



## S4.1 Practical gardening techniques



The previous sections talked about planning your growing space and introducing new crops. This section looks at the detail of keeping them all growing well, starting with feeding and managing problems, and moving on to growing under cover and innovative systems and materials. These techniques have a few do's and don'ts, but there is plenty of room to experiment. As before, for every topic there is an Activity suitable for pupils and the community (numbers 38-47). See the DVD.

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## S4.2 Using compost



Home-made compost is great stuff. This sweet smelling, dark, crumbly material is easily made from garden waste and vegetable peelings rotting down in a compost bin. See B5.7. Compost is valuable because it recycles plant nutrients and improves soil. This section brings together the typical uses of compost in a school organic garden. A38 takes a closer look at using compost in potting mixes.

### Benefits of using home-made compost

- Adds fertility** Adding compost gives plants nutrients they need to grow well and have more resilience to pest and disease. This applies whether digging in, mulching or using compost in potting mixes. Using too much compost though is not helpful, as it overfeeds plants, producing soft growth more vulnerable to attack by pests.
- Improves soil** Compost improves soil structure and encourages worms and micro-organisms that aerate soil and keep it biologically active. There are lots of benefits that include the following.
- Creating a crumbly, airy, less compact soil where roots can establish easily and find nutrients.
  - Improving drainage in wetter soils and moisture retention in free draining soils.
- These effects on soil are long term, and get better the longer you add compost - unlike using artificial fertilisers. This is essential to good organic growing.

### When to use compost

Spring is the best time for digging in or mulching. Don't use in autumn and winter so fertility doesn't leach out of the soil, wasting nutrients and potentially causing pollution.

#### Top tip



#### How much compost to use

One wheelbarrowful of compost per 5m<sup>2</sup> of soil per year.



Spreading compost around crops as a mulch (A39). Digging compost in a new vegetable bed (A26).

Lancaster School pupils deciding where to use the lovely compost.

## Priorities for using compost

Few gardeners ever have enough compost for everything they'd like, so have to use it where most needed. It can also take time for your school to build up a regular supply of home-made compost, so it may be necessary to use substitutes at first. See table below.

### Adding to soil or raised beds

- Dig in compost or mulch around the most 'hungry' vegetables, such as members of the potato, cabbage and cucumber family. See A7 for a list of families and S3.2 for how this fits into crop rotation.
- Planting fruit trees and bushes, and then as a mulch (A36).



Potting on a young aubergine plant.

### Using as growing media

- Potting on young plants into larger pots and trays (A21)
- Potting plants in larger containers (A11).

These uses are handy and can save money, especially for larger containers, but alternatives are easily bought. Home-made compost for potting needs to have a finer texture than needed for digging in/ mulching, so may need to be sieved if it contains lots of twiggy bits. Don't use home-made compost on its own for sowing seeds because it is too high in nutrients.

## Substitutes for home-made compost

Substitute	Improves structure	Fertility relative to homemade compost
Leafmould	Yes	Very low. Use 2-3cm deep. See S4.4 for how to use. Apply year round.
Green waste*	Yes	Lower and variable. Use one wheelbarrow to 3m <sup>2</sup> . Due to slightly different ingredients from typical home-made compost, there is often more potassium, useful for fruit. Can be applied year round, since nitrogen is slow release.
Well-rotted manure**	Yes	Higher. Use one wheelbarrowful to 10m <sup>2</sup> . Often more nitrogen, useful for leaf growth. Apply spring/summer.
Liquid feeds	No	Varies. Use to boost fertility for plants growing in pots or containers. See S4.5 for how to use.

\*From kerbside collections by Local Authorities.

\*\*Be VERY careful to ensure manure is herbicide-free as this can otherwise severely damage your crops, ie ensure the supplier hasn't used any weedkillers in growing or via animal feeds/bedding, such as commercially used 'Aminopyralid'.

<b>Health &amp; Safety</b>	Compost is safe to handle if the usual garden hygiene rules are followed. Keep cuts covered, wash hands after handling and keep tetanus vaccinations up to date. Follow Manual Handling guidelines (SG1.3) when moving heavy loads.  <i>See also Health and Safety Guidelines (Section SG1.2)</i>
<b>Activities on DVD</b>	A26 Digging A38 Making potting mixes A39 Mulching plants
<b>Further information</b>	B5.7 Making compost S4.4 Using leafmould S4.5 Using additional feeds Garden Organic home composting <a href="http://www.homecomposting.org.uk">www.homecomposting.org.uk</a>



## S4.3 Using mulches



Mulches are any material used to cover the soil surface. They are used to conserve moisture, provide nutrients, moderate temperature and suppress weeds. Use layers of newspaper, cardboard, plastic sheeting or gravel, as well as degradable materials that feed the soil, such as compost, manure, leafmould, straw or comfrey leaves. This section explains when mulch is important. A39 describes how/why to mulch.

### Benefits and different mulches

**Conserve moisture** Mulch provides an insulating blanket that protects the soil surface from drying sun and wind, maintaining a more even/cooler temperature beneath and reducing water loss. This is especially useful during school holidays where mulching can cut down maintenance time on watering. Use particularly for the following.

- New fruit trees, bushes, canes and vines vulnerable to water shortage.
- Crops that particularly dislike interruptions to growth, eg when growing fruit or expanding new leaves, such as cabbage, cauliflower, courgette, leaf beet, potato, runner bean, sweetcorn, etc. See Food Growing Instruction Cards.



