

Sunseed Organic Gardening Volunteer Booklet

Tips and methods from our Organic Gardens
department

Organic Gardening – some basic principles

Feed the soil not the plant - Build healthy living soil through composting, adding animal manures and mulching.

Use natural and renewable methods to grow vegetables - no synthetic fertilizers or pesticides or peat-based composts.

Rotate crops of different families in order to keep soil healthy and to stop pests and diseases building up in the soil and planting area.

Seed save - Use 'open-pollinated' varieties to ensure seed can be saved for following years.

Encourage healthy ecosystems rich in biodiversity by creating habitats for natural predators of garden pests, including flowers to bring pollinating insects to the garden.

Planning: Rotation, considerations and companions

Crop rotation is at the heart of organic farming, as a way to protect the environment. It is used to:

- Avoid the build-up of pests and diseases which affect particular crop families
- Make efficient use of soil nutrients as different crops have different nutritional requirements
- Include fertility-building phases where a 'green manure' is grown, i.e. clover which fixes nitrogen from the air and gives the soil a 'rest' period
- Help maintain soil organic matter levels and soil structure

These techniques create an efficient and sophisticated system which does not rely on chemical inputs.

Major crop families are:

- Alliums – onions, garlic, leek, asparagus
- Legumes – peas, beans, lentils, clover, alfalfa
- Cucurbits – cucumber, melon, pumpkin, squash, courgette
- Solanacea – tomatoes, peppers, chillies, aubergines, potatoes
- Brassicas – cabbage, broccoli, cauliflower, kale, turnip
- Chenopodiaceae – beetroot, spinach, chard

Considerations that you may need to think about in your planning:

What do you like to eat? - This is perhaps the most important!

Who are you harvesting for? - At Sunseed we get through an amazing amount of veggies every week and so gluts aren't really a problem. If you're growing for yourself you may want to stagger sowings of seeds over a period of a few weeks to avoid gluts and/or look at ways to preserve. Here we are also able to ensure that harvests which don't keep well are used first to reduce waste and to get the most nutrients and flavour when we eat them.

Who is using the garden? Here we have lots of volunteers with very varied levels of previous experience and so it's helpful for us to group plants of the same type (for example salad crops) together so that harvesting is easier.

What conditions do you have? - There's no point putting all your time and effort into trying to make a tropical, humidity and warmth-loving plant grow in dry, cold conditions. Choose crops that are known to grow well locally, in your conditions or have grown well in past years.

What are the expensive foods you buy? Here we don't have enough land to grow all the food we would need and so we are selective. If we tried to grow all the onions and potatoes we'd need then the gardens would only have onions and potatoes in them. These are very inexpensive to buy so this wouldn't make sense. We grow things (for example kale and orientals) which are expensive to buy and difficult to find so that the garden is helping us to save money and give us diversity in our diet.

Planning Tips:

If beds are the same size and shape then nets, fleece and even drip irrigation sections will be inter-changeable between them.

When the same plants are planted together in a bed then the same treatments can be easily applied: nets, garlic/chilli sprays, liquid feeds etc.. and they can be removed at the same time to make way for the next crop.

A map of the crops can be useful to check that one crop will not shade another and to get an idea of spacing between different crops and pathways between (important for harvesting!).

Companion planting is the idea of using plants which either grow well together; through not being competitive with each other for the same nutrients or through providing each other with needed nutrients or providing some protection either by confusing pests with strong smells, by being a sacrificial/trap crop where pests will be attracted to it and not the crop.

Growing corn, beans and squash together is an ancient technique, over 8,000 years old which is referred to as **3 Sisters**. Each crop occupies its own niche (and provides different nutrients). Corn grows very tall providing a structure for the climbing beans which in turn strengthen the corn plants from the wind. The squash provides ground cover, suppressing weeds and holding moisture in the soil.

We have found that Giant red mustard can be a good companion for brassicas as it can be used as a 'trap' crop for Cabbage stem flea beetle. The grubs of these beetles were found to prefer to attack the mustard, causing less crop damage than attacks on Kale, Romanesco cauliflower or broccoli on which the core can be eaten totally away. Especially because you remove the leaves (and usually the larvae) when harvesting the mustard.

