

SEED TO SEED

FOOD GARDENS IN SCHOOLS



by Jude Fanton and Jo Immig



seedsavers

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by Jude Fanton and Jo Immig
illustrated by Liz Elliot

seedsavers

"Preserving the genetic basis of tomorrow's food"

Supported by the Mercy Foundation



About this book

This book is written for teachers, in particular primary school teachers, as a planning and educational tool. It is best read from cover to cover, though you will find satisfaction from dipping into it. We have suggested activities for most of the topics. Many of these are weblinks. All links were operational as at August 2007. Should one not work, try connecting to the home page of the website listed.

About the authors

Jude Fanton co-founded The Seed Savers' Network in 1986 and is co-author of the best-selling 'Seed Savers' Handbook'. She loves teaching gardening and finding out what will be the next meal by looking in the garden.

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About the illustrator

Liz Elliot is a medical practitioner whose approach to health incorporates traditional alternative medicine practices. She is the author of "Health = Energy" a book on how to stay healthy. Liz donated the drawings and fashioned them with astounding speed.

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Disclaimer: Whilst we have included a list of occupational health and safety tips in the Appendices, we accept no responsibility for accident or injury due to information provided in this book. Please use your discretion and follow relevant O H & S regulations before working on, or in, a garden. Some of the children were photographed in the evening or were asked to remove their hats to make the photos more appealing; we recommend that hats should be worn in the garden, especially during school hours when the sun is at its strongest.

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Chapter 1: Introduction



Gardening can be a magical experience for children. They love to help out and delight at ripening berries, blooming sunflowers, and gathering up lemons for lemonade.

Most adults can recall happy times spent in the garden when young, learning how to plant seeds and stake tomatoes, an experience often shared with our parents and grandparents. Many of us remember the exquisite taste of homegrown food – in contrast to the bland taste of many supermarket fruits and vegetables today.

Unfortunately, with the trend towards shrinking backyards and increasingly busy lives, domestic food gardens have become 'a thing of the past'. The opportunity to pass on important gardening skills from generation to generation and to share in the joys of homegrown food is being lost.

For children without a vegetable patch, or even a fruit tree, there's little opportunity to observe how food grows. They may only ever see fruit and vegetables at the supermarket where they come neatly packaged, bear little resemblance to the whole plant and may be sold outside the normal growing season.

Schools are excellent places for creating food gardens as they often have more space than homes. As 'outside classrooms', school food gardens can be used for a range of activities across all curricula. They provide a great opportunity for physical exercise and hands-on, experiential learning.

Seed to Seed Food Gardens in Schools hopes to inspire a rebirth of food gardens so children will be able to enjoy gardening and growing their own food and their own seed for the next season.



a magical
experience...

Principles of seed to seed food gardens

This book recommends establishing a seed to seed food garden with four fundamental principles in mind:

- Low input and organic gardening methods
- Respect for the entire life cycle of the plant
- Sustainable water use
- Maintaining biodiversity.

In the seed to seed food garden children are encouraged to be resourceful by using what's around them to create low input and low maintenance gardens. This approach provides the opportunity to think creatively and teaches the importance of treading lightly on the earth.

A commitment of time is also required to establish an abundant food garden. You'll need a minimum of at least a year to ensure there's plenty of time to collect, grow and re-sow seeds. Once the garden is established it may become a permanent feature as its many benefits are experienced.

Seeds are central to a food garden. Rather than starting with shop bought seedlings, we grow from seed to seed. Children learn the skills needed to sow and save seeds, which helps them to develop an understanding and appreciation for the entire life cycle of the plant.

Seed to seed gardening teaches self-sufficiency and reaffirms the abundance that is available from seeds. Growing from seed also gives children the opportunity to interact with the seasons and to experience the excitement of sprouting and harvesting seeds.

Collaboration is the key to a successful school food garden. The process of planning and creating the garden provides an opportunity for the whole school community to work together to foster a sense of care and involvement toward the garden.

A variety of techniques for designing, making and maintaining a food garden are detailed in the following chapters.

Low input and organic gardening methods

A food garden doesn't need to cost a lot of money or use lots of resources to be successful. By using waste, second-hand or donated materials and by drawing on children's ingenuity, you can create a wonderful and functional garden.

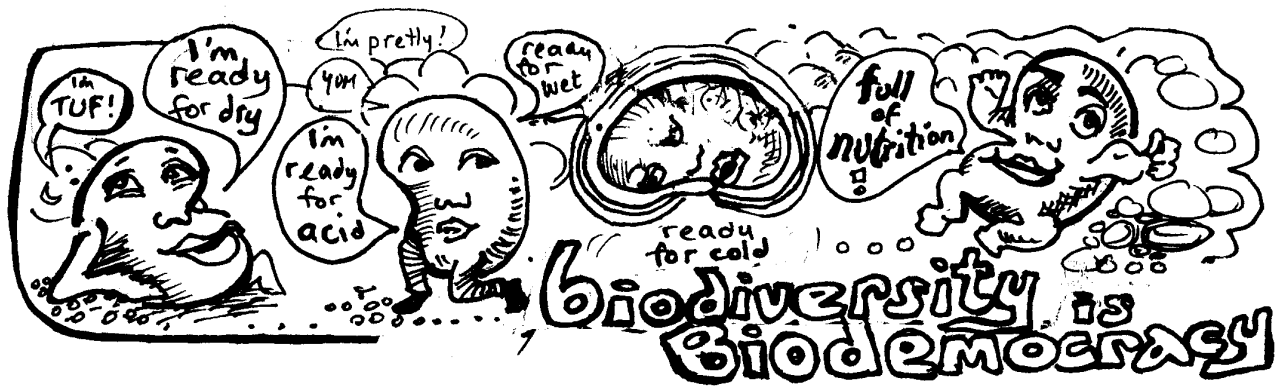
Organic gardening techniques have been used for many thousands of years. Apart from being safer for children and the environment, research shows that organic food has a higher nutritional content and tastes better. Organic gardening methods are inexpensive and enhance the experience of working with nature and, most importantly, these methods work.

Synthetic pesticides should not be used in the school food garden. Toxic products require special handling and disposal procedures and may leave residues in the food. Children are highly sensitive to the effects of pesticides and may be severely and irreversibly affected if they are exposed to them in any way.

Respect for the entire life cycle of the plant

Growing from seed to seed involves germinating seeds, transplanting seedlings and nurturing selected healthy plants to full maturity so their seeds can be collected and stored for the following year. Gardening in this way shows children the entire life cycle of the plant and the abundance available for the following year if seeds are saved.

Plants adapt to the environment they are grown in and produce seeds that carry those adaptations, producing healthier plants better able to cope with the local environment.



School food gardeners can play a role in saving seeds from open-pollinated heirloom varieties by becoming part of the Local Seed Networks across Australia – see Resources, page 71. Saving and swapping seeds also keeps the cost of the garden down.

Sustainable water use

Being water-wise in the garden is essential. Mulch is a must, as is efficient watering equipment and knowing when to water. Other school environmental initiatives such as rainwater tanks and grey-water recycling may also work in with a water-wise food garden.

Ensure there is a sustainable water supply to the garden and water is used wisely. Investigate installing a rainwater tank for the garden. NB: Rebates and grants may be available in your state or territory to install a rainwater tank at the school. Check with your local water authority.

Lesson and activity ideas:

- Find out about your local catchment area and water supply. Lesson plan for Victoria available from

http://landlearn.netc.net.au/print/catchments_know_your_catchments.htm

- Determine the average rainfall for your region, measuring rainfall and keeping records with a rain gauge. Lesson plan available from

http://library.thinkquest.org/C0112425/lab_child_raingauge_1.htm

- Locate garden water sources and measure the distance between the taps and the garden to determine hose lengths.

- Conduct a school water audit and find ways to save water. Information and lesson plan from

<http://www.environment.gov.au/education/publications/enviroaudit.html>

Case Study: Kitchen Garden at Collingwood College

The Kitchen Garden at Collingwood College, a Melbourne public school, was the inspiration of Stephanie Alexander, a well-known author of cookbooks and a passionate advocate of food issues. Her goal in creating the Kitchen Garden in 2001 was to provide a positive model and experience for children around growing, cooking and eating food.



With the proliferation of convenience foods, her central concern was that many children never experience cooking with fresh food. As adults they may not be able to offer themselves “one of life’s most accessible joys: preparing and sharing fresh, delicious food with family and friends every day”.

The Kitchen Garden involves around 120 children from Years 3-6. Each child has one and a half hours per week of food gardening, preparing food and eating it convivially. The model emphasises sharing and eating together, and learning through experience and doing. Reflections on the first few years show the Kitchen Garden at Collingwood College has been a very positive experience in many ways. Children enjoy the garden, eating together, and are trying new foods. They work well in teams and have gained new skills. Parents have reported an increased interest in food and cooking at home.

Seed saving has been embraced by gardening teachers at Collingwood College. At any one time the garden has plenty of plants tagged for seed production. The children learn how to select, collect, harvest, dry and process seeds.

It’s hoped the Kitchen Garden at Collingwood College will provide a model for every Australian primary school. Stephanie has also established the Kitchen Garden Foundation and successfully negotiated for the Victorian Department of Education and Training to support this programme – see page 8.

In her book *Kitchen Garden Cooking with Kids*, Stephanie tells the story of the successful Kitchen Garden at Collingwood College at the end of its sixth year. It records the challenges and the milestones experienced and offers guidance and practical advice to schools and communities interested in establishing their own kitchen garden. It also includes more than a hundred recipes for real food that have all been cooked by the students at Collingwood in a format designed to encourage cooking with children either at home or in the classroom.



www.collingwood.vic.edu.au www.stephaniealexander.com.au www.kitchengardenfoundation.org.au

Pictured at top of page: Collingwood College garden, a joint venture between the Stephanie Alexander Foundation and Cultivating Community, teaches students to save seeds, grow, plan menus, cook and eat in shared meals.

Maintaining biodiversity

It is a sad fact that 75% of vegetable varieties have disappeared in the last century. This is due in part to the domination of a few international seed suppliers and the demand for food that is uniform in shape, size and colour. This enormous reduction in varieties is a big loss of biodiversity and threatens food security for coming generations.

We know that variety is the spice of life, but it is often overlooked that biodiversity is the foundation of a healthy garden. Growing a mixture of plants such as annuals, perennials, herbs, flowers, vegetables and fruit trees helps to maintain a diverse ecosystem in the garden which, along with healthy soil, is the key to keeping pests at bay.

By promoting biodiversity in the food garden children learn the importance of having a mixture of plants to create a dynamic ecosystem. The same message is also carried through in terms of the choices they make about the diversity of food they eat and their own health.

Activities in the garden

A school food garden provides plenty of opportunities for developing lessons and activities across all curricula. Garden-based classes can deliver learning outcomes across all subjects such as art and design, mathematics, English, science, biology, chemistry and history.

Lessons and activities will be shaped by the intention of your garden, its stage of development and the age of the students. As the garden is a living system, the climate and seasons will also influence what you do and when.

Feedback from teachers and students who have created food gardens and used them as outside classrooms is overwhelmingly positive. Don't be concerned if you are inexperienced at gardening as students and teachers grow together as the garden develops.

Some schools have found that food gardens become a central part of the school community and curriculum delivery. Other school food gardens have a different focus like growing food for special events or growing bush tucker.

Students of all ages can be involved at all levels of garden planning and establishment. The tasks associated with starting the garden will provide the main lessons and activities at first and as the garden develops the tasks will change and other lessons can be integrated.

A selection of activities can be found throughout this book with links to relevant web sites and lesson plans.

Kids love to water. Teach them how to best satisfy the needs of the plants and remain water-wise.



Governments supporting school food gardens

Healthy School Communities Grant Programme

The need to encourage children towards healthier eating habits was acknowledged by the Australian Government in 2004 with their announcement of a Healthy School Communities grant programme to promote good nutrition in schools.

Grants of up to \$1500 per school were available for projects that helped to give parents and children the skills and knowledge they need to develop healthy eating habits.

Suggested project ideas included organic vegetable gardens, healthy cooking classes and developing healthy school canteen menus. This was an excellent opportunity for funding the establishment of school food gardens.

The grant application was straightforward and required non-government organisations such as the Parent's and Citizens/Friends Associations, school auxiliaries, canteen groups etc to apply for the grant. Find out more about grant availability at:

www.healthyactive.gov.au

Victorian Kitchen Gardens

The Victorian Department of Education and Training in August 2006 invited applications from government primary schools for grants to be used for the establishment of 19 kitchen gardens in 2007 and 2008.

Envisioned is a comprehensive gardening and cooking programme for primary school students from grades three to six as was developed by Cultivating Community and the Stephanie Alexander Foundation at Collingwood College.

Each successful school will receive a total of \$62,500 to be paid over two years. In 2007, schools will receive a grant of \$12,500 to develop the infrastructure of the garden and kitchen and a grant of \$25,000 towards the salary of staff needed for the implementation of the programmes. A second grant of \$25,000, to be paid in 2008, will support salaries.

The programme aims to introduce students to the benefits of fresh garden produce and to provide them with the practical skills essential to the development of life-long, healthy eating habits.

For more information on funding see Resources, page 76.



*The Spensley Street Primary School
in inner-city Melbourne, Victoria.*

Five good reasons for creating a school food garden

1. Promotes a fun approach to eating a variety of foods

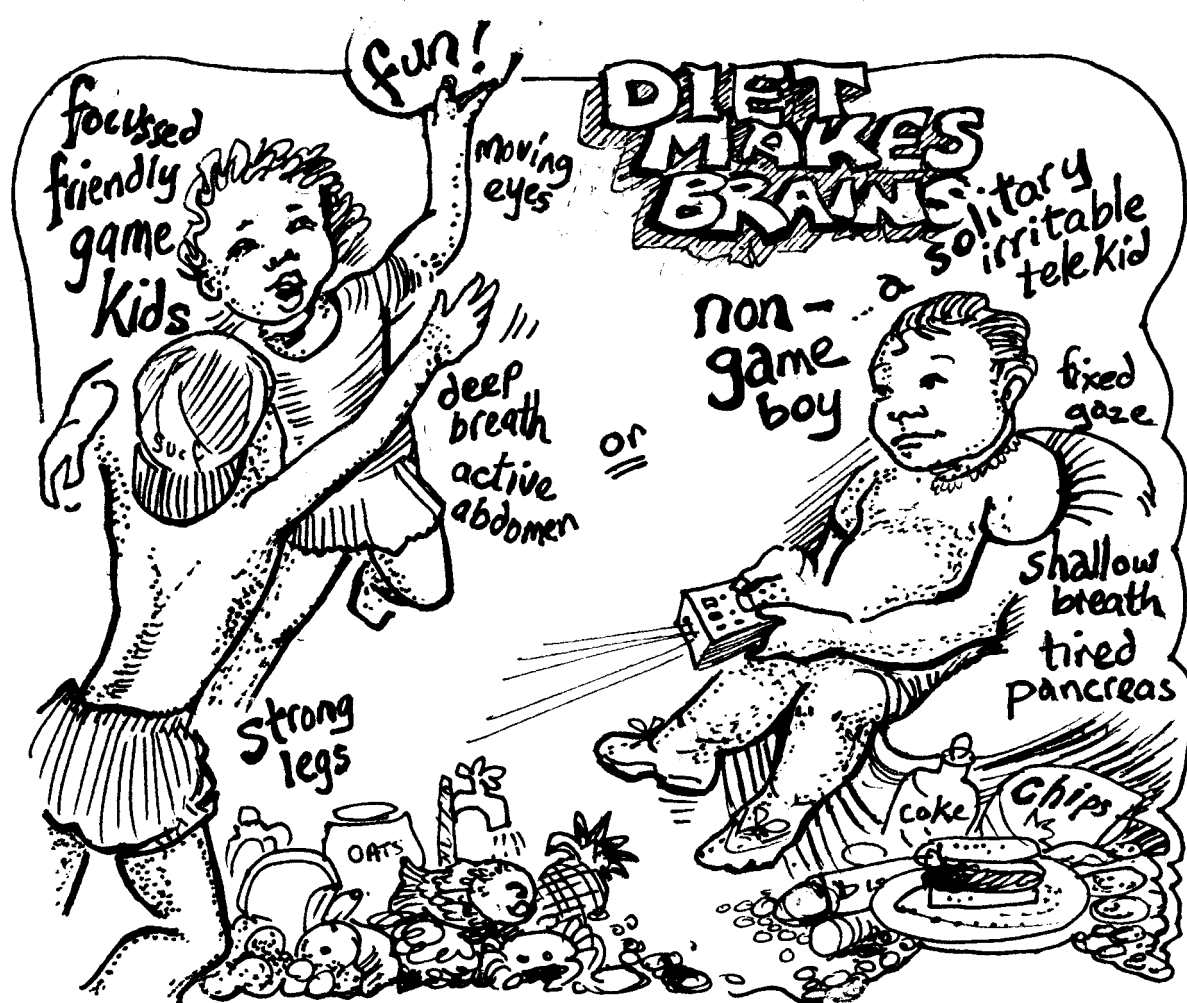
There's a great deal of truth behind the phrase 'you are what you eat'. Unfortunately, the proportion of overweight Australian children doubled in the ten years from 1995 and is linked with increasing rates of serious disease such as diabetes. The obesity problem has been attributed to 'eating more and moving less', but it's also what children are eating.

