



Railway Garden Technical Manual

The North Carlton Railway Neighbourhood House

By Jesse Kalic

Railway Garden Coordinator (May 2021 – April 2022)

Contents

| 1 | | Int | ntroduction0 | | |
|---|-----|--------|--------------|---------------------------------|---|
| | 1. | 1 | Gar | den Design | 0 |
| 2 | | Тур | oes c | of Plants in our Garden | 4 |
| 3 | | Cro | op Ro | otation | 5 |
| | 3. | 1 | The | Rotation Cycle | 5 |
| | 3. | 2 | The | Seasons | 8 |
| | 3. | 3 | Wh | at to Plant | 9 |
| | | 3.3 | .1 | Green manure1 | 1 |
| | 3.4 | 4 | Em | pty spaces1 | 2 |
| 4 | | See | eds . | 1 | 2 |
| | 4. | 1 | Dire | ect sew or grow in punnets?1 | 2 |
| | 4. | 2 | Нον | w to plant a seed/seedling1 | 3 |
| | | 4.2 | .1 | Depth1 | 3 |
| | | 4.2 | .2 | Spacing1 | 4 |
| | | 4.2 | .3 | Watering1 | 4 |
| | | 4.2 | .4 | Seed saving1 | 4 |
| 5 | | Ma | inte | nance1 | 6 |
| | 5. | 1 | Nut | rients1 | 6 |
| 6 | | Со | npo | st1 | 6 |
| | 6. | 1 | Gre | en vs. brown matter1 | 7 |
| | 6. | 2 | Нον | w to add to the compost1 | 7 |
| 6 | | 6.3 Ho | | <i>w</i> to manage the compost1 | 8 |
| | 6.4 | 4 | Mu | lch1 | 8 |
| 6 | | 5 | Ma | naging Pests and diseases1 | 9 |
| | | 6.5 | .1 | The disease triangle2 | 0 |
| | | 6.5 | .2 | Snail Solutions2 | 1 |
| 7 | | Ref | erer | nces2 | 3 |

1 Introduction

Welcome to the Railway Garden! We are an open garden with limited arable land compared to most community gardens, but what we lack in space, we make up for in open access to this beautiful space. We aim to be an organic garden which makes use of crop rotation to reduce our inputs. This technical manual provides some general gardening advice that is specific to the purpose and location of the Railway Garden.

1.1 Garden Design

Our garden can be split into four different sections that each have different maintenance needs. See Figure 1 (next page) for a diagram of where these sections are located in the garden.

- 1. Seasonal beds
- 2. Fruit trees
 - a. 2 x apple, 2 x pear, 1 x apricot
 - b. Citrus bed
- 3. Wicking beds
- 4. Indigenous plants bed
- 5. Compost

This manual will focus on the management of the seasonal beds.

For advice on the fruit trees, please consult our resident orchardist John Blackstock on 0419 203 048. Try and contact John at least every winter and spring for pruning and fertiliser advice. He will happily demonstrate for our gardeners.

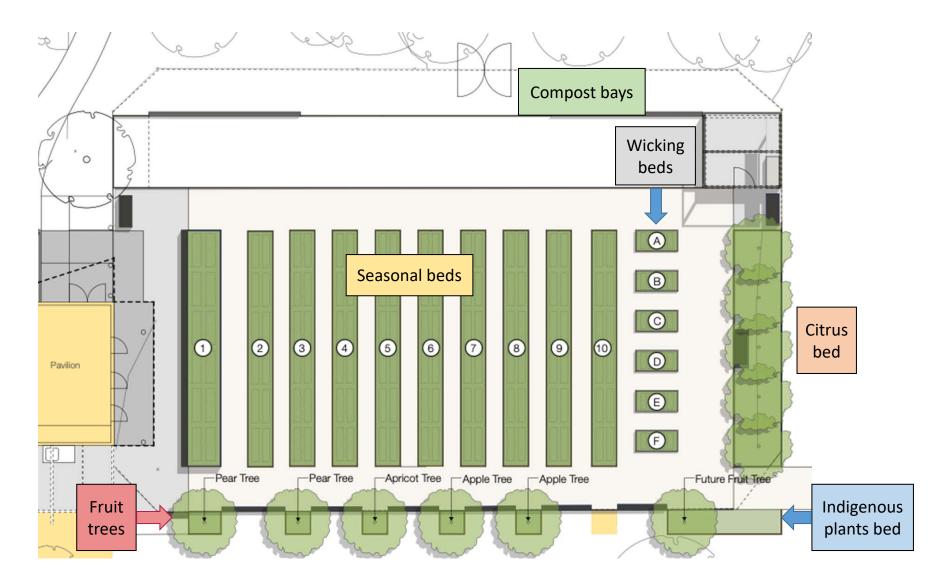


Figure 1: The different sections of the garden.

