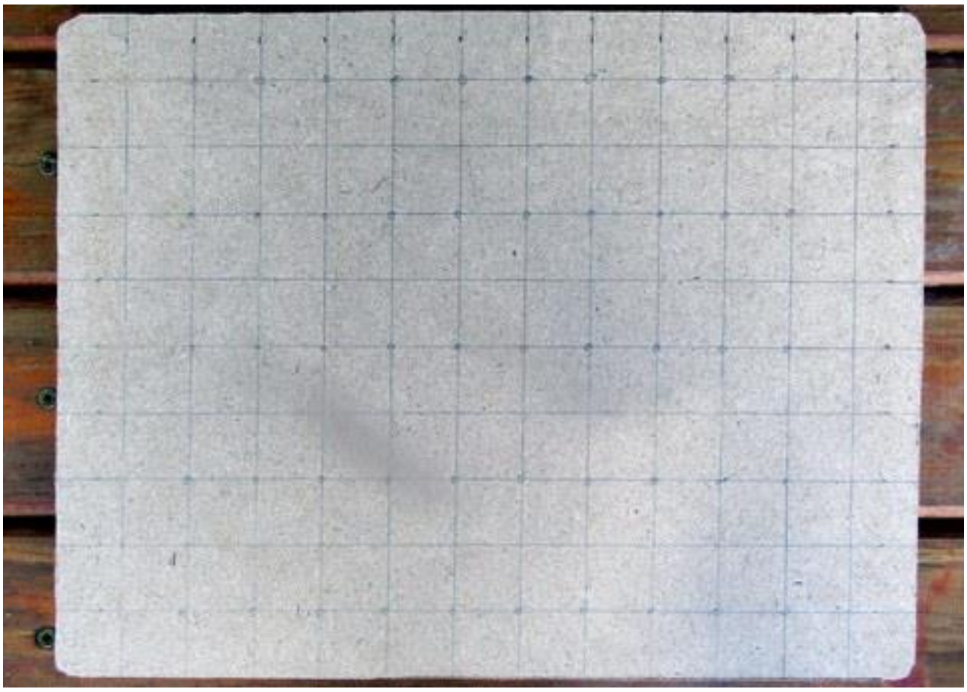
We have seen a couple of recipes recently that required baby spinach leaves, usually to go in wraps and the like. I refuse to buy the over-packaged stuff but figured it was just another type of microgreen so I would have a go at growing it myself. When I came to do a bit of research on it, there was remarkably little specific data on how it baby spinach be grown in a home-based setting, either on the 'net or in my books. It seemed to me it was time for a bit of experimentation!

My thoughts were to use a seedling tray (348mm x 290mm x 55mm black plastic seedling trays used by nurseries, hardware's etc. to hold seedling punnets), fill it with my standard seed raising mix and then plant it out. Once the tray was prepared I would sit it one of my sand filled cat litter watering trays to keep it damp for germination and growing.

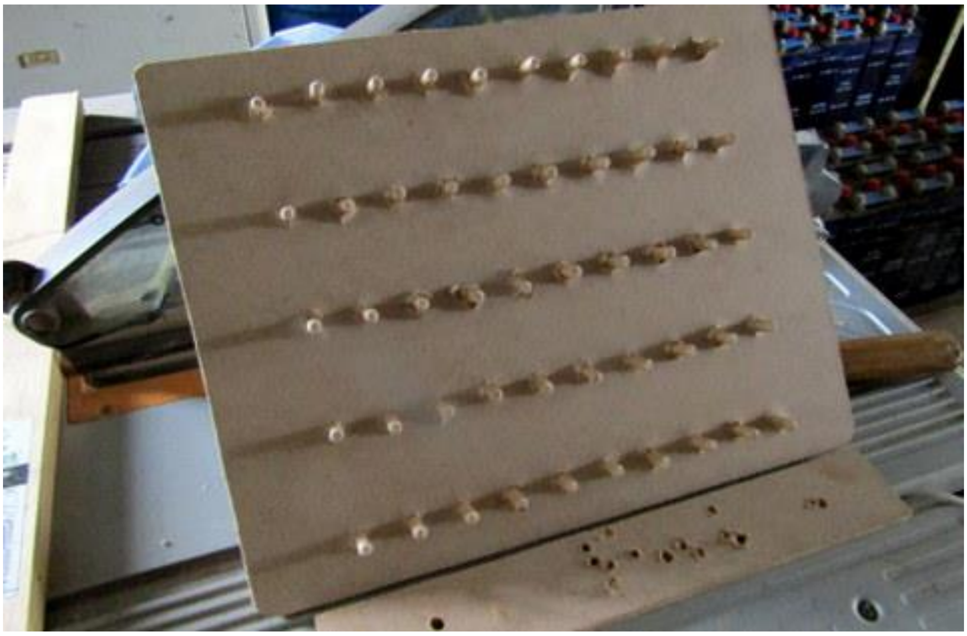
It all seemed to make sense, but I really had no idea how close of far apart or even how deep to plant the seeds, as information either wasn't there or was conflicting. So what I decided to do was make up an adjustable rig to put holes into the seed raising mix at a pre-determined points to see what worked. That way, what I was doing would be reproducible once I worked out how best to do it.

Making the Sowing Rig

I had some 6mm MDF (and, yes, it was left over from a previous project!) so I cut it to 325mm long by 250mm wide and rounded off the corners so that it would fit more neatly into the top of the seedling tray. To cut it I used a hand saw but used my small band saw to round off the corners. I then sat down and did some calculations (clearly not my strong suit) and worked out I wanted to try to fit 100 baby spinach into the seedling punnet. I ruled up one side and one end into 25mm graduations with a pencil then ruled up the back of the MDF into 25mm squares. The idea was that a seed would be placed at the corner of each square. At 130 total squares this meant I could leave some room at each end of the seedling tray.



Setting out



The next challenge was to work out how I would arrange it so that I could push a hole into the seed raising mix at the appropriate places, into which I would then plant a seed. For years I have had a pack of 50 fluted timber dowels (6mm in diameter x 32mm long) which were designed to be used in timber joinery but I hadn't used for anything. Only 50 you say? When I needed 100? Well I had an obvious answer, I would use the aforementioned band saw to cut them evenly in half!

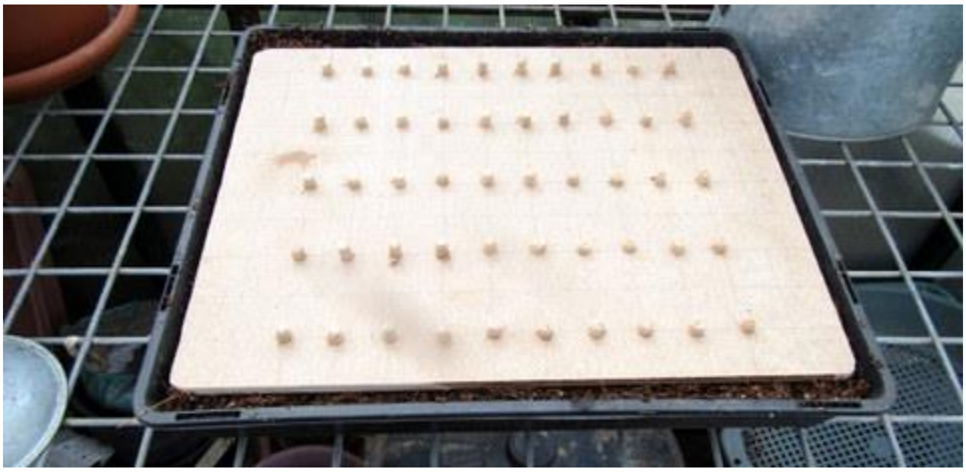
Have you ever tried to cut a whole stack of 6mm x 32mm cylinders, exactly in half, without losing a finger in the process? Anyway, through an amazing coincidence after recalculation it turned out that the best spacing for the seedlings meant I would only need 50 of the dowels. Thankfully the original pack actually had 54 dowels so I was able to carry out some (mostly bloodless) practice with the band saw but still have enough dowels left over to complete the job properly.

I drilled 50 7/32" holes (sorry, I have had my drills for many years and they are pre-metric) into the MDF board at designated places. Drilling 7/32"holes for the 6mm dowels gave me a firm enough fit that they would stay in place without glue, but not so tight that they couldn't be tapped in with a hammer. I have a bench drill and used that so that the holes were as close to 90° to the surface of the board as I could get them, pretty much. The new deal actually worked out better than my original idea of gluing the dowels into the holes, because it meant that the length of the dowel (and hence the depth of the planting hole) was adjustable.

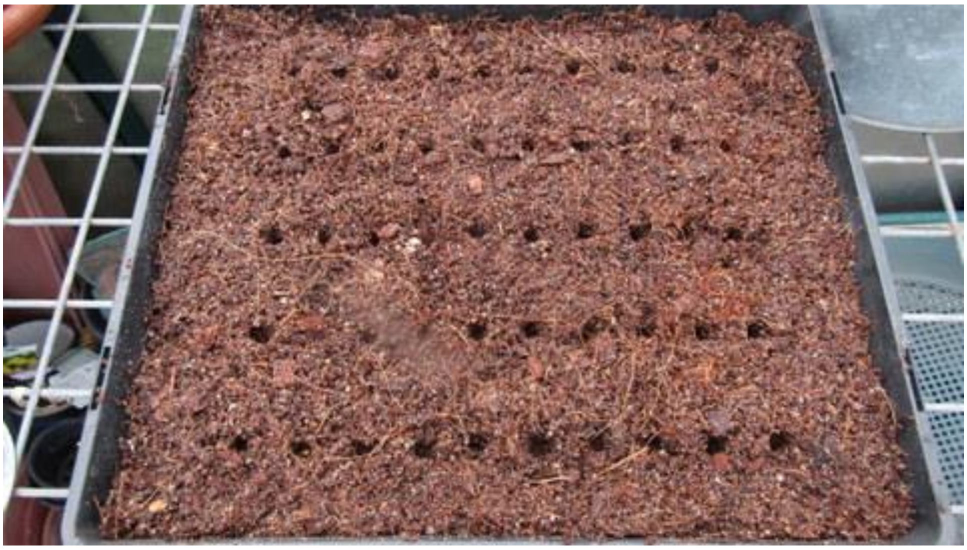
In some of my reading it had appeared that the spinach seeds needed to be sown 12mm deep, which seemed a bit deep to me, but anyway. By placing the rig on a flat surface and applying a hammer gently to the back I was able to set the dowels all at 12mm.

The Set Up

I made a batch of my seed raising mix up, which is covered elsewhere but for simplicity is basically a mix of 1 part coarse sand, 2 parts worm castings and 3 parts cocopeat (horticultural coir) all by volume, I use a 500ml plastic take-way food container as the measure. I mixed it around, making sure it was nice and damp then loaded it into the seedling tray and levelled it out a few mm below the level of the rim, then pressed the sowing rig down on top, to flatten and compress the seed raising mix and press in the holes. Then into each hole I dropped a spinach (English medamia) seed and covered each seed with a bit more seed raising mix.



Pokin' the holes



The holes!

Comin'up!

The seedling tray, seed raising mix, seeds and all, was then placed into one of the cat litter trays three quarters full of sand and water, to ensure the seed raising mix was damp, but not sopping. I kept the water up in the cat tray manually, the seedling tray was too large to allow me to put the upturned bottles in as I usually do in capillary beds to provide a water reservoir.

Results

The seedlings started to emerge about a week later, just not as many as I had hoped for. We got a total of 17 plants out of the 50 seeds of which 14 plants made it to harvestable size, about 2 and a half weeks after the seedlings emerged.
It is amazing what you find out when you do things for yourself! I had assumed that the baby spinach would be harvested in the way that most microgreens are – once they have achieved the required size you take a pair of scissors, cut them off and serve them up in true MasterChef style, followed by dumping the growing medium and starting again from scratch.

Not so! We don't have a huge number of plants but I have been able to harvest half a dozen, to a dozen leaves every day or two to have on our lunch since they got to harvestable size. The supply doesn't seem to be slowing down yet either!

The Future

I am going continue and see how long we can push the harvest for but also about a week ago I set up another seedling tray, but this time I modified the sowing rig so that the seeds would be sown closer to 5mm – 6mm deep.

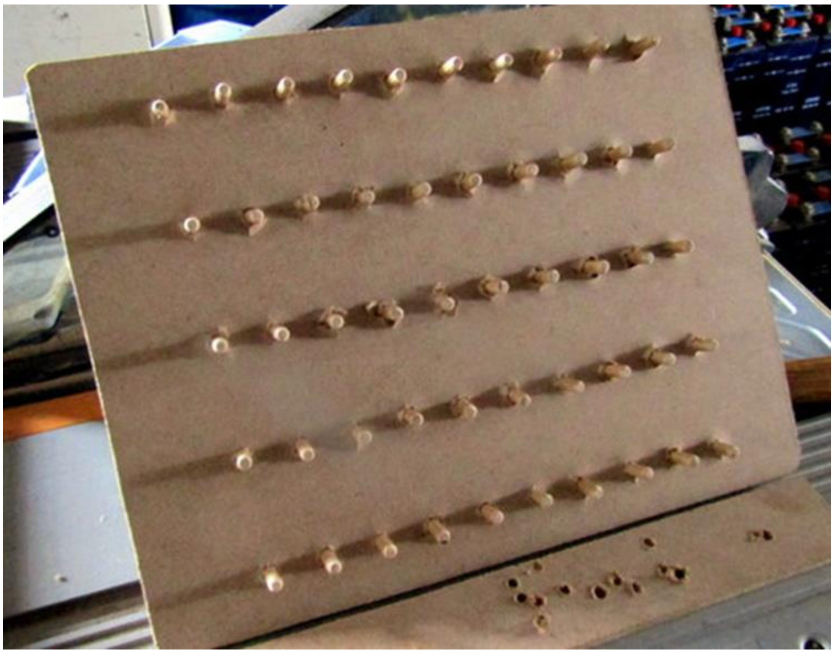
The new one - Comin' up!

The new tray has been remarkably productive (see above) with a hugely increased germination rate and continued cropping. It seems that the sowing depth of 5 – 6mm is the way to go, but to be fair, even the original tray is still producing on a regular basis a couple of months later. Another difference was I didn't put as much sand in the kitty litter tray the spinach tray is sitting in. This makes watering easier, into the gap between the two trays, and also allows some liquid fertilisation to go in with the water.

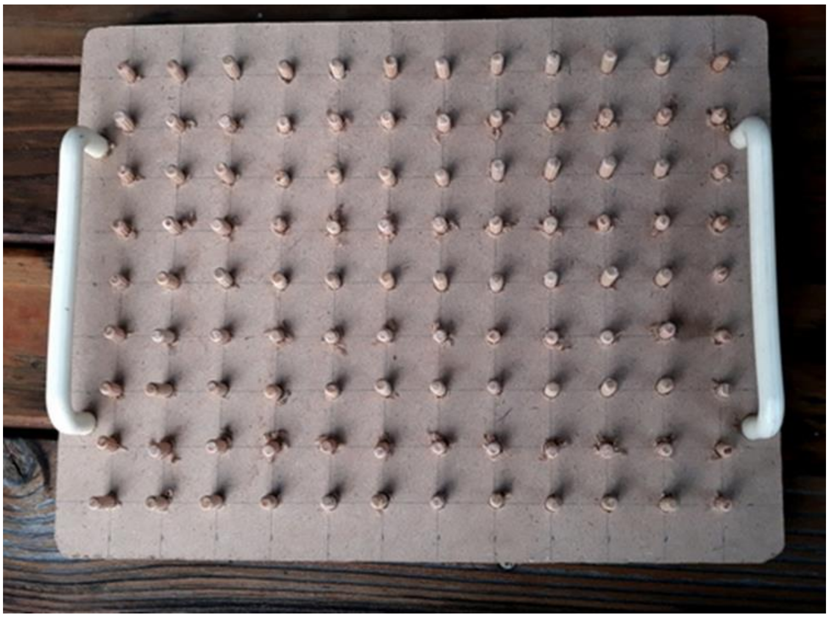
I think this has been a great proof-of-concept, if you don’t have much space and want a regular, if small, harvest then this is one way to get it!

2.14 Making a microgreen spacer

This little sowing aid starred in above article on baby spinach, and it worked pretty well after some initial mental gymnastics, but after using it some more I got to thinking that it could be more flexible if I drilled and inserted extra pegs into the spaces I originally did not drill.



The Original Construction



After Revision

The new deal

So, with the pegs in place and working well, I decided to drill the extra holes anyway. I have had several goes of growing microgreens like peas, which you then cut off once they are a few centimetres long and toss into stir fries or what have you. My main problem has been inefficient use of space because I always seem to wind up with some parts of the seedling tray pack up tight, with other parts being very sparsely populated. The idea to get around this was to drill the original holes and place pegs in them, which would give me an evenly spaced coverage of 108 plants per seedling tray.

This would not cause problems when setting up more baby spinach trays because I could always hammer the pegs up where I did not want holes for baby spinach, or remove those pegs entirely, or (yes, it just occurred to me) make the full set of holes and only put the spinach seeds in the appropriate holes. Also, the pegs were still adjustable so I could put in shallow holes for the spinach and deeper holes for the (larger) pea seeds. Works for me!

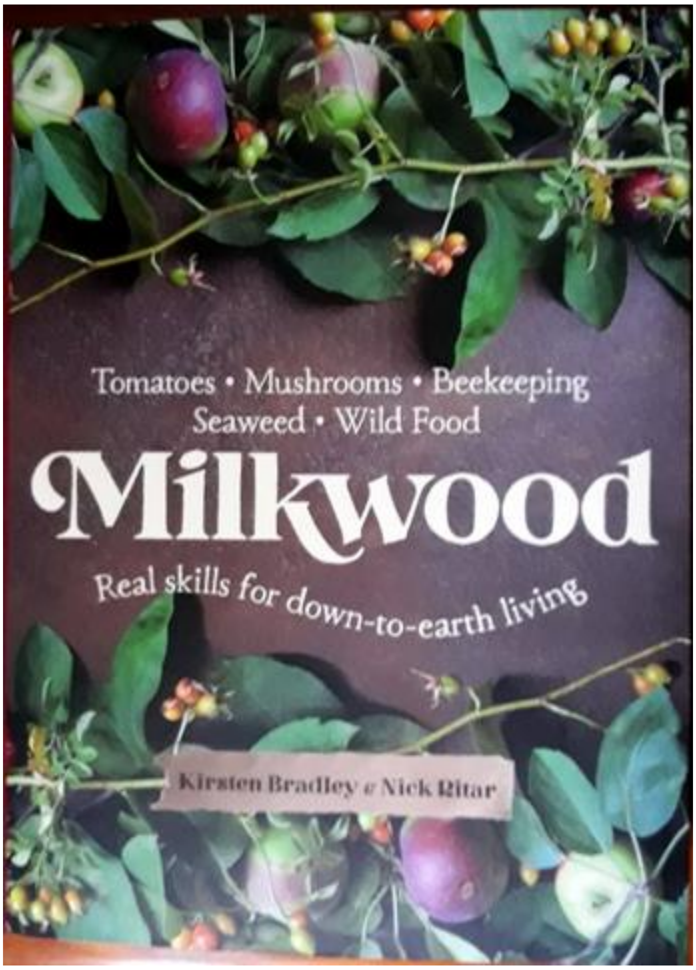
In the end it turned out to be a fairly simple matter to drill the required holes using the bench drill, with the board supported from underneath on some waste DAR pine. That way I could drill the remaining holes without having to pull out all of the existing pegs. I then just supported each side of the board and hammered in the new pegs. To improve its ease of use I dug around and found a pair of old plastic drawer handles and fitted them on each side.

With the spacer now complete, I didn’t waste time and prepared a seedling tray with seed raising mix, then adjusted all of the pegs to 20mm long by placing both sides of the board on some 20mm thick timber and hammering all the pegs down until they touched the bench. It was a breeze with the new handles to press the spacer down onto the top of the seed raising mix and then lift it up leaving 108 precisely spaced 20mm deep holes in the mix, ready to be filled with pre-soaked peas. Winner!

3.0 Growing Mushrooms

3.1 An Introduction

I have been wanting to grow mushrooms here at the Choko Tree for years, and I have fooled around with various forms of commercial kits (and one from-scratch foray) without, I've gotta say, much success. My focus has been on the usual style of button (agaricus) mushrooms most readily available commercially, but reading has recently lead me to the idea that maybe I could grow white oyster mushrooms. We had never tried them, so Just to be sure, I bought some and we cooked them up and found them to be quite palatable, so why not?



The process which I am using is based up the method set out by Nick Ritar and Kirsten Bradley in their book **'Milkwood'.** The book gives lots of good theory and practical type information on mushroom growing using a number of different techniques and also covers stuff like beekeeping, wild food, seaweed and tomato growing. Before finding this book the stuff I had on mushroom cultivation was from overseas (the US and UK mainly) and while the theory doesn't change the mechanics and required bits and pieces will vary. Also climatic differences and species available will have an impact on how you grow mushrooms and these will vary depending on location. This is an Aussie book for Aussie conditions and that made lots of things easier.

Context

Mushrooms can be grown using commercially available kits or 'from scratch', indoors or outdoors and the species and set-ups will vary. While the most commonly available commercial species generally known as button mushrooms (agaricus bisporus) have been available in kit form for many years, other less familiar but just as tasty and nutritious mushroom species are also becoming available in kit form.

Likewise, many suppliers of spawn, equipment and knowledge are now accessible through the internet and are able to provide all the requirements for growing both familiar and unfamiliar mushrooms indoors or outdoors from scratch.

Terminology

There are some terms in mushroom growing which I shall be using and just to make sure we are clear on what I am rabbiting on about, here are some definitions –

Mycelium/Mycelia: the vegetative part of the mushroom fungus consisting of a mass of branching white threads called hyphae.

Mushroom: the fruiting body of a mushroom fungus which produces spores, allowing the fungus to reproduce.

Spawn: a substance which has been treated with mushroom forming mycelium of a particular type. Spawn is most commonly supplied in the form of grain, hardwood plugs or sawdust but can also be supplied (less commonly) as straw spawn, woodchip spawn or a liquid slurry. In this case I was using grain spawn.

Substrate: the organic material which the mushrooms grow on. May be straw, hardwood logs, hardwood sawdust, paper or other materials. The substrate required will vary with the type of mushrooms grown. In this case I was using a mix of chopped straw and hardwood sawdust as my substrate.

Some Edible Mushroom Species

East to grow

- King Stropharia/red wine cap (*stropharia rugosoannulata*) – grows outdoors in woodchip gardens – Temperature range: 5 – 35°C; Preferred substrate: hardwood chips
- Oyster Mushroom (*pleurotus ostreatis*) – comes in a number of strains – grey, white, tan – Temperature range: 7 - 25°C although temperatures can vary depending on the strain; Preferred substrate: Will grow on most cellulosic substrates such as straw, hardwood sawdust, leaves, corncobs or paper
- Shiitake (*lentinula edodes*) – grown outdoors on logs - Temperature range 14 – 20°C; Preferred substrate: Hardwood logs
- Velvet Pioppini *(agrocybe aegerita*) – native to poplar wood - Temperature range 10 - 18°C; Preferred substrate: Hardwood sawdust

For more advanced growers

- Button mushroom (*agaricus bisporus*) – favourite commercial mushroom – Temperature range: 20 - 25°C; Preferred substrate: Manure & straw compost
- Enoki mushrooms (*Flammulina velutipes*) – Used in Japanese cooking. Temperature range: 8 - 12°C; Preferred substrate: hardwood sawdust
- King Oyster (large cap) – (*pleurotus eryngii*) – also has medicinal properties – Temperature range 10 - 21°C; Preferred substrate: wheat straw or hardwood sawdust.
- Morel – (*morchella angusticeps*) – prized by gourmet cooks, especially in French cuisine – Temperature Range: 13 to 15°C; Preferred substrate: Soil
- Turkey tail (**trametes versicolor**) – considered to have positive health impacts – Temperature Range: 8 - 23°C; Preferred substrate: Hardwood sawdust
- Yellow oyster mushroom (*pleurotus citrinopileatus*) – grows well with straw log bags – Temperature range: 21 - 29°C; Preferred substrate: will grow on most cellulosic substrates such as straw, hardwood sawdust, leaves, corncobs or paper.

3.2 Growing Oyster Mushrooms

Setting Up

To set up to grow oyster mushrooms using this process you are going to need a few things and some stuff.

Equipment

- Fruiting containers – in this case food grade buckets with a tight fitting lid, we find the 11 litre style supplied by the big green hardware store works for us.
- A half inch or 10 - 12mm twist drill bit, a quarter inch or 5 – 6mm twist drill bit and a hand drill of some description to drive them.
- A fruiting chamber (read small plastic greenhouse, more detail under 'Inducing Fruiting).
- Several large containers for use with pasteurising including 20 litre container and a 55 – 60 litre container or two.
- A method of heating 40 litres of water (more details on this in the pasteurising section)
- A thermometer that will read to 80^{o}C or greater.
- PPE – Dust mask (P1), safety glasses or goggles and gloves (Eg PVC or nitrile washing up gloves).

Consumables

- Micropore tape (try your local chemist)
- Substrate (hardwood sawdust, chopped straw, slaked lime)
- Mushroom spawn of the correct species.

Micropore Tape

Preparing the Containers

To prepare the fruiting containers (Plastic buckets) used to hold the mix of substrate and spawn that will eventually produce the mushrooms, you need to drill holes in the side. This is to allow gas exchange initially and then later on these will be the holes from which the fruiting bodies (oyster mushrooms) will emerge for harvest.

Marked out and pilot hole drilled

I have found it easiest to drill a 6mm pilot hole first, as this prevents the larger 12mm twist bit wandering around before biting in and drilling the hole. I drilled two lines of 6 holes each 150mm apart in the line with one line 50mm down from top and the other 50mm up from bottom. The two lines of holes were offset from each other by ½ rotation (see photo). I marked them out with a tape measure and marker pen prior to drilling.

Main hole drilled and being deburred

Once the holes are drilled, the idea is to place some of the micropore tape over each of the holes. Due to the tape's construction, it allows gas exchange, but keeps out spores of mushrooms present in the air which would compete with the species we are trying to grow. Thus, air can get in and CO2 can get out without compromising the integrity of the inoculated substrate. To ensure the tape fits well it may be necessary to 'deburr' the holes with a sharp knife to remove any plastic burrs remaining on the edge of the holes prior to applying the tape.

main hole cleaned up and taped

Job done!

Mixing, Pasteurising and inoculating the substrate

This was the most technical and time-consuming operation of the whole growing process and to produce enough material to fill three by 11 litre buckets took us the greater part of a day.

Mixing and hydrating the substrate

For this process you need about 30 litres of substrate. The recommended substrate from the book is one third chopped straw (I believe 100mm is the usual straw length of chopped straw) to two thirds hardwood sawdust, although I have been told that the exact proportions are not critical and there is some flexibility here so don’t get too uptight about it.

For us the straw was relatively easy as we keep it for the chooks, but the hardwood sawdust was a bit more problematic. This is going to be used to grow stuff we were going to eat and so needed to be sources in the same way you would soil to grow veggies in, it needed to be hardwood, not softwood and no pressure treated (CCA) sawdust. Also, I am cheap and my first thought was to get some for free from wood machinists/saw mill somewhere. This proved to be more difficult than I thought and the only stuff I could source which seemed able to do the job came in one metre cubed bulkabags. OK, they were free but would be difficult to transport (it was pick-up only) and store.

I had just about shelved the mushroom plan for lack of substrate when a mate shouted me a 75 litre bag of hardwood sawdust from a butcher's supply place. While it did not cost too much for the bag, the cost of delivery from Melbourne more than doubled the total cost of the material. So a shout out to John for his generosity!

When looking at substrates for your mushroom projects I think Nick's words should be borne in mind – "There are many options for container substrate, and it's important for the long term resilience of your mushrooms that you choose a source that is locally available, preferably a waste product" (Milkwood Page 81). Fortunately, with a ready supply of sawdust provided for me, I can start experimenting now while I research local sources.

Preparing the Substrate for Pasteurising

Note: builders' lime is an irritant so when handling it you should wear the dust mask, gloves and eye protection.

To prepare the substrate it needs to be mixed, limed and hydrated. To do this I measured out a full 10 litre bucket of straw and a full 20 litre bucket of the hardwood sawdust into a 60 litre plastic tub. I then weighed out 250grams of hydrated or slaked lime, also called builders lime. I got the lime from the green hardware but because it was builders' lime not garden lime (Calcium hydroxide vs calcium carbonate) the only bag I could get was 20kg. I have enough lime for mushroom growing for the next 100 years!