Other common companions:

- Tomatoes and basil
- Potatoes and garlic
- Many flower species e.g. calendula, nasturtium, marigold

Soils and Fertility: nutrients, compost, manures, liquid feeds, soil improvements and deficiencies

Nutrients are important because they help the plants to grow healthily. Particularly important are:

Nitrogen – which the plants use for making proteins, this enables chlorophyll production and general leaf growth

Phosphorus – is used in all stages of plant growth particularly photosynthesis and transporting and using the sugars made through this process

Potassium – which plants use for making and increasing the size and quality of fruits

Composting is the breaking down, by bacteria and fungi, of organic matter to produce nutrients for plants and humus for the soil. To speed up this natural process we mix:

- 1/3 'greens'/nitrogen rich materials: weeds, urine, goat manure
- 2/3 'browns'/carbon rich materials: paper, prunings, straw
- Plenty of water.

In the first week the pile should heat to 60°C/120°F as the micro-organisms (bacteria and fungi) breakdown compounds, killing weed seeds and converting material to more accessible plant foods.

Successful composts require sufficient room (pockets created by larger particles which are not easily compressed) for oxygen so the processes of the micro-organisms will be aerobic not anaerobic. The piles need turning to aerate (add more oxygen) after the first decomposition. We usually also add water at this point if needed. Compost can be ready for use in as little as 2 months, and when it is finished you have a rich brown, crumbly material.

Trench composting is the method we use for composting food waste due to the high volume of food waste from the kitchen. A deep hole is made in a part of the garden which we would like to use as a bed and this is filled over time with a mixture of the organic kitchen waste and a carbon-rich material such as dry grass or used straw mulch. When full we cover the hole with soil and leave for 6 months to break down and then we can use as a new bed which contains lovely rich compost underneath. This is also interesting as it can show the types of plants that come up naturally in still composting material such as: squash, cucumbers, tomatoes, melons and sweet potatoes!

Manures are important to add both nutrients, structure and micro-organisms to the soil. We use goat manure as it is a local resource and it is worth considering what you have nearby. Chicken litter is very concentrated in nitrogen and phosphate. Sheep manure is high in nitrogen and potash, pig manure is lower in both. Horse and cow manure are the lowest nutritionally and horse manure can contain grass and weed seeds, as horses do not digest seeds the way that cattle do.

Liquid feeds are a way of supplying additional nutrients (potash, phosphates, nitrogen etc) to nutrient demanding fruiting crops.

Chopped up Comfrey: used mainly for potassium, nettles: used mainly for nitrogen and Poseidon grass: mainly for nitrogen, or Alfalfa: high in nitrogen and also a natural growth hormone; are mixed with water in barrels to ferment, producing potent liquid. These could also be used for plants which show signs of nutrient deficiencies.

Deficiencies can usually be seen by a change in colour and/or decline in the health of the plant. Sometimes this is signaled by the plant being attacked by pests who will be attracted by the weakness of the plant. In general a **Phosphorus** deficiency usually causes leaves to turn blue/green but not yellow. **Potassium** deficiency usually causes brown scorching, on the outside edges of the leaves, curling of leaf tips and chlorosis (yellowing) between leaf veins. Purple spots may also appear on the leaf undersides. **Nitrogen** deficiency usually causes yellowing of the leaves.

Propagation: Seed sowing, Transplanting, Layering, Cuttings, Grafting

Seed sowing is done in many different ways, the most successful we have found here is the the following method:

1. Fill a tray with compost and lightly press down in each cell to check for cells which have not been filled fully
2. Add extra compost in cells (usually around the edges) which have a lower level of compost
3. Place the filled tray into a bath of water (around 2/3cm deep and with a level base) so that the soil can evenly absorb water from below
4. Remove from the water bath when most/all of the cells have visibly wet soil and the tray feels heavier
5. Make holes of the correct depth for the seed (we use the head of a nail or the end of a pencil). The benefit of having wet soil is that the holes keep their shape and don't collapse and it also means that the seed has an instant moist environment. You will have to remove small amounts of wet soil from the hole-making tool periodically
6. Dry your hands and pour a small amount of the seeds into your hand. With the other hand, take a tiny pinch of the seeds between your finger and thumb and then slowly and carefully rub finger and thumb together to release one seed into each hole. Our germination rate is good and so we often put just one seed per cell. To save time and compost with plants which are not very competitive we can sow more seeds per cell: beetroot – 2/3 per cell, leeks – 4 per cell and onions – 6 per cell. You may also want to sow more per cell if you are unsure of the quality of the seed – in which case you would remove weaker plants if more than one germinated in the cell
7. Gently cover each hole with the surrounding compost (apart from basil seeds which should be left uncovered). At this stage you can cover the tray with a layer of transparent plastic to retain the moisture in the soil. This must be removed as soon as seeds begin to germinate to maximise the light