2 Types of Plants in our Garden

There are a few types of pl ants in our seasonal beds, including:

- Annual crops
 - Annual crops take less than one year to complete their full life cycle. This means they grow from a seed, flower, and produce fruit or seeds within six months or less. These plants are highly rotated in our crop rotation system.
- Perennial plants
 - These are plants that take more than two years to complete their life cycle and can live for many years. They are (semi-)permanent fixtures in our garden and should not be moved or removed as the seasons change (but they can be removed for other reasons). These plants can be herbs such as rosemary, fruiting crops such as strawberries, or ornamental plants such as lavender that provide our garden benefits other than food.
- Companion plants
 - Companion plants are simply plants that grow well together. When we think of companion plants in our garden, they are usually in reference to the crop plants that we want to eat. Good companions include:
 - Anything in the onion and garlic family deter bugs, great for growing amongst brassicas
 - Peas and beans can climb up a sunflower or corn plant, returning nitrogen to the soil
 - Parsley and coriander create a groundcover that outcompetes weeds, use throughout the garden
 - Anything that flowers, particularly compound (like a daisy) or umbelliferous¹ flower heads, as they attract predatory and pollinating bugs. Another way to achieve this is to let food plants like leafy greens, parsley, dill, coriander, chives, and carrots go to seed.

¹ A spreading flower head that looks sort of like an umbrella.

3 Crop Rotation

Our annual plants will be changed seasonally in a **crop rotation** system. Crop rotation is a system of changing the **type** of crop grown in the same patch of soil every season to reduce the need for fertilisers and to manage pests and diseases. A benefit of this system is that no patch of earth will have the same type of plant grown in it season after season. Crop rotation has two main benefits. Firstly, nutrients will cycle through the soil as we move from nutrient producing to heavy feeding to low feeding plants, and secondly, certain pests and diseases will die off, or reduce in number, as their host plants are harvested.

3.1 The Rotation Cycle

For our purposes, there are or five types of crops that each have different nutritional needs (Table 1). Examples of each of these types of crops will be given in section 2.2.3.

| Type of plant | Description | Nutrient profile |
|--------------------|--|---|
| Leaf | Plants that we eat the leaves of | Heavy feeder - Needs a lot of nutrients |
| Fruit ² | Plants that we eat the fruits (or seeds or flowers) of | Heavy feeder - Needs a lot of nutrients |
| Root | Plants that we eat the roots of | Light feeder - Needs few nutrients (adding nutrients will actually <i>reduce</i> our yield) |
| Legume | Plants from the Fabaceae family. The roots of these plants have nodules that house nitrogen-fixing bacteria, which transform atmospheric nitrogen into a form that plants can use. | Restores nitrogen to the soil |

Table 1: The types of plants that we use in our crop rotation system and their nutrient profiles.

² During winter, we consider brassicas to be our "fruit" plants (the parts that we eat are the flower buds).

| Type of plant | Description | Nutrient profile |
|-----------------|--|---|
| Green Manure | Green manure (or "cover crops") are grown for a short while and then turned into the soil before they produce seed. Legumes are commonly used as green manures, as well as mustard, sunflowers, and some grasses. The types of crops that we use in spring/summer are different to | Restore carbon and nitrogen to the soil. Draw up nutrients from lower in the soil profile, to be mixed into the topsoil, where it is accessible to our plants. |
| | the types that we use in autumn/winter. | |

Some crops need a lot of nutrients, some need little, and some return nutrients to the soil. To take advantage of the abilities of some of these plants, to reduce the amount of fertiliser we have to use, to continually contribute organic matter and nutrients to our soil, and improve our soil health, there's a particular pattern of rotation that we should follow (Figure 2).