With the rise in 'convenience' foods, children's options for healthy food have been greatly diminished both at home and school. Changes in our lifestyles have also meant there are fewer family meals, with children often eating in front of the television where they tend to snack and are influenced by fast food advertising.

The impact of a poor diet on children is profound. It not only affects their health, energy levels and attitudes, it also influences what they are likely to eat as adults. Children need to be introduced to a range of foods and encouraged to try new things. Even if they try something and don't like it, they are more likely to come back to it as adults.

Creating food gardens in schools is a fun way to involve children in producing and preparing food. Experience shows that a hands-on and playful approach to learning is an effective way to teach children about nutrition and health. Developing children's interest in food and cooking gives them confidence and skills, which later in life will help them to enjoy a diverse food culture.

There are many new initiatives in schools encouraging children to eat more vegetables and revamping canteen menus to ensure healthier choices are available. School food gardens complement and enhance these policies through active learning.



2. Demonstrates ecologically and socially responsible values

A school food garden requires cooperation and collaboration providing opportunities to build self-esteem, social skills and school spirit. Focusing on low input gardens encourages creative thinking with an emphasis on novel approaches and recycling wherever possible. It also naturally encourages teamwork, communication and consideration of the impacts of our choices on each other and the environment.

By creating and tending a food garden children are able to investigate interactions between people and their environment. They experience the interconnectedness of living systems and develop an understanding about their own place in this relationship.

Waiting for seeds to emerge and plants to grow is exciting and requires patience and understanding of the seasons and life cycles. Learning new skills for sowing and saving seeds is empowering and teaches self-sufficiency. These are life-shaping learning opportunities for children. Having experienced the passage of time it takes for food to grow, children may also appreciate the rewards all the more.



3. Re-connects schools with local food and community

Perhaps one of the greatest challenges facing children today is the broken connection between food and community in our society. We have come to depend on fast food, convenience stores and supermarkets that transport food in from all over the globe.

The choices we make about food not only affect our health they also have an impact on our environment. Many people are unaware of how their food is grown and where it comes from. Few stop to consider the significant environmental and social costs of chemically grown foods that travel huge distances around the globe before arriving on our plates. Just as we aim as a community to conserve water and energy and to reduce waste, we must also teach children to make the best choices in the food they eat.

Local communities suffer when supermarkets become the sole providers of food. Local growers find it hard to compete and local varieties diminish – the flavour of a region is lost. Many children may never get to see food growing where they live or experience anything other than supermarket food.

On the upside, Australia is a multicultural society and has a wonderful fusion of food and flavours from many countries. An encouraging trend towards local farmer's markets, community supported agriculture (weekly, pre-paid boxes of produce) and locally grown food is a signal that people are seeking to re-connect with their community and where their food is grown.

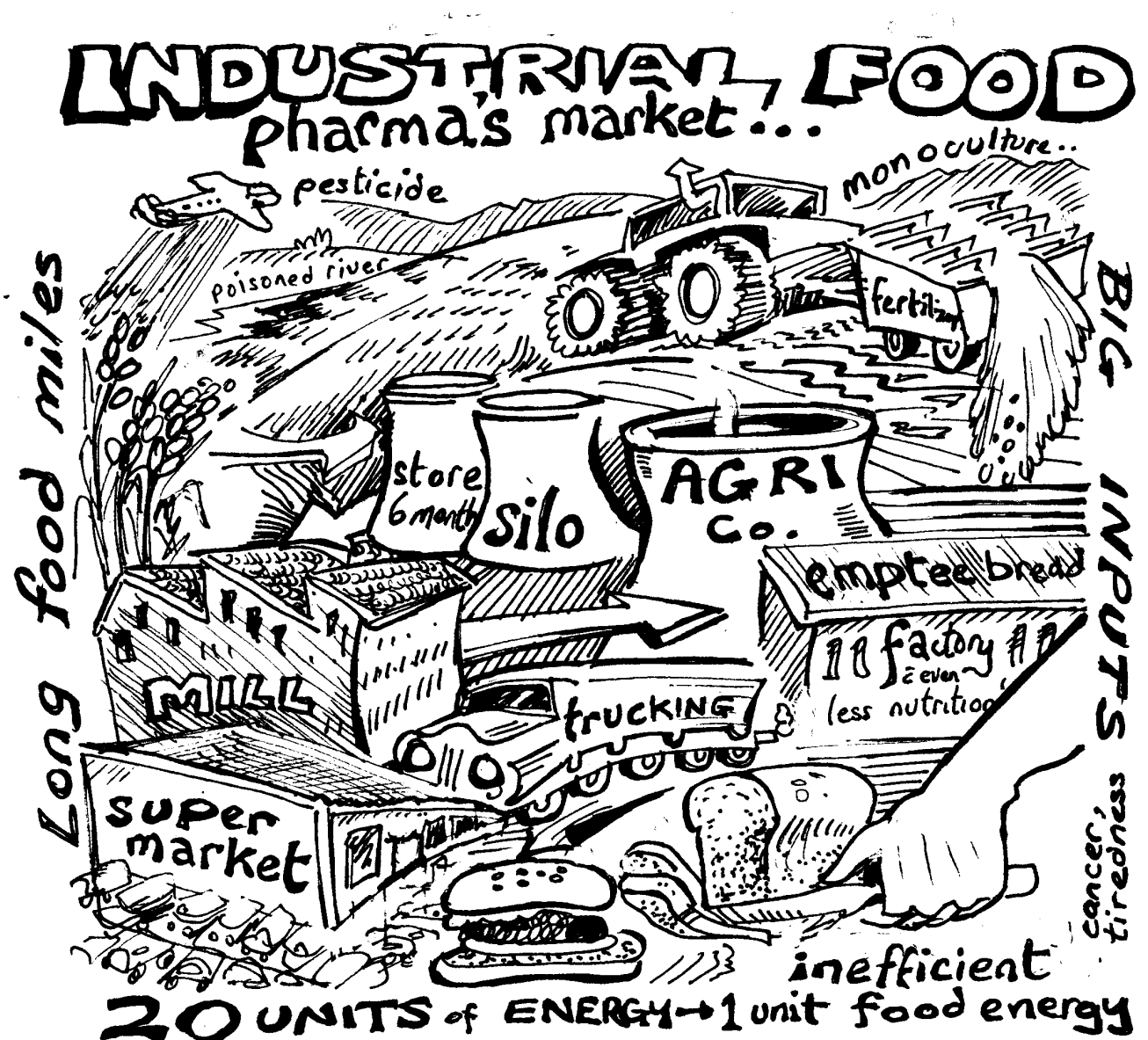
School food gardens provide a great focal point for the community to re-connect over locally grown food, which helps to engender a sense of place. Some schools with established food gardens grow enough food to provide produce back to the local community, others grow food for the school canteen and some schools have become the central point for cooperative approaches to purchasing local organic food.

By involving the local community in school food gardens there is an opportunity for sharing ideas, stories, seeds and cuttings from the region. Schools may also become a hub for a local seed network or organic gardening resource exchange.

4. Engages children in multiple learning styles

According to educational philosophers, children have diverse learning styles, like to work in groups, and generally prefer some level of activity with any task. Food gardens provide a context to address all of these key requirements for learning.

Garden-based learning gives children an immediate and familiar place where they can explore and learn at their own pace. There's time for reflection and self-reliance. They provide a place for hands-on, experiential learning in 'outside classrooms', where the walls and windows as natural boundaries are replaced by the seasons, sun, wind, water and the soil.



Garden-based learning

Gardening can be a transforming activity for young and old. It can move us from ignorance to understanding and appreciation, from passivity to action, from consumption to production, from silence to dialogue...

City Farmer, Canada's Office of Urban Agriculture www.cityfarmer.org

5. Provides a holistic educational experience across all curricula

There aren't many opportunities for children to get their hands dirty these days in a world that seems to favour virtual pursuits (television, computers and shopping malls) over direct physical experience of the world.

Garden-based learning is gathering momentum because it provides a natural convergence to integrate and focus fragmented curricula. English, science, mathematics, art, industrial education, environmental studies, and health curricula can all be enriched through garden-based learning lessons.

While there is support for food gardens in schools and a growing number of resources available, more resources need to be dedicated to helping teachers find and recognise the ways that garden-based learning can be used to teach and fulfil curricula requirements.



Gardening should be as important a part of education as English, Maths and Science. Gardening...combines the heavenly with the terrestrial, the sun with the earthworm, and serves as both metaphor and literal truth in a human world dangerously distanced from its real self.

Peter Quince, *Compost or Computers?* Resurgence No. 198, 2000.

Chapter 2: Planning



The importance of early planning for your food garden can't be over emphasised. Like any endeavour, good preparation often makes the journey smoother and saves time and frustration further down the track.

Often the proposal to start a food garden will come from a few interested teachers or parents. The challenge then is to spark the enthusiasm of the whole school community so that the keen beans are supported. Try to gather the support of as many individuals and groups as possible so that you have help in planning, costing and funding the project and can spread the responsibility.

When selecting a site you will need to consider its relationship to buildings, pathways and vegetation so as to have good sun access, protection from any winds, available water and beneficial microclimates. Security also may be an issue to address.

Consider soil type in terms of structure, content of organic matter, mineral deficiencies, pH and possible contamination.

Design the garden with the principles from Chapter 1 in mind. Consider themed beds, natural pest control, maximum diversity such as plants with multiple uses and forming many layers.

When you design the garden layout be imaginative with bed shapes and definite about pathways and edges; include spots for trellises and signage and don't forget a compost area.

Now you need to collect materials such as compost components, mulch, tools, seed and plants.

**THIS IS A
CHILDISH
PLOT**

Early planning

Linking to the whole school community

Many hands make light work, so the saying goes. Involving the whole school community in making and maintaining the garden will help to ensure its long-term success. It is also a good way to ensure that many people benefit from the garden. The food garden may also fit nicely with other environmental or healthy eating initiatives at the school.

To start the planning process, a useful step is to build early support, enthusiasm and ownership by holding a food garden get-together with parents, students and all school staff. It is best to involve the school gardener or groundsperson from the outset as they will have essential knowledge about the school grounds and may also be willing to help maintain the garden, especially during school holidays.

It is important to facilitate and document this meeting well. There should be a clear sense of people's willingness to be involved, as well as their level of commitment. Gathering ideas and uncovering any challenges is also important. Jobs need to be delegated and a realistic timetable established. Finding a suitable site to put the food garden is often the first challenge.

Gathering support

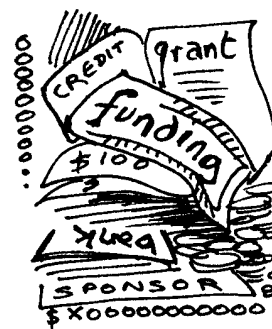
Connecting the food garden with other community projects in your local area is a good way to build wider support and recognition for your garden. The local council may be able to help with promotion and educational resources. Use the local media to promote the food garden and ask for support and donations from local businesses and the community. For instance, a local hardware store may be willing to donate tools, a nursery may donate mulch, a farmer or horse stables could have manure to spare.

There might even be a community garden or Local Seed Network in your area where people in the know can help with seeds, seedlings, cuttings and advice. If there is a botanical garden in your area, there may be some assistance available from there.

Posters to promote gardens in schools and seed saving are available from Seed Savers. See Resources, page 71. Acknowledgement for small donors can be a certificate or thank-you note and for larger donors a plaque in the garden.

Costing and funding the garden

There are costs involved in establishing and maintaining a garden. However, a successful food garden need not cost a lot of money, especially if you are creative and can attract donations in kind. It is important to design the garden according to your budget and the level of support available. You can start small and build on your successes.



Lesson and activity ideas:

- Prepare an 'appeal for help' poster by using students' drawings and vision for the garden. Include a name for the garden, display the appeal in the school and get students to make copies to take home to their parents.
- Hold a fundraising event for the garden. Make each class responsible for an item (e.g. watering cans, hose, wheelbarrow, mulch, tools etc).
- Have a garden party and invite helpers and parents and ask them to bring some food to share and a contribution to the garden. Work for a few hours and sit down to eat together.

Essentials include good quality mulch, compost, tools, seeds, seed trays, signs, tap, hose and watering cans. You may also need materials to make paths and trellises and to fence the garden. Some of these items are one-off costs, but ongoing ones include mulch and compost. By establishing a seed to seed food garden you will ensure the cost of seeds is kept to a minimum.

Check to see if your school is eligible for a Commonwealth or State grant to help get started. See page 76 for details.

Taking responsibility

Ownership of the food garden is paramount. People need to feel connected to the garden, to want to take responsibility and care for it. Garden coordinators need to ensure the essential jobs are clearly defined and that expectations are realistic and well communicated. Take care to ensure the job of coordinating does not become a burden for any one person.

It is essential the garden is watered regularly, especially during summer, dry periods and school holidays. To overcome holiday dryness, retain moisture by applying thick mulch to garden beds and even rocks around fruit trees. Plan to install a drip system on a timer if necessary. Checking for pests, weeding, sowing and saving seeds, and transplanting seedlings are other ongoing tasks.

It is important to nurture those who are particularly interested in the garden and to share jobs and responsibilities. Children love to do a variety of things and can be involved in every aspect of the garden. They need to see the result of their actions – good or bad – so they can come to trust their green fingers. Perhaps a garden club is a good way to keep enthusiasm going. Regular meetings and a notice board or newsletter may be useful to let people know what's happening in the garden.

Ideally the food garden should be used as an 'outside classroom' where lessons can occur in a more natural and hands-on environment. Some garden activities are provided in this book, however the different ways teachers can integrate the garden into their lessons is limitless.



Meeting of parents, teachers and children at Byron Bay Public School to plan the garden.

Selecting a site

The location of the garden is fundamental to its success. Food plants need plenty of sun and water, protection from wind, and ongoing maintenance. Plants need to be chosen to suit the climate and soils often need to be improved. Security and access also need to be considered.

Once you've selected the site for the garden, you may like to hold a sod turning ceremony and invite the school community to celebrate the birth of the food garden! The garden can be a source of inspiration, beauty and joy for passers-by as well as for the children who work in it and eat from it.

You will find both challenges and opportunities in selecting a site. Apart from visibility there are other factors to consider. Experienced local gardeners will be able to help with advice on soils, wind and other factors discussed below.



Location

Let your food garden be your school's pride and joy by locating it where parents, teachers and children pass every day. There is no need to tuck it away where few see it. Choose a prominent position so the maximum number of school community members can view the garden. Areas near to busy pathways and playgrounds are ideal.