With the solid materials in the tub I gave them an initial mix and then started to add water. It is important to add the water slowly because you need to add enough to moisten the entire batch of substrate but not wind up with a soupy mess! The way I did this was to add water in small increments, then mix, and repeat. The whole mass of substrate needs to be moistened to allow the heat to penetrate during the pasteurisation process, otherwise there may be pockets of unpasteurised substrate which can contaminate the whole lot once the substrate is inoculated and left for the mycelium to run.

All in the bucket

After water and mixing

Pasteurising the Substrate

The substrate has been formulated to be ideal for growing fungi, but the idea is to prevent as much as possible other fungi from colonising it so we can grow the species of fungi we want, in this case oyster mushrooms. For the substrate to be pasteurised it needs to be kept at a temperature above 60°C for in excess of two hours by soaking it in hot water. To contain the substrate while this is happening it gets placed in cotton pillowcases, in this case three pillowcases with 10 litres of substrate per pillowcase.

Heating the water

To pasteurise 30 litres of substrate we needed about 40 litres of fresh water heated to 80°C, and this proved to be one of the most problematic parts of the whole process. One of the hints is to use an electric urn, which is what I intended to do because after holding some workshops at our place we had picked one up so we could provide tea and coffee easily when required, and then filed that issue as sorted. Unfortunately, as the day grew closer I realised that the volume of the urn was 10 litres so I had to find another 30 litres of hot water from somewhere.

I had intended to start off with water from the solar hot water so at least I was not starting with dead cold water, but true to form, the days leading up to ‘mushroom day’ were cold. Rainy and sunless, leaving only tepid water in the hot water system. Yes I could have turned on the electric boost but that kind of defeated the purpose of using the solar.

I finally decided to use the urn, but to also heat the remaining 30 litres water I needed in a steel 50 litre drum I had, perched atop my rocket stove. That way I could use sticks and stuff I had gathered from the local park to heat the water. I had tried a similar stunt with a Vacola bottling kit years ago, and it took forever and didn’t get much above 60^{o}C due to (what I assumed to be) loss of heat through the sides. To reduce this I grabbed a spare glass fibre insulation batt, wrapped it around the sides of the drum and taped it on. It covered the majority of the sides so hopefully it would work!

The water started out at a balmy $15^{o}C$ and while the rocket stove was starting out I filled and set the urn going. I set the 50 litre drum up and then slowly put 30 litres of water in it. It took a while but after half an hour the water was $25^{o}C$ and the urn had boiled and been turned off. Then my sweetie came up with the classic idea – take 10 litres out of the drum and put in the contents of the urn! Winner!

So I did that and refilled the urn and turned it on to reheat, the water in the 50 litre drum was now at $50^{o}C$ and heating steadily, the insulation seemed to be doing its job. After about an hour the 50 litre drum was just over the $80^{o}C$ mark and the urn had long since boiled and was keeping hot – we had hot water!

As a vessel to hold the substrate filled pillowcases I intended to use a cleaned out 55 litre plastic garbage bin I had been using as a storage container. When I put the pillowcases in I was a bit concerned at how much space they took up, would all the water fit? I moved the garbage can to where I had the rocket stove set up (I was NOT going to juggle 30 litres of hot water!) and placed it inside the 60 litre plastic tub. I did this for three reasons –

1. It was a cold day and I wanted to see if the airspace between the garbage can and the side of the tub would act as an insulator to reduce energy loss,
2. I was not totally sure about the structural integrity of the plastic garbage bin as it would have to have been at least 10 years old and if it sprung a leak the tub would contain it and hold it close to the substrate pillowcases, maybe allowing me to continue pasteurisation, and
3. If all the water did not fit in the garbage can I would pour it into the tub so its heat could still contribute to the pasteurisation process.

I have a plastic dipper I use when topping up the batteries and I used that to transfer the water from the drum and the urn into the garbage bin as quickly as I could and in the end, I was able to fit all the water in except for the last 2 or 3 litres, which dutifully went into the tub. I placed the lid onto the garbage can and then placed on top a couple of bean bag bean filled pillowcases I use as insulation in our stored heat cooker. This would hopefully keep the water in the pasteurising set up from falling below 60^{o}C for two hours. Then, as Nick Ritar suggests, I had lunch!

After a nervous wait of two hours I removed the insulation cushions and the lid of the garbage tin and measured the water temperature, it was 68^{o}C, we had pasteurisation!

Inoculating the Substrate

The next trick was to remove the soaking wet and still very hot substrate filled pillowcases, so I put the plastic washing up gloves on and washed my hands because cleanliness is important in preventing contamination. I pulled them out and squeezed them to remove as much excess water as I could and hung them up on hooks I had built in to the roof of the back deck to drain. I needed to move quickly to inoculate the substrate so I let them drain for 12 minutes only.

I set up a portable table in the back yard and wiped it over with vinegar as a disinfectant and left it to sit and retrieved the pillowcases. I had removed the gloves by this stage and washed my hands thoroughly. I emptied the substrate out onto the table, it had cooled to the point where it only felt a bit warm to my hands. I spread it out so that it make a layer 75mm to 100mm thick.

I retrieved the spawn from the fridge and opened the pack and broke off chunks, crushing them up and distributing them over the surface of the substrate, then spent about 10 minutes mixing the spawn and substrate thoroughly together. When that was accomplished I packed the inoculated substrate into the fruiting containers and affixed the lids.

It’s winter here so I took the filled containers inside and placed them under our dining room table, so they would be somewhat warmer than storing them outside or in the garage or shed. It was then a 3 week wait to see how things had gone!

Inducing Fruiting and Harvesting

The theory was –
Leave the buckets full of inoculated substrate in a warmish space with stable temperature and I chose under our dining room table and leave them for three weeks. After the three weeks had elapsed, remove the lids and check to see if the spawn had run properly and the substrate was properly coated with mycelium. If the mycelium had run, move to the next stage, if not, replace the lids and put them back, check in a few days.

Assuming the mycelium run was good, fill the buckets with cool, clean water and leave them for 12 hours, I was going to leave them overnight, to stimulate fruiting. Drain and place them in the fruiting cabinet (small greenhouse) to maintain humidity and watch to see when fruiting occurs. You don't need to remove the micropore tape, the mushrooms will push it to the side and break out as they need to.

What really happened –

I pulled the buckets out and all of them had really good spawn run and were chockers with the stuff. But one bucket already had mushrooms busting out from half of the holes, the second bucket had mushrooms bursting out from one hole, and only just bursting out at that. The third bucket had no mushies bursting out at all!

Now this was a good thing and a bad thing, it was good because it showed I had the process right, but it also meant that I should have been keeping a better eye out on what was going on! The oyster mushrooms which emerged while the buckets were under the table never really got any bigger, and the best I can make out of that is that the humidity is was too low. Now that they are in the fru1ting chamber, new sprouts of mushrooms are emerging.

The idea with the fruiting chamber is that it keeps the whole set up in high humidity, but you also need to maintain airflow. We had mushrooms protruding from most of the holes in all three containers within a week or two, but it did seem to be a bit of a struggle to keep the moisture up using my go to technique – regular spritzing with a hand powered water spray. I made sure the fruiting chamber was in an obvious place which I would walk past regularly, but when things got busy I would forget (being old probably didn't help either!) and I think the humidity would drop, resulting in weird mushrooms

Fruiting Chamber

I think the best thing would be to invest in an automatic mister (available online). Some small greenhouses I have seen advertised already come with an automatic mister and so if I was buying a greenhouse for use as a fruiting chamber again, I would get one with an automatic mister fitted.

There has also been another blessing in disguise! In my naivety I assumed that there would have been a uniform eruption of the mushrooms. If that had been the case, ie mushroom bursting out of all the holes, in all the buckets. All at the same time, I would have been up to my armpits in oyster mushrooms, so: mushroom soup, mushroom salad, mushroom pasta, mushroom ice cream – I'm sure you get the picture. In the event though, the harvest of mushrooms has been spread out over a couple of weeks rather than all at once! (thank heaven!).

Mushroom buckets in the fruiting chamber

In the end we got quite a few mushrooms but they mostly tended to be small and some came out very spindly, as a result of the inconsistent humidity. What we did get was very palatable and I included them in dishes I was cooking at the time.

The Adventure Conitnues!

Pillowcases, Second Flush and Lessons Learned

The first time I pasteurised a load of substrate, I was left with some pretty unpleasant looking pillow cases once they had been filled with sawdust and straw and stuck in hot water for two hours! Clearly, others had gone before me and would know the secrets of how to revive them, so I contacted my mushroom guru and asked how he cleaned them. His answer, elegant in its simplicity was: “I don’t!”

The pillowcases - since re-used

It turns out he had evolved past using pillow cases and now used nylon brewers’ bags which are much easier to clean and reuse. This left me in somewhat of a quandary, but I am nothing if not stubborn! I dumped the pillowcases into a trug of clean water and sloshed them around to remove as much particulate material as I could, then turned them inside out and hung them on the line. Once any remaining particles dried off they were easy to remove by shaking the pillowcases. After that it was just a case of running them through the washing machine with a load of washing and they came out ready to go again, if not looking totally pristine.

The Second Flush

After the first flush of mushrooms from the containers, I removed the remains of the previous flush, re-applied the tape and then returned the buckets to the fruiting chamber and continued spraying with water regularly. The mycelium was still growing rampantly through the buckets and I held out great hopes.

After a couple of weeks there was no response so I tried the water soak overnight, but still there was no response and after a couple of weeks more I came up with a new idea which I am still investigating. But there was no second flush from that set of containers.

What the second flush looked like

Lessons Learned

As always with this stuff there are lessons to be learned and from comments on my posts and my own research, I believe the lack of fruiting and other mushroom issues can be put down to –

1. not enough ventilation in the fruiting chamber allowing an accumulation of carbon dioxide, and/or
2. lack of humidity in the fruiting chamber, the spraying I was doing just wasn't enough.

Another suggestion which came up (thanks Bart Acres) was rather than leave a space at the top of the bucket, fill the buckets up to the top leaving no air gap. This will encourage more and better flushes.

I have a couple of ideas that I am currently working on which I hope will remedy the above issues and in doing so provide more better-quality mushrooms. I'll report on those as the results come in. Stay tuned!

The Next Generation

Fixing the problems

Previously, I recorded that I had concluded that my yields were not good because –

1. There was not enough ventilation in the fruiting chamber allowing an accumulation of carbon dioxide, and/or
2. There was a lack of humidity in the fruiting chamber, spraying water with the hand sprayer every so often just wasn't enough.

So, I did some research to see what I could do to rectify these problems and it turns out that there is a comparatively easy fix for both.

- For the lack of ventilation, I used a 12mm hole punch to make a series of holes in the top and sides of the fruiting chamber (ie small plastic greenhouse) to allow more ventilation/gas exchange. Then to restrict the entry of unwanted fungal spores I covered the holes with micropore tape, thus letting the air in but keeping the spores out.

- For the lack of humidity issue I got hold of fogger/mist maker of the type used in small indoor water features. I bought it off Ebay for the vast sum of $20 including postage. You plug it in and immerse it in a water supply and it uses ultrasonic waves to create a mist which raises the humidity in the fruiting chamber. I set mine up on the top shelf of the chamber in a cat litter tray which I fill with water as the reservoir. My idea was the water vapour would be generated and then flow down over the mushroom fruiting containers, and it does seem to operate like that.

So did it work? Well, therein hangs a tale –

Changing the paradigm

One of the problems I have had conceptually with setting up a system to grow mushrooms has been that I thought I needed to treat them like veggies. In other words, buy the seed (spawn) sow and raise seedling and pot them on (make, sterilise and inoculate the substrate) plant them out and grow them on (fill the fruiting containers and place them in the fruiting chamber) then look after them until they fruited. Maybe get two or three flushes then tip the spent containers out into the compost or veggie patch. This approach means buying more grain spawn each time I want to grow mushrooms and that gets expensive. (I don't have the gear, knowledge or skill to make my own grain spawn).

But mushrooms are not veggies, in fact they are not plants at all!

So, is there a way I can use so that I don't have to buy new spawn every time I want to grow mushrooms? It turns out there several, and this is my experience with the one I came up with.

After attending an online mushroom talk run by a friend of mine with Permaculture Sydney West it dawned on me that spawn is a way of distributing fresh mushroom mycelium evenly throughout the substrate to allow it to run and colonise the substrate. But what if you got mycelium from another source, mixed it through the substrate and allowed it colonise it in a similar manner to the grain spawn?

My thought was could I take the mycelium from a bucket which had already produced mushrooms and then use it in a similar manner to grain spawn? From some limited online research and reading through my books I didn't find any details about how to do it or even that you could. However, I also saw nothing that suggested it wouldn't work, so I figured the easiest thing would be to give it a go!

I made up and pasteurised some substrate as I had for the original three buckets then once I had this new substrate laid out on the table I took the mycelium/substrate mix from one of the original buckets, broke it all up with my hands then distributed it throughout the warm, freshly pasteurised new substrate. The other two buckets I emptied into the garden and then washed out the buckets.

I packed the new substrate/mycelium mix into all three of the now cleaned out original buckets and applied fresh micropore tape to each of the fruiting holes, closed them up and then placed them under the dining room table (as I did with the originals) for the mycelium to run through the substrate in a relatively temperature stable area.

I kept an eye on the buckets, opening them up once a week or so to see how they were tracking and indeed the mycelium was running through the substrate pretty well. The problem was that after about 6 weeks and a really good mycelium run they were showing absolutely no inclination to fruit. Clearly it was time to get serious!

I soaked one bucket in cold water overnight, then placed it in the ‘new and improved’ fruiting chamber (which I had installed in the garage) and a week later soaked the second one overnight and added it to the fruiting chamber. I kept an eye on them for another five or six weeks and not much happened. There was also no change in the remaining bucket under the dining room table.

When I say not much happened, one hole on one bucket did start to produce some oyster mushrooms, but in accordance with Murphy’s Law, the reservoir (cat litter tray) ran out of water just as that was happening, allowing the fruiting chamber to dry out and the mushrooms never came to much. I had another talk with a friend who is a mushroom expert and after much consideration we decided that while I had been doing the right things, the original spawn I used was for a winter strain and maybe that was why I wasn’t getting any fruit. It was summer after all, even if it had been a comparatively cool and damp summer.

I kind of lost interest at this point and transferred the last remaining bucket from under the dining room table into the fruiting chamber without bothering to soak it overnight. I did keep the fogger reservoir topped up just in case SOMETHING happened. And sure enough it did!

Some weeks later I was searching around the garage and noticed some large, white protuberances emerging from the side of the third bucket! Low and behold, we have oyster mushrooms! I quickly removed the bucket, harvested the mushrooms and transferred them to a container in the fridge and returned the bucket to the fruiting chamber. This process continued for a number of weeks with small flushes from, in the end, all three of the buckets.

From my playing around it does seem that the idea works, at least for one more generation. How long it will continue for I have no idea, because in my continuing research I have found out about the concept of strain senescence.

Strain Senescence

The term strain senescence when applied to mushrooms means that, over time as the cultures divide and age, genetic errors can creep in, changing their original vigour and vitality. This results in less mushrooms and smaller mushrooms even on the first flush of the next run. When that happens it is time to get rid the mycelium currently in use and buy more spawn, but I have no idea how long that takes, but from what I have read maybe five to six generations out. I will just have to see!

Either way it is a means of getting more mushrooms from your original investment in mushroom spawn so it seems to me it is worth considering.

3.3 Making a Fruiting Chamber

My research in trying to get the best harvest I could out of my mushroom growing efforts led me to the idea of a fruiting chamber. This is a structure that keeps the atmosphere surrounding the mushrooms high in humidity, while still allowing sufficient airflow so that carbon dioxide generated by the mushrooms can escape. Both low humidity and carbon dioxide build up and interfere with mushrooms fruiting.

People have made DIY fruiting chambers from many things, including: old, modified fridges, shower screens or windows constructed to make a cabinet, or a plastic tub (or tote) with holes drilled in it. (called a 'shotgun' fruiting chamber). One of the more popular ones, and the design I chose, was to use a small plastic greenhouse, and by small I mean the 580mm wide x 380mm deep x 1280mm high model readily available in hardware stores, nurseries or online.

Initially I set it up inside the house, in our lounge room to keep it a bit warmer and relatively temperature stable. Also, seeing as it needed to be sprayed with water using a spray bottle regularly, I wanted it to be somewhere I could see it and go, "that's right, I have to keep that thing damp!"

In its original form (just the greenhouse by itself) the fruiting chamber worked, but not very well and my sporadic spraying of water from the spray bottle didn't help, it just didn't keep the fruiting chamber humid enough, resulting in stunted mushies. There was also the other issue, on further research it seemed likely that due to the fact that the mushroom containers were fully enclosed to keep the humidity in, it also kept the CO_2 in, which also results in stunted mushies!

I needed a two pronged approach to make my fruiting chamber work better. The continual (and ineffectual) spraying I was doing got old pretty quickly and so I needed to get something of a more automatic type that could keep the chamber humidity high, thus removing the need for continual intervention by me!

I got hold of a fogger/mist maker of the type used in small indoor water features, you know, the ones with a fountain that is shrouded in mist for a calming effect. You plug the fogger in and immerse it in a water supply, it uses ultrasonic waves to create a mist which then rolls out over the fountains landscape.

I bought one off Ebay for the vast sum of $20 including postage, I set it up on the top shelf of the chamber in a cat litter tray which I then fill with water to act as the reservoir. My idea was the water vapour would be generated and then flow down over the sides of the cat litter tray to the mushroom fruiting containers below, and that is in fact what happened.

To install it I punched a 12mm hole through the side of the greenhouse/fruiting chamber (see below) and then unplugged the fogger from the plug in transformer lead. I placed the fogger itself into the cat litter tray, ran the lead through the hole and reconnected it to the supply lead, then plugged in the transformer. I then used a bit of the micropore tape to seal the hole through which the supply lead ran. I turned it on, the result? Fog!

Next, to improve the ability of the system to remove CO2 without also removing the humidity, I hit on the idea of using a 12mm hole punch to make holes in the top and sides of the fruiting chamber and then covering the holes with micropore tape. The tape allows gas exchange while retaining the water mist inside and keeping any unwanted wild fungal spores outside. That was the theory I was operating under and it seems to have been successful.

Next, I needed a place to set up the fruiting chamber for full time use, and sitting it in the lounge room wasn't going to cut it. All of that humidity is great for the mushrooms but there can be considerable condensation on the floor as a result. I have read that some people put theirs in the bathroom, for consistency of temperature (and the tiled floor would not be wrecked by the condensation) but our bathroom is too small for that so I elected to put it in the garage. The garage has a concrete floor but it does get a bit colder than I or the mushrooms would like but overall it seems to work very well except perhaps, in the depths of winter.

To use the chamber, just put your mushroom boxes, tubs, bags or whatever containing the spawn and substrate into the fruiting chamber shelves below the fogger and water reservoir, turn on the fogger and then zip up the front of the greenhouse/fruiting chamber and away you go. Keep a check on things every few days at least, so you can top up the water reservoir as required and see if fruiting has started. Some mushrooms will progress quite quickly, so you need to keep an eye on them daily once they start to emerge and harvest them when they reach the stage you want.

So far I have found the fruiting chamber to work very well and, all things being equal, allow me to get a much better harvest from commercial kits and DIY mushroom growing set ups too. It was cheap to put together but it is remarkably effective, so if you want to grow your own mushrooms I would suggest putting one together.

3.4 Using Commercially available kits

I have had variable results when using commercial mushroom boxes/kits over the years, trying to coerce a crop out of something which does not want to be forthcoming. Certainly part of the problem has been my lack of understanding of the process of mushroom fruiting and this has prevented me from providing the correct environment for fruiting to occur.

That, and some of the boxes have just been utter crap!

But, growing mushrooms with a kit can be easy, fun and productive once you know how to do it and has little in the way of up-front costs, just the kit itself and a few small one-off purchases to help along the way. The requirement for growing each mushroom type will vary and details for two types are provided below: the common and very popular button mushroom and the less well known but easy to grow oyster mushroom.

Button mushroom (Agaricus bisporus)

Button mushrooms will fruit and grow at the open top of the kit.
The kit will usually come as a corrugated cardboard box with a plastic bag inside containing the substrate and mycelium, there will also be a smaller plastic bag within the main one containing the casing material. Open the box, and the inner plastic bag, remove the smaller bag of casing material and inspect the substrate, it should be covered in white thread like material called mycelia or mycelium. If the compost substrate looks brown the mycelium run has not been completed, reclose the plastic bag, shut up the box and leave it for a week. Upon re-opening the box, the mycelium run should be showing up as white thread-like material, if not close up and wait another week.

Casing applied

Once the mycelium has run and it ready for the casing material, fold the opening of the box down onto the sides and then run the inner plastic bag down so that it keeps the cardboard flaps down against the side of the box. Then fluff up the mycelium containing substrate and even out the top, so it is level, then open the bag of cocopeat ‘casing’ and spread it evenly over the top of the substrate and mycelium. Give the casing a fine spray with water to ensure it is damp. The kit is now ready to go.

Place the kit in a low light area (not necessarily dark) that will maintain a temperature of 20 to 25° C and a high humidity. Humidity can be maintained by regularly misting the top of the casing a few times a day, but the best way is to put together a fruiting chamber. The fruiting chamber (See previous chapter) will ensure the mushroom kit stays in a moist but well-ventilated environment.

Comin' up!

They're up!

Fruiting should occur in three weeks or so, although this could take longer at colder temperatures. Fruiting starts with pinning, or the appearance of small white dots or 'pinheads' coming through the casing. Each pin head will develop into a mushroom. Mushrooms should be harvested by twisting them out of the substrate/casing. They can be harvested at the 'button' stage, where the cap is still attached to the stem, the 'cup' stage where the cap has detached from the stem but has not flattened out and the fully mature ‘flat’ stage where the cap has flattened out. The flavour of the mushroom becomes stronger and more ‘meaty’ the later the stage at which they are picked.

Flat, cup and button

Once the first ‘flush’ of mushrooms has been harvested, leave the kit in the fruiting chamber and it may produce several more flushes. The kit will continue to produce mushroom flushes until all of the nutrients are used up, after which the contents of the kit can be added to a compost pile or placed directly onto the garden.

Oyster mushroom (Pleurotus ostreatus)

Oyster mushrooms may fruit and grow from the side of the kit or the top. Depending on the maker of the kit, you may be required to set up using the outer box and the inner plastic bag, or just using the inner plastic bag. Before starting, ensure the mycelium has run through the substrate block to the point where it is predominantly white. If the block is not predominantly white leave it and check in a week.

Once the mycelium run is complete, open the box and remove the inner plastic bag full of substrate and mycelia. Cut a slit in the top of the bag or remove the top just below where it is sealed, fill the bag with cold clean water and allow it to soak for 24 hours. Once the 24 hours has elapsed, empty the bag. This is done to stimulate the mycelium to fruit, producing mushrooms.

If there appears to be a ‘skin’ on the surface, scratch it to expose the mycelium underneath. Either leave the top of the bag open or cut a flap in the long side with a sharp knife, but don’t remove it. Some kits may require to cut out a 50mm x 50mm hole in the side of the box, replacing the bag in the box and then cutting an X in the plastic bag through the hole in the box, to expose the mycelium. The kit is now set up.

Plentiful harvest

Keep the kit in an area which gets at least 6 hrs of light (either artificial or indirect sunlight) per day, within its preferred temperature range of 7°C and 25°C and preferably in an environment of 70% humidity. This can be facilitated by misting with a hand sprayer with cool boiled of filtered water 2 – 3 times per day or placing the block in fruiting chamber as mentioned above.

Check the block regularly. Mushrooms may start to appear within 7 to 10 days. Harvest then when they reach 7 to 10cm in diameter cut them from the base with a clean sharp knife and they will be ready to eat. Rest the block for a week, then recommence misting and more flushes of the mushrooms will occur.

Mushroom kit troubleshooting

No mushrooms –

1. **Too dry or too wet** – The substrate in the kit needs to be kept moist but not soaking wet, it should release a few drops of water when squeezed between the fingers. Checking on the kit regularly and misting as required should keep the moisture in the ideal range, but it is easier with a fruiting chamber.
2. **No air exchange** – ensure the kit is stored in an area where there is adequate ventilation to allow carbon dioxide out and oxygen in.
3. **Wrong temperature** – A temperature lower than the optimum range for the mushroom can slow the growing process down and too high a temperature can stop the process entirely and even killing the mycelium. Ensure the area where your mushrooms are growing is maintained within the optimum range for that type of mushroom.
4. **Impatience** – these things take time so be patient when things are not happening as quickly as you would like.
5. **A dud kit** – occasionally kits can be stored wrongly by the retailer or be too old when they were bought resulting in zero mushrooms. Buying fresh kits from a reputable supplier will prevent this happening again.

Oher issues

1. Fine powdery material around the kit when the mushrooms have fruited – these are mushroom spores and can just be wiped off with a damp cloth.
2. Flies around the kit – they are attracted by the compost, spread olive oil around the lip of the kit, the flies will get stuck to it and dry out.
3. Stunted spindly mushrooms that are all stalk and no cap – build-up of carbon dioxide due to poor ventilation, improve the ventilation.

Setting up and using a commercial kit is a great way to get into mushroom growing. Fun and educational for the whole family it is worth the small investment in money and time – and in the end you get mushrooms!

4.0 Growing Crops in Pots

4.1 Basic Vegetables in Containers

My brother grew tomatoes , onions , lettuce , silver beet , broccoli and cabbage on the balcony of a one bedroom flat in Cabramatta. 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 (see later in this section). They grow lettuce, tomatoes, herbs, onions and even watermelon, all in homemade containers.

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. Earth Boxes are the subject of another article.

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.

-Home-made 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

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. As previously mentioned 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.

4.2 How we grow potatoes

Back in 2017 when I redid and expanded the western veggie patches, I included a gravel area on the southern end that was in front of the shed, giving it a northerly aspect that I thought would be good to grow stuff, even in the cooler months. To make use of this area I needed to come up with some containers that I could grow crops like potatoes in. My original choice were white 20 litre containers but they were a bit narrow for what I wanted to do, plus over time they start to break down in full sun.

I looked around and found some black 30 litre tubs with a handle on each side at our local cheapo shop, so I grabbed four. These were more of the profile that I wanted, to allow the potatoes to spread out a bit, and because they were black, they would last for many years. In fact, they have been in place for seven years now and look almost no different from when I first set them up, just a bit faded.

Of course, they were tubs and not containers designed for growing things so I had to install drainage holes in the bottom so they would not fill up with water, but this was quickly and easily accomplished with my drill and 18mm spade bit.

I then half-filled them with a mix of compost and potting, placed a couple of seed potatoes, filled the pots up the rest of the way and then added some mulch to the top of the container. I have been growing potatoes in this way ever since, including through winter.

If you want to grow spuds 'up' by planting them in the bottom of the container, then adding more growing medium as they grow to get a larger crop, it is important to start out with a potato variety that is indeterminate as opposed to determinate. Indeterminate potatoes produce their crop along their growing stem, so that they need the developing stems to be covered as the plant grows to produce a bumper crop, they take longer to produce but because they grow up rather than out, they are better suited to small areas like containers.

Determinate potatoes grow to a set height and then produce their crop of tubers without needing the stem to be covered, the produce a faster crop but grow out rather than up so need more space.

Indeterminate potato varieties include 'Brownell', 'Desiree', 'Dutch Cream' (a favourite of ours), 'King Edward' 'Nicola', 'Russet Burbank', 'Salad Rose' and 'Sapphire' Determinate potato varieties include 'Carlingford', 'Kennebec', 'Purple Congo' and 'Red Pontiac'.

4.3 Growing Capsicums in Cans

Capsicums do not fit well into our veggie plot rotation; they are slow growers and slow to fruit so by the time they get really going there is only a couple of months left of production time and the bed goes under the chook tractor – frustrating! So we do grow them in other areas of the garden, particularly in the wicking beds in the front garden, but I figured that a few beautiful and productive plants scattered around in recycled is the way to go. The pots will also allow us to extend the harvest by taking them into the greenhouse before the first frost.

We buy our vegetable oil in 3 or 4 litre tins and I decided a good way to recycle them was to used them as capsicum pots. The process was a fairly simple one –
Using a can opener I took the top off the can and washed it out with detergent to remove any remaining vegetable oil, then to make drainage holes in the bottom I used and old fashioned can piercer and pierced a hole in each corner of the bottom of the tin. If I didn't have the can piercer it would be just as easy to drill some holes in the bottom.

To ensure the drainage holes do not get blocked up I threw in about a centimetre of 20cm scoria I had hanging around from a previous project (any reasonable sized pebbles or even gravel would do).

