

Sustainable Living Programme NZ

2009 Edition



Organic Growing: An Introduction



Raised beds in Spring with new potatoes under grass-mulch (front), garlic, peas, silverbeet, strawberries & marigolds (rear)

The focus of this topic is to help you grow food organically, at home. Even if you don't have a garden, you can still grow some organic food (sprouts, herbs and salads) in containers, and in a backyard you can grow much more.

What food to grow?

The first thing you might want to do is to list what fruit and vegetables your family like. There is no point of growing things that your family don't like!

Once you have got the list of what you would like to grow, research what you can actually grow in your climate and soil conditions.

If you live in Northland you can grow subtropical fruit and vegetables (e.g. citrus, kumara) but if you want to do that in Dunedin it will be very difficult. On the other hand, if you want to grow kale, that needs frost to improve the flavour, you will have difficulties to do that if your area does not get any frost.

Your soil type will also influence what you can grow. A sandy soil is very free draining but as a rule is not very fertile while a clay soil is just the opposite. Some crops are more suited to the one than the other (e.g.: carrots like to grow in sandy soil).

If you are a novice gardener or have just moved into the area, observe what other people grow in your neighbourhood, talk to experienced gardeners, perhaps join the local branch of the Soil & Health Association if there is one close by: www.organicnz.org or become involved in a community garden in your city suburb. By doing this you will increase your knowledge of the local conditions and what grows well in soil and climate. Also, find out what grows at what time of the year, as length of season varies across the length of NZ.

Next, decide if you are going to sow seeds or buy seedlings. There are a few producers of organic seeds (see final page) but very few garden centres sell organic seedlings. Choose disease-resistant heritage cultivars, as they will increase your chances of success (e.g. carrot '*Berlicum*' which is *Alternaria* rot resistant; cucumber '*Marketmore*', tomato '*Diplomat*' and watermelon '*Crimson Sweet*' all have good disease resistance). If possible, use open pollinated seeds, as you will then be able to start saving your own seed, provided you do not plant several varieties close together and create hybrid crops.

Where you can grow food

(ranging from smallest to largest location)

1. On a bench in preserving jars

If you fit preserving jars with a 'sprouting lid' or cover them with muslin, you can grow your own delicious and very nutritious fresh sprouts. You don't need any soil at all. Easy seeds to sprout include alfalfa, lentils, mung beans, radishes and mustard. Organic seeds for sprouting are available from most organic shops. You will find that some imported and irradiated seeds in supermarkets will not sprout. Kings Seeds sells sprouting lids for Agee-type jars as well as organic seeds for sprouting. Their annual catalogue also contains information on how to sprout seeds.

2. In recycled containers

You can recycle some discarded ones, make your own or buy them. Some examples: Recycle half 44-gallon steel drums, plastic drums, old drainpipes, old sinks or baths, tyres. Make some, using untreated timber, pallets, bricks, tree trunks or plastic sheets. Use pots (terracotta, stone, plastic), or hanging baskets.

Any container will do, as long as it is at least 20 cm deep and it has got some drainage holes at the bottom. Clean the container before using it to reduce plant disease problems. Watch out if you use containers in a small paved or concreted area, if surrounded by stone or brick walls, as the plants might overheat in the summer, and need extra watering. Choose suitable heat-loving crops such as tomatoes, for such spaces.

3. In existing garden beds, with or instead of flowers

If you have already got a flower garden, you can reserve part of it to grow your own food.

4. In new garden beds - replacing lawn, or concrete or even a garage!

There are a few ways of starting a bed from scratch, here are four:

Method 1: Building layered raised beds using the 'Esther Deans' method:

- start at bottom with a thick layer of wet newspaper (a supermarket bag-full on each square metre);
- then put down 20cm deep 'pads' from a bale or two of pea straw or lucerne hay (which have more nitrogen in them than cereal straw);
- Next a dusting of 'blood and bone' or seaweed meal or another organic fertiliser (about 250 g/square metre);
- 10cm depth of dry grass clippings or loose pea straw (you will need a few wheelbarrow loads);
- another sprinkling of the fertiliser on top;
- the final bed layer is fine, sieved compost, several cms deep, into which your seedlings can be planted. These can also be mulched with straw if wished.
- Water regularly, as the bed sits above the soil water-table and will drain quickly.