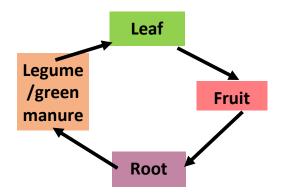
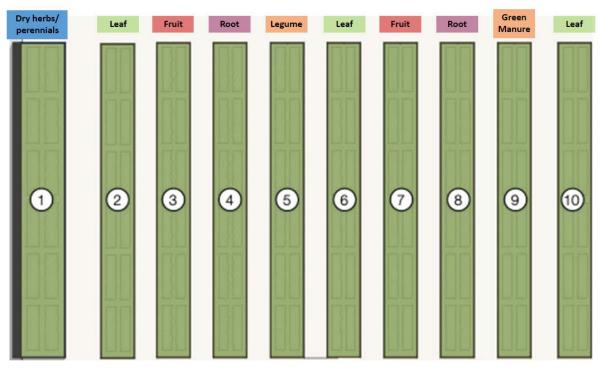


Figure 2: The crop rotation cycle that we follow in our garden.

Our long beds facilitate our rotation. Every new season, each bed rotates to a new type of crop. For example, Figure 3 shows our autumn/winter 2022 and spring/summer 2022 crop rotation plans. As we move from one season to the next, we can see that each bed has changed its crop type according to the cycle shown in Figure 3.

Garden Plan autumn/winter 2022



Garden Plan spring/summer 2022

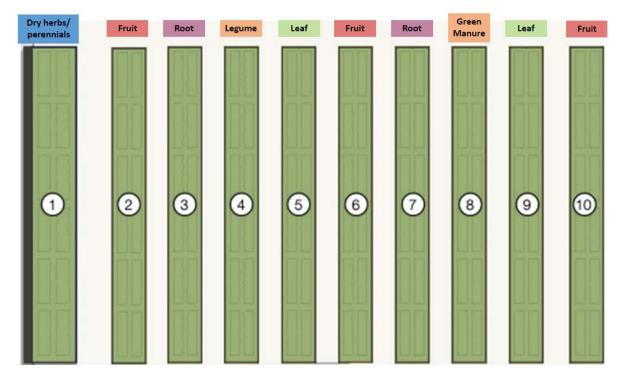


Figure 3: The autumn/winter and spring/summer 2022 crop rotation plans.

3.2 The Seasons

For the purposes of our garden, we will consider there to be two main seasons every year: spring/summer and autumn/winter (Table 2). Consider the equinox as the start of the season. The Spring equinox is the time that the days start getting longer and the temperature heats up, and the Autumnal equinox is when days get shorter and the temperature cools down.

| Month | Season | Equinox |
|-----------|--------|------------------|
| September | Spring | 23rd September |
| October | Spring | Spring equinox |
| November | Spring | |
| December | Summer | |
| January | Summer | |
| February | Summer | |
| March | Autumn | 21st March |
| April | Autumn | Autumnal equinox |
| May | Autumn | |
| June | Winter | |
| July | Winter | |
| August | Winter | |

Table 2: The gardening seasons in Australia.

The "start" of the season should be the time that you will be pulling out old plants (unless the particular crop should stay in longer) and planting new ones, rotating over to the new type of crop. Seasons can be variable every year, so think of the equinox as a guide for seasonal planting, not a strict rule. Start thinking a month or two before the season ends for what to plant next.

As a general rule, NEVER pull out an old crop unless you have something new to plant. It's better to have something covering the soil than nothing. Bare soil can erode, weeds could take hold, and it will be better for the microbial environment to have some plants in the soil. Stagger your planting, replacing old crops with new crops over the span of a few weeks. Try to stagger the planting of each crop so that the same crops won't all be ready at the same time.

3.3 What to Plant

Here are some suggestions for what to grow when. Some of these ideas come from the Digger's club website page <u>"Seeds to grow – warm region"</u> (The Digger's Club, 2022). Although Melbourne is within the cool zone, consider the city itself to be a warm zone due to the urban heat island effect. Table 3 gives some suggested options for planting for each crop type. Also look at the suggested planting times on seed packets. For the brand "Southern Harvest Seeds," consider Melbourne to be a temperate zone.