I then filled the tin with my home-made potting mix which consists of –

1 part coarse sand,

2 parts compost or worm castings (in this case I used compost), and

3 parts rehydrated cocopeat (AKA horticultural coir)

I use an old Chinese takeaway container of about 500ml but the actual size of the measure doesn’t matter, it is the ration of the components that counts, and mixed it all up in the ever useful cat litter tray (bought new for the process, not pre-used by the cats!)

I filled the tin to the top and then dug a hole and planted one capsicum plant (raised in the greenhouse of course) in each tin. I firmed the potting mix down around the roots and added a layer of the scoria rock on top to act as mulch and for visual appeal (i.e. to pretty it up a bit!).

After giving the capsicum cans a good watering the work is done and I can look forward to a nice batch of capsicums in a few weeks, and for me the smell of cooking capsicums means pizza!

Note: It has pretty damn hot around here lately with temperatures getting up above 40C and the capsicums have not been happy. I suspect that the roots are getting a bit warm due to the steel pot so if this happens to you I suggest putting the capsicums under vegetation so that the pots are not fully in the sun, paint the pots white (a shame because I like how they look) or even place them so that they only get morning sun.

Good luck!

4.4 Growing Veggies in Our Courtyard by Kevin Mechelmans

There are a number of ideas in this article that could be used in Zone Zero areas where there is sufficient light or could be adapted to growing under lights indoors.

Why?

So why would you grow your own veggies and go through that much work?
For me personally there were several reasons, I always loved growing things, to ease the financial pressure of living in Sydney, and it's a relatively cheapish hobby which is quite rewarding in the end.

How?

While currently renting a home with a small courtyard the only option was to grow out of containers. To know what sort of containers you would need you will first have to figure out what sort of veggies or fruit you will want to grow. From there on set up can be as expensive or as cheap as you'd like. You can either buy containers or scrounge for them, 200l drums cut in half lengths ways also make excellent growing beds. Buckets are also good growing mediums and extremely cheap. The other alternative if you still want your courtyard to look presentable and if you're a little handy with tools you can make your own wooden veggie boxes. You will have to make sure there is plenty of drainage in whatever medium you use.

One of the first things we bought was a bokashi bucket, which while it works well enough, it fills up pretty fast and smells anyway, after 3 months we went looking for an additional way of composting our leftovers. At the time I was toying with 3 possibilities, a worm farm, another bokashi bucket or normal composter or something else. I decided to go with something else, as we were trying to save money the other two were expensive options. What we did was find a 50l container and added 20l of soil on the bottom, then added the bokashi contents in the container and whilst holding our breath we added another 20l of soil on top and left it to decompose for a further 2-3 weeks after which it will smell more like wet soil.

Soil?

Unfortunately, due to it being a courtyard we had to buy potting mix, I could've dug a nice big hole in my in-laws front yard but I suspect they would not be all that impressed. Because we already had the bokashi bucket we did not need to spend mega money on the premium potting mixes available and where able to use the cheapest stuff we could find. Generally, I do not mix the potting mix with the compost, I add in 1 inch of potting mix on the bottom, add in the compost, about another inch, and then fill the container up to about ½ inch from the rim.

What did work?

Wooden Veggie boxes: the wooden veggie boxes worked better than I had imagined basil, squash, thyme, capsicums and tomatoes grew quite well drainage if excellent. Containers: currently growing several winter veggies in the containers and they seem to be going reasonably well, but at the moment it is still too early to tell for certain. The carrots on the other hand have worked out extremely well, and the radishes that I currently have in a 100mm deep container are growing like crazy.

We also currently have several fruit trees in self watering pots, a cumquat which I have had less than six months, and it already has fruit which is almost ripe, a dwarf nectarine tree and an Irish strawberry tree, they are all growing faster than I thought they would considering they are confined to a pot, using the same soil mixture as the containers
Polystyrene containers: onions, carrots (small round variety) worked well.
Buckets: plastic buckets seemed to have a mixed result, my sole strawberry plant has tripled in size since I removed it from its original container, and our Basil seems quite content as well.

What didn't work?

Wooden Veggie boxes: the strawberry plant did not fare as well as the rest, mostly because it got overshadowed by the other plants, although I did get around 15 strawberries during the season which tasted great, or the one I could get my hands on before the ants did.

Containers: need plenty of drainage, but otherwise successful so far.

Polystyrene containers: I haven’t had anything that didn’t grow in the polystyrene containers.

Buckets: The tomato plants have grown slower than usual and have not born any fruit yet even after being in there for over the required time.

Good experiences

Fruit and veggies

We have plenty of small lizards scooting about the place eating caterpillars and the like acting as a natural pest control.

Bad experiences

Bloody caterpillars mostly cabbage moths but also a few hawk moths!! I haven’t had any problems since I have been using a chilli, garlic and some dish washing liquid mix as a spray. Plenty of ants as well, haven’t had any problems with aphids though

For seeds, instead of using a punnet full of seed raising mix I used normal potting mix but sprinkle seed raising mix over the seeds and then water. The punnets then get placed in my greenhouse which in winter has a plastic cover and in summer 50% shade cloth.

If I plant seeds directly into the container where I expect them to grow I use the same principle, filling the container with the compost and potting mix but also sprinkling seed raising mix over the top after planting the seeds.

I also use 50% shade cloth for those containers in summer, late spring/autumn, in winter I tend to leave them open.

The greenhouse you can either make reasonably easily or buy, I got my two tier one from Bunning's

4.5 Growing Herbs in Recycled Containers

My elder daughter lived in a unit in western Sydney which has a large and a small balcony area. We did up a permaculture plan for the larger balcony, but I left the smaller one out because it is really small and only gets light at certain times of the day. A while back I gave her some recycled containers that I got from a friend, and she has gone full steam ahead and used them to create a herb garden on the smaller balcony.

The containers are white plastic ten litre ice cream containers, my friend runs a nursing home and they use this ice cream on a regular basis. If nobody has a use for them they are thrown out so I got hold of nine and kept three for myself (they are great for storing compostable materials before I toss them in the composter).

To create the herb garden all she did was drill a couple of 5mm drainage holes in the front, bottom of each container, then drill two holes in the back of each container near the top. Through these holes she threaded some thin rope and tied the buckets to the rail. The rope is sized so that back bottom of the containers are balanced on the edge of the bricks which make up the wall at the edge of the balcony and on which the steel handrail is mounted. This creates a tilting effect so that the water runs forward to drain holes and supports the containers so that most of the weight is taken on the bricks rather than on the rope.

She filled each of the pots with a good quality potting mix and then planted each of the six pots with a different herb – sage, parsley, chives, thyme, basil and mint. With everything in place, she has a space that is newly productive, herbs to use whenever she wants and it has been accomplished by reusing containers which would have been thrown out!

4.6 Setting up the Grape Vine

I have wanted to grow grapes for a while, but as usual, I found it difficult work out the right place to grow them. After some thought I decided to grow them up under the cover over the back deck, that way as well as grapes we would have shade in summer and sun in winter. There are some issues to be overcome with this approach, mainly around making sure the grape gets enough water without overflow or drainage staining the timbers of the deck. So, this is how I got around it.

The Pot

Our local shops have some black 30 litre pots with rope handles which seemed ideal for the purpose. The black plastic is very resistant to the sun – witness the self-watering pots which have been in the back yard for 7 or 8 years and still doing great service – so black it was (not that there were any other colours…….but you know what I mean!) Normally I would drill 12mm holes in the bottom for drainage, but as mentioned above I didn't want it discolouring the deck timbers so I chose a the following approach.

I put in a drain about 25mm up the side of the pot by drilling a 22mm hole with a spade bit and inserting a 15mm male to female irrigation adapter and screwing onto it a 19mm barb x 15mm BSP female threaded elbow. This allows any excess water to run out of the pot to the side, without making a mess of the deck. To ensure drainage, I mounded up some pebbles on the inside of the pot, around the drainage hole so the growing medium would not block the drain hole.

Water Reservoir

To provide a water reservoir in the pot so that the grape has a plentiful and continuous water supply I made a buried capsule to go in next to the grape when I planted it into the pot. I got hold of a 20cm unglazed terracotta pot and similarly sized terracotta pot saucer with which to make the buried capsule.

To start I installed a fitting with a 19mm thread on one end and a 15mm BSP barb fitting on the other into the drain hole of the terracotta pot. (you need two per capsule). To help secure the fitting into the capsule I butchered a Garden Rain 15mm Female to Female Rural Poly Irrigation Coupling and to join the reservoir to the capsule a length of 19mm clear vinyl tubing. One fitting is screwed into the drain hole of the pot and then the vinyl tubing is used to secure the two barbed fittings end-to-end. (for more detail see **here**)

To complete the buried capsule I siliconed the pot saucer to the top of the pot, creating a watertight capsule which is filled with water through the open end of the fitting secured in the drainage hole. The whole assembly is then buried upside down, so that the fitting sits above the soil surface.

I then placed some potting mix into the pot, installed the buried capsule and the grape vine, and filled the pot with potting mix ensuring that the grape was buried such that the soil surface is the same in its new position as it was in the original pot.

Something to Climb On

The idea is that the grape vine will now climb up one of the deck roofing supports and then spread out under the deck roof. It does, however, need some way of climbing up the supporting timber. I cast around to find something which would do the job effectively (but hopefully cheaply) and found some lattice which was designed to be used horizontally as a fence (it was 1800mm x 300mm border fence). All I needed to do was trim off the two spikes which would be used to secure it into the ground if it was being used as a fence. I then screwed on a couple of supports and then screwed the supports onto the deck roof support, and there you have it!

It is still early days and it will be interesting to see how the grape vine develops. I am assuming it will take several years to get where I want it to go, but I have the time.

4.7 Growing a Pineapple from the Cut Top

Pineapples are a tropical fruit but with a bit of work you can even grow them here in temperate Sydney with the right microclimate. The easiest way to do this is to buy a complete pineapple (that is to say, without the green top bit removed as is so often the fashion these days) from your local organic shop or fruit & veg merchant. Make sure the green top bit (technical term) is complete and not damaged.

Then follow these steps –

1. Cut down into the pineapple making two diagonal cuts under the green top bit, taking about 2 – 2.5 cm of fruit, so it can be removed from the pineapple.
2. Leave it to air dry for a couple of days.
3. Get hold of some potting mix (standard potting mix is OK or use my 1 part sand, 2 parts compost or worm casting, 3 parts cocopeat formulation) and a clay pot big enough to take the circumference of the fruit attached to the green top bit. Add a pinch of iron sulphate or iron chelate into the potting mix before planting.
4. Plant it into the potting mix filled pot and then cover with a plastic bag, with some ventilation holes punched into it. This will keep the humidity high and keep the plant hydrated until it can grow some roots.
5. Place the pot in a well-lit spot, but not in direct sunlight.
6. Pineapples can absorb water and nutrients through their leaves, so watering with weak liquid manure solution every week or two is worthwhile.
7. Roots should develop in 6 – 8 weeks at which point the plastic bag can be removed.

8. Leave the plant in a well-lit spot and regularly spray the leaves to water and feed it. Add some more iron sulphate or chelate to the soil when the plant is starting to flower.
9. Commercially pineapples can take 1.5 to 2.5 years to crop, so don't get too impatient because in the less-than-ideal conditions of a backyard it may take even longer. Ripening fruit in proximity to the plant (eg apples or bananas) will emit ethylene which may stimulate the pineapple to flower.
10. When the plant is flowering, move into a sunny position to assist the fruit in developing.

4.8 Setting up a Strawberry tower

This is an interesting idea for a Zone Zero Farm, but it brings with it quite a bit of weight. So before constructing and installing a tower of this sort, particularly on a balcony, it would be worth talking to a structural engineer to ensure that the structure it is installed on can deal with the weight. Just sayin'!

I call it a strawberry tower because that is what I will be using mine for, but it could just as equally be a herb tower, lettuce tower or tomato tower or a "whatever you want to grow in it" tower.

Raw materials

To make a tower like this you need a 205 litre plastic drum, preferably one that has not held anything nasty. The one I got hold of had been washed out well but even so it had only contained sorbitol, a food grade sugar alcohol sometimes used as a sweetener in sugar-free gums. To be sure I also gave it a wash out with water too!

To keep things fertile over time I wanted to construct a worm tower in the centre so I got hold of a one metre length of 100mm plastic tubing to house the worms. I also needed something for the strawberries to grow in so I got hold of some potting mix, compost, wood ash and sulphur (more about these later). I needed some rocks to go in the bottom to ensure good drainage but had some scoria hanging around from previous projects, so I decided to use that.

I also needed a lazy Susan bearing. The whole idea behind a tower of this type is that you can grow plants over its entire surface and being round most of it will get some sun at some time of the day. The trouble is that the quarter which faces south will get no direct sun, especially in winter, which for a fruiting crop is critical. I planned to get around this by placing a large, heavy duty lazy Susan bearing under the drum to make it easier to turn, and so far it is working.

I worked out where I wanted the tower to go so it would get sufficient sun and be reasonable accessible, which turned out to be the northern end of our front yard. Once I knew where it was going I grabbed a 600mm x 600mm concrete paver which was sitting doing nothing in the back yard. I used it to provide a stable base for the bearing to sit on, which would be where the drum would finally sit. The land slopes a bit so I had to dig out a bit of soil from the high end and check it with a spirit level to ensure it was level enough.

Constructing the Strawberry Tower

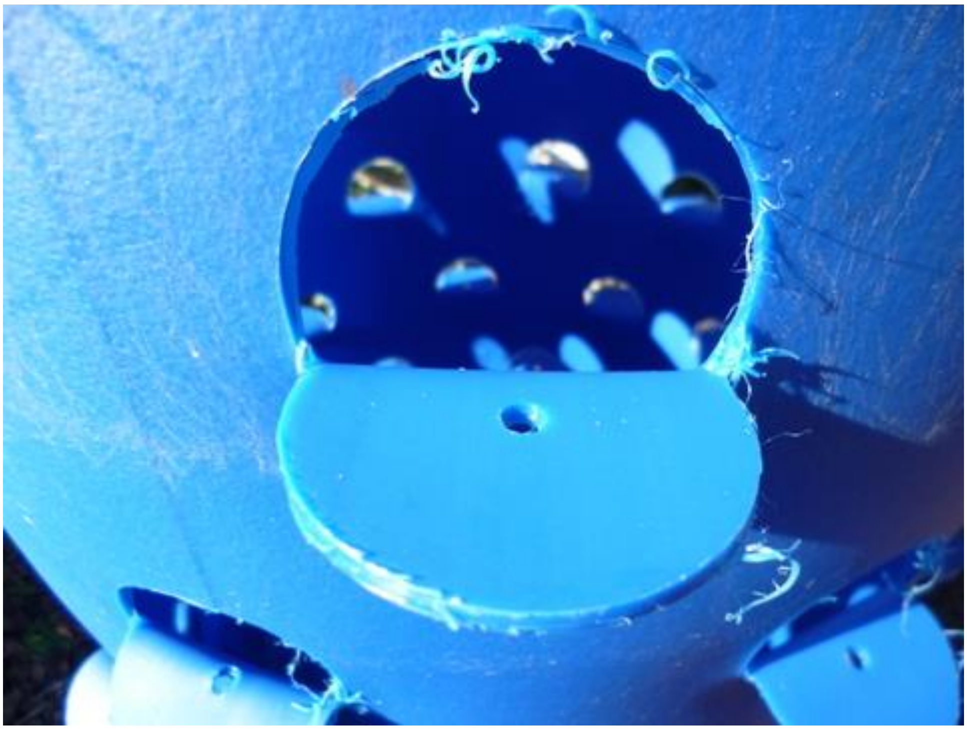
The first job was to remove the top of the drum, it was a closed head drum so it had to be cut off, but the drum being plastic made it easier. To remove the top I simply drilled a hole in the top at the edge the size of a jigsaw blade, then inserted the jigsaw and cut around the inside of the rim. Quick and easy, but it did create lots of small bits of blue plastic, which got, everywhere! I then turned the drum upside down and drilled some 12mm drainage holes around the edge of the bottom of the drum.

With top cut out and the drain holes in it was time to turn it back over and mark out and cut the holes where the strawberries are to go.

To mark it out, I ran some string around the circumference of the drum and then used some bits of tape to mark it off into 10 equal sections. I then used the string-and-tape to measure out 5 rows, about 200mm apart down the sides of the drum, then marked them with a dot of permanent marker. Using a small 1/8” drill I drilled a pilot hole into each of the marks.

To make the holes where the strawberry plants were to go I got hold of a hole saw, which I use with my drill. You can buy sets of hole saws and the largest one in the set is usually 50mm across, but sometimes bigger can be better and this is one of those times. I had a 70mm hole saw which I had bought to assist with a previous project so I used that. After getting the central drill lined up on the pilot hole, I drilled in then tilted the drill and hole saw up so that it only cut through the top half of the circle. The bottom half was still attached because I wanted to use it as a flap for the strawberry plants to grow out onto.

To form the flap I used my heat gun (looks like a hair drier but runs much hotter and is used to strip paint) to run hot air back and forth over the plastic until it was soft, then pushed the flap out and held it until it cooled down, it then remained fixed in place. Doing this took a couple of hours but was made easier by the fact that I had already mounted the drum on the bearing, making it easy to sit next to it and turn it around as required.



With the holes in place I made the worm “tower” for the centre. It was just a case of getting hold of the metre length of 100mm plastic tubing, drilling holes in it and then holding it in place while I filled the strawberry tower with growing medium.

Filling the strawberry tower

The first thing I did was to set up the worm tower in the centre of the drum so that I could fit the growing medium in around it. Then, to ensure good drainage I poured in scoria up to a level of 50mm to 75mm in the drum, then levelled it out with a hoe. With drainage assured I could put in the growing medium.

The growing medium was a mix of 50 litres of potting mix, 25 litres of compost and about 500mls of wood ash and about 150mls of elemental sulphur added in. The potting mix provides the basis of the mix with extra fertility provided by the compost, the wood ash is to provide extra potassium for good fruiting. The wood ash will, however raise the pH of the mix, but strawberries prefer the pH to more on the acid side so the elemental sulphur was included to drop the pH back a bit.

I made the mix up in my wheelbarrow, using a shovel and hand hoe to mix everything until it seemed to be pretty homogenous to me. To completely fill the barrel, I needed to make up 3 full mixes, with a bit of compost left to go on the top.

I filled the barrel up with growing medium until it was just level with the first row of holes for the strawberry plants. I then separated out enough plants so that I had one for each hole, then arranged them on top of the growing medium so that the roots were inside and the crown of the pant was level with where the growing medium would come to. I then shovelled in more growing medium, covering the roots of the layer below until it was just below the next level of holes. I repeated the process until the barrel was full and all of the holes were planted with a strawberry plant.

To finish of the process I filled up the last 100mm with compost and then added some sugar can mulch. To make sure that there were no spaces I watered everything in from the top until some water was coming out the bottom. The worms and veggie scraps will go in once things have had a chance to settle down.

Review and Lessons Learned - 2023

While it did work fairly well, it was not without its problems –

1. First off, there were too many holes/growing points. It would have been better to put in half as many and in the end, I wound up using every second one.
2. While the lazy Susan was a good idea, just using the bearing meant that it filled up with dirt and rubbish and after a few months refused to turn. I wound up replacing it with a similar bearing, but this time I screwed a disk of 20mm plywood (pre-painted green) on each side of the bearing and this worked much better. It is still important to give it a turn or two every few days to keep it turning freely.
3. I installed it in the wrong place, there was not enough light for the strawberries due to the shade from the mulberry tree, plus it was not in one of the more travelled areas, so it reduced the amount of turning that it needed. So, I emptied it, transported it around the back and installed it on a plinth of sorts, right next to the back door, but now the bananas have overshadowed it. So back to the drawing board!

4.9 Growing Okinawa Spinach

About a year ago, a Chinese friend of ours gave me some Okinawa spinach (hung tsoi or hong tsoi in Chinese), which I have been able to propagate, and it goes really well in any of the leafy vegetable recipes in our **recipe section**. It can be eaten raw or cooked, but it can go a bit slimy if overcooked.

Okinawa Spinach (I initially though the latin name was *Gynura crepioides* but seems that it is in fact *Gynura bicolou*) is a fast growing and productive perennial leaf crop which can grow up to 0.7 metres high, but it can become invasive if left to its own devices. It has green leaves with a purple underside so that as well as being productive it is also quite an attractive plant.

It is a tropical plant and so is very frost tender, but we have found that growing it next to a brick wall of the house with morning sun has allowed it to survive what has been for us a fairly hard winter with frost down to -3°C. My daughter also grows it and she has found, that even if the foliage is killed by the frost, it will re-sprout from the base of the plant when the weather warms up a bit. If all else fails you could use it as a perennial grown as an annual in areas where they temperature dropped too low in winter and just replant it every year. It likes moist, well drained fertile soil (what doesn’t?) with a pH of 6.0 to 6.5.

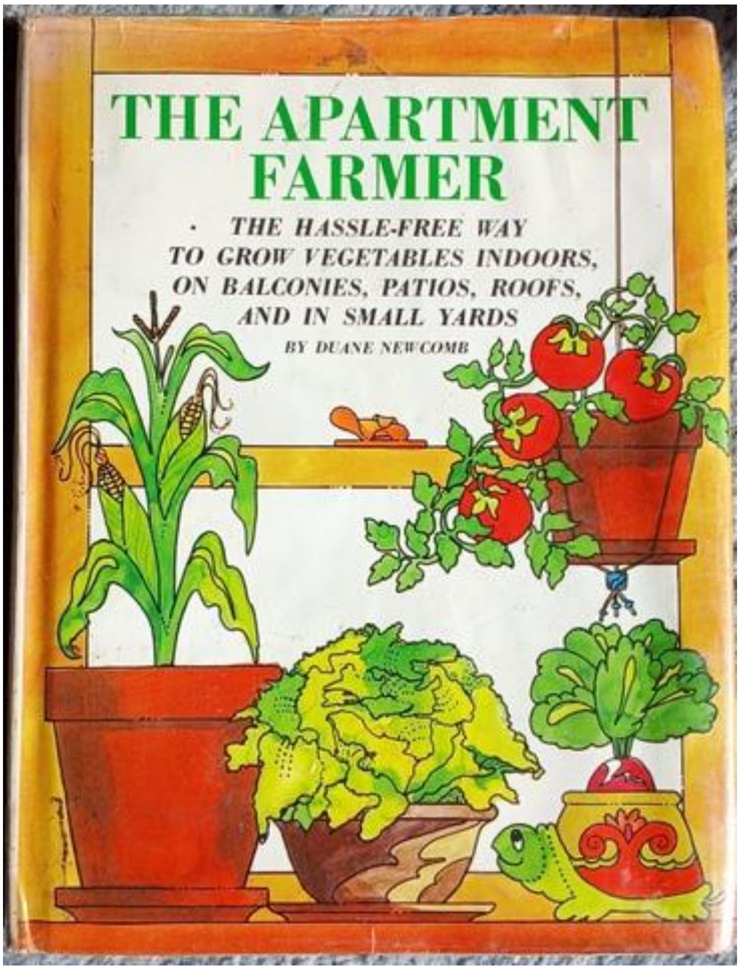
It is ridiculously easy to propagate from cuttings. Prune the cuttings to about 150 – 200mm long and remove the leaves from the bottom half of the cutting. Place the cuttings in water and renew the water if it starts to get cloudy. I did not use any stimulant (honey, willow water) for the cuttings to rapidly produce roots. The cuttings will send out roots and then can be planted into the soil in spring or summer. We planted ours into a found concrete pot with an olla made from two small terra cotta pots in the centre to allow easy watering and to keep the plant moist in hot dry weather.

Okinawa spinach can be grown in full sun if the water is kept up to it but also likes partial shade. As previously mentioned, our pot of spinach gets morning sun up until roughly midday then is shaded by the house in the afternoon.

Okinawa spinach seems to be affected by few pests or diseases but can be subject to attack from aphids on occasion, but if you can put up with that for a while and let the ladybirds breed up, they will keep the aphids in check.

4.10 Making a Windowsill Farm

With the increasing sizes of houses, the reducing sizes of yards and more and more people choosing to live in high rise apartments, we need to be finding more creative techniques if we want to grow our own food. Also, with the cost of living currently escalating, growing our own food is looking even more attractive.



Ironically, the idea for the windowsill farm comes from a book written in the '70s called 'The Apartment Farmer' by a gentleman called Duane Newcombe. He explains the concept and provides some line drawings of how it may be laid out. Once you have the idea, the rest will need to be tailored to your particular circumstances, and to your windows.

Finding a spot

When I decided that I wanted my own window farm, I needed to work out which window(s) to set them up in. Ideally it would be a north facing window, but the original builders of our house saw fit not to grace us with such a thing (or southerly windows either). Our house faces a little south of east, cutting down on access to the morning sun but the back faces a little north of west, so it seemed to provide some opportunity to grow stuff.

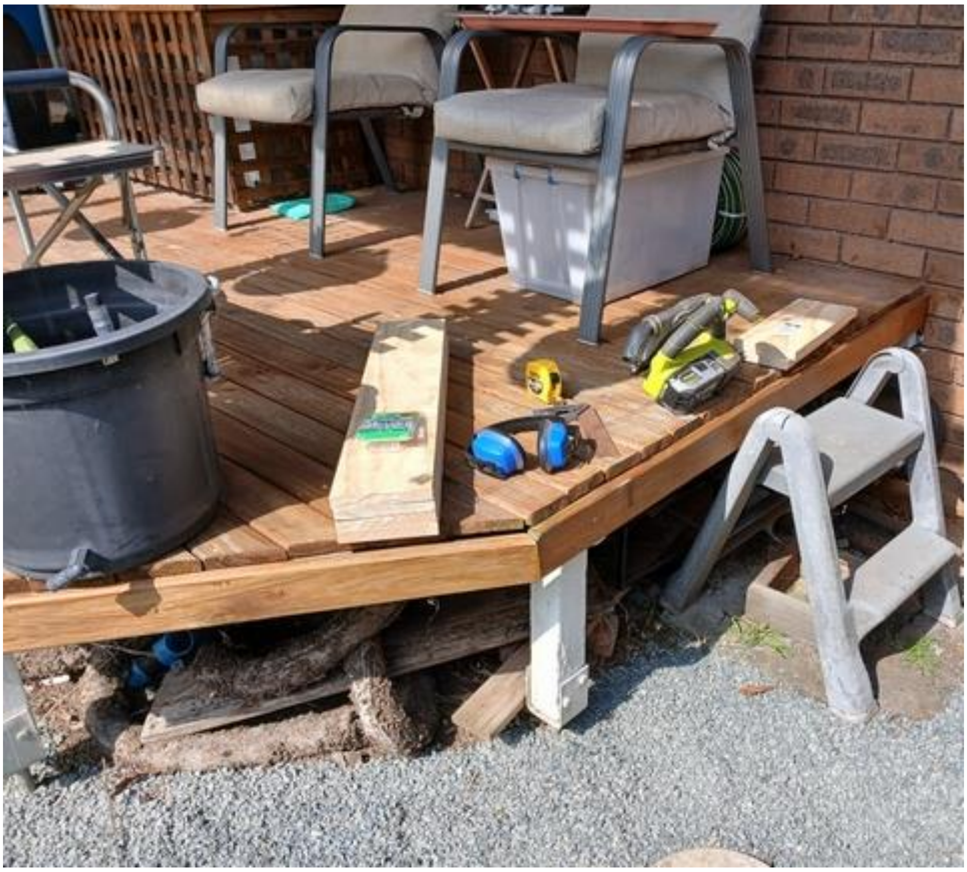
The office window from the outside, showing the effect of the mandarine tree

The problem is that I have spent many years trying to insulate the house from the heat, particularly the western summer sun, with structures and foliage. The result of all this work meant that the only two real candidates with any chance of getting enough light were the most northerly (my office) and most southerly (the dining room) western windows.

I chose the window in my office for warm season growing but both would work well for cool season growing. Another advantage of using the office window and its northernmost exposure was that, with a minimum of mucking around, I could still open the window easily to let fresh air in and providing air movement for the growing plants.

Building the Farm

I had some rectangular plant ‘saucers’, sitting around, bought on the cheap ($2 according to the labels) years ago for a long-forgotten project that were sized 730mm long by 220mm wide. I could put the pots on them to protect the wood of the farm frame so I decided to size the farm around them.



To make the frame of the farm I used DAR pine 240mm wide by 18mm thick, mainly because I had some, but also thought it would do the job. There is 1200mm between the windowsill and the inside top of the window frame so I cut the uprights to 1180mm and the shelves to 750mm to allow 10mm between each end of the ‘saucer’ and the uprights. This gave a total width of the farm to be 790mm, allowing about 60mm on each side once it was fitted into the sill.