As a general rule, seeds should be sown into holes which are twice the height of the seed, for example lettuce seeds are tiny and so need a thin layer of compost covering them but beetroot seeds will need 0.5-1cm of compost covering them.

Transplanting/Planting out generally happens once the seedlings have two or three sets of 'true' leaves. True leaves are the proper leaves of the plant, not the first set which appear during germination (these are called cotyledons). Sometimes it is a good idea to soak the trays of plants in a

watering tray before planting as this helps the soil bind together which helps when removing the plant from the tray. Never plant out when the conditions are too hot (anytime between 11am - 6pm in summer here!) or too cold as this puts too much additional stress on the plants at an already stressful time.

1. Dig a hole at least as big as the plant module, usually a little deeper. Any 'leggy' plants which have grown too tall and weak and Brassicas can be placed lower down in the ground and part of the stem buried to help to make the plant stronger and hold it firmly in the ground
2. Carefully remove the plant module from the tray by pushing up through the hole in the bottom (a pencil can be used in your fingers don't fit)
3. Place the plant in the hole and carefully fill the hole around the plant roots with water. This is important for two reasons: a) it provides the plant with a small supply of water to help it establish in it's new home and b) it helps the soil particles to immediately bind to the roots
4. Fill the hole with (preferably moist) soil and use your hands to press firmly down around the plant so it is firmly held in place

You may need to cover with a net (to protect from birds/caterpillars) or fleece (to protect against frost) at this stage.

Layering is a method of propagation in which a section of stem of an existing 'mother' plant is buried under the soil – either directly in the ground or in pots of soil placed around the existing plant – with the tip protruding. In some cases the skin of the stem is partially removed (where it is to be buried) in order to encourage it to form roots. Once the top section has begun to grow well we can surmise that roots have formed under the surface – you can also carefully check. If roots have formed then the section of stem which still attaches it to the 'mother' plant can be cut and the plant carefully removed.

The benefit of this type of propagation is that the new plant is still supplied with water and nutrients from the mother plant while it establishes roots.

Examples: Strawberry runners

Tip layering is used for certain berry plants which form roots at the tip of the stem. In this case the tip is totally buried but the method is otherwise the same.

Cuttings are another form of propagation in which a section of stem is removed from the 'mother' plant and placed in the soil (with the tip facing upwards) to root. There are a few main types: **Softwood** – taken in Spring, take a new shoot with section of stem, best for plants which are difficult to propagate but need a lot of care as they dry out and wilt quickly.

Greenwood – taken in early-mid Summer from more mature wood. **Semi-ripe** – taken in late summer, less chance of wilting. **Hardwood** – taken at

end of growing season (Autumn – Spring) from fully mature wood, slow to root but less care required. **Stem cuttings** – sections of stem with no/removed flower buds, anytime. **Root cuttings** – (eg mint) sections of root no less than 3cm in length, important to plant correct way up, taken in dormant season.

Grafting is often carried out to make trees which have many, large fruits but which are kept small by a limiting root system. The upper part of the plant is referred to as the scion and the lower part as the rootstock. Sometimes the rootstock can provide resistance to disease or is more suited to particular conditions. The scion and rootstock are both in the same genus and most often are the same species eg pear (scion) onto quince (rootstock), plum (scion) onto blackthorn/sloe (rootstock).

Water and Irrigation: Bed types, irrigation methods and mulching

Irrigation is one of the most important things for us to consider in this hot, dry climate. We use several different methods with their own benefits (+) and problems (-).