Make sure the garden is in a position that can easily be accessed by classes; that is, not at the far end of the sports field. Some schools have found locating their food gardens near the canteen works best as the produce can be used there and the canteen scraps can be recycled easily.

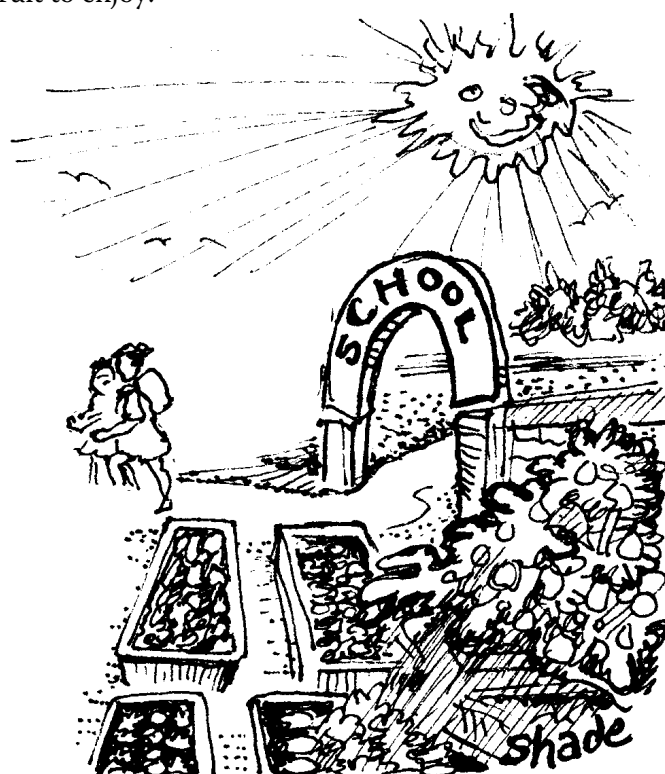
Make the garden a schoolyard feature that the children can casually observe and interact with as they pass or play nearby. If you are putting in an orchard, you may like to locate it on part of the oval to create more shade for the children at play, and of course for fruit to enjoy!

Sun access

Food plants need sun to grow well. A food garden will need at least six hours of sun each day. Clear access to the northern sky along with access to the east and west of north is most important.

Morning sun is the most beneficial for vegetable gardens so an easterly aspect is preferable to a westerly. This is particularly important in low rainfall areas, as a west-facing site will be more prone to dehydration.

In temperate areas, where in winter the sun angle is low and the days are short, it is important to have your garden with no tall obstructions such as buildings or vegetation to the north.



Lesson and activity ideas:

- Investigate why plants need sunlight.
- Determine aspect and why the sun changes its position during the day and the seasons.
- Read a compass to determine aspect. Lesson plan available from <http://www.funsocialstudies.learninghaven.com/articles/compass.htm>
- Make a sundial. Lesson plan available from <http://www.sundials.co.uk/projects.htm>

Wind

The direction, temperature and speed of seasonal winds can be important, especially in schools on exposed sites. Harsh cold winter winds, spring gusts and summer storms usually come from a particular direction. Ask local experienced gardeners about whether there is a need to protect your prospective garden from winds either by placing it in the lee of a building or windbreak, or by planting a windbreak of shrubs and, if necessary, trees.



Lesson and activity ideas:

- Investigate why some plants need wind to reproduce.
- Measure wind speed. Lesson plan available from http://www.bom.gov.au/lam/Students_Teachers/Worksheet16.shtml
- Make a weather vane to determine wind direction. Lesson plans available from <http://www.kinderart.com/folkart/weathervane.shtml>
<http://educ.queensu.ca/~science/main/concept/gen/g08/G08LAAG2.htm>



Water availability

The location of one or more water taps near the site is important. For large gardens of more than a hundred square metres, more than one tap will be necessary. If water availability is a problem for the school, explore avenues for the installation of one or more rainwater tanks.

Place the garden near the tanks and downhill from them if possible so you can water by gravity. There is now more interest in the installation of rainwater tanks and even greywater recycling units. Perhaps planning the garden will precipitate moves towards these at your school.

Existing vegetation

Take note of existing vegetation on your garden site. If it is a lawn or weedy patch you will have to suffocate it before planting your garden – see page 37 for box on no-dig methods of mulching.

Trees and shrubs can provide protection from winds for food gardens. However if they are too close their roots may invade your vegetable garden. Some trees, especially those with aromatic leaves such as Eucalyptus, many conifers and Camphor Laurel, exude substances from their roots that inhibit the growth of other plants near them.

Some trees such as Mulberry and most Ficus have very long and adventurous roots that will seek fertility and moisture for many metres. A mature specimen of these types of trees will need to be more than ten metres away or its roots will invade your garden within a year or so.

Fruit tree roots are less invasive and it may well suit your food garden plans to have some nearby. However they should be planted five or more metres from your prospective garden. Very large fruit trees, like mango, jackfruit and pear or nut trees like walnut, pecan and macadamia, should be further away to avoid root and shade problems.

Microclimate

Different areas of the garden will have different microclimates; that is, differing ranges and periods of temperature and humidity. These are created by variations in sun access, wind and soil type and the presence of water bodies, existing vegetation and heat sinks.

In any schoolyard there will be areas that are more sunny and dry and others that are more shady and damp. These may change with the seasons.

Asphalt and concrete play areas, buildings and masonry walls act as a thermal mass that retains the day's heat into the night.

Equally, lakes, dams, pools and ponds act as heat sinks. These water bodies also increase humidity and reflect light onto their southern banks, especially in winter when the sun angle is low. The resultant extra heat may be critical for some plants in cool temperate climates.

Local knowledge helps in deciding which microclimate is best for a food garden. You can change and create microclimates:

- Piles of logs and rocks can store heat and moisture underneath to provide the conditions for marginal plants in a cool, dry area to thrive.
- Masonry walls and buildings act as windbreaks and heat sinks. In a cool climate a north-facing wall is useful because it stores heat on winter days and into the night. In a hot climate a south-facing wall will provide shade and protection from hot, dry northerly winds.

Lesson and activity ideas:

■ Investigate the six major Australian climate zones: equatorial, tropical, subtropical, desert, grasslands and temperate.

■ Determine your climate zone, including rainfall and temperature averages. Lesson plans for climate and weather activities available from the Australian Bureau of Meteorology

http://www.bom.gov.au/lam/Students_Teachers/learnact.htm

and The Diggers Club

<http://www.diggers.com.au/climate.shtm>

Security and fencing

Weekends and holidays when schools are not under surveillance can pose security problems. We heard of a class that had a lovely crop of carrots and the day before they had planned to pick them, someone took the whole lot! Having neighbours involved with the project and happy to look out for the gardens helps, but perhaps a fence will be necessary. Depending on school policy there may also need to be an internal fence around the garden. Climbing vegetables can be grown on the fence.

Lesson and activity ideas:

■ Make a sketch-map of the school showing options for garden location, taking into account sun, wind and water access and noting activities adjacent and next to the school perimeter that can impact a food garden.

A free 3D Map Maker program is available from

<http://www.mapmaker.com>



If your school fencing offers good security then consider siting your garden so that it is visible to the community and encourages involvement.

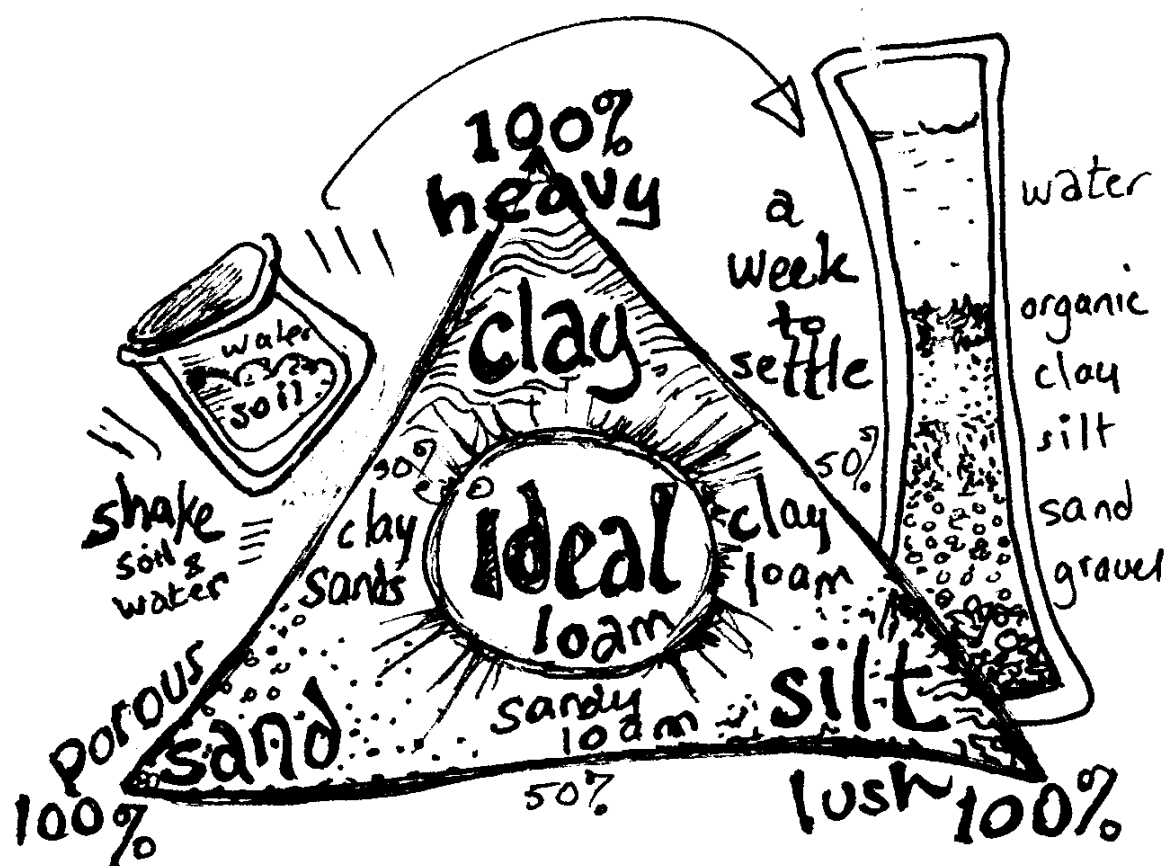
Determining soil type

You can make a garden in most soils. You are lucky if you have fertile, friable soil, but do not despair if you think your soil is poor, as the addition of compost will make most soils ready for gardening. The whole gardening process can illustrate to children how to make do with what is available locally.

Good soil means there will be fewer pest and disease problems, so decide on a soil improvement regime for your garden, such as using compost, mulching and green manuring – see page 30.

The ideal soil for food gardens is deep, loose, fertile, well drained, near neutral pH with lots of well-rotted organic matter. While many soils may initially be less than perfect, there are many techniques available to improve soil. It is much better to work with what you have than to bring in unknown soil from outside.

NB: Please ensure soil for the food garden is not contaminated with heavy metals or chemical pollutants. Testing for lead is strongly recommended. More information – www.lead.org.au



Soil structure

Gardening books contain information to help you work out your soil quality. Here are a few hints on soil structure and fertility. A simple test is to take a handful of the soil and moisten it a little. Rub some between two fingers. Clay has the smallest particles and will feel silky. Sand has the largest particles and will feel gritty. Silt particles are in between the two. Ideal soil structure for food gardens is a mix of all three that is called sandy loam.

A more detailed soil structure test can be performed by adding four tablespoons of soil and two cups of water to a jar, shake it well and let it settle for a week. Observe the layers (as illustrated above) to determine the composition type of your soil.

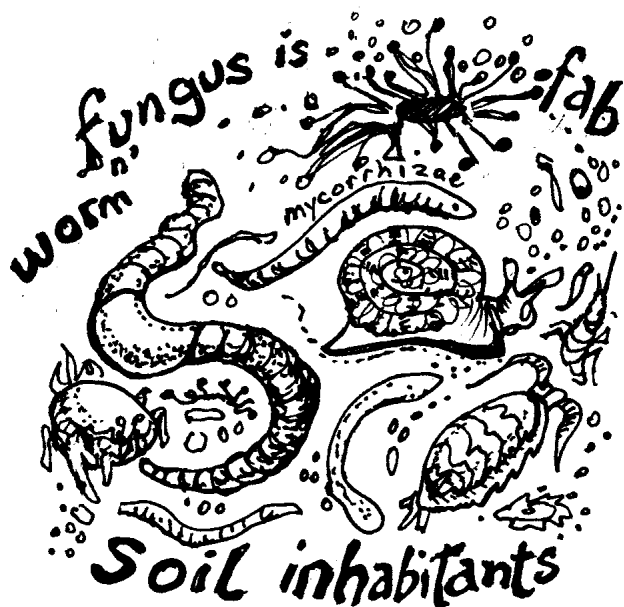
Clay soils have adequate fertility but it tends to be locked up; that is, unavailable to plants. Sandy soils have too little fertility for food garden plants. The more clay the less drainage and the higher humidity, with the opposite effects in sandy soil. Humidity may cause a greater incidence of fungal diseases, though tropical food plants thrive in humid conditions. Never fear, if your soil is too sandy or too clayey, regular addition of organic matter in the form of well-rotted composts and mulch fixes both these problems.

Lesson and activity ideas:

■ Soil structure test. Determine the soil type looking at structure, texture and organic content. Lesson plan available from

<http://www.sasta.asn.au/qualityscience/primaryyears/CookeLessons.html>

http://www.funsci.com/fun3_en/exper1/exper1.htm



Lesson and activity ideas

■ Make a worm farm. Information available from

<http://www.epa.nsw.gov.au/envirom/wormfarm.htm>

Organic matter

The fertility of the soil is dependent on its organic content consisting of humus and soil inhabitants. What we all need now is a sense of humus! Once again, applications of well-rotted compost are the answer to any deficiency.

Organic matter helps to make soil nutrients available to plant roots, makes the soil soft to allow roots to penetrate, and holds water like a sponge (which also helps drainage). To test how much organic matter your soil already has, look at how dark the water is in the soil structure test. The higher the organic content, the darker the water will appear.

Mineral content

The soil in your area may be deficient in certain elements. Local gardeners should be able to tell you about this, or you can ask the local Department of Agriculture. Phosphorus is widely lacking in Australian soils and can easily be supplied by poultry manure. There are excellent natural products, such as rock dust, to improve soils with mineral deficiencies.

Vegetables need more magnesium and calcium than is available in many Australian soils. Dolomite has both these minerals and each year or two should be sprinkled over the soil, unless you are in an alkaline area.

Acidic or alkaline soil

The pH of the soil is a measure of how acidic or alkaline your soil is and is dependent on the subsoil. In limestone areas soils are alkaline, whereas volcanic soils tend to be acidic. The ideal pH for a food garden is 6.5 - 7, which is slightly acidic to neutral. Inexpensive pH kits can be obtained from hardware shops and will help you and the students determine your soil's pH and monitor any changes as you add compost to the soil.

Whatever your pH, the addition of compost will bring it closer to the ideal of neutral.

Lesson and activity ideas:

■ Test the pH of the soil. Inexpensive soil pH testing kits are available from hardware stores and most garden centres complete with instructions. Information from

http://www.greenharvest.com.au/tools/info_sheet/soil_ph_info.html

Soil colour

Soil colour affects the temperature of a garden. If you have dark soil, you will find it heats up more quickly and retains heat longer than light soil, e.g., white sand. The microclimate of dark soil is thus warmer and you may plant earlier in spring, especially useful in cold climates.