Carcase

Carcase with shelves in place

To hold everything together I picked up 8 ‘multigrips’ (no, not the pliers, see below) that were 100mm x 35mm x 1mm to act as brackets. They were cheap, effective and didn’t take up much space. To secure the multigrips to the timber frame of the farm I used 8-gauge x 15mm long stitching timber screws with button head and Phillips drive.

'Multigrip'

The construction process was pretty simple: I just screwed a multigrip to each end of the four shelves using two or three screws, then screwed the ends to the uprights to form a rectangle, then screwed the two remaining shelves at about the 400mm and 800mm mark on each side. I did need Lindas assistance to hold stuff steady when I was screwing the shelves and uprights together but all up, even with cutting the timber to size it only took a couple of hours to make.

Installing the farm

To allow me room to be able to open the aluminium sliding window I needed to install the farm sitting a few millimetres back from the window frame. This was easy to do, but to make sure that it was solid and not likely to move I installed a small wedge between the top of the farm and the top of the window frame. This made sure that the farm was solidly mounted.

How it is Working

It is still a work in progress and somewhat experimental. The bottom floor of the farm has two tomatoes, some radishes and baby carrots, the second floor has sage, basil, mint and a lettuce and the third floor is, as yet, untenanted. I am still unsure if there will be enough light to grow the plants that I want and I need to rotate the pots through 180° every day due to their tendency to grow towards the light.

Also, there are some benefits that I did not see coming –

- It really looks nice, and it is a pleasure just to look at out food growing on the windowsill,
- With the window open and air coming into the room there is the odd herbal scent coming in with it,
- I have been working for years to build up barriers between the western sun and the house to keep things cooler, and as they grow, the plants will become an integral part of that barrier.

Irrigation equipment

All in all, even though it is still early days, I am very happy with how it has turned out and it was well worth the effort to construct it.

Update

It has now been working for a few weeks and some things have become clearer -

- The area only gets an hour or two of direct sunlight, even on a good day
- It is almost summer and there is just not enough light to grow radishes, or I suspect any veg from seed. The radishes are very leggy and the mandarine tree outside the office window is having more impact than I expected.

- Having said that, microgreens and similar things like shoots and soil sprouts to seem to germinate and grow well.
- Established plants like the herbs seems to do OK in this environment.

While I don't think these results reflect on the idea of the windowsill farm, they do underline the importance of working out what you want to grow, in combination with how much light is available.

5.0 Self Watering Containers & Other Irrigation Strategies

5.1 Introduction

In theory, because you are closer to your plants in Zone Zero Farm, you would think that it is less likely that they will be allowed to dry out, but life gets busy, and it is not always the case. Also, when growing in containers in zone Zero they can dry out more quickly, particularly if grown in a low humidity, air-conditioned space. Following are some ideas that can be used to reduce the likelihood of our precious food plants dehydrating and dying.

5.2 Making a Self-Watering Container

The idea of a self-watering container is similar to a wicking bed, in that there is a water reservoir that some of the growing medium is allowed to go down into and water from the reservoir wicks upwards by capillary action to keep the plants watered. They are a great idea and work to fix one of the biggest problems with container growing – the containers can dry out very quickly. The plant roots need water to be able to take up nutrients and oxygen, keep the plant from wilting and be productive. The problem I have with commercial self-watering pots is that the reservoir is usually much to small, so the answer: make your own!

The self-watering container, originally marketed in the US as an Earth Box and now is available in Aus, but you can also make them yourself. In principle, they are a container with a layer of growing medium on top and a water reservoir in the bottom and a structure that allows the growing medium to contact the water and wick it up to the plants in the growing medium by capillary action.

A good container to start with are those rectangular storage containers on wheels, you can buy them almost anywhere these days, I used ones 542mm long x 310mm high x 385 mm wide , 280mm high from bottom of growing chamber to top of rim and a volume of 55 litres. It is best to get the opaque ones made of black or dark blue plastic rather than the clear ones which suffer horribly from degradation due to the sun's ultraviolet light. The clear ones will turn very brittle in about 12 months whereas the black ones I used have been in use in the back yard for over 5 years and show no signs of falling apart.

To make a self-watering container I followed the process below and got to the point where it only took me an hour to whip one up –

1.Cut out the inner part of the lid to form the base of the growing chamber – use a jig saw by drilling a 6 mm hole and inserting the blade or starting the saw on an angle and slowly bringing the saw blade down into contact with the plastic. As you cut the rim off, stay as close to the outer rim as you can and when you are finished retain both parts.

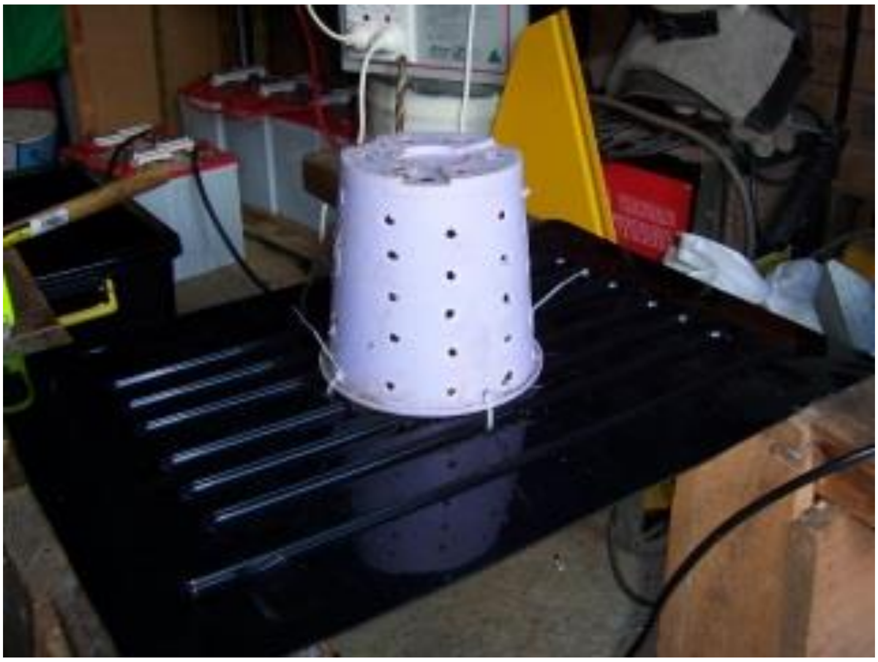
Note: This process is noisy as buggery so wear hearing protection at all times when using the jig saw and where there is any chance of flying materials always wear eye protection.

2.Use a Stanley knife or equivalent to trim off any plastic waste from the base.

3.Select the flowerpot that you are going to use as your capillary well, one about 125 +/- 5mm is a good size. To allow water access to the material in the pot it needs to be perforated. This may be done by a drill, but it is probably quicker to use a pad punch and a hammer with the pot placed over a piece of scrap timber secured in a vice. The holes should be around 6mm in diameter and placed in rows up and down the pot.

4.Measure the diameter of the pot and mark a circle slightly smaller than the pot (say about 2cm smaller than the pot diameter) using a pair of dividers on the top of the base that you just cut out.

5.Drill a 6mm or so hole just inside the scribed line, insert the jigsaw blade and cut out the scribed circle. It is important to be aware of what you are cutting onto……….if the saw gets hard to push you may be disfiguring your table or saw horses. (I’m speaking from experience here!)

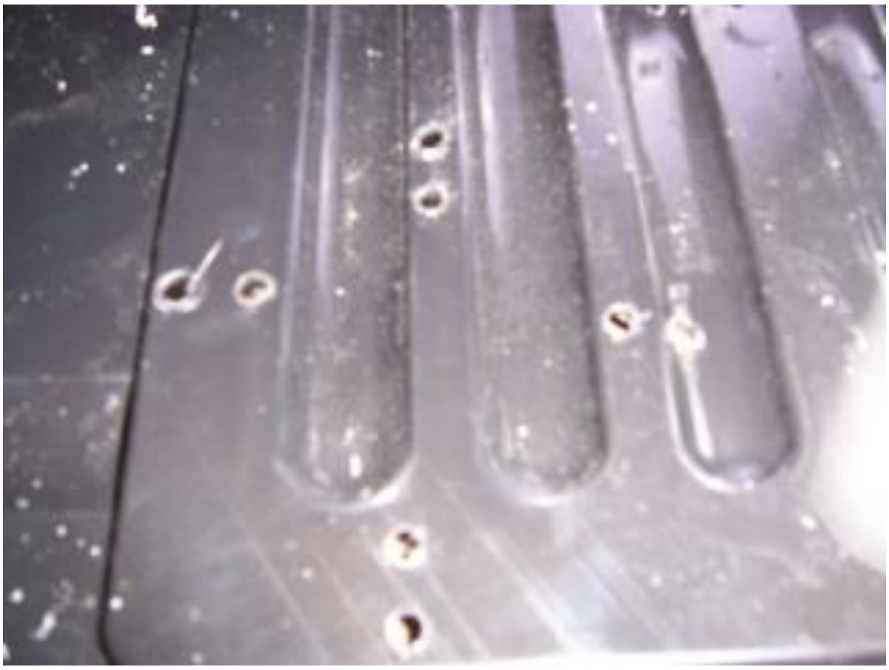


6.Drill or punch four holes equidistant from each other around the top of the pot. Place the pot top down on the base and over the hole you just cut out. It should be resting on the surface that will become the underside of the base. Drill four 6 mm holes in the base so that they line up with the holes in the top of the pot. Attach the pot to the base using four cable ties (I used 100mm x 2.5 mm cable ties, you will need 20 for each earth box you plan to build.) and then using side cutters, cut off the end of the cable ties.

7.It’s now time to attach the supports so that the base that will support the growing medium won’t wind up filling the water reservoir. I used 80mm diameter PVC pipe, because that is what I had but other things, even more pots if they are the same height, could be used.

8.Measure the height of the pot and then cut off 4 lengths the PVC pipe, I found a little band saw works very well for this but there is no reason why a hand saw would not do as good a job.

9.Drill the 4 equidistant 6mm holes again, around 6mm from one end of the cut pipe and then place the pipe on the base and drill a corresponding hole in the base and attach each piece of pipe with the cable ties. The base should now sit in the box and be stable. You should now drill a series of holes, say 6mm (1/4") through the base to allow transfer of oxygen and rainwater to drain into the reservoir below, I drilled them around the perimeter of the base and between each of the stiffening ribs.



10.In one corner of the base drill a 25mm hole using a speed bit or auger to fit the 25mm outside diameter plastic filler tube. Cut a length of tube so that when the tube is resting on the bottom of the box, it protrudes 25mm or so above the top of the box. Then chamfer the lower end of the filler tube so that one side is cut away, allowing water to be run into the bottom part of the box as needed.

11.Place the base into the box and drill two drain holes (around 6mm diameter is fine), one in the middle of each of the long sides of the box just below the level of the base, the idea being that when the water reservoir in the bottom is full, it will announce this fact by spurting water out of the drain holes.

12.The box is now ready to assemble by placing the base into the box and filling the top section of the box with potting mix, planting the veggies and then putting mulch on top.

Normal hay, straw or other organic mulch can be used or black plastic may also be used by putting it on top of the box then re-fitting the rim of the cut-out lid and making cross cuts in the plastic where each of the plants is to go. The black plastic will maximise solar heat in winter and keep weeds down but will not break down and add fertility to the box.

Almost any veggie can be planted in the completed box – a half a dozen brassicas, or eight lettuces, or a dozen shallots or you could fill it with herbs, the possibilities are endless. This year we grew ginger in one and had the best ginger crop ever!

You can also put liquid manure into the water that you fill the reservoirs with to water and feed your veggies at the same time. To fill the reservoir, I just run a stream of water from the hose into the filler nozzle until water gushes out the holes in the side, or top them up with a watering can and with a full reservoir you don't have to worry about going away for the weekend or a week.

2017 update

The self-watering containers are still working well in our backyard, some seven or so years since I put them together, and I thought I would mention what I have learned in the interim –

- Leave the plastic mulch off! It only cuts down on oxygen transfer between the atmosphere and the soil. Regular organic mulch works much better in the long run.
- Unless you have intentions on pulling things to bits regularly, cable tying everything together is not necessary. It can help to keep the central pot in place, but if you get a pot with a lip and then cut the hole so it is a bit smaller than the lip, it will support itself.
- Just to re-iterate – you really do need the black containers, preferably labelled as shock resistant or some-such. I was reading a garden book the other day where they talked about making these self-watering containers, but the pictures were of the translucent ones. Seems to me they had written the book from a theoretical rather than a practical experience perspective. (just sayin')

5.3 Revamping the Original Self-Watering Containers

17 years later……

In 2005 I put together 4 self-watering containers to grow various crops in the back yard. To access the article I originally wrote about how I did it, see above.

While I started out growing all sorts of things in them, I eventually settled down and used three of the four to grow members of the Zingiberaceae family, that is to say ginger, turmeric and galangal, and they have all been very fruitful. The fourth one has been a bit varied, with its occupants including, at various times, spring onions; tomatoes and cotton, among other things. Now I have decided to grow another of the Zingiberaceae clan: cardamom, in the fourth container but that is a tale for another time!

I must admit that it has been many years since I pulled them down, removed the growing crops and inspected the containers themselves as well as refreshing the potting mix, so it was not before time that I decided to do it this winter just gone (2022).

To start the process I cleared the area and put down a tarp to take the plants and spent potting mix, then attacked each container in turn, it took a few days.

The first part of the process was to remove any vegetation still growing from the rhizomes with secateurs, but because it was late winter here they had died back to the soil surface (except for the galangal for some reason).

The next trick was to tilt the container up on one end to allow any remaining water in the reservoir to drain out, which only took a few minutes. I then tipped the container fully over onto the tarp, face down so to speak and then removed the container from around the plant mass. At this stage the barrier between the growing area and the reservoir, the pot allowing the water to wick up and the supports for the barrier were totally enclosed within the plant mass in what should have been the water storae reservoir in the bottom of the container.

After a bit of rummaging around it was a simple matter to remove the supports (Plastic tubing), the pot and the root mass from the reservoir area of the container. One point of note was that when I originally built this set of containers I used cable ties to secure the pot and the supports to the underside of the barrier, although in later builds I figured this was unnecessary. It seems it really was unnecessary because the ones in place securing the supports and the pot were mostly broken and no longer effective, only one or two in each container were still intact.

With the bottom stuff removed, this left the barrier, firmly secured to the plant mass by roots and looking somewhat distorted by the weight of the plant mass such that the edges had a distinct downturn. To remove it from the plant mass was not as difficult as I expected and I removed all the roots from the side I had access to, then peeled it off the plant mass, leaving a whole stack of roots and rhizomes of the main plant, plus some weeds!

The deformation of the barrier needed to be fixed before replacing everything in the container so that all the new potting mix didn't get immediately dumped into the reservoir of the container around the deformed sides of the barrier. I did this by placing the black plastic barrier between a thick pane of glass and some fibre board, in the sun. The sun went through the glass and heated up the plastic barrier, softening it. The weight of the glass then pushed down on it, flattening it out again. Job done!

On inspection, the outer containers were in pretty good nick for being out in the weather for over 15 years, the only issues were caused by me falling over the *@%&*! things while carrying some stuff and walking backwards (don't ask!). Anyway a bit of silicone at the time and they were good as new.

It was then a fairly simple matter to replace the supports and plant pot in the correct area and replace the barrier so that the container could be refilled with potting mix. Unfortunately, the containers had bowed out a bit at the sides, which would have allowed some potting mix to fall into the reservoir area. To prevent this, I still had a bit of the plastic which goes around the top of the container spare, so I cut some lengths and placed them in the sides of the container to fill the gap.

I then refilled the container with potting mix, and after freeing some suitable (decent size reasonable root growth) rhizomes from the plant mass I replanted them in the potting mix and mulched them all with sugarcane mulch. Once the weather warms up they will have plenty of space and nutrients to regrow, while I process and/or pass on to others some of our sizeable rhizome harvest.

5.4 Making a Self-Watering Container from a 20 litre Bucket

The rectangular self-watering containers described in another article work very well for growing a number of veggies in the one container, but if you want to grow one larger plant like say a tomato, capsicum or eggplant then the 20 litre bucket (or buckets) may be the one for you. They are also quicker, cheaper and easier to construct and so are a good way to start out, plus you can make up as many as you want to plant the number of crops you want to grow. Needless to say, recycled buckets are the way to go, cheaper and more environmentally friendly; we get ours from a local hardware that gets them from the delicatessen next door. They have been used to ship and store cheese curd so they are food grade and can also be used to store dry goods such as flour, grain, sugar or pasta etc if you want. Herbicide or pesticide buckets should not be used for this purpose (obviously).

For each container you will need –

- Two recycled plastic 20 litre buckets (complete with lids if possible, although you will only use one lid per container).
- One small plastic pot approximately 90mm (or a bit less) high by 100mm wide.
- One 500mm length of 20mm wide plastic pipe as a filler.
- Two cable ties.
- 20 litres or so of good quality potting mix, homemade if possible.

Plus the following tools –

- Hand or electric drill plus –
    - One 6mm or ¼ inch twist bit (roughly, a bit bigger or smaller is OK)
    - One 20mm spade bit (or at least a spade bit slightly larger than your filler tube)
    - One hole saw, large as you can manage but 50mm is good.
- A jig saw with a blade designed to cut plastic
- 6mm (or so) hole punch and hammer
- Side cutters or scissors
- A black permanent marker

To make your container –

1. Take the container you intend to be the inner one and mark out where the pot is going to sit by placing it directly in the centre of the outside bottom of the container and drawing around it with your permanent marker. As luck would have it I could leave out this step because there was a raised plastic circle on the bottom of my containers that was more or less the same size as the opening of the pot I was using.

2. Then drill a whole stack of 6mm holes in the bottom to allow exchange of air and water where required and drill one hole on the inside of your marked line so that it is just touching the inside of the line or raised circle as it was in my case. Be sure to drill two holes on opposite sides of the centre circle to allow fitting of the pot. Also allow a 50mm or so area of the bottom of the container to be free of holes so you can drill the filler tube hole there.

3. Take the jig saw and poke the blade through the hole you drilled next to the centre circle and cut along the inside of the inner circle so that it is entirely removed and discard the bit you cut out, or throw it at your kids, either is good.

4. Using the hole punch, punch a few holes around the sides of the pot and two at the top, on opposite sides of the top. Using a hole punch in this case is generally easier than a drill of the pot has very thin walls like mine did.

5. Fit the pot on the bottom of the inner container by placing it over the large hole and fixing it in place by running a cable tie through each of the holes at the top of the pot and then through the holes you drilled each side of the 100mm hole in the bottom of

the container. Pull them up tight and cut the excess off with scissors or side cutters etc.

6. With the spade bit, drill a hole in the bottom of the container about 25mm in from the side in the area you left for it when you were drilling the 6mm holes. At this point you can also drill a 20mm hole in the lid for the filler tube to pass through.

7. Take the filler tube and saw one side away at the bottom on an angle of about 30 degrees to the side so that water being run into the filler tube can get out into the reservoir quickly.

8. Insert the inner container (now full of holes and complete with fitted pot) into the outer container. Drill a 6mm overflow hole in the side of the outer container at the level where the bottom of the inner container sits. You can measure down or just take the whole assembly out in the sun and look for the shadow that the bottom of the inner container makes on the side of the outer one.

9. Fit the filler tube into the inner container. It should be long enough to travel down to the very bottom of the outside container and still stick up a centimetre or two above the lid when it is in place. In my case 500mm was perfect and allowed me to get two filler tubes from one 1 metre long section of tube.

10. Drill your 50mm or so hole in the very centre of the container lid using the drill and hole saw, if you are lucky there will be a mould mark at the exact centre of the lid on either the inside or outside. If you are unlucky, draw two lines at right angles across the diameter of the lid and drill where they intersect.

11. Fill the inner 20 litre bucket with your potting mix and plant your tomato, capsicum or whatever in the centre of the container so that it will come out of the central hole drilled into the lid. And then fit the lid so that the filler tube is also protruding from the top of the lid.

12. Fill the water reservoir in the bottom of the pot by pouring water down the filler tube until water can be seen coming out of the overflow hole – and you're done!
This style of self watering container does not have as big a reservoir as the rectangular type so you will need to top it up a bit more often, particularly initially as the water wicks up into the potting mix, unless the potting mix was very damp to start with.
Despite the number of steps, these containers are much quicker to build than the rectangular ones and I set up a small production line and made five of the things in less than half a day. They are well worth a go, and will make veggie growing simpler and easier for you, as well as making it easy to move your crops around to catch the best sun, even with a full reservoir they are easily portable by trolley.

Update December 2010

You can't say I only talk about successes on this site, because here is one of the failures. The bulk potting mix that I used to fill up the 20 litre buckets seems to be somewhat deficient in nutrients and so the resulting tomato crop has been more than a little disappointing (insert swear words appropriate to your area here). The next trick will be to get hold of some good quality bagged potting mix and replant with new seedlings. In the words of a well-known philosopher - "bugger!".

5.5 Making a Self-Watering Container from a PET Bottle

One of the great ideas that has been developed in recent years to help us out with the long hot summers is the concept of self-watering pots. That is to say, pots for growing plants which have a built-in reservoir of water, which keeps the plants hydrated. As usual, the idea has been latched onto by pot manufacturers, but they seem to have missed the point. The commercially available self-watering pots have a very small reservoir and tend to be gimmicky, rather than a serious alternative to standard plant pots.

However, it is possible, even desirable to make your own and now you can use PET drink bottles to make a self-watering pot too!

1. To start out you will need a bottle that has enough volume for the roots of the plant to grow, so use at least a 1.25 litre bottle, although a 2 litre or 3 litre bottle would be even better! And don’t throw away the lid, you will need it.

2. Using a sharp knife (and wearing a solid leather glove on your non-dominant hand, I'm just sayin') cut around the bottle about two thirds the way down towards the base. The top will be the growing space, and the bottom will be the reservoir, and now you just need to connect them. This will be done with some wicking material, I use synthetic rope. Natural fibres can also be used but will rot down in time.

3. Nylon or polyester braided rope is ideal (polyethylene is hydrophobic and so not a good choice). Unfortunately quite often the material which the rope is made from is not put on the label, in which case you could ring or email the company to find out or just use one which is labelled if you can find one. I was able to find some labelled as being polyester where other types from the same manufacturer were not labelled.

4. Cut sufficient length for your wicking material to go from the bottom of your reservoir up to a least half the way up your growing area. If you are using a synthetic wick, apply a bit of heat to one or both ends to melt them, it will stop the wick fraying and make it easier to get though the bottle lid. Since the material is a wick and not a tube, this will not affect its ability to conduct water.

5. Drill a hole through the centre of the lid approximately the same size as the wick you are using, I used 6mm wick so I drilled a 6mm hole. Push the wick up into the growing area, ensuring you leave enough length for it to get to the bottom of the reservoir and coil around a bit.

6. Fill the top section with growing medium and the bottom section with water, assemble you pot and install your plant!

There will be no more coming home after a weekend away at the beach (well, it's hot, right?) to find all your beloved pot plants have dehydrated and died.

5.6 Making Small Olla's

There are occasions, such as when planting into pots or other planting spaces with restricted areas where the usual size ollas (380mm tall x 180mm max. diameter) just won't work. In this case I wanted to plant into 'self-watering' hanging pots but the alleged reservoirs built into the pots were tiny. So, I decided to add some small ollas with a base measuring 75mm, a top of 120mm and holding about 1350mls when full, to improve the water holding capacity of the pots. Also, near the mint in the herb spiral I used an even smaller olla composed of two pots that were 50mm across the base, 80mm across the top with the completed olla holding 500mls when full.

The process of making ollas of any size is simple enough. It is just a case of getting two terracotta pots the same size, using silicone sealant to block the drainage hole of the pot that will be on the bottom, sanding the top edges of both pots to ensure they are flat. Finally apply silicone sealant to the top of the bottom pot and placing the top pot so that the top of both pots are sitting together, sealed by the silicone. Leave them until the sealant is set (24 hrs minimum) then test by filling the new olla with water and ensuring there are no leaks. Easy!

Completed olla prior to placing in the herb spiral

Olla in place

My concern has been that the hole on the top (formally the bottom of one of the pots) was only about 8mm for the herb spiral olla or 11mm for the hanging pot ollas and getting the water in through a hole that size can be slow. I do have a small funnel which exactly fits the filler holes but allowing air to get out as the water gets in is what takes the time. I decided that one possible fix was to drill a small hole beside the main filler hole that would allow the air to escape as the water flowed in. I was unsure how to do it without completely wrecking the olla, but figured a small tungsten carbide tipped concrete drill might be worth a go.

After searching around I found a 3mm one which looked like it might work, I gave it a go on a piece of terracotta pot, and it worked perfectly. I lined it up on the top of the herb spiral olla and, again, it worked perfectly. The hanging pot ollas were already installed so I had to take down each pot and then drill each of the holes individually.

With all the ollas installed/reinstalled I tried filling them using my funnel and the water went straight in, only taking a couple of seconds to fill each olla until it came rushing out the breather hole. The experiment was a success!

It works!!!!

5.7 Bottle and Wick Irrigation for Pots

Self-watering pots are a wonderful idea! They reduce the amount of work you have to do to keep your precious plants watered and they are very water efficient, providing a reservoir so the plant stays hydrated but with a minimum of evaporation. Unfortunately, my experience with the commercial models is that the reservoir is way too small for the size of the pot and resultantly the size of the plants being grown. I prefer the homemade variety described earlier in this eBook, because you can make them to your own specifications.

The downside is of course that no matter whether your self-watering containers are store bought or home builds, it would be somewhat expensive to convert all potted plants over to this style of watering. This is especially true for those container-growing enthusiasts amongst us. So what is the answer?

I'm glad you asked!

The answer is to convert all of your existing growing containers over to the "bottle and wick" watering system. It is cheap, very water efficient and reasonably easy to do, especially at repotting time.

The idea is that a synthetic rope wick of the right type connects an external reservoir to the root zone of the plant in the pot, the water travelling down the wick by capillary action. This allows a large reservoir to be connected to a standard pot so that it will have all the advantages of a self-watering b pot, but without the expense.

How To

The first thing is to get hold of some material to use as the wick. Nylon or polyester braided rope is ideal (polyethylene is hydrophobic and so not a good choice). Unfortunately in many cases the material the rope is made from is not put on the label, in which case you could ring or email the company to find out or just use one which is labelled if you can find one. I was able to find some labelled as being polyester where other types from the same manufacturer were not labelled.

Cut the rope to size allowing enough length so that the rope will go to the bottom of the reservoir and coil around, run between the reservoir and the pot and still have enough rope left over to coil around the inside of the pot.

To keep down evaporation from the wick between the reservoir and the plant pot some plastic tubing, just a bit bigger than the rope, will also be needed. I got 6mm rope and 8mm tubing, although larger diameter rope would allow more water to be transported. Cut the tubing to size so that the rope will be covered from where it leaves the reservoir to where it enters the soil surface at the pot.

To make it easier to thread the rope into the tubing, apply a small flame gently to the free end of the rope so that it melts down a bit, this keeps the core and outer layers of the rope together and makes passage through the tubing easier. I used a needle to thread some cotton through the free end of the rope, then holding the pre-cut tube vertically, allowed the needle to act as a weight and pull the cotton through the tubing from end to end. I could then grab the cotton and use it to pull the rope through the tube so there was rope hanging out each end of the pre-cut tubing.

To make the reservoir, I recycled a two litre plastic milk bottle. I cut a cross up near the top of the bottle and inserted through it enough of the rope so that it went down to the bottom of the bottle and coiled around a bit. I then inserted the plastic tubing around the rope so that it fitted through the hole leaving no rope exposed.

I place some potting mix into the pot so that it was about a third full, then took the free end of the rope and ran it down onto the soil surface. I placed the plant in place and then filled the pot with potting mix, ensuring the rope wick is fully covered with soil. I then filled the bottle with water. Make sure the bottle lid is not on so tightly as to cause a vacuum as the water is drawn from the bottle, otherwise the water will stop flowing. The water should move along the rope wick by capillary action, and you can see the progress of the water through the clear tubing. It took a few hours to move along the 40cm or so of the wick I made, and you could see the progress of the water through the clear tubing.

6.0 Box Gardens

6.1 A Box Fulla Veggies – Making a Box Garden

In this article we will be talking about how to grow a load of seriously tasty veggies in a recycled polystyrene veggie carton, and some soil and stuff of course! Why a recycled polystyrene veggie carton? They are a good size, readily available quite often for free and they are light and easy to move around so it makes sense to use polystyrene boxes if you can get hold of them.