Method 2: Cut squares (approx 20cm X 20cm) approximately 10 cm deep into the lawn using a spade. Remove the squares and place them upside down on top of each other in a heap and sprinkle them with some animal manure so they will decompose, over time. Loosen the bare soil using a fork. Add compost (at least 3 shovels per m²) and gypsum if you have clay soil, and work it into the soil with a fork. The ground is ready to be planted into. After a few months add what used to be the lawn on the top of the existing soil, removing roots of persistent weeds.

Method 3: In the autumn cover an area of lawn with cardboard or a thick layer of newspapers. Make sure that cardboard and newspapers overlap well so the weeds underneath don't get a chance to grow into light. Put at least a 5cm layer of animal manure on the paper layer, add straw on the top and leave it to the soil organisms during the winter. Next spring, some straw stems will still be there but the manure and lawn underneath will have turned into a rich soil. A few days before planting seedlings in spring, pull the straw mulch aside to allow the ground to warm up and remove slug hiding places. If there is still some cardboard or paper left, put a hole through it where you are going to plant the seedlings.



Concrete blocks surround this bed, formerly lawn, in a small urban backyard. Autumn food crops here include greens, tomatoes, runner beans - which benefit from warmth and support of the garage wall behind.

Neat wooden framing around a raised bed for food crops (ranging here from chives to artichoke). The surrounding area in this sloping site is covered by a woven weed-mat and pea gravel, to control grass. (Photos: Rhys Taylor)

Method 4: Dig up an area of lawn and turn the grass into the soil. This is the most labour intensive and backbreaking method. Pull out perennial weeds such as docks, thistles and couch. The best time to do this is probably in autumn, as the winter rains will help the grass to break down. If the digging is done in spring or summer, you will need to keep the soil moist and leave the grass to decompose for at least 4 weeks before planting into it.

Location of containers or garden beds

The vigour and growth of plants will depend on how much sun they get -six hours sun a day is a minimum for summer crops. Don't try to grow veggies close to the shaded south or east side of your house! To be able to grow food all year round you need to look at where the sun reaches in the winter and have your garden in that area if you want to be successful. This is even more important for people in the cooler South Island. Also make sure that this part of your garden is protected from prevailing cold winds by tree shelter, trellis, fence or hedge. Garden beds can be of any shape. If you make them no more than 1.2 m wide you can easily reach everywhere without having to walk on them. This avoids compacting the soil.



When Lisa and her partner moved to their Christchurch house, most of the 'backyard' comprised several garages, pictured here in her photo-album.

Two were dismantled, the concrete bases broken up, and through repeated mulching a garden was created - which is now beginning to produce crops and flowers from new soil.

Preparing the soil

Soil in Containers:

Use a big container with a soil mixture that allows good drainage and aeration. Don't use a mix that is peat based as it dries quickly and is difficult to wet again once dry. Peat, sold by garden centres, is also a non-renewable resource. It can be substituted for by leaf mould (see box).

Leaf Mould:

Leaf mould is the result of the decomposition of leaves. To make leaf mould, gather leaves in the autumn. Put them in an open bottom container (e.g. 4 poles and some chicken wire sides). Water as you put the leaves in, cover top from the rain and leave to decompose for approximately 1 year. Grass clippings can be mixed with them if available.

To aid drainage, always use some coarse material e.g. broken pots or stones at the bottom of the container. Depending on where you live, you might be able to buy commercial organic potting mix. Otherwise you can make your own, using ratios of 7 parts of soil or compost, 3 parts of leaf mould, 2 parts of sand and ½ part seaweed meal or blood and bone. Worm casts are useful if available.