1. Flood beds (traditional)

- + Reduce water evaporation as bed is sunk into the soil
- + Less frequent watering as soil is saturated
- Water evaporates more quickly as there is a larger surface area exposed
- Uses lots of water

2. Caballones (ridge and furrow irrigation)

- + Soil does not get waterlogged as water infiltrates from the side
- + Garden design can change each year
- Uses lots of water
- Changing sizes of bed for different crop requirements is time and labour intensive

3. Drip irrigation

- + Very water efficient – water only goes where it is needed
- + Less weeds (than flood beds)
- + Easy to operate, can water large area at once
- Uses plastic pipes
- Drippers need to be cleaned due to Gypsum in the water here
- Requires adequate pressure (from vertical drop)
- Mulching can interfere with water movement due to raising level of bed over time
- Soil can become water-logged and heavy, hindering root development and the Gypsum can build up in the top layers of soil.

Mulching is the method of covering exposed soil around plants with a material, it is very useful in organic gardening as it can help prevent weeds, retain moisture, heat or cool conditions and even add nutrients (eg alfalfa) as it breaks down. With most mulches it is advisable to leave a small circle of bare soil around plants.

There are many different materials which can be used for mulching, the best one for you will depend on your crops and conditions:

Paper: This can be easily put on and fairly easy to remove and is good in dry conditions but will rot quickly in wet conditions can be easily torn by wind/birds/animals.

Cardboard: Provides a good cover especially in hot, dry climates where it will not rot down and can be easily lifted off (if kept in large sheets) to inspect underneath however it can provide a habitat for pests underneath.

Hay/Straw: Cheap to buy and good to provide vegetables such as

pumpkins with a dry protected bed to sit on. It can be blown away however and needs to be used quite thickly and re-applied after some time.

Alfalfa/Green manure: Can be bought as alfalfa straw or easily grown and cut down once in flower. Rich in nitrogen and with a natural growth hormone it provides the plants you are mulching with extra nutrients as it rots down and can be covered with another mulch (here it dries out otherwise).

Weeds: Are a quick, easy and readily available mulch but need to be used quite thickly (at least 5cm). In wetter climates it may be advisable to remove weeds with seed.

Compost/manure: This is used in the no-dig approach to increase soil fertility and structure but can also provide some mulching capabilities. The idea is that the worms and insects gradually take the manure/compost down into the soil but here we don't have enough worms and it would dry out too quickly in the sun.

Plastic: This is used often in larger farms, the benefit is that it can be reused as it doesn't break down and that it can be removed easily after a crop has finished but can be difficult to plant through.

Plant care: Structures, fleece and nets, pests and diseases

Structures are needed to help support certain plants which cannot hold the weights of the fruits/vegetables they produce. The main examples of these are: tomatoes, peas, beans and cucumbers. Broad beans often need a low fence with string to hold the block of plants upright. Pumpkins, melons and most gourds can be grown up structures to increase airflow and use less ground space.

Fleece needs to be used to cover beds when the temperatures get too low and starts to stress plants. Its helpful if your beds are the same size as you can reuse these on other beds. Make sure beds are covered if the nights start to get cold, especially in an area which can get frost, the frost settles on the fleece but not the plants underneath.

Nets are used where birds or insects are a problem, especially with brassicas, lettuces and any other delicate seedlings. Different size holes are used for different pests. These must be put onto beds as soon as the seedlings have been planted.

Shade nets are used in hot climates to protect seedlings and transplanted plants while they establish roots.

Pests vary and are usually specific to the crop which is one reason to change crop every growing season with your crop rotation. Nets, sprays (garlic, chilli, tansy), sticky traps and/or trap crops can be used to control them but the best first step is to observe your plants often and manually check for insect pests, removing them when you see them.

Diseases are also specific to the crop which is again why crop rotation is used. You can help to prevent disease by keeping plants healthy with good, nutritious soil, regular watering and observation to catch early signs of a change in health. Sprays such as Horsetail can be used to prevent fungal diseases and milk/lactic acid bacteria also seem to help fight this.