Reasons why you might want to make one of these little white marvels include –

- A veggie box is a good way to start small if you are new to veggie gardening, and
- You can add more boxes as your confidence and interest grows,
- They are a great project to do with the kids, you never know they might be the start of a lifetime of gardening,
- They make a great present for a family member or friend who isn't a veggie gardener,

- If you are in rented premises you can pick up and take your veggie garden with you if you have to move, or the landlord won't let you dig up the lawn.

The Process

The process is simplicity itself!

1. Get hold of the polystyrene box and make sure that it has sufficient drain holes to precent water logging. If there are no drain holes, like with a broccoli box then cut or push some through using a hot wire or hot soldering iron etc. Holes can be drilled into the polystyrene but it creates a whole stack of little white balls that get EVERYWHERE!

2. Half fill it with grass clippings and weeds making sure that none of the weeds have a seed head that will create problems afterward. It would also be better to leave out things like wandering jew or couch grass runners unless they have been left to dry out in the sun first, just in case. The weeds will decompose slowly and provide nutrients for the veggies so to get a better result use a mix of weeds providing a mix of nutrients.

3. Get hold of or make some good quality potting mix. If you want to make it you could try the 1 sand: 2 worm castings or compost:3 cocopeat mix or if you are buying it in get some middle of the range stuff (not too el cheapo) that is designed for growing veggies. Fill the box right to the top, the soil surface will drop somewhat as the weeds decompose.

4. Plant appropriate veggie seeds or seedlings , these may include –

BROCCOLI - Mini; broccolini

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.

5. Mulch any seedlings with a light mulch such as sugar cane but don’t mulch areas where seed is planted, particularly small seed like carrot or it may have difficulty breaking through once it is germinated.

Keep your box ‘o’ veggies in the sun, but near at hand so that you can harvest them when you need them. Even if you are an experienced grower it can be nice to have salad veggies or herbs in a box near the back door when it is cold and raining.

6.2 Making a Wicking Bed Box Garden

In the previous section you will read how to make a “Box Fulla Veggies” box garden out of a Styrofoam veggie box using some weeds and a bit of potting mix, it is ideal for almost any area I thought, until I met a lady who had problems with the water draining out of it when she watered. It appears that she lived in a second storey flat and only had the balcony to grow her veggies on and while she gave it a go, she had to keep apologising to the folks below for raining on their parade. The answer of course was to put together a box garden that did not need to drain by turning a Styrofoam broccoli box into a wicking bed.

The wicking bed is also very water efficient so if you veggies are without care for days at a time and/or you live in a hot area you may consider this as a more water efficient alternative to the standard veggie box garden. We use a Styrofoam broccoli box because it is light, available and cheap - there are some things that are totally undervalued by our society and in my opinion the Styrofoam veggie box is one of them. The process is simple –

Get hold of a broccoli box, a bag of potting mix or similar growing medium, some material to support the potting mix such as wood chips, gravel, perlite etc. (gravel is heavy and perlite is expensive so I go with the wood chips) and a length of filler pipe (I used some 55mm OD PVC because it is what I had hanging around and it is wide enough to allow you to see the water level).

1.Cut the filler pipe so that it is several inches longer than the depth of the box and then using a band saw or hand saw, cut a vee shaped notch out of the bottom of the tube to allow water to fill the support material

2.Place the filler tube into the box and then half fill the box with the support material.

3.Using a hot electric soldering iron punch a hole through the side of the box roughly level with the surface of the support material. This will be the overflow hole.

4. Place your growing medium into the box up to the level of the rim or slightly lower and then place organic mulch such as sugar cane mulch (bagasse) on top.

5.Plant your seedlings through the mulch then fill up the water reservoir through the filler tube until water comes out the overflow hole.

Once you have your box put together but before you add the water I suggest you position it roughly where you want it to go because putting in the water is likely to add another 8 to 10 kilograms of weight and moving it around after that will definitely be a two person job.

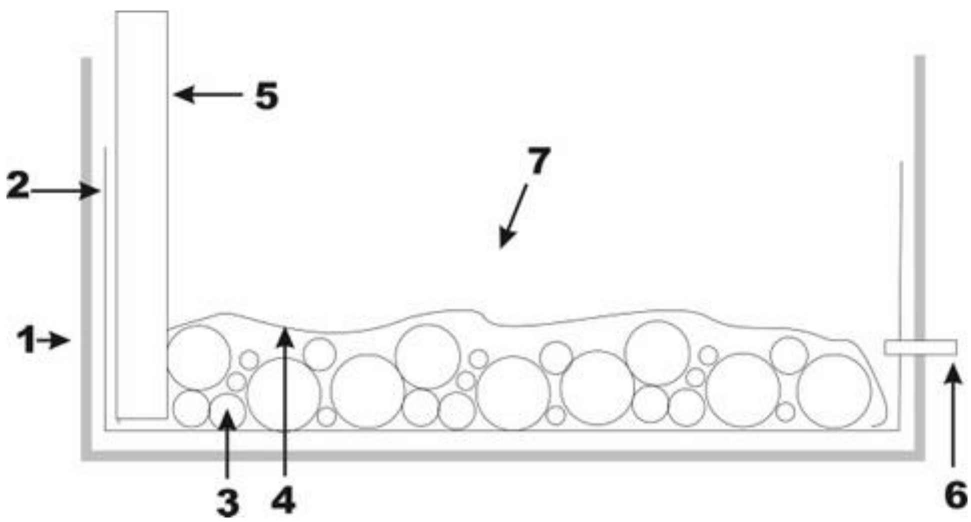
To keep up the fertility of your box garden apply a liquid fertiliser every two weeks. By making multiple boxes you will be able to produce all sorts of veggies and can even use crop rotation by not planting veggies from the same family successively in each container. The level of the growing medium will drop over time and need to be topped up.

This is another project that is good to involve the kids with; it's fun and will teaches them something about growing their own food, so give it a go!

6.3 Making a Wicking Bed Box Garden – Another Take - By Elaine Seaman

This article was written by Elaine Seaman, It is a novel way to make self-watering containers completely from discarded/recycled materials.

Basic Elements of the Wicking System



1. A container—large or small, anything from a large pot or half barrel to a polystyrene box, to a raised garden bed. For small containers a depth of about 30-40cm is perfect, 6-8cm for water and 20-30cm for soil.
2. A plastic liner, unless your container is already watertight. A large carrier bag, a piece of polythene packaging, etc. If necessary, buy some of the thickest builders' plastic from Bunnings. This should come up at least 6-8cm in the box, though if it comes all the way to the top that's fine too.
3. Something to put in the water reservoir that leaves plenty of space for water, and will hold up the soil above. Gravel, empty plant pots, old milk cartons—you get the idea, be inventive here.
4. Something to stop the soil above from falling into the reservoir below. A piece of geotextile is ideal, but an old T shirt would work for a couple of years, until it starts to break down.
5. A tube so you can fill the reservoir with water without disturbing your plants. A scrap piece of drainpipe, a juice bottle with slits near the base, you're beginning to understand where I'm coming from, aren't you? With drainpipe cut an uneven bottom edge so it doesn't form a seal against the polystyrene. You want water to flow out of it easily.
6. Possibly the most important part of the design, an overflow. This can be as simple as a hole about 1cm across melted in your poly box, and a corresponding hole in the liner. You can pretty it up with a piece of tubing but it's not necessary.
7. Fill up with good quality potting soil, or a mix of compost and soil, and then add your plants or seeds. Only plant seeds if you are sure you can keep the surface moist until they can get their roots down a few centimetres.

Water will wick up from the reservoir into the soil above, keeping the plant roots moist. The top layer of soil can get quite dry, but below that will always be damp.

What can I Plant in my Box?

- 6 or 8 lettuces from a punnet.
- 1 tomato or cucumber in the middle of one edge, and a few basil plants. To stake the tomato/cue, put a stick right down the inside edge of the box, but be careful not to disturb the reservoir or pierce the liner/base of the box.
- A selection of herbs—and keep the box close to your kitchen door for easy picking.
- 1 small variety pumpkin, or zucchini—allow it to trail over the edge and you can fit a few herbs or lettuces in as well.
- A dozen pea plants or climbing beans, make a stick wigwam for them to climb, but be careful with the sticks as above.

Don't forget your box will need plenty of feeding to keep your plants growing well. Liquid feeds like worm juice can be added straight into the reservoir via the fill tube. When you harvest some of your plants, just pop new ones in to take their place. Keep an eye on the water level in the reservoir. Bigger plants will use more water and need watering more often.

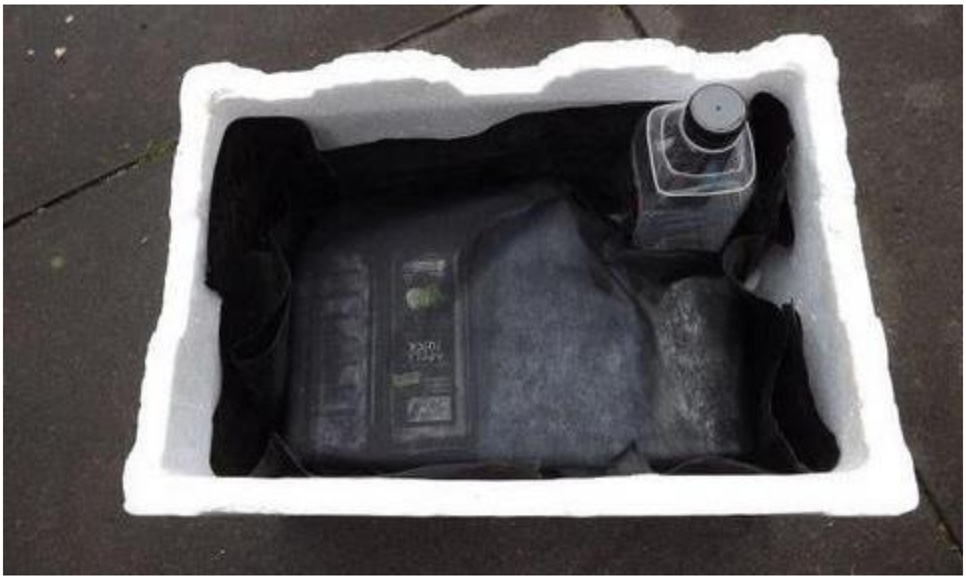
It's good to mulch your box with about 2cm depth of sugar cane waste or chopped straw or similar, which helps prevent evaporation—it breaks down and feeds the plants, too.

How to make a planter that waters itself, from a polystyrene box

Poly box with plastic liner, and bottles to form the reservoir. I have poked/melted holes in the bottles to allow the water level to rise and fall easily.

Close up of fill tube—this gives a larger hole than the bottle neck to make it easy to fill, and the top of another similar bottle, cut slightly larger, sits over it to keep the mozzies out. The rest of that bottle is in the reservoir.

Close up of the overflow—a piece of the liner cut out to coincide with a hole already in the poly box, at about the height of the top of the infill. If you have a water-tight box, just melt a 1cm hole, 6-8cm above the base.



A piece of weed mat or ideally geotextile is tucked down around the bottles. This box is ready to fill with compost.

The base of the fill tube. I have melted several slots to let the water flow out easily into the reservoir.

The compost is in and the reservoir filled with water until it started to overflow (at the overflow!). Here you can see the water level just by looking; with a narrower tube you can use a dipstick to check it. Ready for planting!

The finished product!

7.0 Growing Vertically with Containers

7.1 Hanging Pots

Hanging baskets/pots are great because they increase the amount of food you can grow, particularly if you only have a small space, make unproductive spaces productive and are good for amenity (they look nice). Over the years I have tried them with varying levels of success mainly because they have one significant downfall – the dry out quickly, particular if exposed to the hot dry winds of a western Sydney Summer.

I am always on the lookout to increase the area we can use to grow productive plants and just recently have been re-evaluating some of our vertical spaces. I have not done anything with hanging baskets for years and certainly not since the new back deck was constructed. So I took some time to have a look at what we could do.

Where to Hang them?

Just to refresh, our deck is on the western side of the house, to reduce the amount of sun hitting the back wall of the house and making it more tolerable on those really hot days, without having to run the air con 24/7. It was a great place to install productive hanging baskets, but I had a bit of a dilemma. If I installed the hooks on the outside end of the rafters, the baskets would get lots of sun in the cooler months but they may overheat in the full heat of summer, If I put them inside the protective blinds and under the shade cloth covered area they would not get enough light, particularly at the start of the growing season before the plants started to spill over the edge and trail down over the pot. What to do?

After much consideration, and to illustrate that light shines through to even the dullest places at times, I had my answer. As they say in the taco commercial - "Por que no los dos!" ie, why can't we have both? So that is what I did, I installed two sets of hooks for each hanging basket so that they could be hung in the outer sun drenched area or the inner more protected area as required.

What Pots?

The next decision was which pots to use. I wanted hanging baskets that were a decent size and after some looking around I found a brand that offered 340mm wide, 8 litre plastic self-watering hanging pots which were Australian made, so I bought half a dozen. I am not a huge fan of commercial self-watering pots because I find that the reservoir is usually too small and they are more of a gimmick than serious gear, but in this case I figured every little bit helps.

Mind you, I had no intention of leaving them like that. Before I put soil into the pots I made up an olla composed of two 12cm unglazed terracotta pots connected with silicon sealant, and with the same sealant blocking up the drainage hole of the bottom pot. This will give me a reservoir capacity of a bit over a litre, plus whatever is in the self-watering pot reservoir itself.

What plants?

This one was fairly easy. I wanted to grow productive plants which would trail over the side of the pot and look nice and jungle-y, so I chose cherry tomatoes and cucamelon, plus maybe a bit of luffa and Lebanese cucumbers as well.

7.2 Up-The-Wall Container Growing

While this was an idea that I originally stole from my mate **Salman**, and both of us used it on the side of a shed, it could easily be transferred to any vertical surface that received enough light. It uses recycled materials and allows you to grow food vertically with a minimum footprint, so what is not to like?

We go through a reasonable amount of milk and until recently bought it in 2 litre bottles, but it was brought to my attention that the 3 litre bottles are made from thicker stronger plastic and can be repurposed to make all sorts of interesting things. One of the interesting things that can be made is a vertical veggie garden. However small containers like these have a tendency to dry out pretty quickly on a hot western Sydney summer afternoon so I have made them “self-watering” by using the same method as used in the wicking beds.

Making the Containers

I found it easiest to save up a load of milk bottles and then convert them to plant containers all at once. After washing them out I made a cut just in front of the handle and then down and around the neck so that the main area of the body was intact but there was enough of an opening for a plant to grow out. I used my small band saw to make the cut but you could probably use a Stanley knife (with a leather glove on the other hand!) or a coping saw, or perhaps even a jig saw would do the job.

Once the bottles were cut I got hold of a bag of 12mm scoria left over from a previous project and poured 20 to 30mm into the bottom of each bottle, then drilled a 6mm hole in the side at the surface level of the scoria. That way the bottom 20-30mm acted as a reservoir and turning the bottle into a self-watering pot or verrry small wicking bed.

Once the scoria was in place it was just a case of topping up the bottles with potting mix and then plating a seedling in each. With the containers now ready to go, it was time to mount them on the side of the shed.

Mounting the Containers

I needed strapping of some description to wrap around the handles and secure them to the side of the shed and after a bit of looking around I found “Abey” brand builders strapping, used to join timbers together in construction work. The particular strap I used was 25mm wide x 0.6mm thick and at $4.50 or so for a 6 metre length it was pretty good value and it was pre-drilled with 6mm and 4mm diameter holes to make fitting even easier.

Having found my strap I cut off 10 x 90mm lengths using tin snips, one for each milk bottle, and bent them around in a U-shape with the ends flared out slightly to go over the rib in the shed wall. The shed is a Colourbond steel prefabricated shed with stiffening ribs formed vertically in the walls and by taking the strapping around the handle and down each side of the rib, I could put fastenings through the strap and into the sheet metal rib. This gave the bottles a secure attachment.

I must admit my first thought was to drill and pop rivet the straps to the shed wall, but it occurred to me that if I wanted to take the bottles down for any reason, like replace the potting mix, replant them or even replace the whole bottle I would need to drill out the pop rivets first. So after a small amount of consideration, I decided to drill the ribs and then use self-tapping screws, put in with my cordless drill.

It didn’t take long to put them up with the minimum of dropped screws and swear words. Although there were times when I was holding up the bottle, holding the strap in place, holding the screw on the end of the driver while driving it home, where a few extra hands would have been useful. As you could see I tried to be a bit artistic in mounting them, well I tried!.

I have been putting them up in the middles of a pretty hot summer and while the seedlings are staying wet enough, they are still suffering from the strong sun and are not particularly happy. I need to give them a bit of protection with some shade cloth or better yet, plant earlier in the year and give them a bit of time to grow on before the real hot weather hits.

An example from Floriade, Canberra a few years ago

Jan 2014 Update

While the veggies seemed to do OK, the hot weather really took it out of them. The containers are too small and too exposed to maintain a steady and reasonable temperature for good growth. The best thing would be to get them well and truly established earlier in the season before the hot weather came and to install them in a less exposed position where they have some relief from the midday summer sun.

Another problem has reared its ugly head. The containers are starting to fall off the wall because UV embrittlement of the plastic means they can no longer support their own weight, so about 12 months is the best you can expect from the untreated containers. If you want to try this method I suggest painting the containers first with a non-toxic outdoor paint to put a barrier between the plastic and the UV. Again, a more sheltered position would probably extend their life too.

7.3 Repurposed Potato Sack Vertical Container Garden - By Angie Sweeney-Bas

I have a balcony on my apartment. This is the only "land" I have to work with to grow veggies. Because of this a vertical garden on the side of a wall helps to grow on all areas of the balcony. I have used mine to grow salad greens, but you could use it to grow smaller veggies or herbs.

Materials:

Potato sack or old clothes
Sewing machine
Scissors
Pins
Hooks
Plants
Mushroom Compost or nice soil


BLACK
CROW
ORGANICS
Growers of
Quality
Organic Potatoes
Tenthill Qld
Australia


JANOME

Method:

I chose a potato sack for a few reasons. Firstly it re-uses something, Secondly it already has the sack look to it which does some of my work for me and lastly the thread in the material is woven loose enough to hold the soil but still pass water through.

1. Mark out where you will sew the sack. I marked it out into 9 equal squares, but you could make them bigger and make 6 squares or 4 squares. I would not go smaller than 9 though.
2. Sew along the pins to sew both pieces of fabric together. It should look like the side of a rubix cube but stretched a little. My boxes were 6 inches by 10 inches.
3. Sew again over the squares but use the zig zag stitch to make it stronger.
4. Sew around the outer seams with zig zag stitch to strengthen them. Just make sure you do not sew the top together.
5. Sew buttonholes into the back piece of fabric at the top of each box, or as many as you feel it might need. At this point you could also use eyelets. I used 3 buttonholes at the top of my sack. This was one per pocket since I had 3 pockets at the top. You could do more, but I would not do less than 3.

6. Cut the tops of each box to create a pocket. At this point you could hand blanket stitch across the top of each pocket to stop fraying and make it stronger.

7. Use cup hooks to hold it onto your wall or a door. This is what I did, but you could use lots of things to hang it and it depends what you will hang it to. You could use wire, coat hangers, 3M hooks, string.

I read somewhere that planting the plants into Mushroom compost is best so this is what I did. It could be that it holds better in the material as Mushroom Compost is coarser. Might have nothing to do with nutrients. I also used Seedlings. Use seedlings if you are going to plant into Mushroom compost. Otherwise, you can plant seeds into nice potting soil.

So far it has seemed to work well. The bag seems to hold the water too to keep the plants moist. I feel like the eyelets would be sturdier, but it has not fallen down so far. I have planted it on a wall that gets lots of sun so it should work well.

8.0 Growing Veggies from Seed

8.1 Why Grow Veggies from Seed?

Next to being able to save seed from your own veggies, I think the ability to grow your veggies from seed is one of the most valuable skills to have. It is easy to learn, needs a minimum of kit and does not require a huge amount of time, money or effort, but why should we bother?

Reasons to grow from seed –

1. Save Money – A cheap punnet of 8 to 10 veggie seedlings can cost around $4.00 (AUD, 2023) and some can even run as high as $8.50, whereas a packet of 750 lettuce seeds can be had for as little as $2.00.
2. Variety – As far as commercially available seedlings go, you would be lucky to find 3 or 4 varieties of, say, tomatoes available at the hardware or nursery, whereas there are over 200 varieties of tomatoes that can be grown from seed. There may be a variety out there ideally suited to the environment you are growing in, and if you grow from seed you can try out as many as you want! Also, if you want to try growing an unusual vegetable, it may not even be available as a seedling and growing from seed may be your only option.
3. Grow from your own – As I mentioned above, being able to save your own seed is a valuable skill to have, but to be able to capitalise on that of course, you also must be able to grow vegetables from your saved seed.
4. You can grow root crops – Root crops need to be direct sown where they are to grow and do not do well if raised in a punnet then transplanted. I know that it is possible to buy carrot seedlings in punnets, but they will not do well and are a waste of money. The seeds need to be sown directly, and a knowledge of growing from seed will assist!
5. Resilience – You can store seed, home grown preferably, but commercially available as well. This will increase your options should there be personal issues like unemployment, or if there were to be something more widespread, like another pandemic. In the middle of the Covid pandemic, when there was a renewed interest in home growing, seedlings and then seed became difficult to get. If you are used to

growing your own veggies from seed, you won't be reliant on others for seedlings and so more resilient in your food growing.

6. Spread the Harvest, reduce waste – One of the things with buying, say, a punnet of 8 to 10 lettuce seedlings, is that they all go in the ground at the same time and mature at the same time. So, unless you have a big family it is highly likely that you will harvest two or three of your lettuces before the rest start to bolt to seed and become bitter. Sowing your own means you can grow as many as you want, when you want, reducing the amount of your crop that doesn't get eaten.
7. Control – You will know what has been applied to the seedlings, and what has not. There is no way of knowing if commercial seedlings have been treated with chemicals of some type. Note - If you want to grow organically and are growing from commercial seed, check the packet to ensure that the seeds have not been coated with a fungicide prior to being packaged. It should make note on the packet that the seeds are not suitable 'for food, feed or oil'.
8. Satisfaction – it is remarkably satisfying to be able to harvest and eat a vegetable which you have nurtured throughout its entire life journey, from germination to maturity.

Whether you are direct sowing your seeds, or sowing into punnets to grow your seedlings, it is worthwhile from so many angles. It is a simple skill worth acquiring, why don't you give it a go today?

8.2 Sowing, Potting on and Planting Out

Sowing seed into punnets

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

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

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

These are some punnets in my collection

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

If you are re-using your seedling punnets you should wash them in disinfectant and dry them off before you use them. This is to prevent a build-up of diseases like damping off, I usually use Dettol® or one of the "el cheapo" quaternary ammonium disinfectants available from the supermarket. Another way is to wash them with soap and water, then put them out in the sun to be dried and disinfected by the sun's rays.

This is the style of punnet I use mostly today

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

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

Sieved compost (L) and Raw compost (R)

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

This is what the mix looks like

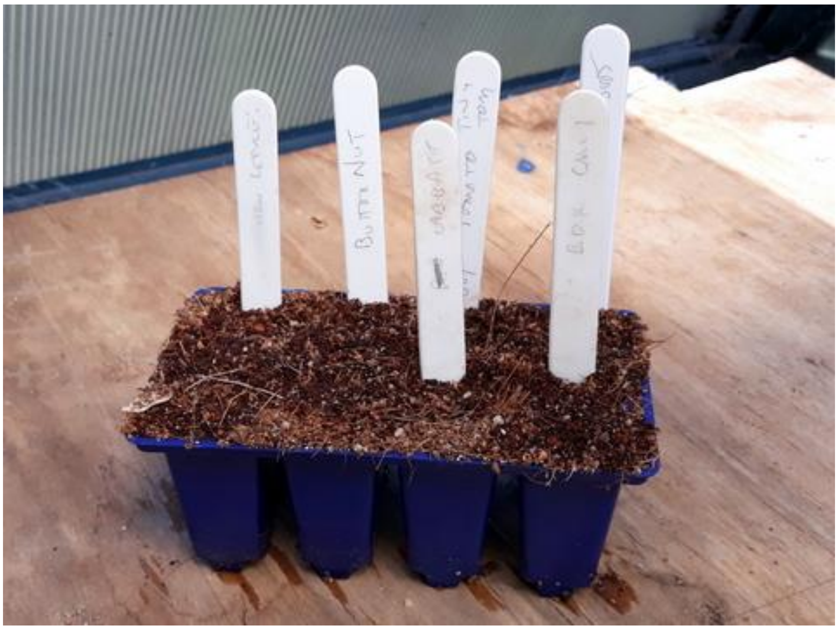
The compost/worm castings give some nutrition and body to the mix, the cocopeat ensures water retention and the sand ensures drainage. I was adding one part of perlite to the mix and also tried vermiculite, but both were expensive so I left them out and it did not seem to make any difference. I use a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

Vermiculite (L) and Perlite (R)

A Quiet Warning

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

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



A punnet sown and labelled

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

The veggies have sprouted!

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

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

Capillary bed in action

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

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

Potting On

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

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

I used to pot the seedlings on into 100mm lengths of cardboard tube that I was getting from where I was working at the time (They are the spool around which paper for the

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

The old system

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

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

My potting on tool!

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

8.3 Making a capillary bed

The amount of water held by punnets in which seedlings are grown is fairly small, and there is nothing quite so demoralising as coming home after a weekend away or a particularly hot day to find all of your seedlings have dried out and are now fried. Fortunately there is a piece of kit which you can throw together quickly, most likely from stuff you already have hanging around, which can prevent fried seedlings from ever happening again. Enter the capillary bed!

Another advantage of using a capillary bed is that it allows you to keep your punnets moist without having to water them from above and possibly washing some of the seeds out. This can be a real problem, particularly with the smaller seeds.

A capillary bed in use

In basic terms a capillary bed is a container of coarse sand which acts as a store of water. Seedling punnets or other plant pots are sat on the sand and water passes up into them and keeps them moist by, you guessed it, capillary action. The better ones have a method of keeping the water topped up too.

To start making your capillary bed get hold of a cat litter tray, they are available from the el cheapo shops for a few dollars and are mind bogglingly handy for plant propagation and other grow-it-yourself tasks. They are great for mixing seed raising/potting mix, carrying stuff like punnets or pots around and they can be used when sorting seeds from trash. Let's face it, if all else fails you could use it for your cat!

To fill the cat litter tray, you need coarse river sand. Course sand is best because it doesn't crust over and river sand has no salt issues attached as beach sand may. Fill your cat litter tray almost to the top with the coarse sand and then water with a watering can until the sand is saturated. It is then just a case of resting your seedling punnets, newspaper pots etc on the moist sand.

Judging the water level using a pot

I have operated these for years and they work very well, and no fried seedlings!
With a little bit of effort you can extend the period between waterings even more. Get hold of a small pot, the one I use is 70mm long by 50mm in diameter at the top, and sink it into the sand as far as it will go. Then get hold of a small empty bottle where if you insert the neck into the small pot it comes about half way down.

The pot I used

Fill the bottle of water (I use a 600mm soft drink bottle) and insert it neck down into the pot. As the water level drops below the level of the bottle neck due to evaporation and usage by the seedlings, more water till flow out of the bottle to maintain the level. This will happen until the bottle is empty and requires refilling.

Sand and pot in place

It is a simple thing to make, but it makes growing your own from seed much easier and more secure.

8.4 Making Newspaper Pots

For years the process that I followed to produce my veggie seedlings was to put the seeds into punnets, then once they were at the four leaf stage I would fill cardboard tubes with the same homemade mix we used to state the seedlings off and then pot on the seedlings into the tubes. I got the tubes from work, they were 800mm long and 60mm wide so I used my band saw to cut them into 100mm long planting tubes. Unfortunately, about 12 months ago, I was retrenched from that particular job so the supply dried up. It took me the 12 months to burn through the tubes I had in storage but all of a sudden i had to come up with something new.

I have been aware of the old newspaper pot trick for years and never had to use it, but with my tubes all gone, the newspaper pot seemed like the answer to a maiden's prayer, or at least mine anyway. I was concerned that they would not stand up to the task of being moist and full of growing medium for weeks at a time, but they have surprised me! Another surprise has been that the seedlings actually seem to hold better for longer and are happier in the newspaper pots rather than the old tube style, so if you want to follow my ideas give it a go.