As a general rule, fruit crops, brassicas (other than kale), and peas and beans will need a long period of the season to reach maturity. So try to get these plants in as early as possible, while still trying to stagger them. Try to have all fruiting, brassica, and pea and bean plants in by winter or summer. If you plant them after this time, they won't have enough time for the edible parts to mature. Herbs, leafy greens, and most root vegetables can be planted throughout their season, however, they may not reach a large size if planted late in the season.

| Crop type | Autumn/winter | | Spring/summer | |
|--------------------------------------|---|-------------------------|--|--|
| | 1 | | | Herbs: |
| | Leafy greens: Kale | | Leafy greens: | Basil |
| | Lettuce Mustard greens Silver beet Spinach | | Celery | Chervil |
| | | Onion family: Chives | Kale | Coriander |
| | | | Leek | Dill |
| Leaf | | Garlic | Lettuce | Fennel |
| | Swiss chard | Leek | Silver beet | Parsley |
| | Herbs: ³ | Onions Spring onion | Spinach | Onion family: |
| | Coriander | | | Chives |
| | Parsley | | | Leek |
| | , | | | Spring Onion |
| Fruit (summer) Brassicas (winter) | Broccoli/broccolini Brussels sprouts Cabbage | Cauliflower Kohlrabi | Artichoke Capsicum Chilli Corn Cucumber Eggplant | Pumpkin Rockmelon Squash Tomato Watermelon Zucchini |
| | | | Beetroot | Radish |
| | Beetroot | Radish | Carrot | Swede |
| Root | Carrot | Swede | Daikon | Sweet potato |
| | Parsnip | Turnip | Parsnip Potato | Turnip |
| Legume | Broad beans | | Beans (all beans except broad beans) | |
| Leguine | Peas (ar | ny kind) | | |
| | Barley | Oats | Buckwheat | Marigolds |
| | Broad beans | Rye corn | Cowpea | Mung bean |
| Green manure | Fenugreek | Subcover | Millet | Soybeans |
| | Lupins | Wheat | Lablab | , Sunflowers |
| | Mustard | Woolly pod vetch | | |

Table 3: Crops of each type to grow in each season. Green manure information was sourced from Sustainable Gardening Australia (2022).

³ Use herbs and plants in the onion family as companion plants in other beds if you like.

3.3.1 Green manure

What to use as green manure:

- If we have any leftover seeds in the shed that we don't want to use eg. sunflowers that are sterile, or some plant that we have decided that we don't want to grow anymore, we can use them as a green manure.
- Buy a bag of broad beans from a grocery store for green manure. It will be much cheaper than buying broad beans from a seed company. The quality of the seeds doesn't really matter as we won't be eating the beans. However, buy the high quality seeds from Southern Harvest or The Digger's Club (or another nonhybridising/open-pollinated/heirloom seed business) for the broad beans that we want to eat.
- Plant alfalfa/lucerne seeds (from a seed company or a grocer) they have very deep roots (up to 2 m, but we will chop them down before they grow that deep), so they will draw up any nutrients from deep in the soil)
- It is always good to have a variety of green manure seeds as different plants do different things and will draw up different types of nutrients. CERES sell a large bag of a mix of seeds for autumn/winter and spring/summer, you could buy this or go for a mix explained above, or the mixed bag PLUS the mix.

How to plant green manure seeds:

- Broadcast the seeds and use a rake to mix them into the soil. Water in well.
- After you have spread the smaller seeds around, plant broad bean seeds (for green manure) VERY DENSELY. More than if you were planting them to eat the broad beans.

How to incorporate green manure into the soil:

- Remember to always chop green manure plants down BEFORE they go to seed.
 One way to chop them down is to pull them out, lay them on the garden bed, and chop them up (as small as you can manage) with a shovel. You can also chop them up with secateurs.
- If you have chopped up your green manure and there is still time in the season, you can plant another green manure crop, plant some herbs or leafy greens, or plant some flowers.

3.4 Empty spaces

Always try to avoid empty spaces in the garden to protect the soil. Plant a crop from that bed's crop type, plant a herb, a flowering plant, or spread some parsley seeds around. If you're stuck as to what to plant next, throw some parsley seeds in anyway, you can always pull them out later if you need to.