Harvesting: When and how to harvest and store crops

Harvesting methods vary depending on the crop and your situation (here we have a lot of volunteers and time so it's worth taking our time). The main thing is that the plant should be left clean and as undamaged as possible. The best method is to find the natural break – so for example with lettuce leaves you can bend the leaf carefully down close to the base until it snaps and then tear it sideways – this is a good method as it doesn't leave short sections of stem which would rot and provide an entry point for disease. If you need to cut the fruit/leaf off the plant then try to do it as cleanly as possible.

It's important to know when is the best time to harvest the crops – too soon and you can have small vegetables which are not ready and too late and they may have started to rot, become hard and or taste bitter.

Aubergines, Peppers, Chillies – snap backwards against where the fruit stem joins the main stem or cut cleanly close to the main stem.

Broad beans – can be harvested young, especially the first ones, to encourage more, or when they are large and fat. Twist and pull off. You can also eat the top shoots of broad bean plants in salads or cooked like spinach. These can also be left on the plant to dry and stored as dried beans (see below) but be careful they don't rot.

Winter squash/pumpkin – is ready when the pumpkin stem has begun to dry out and brown. Cut off the stem with a knife leaving some stem attached (will help for storage)

Potatoes, garlic, jerusalem artichokes, carrots, beetroot, celeriac, fennel – can be pulled up or dug up when ready.

Lettuce, orientals, kale – larger leaves can be harvested when the plants are strong enough. Only take a few from each plant, usually the lowest on the stem due to harvesting method (see above). Cut and come again salads can also be harvested by cutting the whole plant 5-10cm from the ground but here we have found that the plants tend to go to flower when they grow back. Remove flowers when they start to form as this will make the leaves bitter.

Storing crops can be an essential way to ensure that you have food all year round. At Sunseed we don't really have much need to store vegetables as we eat as most of what the garden can provide, fresh. Only store vegetables which do not have any damage as this can cause them to rot. Be careful that animals (such as rats) cannot get in and eat your harvest!

Winter Squash/pumpkins – these can keep for months as long as they are stored in a warm, dry place. They should be allowed to fully mature on the plant as the sun helps the skin to form a hard, protective layer. Storing in straw can be good as long as it is kept dry. Keep checking them for any signs of rotting.

Carrots, parsnips, beetroot, potatoes, celeriac – again these can be stored for months in paper/Hessian sacks. Potatoes need to be as dry as possible, carrots beetroot, parsnips and celeriac should have some soil on them to keep a little moisture. Check for rotting/damp spots and remove those affected.

Beans – these can be left to dry on the plant and then harvested and kept dry. We usually hang them in a net bag to make sure they are dry before storing them in glass jars (so mice cannot eat them). When it comes to cooking they must be properly soaked and boiled. These can keep up to two years!

Garlic, onions, shallots – can also be stored for months, leave outside in good weather for 1-2 weeks to dry out and then tie in bunches and hang indoors in a place with a good airflow.

Lettuce, oriental leaves, Kale – can, in cool climates be kept for about a week at low temperatures in plastic bags to retain the moisture. Here we can't leave any harvest in plastic bags as it sweats and goes bad very quickly.

Seed saving: easy crops to seed save from, selection, rogueing and isolation, hybrids

Seed saving is very important to organic gardeners for many reasons: it helps to save money – the more seeds you save the less you need to buy, you can be sure where your saved seeds have come from and ensure they are chemical free, you can ensure diversity and carry on traditional varieties that are being lost due to commercial, market-focused seed companies and you develop plants which are well adapted to the conditions you have.

Selection is important as you want your seeds to inherit the best possible characteristics. This should include disease and pest resistance, good productivity, strong and fast growth and good adaptation to your conditions (weather, temperature, soil type etc..). In practice this means selecting the strongest, healthiest plants which have the most fruits/vegetables.

To understand seed saving you will first need to know some terms:

Annual – A plant that completes it's lifecycle (germination-flowering-seeding-dying) in one growing season

Biennial – A plant that flowers and dies in the second season of growing after germination

Perennial – A plant that lives for at least three growing seasons

Self Pollinating/Autopollination – The transfer of pollen from the anthers to the stigma of the same flower or to flowers on the same plant

Cross Pollination – The transfer of pollen from the anther of a flower on one plant to the stigma of a flower on another plant.