Plunger and base - pot maker and they work well

There are apparatuses that you can buy to help you make the pots that consist of a plunger and a base (OK so it is a hopeless description......just look at the photo!) but you can achieve the same thing with a straight sided drinking glass or jar. For the purposed of making the pots to take out seedlings to grow them on before planting out, a base size of 60mm to 80mm would be best.

1. Get hold of some newspaper and cut it into strips 10 to 12 cm wide by about 60cm long (ie the length of an open newspaper page). If the glass you are using is bigger than the recommended 6 to 8cm the strips will need to be proportionally larger.

2. Wind the strip around the open end of the glass with about half the diameter of the glass or a bit more overhanging the edge.

3. Fold the free edge over into the open end of the glass so that it is lying along the inside surface of the glass. Then slide the paper off the open end of the glass.

4. Place the bottom end of the pot on a flat surface and fold down the inner flap of paper to form the base of the pot then reverse the glass and push it into the pot bottom first so you can push down and flatten out the bottom of the pot. This is easier to do if you are working on a firm, flat surface like a table.

5. Job done!

The pot can now be filled with the seedling raising/potting mix and a seedling. Making the pots is easy; you can make a stack while sitting in front of the TV at night and then plant them out as needed.

8.5 Germinating Seeds with a heat pad

Over the years I have liked to be able to get some warm weather seedlings such as tomatoes (particularly), cucumber, zucchini, capsicum and on the odd occasion chillies, up and going early. We have a greenhouse, which makes things easier, but we still get to zero Celsius or a bit below and there is no artificial heating in the greenhouse.

Considering these factors, even though I like to sow them early, they rarely come up. While I was aware of heating pads to assist such endeavours, my original thoughts were that I would have to provide 240v power to the greenhouse to operate said heating pad. This, of course, was incorrect. The use of the heating pad is purely for the purposes of getting seeds to germinate, and the veggies I wished to germinate do not need light. Once they are germinated the seeds can be relocated to said greenhouse, and they will thrive.

So I decided that I needed to get myself a heating pad!

I think that it is worth noting that if you germinate your seeds inside your house, they do not require a lot of extra heat, (tomatoes need to be somewhere between 20^{o}C to 30^{o}C depending on who you read). We don't heat the house overnight and it can get chilly here, down to 15C or less inside.

There are various levels of complexity, some with variable thermostats, some without, and of varying sizes and shapes. It also appears better to use a heating pad that is designed for use with seedlings rather than for other purposes such as keeping pet reptiles warm or brewing beer in colder areas.

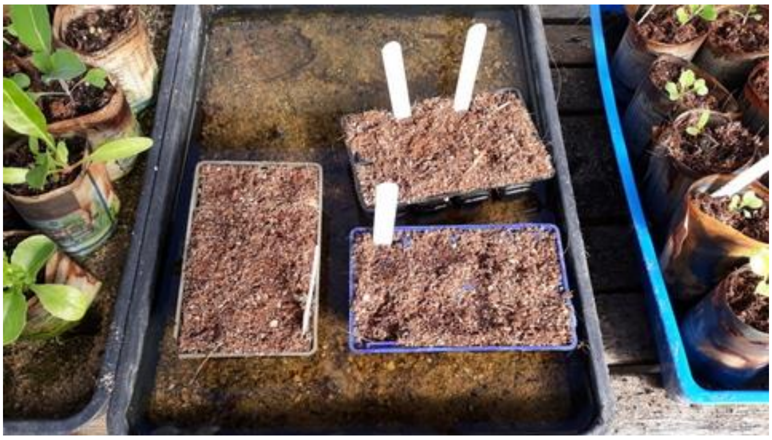
The one I got was a 'plug in and run' with no controls or lights of any description, but it was available immediately from the hardware store and seems to do the job. It also uses a ridiculously small amount of energy at 10 watts so that even if you are totally off grid it would not be an unacceptable overnight power drain.

The instructions stated that it heated the seedlings up to 10^{o}C above ambient temperature. If you were doing this outside in winter (at least around here) that would not be enough, but inside it worked fine. The instructions also make the point that the heat pad should not be located near a heat source such as an appliance or in full sun because this may cause overheating of the seeds. Also, getting it wet should be avoided because it is electrical equipment.

How I set it up and results

Obviously, it needs a source of 240vAC electricity to run it, so I set mine up on our dining room table next to our tabletop oven. Yup! I did make sure it was few centimetres away and on the rare occasion the oven was in use it did not add anything to the temperature of the seedlings. In this position it was also near a western window where the punnets got some indirect light but were protected from direct sunlight by an awning. This meant it was also in an area where I could keep an eye on the whole set up.

Once set up and running I put together some 8 celled punnets with tomato, cucumber, zucchini and capsicum. I did some monitoring of the temperature and, for example, with an ambient air temperature inside the house of 18^{o}C the mat temperature was 28^{o}C and this translated to a temperature at the top of the punnet of 22^{o}C. Over a couple of days the punnets dried out somewhat so I placed them in a tray of warm water in the greenhouse for 20 minutes during the day to rehydrate. I then gently shook out any excess water and placed them back on the heating pad once they were rehydrated.



The result was that after 4 to 5 days the cucumbers started to come up, followed by the zucchini a couple of days later, with the tomatoes coming a few days after that. The capsicums never did eventuate but I think that that was due to the seed being a bit old rather than a problem with the system.

I am very happy with the way things worked out and am a little chagrined that I did not apply this approach sooner. However, I am now tooled up with an understanding of the process and will be starting my spring crops earlier than I can with just the greenhouse.

Growing well!

8.6 Troubleshooting Your Seedlings

What happens when your seedlings don't come up? Or they come up then keel over? If you are having problems turning your seeds into seedlings, here are some problems you may be having without knowing it, and how to deal with them.

Seed Germination problems

Too wet or too dry? – Some seeds can be finicky about the amount of water they need and when you have seeds in a punnet keeping them damp but not flooded, and not letting them dry out too much can take some effort, especially if life gets busy. Fortunately the solution to this one is simple, make yourself a capillary bed from a cat litter tray, some coarse sand, a small pot and a bottle. The capillary bed is a container of coarse sand that is kept moist by an upturned bottle of water, allowing the water to move up into the seed punnets by capillary action. This keeps the seed raising mix damp but not sodden. Another benefit is that you don't need to water your punnets from the top, taking a chance that small seeds can be washed out during the process and possibly contribute to damping off (see below). How you can make your own capillary beds is covered previously in Section 3.

Too cold or too hot? – Like moisture, seeds can be touchy about temperature too. Most veg will be OK to germinate between 25^{0}C and 30^{0}C although seed germinating conditions can vary outside this range, generally to the warmer side, a little research at the start can prevent frustration later! A greenhouse (even a small one) in a sunny spot will help keep temperatures up, but if that is not an option or you are starting crops indoors early in the season to get a jump on your growing, a heating pad can be worth investing in. There is more detail on using a heating mat is covered previously in Section 8.5 of this eBook

Too Deep – sowing your seeds too deeply, particularly for the smaller seeds like celery or carrot, can mean that the energy within the seed will expend itself before it can break through all that overhead cover. Fortunately there is a fairly simple equation to help you sow each seed at the correct depth – seeds should be sown two to three times their diameter deep into the seed raising mix or soil. Thus if your celery seed has a diameter of 1mm, it should be sown 2mm – 3mm deep. Simples!

Out of Date or Dud Seed – Seed has a definite shelf life, some like parsnip will only last a year, while cucumber seed may last ten years. So it is worthwhile when you are saving your own seed to write down when the seed was harvested for future reference. If you are buying your seed commercially, take a note of the ‘sow by’ date and use them up beforehand to prevent waste. Unfortunately, you can get a dud batch of seed from a commercial supplier, or maybe your seed has not been stored well and it is no longer viable. To eliminate this as a possibility for seedling no-show, you can do a germination test. This means wrapping the seed up in a moist, warm atmosphere and then seeing how many germinate. More detail on conducting a germination test is available in Appendix 1 of this eBook.

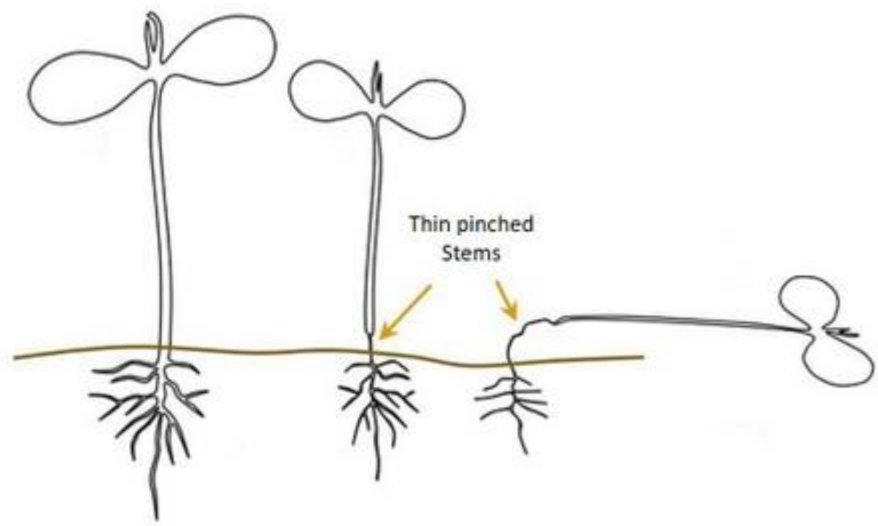
Seedling problems

Once your seeds are up and going you are almost there. Almost! There are a couple of things that can still derail your plans pretty effectively.

Leggy seedlings – This is the term used for seedlings that have grown long and spindly and is usually due to a lack of light where the seedlings are growing. This could happen if the seedlings were being germinating on a heat pad inside the house, but once they germinated they were not directly transferred to a sunny area, if they were germinated in a dark area or if they were sown so densely they shade each other. So, to avoid leggy seedlings ensure they have access to plenty of light. But, if you already have some seedlings that have gone leggy, you still have some options. If the problem is that the seedlings are too close together, break them up and transplant them further apart. Leggy seedlings can also be transplanted deeper into the seed raising/potting mix although this will work better with some seedlings than others. It will work well with tomatoes, capsicum, cucumber and squash, but not so well with leaf crops or root crops. In the end you can just plant them out when they hit the stage of having three to four true leaves and see how they go.

Leggy seedlings!

Damping off – So, your seedlings are of and growing well……….then all of a sudden, they fall over and DIE……….. Welcome to damping off! Damping off is caused by a fungus (usually Pythium species and Rhizoctonia solani but there may be others) that attacks the seedlings at or below the soil surface, resulting in the newly emerged seedlings collapsing. Damping off can become a problem where there is still, moist air that encourages fungal growth, also contributing can be old seeds being planted into cool, damp soil. To prevent damping off the following actions can be taken –



Drawing by Kevin Mechelmans

- Soak all seedling punnets, pots and trays in 10% bleach solution for 20 minutes between uses. Exposing them to direct sunlight will also help. This prevents a build-up of fungal disease on your germination equipment.
- When sowing seeds into the punnets, the surface of the seed raising mix should be level with the edge of the punnet to ensure good air drainage.
- If damping off is a real problem, seed raising mix can be sterilised by microwaving at full power for 90 seconds per kilo of seed raising mix.
- Sow seeds thinly to prevent overcrowding, improving ventilation and reducing damp conditions.
- Watering from below rather than above (see ‘too wet, too dry’ above) using a capillary bed will prevent water getting on the seedlings.
- Don't let your cat use your seed raising mix as a toilet (don't ask!)

Damping off

Direct Sowing – Some seeds (large seeds, root crops) can do better if sown directly into the soil where they are to be grown. When this is the case it is best to research what the optimum soil temperature for the seed to be sown is and then confirm the soil has reached that temperature with a soil thermometer. Also, the use of a soil moisture meter to ensure the soil is not waterlogged prior to sowing the seed. These actions together will go a long way to preventing damping off in direct sown seed.

Conclusions

From my experience, growing your own plants from seed will be successful 95% of the time and problems are rare, but if you do have issues with failures to grow your own seedlings, it can be intensely frustrating. It is therefore handy to use the above process to work through what the problem is and how to fix it.

9.0 Keeping the Pots Fertile

9.1 Introduction

It is comparatively easy, all things being equal, to get a crop from a pot or container with fresh potting mix/growing medium, although adding some nutrients during the growing cycle can improve yields as well. However, once the first crop is obtained, to keep yields up it is always advisable to add nutrients in some form. If the nutrients can be produced within our productive Zone Zero, so much the better.

Below are instructions on how to construct and use Four pieces of equipment that will allow you to take advantage of materials or wastes produced within or near our Zone Zero –

1. Bokashi Bucket – This uses an anaerobic bacterium to ferment vegetable and other wastes and convert them into a form that plants can use directly to supply their nutrients. The downside is the need to buy the bokashi mix regularly and I believe that this can be produced at home using a commercial starter, but I have not tried it, so can't really comment.

A lady I know uses the output of her bokashi bucket by placing it unaltered into the bottom of her pots and then covering it with growing medium. This allows the plants to send roots down and harvest the available nutrients directly as they grow. Bokashi also does not have the drawback that composting can have, in that no unpleasant smells are produced. It does have its own odour, but I for one do not find it offensive.

2. Low Tech Worm Farm – There are lots of worm farms on the market, but this is an idea for making your own out of readily available, cheap and recycled raw materials. There a few more restrictions on what you can put into a worm farm vs a bokashi bin, but they still have their place and are a great way to prepare veggie waste for re-use and capitalise on the nutrients it contains.

The output comes in liquid (so called ‘worm wee’) and solid (worm castings) forms. The liquid form can be diluted and added directly to container gardens and while the solid form can also be added to the growing medium as a mulch, or mixed in, it also has another benefit. When combined with coarse sand and cocopeat it can be used to make your own Zone Zero seed raising mix, which will help when starting your own veggies from seed.

3. Liquid Fertiliser Extractor – While this was originally put together to extract nutrients from comfrey (a wonderful dynamic accumulator) but can be used with any dynamic accumulators you may be able to harvest in your surrounding area, or from the yards of friends and family.

The biomass obtained goes into a cylinder and breaks down over time, yielding a nutrient rich liquid from the bottom of the cylinder which is then diluted and applied directly to the productive pots and containers.

4. Bio-fertiliser Reactor – Back in the 80’s when I was doing the Farm Technology Certificate and we talked about growing mediums and soil, fertility was discussed in terms of chemistry rather than biology and there was no mention of the soil biota. The previous three techniques have been about replacing the plant nutrients, this one is about improving the biota in the growing medium.

It is basically a small fermenter and by adding water, nutrients and a starter in the form of good compost or worm castings, keeping it aerated using a small air pump and at the right temperature you can grow your own beneficial bugs! The liquid is applied in diluted form directly to the growing containers (early morning or late afternoon preferable)

Oh, and Compost Tea!

What I have not mentioned is perhaps the lowest tech, cheapest and easiest way to harvest nutrients from waste and plants that has ever been designed – Weed/compost/

manure tea. It is simple in that all you do is get hold of a bucket, fill with water, then steep organic material in it, leave it for a couple of weeks, decant, dilute (to the colour of week tea is best) and apply to your growing veggies. There is a downside – This is another way of harvesting chemical nutrients and it is anaerobic, so it STINKS! This is not the sort of technique that will be embraced by any other people inhabiting your Zone Zero, regardless of your enthusiasm! So while it is cheap simple and easy, I suggest you think very hard before setting it up in your bathroom or laundry. Perhaps the garage if no-one ever goes there!

9.2 Making a Bokashi Bucket

Bokashi is a small scale food composting system that uses an air tight bucket and special micro-organisms to break down the food and it does so without the yuk factor of the disgusting smells usually associated with anaerobic decomposition. It will also handle some materials that are verboten in normal composters and/or not particularly enjoyed by worms such as onions/garlic, citrus rinds and uncooked/cooked meat. They are ideal for those living in the city and suburban environment that want to compost their waste but are put off by the associated stink and hassle. Does this interest you? If so, then read on!

Making the Bokashi Bucket
Of course it is possible to go out to Bunning's or wherever and pick up a commercial Bokashi bin, but they can cost over $70 and if you are a bit short of cash you can make yourself one for a bit over $10, or less if you have any 20 litre buckets already hanging around.

1. Get hold of the raw materials – 2 x recycled plastic 20 litre buckets with tightly fitting lids, a valve and hollow bolt to go through the side of the bucket. The big hint, particularly if you are using recycled buckets, is to ensure that both buckets are the same size otherwise even a small difference in size can mean that when they are put one inside the other there will be a gap meaning they are not sealed, or they can seal so tight you can't get the buggers apart when you need to!
2. Pick the bucket that you are going to use as the inner bucket and drill some 6mm or so (it's not critical) holes in the bottom to allow excess liquids to drain off.
3. Get hold of the outer bucket and drill a hole as low down the side of the bucket as you can the same size as the hollow bolt or a bit smaller, I used a speed bit and my battery drill.
4. Insert the hollow bolt through the hole form the inside out, wrap the threads in Teflon tape (plumber-on-a-roll) and then screw the valve onto the bolt and tighten up. At this point it is best to test your seal by putting some water in the bucket and checking for leaks around where the valve goes through. If you don't do this now you may find unmentionable fluids leaking onto your floor and it will be much more difficult to fix. If you do find some water leaking out when you

test it, run a bead of the appropriate silicon sealer around where the valve comes out and allow to dry.

5. The material in the bucket must be compressed to remove air spaces so you can make a tool to do this from the second lid, which will not be needed. Measure the bottom of the inner bucket and then draw a circle the same size around the lid using a pair of dividers. You can then cut out the circle using a band saw or jig saw. The plastic top is still a bit flexible to effectively compress the organic material so I grabbed a couple of pieces of recycled 70mm x 20mm DAR and cut two lengths the same diameter as the plastic disk, I then cut a jigged edge lap joint so that the timber formed an X. I screwed the X to the back of the disc and the tool, was ready to go.
6. I grabbed some pieces of scrap timber that I had lying around and cut them to size and screwed them together so that I had a box to sit the whole assembly on to get it off the floor and give better access to the drain valve.
7. The DIY Bokashi bucket was ready to compost (or bokash, or whatever you call it....)

Operating your Bokashi Bucket

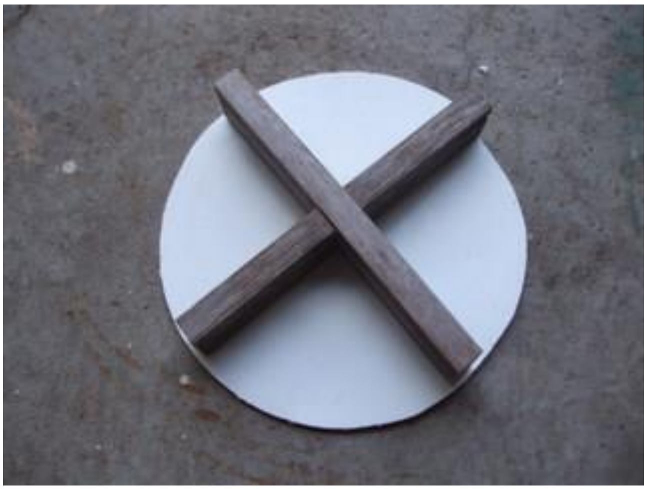
1. When you start out, place a 3cm to 4cm layer of your finest veggie scraps etc in the bottom of the inner bucket, then add in a layer of the Bokashi material, which you will need to buy from a hardware store or other supplier. This is one of those rare times, like eating chocolate, where more is better so don't skimp, if in doubt add more. In any case at least a handful per layer of organic matter.

2. Take your faithful compression tool in hand and press down on the organic material to push all the air out. If you want you can leave the tool sitting inside the bucket on the surface of the organic material, I certainly do.
3. Replace the lid on the inner bucket making sure that you have a good airtight seal, because this is needed to reduce the oxygen inside the bucket to get the Bokashi doing its thing.
4. Just repeat steps 1 to 3 every time you get some organic material until the inner bucket is completely full, making sure you put plenty of bokashi material in the last addition before sealing.
5. During this time you should regularly open the valve on the bottom of the outer bucket to drain off any liquid, preferably into a container, the pour it onto your garden beds as a liquid fertiliser.
6. Then seal up the top and leave it for two weeks to finish "Bokashing" (which is a fermenting type process), regularly draining off any liquid as in step 5.
7. Having a second set of bokashi buckets at this point would be good, but otherwise if you don't have too much organic material accumulating you can freeze it and use it to start up the next bucket once it is empty and clean.
8. Once the bucket has finished Bokashing you can use the output for a number of things (See the next section) and once the bucket is empty, clean it out thoroughly and it will be ready to go again either when you other bucket is full or to start now with your frozen stuff.

Any Problems?

If you bucket has not been doing what it is supposed to you may start to get anaerobic decomposition that produces the characteristic rotten egg smell or it may show the presence of black or blue green fungi, and this may be due to one or more of the following causes –

- You haven't put in enough bokashi material between additions of organic matter, remember more is better!
- You haven't drained off the liquid often enough and it is flooding the organic material, although with the larger reservoir of the home made bokashi bucket this is unlikely, it is still possible.
- The bucket lid has not sealed adequately, this is why it is important to make sure your lid seals before you make your bin and to always ensure you seal the lid tight after adding more organic material.
- The bucket has been too hot or too cold for a prolonged period of time. Again this is unlikely if you keep your bucket inside, but don't stick it out in the shed particularly if you are subjected to the 42°C that we get here in a Western Sydney summer!



Now What Do I Do?

Now that you have the output of your Bokashi the question is what can you do with it and there are a number of options –

- Add it to your existing outdoor composter if you have one

- Add it to a worm farm if you have one of those
- Dig it in directly into one of your veggies patches as is.
- Use it to attract black soldier flies. This is the stuff of a whole 'nother article but briefly you can use you bokashi output in a commercial or homemade black soldier fly larvae farming set up. This set up induces the black soldier fly to lay eggs in or around vegetable waste then captures the larvae (maggots) as they go looking for soil to pupate in. The maggots can then be fed to chooks or fish in an aquaculture system. I have found that the bokashi material attracts black soldier fly like nothing else!

Helping your Bucket do its work

- Do not add water, milk, juice or other liquids to your Bokashi bucket
- Keep the lid firmly sealed at all times
- Cut up any large lumps of organic matter to facilitate packing down
- If you only get small amounts of organic matter you can freeze them until you have enough to make a 3-4cm layer
- Don't put paper, plastic wrap or meat bones in your bucket
- Keep the bucket in the shade

The only real down side to the Bokashi system is the continuing outlay on the Bokashi material itself, and I have read that it may be possible to home produce something similar, but I haven't tried it so more research is needed. Watch this space!

Update 2012

No I haven't gotten around to making my own bokashi stuff yet, but the bucket itself is still in daily use. I must admit that I was never happy with the tap in the original design above, it is just too expensive. I have done a couple of workshops on composting which included making a Bokashi bucket and in the lead up to those I spent some time wandering around the local hardware shop to try and come up with something just as effective but cheaper and lo and behold I did! There are black plastic taps made to screw into 20 litre plastic cube shaped liquid storage bottles but need to be secured in the bottom of the bucket and if you get hold of a 25mm plastic female plumbing connector it will screw straight in. You don't even need the full length of the connector so you can (as I did) saw them in half with a hand saw or band saw and use one connector to fit two bokashi bins with taps. Just drill a 25mm hole in the bottom of the bucket with a speed bit, push the threaded bit of the tap through into the bucket and screw on the half 25mm connector on the other side to secure the tap. It works pretty well but even so I would run a bead of silicone around the outside of the tap seal, just to make sure, so you don't get any Bokashi water making a break for it. Good luck!

9.3 Making a Low-Tech worm Farm

We have the worm bath but you may not want to sacrifice your bath to keep worms in, so there must be another way I hear you say, no not picking up a black plastic worm Taj Mahal from Bunnings – there must be ANOTHER way. There is of course and, you guessed it, that is what this article is all about.

If you are short of cash, space, a bath or whatever but want to recycle your veggie scraps you can still do it by following the steps below, and the most expensive part of the whole shebang will be the worms themselves, so the big hint there is to ask around to see which of your friends has a worm farm and pinch a "seed" population from them!

What you need to get hold of is –

- two polystyrene broccoli boxes complete with at least one serviceable lid,
- some shade cloth,
- a PET soft drink bottle which is preferably empty,
- and some means of making holes in the polystyrene,
- Some polystyrene friendly silastic (ie no solvents), a brick of cocopeat and some hessian would also be good.

The process is –

1.Get hold of the best-looking broccoli box, the one that will be used as the worm chamber at the top, and make sure that the lid fits well. Pump a whole stack of holes in the bottom for drainage. You can use a say 6mm drill to do this, but it will generate vast amounts of those little polystyrene beads that get EVERYWHERE! If you can get access to a hot wire cutter that is better, or even a nail held in pliers and heated over a flame. We got a hot wire cutter that has a long stiff wire from a hobby shop that works well.

2.Grab the bottom one and in the middle of one of the ends, as low down as you can manage cut another hole about 30mm in diameter as a drain hole to harvest worm wee, should you so desire. The drain hole is optional, you can still harvest the wee by removing the top box and just tipping out the bottom one, but I like to get a little techo. To form the tap, I bought a comparatively cheap plastic 25mm control valve although what it was designed to control I have no idea – but as a tap it sucked! Damn thing leaked like a sieve; anyway I ended up by cutting off the end of a PET drink bottle complete with lid then by insinuating it into the hole and screwing the lid on tight (plus a bit of silicone) it worked tolerably well holding back the wee but allowing harvest as required.

3.That's most of the construction work completed. Now all you need to do is to put down a layer of shade cloth over all the holes in the bottom of the top box to stop the worms falling into their wee, dump in a hydrated brick of cocopeat and cover the surface with some hessian to keep the worms comfortable and install the lid.

4.To operate add worms and worm food and away you go! Freezing the vegetable material first starts it breaking down making it easier for the worms to consume too.

By placing food on one end and encouraging the worms to work there you will get a build up of castings in that end, after a while you can place the food at the other end and give the worms a few days to migrate. You will then be able to harvest the worm castings from the original end and use them in your seed raising/potting mix or added to pots or beds as a fertiliser or used to make a fertiliser tea or whatever.

9.4 Making a Liquid Fertiliser Extractor

Comfrey is, among other things, a dynamic accumulator; that is to say it sends its long taproot down into the soil, brings up nutrients inaccessible to other shallower rooting plants and accumulates them in its leaves. There are a number of ways to make these nutrients available to other plants, the simplest being to cut the leaves regularly and leave them as a mulch under the plants you wish to fertilise. The leaves break down over time and the other plants get the benefits of the extra nutrients, but there is another way where you can concentrate or extract the nutrients in liquid form. This is how to build a gadget to do it.

This gadget was originally designed to work with comfrey and while comfrey is a very easy to grow and useful herb, it is unlikely you will have the space in your Zone Zero to grow much of it. The idea is, though, if you have one of these setups, perhaps on an outside wall, you can still use it to extract nutrients from other plants that are dynamic accumulators and that may be growing in your area. These plants might include: clovers, stinging nettle, dandelion, chickweed, fat hen, purslane, chicory, plantain or amaranth. Even if you have friends growing comfrey, you might be able to pinch some of theirs!

The idea is to confine the comfrey leaves within a container and allow them to break down, applying a weight to provide pressure and extract the liquid nutrients from the leaves as they break down, then channel them into a container for use. To make the extractor I used some storm water pipe, some pipe fittings and a couple of 1.25 litre recycled soft drink containers.

The Pipe

While the diameter and/or length of the pipe isn't critical, the larger the pipe you have the more comfrey leaves you can fit in at any one time. I used a 1 metre length of 110mm outside diameter pipe. I use this because it was available, a good size to work with and fitted the soft drink bottle fairly snugly while still allowing it free movement. I had to buy in a couple of push-on end caps and a couple of purpose designed brackets to allow me to mount the pipe on the fence, but that didn't amount to much and I found the rest floating around the house.

The extractor will be mounted vertically so there will be some weight on what will become the bottom end cap so I intended to glue that one on. Also, there should be no need to remove it.

The bottom end cap was also where the comfrey extract will be flowing out of, so I needed to install a delivery pipe before fixing it to the bottom of the pipe. I got hold of a garden hose tap fitting I had hanging around and placed on the centre of the bottom end cap. Using the tap fitting as a template I drew a circle around the edge with a pencil and then drilled half a dozen 6mm (1/4 inch) holes inside the pencil circle. I then fixed the tap fitting to the end cap over the drilled holes using silicone sealer. After giving the silicone 24 hours to cure, I glued the end cap onto the pipe using plumbers glue.