4 Seeds

4.1 Direct sew or grow in punnets?

Some crops types are more successfully grown from seeds and others from seedlings. Directly sewing seeds into the soil is a very cheap and efficient way of planting, and the plants will have a great start to life as their roots will have immediate access to all of the nutrients and water in the soil.

If you want to raise your own seedlings in punnets, it will cost money for seed raising mix, you will need to fertilise them with a liquid fertiliser (as seed raising mix does not contain additional nutrients), you will need to make sure you water them daily (or twice daily on a very hot day), and they might experience some transplant shock and/or root breakage as your transfer them to the soil. However, growing seeds in punnets can be a very efficient way of growing plants that have specific ways of planting (such as tomatoes), or plants that are susceptible to insect attack (like brassicas). It can also be useful to plant seedlings from punnets if you want to space out large-growing plants (like fruit crops).

Buying plants in punnets from a nursery is an expensive and convenient way to grow well-established plants. Try this if you can't manage to grow the seedlings in punnets or want to grow specialty varieties that you can't find seeds for.

See Table 4 for advice on which types of plants to direct sew and which to transfer from punnets.

Table 4: How to plant each type of crop.

| Type of crop | Direct sew or transfer from punnets? | | |
|------------------------|---|--|--|
| Leaf | Grow easily when direct sewn from seed. You can also plant the seeds in punnets to start them off or buy the seedling in punnets. However, direct sewing from seed will be much easier and cheaper. | | |
| | Herbs such as basil and dill should be started off in punnets as they are highly susceptible to snail attack. | | |
| | It's best to most fruit crops/brassicas as seedlings, as they are sensitive to bug attacks when young, and need to be spaced properly. Exceptions include: | | |
| Fruit/brassicas | Tomatoes should always be sewn as seedlings as they need to planted deeply, with approximately half of their stem buried (see the video we made on YouTube for guidance (North Carlton Railway Neighbourhood House, 2021b). It is extremely easy to start tomato seedlings off in punnets. Always plant pumpkins from seeds as they don't like to be disturbed. Grow corn from seed as it very easy and successful. | | |
| Root | ALWAYS plant from seed. Planting as seedlings will result in distorted roots. | | |
| Legume/green manure | Always plant from seed. They are too easy to grow from seed to waste money or time on seedlings. | | |

4.2 How to plant a seed/seedling

4.2.1 Depth

Follow the directions on the packet. However, a general rule of thumb should be to plant the seed about 2x the depth of the size of the seed. This is not very deep! A

common mistake that gardeners make is planting the seeds too deeply and the growing tip doesn't have enough energy to reach the surface.

For advice on how to transfer seedlings from a punnet into the ground, see the video that we made on YouTube (North Carlton Railway Neighbourhood House, 2021a).

4.2.2 Spacing

How far to space the plants out will depend on what type of plant it is, so consult the seed packets. However, here are some general rules:

- Leaf vegetables simply spread them out, sewing too many seeds. Don't worry about sewing seeds to close to each other, as you will thin them as they grow. Continually pull out and eat anything that is growing too close to something else. Leave a few plants to grow large and go to seed.
- Root vegetables sew them in rows, overseeding and continually harvesting, as stated above.
- Fruit/brassicas/legumes imagine how big the plant will grow and space accordingly. Try fitting in as many as you can within the space but not so much that the plants will overlap a lot – they need air to be able to flow through them to reduce fungal growth.
- Broad beans plant them closely as they need each other for support.
- Green manure plant VERY densely. Don't think about how they need to grow as they'll be killed off soon enough.

4.2.3 Watering

Water the seeds as soon as you've planted them and continue to water daily until they germinate. If they germinate and then dry out, your seedlings will die. Most seeds will take 7-10 days to germinate, but remember that carrots can take up to three weeks.

Pre-soak any large seeds (legumes, pumpkin, corn) for 6-12 hours before planting. This will quicken their germination time.