**Suppress weeds** Mulching smothers weeds by excluding light to stop/reduce regrowth. Mulch also reduces the number of weed seeds germinating. Choose mulch depending on the severity of weeds, eg grass clippings will deter small annuals, while damp newspaper or plastic sheeting can clear tougher perennial weeds after six to twelve months.



**Feed soil** Degradable mulches release plant nutrients as they break down on the soil surface. This gives plants an extra boost, eg comfrey leaves are rich in potassium that helps fruit development, while compost gives a more balanced boost of major plant nutrients. Degradable mulches also improve soil structure.



<b>Health &amp; Safety</b>	Follow Manual Handling guidelines (SGI.3) when moving heavy bags and wheelbarrows full of mulch and spreading materials around plants.  <i>See also Health and Safety Guidelines (Section SGI.2)</i>
<b>Activities on DVD</b>	A39 Mulching plants
<b>Further information</b>	G4.3 Gardening without digging G4.4 Using green manures (as living mulches)



## S4.4 Using leafmould



Leafmould is a lovely, crumbly dark material made from fallen leaves of deciduous trees. It's less nutritious than compost and well-rotted manure, but still offers opportunities for improving soil and is an invaluable ingredient for potting mixes. This section looks at the role of leafmould in organic food growing in school. A40 shows you how to make leafmould.

### Benefits and different uses

How	Why
Dig in (A26) or as mulch (A39) after 12 months, up to a 3cm deep layer	<ul style="list-style-type: none"> <li>Develops soil structure, eg better drainage/water retention, etc. See S3.2 for how this fits into crop rotation.</li> <li>Since low in nutrients, it can be spread in autumn without risk of nutrients leaching out and being wasted/polluting, unlike compost and well-rotted manure. This is useful for protecting otherwise bare soil and for crops that benefit from an autumn mulch, such as over wintering cabbage.</li> </ul>
Making potting mixes (A38) after 24 months	<ul style="list-style-type: none"> <li>Adds bulk to support plants in range of potting mixes, together with good structure for drainage and air content.</li> <li>Low in nutrients for using on its own for seed sowing.</li> <li>Rich in micro-organisms helpful in suppressing diseases, but can contain weed seeds.</li> </ul>

### Stages of decomposition



Fresh leaves in autumn.



Halfway there: after 12 months.



Fully done: after 24 months.

<b>Health &amp; Safety</b>	Be careful when handling leafmould; cover cuts and wash hands afterwards. Ensure appropriate adult supervision.  <i>See also Health and Safety Guidelines (Section SG1.2)</i>
<b>Activities on DVD</b>	A26 Digging A38 Making potting mixes A39 Mulching plants A40 Making leafmould
<b>Further information</b>	S3.2 Planning crop rotation S4.3 Using mulches



## S4.5 Using additional feeds



Additional feeds are no substitute for creating a healthy, sustainable fertile soil by adding organic matter such as compost. On occasions however, plants need extra nutrients from ‘concentrated’ fertilisers to keep them growing strongly or correct a problem. This section explains the scope of these feeds. A4I shows you how to make your own liquid feed from nettle or comfrey plants.

### Types of additional feed

- Liquid feeds* These provide plant nutrients quickly by watering on to roots/leaves. You’ll often see plant growth improve rapidly after feeding, but unlike organic matter, they do little to improve the soil structure and life. They are particularly useful though if you’re still building up your own supplies of organic matter.
- Granular feeds* Granular fertilisers release similar nutrients to liquid feed, but at a slower rate. They may improve the soil, but are still no substitute for good soil treatment with organic matter.

### Main uses

*General boost* Plants not growing as well as hoped, despite organic matter added to soil, eg cabbage, sweetcorn, pumpkin, etc. Use a general fertiliser\* during the growing season. This is not best practice, so should not be relied on regularly.



*Restricted space* Plants in pots, containers and greenhouse/polytunnel borders use up nutrients quickly in the small amounts of soil or compost. These plants also benefit from general fertiliser\*.



*Extra nutrients for particular crops* Certain crops that benefit from more of a specific nutrient, eg comfrey and organic tomato feed provide extra potassium for better fruiting of tomatoes, while liquid manure offers extra nitrogen for leafy crops.



*To correct deficiency* Plants suffering from too little of a specific nutrient, eg raspberries develop yellowing between veins when short of magnesium, corrected by ‘Epsom salts’ (short term only). Correct identification of a deficiency before treatment is essential.



## Useful background notes

- \*General fertilisers contain fairly balanced amounts of the three major plant nutrients, ie nitrogen for leaf growth, phosphorus for roots, and potassium for flowers/fruit, described as NPK respectively. Some fertilisers favour one of these three, eg bone meal is high in phosphorus, useful when planting trees.
- Other fertilisers have 'trace minerals' needed for good plant function and uptake of other nutrients. The best general source is seaweed (liquid or granular). Others provide specific trace elements, such as 'borax'. This treats boron deficiency, a common disorder in cauliflowers.
- Buy concentrated fertilisers with an 'organic' symbol when possible as their ingredients are from certified organic sources.



*Diluting home made comfrey feed to give tomatoes extra potassium for good fruiting.*

## Three easy to make liquid feeds

- 1 **Worm liquid** Drain this feed from a 'wormery'. See A53 for how wormeries work by composting mostly kitchen waste. Dilute liquid with water about 1:10. The feed is not reliably nutrient rich, but a good general fertiliser for established plants.
- 2 **Liquid manure** Soak a shovelful of manure in a bucket of water for four weeks and use diluted 1:10; or hang a shovelful in a net in a waterbutt filled with water and use undiluted. Liquid manure is a rich feed, especially high in nitrogen, useful for leafy crops.
- 3 **Comfrey or nettle** Cut leaves of these easy to grow plants and soak in water for a few weeks. See A41 for instructions about to make and use. Nettle feed is well balanced and comfrey especially high in potassium for better flowers and fruit.