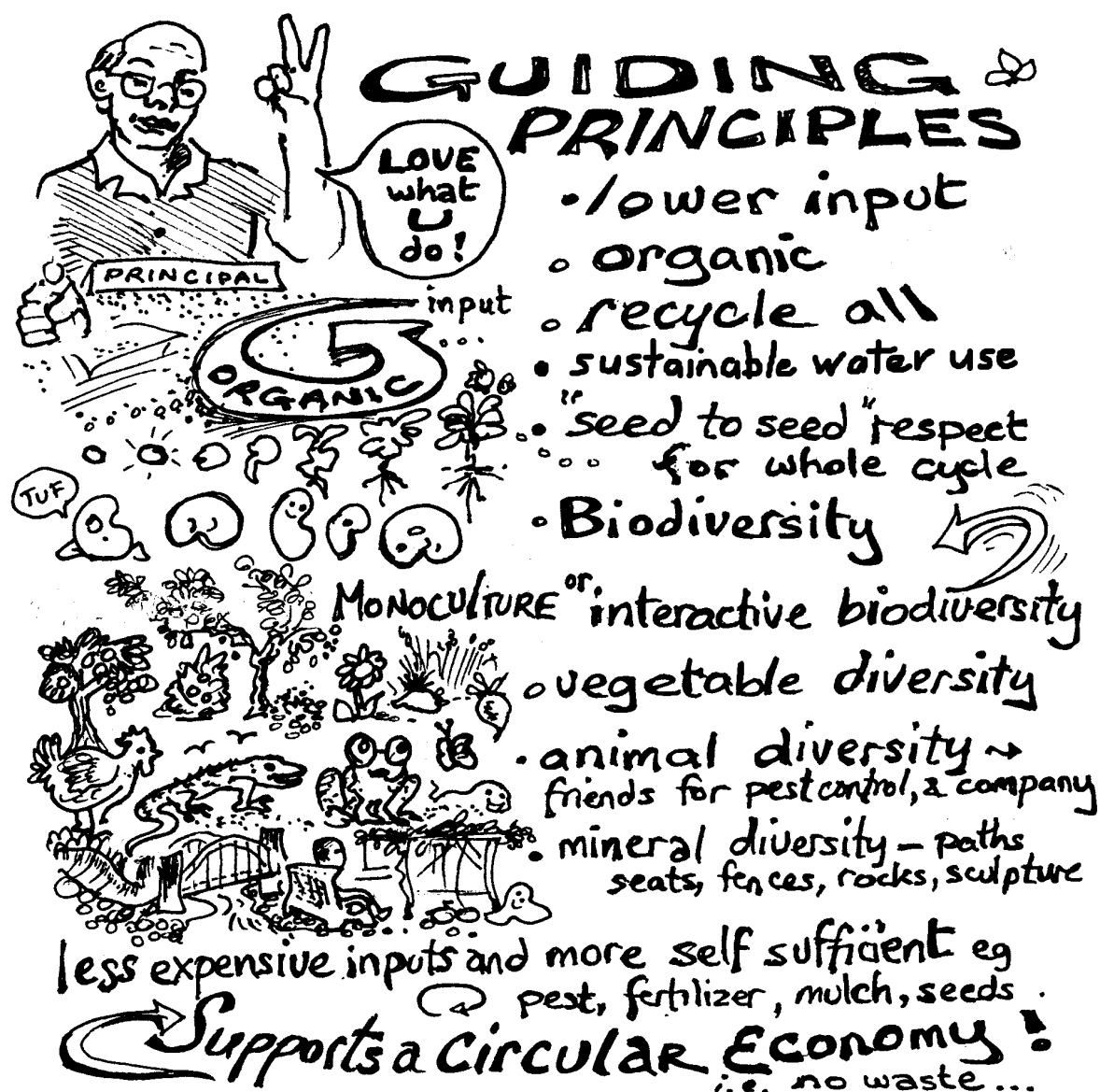


Possibility of contamination

The soil may have been contaminated with agricultural or industrial poisons. If it is, the contamination can pass into the food plants that the children will eat. Ask your local council or office of the Department of Agriculture (Primary Industry in some states) about the likelihood of contamination and where to have it tested. Contact the Global Lead Advisory Service for advice on soil lead testing www.lead.org.au/fs/fst6.html.

The garden at Byron Bay Public School has begun to grow. Using compost and mulch, this sandy soil has become fertile ground in a little over three months.

Designing a natural garden



Regimented monoculture or exciting, interactive biodiversity? We recommend highly diverse gardens in terms of animal, vegetable and mineral components:

- vegetable – besides vegetables, also consider herbs, flowers, cereals, shrubs, vines and even trees
- animal – designing in habitat for wild birds, frogs and lizards will result in free pest-catching workers as well as the enjoyment of their company
- mineral – collecting a range in size and shape of stones, rocks, wood and clay objects, and building infrastructure such as pathways, steps, trellises, sculptures, seats and walls, makes a garden a more interesting place.

Parents, teachers, students and the rest of the school community have a chance to learn more by observing and experiencing the interactions between these components.

In tune with this idea is letting some plants go to seed so that their full life cycle and regeneration can be experienced.

There will be less need for ongoing expensive inputs when the garden is providing its own pest control, fertiliser, mulch and seeds.

Themed gardens

Developing a theme for individual beds or a whole garden is a useful teaching tool and has proven a successful approach in school food gardens. Here are some ideas for themes:

- aromatic plants
- plants that attract butterflies or birds
- plants that originate from one continent, such as South America.
- bush-tucker plants
- all plants for making a certain dish, such as a pizza or potato salad
- different gardening techniques such as water-wise, no-dig or permaculture.

Whatever theme your garden has, leave the plants to go to seed so children can experience a seed to seed garden.



Lesson and activity ideas:

- Sketch out a design for the food garden.

Teaching aids and information for permaculture design from

<http://www.holmgren.com.au>

and Multicultural School Gardens

http://www.gould.org.au/html/multicultural_school_gardens.asp

The dangers of glyphosate herbicides

Glyphosate herbicides (one common brand name is Roundup) are the most commonly used herbicides in Australia. They are used extensively in agriculture, by revegetation groups and for non-agricultural purposes.

Symptoms of exposure to glyphosate include eye irritation, burning eyes, blurred vision, skin rashes, burning or itchy skin, nausea, sore throat, asthma, difficulties breathing, headache, lethargy, nose bleeds and dizziness.

Glyphosate herbicides have caused genetic damage in laboratory tests using human cells, as well as in tests with animals.

There is laboratory evidence that glyphosate herbicides can reduce production of sex hormones. New results indicate that they can commonly contaminate streams in both agricultural and urban areas. Glyphosate herbicides caused genetic damage and damage to the immune system in fish. In frogs, glyphosate herbicides caused genetic damage and abnormal development.

Glyphosate herbicides are broad spectrum, so can kill many types of plants. Application of glyphosate herbicides increases the severity of a variety of plant diseases.

Adapted from Glyphosate: Herbicide Factsheet, Journal of Pesticide Reform, Winter 2004, Volume 24, No. 4, by Caroline Cox, Northwest Coalition for Alternatives to Pesticides.

www.pesticide.org

Designing for natural pest control

Food grown with chemical biocides is dangerous, particularly for children. Avoid using any biocides in a school garden. Biocides include weedicides, insecticides, nematocides, fungicides and herbicides such as glyphosate.

The prevalent response to infestations of pests and diseases is to reach for a spray. However pests and diseases can be viewed as learning experiences. Many times, if the garden has sufficient diversity, the predators and cures will turn up in time. For example ladybirds consume aphids, but you may have to wait a week or two for their numbers to build up. If you spray immediately with an insecticide, even if it is organic, you may kill the ladybirds along with the aphids.

Diseases and pests may indicate a deficiency in soil nutrients that needs addressing.

A complex garden that is in balance with nature will provide habitat and food to encourage a wide range of birds, lizards and other small creatures that are predators on pests.

Lesson and activity ideas:

- Investigate natural pest management. Information from

<http://www.organicgardenpests.com/resources.html>

- Investigate companion planting. Information from

<http://www.jackiefrench.com/companion.html>

<http://www.abc.net.au/gardening/stories/s1063743.htm>

http://www.sgaonline.org.au/info_companion_planting.html

Attracting birds

Near or around your garden, place shrubs and, if room, trees that attract insectivorous birds. To encourage native birds choose plants that are native to your area.

Attracting butterflies

Butterflies are like flowers on the wing and can be attracted into the garden by planting shrubs that attract them. Research what plants are hosts and food for local species of butterflies. You can even make a whole project of this – see Monarch Butterfly box, next page.

Attracting beneficial insects

Plant annual flowers in and around the garden, let vegetables go to flower and provide flowering shrubs to encourage a wide diversity of beneficial insects. The nectar of the flowers of the *Apiaceae* family such as fennel, dill, parsley and coriander is food for tiny wasps that parasitise and kill pesky caterpillars. The wasps do this by anaesthetising the caterpillars and laying their eggs in them.

Flowers of the *Asteraceae* family such as daisies, lettuce, chicory and dandelion, attract ladybirds that feed on aphids. Flowers of the *Brassicaceae* family, such as radish, mustard, cabbage, rocket and bok choy also attract beneficial insects and have brightly coloured flowers. We cannot over-emphasise the pivotal role of flowers for natural pest control.

The Monarch Butterfly Project

by Jenny Smith, Blair Athol Primary School, Adelaide, South Australia

Milkweed in auntie's garden

Our Monarch Butterfly Project started with a visit to an elderly relative's garden, who is a former principal and superintendent of schools. While much of her back garden was covered in the common paddock weed, milkweed, an *Asclepias* species, it was not through neglect. Each was carefully tended, some staked. As it turned out our aunt was actively working at increasing the numbers of Monarch butterflies in the area as their preferred food at larva stage is milkweed. As well she was showing the children in a nearby school how to grow milkweed and teaching them the life cycle of the beautiful butterfly.

Our Monarch butterfly garden

I was inspired to do the same in our school garden. The project lasted from February to April. My class closely studied the butterflies in all their stages and, with the help of visiting artists, created a mural and a mosaic sign celebrating them.

Preparation for the Monarch

As a full-time classroom teacher of a junior primary class, with release time as gardening teacher, I had obtained a small area for our Secret Garden, now fully productive with fruit trees (including bananas and a large mandarin), vegetables, flowers, herbs and a pond. It is in the middle of our inner-city school yard with a fence around.

We started in the first week of February by growing milkweeds in pots from seeds and seedlings from my aunt. We also planted three different colours of Sedum as their flowers provide nectar for Monarch adults.

Larvae eating, pupae dangling

At the end of March when the plants were tall enough, we contacted the Nature Education Centre for ten tiny Monarch larvae. We brought the pots of milkweed into the classroom so



Pictured: (above) We made a folder to record what we did; (right) Jenny Smith with the Monarch mural; (far right) Monarch mural and tile piece.





as to observe the process closely. It was a challenge to keep track of the less than 2mm long larvae, but by the end of April, the milkweeds were approaching leaflessness and we had seven fat black, yellow and white striped larvae that magically began to spin their glorious gold-encrusted pale green pupal cases, attaching them to the branches.

Butterflies emerging

When their metamorphosis was imminent we set up a clothes drying frame around the milkweed plants in their pots and draped a mosquito net over it. Can you imagine the children's wonderment when they arrived at school to see orange and black butterflies flapping around inside? Every few days over two weeks we witnessed the butterflies hatching, unfolding and drying their wings. We put flowers of Buddleia, hollyhocks, Jerusalem artichokes, Sedum and sunflowers as food for them and kept them only a day or two before letting them go. The children took great delight in releasing them in the garden.

What are Monarchs?

I found several reference books about the life of a Monarch. The recent news from the USA about them dying probably from ingesting genetically engineered pollen is a low point in their long history. They are far wanderers, which is their other name, and fascinating to research. The children loved hearing these stories and wrote their own stories and painted pictures of them.

The butterfly is immortalised in a mural project on a wall in the garden done by 36 children ranging from five to twelve years old. Each painted a large Monarch. This project and mural attracted the interest of many parents and children in all the classes and is a continual reminder of the whole wonderful experience.

Attracting beneficial animals

Provide frog ponds and piles of rocks as habitat for lizards as these have huge appetites for pests.

Lesson and activity ideas:

■ Attract beneficial insects and animals to the garden. Information from

<http://www.museum.vic.gov.au/bugs/friendorfoe/beneficial.aspx>

<http://www.gardenorganic.org.uk/factsheets/gg44.php>

<http://landlearn.netc.net.au/print/invertebrates.htm>



Planting repellent herbs

Plant aromatic herbs, such as mints, pennyroyal, feverfew, oregano, thyme, marjoram and sage, on pathways and in and around garden beds. Their aroma confuses and masks the smell of plants valuable to you and repels the insect pests. Caution: mints can be invasive in heavy and damp soils. See page 36 for dealing with weeds.

Planning for lots of diversity

You will make a more interesting and healthy garden if you plant many sizes, shapes and colours of plants that have different life spans and that you let go to seed.

Most people think of a vegetable garden as having only annuals, that is plants that have a life cycle of less than a year. However if you also plant perennials, that is plants that survive from year to year, your garden will look more attractive and will always provide something to eat. Examples of perennials are bunching leeks and spring onions, herbs like lemongrass, oregano, sage, rosemary, thyme, sorrel and horseradish and shrubs like lavender and daisies.

Choose more than one variety of any one species, such as early, mid and late season varieties for continuous production. Choose plants that self-seed easily, like rocket, basil, parsley, lettuce and beetroot and show the children how to spread the seeds from the seeding plants onto other garden beds directly.

Fruit trees and vines around or alongside the garden will complete the food theme.

Choosing plants with multiple uses

Choose plants that have more than one use. An example is celery whose stem is commonly eaten, but did you know the seeds make an excellent salt when dried and ground, and the stem-base and root are useful in soups? The leaves of coriander are commonly eaten, but also the roots flavour Thai curries, and the roasted and ground seeds are an important ingredient of Indian curry powder.

If you start thinking about it, just about every plant has multiple uses. A beetroot's leaves can be eaten; peas have edible leaf tips and flowers; a pumpkin has edible leaf tips and seeds (pepitas) and the young male flowers are routinely stuffed and eaten in the Mediterranean and South East Asia.

Multiple layers of plants

Think about the structure of a forest with its climax trees, saplings, shrubs, vines, ground covers and even plants that exist largely underground. A healthy natural food garden will have all of these elements.

Here are some examples. Taller plants that bush outwards during summer, like capsicum and eggplant can be used to shade more delicate low plants, like lettuce, during a hot time. Trellises with vine crops can serve as a windbreak or shade for other crops.

Ground covers such as running herbs, peanuts or sweet potato (though these last need confining so they are easier to harvest) serve as living mulch and that means less weeding. Root crops can fit in between other plants as they don't take much airspace.



Infrastructure

Bed layout

Have the children involved in the garden layout from the beginning. Some school gardens we have seen are very regular in design and some are set out in circles, rectangles, triangles, rhomboids, segments or keyholes – the list reads like a geometry quiz. The advantage of squares and rectangles is that they are easy to lay out and easy to enclose with hard edges. The advantage of more curved and irregular shapes is that they look more natural.

Circles are easier to water with a regular sprinkler. Wide beds can be accessed with stepping stones or bricks that also make the garden all the more interesting. The beds and pathways in the kitchen garden at Collingwood College in Melbourne (page 4) are all different shapes with wide and narrow pathways, dead-ends and winding trails of stepping stones. Little girls sometimes lie amongst the flowering shrubs in a cul-de-sac area.

If the beds are too wide for children to be able to reach the middle, place stepping stones strategically. Another consideration is whether you intend to have a chicken 'tractor'. This is a small, moveable pen designed to fit over a garden bed. It houses two to six chickens that eat any left-over crops, cultivate and manure the soil and clean up any grubs and snails. In this case beds will all need to be the same size.