4.2.4 Seed saving

How to select plants for seed saving:

- Always try and choose the healthiest/hardiest looking plants.
- For fruiting plants, choose those with the biggest/highest quality fruit.
- For leafy and root vegetables, select a few plants (6-10 at least) towards the end of the season and let them go to seed (i.e., don't eat them).
- For peas and beans, let the seed pods go dry on the plant before picking them for seed saving. This does not count for broad beans, just save the biggest beans from your harvest (from as many individuals as you can).

How to save:

- Only save seeds that seem ripe. For a lot of seeds, like parsley, carrot, dill, basil etc., this means that they will be very dry and will go brown/black. Seed pods (beans, peas, rocket, kale) will be dry and straw-coloured.
- If the seeds are very wet, like tomato or pumpkin seeds, dry them on a paper towel on a plate at home for a few days.
- If the seeds have a moderate water content, like beans (except broad beans) or peas, or anything that has been rained on, let them dry out in a (labeled) paper bag for a few days to a week. Try to hang the bag up, but anywhere dry will do.
- Broad beans have a very high water content and need to be spread out on paper (like newspaper in a dry, sunny spot (like a windowsill) for 7-10 days.
- Put the seeds in an envelope and label the seed packet with the name of the plant (try and record any cultivar or variety info) and the month and year. Put the packet in the correct seed box.

What NOT to save:

- Do not save zucchini seeds zucchinis are baby marrows (also called zuccas), they are never ripe, unless you let them grow to be a full marrow!
- Do not save cauliflower, broccoli, cabbage, Brussels sprouts, or Kohlrabi seeds (unless you are only growing one variety). They are different varieties of the same species,⁴ so they cross-pollinate with each other and the offspring won't be reliable.

⁴ Kale is also in this species. Don't save kale seeds if they are growing in the same bed or next to any of these other plants, however, if you are growing kale NOT near these other plants or in summer when you won't be growing the other brassicas, save the seeds.

5 Maintenance

5.1 Nutrients

We use compost, manure, and organic fertilisers to give our soil nutrients. As a general rule, NEVER fertilise legume/green manure beds (they don't need it) or root beds (the fertiliser will make the plants spend energy on growing their leaves rather than their roots).

Add compost or (store bought) manure to the leaf and fruit beds after your have pulled out the old crop. You can also add compost (but not manure as it is too nutrient rich) to the legume beds, but this is not a high priority. NEVER add fresh manure (from the farm) to the garden, as it will be too rich. Compost it first. You can place new compost on top of old mulch. Also add compost around perennial plants at least twice per year as you compost the leaf and fruit beds.

Spread the compost/manure with your hands or with a rake to lightly incorporate it into the soil. You can also give the soil a light forking if you think that the soil is compacted, particularly if you are planting root vegetables. However, NEVER turn the soil over with a shovel. Many people have a belief that turning the soil will bring nutrients from lower down in the soil profile to the top. However, most of our nutrients will be in the top 10 cm of our soil, where the majority of our plant roots and soil microbial activity is occurring. Turning the soil will disturb our complex soil structure that we are spending years constructing. If our soil is healthy, worms will turn our soil and deep-rooted green manures will bring nutrients from lower down to be incorporated into the topsoil when we turn in our green manure plants.

Add fertiliser to the leaf and fruit beds when you plant your plants. Choose a "complete" fertilliser, such as organic Dynamic Lifter. Follow the instructions on the packet.

6 Compost

Compost add nutrients to our soil, helps to retain those nutrients (the breaking down organic matter has a slightly negative charge, therefore attracting positively charged ions), and helps to retain water (the pores of the compost have a high water-holding capacity). Compost is also a useful way for us to dispose of our kitchen and garden

waste, and turn it into something useful. However, there are a few important things to remember to make sure that the compost is not a wet, stinking, or rat-infested disaster.

6.1 Green vs. brown matter

To **break down** *effectively*, compost must be a mix between equal parts⁵ of **GREEN MATTER** and **BROWN MATTER**. This mix will create the ideal microbial environment to breakdown the organic matter.

GREEN MATTER provides Nitrogen, eg.

- Grass cuttings and garden prunings (that have not been sprayed with herbicides or pesticides)
- Kitchen waste including crushed egg shells, (no meat, dairy, bread, oil and only small amounts of citrus or onion)
- Fresh manure from chickens, cows, sheep, rabbits, guinea pigs (can be mixed in with straw)

BROWN MATTER provides Carbon, eg.