Another way is to fill the container with dried leaves that have been well soaked. Add approximately 10cm of soil or compost on the top. This needs to be done a few months before you can sow or plant into. As time goes by, add some more compost as the level of the mix drops when the leaves break down.

Soil in the Garden:

Good soil is fertile, has good aeration and drainage and good moisture retention, aided by humus (dark coloured well-decayed plant material). In a new garden, pay special attention to removing perennial weeds. Docks and Californian thistles need to be dug out carefully, removing the whole root or they will sprout again. Couch/twitch can be forked out, and do try to remove even the tiniest pieces. Annual weeds are not as much of a problem. They can be hoed when small, leaving roots in the soil to decompose, adding organic matter.

Sowing and Planting

Growing plants from seed is cheaper than buying seedlings but requires more time, knowledge and patience. See separate handout from tutor (on request), library books or internet for more detail if you have not sown seeds before.

Transplanting seedlings

Seedlings grown indoors will suffer root damage and get a shock when transplanted outside. At least one week before transplanting them into the garden put them outside in their container, first in the shade then progressively into the sun, so they get acclimatised. Bring them inside at night if there is a risk of frost. This process is called **hardening off**.

Water seedlings well, shortly before transplanting them. This will reduce the root damage occurring when shifting them. Don't transplant in the middle of a hot day - it is preferable to transplant seedlings in the cooler evening temperature.

Planting out

Dig a hole in the ground slightly bigger than the container. Put the stem of the plant in between your fingers, without gripping it, and turn the pot upside down, tapping the bottom carefully so the plant falls into your hand (if it's a paper container you can plant the whole container). Put plant in the hole. The general rule is that the soil surface of the plant should be at the same height as the garden soil. However, in dry areas you could transplant the plant a bit deeper (in a hollow) and in a very wet area a bit higher (on a mound). This will ensure that the plant gets suitable moisture when it rains. Firm the roots so the plant does not rock in the wind. If there are several seedlings in one container, turn it upside down and carefully remove a cluster of plants. Never touch small seedlings by their stems as you risk squeezing them. Get them by their leaves instead. Carefully remove one plant at a time, trying not to disturb the roots too much, and plant into the soil.

Spacing:

There are no general rules. The space requirement of individual plants is written on the seed packet. Spacing will affect the final size of the plant as well as what shade they create and the ease of controlling the weeds. If plants are placed very close to each other, they will only need to be hand weeded while they are still very young. As they grow, their leaves will cover the soil and touch each other and won't leave much space and light for weeds to grow.

Traditionally vegetables have been grown in rows. This makes weeding easier as a hoe can be used in between the rows. This is particularly important for crops like carrots or onions, which do not compete very well with weeds. Some crops, such as maize, grow and pollinate better in blocks than rows. However, nature does not sow seeds in rows and you can grow in any groupings as long as you use the spacing indicated on the seed packet. This ensures that the roots of the plants utilise the nutrients in the soil to the maximum. Planting randomly suits crops like tomatoes, cabbages, silver beet and lettuce. See the study notes on plants that reputedly make good and bad companions for each other – an example of gardeners' traditional experience.

After-care, for best crops

Watering:

Just after transplanting, water around the plants carefully and try not to wet the leaves. If on a sloping site, leave a slight depression at the base of the plant to prevent the water from running off. Keep the plants well watered until they are well established. The best time to water is in the evening or early morning when the temperature is cooler. To find out if the plants need watering at all, test the soil moisture around the plants, below the surface, with your fingers. If it feels moist, don't water. Over-watering can easily kill.

Mulching/Weeding:

Once the plants are in the ground, don't disturb the soil. If the soil is not covered, weeds will grow back quickly. One way from preventing this from happening is by using a 7-10 cm deep mulch (peastraw, grass clippings, hay...) onto dampened soil. Mulch will also keep the soil temperature constant, add organic matter and nutrients to the soil over time and conserve soil moisture. But be careful that the mulch does not touch the stem of the plants otherwise they might be encouraged to rot as the mulch itself decays. Mulch is not a good idea in often-wet areas, and clay soils, as it will provide a shelter for slugs and snails. In spring it may delay soil warming. If you don't use mulch, keep the weeds down using a hoe and/or pulling them by hand. Put the main effort into controlling weeds during the first $\frac{1}{3}$ of the life of the crop. Note that many weeds actually have culinary or medical uses.