### Health & Safety

Be careful when mixing and applying liquid feeds, washing hands and face afterwards. Comfrey, nettle and manure feeds can smell and stain clothes. If applying dusty granular fertiliser, wear a mask and gloves. Crops fed with liquid manure must be restricted to those that are cooked before eating, ie not salad crops.

*See also Health and Safety Guidelines (Section SG1.2)*

### Activities on DVD

A41 Making liquid feed  
A53 Using wormeries

### Further information

B4.4 Building soil fertility  
Organic Gardening Guidelines (see DVD)  
Organic Gardening Catalogue [www.organiccatalogue.com](http://www.organiccatalogue.com)



## S4.6 Managing plant problems



It's normal for plants to have problems. The solution is correctly identifying the problem and then deciding whether treatment is necessary. Prevention remains the first choice, but occasionally you'll need to intervene. This section follows on from B5.10 to look at more techniques for dealing with pests, diseases, deficiencies or disorders. A42 gives more diagnostic techniques.

### Keep managing the organic essentials

#### *The essentials (from B5.10)*

- Grow strong plants more resilient to attack, eg right aspect, good soil treatment (A9), correct watering (B5.6), growing strong seedlings (A18), etc.
- Encourage natural predators/wildlife to create rich biodiversity (B5.11, S4.7). Learn the difference between pests and creatures doing no harm. See A28 for friend and foe game.
- Inspect your plants often for any problems and act immediately, if needed. Small amounts of damage can be tolerated.
- Grow resistant varieties with natural plant defences, eg potatoes more resilient to potato blight.
- Avoid contamination by good garden hygiene, eg keep tools clean (B3.2), be careful what you compost (B5.7), clean greenhouses/polytunnels (A45), buy certified disease free fruit trees and bushes.
- Provide defences so pests and disease don't have the opportunity to attack, eg barriers.
- If all else fails, sometimes you have to give in gracefully!

### Deficiency

<i>Cause</i>	Plant nutrient is missing or not available.
<i>Prevention</i>	See A9 to ensure soil is properly fed and use additional feeds for plants in containers; see S4.5.
<i>Cure</i>	Feed as above, or apply a specific nutrient as a remedy, eg those available in the Organic Gardening Catalogue ( <a href="http://www.organiccatalogue.com">www.organiccatalogue.com</a> ).
<i>Example</i>	Tomatoes with hard, brown base - calcium deficiency. Make sure plants don't dry out so calcium remains available to plants.
<i>Example</i>	Raspberries with 'bleached' looking leaves with prominent green veins - magnesium deficiency. Apply 'Epsom salts' (short term) and spread compost over soil surface as a mulch (long term).



Keep plants fed to avoid nutrient deficiencies, here magnesium deficiency in raspberry.

## Disorder

- Cause** Environmental and human causes. Disorders are not caused by pests or diseases, but these can cause secondary damage.
- Prevention** Identify cause and prevent if possible.
- Cure** Plants may recover depending on severity and duration of problem. See examples below.

### Examples

#### Frost damage

**Typical symptoms** Top growth brown/purple or all growth destroyed. Vulnerable plants include potato, tomato, sweetcorn, courgette, squash, pumpkin, runner bean, French bean, and other cold sensitive crops.

**Prevention** Protect plants if frost is forecast by covering with horticultural fleece (available from garden centres) or old net curtains.

**Cure** Leave damaged growth to protect new emerging shoots, but remove if rotting.

#### Wind damage

**Typical symptoms** Brown leaf edges. Plant debris scattered around garden.

**Prevention** Grow in sheltered location. Construct windbreaks if needed to slow wind, eg plant hedges or use slatted fences.

**Cure** Established plants usually recover. Young plants may not, but can be protected with cloches or horticultural fleece.

#### Too dry

**Typical symptoms** Wilting, brown/curled leaf edges.

**Prevention** See B5.6 for improved watering techniques and A23 about creating a watering rota. Follow techniques in A9 to develop soil moisture retention, eg by adding compost.

**Cure** Water immediately and thoroughly. Plants should recover unless drought prolonged.

#### Too wet

**Typical symptoms** Wilting, pale leaves, mouldy flowers. Soil/potting mix may be waterlogged, possibly foul smelling.

**Prevention** See B5.6 for improved watering techniques. Follow techniques in A9 to develop soil drainage and free draining potting mixes in A38, eg those with added grit.

**Cure** Stop watering, allow pots to drain, monitor carefully. Most plants should recover.

#### Not 'hardened off'

**Typical symptoms** Stunted growth after transplanting.

**Prevention** Properly acclimatise plants to different growing conditions before transplanting, eg from hotter greenhouse to colder outdoors. See A22 for technique.

**Cure** Time. If plants were moved outdoors, cover with horticultural fleece or cloche for two weeks, gradually removing to increase exposure to outdoor weather.

#### Herbicide damage, ie weedkiller

**Typical symptoms** Distorted and discoloured leaf growth, sometimes fern-like; damage patchy around plots.

**Prevention** Identify and eliminate source of herbicide, eg from use on adjacent land, or chemicals imported in manure, eg Aminopyralid (see S4.2).

**Cure** Plants may recover from mild damage, otherwise remove. If soil/manure contamination suspected, regularly cultivate soil to expose to air and light to hasten degradation of chemical by microorganisms; similarly add compost. Test contamination periodically with sample germination of quick growing seeds such as lettuce.