- Paper
- Cardboard
- Dried leaves and twigs (no herbicides or pesticides)
- Straw

Things that should not go in the compost include:

- Cat and dog poo
- Diseased garden waste
- Weeds that have gone to seed

6.2 How to add to the compost

Chop or tear everything up to make it easy to break down. Chop as small as it is practicably possible. When you add green matter, always add an equal amount of (or slightly more) brown matter. Brown matter is stored in compost bay no. 4.

⁵ Equal parts is easy to remember, but compost can be a mix of between 50-67% brown matter to 50-33% green matter. Slightly more brown than green is ok.

6.3 How to manage the compost

We always add compost to bay 1, with the idea that it will be flipped to bay 2 and then bay 3 as it decomposes. When bin 1 is full, we flip almost all of the contents (leave a little bit to contribute composting microbes) into bay 2. It will sit there and cook for 1-3 weeks,⁶ at which point we will flip in into the next bin and let it sit for another 2 weeks. After this it will (probably) be ready to go in the garden. The compost should be turned 1-3 weeks (more frequently in summer). Turning too often is not good for the compost – in will disturb the microbes, especially funguses that are building structures (hyphae) to break down the material.

Hose down the compost bin if it seems dry. The compost should be as wet as a squeezed-out sponge. If the compost bin smells like rotten eggs, it's either too wet or has too much green matter. Turn it and add more brown matter.

If the compost is taking too long the break down, the components of the compost are probably too big. Otherwise, it could be too wet or too dry, or there may be the wrong mix of brown:green matter. Garden lime and comfrey leaves can help speed up the breakdown of the compost.

A large mass also helps to break down the compost faster. If the compost is very low in bay 2 or 3, combine them together, or add them back to bay 1.

6.4 Mulch

Mulch helps to retain water, moderate soil temperature, suppress weeds, and add organic matter to the soil as it decomposes. Mulches such as wheat, lucerne, and pea straw are good options for our garden. Soak it in water in a wheelbarrow first and lay it on thick on top of compost and fertiliser. Try to retain the mulch layers as they will suppress weeds.

Sugar cane mulch comes from Queensland so it has high carbon miles. However, one good use for it is to lightly sprinkle it around root vegetables, as they need to push through the mulch and will have a hard time pushing through thicker mulches. Instead

⁶ The amount of time it will take is up to the weather, how small the components are, how well it has been aerated, and how good the mix of green and brown matter is.

of buying sugar cane, try to use the smaller particles of the thicker mulches (at the bottom of the bag or the wheelbarrow) around root vegetables.

It is easier to mulch before planting fruit or brassica seedlings as you can roughly layer on the mulch without worrying about disturbing the plants. This principle is the same if you are direct sewing larger seeds such as beans, corn, or pumpkin. However, if you are direct sewing seeds of root or leaf vegetables, mulch after the seedlings have emerged. Always make sure that there is a small circumference of bare soil around the stem of the seedling, as mulch that is touching the stem can cause the stem to rot.

6.5 Managing Pests and diseases

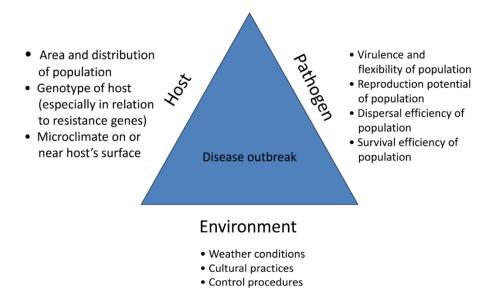
If you grow it, something will always try to eat it. Possums, birds, rats, insects (ones that chew leaves and ones that suck sap), snails, fungus, nematodes, bacteria, and viruses can all have a go at our precious plants. To effectively kill off (or manage) a pathogen, you will need to do some research and devise a plan. However, there are a few general principles that we can use to keep the garden healthy:

- Companion plants make sure there are plenty of flowering plants around as they attract beneficial insects.
- Keep the plants healthy by making sure that they are adequately fertilized and watered. A general yellowing of older leaves can indicate that the plant needs more nitrogen and purple or red older leaves indicates that the plant needs more phosphorous. If you notice any specific colours or spots, google them, noting whether this is occurring on new or old growth.
- Keep the pH between 6 7.5 to optimize the nutrients that are available to plants.
- Keep composting it helps to retain water, nutrients, and maintain the microbial life in the soil.
- Keep the air flowing make sure that plants aren't overly touching each other and prune out anything that is getting in the way of you or the airflow.
- Cut off any damaged parts of plants.