Protection:

Depending on the time of the year, you might want to protect the plants from

- Night frosts, using frost cloth, a cloche (a low glass or plastic tunnel) or a coldframe.
- Wind, using a cut plastic bottle, or tin-can with both ends removed.
- Sun, using suspended shade cloth, or wigwam of branches with leaves.
- Birds or butterflies, using a cloche, frost cloth or bird netting.



DIY 'Coldframe' made from recycled bricks and windows - for spring seedlings. (Photo:Jo Duff)

Feeding:

Some plants, like tomatoes, need a lot of nutrients during the growing season and are called heavy feeders. They will require a regular addition of liquid manure (water-diluted extracts from seaweed, comfrey leaves, or worm farm liquid, or a bought organic liquid fertiliser) during the growing period.

To make liquid manure you need the following:

- container: bucket, plastic drum
- Airtight cover, especially to control smells
- Ingredients: seaweed, fish, comfrey, compost or animal manure
- Something to suspend the ingredients in: sack, onion bag
- Water
- Stick to stir the solution and you may also prefer to use gloves

Seaweed liquid manure:

Put 12 kg of seaweed in a 200 l drum of water. Mix well. Stir weekly for a month. Dilute 1 to 10 for watering (1 litre of the seaweed concentrate for 10 litres of water). Use an even less concentrated solution (1 to 20) for a foliar spray.

Comfrey liquid manure:

Put 6-7 kg of fresh comfrey leaves into 100 l water. Ferment for approximately 4 weeks stirring every day. Dilute 1 to 1.

Wholesome liquid manure:

Put 1.2 kg of wood ash (of untreated wood), 2.2 kg of blood and bone and 2 kg of cow manure into 100 l of water. Ferment for 2 to 4 weeks. Dilute 1 to 3 for watering and 1 to 5 for spraying.

Making Compost

A compost heap is simply an environment where the natural breakdown of organic matter can be sped up. Making compost closes the loop – your excess vege scraps, weeds etc. can be made into compost and used to fertilise the soil to feed your next crop. In order to achieve a quick breakdown of your materials and to ensure that plant diseases and weeds are eliminated it is important to **hot compost** them.

Virtually anything which once was alive can be put on a compost heap. Woody things should be finely chopped first. Evergreen trimmings and pine needles do not rot well and should perhaps be avoided. Citrus should be added in moderation. Wood ashes from untreated wood (not coal) are fine as long as they are added in moderation. Avoid materials such as meat, fat and fish. Also avoid flax and cabbage tree leaves and weeds such as oxalis, fathen, dock and twitch.

Compost can be made in a free standing pile or in wooden boxes or plastic containers. Build a heap using alternate layers of carbon-rich and nitrogen-rich materials. Add water as you go, so that the heap is moist but not wet. Aim to make the heap a minimum of one cubic metre, as smaller piles will have trouble heating up. (If you do not have enough materials in one go, save your materials in a 'cold' compost area until you have enough to make a hot compost. The heap should reach temperatures of 70°C at the centre over the first few days, and this heat will kill weed seeds and partly 'sterilise' your compost. Turn the material in the first few weeks (edges to middle) to ensure that every part is sufficiently exposed to the heat to kill plant diseases and weed roots and seeds, and help breakdown unwanted chemical residues. Once the heap has cooled down and the earthworms have arrived, add lime. A couple of handfuls of lime worked in should be sufficient for a 1 cubic metre pile.