**Disorder: preventing unnecessary plant breakages**

*Pupils from St Andrews School making plant supports from bamboo canes. Protect eyes by using cane caps or plastic cups on cane ends.*

*Supporting heavy tomato plants by wrapping main stems around twine. You can also tie plants to stout bamboo canes.*

*Using figure of eight to tie stem to canes/wire to prevent damage to stem. Would otherwise weaken plant and let disease enter wound.*

**Pests**

**Cause** Animals that damage plants, particularly insects. They may eat, nibble, suck sap, and tunnel into plants. Look carefully for creatures on leaf surface/underside, around shoot tips and bush centres in particular; also for leaves with irregular holes, missing/distorted growth, folded over/curled, and very fine mottling.

**Prevention** Identify cause and prevent if possible, eg barriers, traps. Encourage natural predators, eg wildlife food sources/habitats such as flowers, log piles, etc.

**Cure** Remove pests if they cause a problem, eg cut off infected growth, spray off with jets of water, squash between finger and thumb. There are also organic sprays based on natural ingredients, eg vegetable oils, fatty acids, and pyrethrum, but only use as a last resort as these still damage ecosystems/natural predators. It is illegal to use banned sprays, or make up your own. Visit [www.organiccatalogue.com](http://www.organiccatalogue.com) for products.



*Crop protection cages with netting, eg protect fruit from birds, cabbages from cabbage white butterfly. Cages can be fixed or movable.*

**Examples**



*Help protect apples from 'codling moth' using natural pheromones to attract males. There is also a plum fruit moth trap.*



*Spread specially bought grease around fruit tree trunk (two years and older) to stop ants and winter moths crawling up.*



*Moles can uproot vegetables and ruin paths/lawns around the garden. Try electronic scarers and traps.*

## Diseases

- Cause** Other living organisms ('pathogens') that damage plants, particularly fungi, bacteria and viruses. Look for white fluffy growth, dark coloured spots, flaky bark, corky patches, unusual growth, growth dying back, rots, discolour, wilts, etc.
- Prevention** Increase ventilation between plants, boost plant health with appropriate feed/growing conditions. Clean tools between pruning cuts, eg use Citrox from [www.organiccatalogue.com](http://www.organiccatalogue.com)
- Cure** Remove infected growth.

### Top tip



### Managing plant viruses

Remove plants infected by a virus, such as 'cucumber mosaic'. There is no cure. Choose resistant varieties and control aphids to limit spread.

## Examples



Discourage fungal 'scab'. Feed, prune for airflow (clean tools after), remove infected stems, dispose of fallen leaves/fruit in municipal waste.



Remove dead and dying growth from plants to reduce opportunities for disease to take hold and spread.



Remove leaves attacked by fungal potato 'late blight' on potatoes. Promptly cut to soil level if severe.

### Health & Safety

Follow usual garden hygiene when handling infected plant material, eg wash hands, cover open wounds and wear gloves if necessary. Ensure adult supervision, especially if using any specific control measures involving products. When using sprays, personal protective measures such as respiratory, eye and skin protective equipment should be used. Compliance with Health and Safety Executive's 'Control of substances hazardous to health' (COSHH) and relevant Environmental Protection Legislation must also be adhered to.

See also *Health and Safety Guidelines (Section SG1.2)*

### Activities on DVD

- A9 Testing soil and improving fertility
- A28 Friend and foe game
- A38 Making potting mixes
- A42 Diagnosing plant problems
- A62 Planning biological control

### Further information

- B3.2 Using garden tools
  - B5.6 Watering plants
  - B5.10 Controlling pests and diseases
  - B5.11 Attracting wildlife
  - S4.5 Using additional feeds
  - S4.7 Creating habitats for wildlife
  - G4.11 Introducing biological control
- 'Garden Organic Guidelines' on DVD. Full list of organic products.
- 'Pests, Diseases and Disorders of Garden Plants', Collins Photo Guides by Stefan Buczacki and Keith Harris. ISBN 0007196822



## S4.7 Creating habitats for wildlife



Encouraging wildlife is essential for successful organic growing. Crops remain healthier because ‘friends’ such as frogs and birds eat pests like slugs and caterpillars. This natural balance stops any one pest getting out of control. Some species are also important for pollination for good fruit set. This section talks about creating habitats for wildlife. A43 has further practical instructions and examples.

### What is a habitat?

Good habitats provide reliable food sources and shelter for wildlife throughout the year. The more different habitats you have, the greater the diversity of wildlife.

- 1 Macro-habitats** – your whole garden is a habitat, although it doesn’t work in isolation. It’s part of a network of natural spaces with neighbouring gardens, parks and woodlands. These link together to form valuable ‘corridors’ where wildlife can travel across larger distances. This network is needed to support larger creatures, such as birds and frogs, while smaller creatures usually find everything they need in just one garden.
- 2 Micro-habitats** – your garden is made up of lots of little habitats, such as log piles, compost heaps, ponds, etc. These support large and small creatures. This is where you can make the most difference and get creative. Micro-habitats also form smaller corridors, so think about how things fit together, eg a strip of long grass providing safe travel for ground dwelling creatures by joining up with rotting leaves under a hedgerow.

### Creating habitats in school gardens

There are plenty of opportunities to create a collection of bustling micro-habitats in your school garden. Their creation is an engaging activity for all ages. Habitats are fascinating to watch and offer great opportunities for observing natural creatures.