The top end cap was not going to be glued on because it did need to be removable to add comfrey leaves, install and retrieve the weight and to clean the pipe out when required. It is mainly there to keep rain out of the pipe to prevent it prematurely diluting the extract. I did drill a 6mm hole in the centre of the cap (location of the hole is not critical) so that I could run the string through the hole which is attached to the weight.

The Weight

From my original readings I thought that the weight was going to somehow force the juice out of the leaves as they were but subsequent research has shown that the leaves have to decompose before the nutrients are extracted. I decided that the maximum weight would work the best. The 1.25litre soft drink bottle if filled to capacity with water would weight about 1.25 kilograms, or in other words basically the weight of the water. To increase the weight I first filled the bottle with coarse sand, then slowly ran the water in so that it infiltrated between the sand particles until the bottle was full. The bottle now weighed 2.6 kilograms, which sounded to me like a good weight to do the trick.

All that was needed now was to tie some strong twine around the neck of the bottle, which I could use to lower the bottle into the pipe and then retrieve it as required. The free end of the twine was then run through the hole in the top cap, and the tied to a wire 'key-ring' style ring to prevent it slipping into the tube.

Installing the Tube

After casting around where to set up the tube I decided to place it on the north face of our southern fence, I figured a bit of warmth from the sun will help with the decomposition. I suspect that the location is not critical except to make sure that you can easily get to it and you can remove it when required. Being able to remove it from its mounting and turn it upside down to remove spent leaves will make the eventual cleaning much easier.

Our fences are colourbond steel so I lined up the brackets so that they were straddling a channel and the fixing holes were sitting on flat steel. The brackets need to hold the tube in a vertical orientation so they have to apply some pressure to the tube to prevent it slipping downward. I set it up so that the second plastic soft drink bottle fitted neatly under the tap fitting on the bottom cap with a minimum clearance. I then drilled a pilot hole and screwed in two screws to the top bracket and two for the bottom.

To complete the job I placed some clapped out stainless steel mesh pot cleaner in the bottom of the tube to prevent the leaves from blocking the drain holes. It was then just a case of harvesting and packing the comfrey leaves into the tube and then installing the weight and the top push-on cap. I half-filled the tube with as many leaves as I could get with one harvest. It took about a week for some extract to drip down into the lower collection bottle. It is late summer here and I suspect you should allow more time in case you are doing this at a cooler time of year or in a cooler climate.

To use the extract, dilute it about 20:1 with water, apply around the base of the plants which you wish to fertilise and water in.

9.5 Making Bio-fertiliser on a Small Scale

Since the industrial revolution when the science of chemistry started to come to the aid of agriculture, our understanding of the nutrient requirements of plants has increased in leaps and bounds. To understand the truth of this you only need to look at the wide range of chemical fertilisers available at your local hardware or plant nursery, but the result of that knowledge is that we have focused on the provision of chemical nutrients to the exclusion of all else. We have forgotten what our ancestors knew, that a healthy soil means healthy plants and healthy plants give good yields. We have neglected the biological side of the equation, providing our veggies with the chemical elements they require but not nurturing the soil and soil microbiology.

This is all starting to change however and there is a big buzz around biological fertiliser, quite often shortened to biofert. These biological fertilisers can be home made and they ensure that the soil gets a charge of beneficial bacteria and fungi so that the soil and our veggies stay healthy and productive. They can be made using an anaerobic method, which requires some time but little equipment, whereas using the aerobic method is much quicker and there is not much equipment required.

The more “professional” larger scale set ups I have seen are based on a 200 litre drum but the biofert needs to be used quickly and I found that a 200 litre drum was just too big for a backyard set up. Plus we are not over flush with space around here so I set it up in an old 25 litre fermenter that I bought third hand for a few dollars some years ago and I believe that it is much more suited to the urban/suburban farmer.

What you will need:

- 1 x 25litre fermenter (or even just a 20-25 litre bucket)
- 25 litres of non chlorinated water, I used tank water and that worked pretty well otherwise I suggest drawing the water then letting it sit for a couple of days so the chlorine can dissipate.
- 500g worm castings or well made compost
- 200g molasses
- 20g fish emulsion
- 1 x fish tank aerator complete with flexible tubing and air stone, you could try pinching the one out of your wife’s goldfish tank, but I wouldn’t recommend it. I picked up my set up for less than $20 so they are not that expensive.

The theory is that you get some material rich on the right type of microbes (worm castings or compost, I used worm castings) and then dissolve them in water to allow the bugs to move into the water. The bugs will then start looking around for bug-food and you need to provide it by supplying them with a source of carbon (molasses) and nitrogen (fish emulsion) and oxygen as well, hence the aerator. You leave them until they have bred up enough and then add the bug-water direct to your plants. It's as easy as that!

1. I hunted around until I found an old hessian bag but any coarse cloth, including well worn pantyhose (come on guys, you can be honest with me, I'm sure you have an old pair in the back of your sock drawer somewhere) and fill the 500gms of worm castings into it.
2. Fill your container with 25litres of pure non chlorinated water then use the bag full of worm castings like a tea bag and jiggle it around, then leave it to soak overnight. When you remove the "tea bag" next day the water should be somewhat darker but have a not unpleasant earthy smell.
3. Ok so the bugs are in, now it's chow time! Add the molasses slowly and with plenty of stirring otherwise it will head for the bottom of the container and form a pool that is difficult to mix back in. Once it is incorporated add the fish emulsion. I found that once the molasses went in the water had a mild molasses like smell (unsurprisingly) and having no real end-point to shoot for I was going to run things until that smell went.

4. Next connect up your aerator and air stone. My fermenter had a hole in the top so I fed the clear air tubing through that and then connected the air stone on the other side. That way I could still put the lid on and keep out any unwanted additives, like one of our cats. It is a good idea to mount your aerator above where the tubing enters the container so that if there is a failure of some description the liquid can't siphon back into the aerator motor and make expensive noises or smells.
5. I turned the aerator on and the air stone proved to be too light and just bubbled back up to the surface of the liquid along with the air so I pulled it apart and slid a small nut along the tubing down to the air stone and this provided enough weight to keep the air stone submerged.
6. So I set the system to bubbling and left it overnight, it can take as little as 24 hours if the conditions are right and the temperature is 20°C or 25°C. It is winter here at the moment so the temperature in my garage can be 10°C or less so I figured it would take a few days for anything to happen. Certainly when I checked the next morning there appeared to be no change.
7. The following morning, however, there was froth all over the place! OK, so there was a bit of froth coming out of the hole where the tubing passed through the lid, but it was enough to cause me to wonder what on earth was going on! A bit of research turned up that this WAS the end point and the biofert was ready to go.

To make sure the bugs stay happy and get where they need to be, apply them shortly after the end point is reached, apply them direct to the plants undiluted using a watering can rather than a spray and apply after the sun has gone down and is not shining directly where you are applying it. The bugs have never heard of sunscreen and the UV will kill them rather than improving their tan.

10.0 Saving Your Own Seed

10.1 Introduction

In my opinion, learning to save seed from your own home-grown crops is one of the most crucial skills to become competent in! Especially if you are farming Zone Zero. Don't just take my word for it, here are some of the ways that saving your own seed can benefit you.

Saving seeds from your veggies is an investment in the future

Economy – You will save money because you don't have to buy new seed each year, you will have a guaranteed seed source from your own produce.

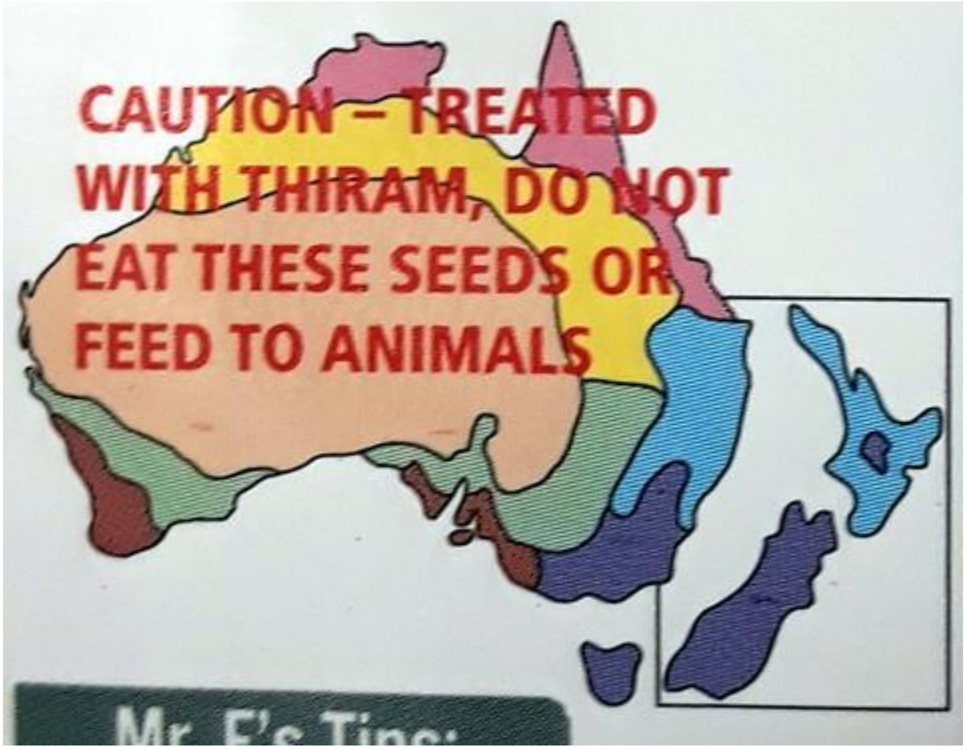
Start out with open pollinated corn and you can grow from your own seed

Genetic Improvement: adapting them to your environment – By saving seeds from the most prolific, most flavourful, earliest producing or whatever you value, over time you can develop varieties adapted to your specific growing conditions.
Improving Seed diversity and security – by growing heirloom varieties and specialist vegetables not favoured by mainstream horticulture you will be helping to preserve the genetic diversity of our vegetable heritage.

Beans are an easy crop to save seeds from and a great way to start a seed saving journey

Resilience - You will improve your own food security and guarantee your capacity to produce your own food. Remember during the Covid out break and resulting shutdown, there was an upsurge in people wanting to grow their own food and vegetable seeds became scarce.

Reduce reliance on commercial seed suppliers – there are a limited number of commercial seed companies in Australia. For example, the most common commercial seed companies around here include: Country Value; D.T Brown, Mr Fothergills, Johnsons Seeds and Garden Starters. All of these seed companies are based out of South Windsor (NSW) and are owned directly or through Mr Fothergills seeds by Harwood Capital Management Ltd which is based in London, UK. Oh, and Yates (another Australian seed company) are owned by a Japanese paint company.



If you do buy commercial seed, check the packet first

Chemical Free seed – some seeds such as radishes, some cucumbers and sweet corn are treated with fungicides such as thiram prior to being packaged by commercial seed companies.

Increase Biodiversity – allowing vegetables to flower provides food for and encourages pollinators to hang around at your place.

Brassica flowers attract the bees

Improved germination – seeds cannot get any fresher than when home produced, and fresh seeds have better germination rates.

It is really worthwhile to learn how to save, clean and store the seeds from your own home grown crops for all of the above reasons, but also because it is fun, and very satisfying to be able to feed your family and friends from seed which you have saved from your own produce!

10.2 General Notes on Seed Saving

Planning

If you plan to save you own seeds, the plants that produce those seeds will take up time and space in your veggie production process so this will need to be allowed for in your sowing plan. This is particularly so for biennial plants such as carrots, onions etc that can take up space for months while you wait for them to flower and set seed. To get a good sample it would be best to harvest the seed from several different plants, so factor the size of the flowering plant into your containers and how long they will have to be there for you to get viable seed.

Starting Stock

You will only be able to propagate from your own seed if they are open pollinated, that is to say they are non-hybrid seeds. Vegetables grown from hybrid seed can be larger, resistant to pests and/or diseases as well as display a phenomenon known as “hybrid vigour” where the hybrid is superior to its parent vegetables in terms of yield or other properties. The downside is that seed saved from a hybrid vegetable will either be sterile or not breed true, so you could wind up with any combination of the parents characteristics.

Open pollinated or non-hybrid varieties have been grown for hundreds or thousands of years by saving seed from this crop to grow the next, so it is vital that you start with open pollinated seed. The seed packet you by from your local hardware or garden centre may be labelled “F1” if it is hybrid, or it may not. Open pollinated sweet corn seed for example is impossible to get from the usual commercial suppliers (you know – Yates, DT Brown, Mr Fothergill’s etc) . The only way to be absolutely sure is to by your seed from a reputable open pollinated seed supplier such as Eden Seeds (See the links area of this site).

Picking your mark

As mentioned above, one of the reasons for saving your own seed is to develop your own mini varieties, specifically adapted to your own microclimate but this will only happen if you save seed from your absolute best vegetable specimens. I know, I know it’s difficult, but your biggest, juiciest, tastiest, earliest (or latest, depending on what you are trying to achieve) vegetables need to be left to mature and set seed rather than consumed. By making sure you only save seed from your absolute bestest crops, over time you will select for those characteristics that make them best adapted to your particular soil, climate and aspect, so it will be well worth it in the long run.

Storage

Home saved seed, or any seed for that matter, should be stored in a cool dry area in a container that is proof against rodents, who love seeds. If you store them in paper envelopes (as I do) or the sealable plastic bags you will need to store these in a stronger outer container such as a tin biscuit box or glass jar. You could recycle small glass jars and store one variety of seed in each. It is also important to mark each batch of seed with the vegetable, variety and harvest date, particularly if your memory is as bad as mine. The harvest date will allow you to work out how long you will be able to keep planting that particular batch of seed.

Freezing your dry seed for a couple of days before putting them into storage will deal with any weevil eggs so that you don’t find a container full of dust and very fat weevils when you were expecting to find seeds. The seeds must be fully dried though or water freezing in them may cause damage, if in doubt, dry a little longer.

10.3 Conducting a Seed Germination test

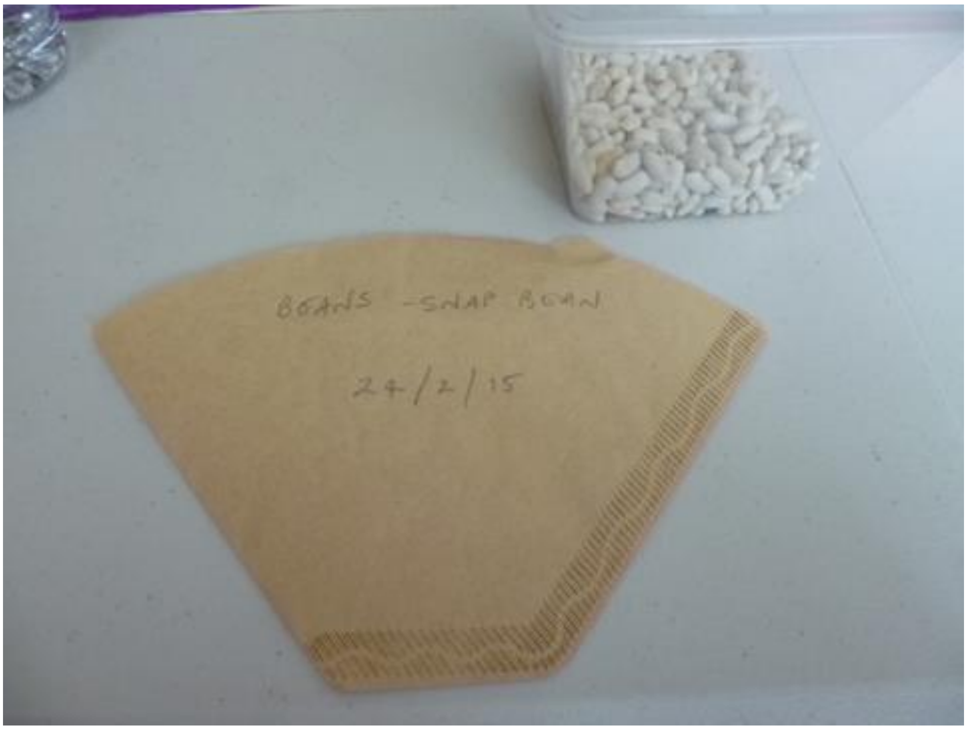
OK, so you have your seed, how embarrassed would you be if you were counting on it for your next year's produce and for some reason it wasn't fertile? To prevent such embarrassment you may wish to test the viability of your seed with a seed germination test.

The idea is to take a known number of seeds, keep them warm and moist for the required time, then take note of how many actually germinate. Expressing the number of seeds which germinated as a percentage of the total number of seed tested will give you the germination rate for that batch of seed.

I used to use paper towel to place the seeds on and keep them wet, but recently I have found that coffee filter papers keep their shape better and are tougher when wet and so are all ‘round easier to work with. I use size 4, designed for 10-12 cups of coffee, you can pick up a box of 40 filters for around $2.00 and they will last you quite a while.

Carrying out the Test

1. Give the seed a good mix and select a representative sample.
2. Write the name and variety of the seed, date and number of seed on your coffee filter (or paper towel or whatever) in pencil before you dampen it.
3. Dampen the filter and place the measured number of seed into the filter in a single layer, with some separation between the seeds where possible.
4. Fold the filter up and place it in a screw topped jar and place the lid on, to keep the moisture in. If the weather is cold place the jar in a warm place in the house, preferably around 25°C.
5. If you have a number of different types or batches of seed to test, you can repeat this procedure and place them all in the same jar if there is room.
6. Leave them in the warm place and check them every few days. Some seeds like peas and beans will germinate quickly but others like celery may take two weeks or more to germinate.
7. Once some seeds have germinated, make a note of how many and remove the germinated seeds from the paper and replace it in the jar.
8. Check again every day or two until no more seeds germinate.
9. To calculate divide the number of seeds which germinated by the total number of seeds originally placed in the jar and multiply the result by 100. This will give you the germination rate for your seeds, expressed as a percentage.


BEANS - SNAP BEAN
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The germination rate, apart from alerting you to an infertile batch of seed will also enable you to work out exactly how much seed of a particular variety you need to plant to get the harvest you are looking for. So in general terms –

- If the germination rate is less than 10% – chuck them out
- If the germination rate is around 50 % then plant them thickly.
- If the germination rate is over 75% plant them normally.

10.4 Setting up a Seed inventory

This is not a 'must have' if you want to grow food in your Zone Zero, but it can help you keep track of your seed and always ensure that you are using fresh seed, which is important to ensure good germination. One tool you can use to help you do that is the seed inventory.

If you are like me, you have a collection of various seeds, bought in form various suppliers as well as home grown, of various ages and in various stages of use. It is a great exercise to get them all into some semblance of order and have a record, so you know exactly what you have, and know when you need to save or order more. When I set up my seed inventory, I took the opportunity to get rid of my surprisingly large collection of out-of-date seeds so I will no longer have that wonderful feeling of going to sow a particular vegetable seed and find they are either all gone or all out of date. To set up your inventory, you can use the blank Excel spreadsheet which I used, it is available as appendix 1. The spreadsheet is set up with 6 columns –

1. Vegetable – Fairly straightforward this one! Just type in the name of the vegetable the seed is from.

2. Variety – Some vegetables have hundreds of varieties available, and you may be growing more than one to extend the harvest, provide variety in your diet or just because you like them. Keeping track of the different varieties of each vegetable is important to make sure they are available when you need them. It can also be handy to keep a record of which variety you are growing, even if you are only growing one so you know which one to re-order when the time comes. Some vegetables do not have a varietal name attached, so I just leave the space blank.

3. Amount – It is handy to also to know how much of a seed variety you have in stock so you know when supplies are getting low and you need to get some more. Some seed packets will tell you how many seeds are in the pack, the

larger seeds can be either counted and entered as the number of seeds or weighed if you have a lot. For a lot of the smaller seeds like brassicas or umbellifers you can get a whole stack of plants out of less than a grams worth of seed, and my scales don’t go down below a gram so in this column I enter “<1 gram” and it works for me!

4. Source – Here you can enter the seed company you bought it from or the friend who provided it of if you saved it yourself (in which case I just put “home grown”). You may as I sometimes do, have the same seed from different sources so it is good to know where your freshest seed came from.

5. Harvest date – is simply the date you harvested your home grown seeds. That way you have some indication of how old they are when you come to use them and whether they are fresh enough. For commercially bought seeds you won’t have this date, what you will have is –

6. “Sow by” date – This can be read from the packet of any commercially bought in seeds. You can work out this date for your homegrown seed by consulting one of the seed viability lists on the net.

There is also a section at the top where you can put in the date the inventory was originated and the date of the last update, where applicable. I used Excel to design the form so that you can go through your seeds and enter them in any order, then sort them for how you want them, I sort alphabetically by vegetable.

There is one more job and that is to review your list the seeds you have with a couple of seed catalogues and determine if there are any vegetables and/or specific varieties which are currently not in your inventory but which you wish to grow. Enter the names and varieties into your inventory but leave the rest of the fields empty, the information can be entered once the seed has been obtained.

It is a worthwhile effort to set up a seed inventory, then you can use it to plan out the seeds which you need to have to grow the food you want to eat. This will ensure that you will always have fresh seed of the right type on hand whenever you need to plant.

10.5 Seed Saving Techniques

There two basic methods of processing seeds for storage, wet processing and dry processing. Lettuce is used as an example of dry processing, and tomatoes and cucumbers are used as examples of wet processing.

Dry Processing (Lettuce)

Growing lettuce is not a bad way to start out growing your own food. The more popular supermarket iceberg lettuce can be a bit of a pain as it tends to bolt up to seed if you get a change in weather conditions just as it is getting to the point of harvest. And an early bolting lettuce is NOT one you want to save seed from (ironically enough)! But the iceberg lettuce is only one variety of one type of lettuce available.

Iceberg lettuce is part of the crisphead group, but there are also butterhead, cos and looseleaf lettuces. Looseleaf lettuces are good because they can be grown as a cut-and-come-again vegetable, which means you go back for a series of small harvests from a growing plant rather than harvesting the whole plant and then having to preserve it. We grow one butterhead (green mignonette) and one looseleaf (usually royal oak or lollo rosso), sowing one or two of each every two weeks.

If you leave a lettuce to its own devices, it will eventually send up a seed head, although crisphead types may need assistance by cutting the head open to allow the flower stalk to emerge. We find with our butterhead and looseleaf varieties, we harvest them for a while then allow them to send up a flower stalk. From the eating stage to seed harvest stage can take two months.

Lettuces are an easy crop to save seed from and are largely self-pollinating although there may be a small amount of cross pollination if varieties are grown side by side or if there are prickly lettuce (a wild lettuce ancestor) growing nearby. If you are only growing one lettuce variety at a time, stagger your plantings so that lettuce varieties set seed at different times, or keep a distance of 2 – 3 metres between varieties this problem will be considerably reduced.

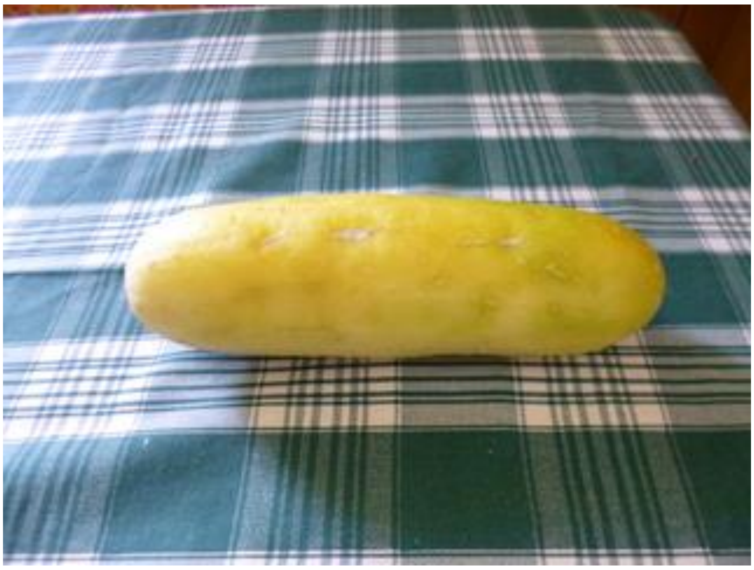
We harvest the seed when two thirds of the flowers are showing the fluffy white calyx tissue on top of the seeds. You do have to keep an eye out as it is easy to go to your favoured seed plant(s) and find the seeds have matured and moved on while you were doing other things! In inclement weather, I have harvested the whole plant once most of the seeds are ripe and left it to hang upside down in the garage, from the rafters to dry out.

To harvest the seeds from the seed head, I rub the seed heads between my hands into a shallow bowl, which breaks the seed away from the calyx and seed heads. I then hold the bowl up to one side and blow along it, removing the light trash but leaving the heavier seeds behind. Once harvested I leave the seeds in the bowl or put them into a paper envelope for a few days to ensure that they are fullt dry, then pack them off (correctly labelled of course) into glass jars or small resealable plastic bags.

There is a world of lettuce varieties so give them a go and step outside the supermarket-iceberg-lettuce mould and try growing new types of lettuces and then save their seeds to ensure your supply of lettuce into the future!

Wet Processing - Tomatoes & Cucumbers

These vegetables are from totally different families but share a characteristic that means they are treated in a similar fashion when we want to save their seeds – their seeds are surrounded by a sticky gel which needs to gotten rid of before they can be dried for saving. This process of removing the gel involves fermentation, which as a side benefit can destroy seed borne disease organisms such as bacterial spot in tomatoes.



Tomatoes are pretty much self-pollinated but with the cucumbers, you need to have ½ a kilometre between varieties, although other cucurbits are not a problem. Leave both fruits to ripen on the vine or plant, the cucumber may grow quite large and will turn yellow to golden or brown. Tomatoes, of course, are tomatoes and should be just past "eating" ripe.

For both types of fruits, slice them open and scrape out the mass of jelly and seeds into a bowl or jar and leave them to ferment for a few days, the tomatoes tend to get frothy, the cucumbers less so. Once they have fermented pour the contents through a sieve and wash in plenty of clean water to remove the remains of any adhering jelly. I then place them onto some mesh or even paper towel and allow them to dry for a week or so before storing them. They will stick to the paper towel but are easily removed.

Store the seeds in an envelope labelled with the name and variety of the vegetable as well as the date the seeds were harvested. Both seeds will last for up to four years when stored in a cool, dry area.

11.0 Resources - Books about Farming Zone Zero

11.1 Container Growing General

The Edible Container Garden (Fresh Food From Tiny Spaces) – Michael Guerra – Gaia Books Ltd (UK) 2000 ISBN 1 85675 089 2 – Good general book on container gardening, how to make and use containers as well as details on individual vegetables, it even makes reference to Permaculture. Chapter one covers getting started, including – design principles, watering strategies, choosing containers, low maintenance gardening. Chapter two talks about growing spaces including: tools, garden structures, pruning and training, weeds, pests, diseases and companion planting. Chapter three discusses the best vegetables, herbs, fruits and flowers for small spaces. Lots of colour photos.

Patio Produce – Paul Peacock – Spring Hill (UK) 2009 ISBN 978 1 905862 28 3 – Lots of good stuff about growing individual vegetables, fruit and herbs on your patio or small outdoor space as well as how to plan and get the best out of your patio farm. Obviously, the section on the patio gardener's year needs to be adjusted to fit in with the seasons here in Aus. Chapter one covers the environment of the patio including why bother, what pots and containers you will need, the best way to grow patio plants, finding novel places to grow and how much you can grow. Chapter two covers planning including tools, trays and propagation, planning crops and growing fruit. Chapter three covers the differences between growing in pots and growing in the ground. Chapter four covers the gardener's year, Chapter five covers the intricacies of growing 39 vegetables. Chapter six covers 15 varieties of fruit and chapter seven covers 24 herbs. The book has no photos and only a few line drawings.

Incredible Vegetables from Self Watering Containers – Edward C. Smith – Storey Publishing (US) 2006 ISBN 978 1 58017 556 2 – This book covers how to make and use self-watering pots, what potting soil to use and which vegetables to plant in them to get the best yield. Although the emphasis seems to be on using commercial self-watering pots, the data is good just team it up with the information on self-watering pots on this site and you're away! The book has three parts, part one covers growing veggies in containers, containers, growing media, tools and accessories. Part two is called 'Putting it all Together' and talks about getting started, sowing seeds, designing for containers, caring for container gardens, pests and diseases, harvesting and actions prior to (US) winter. Part three contains a review of 43 vegetables (from 1 to 3 pages each) talking about the type of container to use, how to grow it, how to eat it and pest and disease issues. Also covered are 20 herbs and 7 edible flowers. The book has lots and lots of colour photos.