Carbon and Nitrogen
 A C:N ratio of 30:1 works best.
 Carbon rich materials are:

- Dried, old leaves
- Straw
- sawdust (untreated timber)
- bark chips

Nitrogen rich materials are:

- Kitchen scraps
- grass clipping
- fresh, green plant material e.g. weeds
- fresh seaweed
- animal manures

A mature compost should be dark brown, friable and should smell like good soil. Usually the worms have started leaving the pile, as they have finished their job.

Detailed notes on compost making, in the Sustainable Living series, are available from your tutor. These include EM Bokashi and worm farm alternatives.



Pests and diseases

When growing plants organically, the best strategy with pests and diseases is to try to prevent them from happening in the first place. Unlike in conventional chemical-dependent growing there is no instant solution (like a spray) after the problem has appeared.

If you think you can eradicate insects you have lost the battle even before starting it. Don't even try to kill them all, as there will always be a few that will become resistant and will reproduce, leaving a worse pest in their place. It is a better strategy to try to create conditions that pests don't like (like using a reflecting mulch around plants to disorientate aphids), or to have decoy plants (aphids prefer red leaf lettuces and cabbages, to green leaf ones) and to attract natural predators or parasites. These beneficial insects naturally take care of the pests. They include hoverflies, ladybirds, and tiny parasitic wasps.

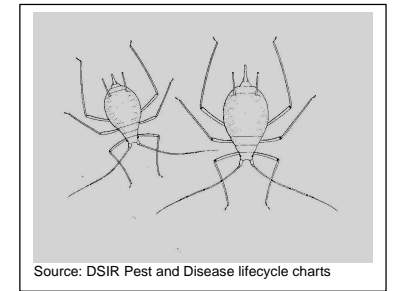
A few common pests and how to deal with them the organic way:



Aphids:

They are prolific especially in early spring before their natural predators and parasites are numerous. The plants likely to be affected are the brassicas (cabbage family), roses and plants grown for an early season, in a glasshouse.

Some ideas of what you can do against aphids:

- Use a high pressure water spray – it washes off the aphid, breaking its feeding parts in the process, so the aphid will die.
- Use a reflective mulch, like aluminium foil on the ground around your plants. This will confuse the aphids.
- They are attracted to yellow, so yellow sticky traps will divert some of them from food crops, permanently.
- Attract predators (ladybird, hoverfly, lacewing) by growing the early-flowering nectar-providing open-flowered plants which they like: phacelia, buckwheat, and plants of the carrot family (Apiaceae) like parsnip, parsley, and – in orchards where taller growth is manageable - cow parsley.
- Spray soapy water, made using pure soap, not detergent.
- Use companion plants, like marigolds
- Use a seaweed, stinging nettle or neem oil spray
- Pyrethrum is a natural insecticide, is but only use it as a last resource as it kills all the insects including the beneficial ones
- Don't use too much nitrogen fertiliser – over-fed plants are more pest prone.



<p>These © photos provided by Natural Science Image Library of Lincoln. 03 325 2052</p> 	
<p>USEFUL INSECTS. These tiny wasps are predators of aphids. They lay eggs inside them - which develop into a hungry larva - the aphid is doomed! Other wasps attack white butterfly caterpillars. Encourage them with flowers.</p>	<p>Look out for purple larvae (top) of the well-known red ladybird (above) – they eat more aphids than the adult beetles and should be welcomed as a helper when seen.</p>

Slugs and snails:

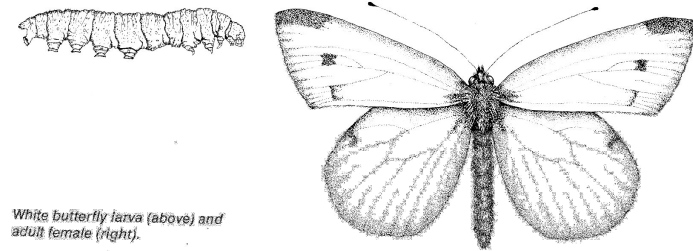
Slugs and snails love seedlings, especially those of lettuce, beans, brassicas, radish and silverbeet.