However, a wildlife friendly garden doesn’t mean a messy garden out of control. Habitats can be tucked away to create a ‘quiet’ space away from gardening activity, or in full view, so long as they are sensitively positioned to link up corridors. It may take a while for wildlife populations to build up, especially if the garden was fairly desolate beforehand or lots of pesticides were used.



*Pupils from the Lancaster School looking at compost heaps as an excellent micro-habitat.*



*Linking up habitats; making a ladybird house (A29) and placing underneath a bush.*

## Example habitats for school gardens; natural and built

Habitat type	Attracts	Why helpful	
Compost heap, log pile, leafmould	Beetles, spiders, hedgehogs, frogs, invertebrates, etc	Eat a wide range of pests, eg slugs, etc	
Water/pond	Frogs	Eat slugs	
Hedgerows, shrubby areas	Bats, birds, spiders	Eat insects	
Long grass, stem bases, winter 'hotels' (see activity list below)	Ladybirds and other insects	Eat sap sucking pests such as aphids, scale insects, etc	
Flowering plants, meadows, wild flowers.	Beneficial insects, eg hoverflies, lacewings, parasitic wasps	Larvae eat pests, eg aphids, caterpillars, etc. Also help pollination	
Feeders, eg bird tables, shrubs with berries, fat balls	A range of birds, eg blue tits, wrens	Eat caterpillars, other grubs in soil, woolly aphids and other overwintering pests	
Soil habitats, eg develop by adding organic matter like compost	Earthworms and beetles, plus micro-organisms such as fungi and bacteria	Improve plant growth and resilience to problems. Diversity helps prevent any one population causing problems	

**Note:** not all wildlife you might attract will be helpful of course, such as the raspberry beetle or pigeon, but they're all part of a natural balance. If an unwelcome guest does get out of control, see A42 to diagnose and prevent a problem.

<b>Health &amp; Safety</b>	Be careful of any wildlife you're uncertain about or don't recognise, and larger animals found dead or diseased. Ensure adult supervision at all times. Wash hands after handling any living or dead creature and soil; cover open wounds and wear gloves if necessary.  See also <i>Health and Safety Guidelines (Section SG1.2)</i>
<b>Activities on DVD</b>	A29 Ladybird house A30 Apple bird feeder A31 Lacewing hotel A40 Making leafmould A42 Diagnosing plant problems A43 Building a wildlife habitat A63 Growing wild flowers A64 Creating a wildlife pond
<b>Further information</b>	B5.11 Attracting wildlife S4.8 Choosing attractant plants



## S4.8 Choosing attractant plants



Attractant plants are important for creating a healthy organic garden for growing food. They provide food and shelter for beneficial insects that eat pests and pollinate plants. These flowering plants can be used when learning about sustainability/science subjects such as food chains/webs. This section helps you pick attractant plants and A44 shows you how to 'divide' them to get more plants for free.

### Benefits and examples of attractant plants

#### Attract predators

Flowers attract natural predators such as hoverflies whose larvae eat 'aphids'. Aim for year round flowers, eg witch hazel (winter), wallflower (spring), coneflower, geranium, golden rod (summer), aster, rudbeckia (autumn).



#### Pollination

Flowers attract pollinating insects. Early season examples include daffodils, blackthorn, primrose.



#### Food source

Seed heads and berries provide a valuable food source for birds in autumn and early winter, eg Guelder rose, elderberry, grasses, teasle, etc.



#### Confuse pests

Some flowers 'confuse' flying pests by masking the scent and/or sight of their preferred host (known as companion planting), eg scarlet flax among onions (pictured) deters onion fly; French marigolds under tomatoes deters whitefly.



#### Wildlife shelters

Stems of attractant plants provide invaluable shelter for wildlife, particularly in winter if dead stems are not cut down, but instead left standing or tied into bundles.

#### Raising funds

The flowers of attractant plants make them easy to sell. See G2.3 for ideas and G4.7 about quick ways of increasing your stocks.



Spring flowers between fruit trees and bushes.



Flowers in borders in greenhouses and polytunnels.



Flowers between vegetables; here marigold.



Getting to know attractant plants in school and public gardens.

## Selecting attractant plants

Prioritise your selection to give you flowers for as much of the year as possible. Also choose ‘single’ open faced flowers from families such as carrot and daisy, ‘single’ rather than ‘double’ flowers are better for attracting beneficial insects. Visit local gardens for ideas and see [www.organiccatalogue.com](http://www.organiccatalogue.com).

### Plants for specific wildlife

Hoverflies and other beneficial insects	Honey bees	Butterflies	Bumblebees
Blackthorn (Sp) Ivy (Su) Cornflower (Su) Corn marigold (Su) Figwort (Su,Au)	Wallflower (Sp) Borage (Su) Dog rose (Su) Russian sage (Su,Au) Heather (Sp, Su,Au)	Sweet William (Sp, Su) Buddleja (Su) Lavender (Su) Field scabious (Su,Au) Ice plant (Au)	Lungwort (Sp) Honeysuckle (Su) Phacelia (Su) Viper’s bugloss (Su) Bergamot (Su,Au)

(Sp = spring; Su = summer; Au = autumn)

### Growing attractant plants

Type	How to grow	Examples
Annuals/biennials	Grow from seed. Plants flower and die in first season (‘annual’) or second (‘biennial’).	Poppy, marigold, foxglove, coriander, parsley, poached egg plant.
Bulbs	Buy bulbs or divide existing crowded patches. Especially good for early flowers.	Daffodil, tulip, snowdrop (spring). Lily (summer).
Perennials	Grow from seed, division and cuttings. They flower every year, dying back in winter.	Red valerian, yarrow, catmint, phlox.
Shrubs and herbs	Buy or grow from cuttings. They are permanent, flowering and some have berries.	Barberry, cotoneaster, blackthorn, thyme, rosemary.