6.5.1 The disease triangle

Pathogens don't occur in a vacuum. They have a relationship to their host and their environment that we can work with to our advantage. This relationship is shown in the disease triangle (Figure 5).

Figure 4: The disease triangle.



The main takeaways for the disease triangle are:

- Host make sure your host plant is healthy and in a good position where it is. It
 might need a different amount of sunlight that what it currently has, or it might
 be a variety that is particularly susceptible to the disease. Make sure the plant's
 needs for fertilizer and water are being met and move it if you need to. Consider
 growing a different variety next year if you need to.
- Environment the weather, surrounding environment, or cultural practices might be making the plant more susceptible to the pathogen. Make sure that the plant has good airflow and that other gardeners aren't doing the wrong thing for the plant (eg. overwatering, over fertilizing).
- **Pathogen** Identify the pathogen before taking any action. Observe anything you can about the pathogen either what it looks like or what the damage it causes looks like. Get to know what it eat, how it eats, what time of year it breeds, how

it moves. This information will help you to figure out what to do, and a positive ID will help to find the most accurate information online.

Once you have your positive ID for the plant, try to devise an action plan that considers the life cycle of the pathogen, the plant, the time of year, and using non-chemical solutions. The next section is an example of how to manage a common garden pest that we deal with in our garden: snails.

6.5.2 Snail Solutions

We cannot escape snails! However, by understanding the elements of our disease triangle, we can use our resources wisely and make the snails more manageable.

- Host Snails love any kind of leaf, particularly soft and young ones. Herb, lettuce, and brassica seedlings are very vulnerable.
- Environment Snails love moist and dark environments. Perennial plants and mulch create a perfect environment for snail to thrive.
- **Pathogen** Snails breed in autumn and early winter. They are most active at night and after rain.

The solution is combination of interventions but focuses largely on the *timing* of the life cycle of the snail. This is called integrated pest management.

Protecting the hosts and improving the environment:

- Try and grow susceptible plants in punnets and then transfer them into the garden when they are a little bit bigger and stronger.
- Try and keep perennial plants neat and pruned and, as much as possible, try and keep any plant that can be staked off the ground.
- Pull out the old summer crops that are at the end of their life.

Killing the snails:

• Spread non-toxic snail pellets in autumn when you start to notice many small snails around. Try to coincide this with when you have pulled out the majority of your old summer crop, and after a big rainy period. Spread the pellets on EVERY bed simultaneously. Focus on dark and moist spots.

- Spread the pellets again a few weeks later if they are still a problem. This is to catch the ones that were eggs the last time you spread the pellets.
- Organise a once-per month nightly snail killing session. A time after rain would be best or run the irrigation beforehand.
- Have one person from each gardening day dedicated to snail patrol.
- Refresh beer traps weekly.

The snails MUST be killed and not simply moved away. Drown them in a bucket of water with a squirt of dishwashing liquid for at least half an hour.

7 References

- NORTH CARLTON RAILWAY NEIGHBOURHOOD HOUSE. 2021a. *Planting rootbound seedlings* [Online]. Available: <u>https://www.youtube.com/watch?v=-276A8RzJTU</u> [Accessed 18 April 2022].
- NORTH CARLTON RAILWAY NEIGHBOURHOOD HOUSE. 2021b. *Tomato Planting Guide* [Online]. Available: <u>https://www.youtube.com/watch?v=dk04nksuscM</u> [Accessed 18 April 2022].
- SUSTAINABLE GARDENING AUSTRALIA. 2022. *Green Manure* [Online]. Available: https://www.sgaonline.org.au/green-manure/ [Accessed 14 April 2022].
- THE DIGGER'S CLUB. 2022. Seeds to sow Warm region [Online]. Available: <u>https://www.diggers.com.au/pages/seeds-to-sow-warm-region</u> [Accessed 13 April 2022].