Some of the things you can do to control slugs and snails:

- Place inverted orange and grapefruit skins or empty containers turned upside down around plants, and in the morning collect (and kill) the accumulated slugs.
- Locate and collect snails by walking the garden with a torch on rainy nights
- Remove the main slug hiding places (debris, mulch, planks and firewood heaps)
- Sprinkle a coarse substance around seedlings (e.g. wood ash, eggshells, sand)
- Put beer in a container buried at ground level and empty the drowned slugs daily
- Encourage birds such as thrushes into the garden; have domestic ducks.

White butterfly:

All the members of the cabbage family (cabbage, broccoli, cauliflower, red cabbage, Kohlrabi, kale, mustard and various Asian greens) can be affected by white butterfly, usually during the warm summer months. The caterpillars hatch from eggs laid under the leaves and eat big holes out of them.



White butterfly larva (above) and adult female (right).

Source: R.R. Scott, New Zealand Pest and Beneficial Insects, Lincoln University 1984 Reproduced (this page and page 7 aphid image) by kind permission of Lincoln University. Copyright – limited to non profit educational use.

What you can do to control white butterfly caterpillars:

- Cover freshly transplanted seedlings (pegged-down old net curtains are great)
- Remove the tiny white eggs from the leaves, find and squash the green caterpillars. (They are not hairy)
- Mulch around plants in summer – but remove debris in the winter
- Grow caterpillar-tolerant cultivars like 'Eureka' or 'Green Coronet'
- Grow broccoli accompanied by companion plants: beetroot, celery, celeriac, dill, rosemary, hyssop and sage. The companion plants should not actually be planted among the broccoli as they compete for the soil nutrients and the broccoli are heavy feeders—better to grow the herbs around the outside of the garden area, or put in a special beneficial insect-attracting garden bed.
- Grow plants attracting lacewings and hoverflies (phacelia, and carrot family)
- Spray smelly rhubarb, garlic or fish fertiliser sprays
- Spray Bt *Bacillus thuringiensis* (bacteria that kills caterpillars) such as Delfin WG manufactured by Fruited, or Dipel DF manufactured by Nufarm.
- If all else fails, spray derris dust, neem soap or Bordeaux mixture (NOTE all these are Bio-gro 'restricted' category, if you are a Bio-gro registered organic grower). These will kill beneficial insects too.

Plant Diseases

Diseases occur when 3 conditions are met:

- The pathogens (organisms causing diseases) are present in sufficient numbers
- The plants have got little resistance (plants not healthy, dry, stressed...)
- The environment is favourable to the pathogens (e.g. acid soil for club root on brassicas).

A few things you can do to prevent diseases:

- Grow healthy plants by providing them with the right conditions (like higher pH for brassicas, using lime), humus and balanced nutrient supply (using compost rather than chemical fertilisers)
- Grow disease-resistant cultivars
- Rotate crops each season, so diseases won't build up in the soil
- Practise good hygiene and remove diseased plants
- Use companion planting (this topic is a mix of science and 'garden lore')
- Use preventive "compost tea" spray

Recommended resources:

- **Organic gardening books:**
 - *Down to Earth – The Absolute Beginner’s Guide to Growing Organic Vegetables* by David Prosser, 1995, Shoal Bay Press, Christchurch
 - *Organic Gardening for New Zealand Gardeners* by Dr Judith McLeod, 2004, Random House, Auckland
 - *Organic Gardening in New Zealand* by Richard Llewellyn Hudson, 1982, Reed Ltd, Wellington
 - *Organic Gardening* by Peter Bennett, 2001 (6th edition), New Holland Publishers Pty Ltd, Australia
 - *Successful Organic Gardening* by Geoff Hamilton, MacMillan Company of Australia Pty Ltd, Melbourne
 - *Organic Gardening: a practical guide to natural gardens from planning and planting to harvesting and maintenance* by Christine and Michael Lavelle, 2003, Lorenz Books UK / David Bateman NZ
- **Pest and disease identification books:**
 - *Simple pest and disease control* by Colin Campbell, 1994
 - *Managing pests and diseases* by Rob Lucas, 2005
 - *Backyard Bugs* by R.B. Chapman, 1998
 - *The organic garden problem solver* by Jackie French, 1994
 - *Natural Control of Garden Pests* by Jackie French, 1990
 - *What’s that pest?* by Rob Lucas, 1998
 - *An Illustrated Guide to Common Weeds of New Zealand* (2nd edition), by Bruce Roy (and others) 2003 [but note that responses to weeds here are not organic].