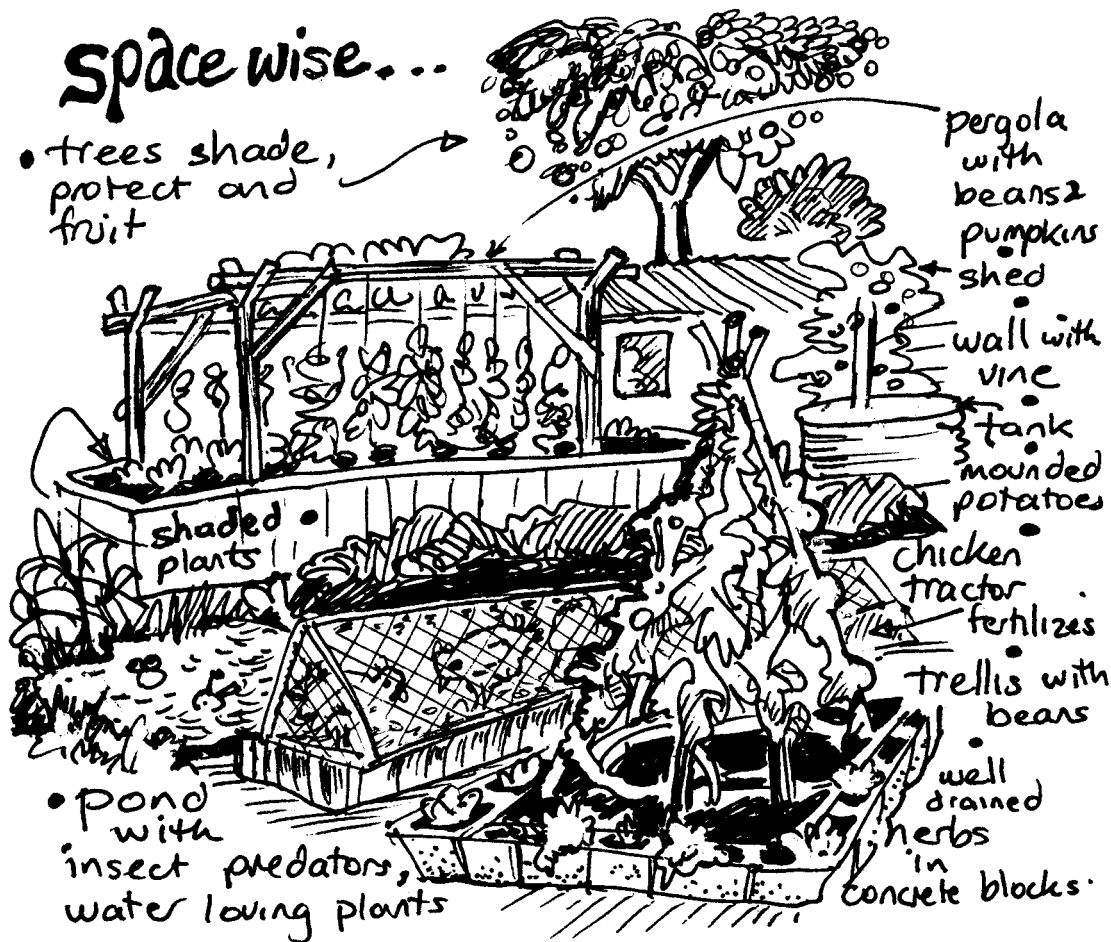
Pathways

Here finances may dictate your choice. Permanent pathways, such as concrete or paving, save a lot of labour and could be a budget item when seeking funding or fundraising.

For cheap and effective paths seek out rough mulch like sawdust, ti-tree mulch or wood chips. These will need to be replaced or replenished every year or so. A side benefit is that after a year or two the mulch will have rotted and become compost that can be used on the garden. To avoid weeds and running grasses infesting paths from underneath, first lay a thick barrier of newspaper or cardboard right up to the edges.

Pathways of running herbs such as pennyroyal are very attractive, repel pests and have a lovely aroma. However they are hard to keep weeded. This should not preclude you from having small areas of such herbs.

Gravel paths tend to become infested with weeds from seeds in the soil underneath and from weed seeds that blow in.



Edges

Defining the edges of pathways helps to keep them neat. Soft edges, such as a simple change in the level of the earth, or border plants, are cheap but need constant maintenance. Some plants are well suited for edges – see page 41.

The edge between pathways and garden beds can be defined with hard materials such as rocks, bricks and pieces of timber like railway sleepers. Be aware that you will need adequate footings to anchor these constructions into the ground. They must be able to take the weight of several children without collapsing. Be careful not to construct such edges where there are any invasive weeds such as running grasses (primarily couch and kikuyu) or nutgrass as these can be concealed underneath and reinvade the garden.

Sloping land may require retaining walls to hold up terraced beds. While detail is beyond the scope of this guide, be sure to provide adequate drainage through any impervious walls in heavy (clay) soils.

Trellises

Climbing plants are economical on space and suit school gardens that are small in area. Decide whether your trellises will be temporary or permanent. Materials for temporary trellises can be tomato stakes, string and bamboo pieces. For permanent trellises, use star droppers, galvanised pipe or hard woods that are well-anchored into the soil.

A fence around the garden, provided it is not on the school boundary, can also act as a trellis. Fruit trees can be espaliered up these trellises.



Signage

Being proud of your garden, you will want to put up a sign to announce it. Construct a pinup board or blackboard that is protected from the weather to tell passers-by about the progress of the garden, upcoming projects or garden events. Plan to have labels for your plants.



Pictured: (left) a big sign explains to passers-by what the current activity is; (right) a small sign ensures you remember what was planted where.

Lesson and activity ideas:

- Use recycled materials creatively for fencing, edging, trellises, scarecrows, bird baths, signage and pathways. Lesson plans from

<http://www.teachernet.gov.uk/growingschools/resources/>

Designing a compost area

Ideally a compost area should be near to the garden and, if possible, close to the canteen and eating areas so food scraps can be recycled. When designing the area, leave enough space to amass materials, for access to the compost piles or receptacles and to turn a wheelbarrow. Grow herbs, such as tansy, yarrow and comfrey, that are beneficial for compost heaps in a bed or along a border nearby to the composting area. Composting is a science of its own.



Collecting materials

Now that your planning is nearing completion it's time to start collecting compost materials, seeds and tools.

Compost components

Before making compost, stockpile all the necessary materials, as it is best to make the pile in one go. Collect locally sourced materials such as manures, straw, garden waste, leaves and grass clippings. If possible source any agricultural waste from organic farms and processing yards.

You may be able to find leaf mould and fallen autumn leaves in the school grounds. Leaves of some trees such as oaks, she-oaks (Casuarina) and deciduous trees are better for the compost than aromatic plants such as Eucalypts and Camphor Laurel. Some landscape garden and garden maintenance companies have excess chipped garden waste and may be happy to deliver it. Coffee grounds, available in bulk from cafes, are an excellent source of organic matter and they deodorise kitchen scraps!

Recommended proportions of carboniferous materials (such as straw, garden waste and other dry materials) to nitrogenous materials (such as manure and kitchen scraps) vary, but aim for 19 to one.

Lesson and activity ideas:

- Make a compost bin. Information available from

<http://www.silverlf.com/barrick/composting.htm>

http://www.bbc.co.uk/gardening/gardening_with_children/homegrownprojects_compost.shtml



Mulch

The purposes of mulch are to keep moisture in the soil, protect the soil from the harsh effects of sun, heavy rain and wind, discourage weed competition, and eventually to break down to organic matter. If the first and second of these are most important to you, choose a mulch that does not break down quickly, such as sugar cane, ti-tree or chipped garden waste.

Straw and hay break down quickly, but provide a quick source of organic matter. They are also softer for use around young tender vegetable plants. A word of caution here – straw may have seedheads in it. Many weeds are introduced to gardens this way.

Bales of hay and straw are easily stored until needed.

They are useful in the school garden scene as they can be

used as temporary seats and tables during lessons. We have for example used them for potting tables. Hay has more nitrogen (fertility) and it will be more expensive than straw, which is largely carbon.

If there is enough space, mulch can be produced in or near the garden. Cereals such as wheat, barley and oats can be grown and cut just before they mature. Even in between crops, say during holidays, these cereals can be sown with mulch production in mind. Other plants that can be cut for mulch are lemongrass, comfrey, borage and other soft herbs.

Lesson and activity ideas:

- Investigate the benefits of mulching for water saving and soil improvement. Lesson plan and information available from

<http://www.sasta.asn.au/qualityscience/primaryyears/PrIndex.html>

<http://www.abc.net.au/gardening/stories/s1484684.htm>



Seeds

Aim to collect locally adapted seed from local gardeners. Ask in the school newsletter for donations of seeds from parents' and grandparents' gardens. This way you could benefit from varieties that thrive in your area and you may find varieties that have a historical significance for your region.

At the time of writing there are 66 Local Seed Networks around Australia that you could contact for local varieties. For a current list see Seed Savers website, www.seedsavers.net.

Local seed companies too may have locally-adapted varieties. If you have to buy seeds, make sure they are non-hybrid. Hybrid seeds do not come true-to-type, that is, the parents don't produce the same offspring.

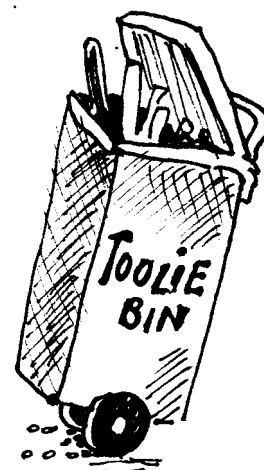
Tools

Choosing tools

Your tools may include a wheelbarrow, hand trowels, forks, a soil sieve and weeders. At the outset larger tools such as rakes, shovels, spades and hoes could be borrowed from parents. For small children, hand tools will need to be smaller than adult-sized ones. Children love using watering cans.

Containers like baskets, buckets, nursery trays and old ice cream containers are useful to have ready when organising tools for small group work.

Buy good quality hoses and sprinklers as they will last longer. Even with a limited budget, it is best to buy fewer, good quality steel tools than lower quality ones as they simply will not last. Choose well-designed, small ones.



Storing and tracking tools

Wheelie bins are useful for storing tall tools as they are portable and have a compact shape. Shelving and bench space are useful in a tool shed to store boxes or bins of tools. If you are working with older students and have several tools, a 44-gallon drum works well for storing long-handled tools upright.



To store hand tools out of the way make a shadow-board (pictured above). Arrange the tools on a piece of plywood attached to a wall. For each tool affix several long screws in position to support it securely. To create the shadows, rub the tools with grease or oil, hang them in place on the board and lightly spray aerosol paint over the whole board. Use a cloth to rub off the paint, grease or oil from the tools. You can write the names of the tools in the spaces with a permanent marker or paint. At the end of a lesson it's easy to see what is missing.

Labelling and upkeep of tools

You can 'brand' the school's tools by painting their ends with a bright colour and label them by painting or burning the school's initials onto them with a magnifying glass.

Dirt and mud should be removed from tools and wheelbarrows before storing them under cover. Every six months lightly oil any moving parts, and rub the metal parts with an oily rag to keep them in good condition. Give wooden parts a dose of linseed oil every couple of years to keep them from drying out and splitting.

Chapter 3: Breaking Ground



Managing the layout of the garden and soil quality is important both at the outset and on a continuous basis. To commence the garden, you may have to undertake significant earthworks such as decompaction, drainage, terracing and even bringing in outside soil.

Digging is back-breaking work. Gaining favour are various non-dig methods that all embrace adding compost and/or mulch onto the soil's surface on a continuous basis. This encourages worms and other soil inhabitants that do the digging for you.

You will have an overall plan indicating the placement of your various garden elements. Work out where your groups of plants will go so as to have the beds an appropriate size and shape and mark out the territory.

Decide on how to kick-start the land, even utilising existing lawn and weeds with the Lasagna Method. Once your beds are established, create a tilth in readiness for planting. Plan to follow crop rotation principles.



Earthworks

Moving dirt

If you are starting a garden in an area that is asphalt or concrete, it will need to be removed. Using a jackhammer is easier than a crowbar.

Major earthworks will be necessary if you are planning a large garden, the site is sloping, or if soil needs to be brought in or removed. Keep in mind that the surface of each garden bed should be as close as possible to horizontal so that rain and hose water spread evenly over it.

To dig or not to dig, that is the question. Non-dig methods of sheet composting and mulching have become very popular. However if you are starting with compacted heavy soil, as many schoolyards are, you may have to aerate the soil to kick-start the garden. Later when you and the children have worked the soil into a finer structure with a good humus content, the non-dig method could well be appropriate. Also see Kick-starting the land, page 36

Compacted soils?

If you have compacted soils, especially if they are heavy clay soils, they will need aeration. You may need to rip the soil in order to break up the topsoil and even the subsoil. If there is a large area to be done, hire a tractor or front-end loader for the job. They are very efficient and will save hours of back-breaking work.

On a small scale a Gundaroo tiller (photo right) does a good job of breaking up the soil to about 500mm. A fork will work down to about 350mm. If you have time before installing the garden, the Lasagna Method will soften soils. See box on page 37



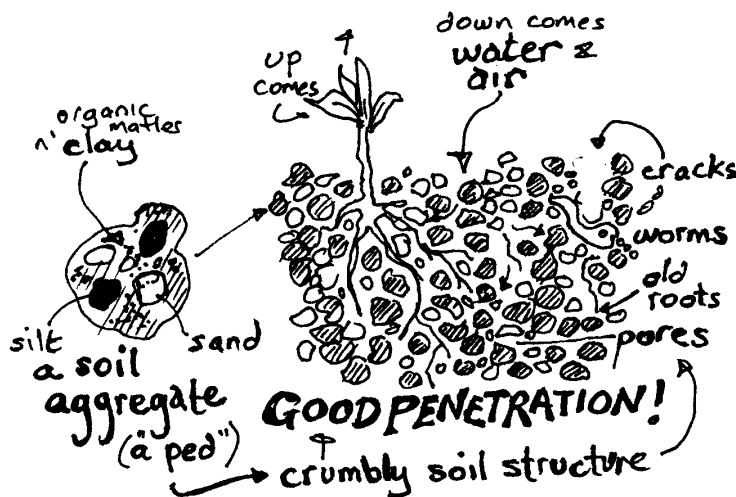
Bringing in outside soil

If you have absolutely no topsoil and very poor subsoil, you may need to bring in topsoil. If you can manage it, however, it is better to build up your soil with compost and mulch as you risk introducing weed seeds, slips of running weeds and nutgrass which are very difficult to remove. Buying compost to establish the garden can be costly, so you may consider making a large compost heap on-site as an exercise to kick-start your garden. If you turn it each week, the compost will be ready in three to six weeks, depending on temperature. The cooler the weather, the longer compost will take. If you do not turn it, leave it for two to three months before using it.

Drainage / water retention

Garden beds on flat ground with heavy soils may need to be raised. If the garden site is in a depression that receives rain run-off from elsewhere in the schoolyard, the whole site may need draining. While earthworks on such a scale as this are outside the scope of this book, we can recommend French drains that are filled with gravel or Agpipes (that have holes in them) for taking away excess water.

If your garden is on sandy soil with too much drainage, you will need to work out strategies for water retention, such as a



regular mulching regime or making sunken garden beds. We have seen this done as a regular practice at a school for poor black kids in the sandy Cape Flats near Capetown, South Africa. About a cubic metre of garden waste (from wealthy white suburbs) was buried in a hole one metre deep by one metre wide by two metres long along with upright empty tin cans that would catch and hold water. The hole was covered up again with sand and compost to within 300mm of the normal surface level. This sunken garden model was successfully replicated at the Murrayville School, Victoria, where the climate is semi-arid and the soil sandy.



Children visiting a terraced garden constructed with railway sleepers and wooden pegs.

Sloping land? - form terraces

Sloping land is challenging, but it does tend to have good drainage. Form horizontal terraces along the slope's contours with pathways in between. The surface of the horizontal terrace is ideal for planting on. When it rains, or you water the garden, the pathway depressions collect the runoff and gradually allow it to penetrate the soil under the terrace below. If you are in a high rainfall area, make the pathway slope run very slightly towards an area where you can redirect water during downpours.