<b>Health &amp; Safety</b>	Be careful of bee/wasp stings around flowers.  <i>See also Health and Safety Guidelines (Section SG1.2)</i>
<b>Activities on DVD</b>	A18 Sowing seed A44 Dividing plants A58 Taking cuttings
<b>Further information</b>	S4.7 Creating habitats for wildlife G2.3 Displaying and selling G4.7 Increasing plant stocks

## S4.9 Using greenhouses/polytunnels



Greenhouses and polytunnels are sheltered growing environments for crops. They protect plants from cold and wind, as well as increase temperature that encourages quicker growth. However, plants in these structures are fully dependent on you for survival. This section explains how to choose structures and how best to grow plants inside. A45 has assessment of both structures, whether buying new or inherited.

### Benefits of growing in a greenhouse/polytunnel

- 1 Raising young plants is faster and more reliable, ie growing in pots/trays to later transplant.
- 2 Extend the growing season by speeding up growth and getting an earlier/larger harvest, eg transplant tomato plants into an unheated structure in late April for fruit from early July until mid October. This extends the harvest season by a month either side compared with outdoor tomatoes. You also get an average of seven 'trusses' of fruit rather than five.
- 3 Growing crops not possible or reliable outside. The extra warmth and wind protection helps during summer, eg for sweet potatoes, and winter, eg for winter salads. Heating makes growing during winter and spring more reliable, but environmental and financial cost is high, especially in polytunnels with lower heat retention than greenhouses. Reduce cost by only heating to just above frost level and insulate structures with bubble plastic on the inside.



Structures provide valuable indoor workspace in bad weather; here pupils at Eastwood Comprehensive School preparing plants.

### Drawbacks of growing in a greenhouse/polytunnel

- 1 Plants are entirely dependent on you, needing daily attention in summer for watering, opening vents, moderating humidity, etc. You'll need help during holidays. See A17 for how to set up a rota.
- 2 Pests and diseases also do well in a sheltered, warm environment so control is especially important. See A42 for diagnosing problems. See also S3.2 to set up crop rotation to avoid build up of problems if growing in soil, just as for outside.
- 3 Structures can be expensive. See money saving ideas in Top tip on page 42.



Use 'biological control' to help control pests in structures; here 'Encarsia' wasp that will prey on whitefly. See A62 for more options.



Spray water on the floor on hot summer days to lower temperature and keep air moist for crops, but not too humid. Avoid getting plants wet.



Follow best practice watering, including options for watering systems (B5.6, S4.10). Manage soil as for outdoors (A9), using extra feeding as required (A41). Still attract beneficial insects for pest control (S4.8).



## What to grow in a greenhouse/polytunnel year round (see also Food Growing Instruction Cards)

Term	Example job/harvest
Spring (Jan-Mar)	Sow/plant: pea, rocket, onion, spring greens, winter lettuce, etc. Harvest (crops planted in autumn): parsley, carrot, kohlrabi, salads, etc.
Summer (Apr-July)	Sow/plant (early harvest): beetroot, carrot, radish, cabbage, potato, etc. Sow/plant (to transplant): brassicas, tomato, courgette, etc. Sow/plant (summer harvest): aubergine, cucumber, pepper, runner bean, French bean, melon, pepper, sweetcorn, etc. Harvest: salad leaves, salad onion, spring greens, etc.
Autumn (Sept-Dec)	Sow/plant: salads, spring cabbage, green manure, etc. Take cuttings. Harvest: aubergine, cucumber, pepper, runner bean, French bean, melon, pepper, sweetcorn, edible flowers, strawberry, etc.

### Choosing a structure

Choose an appropriate, sturdy structure for the site; flimsy or makeshift structures can be dangerous. Assess the safety of structures before use, especially after heavy rain and windy weather; consult A45 and the school's site manager. Clean structures regularly to help identify/solve problems early. Conduct a Risk Assessment.

Greenhouses have glass or plastic glazing secured on a rigid frame.

- Benefits: long lasting, look good.
- Drawbacks: can be expensive, especially after adding extra roof/side vents. Glass may break, but toughened safety glass is available.

Polytunnels have translucent polythene cover stretched over galvanised steel hoops and doorframe/s.

- Benefits: cheaper so larger model may be affordable.
- Drawbacks: polythene will need replacing after five to seven years, but longer lasting products available.

See A45 for glazing/cover options and safety/practical criteria for structures.



Safe, polycarbonate glazed greenhouse at St Peters School.



Brand new polytunnel at Abbey Road Primary School.



Open/close vents to release excess heat in hotter months and vice versa in colder. Vents also circulate the air for better growth and disease prevention. Automatic greenhouse vents (inset) are cheap and make the daily commitment for opening and shutting vents far easier.



Use green mesh or 'shading wash' to keep temperature down in summer, but not reduce light too much.

## Large or small

Schools often find structures too small after a short time, so buy the biggest you can afford which will fit the site. See funding ideas in Top tip box. The temperature in larger structures is also easier to maintain evenly, which plants prefer. By contrast, the lesser volume of air in smaller models will heat up/cool down more rapidly.

## Position

Position structures carefully on level ground away from overhanging branches. Check local planning permission, especially the distance from buildings and fire safety routes. Check supply of water and power. Choose an open sunny site, ideally avoiding the following.