Useful websites

- Soil & Health Association of NZ: www.organicnz.org
- Organic Pathways: www.organicpathways.co.nz
- Biological Husbandry Unit, Lincoln: www.bhu.co.nz
- UK Soil Association: www.soilassociation.org
- Henry Doubleday Research Association (UK): www.gardenorganic.org.uk
- Create Your own Eden (NZ): www.createyourowneden.org.nz

Organic seed sources

Koanga Gardens RD 2, Maungaturoto Tel: (09) 431 2732 www.koanga.org.nz	ECO Seeds P O Box 12075 Wellington Tel: 04 976 4448 www.ecoseeds.co.nz	Kings Seeds P O Box 283 Katikati Tel: (07) 549 3409 www.kingsseeds.co.nz
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There are also some seed saver groups around New Zealand - contact local branches of Soil and Health Association (Organic NZ) to locate these.

As an example: The Southern Seed Exchange is a charitable trust with about 100 members and run by a small team of volunteers. It facilitates the exchange of seeds between gardeners by receiving seeds from seed saving gardeners and producing seed lists for members to receive seed at no cost, except for membership subscription. Have a special interest in local cultivars and lesser-known nutritious food plants. Some of the seed is heritage or heirloom cultivars, no longer available commercially. For more information email southernseed@paradise.net.nz or phone David on 03 960 3987 or Matt on 03 377 6290.

Appendix - alternatives to garden chemicals.

Chemical input	Non-chemical alternative
Fertilizer	<ul style="list-style-type: none"> ✓ Build up the soil humus/organic matter ✓ Make compost or biodynamic preparations ✓ Use vermi-compost and vermi-liquid ✓ Make liquid fertilisers in drums, from dynamic accumulators (e.g. comfrey) or seaweed ✓ Crop rotation, 3 or 4 year cycle.
Pesticide (incl. insecticide)	<ul style="list-style-type: none"> ✓ Avoid getting pests: timing, plant healthy plants, avoid plant stress by feed & water ✓ Deter pests: plant mixed rows, polyculture not monoculture, companion planting ✓ Increase predators: provide habitat, shelter e.g. ‘insectaries’, companion planting, flowers, or introduce predators (esp. in glasshouses) ✓ Be patient: the predators will build up slowly ✓ Pick off bugs by hand or wash off with spray of water. But don't pick off ladybird larvae! ✓ Spray: pyrethrum, neem, molasses, soap, garlic, vermi-liquid, liquid seaweed
Fungicide	<ul style="list-style-type: none"> ✓ Avoid/prevent conditions in which fungi grow: ensure good garden hygiene, good ventilation and don't over-water ✓ Prune and burn infected cuttings ✓ Use resistant cultivars ✓ Intercrop, including flowers ✓ Timing ✓ For viruses, aim to control the agent which spreads the virus ✓ Spray vermi-liquid (from worm farm, diluted)
Herbicide	<ul style="list-style-type: none"> ✓ Don't leave bare soil for seeds to colonise ✓ Don't clear too much land at once ✓ Mulch/green manure ✓ ‘Stale seedbed’ let weeds grow & hoe them in ✓ black plastic - but this restricts soil oxygen ✓ Hoe between crops ✓ Hand weed ✓ Plant closely/under-crop/companion plants ✓ Plant mature plants that will shade weeds ✓ Harvest ‘weeds’ for edible and medicinal use or chicken food, or compost them ✓ Crop rotation ✓ Get to know weed lifecycles, stop the seeding.