Caution: if you place more than seven terraces on one slope you may risk subsidence. The front edges of the terraces can be simple dirt, or you can construct retaining walls of railway sleepers, basketry, stones or bricks.

Bed preparation

Marking out the territory

When you first install the garden, mark out the beds, pathways and other features. This can be done with pegs and string lines, or more simply with dolomite. This is a white powder that is inexpensive, non-toxic and beneficial to all soils except very alkaline ones.

Overcoming existing lawn and weeds

If you are in a hurry to start your garden, use a hoe or mattock to remove grass and weeds and their roots.

However a more thorough and less labour-intensive method is to sheet-mulch them out. Mow the grass and weeds low. Cover the area with wads of at least six layers of newspaper or two to three of cardboard (ensure that any holes in the cardboard are not coinciding). Especially if you have running grasses such as kikuyu and couch grass, make sure you overlap adjacent wads by at least 200mm as they can run sideways between the layers. Cover with a generous layer of well-teased straw so that all the paper or cardboard is concealed. This straw will add to the fertility as it breaks down. Before planting, wait for one to four months until the grass dies. Lift the straw and newspaper/cardboard to check on progress. In general grass and weeds die more quickly in hot weather than in cold, and on sandy soils more quickly than on heavy soils.



Pictured clockwise from top left: A sandy piece of lawn was the site chosen for the garden at Byron Bay Public School; about to start the garden – bags of manure, bales of straw and a Gundaroo tiller fork; taking out rocks, loosening and flattening soil a bit; spreading straw over the manure.

Kick-starting the land

It used to be common to double dig the soil when starting a new garden. That is, taking out a spade's depth of soil along the length of the garden bed to form a furrow, then a second spade's depth and finally refilling the furrow with the first and then the second lot of aerated soil. However these days disturbing the soil horizons to such an extent is not recommended as it puts the layers of soil micro-organisms out of balance. If done on a regular basis it depletes soil fertility. Here are a couple of less invasive methods.

- For heavy and very compacted soil, take out the first spade's depth and fork down into the bottom of the furrow. Replace the top lot into the furrow.
- For lighter, less compacted soils, use the Gundaroo tiller (see page 34) or just a garden fork and work it well into the soil on a north-south and then east-west grid, with spacing of approximately 200mm. Gently lever the soil up without inverting it. The soil will be aerated and allow water and compost down into it. A minimum of worms will be injured or killed.

The Lasagna Method

Manure and compost lasagna method of kick-starting the land.

This refinement to the sheet mulching system will also kick-start the land with organic matter and fertility, turning grass and weeds into humus.

Mow grass and weeds low, cover with manure, then layers of paper and well teased straw. The manure will kill the grass by burning it with an excess of nitrogen, especially if you use 30mm to 70mm of poultry manure. For cow manure use you will need to go thicker – from 50-90mm, and for horse manure, 60-100mm.

A further refinement is to put in a layer of compost between the paper and straw. This will mean your garden will be really fertile and you can sow it immediately with shallow rooted plants such as lettuce and other greens. If you do sow it, be careful not to pierce the paper layer as the grass and weeds will grow up through the holes.



Lesson and activity ideas:

- Use the Lasagna Method to kick-start the soil. Lesson plan from

<http://www.kidsgardening.com/growingideas/projects/sept04/pg1.html>

To better spread compost through the soil, sprinkle an even layer over the bed before you aerate it. Some of the compost will trickle down the forked holes into the root zone. You can also add rock dust to boost the mineral content at this stage.

Creating a tilth

Once the ground is flat and smooth, it is necessary to put the finishing touches on the surface, especially if you are planting seeds and small seedlings. Creating a tilth means finely sifting or grading soil until it has no lumps or solid objects in it. It is important for seeds and small seedlings to have fine soil otherwise their little roots will have to work too hard to grow through it.

Rake the bed so the lumps are taken out of the top layer (50mm or so). Work at it with a small hand rake or fork to break up the lumps and reject the stones, sticks and other solid objects to create a tilth. You can also use a soil sieve of about 10mm gauge or organise the children to create the tilth with their hands.

Finish off with a rake or by scraping with a board to ensure the surface is smooth and flat because water will run away from any humps and will pool in any depressions.



Placement of plants

Once you have the beds laid out and the soil is friable and fertile enough for planting, you will need to work out where to sow the plants that you and the children have chosen. Rows and patchworks of crops are the two most common shapes.



Writing with radish seeds; the seedlings were timed to come up for the school fete.

Sowing seeds or transplanting seedlings in a regular shape helps you keep track of them, especially if weeds start growing too. Recognition of the good seedlings is easier if they are in a line. String lines help keep furrows straight. Parallel furrows and squares or rectangles of broadcast seeds are more manageable than haphazard shapes.

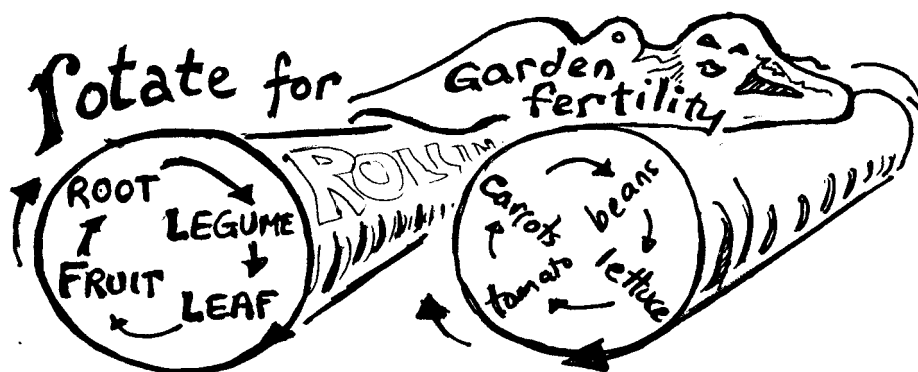
That said, we have seen some creative school gardens where the children have made interesting shapes and even written their names using plants! Mosaics of plantings look more natural.

Some species are best off planted in blocks. For example, broad bean plants need the support of one another and if planted in a block, can be held up and protected from any strong winds with stakes and strings around the outside. Erect this support when the plants are at the half-grown stage. Corn pollinates better if planted in a block because the wind blows the pollen from the male tassels at the top down onto the silks poking out from the immature (female) cobs.

Other considerations in placing plants are their size, their growing time to maturity and how often you will be harvesting them. Near the edge put small, quick-maturing plants and those you harvest often. Larger, slower plants and those you harvest all at once, like peanuts and potatoes, can be put in less accessible spots. See page 43 under Sowing seeds, for more on plant placement.

Other considerations in placing plants are their size, their growing time to maturity and how often you will be harvesting them. Near the edge put small, quick-maturing

Crop rotation



Crop rotation principles dictate that the same crop should not be grown consecutively in any one place. In fact it is best to grow the same type of crop in one place only once every two years or more. The order for crop rotation is to start with Legume then Leaf then Fruit then Root, and then repeat the sequence. For example, in one bed, first plant beans then lettuces then tomatoes then carrots, then start again with a legume. The reason for this order is that an interaction between legume roots and soil fungi supplies underground nitrogen, which leafing plants love. Fruiting plants need less nitrogen and large-rooted plants even less.

Chapter 4: Planting



Choose crops that the children like and local varieties that are suitable to your climate and soil.

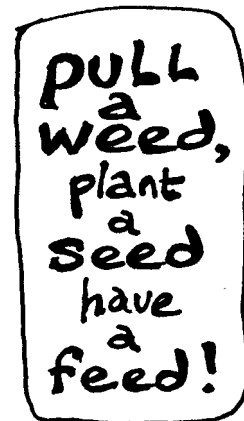
Work out a list of what annuals to sow each season and then choose quick and slow growers so as to have a continuous harvest. There are specific plants that suit bed edges as they look good or they defend the edge from running lawn grasses.

Before sowing, count the seeds, label them and work out whether they should be planted directly in the ground or into trays, pots or punnets, and how thickly and deeply.

Once in, tamp the seeds down, water them in and decide on how long they will need to germinate. Water them daily. If in trays, some may need pricking out to larger pots and all will need hardening up.

Transplanting seedlings is a delicate process that requires care – give the children lessons in the finer points, and supervision.

Permanent plants, or perennials, are the backbone of the garden. Fruit and nut trees will constitute your larger perennials and provide shade and delicious food. Cuttings, bulbs, rhizomes and runners are just some of the propagules that are reproduced vegetatively.



What to plant?

Survey preferences

Involve the children in the choice of plants. Survey their preferences as to what they would like to grow. We have found popular choices are strawberries, sunflowers and sweet corn, and they grow in most areas of Australia. Assign a bed or part of a bed to a child or a group of children so they have ownership.

Mt Barker Waldorf School in South Australia has a strong gardening programme for students in years six to nine where eventually each student devises an experiment on how plants respond to differing conditions, such as spacing between plants and rates of application of compost or water.

Suitable to your climate and soil

Choose plants that are suitable to your climate and soil. Local garden guides, garden clubs and, most accessibly, local gardeners will inform you what crops will thrive in your area. For example, some soils might be too acidic for legumes, or too alkaline for strawberries. You may be able to work on the pH of your soil (see page 20), or grow these plants in pots.

Choosing local varieties

Seek out varieties that are adapted to your area. For example, you may find a certain pumpkin or cucumber does really well where you are. Ask locally amongst parents and good gardeners for their home-saved varieties. Locally adapted varieties are less likely to succumb to local pests and diseases as they are, by definition, resistant to them. Having resistance is how they have become adapted to the local conditions. Once again, contact your Local Seed Network.

Planning measures for seed saving

Quick growers, slow growers

When you plant out a bed, choose some plants that mature fast such as radishes, lettuces and silver beet and also some that take a few months to mature such as eggplant, peas and corn. That way you will have a continuous harvest and a more interesting garden. When you have a food event in mind, find out the time to maturity of your crop ingredients and plant them so they will all be ready at the same time. An example here is the pizza garden, where tomatoes, capsicums and herbs, etc., need to mature at the same time.

Seasonal planting

Possibly the most critical factor for a successful garden is getting the timing of sowing crops right. Some crops will not survive if grown at the wrong time of year. In a warm climate broad beans and peas will thrive in winter, whereas in a cool climate, they can only be sown in spring and grown into summer. Consult local gardeners and, if they exist, printed local guides for the optimum months for sowing crops in your area.

The two main sowing times are autumn (March to May) and spring (August to October, though in cooler climates start in September, or later).

Each area has its restrictions in terms of day length (particularly temperate regions), temperature, rainfall and possibility of frost and humidity. Summer is the main growing season in cool climates like Tasmania

and highland Victoria and NSW; winter in hot climates like northern WA, north Queensland and the Northern Territory. The opposite season is the down time when green manure crops are grown, manured and mulched and the garden bed has a rest from growing.

Working around your school holidays and the expected time of harvest will be an additional factor in your planning. Writing up a school planting calendar could be a class activity.

Seasonal planting calendar devised for Byron Bay, NSW

Note: seasons may be longer or shorter depending on your geographical position. i.e. a longer summer in the tropical north and a longer winter in the temperate south.

Plant in summer (Nov Dec Jan Feb)

FRUITING
Capsicum, Cucumber,
Eggplant, Okra,
Pumpkin
Snake Bean,
Sweetcorn.

Plant in spring (Aug Sept Oct)

GREENS
Coriander, Basella, Dill,
Basil, Lettuce, Water Spinach.

FRUITING
Beans - French, Hyacinth, Lima, Snake, Soya, Sword,
Winged Capsicums, Chillies.
Cucurbits - Cucumber, Gourd, Gramma, Luffa, Marrow,
Melons, Pumpkins, Squash, Zucchini.
Eggplant, Maize, Rosella, Sweetcorn, Tomato.

ROOTS
Ginger(s), Peanut, Sweet Potato.

GREEN MANURE
Cowpea, Soya Bean, Dolichos Lab Lab
Mung Bean, Pigeon Pea.

MISCELLANEOUS
Asparagus.

Plant in autumn (March April May)

Plant all year round

Perennial Herbs e.g., Lemongrass, Mints,
Oregano, Rosemary, Thyme, Sage, Sorrel.
Carrots - except really dry times.
Radish and Lettuce - except really hot times.
Sunflowers, Spring Onions by division.

GREENS

Asian Greens - Bok Choy, Chinese Cabbage
Cabbage group - e.g., Broccoli, Brussels
Sprouts, Cauliflowers
Celery, Chives (divide), Coriander
English Spinach, Fennel, Lettuce
Parsley, Rocket, Silver Beet.

FRUITING

Broad Beans, Cucumber to end of March!
Cereals - Barley, Oats, Rye, Wheat
Globe Artichokes, Peas.

ROOTS

Beetroot, Garlic (regular and elephant)
Jerusalem Artichoke, Leek, Onion
Parsnip, Potato, Spring Onion, Turnip.

MISCELLANEOUS

Rhubarb crowns and seed.
Strawberry runners (divide).

Plant in winter (June July)

GREENS

Coriander, Corn Salad, English Spinach
Lettuce, Silver Beet, Spinach.

FRUITING

Tomato (from July).

ROOTS

Beetroot, Parsnip, Spring Onion, Turnip.

Choosing edge plants

If you have decided on soft edges, there are some plants that are very effective at defining the outline of beds or defending the edges of the garden from invasive running grasses. To define bed edges, use low herbs that are not invasive. Use chives, garlic chives and all varieties of thyme, savoury and oregano, though in warm climates oregano will quickly spread. If you have the space, comfrey and yarrow are a good choice as you can pick and use the leaves for green manure on the beds and as valuable compost ingredients.

Many lawns have the spreading grasses, such as kikuyu and couch. Keep a gutter dug between such lawns and garden beds to help defend the line. A further effective barrier against these is a combination of an outer row of comfrey and about 300mm away a row of lemongrass. Even if comfrey dies back in winter, running grasses don't seem to encroach. If you are in the tropics, comfrey may not do well. In a cool, temperate region lemongrass may not grow well.

Choosing permanent plants

The bones of the garden are the permanent plants, or perennials. They remain there even when you have not had the time to plant annuals. Good spots for permanent plants are at the entrance to the garden, around the outside, at the ends of rows or in a line down the middle of a bed.

Here are some examples of perennials.

- herbs such as the bay laurel tree, chives, thyme, oregano, sage, rosemary, lavender (for Mediterranean climates); kaffir lime tree, garlic chives, Vietnamese mint, lemongrass and Thai coriander (in more tropical climates)
- asparagus – this will need a dedicated deeply composted bed
- flowering shrubs, such as daisies, pentus, gardenia, azalea and salvia
- spices such as ginger, tumeric, cinnamon shrub, cloves and nutmeg – most of these thrive only in tropical or subtropical climates
- multiplying leek, shallots and potato onion
- strawberries – contain these as they can become invasive
- fruit trees, vines and shrubs.

Many of these are good companion plants and some will repel or confuse pests.

Choosing fruit and nut trees

If you have room, fruit and nut trees complement a vegetable garden. Start by thinking of small fruit trees that mature quickly. In temperate climates, berries such as raspberries, loganberries and blueberries give quick crops. In sub-tropical and tropical climates try tamarillos, papaya, banana, acerola and the various guavas.

Be guided by local gardeners and by your local nursery as to what is suited to your area. Grafted fruit trees are quicker to fruit than seedling fruit trees as they have had their seedling's top replaced with a mature branch so they fruit in the first year. They are more expensive than seedlings. In small spaces trees with multi-grafts give a greater range of fruits.

Citrus fruits seem to grow in all climates and children love eating them.

Nut trees particularly suit the school ground as most are harvested when the nuts fall and the children need only pick them up. Almonds, walnuts and hazelnuts are suitable for temperate climates; pecans and macadamias for subtropical and tropical climates to name only a few.