- Shading by trees or buildings. Take account of longer shadows in winter when the angle of the sun is lower.
- Wind tunnels, eg winds channelled between two buildings. In windy sites, position with the ends facing the direction of the prevailing winds.
- At the bottom of a slope or anywhere else cold air may gather ('frost pockets'), or near walls, hedges or fences when on a slope.

Oriente your structure with the longest axis running north to south if using mostly in summer, or east to west for best light in spring/autumn when the sun is lower.

### Top tip



### Making money go further

- Some manufacturers offer an installation service in the price.
- Arrange discounts with suppliers by offering to publicise the purchase in local media.
- Larger structures are proportionally cheaper, especially polytunnels.
- Request donations.
- Speak to local allotments and plant nurseries about buying disused structures.
- Visit reclamation yards to find extra materials, such as shelving/benching and doorframes.
- See S4.11 about making your own greenhouse from 2lt plastic bottles.

### Health & Safety

In addition to safety statements in this section, warn pupils and adults that structures can reach high temperatures very quickly. Monitor each other and report anyone feeling unwell immediately. Everyone should take regular breaks outside and keep hydrated by drinking water.

Be careful using long handled tools inside or around structures. Avoid hitting the glass and leaning tools against panels. Wear gloves if handling glass.

See also *Health and Safety Guidelines (Section SG1.2)*

### Activities on DVD

A5 Risk assessment

A45 Assessing greenhouses/polytunnels

### Further information

'Growing Under Glass' by Kenneth A. Beckett, Royal Horticultural Society. ISBN 1840001542



## S4.10 Using watering systems



Correct watering is essential for good crops. This section explains how schools can use watering systems to benefit plants and waste as little water as possible. These systems make life easier and watering quicker, especially at difficult times such as exam periods and school holidays. See B5.6 for general watering tips and A46 for how to install a water butt.

### Essentials before using a watering system

#### Preparing soil

- 1 Increase moisture retention of your soil by adding organic matter. See A9 for options, such as home-made compost. This also reduces compaction and improves structure.
- 2 Minimise water loss from soil by mulching. See A39 for options, eg leafmould or grass clippings. This reduces surface evaporation and keeps soil beneath cooler.

#### Prepare plants

- 1 Encourage plants to develop strong, deep roots that are less reliant on you for watering, ie give crops larger amounts of water but less often. This encourages plants to search for water deeper in the soil rather than develop vulnerable shallow roots.
- 2 Water plants at stages of development that make the most difference to yield. See examples in B5.6, eg water peas and beans when flowering and pods are swelling. Newly planted fruit trees and bushes need extra watering in their first couple of years and prolonged dry spells afterwards.

#### Top tip



#### Reuse materials

Ask for donations of hoses and connectors from parents and local allotment societies.

Make sure that the equipment/set up is reliable and adaptable. Fix any leaks quickly as they waste precious water and annoy people, particularly those giving up time to help with summer care of the school garden.



Water into pots sunk next to plants, just above soil level. Water will go directly to roots. This is especially useful in containers.



Avoid wasteful runoff by creating shallow basin around plants from nearby soil to allow water to soak into soil.



Create a gravity feed drip watering system by suspending a bottle with a tube going from it into a pot below. Control the outlet with a valve in the tube.

## Monitor watering

Get into the habit of closely monitoring plants to find out whether they need watering. Most grow best in evenly moist soil or compost. Test this with the following activities.

- Remove a plant from its pot to see if the root ball is moist throughout. With experience, you can also judge this by the relative weight of pots.
- Dig down in the soil to see how far moisture has travelled.

Repeat these tests after watering to check the following.

- How far the water has penetrated with a watering can/hose or another watering system, eg seep hose.
- How an automated system should be programmed, eg on for 20 minutes, 2 hours, etc.

This will rapidly improve your knowledge of when plants really need watering. This lets you make a more informed choice about the best watering system for you. Make sure everyone gets the chance to learn how to water properly.

## Essentials for choosing watering systems

Systems that apply water to roots rather than leaves are better. They use less water and reduce waste. Keeping leaves dry also discourages several diseases. Consider drip systems, shallow basins, sinking pots (all pictured on previous page) and 'seep hoses' that are switched on for however many hours needed (photo below). Avoid sprinklers as they spray water over plants and waste water by evaporation and wind.

Drip systems and seep hoses can be powered by hoses from mains water or in a water butt with optional pump (see next page). Timing devices are helpful here. Basic mechanical models simply turn off the water after a set period of time. More expensive electronic models let you programme on/off times, with an option to override the programme if remote 'soil moisture probes' detect the soil is wet enough. It's worth visiting other schools and plant nurseries to look at their systems. This makes it far easier to plan what system/s would suit your space and how they should be laid out.

### Top tip



#### When to water

Watering must respond to each plant's needs and the weather - never use an arbitrary schedule like every third day. This is especially important for outdoor crops to avoid wasting water and time.

This also applies to plants in protected environments such as cold frames and greenhouses/polytunnels. Plants in these structures can dry out very quickly and may need daily watering in summer.



Hose connections. Similar drip pipes are available for individual plants. Clean these regularly.



'Seep hoses' are plastic or rubber hoses that let water escape along their whole length, making them ideal for rows of plants. Lay on the surface or preferably cover to reduce evaporation (A39 for mulches).