From Container to Kitchen – D.J.Herda- New Society Publishers (CAN) 2010 ISBN 978 0 86571 665 0 – This one bills itself as the "complete guide to the no-yard garden". It covers, among other things, selecting the right container and location, optimising soil nutrients, managing light, water and humidity, choosing fruit & veggies and treating pests and diseases. While not being a big book, it has lots of good information. There is a group of colour photos in the centre of the book, with black and white photos scattered throughout the book where appropriate.

Crops in Pots (Part of the "Green Guides" series of books) – Rachelle Straus – Flame Tree Publishing (UK) 2011 ISBN 978 1 84786 719 3 – This book has a small amount of information on a lot of subjects. It covers why you would want to grow food in containers, how to get started, what to grow and how to grow it, harvesting the produce, pests and diseases. There are also sections on the specifics of growing vegetables, salads, fruits, herbs and edible flowers as well as a section on frugal gardening. There are lots of colour photos.

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 – The book starts out with general principles of organic gardening and how to get started and then goes into specifics of how to set up over 30 different types of gardens in pots. Some examples are sweet basil in a clay pot, red lettuce and shiso in metal tins, potatoes in woven sacks and eggplant in a rubber bucket, lots of colour photos

Grow Your Own Crops in Pots – Kay Maguire – Michael Beazley (Royal horticultural Society) UK 2013 ISBN 978 1 84533 686 8 – The book is broadly broken up into sections covering fruit, vegetables, herbs and edible flowers. The book starts with a discussion of general planting techniques, planning, nurturing and protecting your crops in pots. It follows with a comprehensive listing the plants in each section, how to plant them in containers and how to keep them happy. Each plant only gets a page or two but there are a large number of plants covered. Lots and lots of colour photos.

Permaculture in Pots (how to grow food in small urban spaces) – Julie Kemp – Permanent Publications (UK) 2012 ISBN 978 1 85623 097 1 – This book is also set out on the one-month-per-chapter principle. The stat of the book covers general principles and techniques of organic growing and permaculture. Then each chapter/month starts out with what is growing on her balcony that month and what food growing related things can be done during the month. Following is a few pages of discussion about a specific technique or project and the chapter is wound up with a page on the “herb of the month”. Lots of colour photos.

Pot It, Grow It, Eat It – Kathryn Hawkins – New Holland Publishers (UK) 2010 ISBN 978 1 84773 665 9 – The start of the book covers the practicalities of container gardening and getting started (seeds, tools required, feeding and watering, pest control). The main part of the book is made up of monographs on over 45 vegetables, herbs and fruits. Each monograph discusses varieties and general comments, how to plant and where to site seedlings, maintenance requirements, potential problems such as pests and diseases that may be a problem, harvesting, storing and freezing the produce. At the end of the book there are 25 recipes using produce discussed earlier. The book has lots of colour photos.

Crops in Pots – Bob Parnell – Hamlyn (UK) 2007 ISBN 978 0 600 61551 4 – The book is set out like a recipe book, the first section being ‘getting started’ followed by ‘starters’, ‘main courses’ and (of course!) desserts, with a final section entitled ‘what to grow’. The first section covers the basics like why do it, siting and grouping containers, choosing containers and compost, propagation, watering, mulching, feeding, pests and diseases. Each section covers a page or too so not vast amounts of details. The rest of the book covers a series of small scale growing projects (12 starters, 26 main courses and12 desserts) and the information on each project is set out over two to three pages, with a list of what is needed to construct the project ('ingredients') and construction details ('method') and at least one colour photo. The last 'what to grow' section gives a paragraph on various vegetables, fruit, herbs and edible flowers. The book has lots of colour photos.

Window-box Allotment – Penelope Bennett – Frances Lincoln Ltd (UK) 2012 ISBN 978 0 7112 3173 3 – After a short introduction on how window boxes can grow veggies, fruit, spices and herbs and how they are perfect for the elderly, children and the disabled, the book is broken up into twelve chapters, one for each month of the year. Chapters vary in size between 6 pages (September) and 14 pages (October). The content of each month varies, but generally contains information on seeds and plants grown during the month, details on thinks like wormeries and stores of the authors experiences. The book has no photos, but some coloured line drawings.

11.2 Container Growing Plus (small plots, raised beds etc.)

Grow Your Own Fruit and Veg in Pots, Plots or Growbags – Steve Ott, Emma Rawlings & Roxanne Warwick – Foulsham Books (UK) 2008 ISBN 978 0 572 03494 8 – This is set out as an A to Z guide to growing vegetables, fruit and herbs with 1 or 2 pages per plant including varieties, growing tips ie how to sow, plant and grow on. Entries cover 37 vegetables, 13 herbs and 15 fruits. How to grow the plant in question in containers plus preparation and cooking, storing and freezing and a recipe or two is covered. Good for what it is bearing in mind it is written for the UK experience so that planting times will need to be adjusted. Lots and lots of colour photos.

Vegetables for Small Gardens and Containers – Peter De Vaus – Hyland House Publishing (AUS) 1991 ISBN 0 947062 37 8 – This book covers location and planning of veggies, tools, crop rotation, preparation and planting, pest and disease control and harvesting and storage of your veggies. A good book for small scale growers and one of the first to cover container growing veggies seriously. There are sixteen chapters between two and fourteen pages long. Chapter one covers why do it, chapter two planning, chapter three tools required, chapter four understanding soils, chapter five feeding plants, chapter six mulches and watering, chapter seven crop rotation and chapter eight seed sowing. Chapter nine covers seed and seedlings, chapter ten pests and diseases, chapter eleven, protecting your plants, chapter twelve weeds, chapter thirteen gives general comments on growing vegetables in containers and chapter fourteen gives an A to Z of how to grow 67 vegetables. Chapter fifteen discusses harvest and storage; Chapter sixteen gives a series of sowing guides applicable to Aus. The book has 5 sets of colour plates distributed throughout the book plus some B&W photos and line drawings.

Crops in Tight Spots – Alex Mitchell – Kyle Books (UK) 2019 ISBN 978 085783 592 5 – Alex has a number of books out, some of which also reside in my library such as 'Rurbanite', 'The Edible Balcony' (not to be confused with Indira Naidoo's book of the same name) and 'Gardening on a Shoestring'. The main part of the book provides a series of projects, plan and information on individual edible plants designed around: Ledges and Sills; Terraces and Courtyards; Roofs and Balconies; Small Gardens, and Other Awkward Spots. There is also a chapter on 'Which Crop Where' and one on pests and diseases. She does refer to Permaculture at a number of points in the book. The book has lots of colour photos.

Edible Spots & Pots – Stacey Hirvela – Rodale Press (US) 2014 ISBN 978 1 60961 959 6 – The book has six chapters, The first one, Edible Pots, talks about growing vegetables in containers and chapter two, Edible spots, talks about growing crops in raised beds. Chapter three, Spots & Pots Gardening School' covers the basics like seed raising, watering crops, fertilising including composting, staking and pruning, pests and diseases. Chapter four, Spots and pots projects gives details of a series of projects under the headings 'bamboo' eg making a bamboo trellis & tripod, 'Fabric' eg making a fabric grow bag & planting hammock, 'Metal' eg making a mesh tower & tomato ring, and 'Wood' eg making a deck corner shelf and stacked pot planter. Chapter five 'Thriller, Filler, Chiller and Spiller' list different combinations of plants that can be grow together. Chapter six is a' Plant Encyclopedia' giving information on 24 annual vegetables, 5 perennial vegetables, and 27 herbs and edible flowers. Each vegetable entry covers the plant's growing habits, how to start it off, the season it grows (in the US), when to harvest, water and light requirements, recommended varieties, space-to-yield ratio, plot free pointers and garden role. The plant has no photos but lots of line drawings.

Vegetable, Fruit and Herb Growing in Small Spaces – John Harrison – Constable & Robertson Ltd (UK) 2010 ISBN 978 0 7160 2245 9 – This is a small book, slightly larger in size than a standard paperback and 143 pages plus glossary and index and it does not contain a great deal of detail. The first chapter, What to Grow Where, provides various ideas for growing food in small spaces, like containers, raised beds and grow bags. Chapter two covers succession planting, chapter three covers composts and fertilisers including chemical fertilisers and chapter four covers buying seeds. Chapter five covers watering and tools, and chapter six covers a few pests and diseases. Chapter seven provides comments on common annual vegetables, chapter eight does the same for growing fruit and chapter nine does the same for herbs. The book has no photos, but some line drawings.

A Little Piece of Earth – Maria Finn – Universe Publishing (US) 2010 ISBN 978 0 7893 2027 8 – A great little book covering growing fruit and veggies indoors, in window boxes, on terraces and balconies in borders, patios and pergolas. The book is unusual in that it includes section on rooftop gardening, foraging and community gardening. Chapter one covers indoor and window box edibles with things like potting soil and starting seeds and unusual stuff like bananas, vanilla orchids and mushroom logs. Chapter two covers hanging gardens terraces and balconies including containers for small spaces, espaliers and the native wildlife terrace. Chapter three covers rooftop gardens including plants for the windy roof, mediterranean lounge garden and French intensive gardening. Chapter four is about the spaces between: borders, patios and pergolas, including a kids garden, an Asian mixed veg planter and an outdoor kitchen with edible walls, Chapter five is foraging and chapter six is community gardening.

There are also recipes and DIY scattered throughout the book. No photos but some line drawings.

11.3 Books on Indoor Food Growing Specifics

Now, we get to the good stuff!

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 – If you can get hold of, this is a good one. Lots of info about growing under lights and in containers and good detail on individual vegetables. The book starts out with what apartment farming can do, why it is worthwhile, where you can find the space and planning things out. This is followed by a chapter soil, water and planting considerations, then moves on to growing in particular areas: the windowsill, balcony, patio, rooftop, and then indoors using artificial lighting. The last four chapters discuss the fruits, vegetables and herbs suitable for this approach. The book has no photos, but lots or really good line drawings.

Escarole in the Bedroom (Growing Food Plants Indoors) – Jack Kramer – Little, Brown and Co (US) 1977 ISBN 0 316 50314 2 – As well as some good detail on how to grow individual food crops, this book provides some interesting information on areas to grow the plants indoors, using artificial light and what sort of containers to use. Chapter one covers the fundamentals of growing food indoors (watering, feeding pests and diseases), chapter two covers seed sowing, chapter three gives some insight into where to grow plants indoors, room by room and chapter four talks about containers that can be used, pots and recycled containers. Chapter five covers using artificial light for indoor growing. Chapter six talks about sprouting and some herbs, chapter seven talks about growing summer veg and chapter eight covers fruit and autumn plantings. Chapter nine covers processes for growing plants in the (US) winter and chapter ten talks about food plants that can be grown all year round including 10 herbs, 4 sprouts 12 vegetables, 11 fruit and some other miscellaneous crops. Each entry gives an introduction, summary of growing info (spacing, germination, how to grow, harvesting, varieties etc.) and with some there are recipes. There are no photos but lots of line drawings.

Indoor Kitchen Gardens – Elizabeth Millard – Cool springs Press (US) 2014 ISBN 978 1 59186 593 3 – After an introduction, the book is broken up into three main sections. The first section, growing edibles indoors, talks about planning your approach, working out where to grow your indoor crops taking into account space, light, humidity, pets and pests, working out what containers and growing medium you need, plus lighting and air movement, what seeds you need, problems you may face like mould and pests and having the right attitude around indoor growing. The second section provides information on growing sprouts and microgreens, herbs, wheatgrass and mushrooms. The section is quite detailed, giving an oveerveiw of production techniques, requirements and likely problems and how to deal with them. Section Three, in a similar process to section two discusses growing radishes, carrots, tomatoes, leaf crops, potatoes and capsicums indoors. It is a well written and informative book with lots of colour photos.

Indoor Edible Garden – Zia Allaway – DK Penguin Random House (UK) 2017 ISBN 978 0 2412 4897 3 – The book has six chapters and in general terms there are so many (very attractive) colour photos that the actual amount of information on each page adds up to a few paragraphs or less. Chapter one covers planning the indoor edible garden, and talks about where to grow edibles including detail on identifying sunlit, partial sunlit and cool zones, best indoor edibles and choosing a container. Chapter two gives details on growing herbs and edible flowers, chapter three covers sprouts, leaves and roots including sprouts and microgreens, mushrooms, leaf and root vegetables. Chapter four gives details on fruiting vegetables eg tomatoes, cucumbers and capsicums, chapter five covers fruit including curry leaves, strawberries and peaches and nectarines. Chapter six provides ‘Expert’s Tips’ on indoor growing, including planning, watering, pruning and training, pests and diseases. As previously mentioned, the book has lots of colour photos.

Edible House Plants – Laurelynn G. Martin & Byron E. Martin – Storey Publishing (US) 2023 ISBN 978 1 63586 678 0 – The book is divided up into the introduction and five parts, The introduction provides a small colour drawing off all of the plants referred to in the main part of the book. Part one covers 15 citrus fruits, part two covers 'the rest of the tropical fruit basket' or 23 tropical fruits including avocado, banana, fig, miracle berry (?), peanut butter fruit (??) and pineapple. Part four covers coffee, tea and chocolate (4 plants) and part five covers sugar and spices (4 plants). Each plant entry is two pages long and introduces the plant, suggested varieties and plant particulars such as size, bloom season and fruiting season, followed by short notes on growing conditions, care and potential problems (ie pests and diseases), the rest of the two pages being taken up with large colour photos. Part five discusses plant care including getting started by choosing your containers and repotting, followed by maintaining plants by feeding and watering, pollinating and pruning, after which is a more in depth discussion of pests and diseases and a troubleshooting guide. As mentioned previously, there are lots of colour photos.

11.4 Microgreens and Sprouting

Microgreens

Microgreens – Eric Franks and Jasmine Richardson – Gibbs Smith (US) 2009 ISBN978 1 4236 0364 8 – This is a good all-round book on microgreens covering the how and the why with a detailed 10 point description of the process. There is a very detailed section on the types of plants suitable for raising as microgreen and recipes at the end of the book. Commercial production is covered as well as home production.

How to Grow Microgreens – Fionna Hill – David Bateman (NZ) 2010 ISBN 978 186953 765 4 – Another good microgreens book from a bit closer to home it covers the subject more from a home growers perspective and covers a number of techniques for growing microgreens. The author covers a wide range of plants suitable along with growing instructions and information on troubleshooting in the event of problems and she also includes some recipes at the end of the book.

Sprouting

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) covers sprouting pretty well, talking about a number of techniques including wheatgrass and even provides some recipes.

Making Your Own Home Proteins – Evelyn Findlater – Century Publishing (UK) 1985 ISBN 0 7126 0817 6 – Chapter 4 (pp113-134) covers sprouting of beans, grains and seeds, talking about the types of seeds to sprout, using a commercial sprouter or the jar method and even provides some recipes for the finished product. Actually the whole book is a gem if you can find it.

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) this one is for those of you who thought my library was anything less than comprehensive. The book covers sprouting using a tray or jar, tray an towel, it covers a number of seeds that can be used for sprouting including some unusual ones. This is an interesting book!

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) The book covers sprouting using the jar method with some discussion of the types of seeds to use. There are also a series of good colour photos to illustrate the process.

Escarole in the Bedroom (Growing Food plants Indoors) – Jack Kramer – Little, Brown and Co. (US) 1977 ISBN 0 316 50314 2 – (pp52 -58) This is an old book but worth getting if you can find it second hand, it covers the types of seeds used for sprouting and how to grow them with a couple of innovative techniques. A good book if you want to grow any of your food indoors.

The Speedy Vegetable Garden – Mark Diacono and Lia Leendertz – Timber Press (US/UK) 2013 ISBN 978 1 60469 326 3 – This one is a bit different from the others, it covers a number of ways of getting the quickest harvest you can manage. The book starts off with sprouts and 'soaks' and then moves on to microgreens, edible flowers, cut-and-come-again salad leaves, and quick harvest vegetables. Each section taking longer to get a harvest. There is one page generically about soaks and sprouts then a series of entries covering specific seeds, providing a bit of info on cultivation and a recipe or two. The microgreen section is set up similarly with not a huge amount of data on either the sprouting or microgreen process. The book has lots of colour photos, usually on every other page.

There are some books that cover sprouting alone, however, as discussed below – **Sprouts the Miracle Food** – Steve Meyerowitz – Sproutman Publications (US) 2010 ISBN 1 878736 04 3 – There is quite a bit of detail on sprout growing in this one, but the author has his own sprouting business (Sproutman) and tends to push his own sprouters, seeds etc,. There is quite a bit of DIY info too, though. There is lots of stuff on types of sprouters, how to sprout, seeds and how to store them, nutritional values for the sprouts, how to store the sprouts once they are harvested etc. He does talk about medicinal qualities of sprouts, but it would probably be worth checking out any claims before accepting them. There is also stuff you might not necessarily think about, like sprouting using purified water and which purifier to get, using hydrogen peroxide to prevent mould and mixing seeds to get a more diverse sprout harvest. There are a few black and white photos and line drawings.

Sprouting Beans and Seeds – Judy Ridgeway – Century Publishing (UK) 1984 ISBN 0 7126 0323 9 – The book goes through why you should eat sprouts and then gives a detailed description of the sprouts which can be used for sprouting covering appearance and flavour, nutritional value and uses for 25 species. There is then a comprehensive chapter on growing sprouts at home followed by a large selection of recipes using sprouts cold, and large selection of recipes using cooked sprouts. There a few line drawings but no photos.

Year-Round Indoor Salad Sprouting – Peter Burke – Chelsea Green Publishing (US) 2015 ISBN 978 1 60358 615 3 – The book is a comprehensive exploration of what the author calls 'soil sprouts' which to me appears to be a cross between sprouts and microgreens. Their chief advantage is they need no direct light and can provide fresh food when there is 6 foot of snow on the ground. The book starts out (part 1) with a review of the advantages of soils sprouting, how they differ from traditional sprouts and microgreens and tools and accessories required. Part 2 is a detailed treatise on how to grow soil sprouts and part 3 covers which seeds to use and reviews them seed by seed and even includes some recipes. A fascinating book with lots of colour photos.

Sprouts and Sprouting – Valerie Cupillard – Grub Street (UK) 2007 ISBN 978 1 904943 90 7 – The book starts out with why we should eat sprouts, talks about wheat and barley juice, then covers the general sprouting of seeds. The book then gives a series of detailed instructions on how to sprout each of the following seeds – alfalfa, hulled sunflower seeds, lentils, quinoa and fenugreek. Sprout (essene) bread is also mentioned. The rest of the books is taken up with a series of sprout based recipes around appetizers, sauces, raw dishes, main dishes, dessert etc. Lots of colour photos including one every other page in the recipe section.

11.5 Growing mushrooms

Mushroom Growing Today – F. C. Atkins – Faber and Faber Ltd (UK) 1966 ISBN 9781111111113 – This is (needless to say) and old book and focuses on how to start a mushroom farm back in the 60s. Lots of good information but not the only book a backyard grower should have in their library. The book goes through production of the standard (Agaricus) mushroom in considerable detail, with a section on pests and diseases which is certainly NOT organic (DDT anyone?). The section on "Other Aspects" of mushroom growing is slanted towards commercial production, talking about economics, but also abnormalities seen in mushrooms. The very last few pages talk about mushrooms for the "country gentlemen" and the amateur gardener. Some B & W photos and a few line drawings.

Mushroom Growing for Everyone – Roy Genders – Faber and Faber Ltd (UK) 1982 ISBN 0 571 11806 2 – While being and old and not organic in the slightest book, this one is better suited to small scale production of agaricus mushrooms. It talks about setting up, obtaining raw materials, composting, making the beds, spawning and casing, growing mushrooms outside and pests, diseases and their control. I am not sure how the pests and diseases from this UK book would relate to AUS mushroom production. No illustrations.

The Mushroom Cultivator – Paul Stamets & J. S. Chilton – Agaricon Press (US) 1983 ISBN 978 0 9610798 0 2 – This immensely detailed book is a mine of information for anyone who wants to get into growing their own mushrooms, and Paul Stamets is the mushroom guru. I have tried to read this one cover to cover but I find it too technical and information dense for an amateur like me. It is a great reference book and well worth having on the shelf if you are serious about getting into mushroom production. It covers a wide range of fungi including lots I have never heard of and even includes how produce your own spawn. Lots of B & W photos, some line drawings and a colour photo section.

Mycelium Running – Paul Stamets – 10 Speed Press (US) 2005 ISBN 978 1 58008 579 3 – This is more a "Why to" than a how to, but part three of the book does give details on how to grow a variety of mushrooms, covering inoculation methods, substrates, gardening with gourmet and medicinal mushrooms and nutritional properties of mushrooms. Part one talks about the mycelial mind ie lifecycle and natural habitats of mushrooms and part two is about using fungi restore damaged ecosystems using mycofiltration, mycoforestry, mycoremediation and mycopesticides. Lots of colour photos.

Mycelial Mayhem – David and Kristen Sewak – New Society Publishers (CAN) 2016 ISBN 978 0 86571 814 2 – At last! A mushroom book for us beginners! The book covers the basic mechanics of mushrooms and anatomy, lifecycle etc, how to grow easy to hard mushrooms inside or outside. Mushroom gathering form the wild is discussed, which is obviously no applicable here in Aus. There is also advice from their experience in running a mushroom business as well. Lots of B & W photos, some line drawings and a colour photo section.

The Essential Guide to Cultivating Mushrooms – Stephen Russell – Storey Publishing (US) 2014 ISBN 978 1 61212 146 8 – Lots of good stuff here. The book is broken up into 3 sections – The first is basics for beginners covering (obviously) introductory information on fungi. Types of mushrooms, basic options for growing using kits. Premade spawn, toilet rolls and plugs in logs. It also covers making a glove box and the first grow using jars. The second part covers intermediate methods including pressure cookers and flow hoods, grain spawn and liquid cultures, casing, working with sawdust and fruiting chambers. The third section covers advanced methods including agar culture, and larger scale work with large scale grain spawn and bulk substrates. Lots of colour photos.

Milkwood – Kirsten Bradley & Nick Ritar – Murdoch Books (AUS) 2018 ISBN 978 1 7336 411 6 – This is not just a book about mushrooms, but a book about 'real skills for down-to-earth living' and pages 66 to 121 cover mushroom cultivation. This book is great because it is written for Aus conditions and this stuff can be a bit hard to come by. There is an introductory bit about mushrooms in general, , easiest mushrooms for the beginner to try, then information in enough detail to carry the process out about sourcing and pasteurising the substrate, inoculating the substrate, stimulating fruiting and harvesting. They also cover using plastic bags and buckets and outdoor cultivation in logs and the ground. This book was my entry point into mushroom growing. Lots of colour photos.

Organic Mushroom Farming and Myco-remediation – Tradd Cotter – Chelsea Green Publishing (US) 2014 ISBN 978 1 60358 455 5 – This one is an encyclopaedia of fungal knowledge, and difficult to summarise in one short paragraph. It is written in four parts: the first covers the fundamentals of mushroom culture in considerable detail, the second part covers innovative application and projects using fungi including urban mushrooms and off grid mushrooming, the third covers more advanced techniques including starting your own mushroom laboratory, and part four provides detailed information on twenty four mushroom genera. Some colour drawings and photos. If you are serious about mushroom cultivation, you need this book!

Teaming with Fungi – Jeff Lowenfels – Timber Press (US) 2017 ISBN 978 1 60469 729 2 – This is not so much a 'how to grow mushrooms' as a 'how mycorrhizal fungi can improve growing just about any other plant'! The book starts out with an introduction to fungi, generally then to mycorrhizal fungi in particular. The book then provides information in using mycorrhizal fungi in agriculture, horticulture, silviculture, hydroponics and then finished off with mycorrhizae for lawns and turf. Then there is a section on growing your own mycorrhizal fungi! This is followed by some thoughts about the future of mycorrhizal fungi. Some colour diagrams and colour photos.

11.6 Growing Veg from Seed

Raising Vegetables from seed Books

While there is at least a page or two on raising vegetables from seed in just about every book ever written on veg growing, it is rare to come across a book solely on the subject of growing from seed. In my experience I have only found two, and they are noted below.

Growing From Seed – Margaret Hanks – Murdoch Books (AUS) 2002 ISBN 978 0 86411 946 9 – This book was released under the 'Mr Fothergills' brand. The book is mainly broken down into two parts, the first part covers seed raising basics and includes how to plant seeds, types of seeds, the process used to get seeds into commercial packets, how seeds germinate, growing seedlings on, soil and potting mixes and pests and diseases. The second part of the book is a series of short entries on individual vegetables, flowers and herbs. Each entry gives a general description of the plant (and in the flower section that might be it!) but for vegetables, there is a general description including plant spacings and information about cultivation including when the seeds should be planted. This is followed by a description of varieties, presumably those available from Mr Fothergills'. At the very end of the book is a planting chart for the flowers, herbs and vegetable listed. Lots of colour photos, particularly of the flowers.

The New Seed Starters Handbook – Nancy Bubel & Jean Nick – Rodale Books (US) 2018 ISBN 978 1 63565 104 1 – At over 450 pages, this is a large and detailed book. The book is divided into five sections, section one talks about aspects of starting seeds indoors including containers, growing medium, light, sowing the seeds, germination, transplanting, potting on and possible problems. Section two talks about moving plants outdoors including soil preparation, hardening off, planting out, direct seeding, the fall garden, pests and planting seeds with children. Section three discusses growing under cover including cold frames, starting seedlings in a greenhouse and growing veg under cover. Section four is about saving and storing your own seeds including how seeds are farmed, choosing the right seeds to save, collecting and preparing seeds, seed banks, seed viability and seed saving tips. Section five is an encyclopaedia of plants to grow from seed including gardens fruits and veg, herbs, garden flowers, wildflowers, trees and shrubs. Each entry is a paragraph or two long talking about how the seeds are fertilised, and how to save the seeds. The book has a small number of line drawings and the odd black and white photo.

11.7 Saving your own seed

The Seed Savers' Handbook – Michel & Jude Fanton – Seed Savers' Network (AUS) 1993 ISBN 0 646 10226 5 – This book was written by the founders of the Australian Seed Savers' Network and is the seminal work on the subject of seed saving. Part one of the book covers the issues, about the seed savers' network and the importance of seed saving and biodiversity. Part two covers the practicalities around seed saving – which seeds to save, purity and production, selecting and collecting seed, drying and cleaning seed and planning a seed garden. Part 3 is the technical bit of how to save seeds of 117 vegetables, culinary herbs and edible flowers. No photos, some line drawings.

Saving Seeds – Marc Rogers – Storey Publishing (US) 1990 ISBN 0 88266 634 7 – Part one of this book gives you basic information on the theory and practice of seed saving including why you should save seeds, what annuals, biennials and perennials are, pollination, collecting, extracting, drying, testing and storing seeds. Part two covers seed saving of vegetables by twelve categories, listed by plant family. Part three covers how to save the seeds of 61 flowering ornamentals. A few black and white photos and line drawings.

Seed to Seed – Suzanne Ashworth – Seed Savers' Exchange Inc. (US) 1991 ISBN 0 9613977 7 2 – Section One covers the theory of vegetable seed saving such as why we should save seeds, botanical classifications, pollination and flower structure, maintaining varietal purity, cleaning and storing seeds. Section 2 Covers how to save seeds for a series of vegetables divided up into the 8 most common vegetable families, including 127 individual vegetables. Section 3 covers other families with vegetable members – 12 vegetable families including 23 individual vegetables. Some black and white photos.

Seed Libraries and other means of keeping seeds in the hands of the people – Cindy Conner – New Society Publishers (CAN) 2014 ISBN 978 0 86571 782 4 – As the title would suggest, this is not a technical book about the process of saving individual seeds, although there is a chapter on seeds themselves, how to test them, where to find them etc. The book starts off with a discussion of the seed saving movement and an in-depth analysis of why we should save seeds. The main thrus of the book is then about setting up a seed library, who to partner with, how to get started, packaging seed, attracting a patron, keeping things going and how to run a seed swap. There are a series of colour photo pages towards the front to be book, and a smattering of black and white photos throughout the rest of the book.

Plant Breeding for the Home Gardener – Joseph Tychonievich – Timber Press (US) 2013 ISBN 978 1 60469 364 5 – While this is not strictly a seed saving technical book it does give good information about how to use seed saving techniques (among others) to develop your own varieties. The book starts out with a brief history of plant breeding and moves on to how to develop goals for your plant breeding program, how to cross pollinate plants, why genetics matters, evaluating and selecting favourite varieties. The last two chapters cover advanced plant breeding techniques and a series of examples of how to breed selected flowers (8 types) and vegetables (6 types). There is very little in the way of illustration, just a few line drawings.

Appendix One – Balcony 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:

Sketch of shape etc.