Choosing seeds before planting them is easy when they've been labelled properly (left); sorting out seedlings in their punnets before transplanting (right).

Sowing seeds

The joy of sowing seeds and watching them come up should not be denied to children. Some seeds must be planted directly into the ground, as they do not do well when transplanted as seedlings. These are root crops and legumes such as beans and peas.

Once you have decided to give up buying punnets of seedlings grown from seeds of unknown origin in suspect raising mixture, then you need to know how to raise your own seedlings.

First make sure the time is right for planting and the seed you are about to use is viable. A seed has a better chance of being viable if it is fresh and plump, without insect interference. In time you will be planting the seeds you have produced in your own garden.

Start smaller seeds in punnets or trays that are kept near the classroom. Begin this early before the ground is fully ready so that when you plant out the garden you have some advanced seedlings ready to go.

Preparing seeds

Preparing seeds for children to plant can take time. For a class sowing activity, it is best to make the steps clear to the children beforehand. We have had little children pour a whole packet of seeds onto one spot.

Before the lesson count out enough seeds for each student into containers such as small cliplock bags. These are also convenient for attaching the plant label with a rubber band. Assign an area of the garden to each child or small group. Mark out the furrows or patches to be planted. Have them label where they are going to sow.

Some seeds such as Acacia, and other tree legumes, have a hard seed coat. These may need individual scarifying, that is, rubbing on concrete or nicking with a knife.

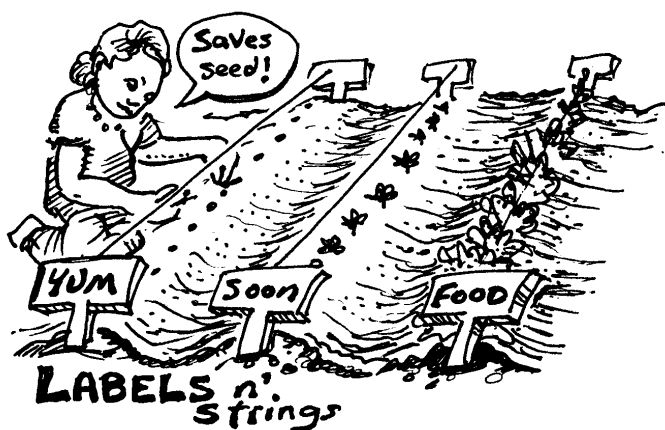
Other seeds, such as carrot seeds, will not germinate if they are too warm. Vernalisation – placing packets in the fridge for a few days before planting – will simulate a cold winter.

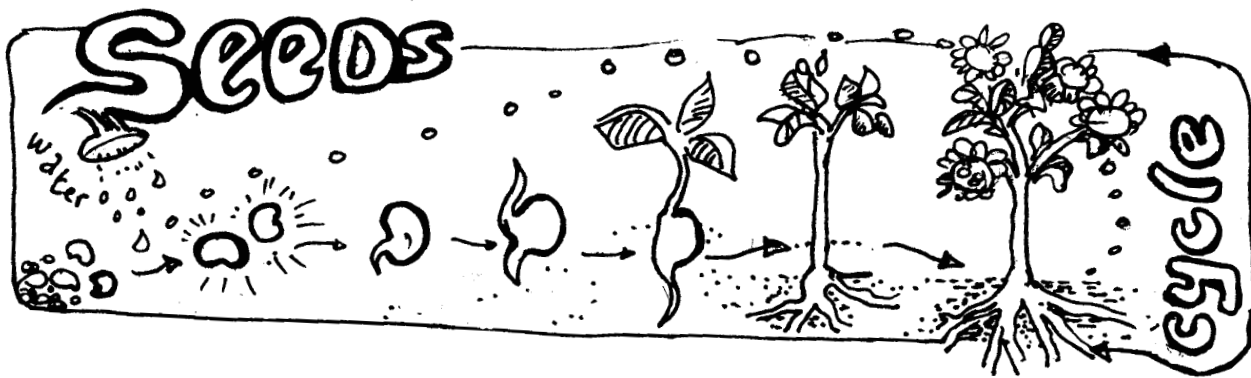


Labelling seeds

Have the children write a label for their seeds before they sow them. We find it best to write with a soft pencil, such as a 3B, 6B or Chinagraph on white plastic labels. Old venetian blinds, paddle pop sticks and recycled ice-cream containers also work. The reason we don't use felt-tip pens is that we have found these unreliable. The sun fades them or the rain washes off the writing.

Write the plant's variety name, such as "Mignonette Lettuce", the child's name and the date. Recording the date allows you to see how long plants take to come up and to grow.





Stages of a germinating seed

The stages of a germinating seed are:

- imbibing water
- digestion of fats and oils into sugars and starches
- cell division with reduced water uptake, more respiration and increase in size
- the radicle (first root) then the plumule (first leaves) appearing. This is when the plant starts to depend on the nutrients in the soil.

Direct or indirect sowing?

In general large seeds, like beans, peas, pumpkins and corn are best planted directly into the ground. An exception to this is if you live in a cool climate and want to start your spring seedlings early. In this case plant them in pots indoors to be transplanted out when there is no chance of frost.

Small seeds are best sown indirectly; that is into punnets or trays. This is because small seeds and seedlings can be swamped in a garden, or the soil is too rough for the fine roots to penetrate.

That said, the finer the tilth in the garden, the smaller the seeds you can plant into it. After five years the soil at our Seed Centre gardens in Byron Bay was so fine that we could sow small seeds like basil, tomatoes and capsicums directly into it.

Sowing indirectly means there are the extra processes of pricking out, transplanting and giving extra care to the new transplants. On the other hand the punnets or trays are more easily monitored and can be kept in or near the classroom to check their moisture levels and progress daily.

Preparing the soil

To learn how to make the bed ready, see *Creating a tilth*, page 37.

Once the soil is fine enough, dig furrows for the seeds with a hand trowel, small fork or even with your hands, piling the soil either side. Mixtures for seedling trays are made with various ingredients but should contain some good soil or compost, some lightening component such as peat moss, well-rotted leaf humus or mushroom compost, and some sharp river sand for drainage. The fertility does not have to be high. The compost should be well matured.

How deep?

A seed should be planted at a depth twice to three times its diameter; for example if a pea is 5mm wide then plant it with 10 to 15mm of soil above it. That said, it is better to sow too shallow than too deep. The reason for this is that the germ cannot make its way through too thick a layer of soil. It will die from exhaustion.

Plant more deeply in sandy soils, in dry weather and in hot weather.

A way to deal with very fine seeds is to mix them with a small amount of sand and run the mixture into a shallow furrow.

How close, how thickly?

Spacing for larger seeds like peas, beans and pumpkins is dependent on your soil fertility, available water and the size of the garden. Think of the eventual size of the mature plant and sow about twice as thickly to allow for seed that does not germinate and misadventure such as pests eating some of the young plants.

Plant small seeds thickly and aim to thin them out later. This applies to root vegetables such as carrots, radishes, onions, turnips and parsnips and to leaf vegetables such as lettuces, parsley, coriander, silver beet, bok choy and other Asian greens. You can always use the seedlings by transplanting to other parts of the garden or you can give them to the children to take home to their gardens.

If seeds are in abundance because the class collected them themselves, you can plant more thickly than usual.



Transplanting seedlings to the garden bed.

Tamping down

After the seeds are sown, cover them with soil to the correct depth and tamp it down so it is firmed around the seeds. Tap on the soil with a trowel or the back of the hand. This reduces air pockets around the seeds.

Why did my seeds not come up?

Seedlings may not have emerged from the potting mix or from the soil for these reasons:

- Seeds were too old, or infertile for other reasons – use better seed
- Too little water – water more regularly
- Too much water – hold off water and increase drainage
- Arrested water supply – this happens when you water, then stop watering causing the germinating seed to die
- The seedlings may have emerged but been bitten off before you or the children noticed them – check for snails, slugs and cutworms around the stems and use natural pest control – see page 23.

Seedlings may emerge then suddenly die; this is usually due to 'dampening off' which is a fungal attack to the young stem – if in pots, raise the level of the potting mix so as to avoid having damp air stagnating around the young plant.

Aim to have a slight furrow in the surface of the bed once the seeds are sown and covered. In this way when you water your seeds, the water runs into the furrow where the seeds are, and is conserved.

Watering seeds

Water with a mist or fine spray twice a day for the first few days and then once a day until they germinate. Legumes such as peas and beans are an exception. They should be planted into damp soil, then not watered until after the shoot appears above ground.



Too much or too little water is a problem. Seeds can be washed away, or tumbled to destruction by too powerful a jet of water, or heavy rainfall. Dehydration is also a killer, particularly if the seed has started to germinate and then the water supply is terminated.

Make sure that the water penetrates the soil enough to encourage the little roots to seek it out. Plants with deeper roots are stronger and more productive.

Germination times

Different plants have differing germination times. Mustard and radish are the fastest of the vegetables. They can be up in two days. Parsley, carrots and onions may take up to three weeks. Most plants will be up within a week, unless it is very cool weather and the soil is cool.

Lesson and activity ideas:

- Sow seeds directly in soil, in seed trays and pots. See page 44 and lesson plan from http://www.growinggrub.co.uk/session1/session1_01.htm

Care of young seedlings

Watering

In the period of a few weeks after the seeds have sprouted until ready for transplanting, the punnets, pots or trays will need daily watering, unless it rains of course. Once the seedlings are up and have their second leaves, they will need watering only every second day or so.

Pricking out seedlings

If the seedlings are in a tray or punnet, they may need to be pricked out and transplanted into bigger pots. This is so their roots have more depth of soil and room to grow. Do this only when the seedling has its adult leaves. Juvenile leaves usually have a more simple shape than adult ones.

They will need to be watered and kept shaded for a day or so afterwards.

Hardening up

Seedling trays may be kept in a shade house or shady spot during germination, especially in hot weather. However for at least a week before transplanting, bring the seedlings out into the open so they are 'hardened up' in readiness for their new location in the full sun of the garden. If it is really hot weather, place them at first in a position where they will get only a short period of morning sunshine. Gradually move them into a sunnier position each day so they can acclimatise to the change.

Transplanting seedlings

Transplant the seedlings when they have several leaves and are tall enough to make their own way in the garden (pictured right). Do it on cool or cloudy days and by preference late in the afternoon. If that is not possible, devise a way to shade the seedling after transplanting, such as with a large leaf, an upturned large pot or shade cloth suspended over the whole batch of seedlings. This shading may be necessary for a few days after transplanting if the weather is very hot. Take the shading off gradually so the young plants are inured to strong sunlight.



Watering pots first

Water any pots, punnets or trays of seedlings gently just before you transplant them. This ensures the plug of earth will slip out more easily and the root ball has more chance of soil sticking to it. Watering also strengthens the plant before the shock of transplant. Dunking the pots in a bucket or container of water is a good method.

Preparing the hole

Dig holes with a trowel or, if the soil is soft enough, with your hands. The holes should be deep enough for the whole length of the seedlings' roots. It is a common mistake made by children, and even adults, not to make a deep enough hole. Pour the equivalent of a cup or two of water in each hole to give moisture to the roots of the seedling after it is planted.

Removing the seedling from the pot

Place the trays, punnets or pots next to their designated bed in the garden. If the seedlings are in a tray, cut around each root ball with a knife or even with your hands. Gently prise them out with minimum disturbance of the roots. If in a pot, slip the whole contents out by holding the pot upside down with fingers either side of the stem of the seedlings. The ideal in this move is to keep the root ball, and the soil around it, intact.

Ensuring roots point downward

Lower the root ball plug into the hole, ensuring that none of the roots are doubled back upwards. Tell the children that would be like a person trying to stand up with their legs all folded up.



Firming the soil and watering in

Anchor the young plant well by pressing the disturbed soil down with your hands around the stem. This is to ensure there is not excess air in the soil around the young roots and to make sure it will not be dislodged by watering.



Now it is time to give a drink to the little plant to refresh the roots in their new situation. Water low around the roots only, not on the leaves as they do not absorb water and if it is sunny the water may burn them. Also watering directly on the plant can dislodge it.

Protecting the seedlings

If there is a harsh sun and drying winds, make sure the seedlings are protected for a day or two by constructing little shelters made of pots, large leaves, ferns or bits of bark. Gradually remove these so that at first the seedlings get only morning sun.

Lesson and activity ideas:

- Transplant seedlings. Lesson plan from

http://www.growinggrub.co.uk/ground/ground03_frameset_session2.htm

Planting vegetatively

That a plant can be reproduced from a little cutting is yet another wonderful aspect of the world of plants. Children really enjoy planting cuttings, tubers, bulbs and rhizomes, etc., such as potatoes and other large propagules (the generic term for pieces of vegetatively reproduced plants) in anticipation of seeing them multiply. Propagules are a cheap source of planting material as they can be obtained from parents and friends. See box next page.

Choosing a site

The ground for all these vegetatively reproduced plants will need to be prepared as for seeds, though the tith need not be so fine. Placement of potatoes, taro, ginger, leeks and other annual crops could be in rows. For the more unusual, decorative or companion plants, place them where they are less likely to be disturbed, that is, in their own bed, at the ends of rows or as a border.

Planting

Show children the growing points on the propagule to give them an insight into how it will grow. They will need to know which end points upward for bulbs, crowns, cuttings, rhizomes and slips. Water the soil after planting to settle it in. Cuttings and root divisions will need regular watering for the first week or more, depending on the weather.

Labelling perennials

It is important to put in a permanent label, as these plants may take a while to emerge. Also some plants die down in winter, such as ginger, tumeric, asparagus (though not in the tropics). Some flowering bulbs die down in autumn and need to be labelled or lifted and stored for replanting.

Examples of propagules

Bulbs: lilies and many other flowers – plant in autumn for spring flowering

Bulblets: tree onion – plant the top bulblets of this walking onion

Corms: taro, water chestnut – plant taro in damp fertile spots and water chestnut in ponds or baths

Crowns: asparagus, rhubarb – plant in permanent beds

Cuttings: herbs, watercress, sweet potato shoots, pineapple tops, many flowers – take the cutting when the plant has finished the flowering stage

Rhizomes: ginger, tumeric and others in the Ginger family – plant in spring for late autumn harvest

Root divisions: shallots, Welsh onions, multiplying leeks, sorrel, strawberries

Slips: pineapple (found around the base of the plant)

Tubers: potatoes, Jerusalem artichoke, dahlias and yams



Corms of celery taro



Root division – garlic chives



Bulb of Hippeastrum



Runners of strawberry



Tubers of dahlias

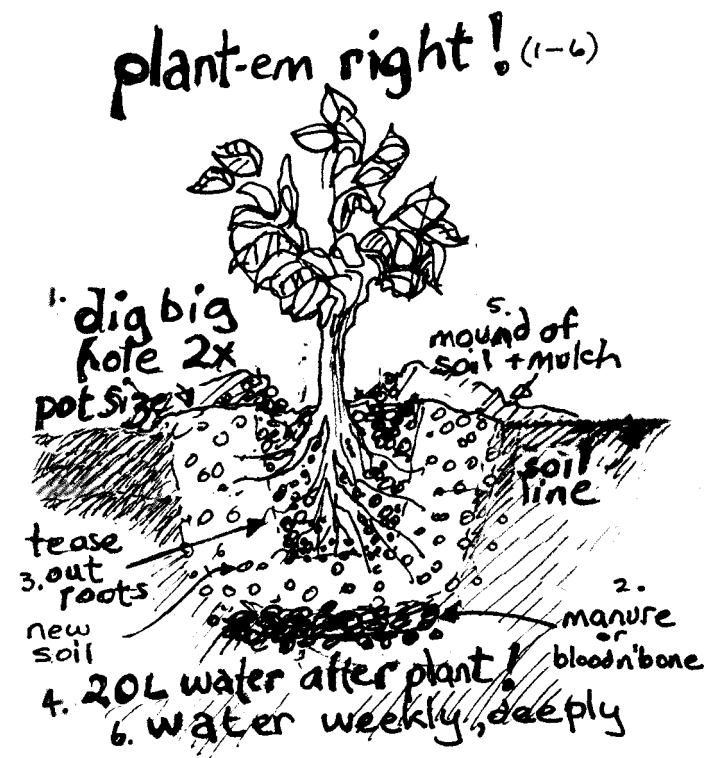


Cuttings of thyme and oregano

Planting fruit and nut trees

Soil preparation

Use a long-handled spade to dig a good-sized hole at least twice the volume of the tree's pot (1), reserving the soil for a mound around the tree (see below). Put a little manure or blood and bone at the bottom (2). Half fill with compost or good topsoil, according to availability. Fill with water two or three times, waiting for the level to subside each time. If you have really poor or shallow soil, you will need to dig a much larger hole and add more compost.