## Using water butts

- Water butts are easy and cheap to connect to plastic downpipes from buildings, sheds and greenhouses. A46 has instructions. Some lids and taps come with child-safe locks.
- You can also buy submersible pumps for placing in water butts to power hoses, eg seep hoses. Consult the school's site manager to check safety details. Bigger water butts/tanks are available for larger storage.
- Rainwater should be used as priority over tap water because it has less cost and environmental impact. It also has a lower pH so is suitable for watering acid loving crops, such as blueberries, and has no added chlorine. However, tap water is still preferred for seedlings to help avoid diseases.



### Case Study

*Installing watering systems – St Stephen's C of E Junior School and Waldegrave School for Girls*

Gardening lead Sally Stratton helped both these Food Life Partnership schools. The first challenge was fixing a large capacity water butt to a downpipe, aided by caretakers. Now Sally connects a cheap 'border watering kit' to the water butt tap on dry Friday nights in summer, stretching a normal hose across a path when the school is shut. This is attached to a seep hose that weaves around herbs and vegetables, dripping water by gravity all weekend to keep plants ticking over until pupils can resume watering during the week. An excellent, simple and safe system tailored to school needs.



### Health & Safety

Seek advice from school's site manager when installing powered watering systems, including qualified electricians if needed for electronic components. Be careful when carrying heavy watering cans and moving hoses; follow Manual Handling guidance (SG1.3). Take care when surfaces are wet and may be slippery. Follow the school policy for using 'caution' signs as required.

*See also Health and Safety Guidelines (Section SG1.2)*

### Activities on DVD

- A9 Testing soil and improving fertility
- A23 Setting up a watering rota
- A46 Installing a water butt
- A39 Mulching plants

### Further information

- B4.11 Holiday care of the garden
- B5.6 Watering plants
- WRAP (greener gardening advice) [www.wrap.org.uk](http://www.wrap.org.uk)
- Waterbutts Direct (example supplier) [www.waterbuttsdirect.co.uk](http://www.waterbuttsdirect.co.uk)
- Organic Gardening Catalogue (example supplier for seep hoses) [www.organiccatalogue.com](http://www.organiccatalogue.com)

## S4.11 Using recycled materials



A core value of organic growing is reducing waste and saving money by reusing materials. This approach can be applied to several areas, such as composting and even paving. This section focuses on reusing items from around school to create useful things for your garden. There are lots of imaginative ways that help schools develop their garden and food growing. See A47 for ideas about making scarecrows.

### Why reuse materials?

The checklist below is a helpful reminder when buying new items and disposing of old. While some compromise is inevitable, more and more suppliers and schemes are being set up to help gardeners find and reuse environmentally friendly items.

<i>Environmental impact</i>	Reusing materials saves huge amounts of 'rubbish' going to potentially harmful landfill sites.
<i>Opportunity</i>	Lots of items can be repaired and used creatively for purposes never before imagined.
<i>Save money</i>	Gardening items can be very expensive for new school gardens. Reusing materials saves buying new, so funds can be used elsewhere, such as for seeds and fruit trees.
<i>Local sourcing</i>	Using locally sourced materials, not least those already at the school, substantially reduces environmental impact and cost of transporting materials long distances. This is similar to 'food miles', ie the distance food travels to get to your plate.
<i>School study</i>	Reusing materials links really well with many areas of the curriculum, such as design, citizenship, science, etc. Use these ideas to research the life cycle of common items and then go outside to create something for nothing.

### Ideas from schools



Reclamation yards are great for finding useful and cheap items to adapt for your garden.



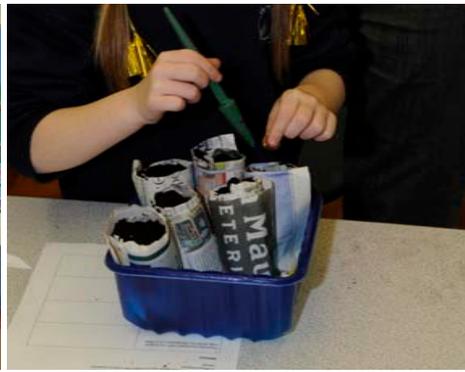
Using plastic bottles to protect plants against cold weather and slugs.



Damson Wood Infant School made a fabulous greenhouse from 2lt plastic bottles, albeit quite a few!



Pupils at Galleywood Infant School made scarecrows out of spare materials from home and garden.



Pupils at Lillington Primary School make plant pots from newspaper, supported upright in reused trays.



Pupils at Lancaster Girls Grammar School planted salads in tubs from school caterers.



Bed labels made in design technology classes.



Long lasting raised bed edges from recycled plastic.



Beautiful new bench from old materials, ready for weary gardeners.



Garden gate created from old branches from plants on site.



Raised bed from spare logs around the garden (never take from the wild).



A large and robust compost heap made from old scraps of wood.

<p><b>Health &amp; Safety</b></p>	<p>Be careful when adapting items for reuse, ensuring adult supervision. Make sure final product/ device is safe for intended purpose and any exposure to weather. Dispose of other items responsibly following local authority regulations. Consult the school's site manager if unsure. Don't use tyres for growing food (SG1.2).</p> <p style="text-align: right;"><i>See also Health and Safety Guidelines (Section SG1.2)</i></p>
<p><b>Activities on DVD</b></p>	<p>A19 Making a paper pot            A25 Reduce, reuse, run-around game            A43 Building a wildlife habitat            A47 Making a scarecrow</p>
<p><b>Further information</b></p>	<p>Organic Gardening Guidelines (on DVD)            Local authorities            Freecycle <a href="http://www.uk.freecycle.org">www.uk.freecycle.org</a>            Recycle now <a href="http://www.recyclenow.com">www.recyclenow.com</a></p>