Wind pollinated – Pollination where pollen is carried by the wind

Insect pollinated – Pollination where the pollen is carried by insects

Monoecious – separate male and female flowers on the same plant

Dioecious – separate male and female flowers on different plants

Plant family – category in plant classification, grouping related genera e.g Rosaceae: Rosa, Sorbus, Rubus, Prunus and pyracantha.

Easy crops to save seed from:

Tomatoes – Most modern varieties are self pollinating and so the seeds should be the same type as the plant you are saving them from. Select fruits from strong healthy plants and leave on the plant to mature.

Sweet peppers and Chillies – self pollinating but will also cross with each other to a distance of 50 meters away so be careful of neighbours' gardens too! Harvest when the pepper or chili is mature and then remove seeds and leave to dry on filter paper or a plate.

Carrots – are biennial, select the strongest and leave them in the ground with plenty of mulch for the winter. They will cross but not many carrots are normally left to go to seed, they will however cross with wild carrots so check subsequent generations for white useless roots and remove. Flowering should occur in the Spring and after the seeds should be left until they are fully dry.

Peas – almost totally self pollinating so you can select the healthiest plants and leave the peas on until they mature fully and dry.

Lettuce – flowers are self pollinating and don't often cross. Select strong plants which do not go to flower early. Allow the plants to flower and then go to seed (roughly 2 weeks) and then collect the seeds daily by shaking them into a bag. Make sure the seed is fully dry before storing.

Broad beans – will cross breed between varieties so only grow one type if you want the variety to be 'pure'. Select strongest plants and leave the beans on these plants until they are fully dry.

Aubergines – are mainly self pollinated but can be crossed through insect pollination. If you want to save the same variety then you need to only grow one variety.

Melon - will cross with other varieties of melon but not with cucumbers, pumpkins or courgettes. If you want to save one variety then only grow one variety. Leave the melon on the plant until it is ripe then keep inside for a few days or more after picking to let the seeds mature fully. Scoop out of the fruit, rinse and then dry on a plate.

Cucumber – will cross with other varieties of cucumber but not with melons, pumpkins or courgettes. If you want to save one variety then only grow one variety. Leave the cucumber on the plant until it is dark yellow/brown then keep a week or more after picking to let the seeds mature fully. Scoop out of the fruit, rinse and then dry on a plate.

Pumpkin – pumpkins, squashes, marrows and courgettes will all cross breed with each other but if you aren't bothered about this then seeds can be collected from inside the pumpkins and dried fully on a plate/tray.

Hybrids

F1 seeds are bred to be variety specific and productive for the plants of the seeds you buy. After this first generation there is no guarantee of what the plants will do, anything from reverting to a wild plant to not even germinating. For this reason it is not advisable to save seed from plants from F1 seed.

Rogueing

Mutations happen naturally in plants as they do in all species and so you will find that the plants you save seed from sometimes display different characteristics. Sometimes these characteristics are beneficial – resistance to disease or pests or better adaptation to the climate. Sometimes they are not what we want – bitter leaves, early flowering or plants which have

reverted to a wilder form (spiky leaves maybe or less flavour). We select against these characteristics meaning that we choose to save seed from the plants which display only the beneficial characteristics in each generation.

Isolation

When seed saving some plants need to be isolated from other varieties or plants from the same plant family when seed saving so that they don't cross pollinate each other. There are three ways to do this: **Distance** – plants are grown far away from each other so the wind/insects will not carry the pollen that far, **Time** – different varieties are grown at different times of year so that they do not flower at the same time or flowers from all the similar plants are removed, **Cages** - of fine mesh are used to prevent insects carrying the pollen to other types of plant. If you want to use isolation I would recommend looking at the Real Seed seed-saving info sheet listed in the more info section.

Further information...

Books:

Teaming with Microbes

The Vegetable and herb expert

Mediterranean Kitchen Garden – Mariano Bueno, Evelyn Fitzherbert

Growing Winter Vegetables – Charles Dowding

Websites:

Seed saving - <http://www.realseeds.co.uk/seedsavinginfo.html> Kate and Ben used to run their company Real Seed Catalogue from Los Molinos!