Planting

Water the pot well or place it in a bucket to saturate the soil. Place the pot next to the hole and, according to the direction the tree's leaves are facing in relation to the north, twist the pot around until it has the best orientation.

You will need to work out the depth of the hole in relation to the tree's pot so as not to plant it too shallow or too deep. The soil level of the pot should coincide with the normal soil level. Add or remove compost accordingly.

Cut off the pot with a sharp knife, or gently ease out the tree with two hands. If necessary, tease out the roots at the bottom (3). Carefully lower the intact root ball into the hole until the level of its soil is at ground level. Backfill around the edges with compost or topsoil and water again with approximately 20 litres (4). Make a doughnut shaped mound about 500mm out from the hole's centre (5). Water deeply, weekly (6) until the tree takes off.

Labelling and protecting

Trees need permanent labels such as painted rocks, a venetian blind marked in Chinagraph pencil or a wooden sign. Record the variety of the fruit or nut tree. A record of its name, the date planted, maintenance notes and perhaps yield should also be kept in the school office in a book, or on a computer.

Mark the tree with a strong, long-lasting stake. It is especially important to protect small trees in high-traffic areas. Where you need to, construct sturdy barriers of stakes, wire or fences around them. Sometimes more effort has to be spent on tree protection than on planting the trees themselves.

Lesson and activity ideas:

- Find out about heritage fruit and nut trees. Story and information from

<http://www.genevar.com.au/seedsavers/resources/14.html>

- Determine appropriate fruit and nut trees based on size and time to fruiting. Information from

<http://www.communitygarden.org.au/ideas/fruits/text.html>

Chapter 5: Maintaining



Once your garden is planted it needs regular, but ideally minimal, maintenance. This chapter discusses some of the tasks that will come up on a regular basis.

Some aspects of maintaining were covered in Chapter 2: Planning, because it is best to be prepared for how much work there is in keeping a garden going.

Soil needs improving about once a year, usually in the period before the main sowing season. Use manure, green manures, compost and fertiliser teas, encourage worms and leave some garden beds fallow.

Planting by the season is the key to success in the garden. Create a calendar of sowing times. Local gardeners will give you tips on the optimum times to sow.

Conserve water by only watering the soil around the roots. Water less frequently, but deeply. Avoid the use of sprinklers, consider a rainwater tank, use mulch and don't overfertilise.

The best strategy with weeds is to avoid allowing them to go to seed. If possible, pull out weeds in wet times, not dry.

*most
is not
lost if
Ostraliains
Compost!*

Low maintenance gardens

In order to have as little maintenance as possible, aim for a garden where at least some areas are:

- self-mulching – use plants that can be cut for use as mulch, e.g., cereals such as rice, wheat, barley and oats (this is best suited to a large garden)
- self-fertilising – use plants that produce fertiliser, e.g., comfrey (in its leaves) and legumes (on their roots, e.g., beans, peas, alfalfa and all pulses – see Green manures below)
- self-seeding – allow plants to go to seed and for the seed to fall or be spread around so that seedlings will come up next growing season (this is suited to seed from seedheads).

Soil improvement

Manures

Manures are really the secret of most organic gardens. The larger the animal, the less strong the manure. The best sources are animal farms, ideally organic, but failing that, hardware stores stock various manures, most commonly chicken manure (strong), in bagged form. If you obtain manure from a farm make sure it is weed free by leaving it in a pile to heat right up. Turning the pile a couple of times, after it has heated up in between, will completely kill weed seeds. If manure is not welcome at school, just use small amounts.

Green manures

Green manures are legumes that are grown to the point of flowering and chopped as mulch or dug into the soil. Seeds are usually available from produce stores and the range will depend on your climate. Ask what the seasonal options are. For example, in sub-tropical areas, woolly pod vetch and lupins are available in autumn and soya beans and cowpeas in spring. If you have excess bean or pea seeds you can grow them as green manures.

Compost

If you are buying compost make sure it is organic. If you are making your own, refer to Designing a compost area on page 29 and web links on page 30 for details. When spreading compost on the soil, it is best to cover it immediately with mulch, or incorporate it in to the surface of the soil, so its goodness cannot evaporate.



Worms

Encourage worms in the garden by aiming to use non-dig garden methods, as digging really chops them up. Contrary to myth, each half of a worm does not survive to make two worms, though both will wriggle for a while. Adding well-rotted manure, compost and green manures will encourage them to multiply. If the soil is welcoming to worms, they can process up to ten tons per year per acre.

Fertiliser tea

To make a fertiliser tea for the garden, soak manure or compost in a drum of water for three weeks at about 20:1 volume ratio of water to solid matter. Stir this tea daily to aerate it. Dilute another five times and apply to the soil in the cool part of the day. This is very good for half-grown plants that need a boost.

Lesson and activity ideas:

- Investigate soil improvement using manures, composts, worms and fertiliser tea. Information from

http://www.greenharvest.com.au/tools/info_sheet/soil_info.html

Regenerating over the holidays

The perfect time for giving the garden a rest is the long summer holidays. Spread compost and mulch thickly enough to last the whole period or grow a green manure crop. This will protect the soil from dehydration and improve its fertility and friability.

Other low maintenance strategies

Seasonal tasks

Good gardening is a matter of successful timing. With the school year starting at mid summer, it is best to start with ground preparation for autumn planting. Drawing up a list of vegetables suited for winter growing is important at this stage.

Consult local gardeners to find out what months are optimal for each crop and for which tasks. Sometimes it is a matter of avoiding frosts or really dry or wet times for certain phases of a crop, e.g., peas succumb to mildew if it is warm and wet at the same time. Frosts do not affect leeks and cabbages, but they can kill other plants.

Good gardeners often put in crops a little earlier than recommended. If they fail, they then have a second chance at sowing them.

Create a seasonal calendar of tasks and sowing times for your school garden – see page 41.

Time their sowing so crops can be harvested before school holidays. Holidays are an ideal opportunity to give the gardens a rest by planting green manure crops or mulching.

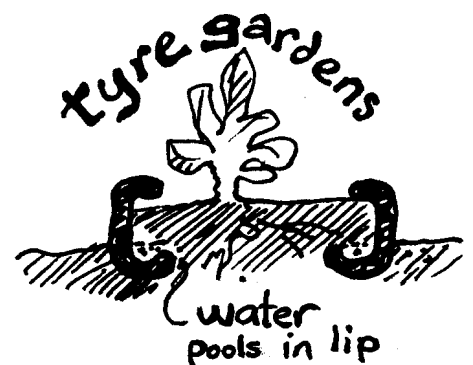
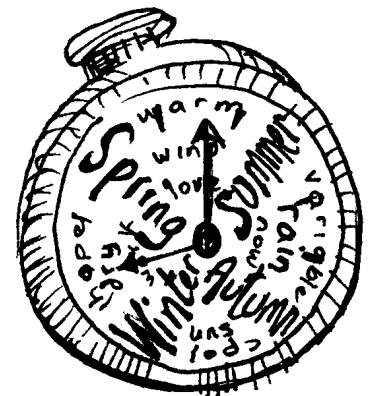
Water conservation

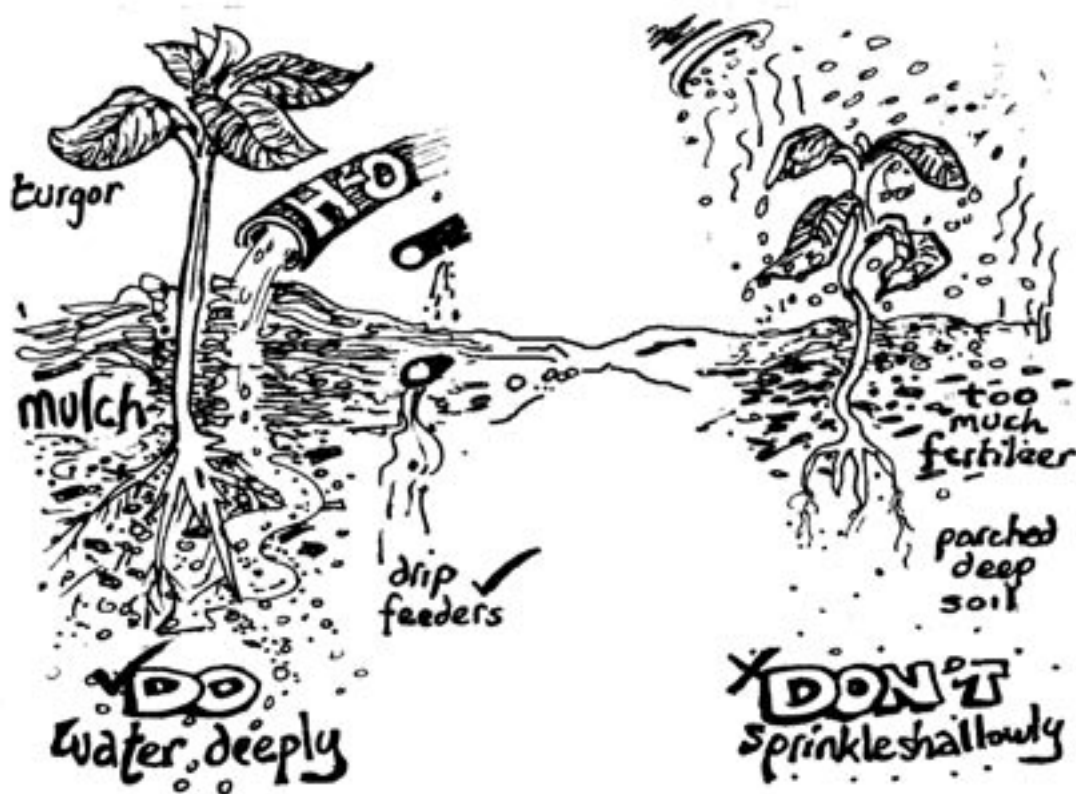
Gardens can consume a lot of water, so here we tell you ways to keep consumption down.

Water the soil, not the leaves. This will deliver water to the roots where it is needed. Leaves do not absorb water, and it will only evaporate.

Make sure you water deeply enough. Watering only the surface is a common mistake and will not make best use of precious water, as much of it will evaporate from the surface. The trick is to water less frequently, but well. We water with a hand-held hose delivering the water around the base of plants and keeping the hose constantly moving. Avoid the use of sprinklers that invariably lose water through droplets blowing away and watering outside garden beds, encouraging weeds.

During winter water in the morning to warm up the soil and in summer in the afternoon to avoid daytime evaporation.





Consider installing a water tank in the school. There are presently incentives available to schools for this. Use mulch as this prevents and slows down evaporation. Don't over fertilise or manure as plants will require more water to cope with the extra fertility.

Choose drought-tolerant varieties of vegetables, trees and shrubs. Some of Seed Savers' home-saved vegetable seeds are from arid areas and can tolerate scarce watering.

Lesson and activity ideas:

- Investigate watering techniques for optimum plant growth. Information from <http://www.abc.net.au/gardening/stories/s1418324.htm>

Minimise weeding

Here are a few ways to reduce the number of weeds:

- pull, cut or mulch weeds before they go to seed so they don't spread around the garden
- install barriers against running weeds around the garden (comfrey and lemongrass suit this purpose)
- mulch out weeds rather than pull them.

When you have to weed, do it after rain or heavy watering as it is easiest to pull the weeds up then.

Lesson and activity ideas:

- Observe what weeds are growing in the garden and make pressed herbarium samples of them with labels.

Chapter 6: Harvesting and Eating



Your garden now offers an alternative to the supermarket. Instead of browsing the shelves, create menus around what is available in the garden. Avoid complicated dishes where the harvested items become minor players.

Remember the adage, you are what you eat? Children may have a poor attitude to certain fruits and vegetables or be reluctant to try new ones. The job is to persist at challenging the taste buds. There is more nutrition and taste in traditional than in modern varieties of food plants.

Determine who has harvesting rights, practise regular and continuous harvesting and teach the children how to pick.

When cooking and serving the garden produce, you may need helpers. If you have a canteen and extra produce from the garden, then work out how to integrate it into the menu.

Harvest feasts bring the school community together around the bounty of the garden.



You are what you eat

“In a major review of more than 200 nutritional studies the evidence was unusually clear: people who regularly ate substantially more fruit and vegetables than average were up to four times less likely to succumb to a huge range of cancers, including breast, lung and colon cancer. A diet rich in fruit and vegetables also seemed to protect against heart disease.” Epidemiologist Gladys Block of the University of California at Berkeley. Adapted from New Scientist vol 152 issue 2061 - 21 December 1996, page 46.

Higher nutrition in traditional varieties of food plants

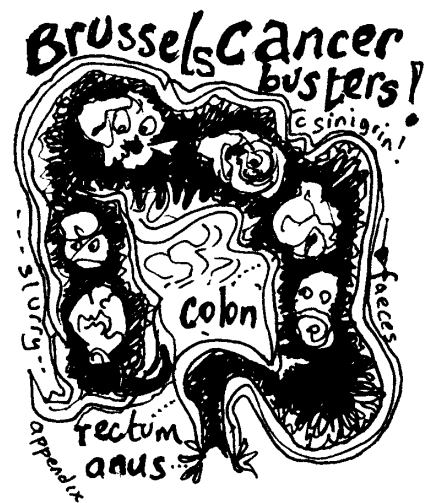
Modern varieties of fruits and vegetables are bred for yield and characteristics that suit broadscale agriculture and long-distance distribution systems. This breeding is at the cost of taste and nutrition. There have been several studies that show that traditional varieties have higher levels of nutrition and better taste. Below see one on apples and here is one on Brussels sprouts.

Brussels sprouts in supermarkets have undergone a revolution in eating quality and flavour in recent years. Gone is the bitter taste, but there is a dilemma here.

Some varieties of sprouts contain much more sinigrin than others, and the more they contain the more bitter they taste. Sinigrin is a compound found in Brussels sprouts. It is a volatile molecule that is largely responsible for their distinctive smell and taste. It repels pests from the plants in the garden and can also suppress the development of precancerous cells in the human body. These are cells that have somehow become damaged and so may eventually develop into full-blown tumours.

Even an occasional dose of Brussels sprouts might suffice to knock out potentially cancerous cells in the colon.

But there's a twist to this tale. Supermarkets are offering us sprouts with milder and milder flavours. Older varieties of Brussels sprouts have higher levels of sinigrin and greater health benefits.



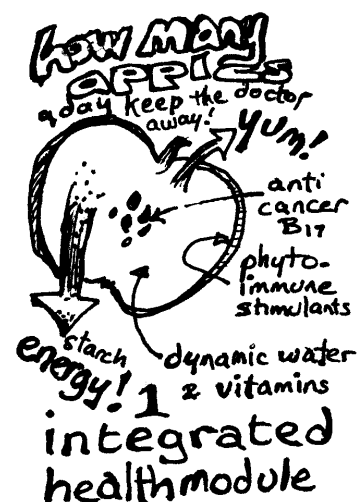
How many apples a day to keep the doctor away?

Breeders choose apples with the qualities that they wish to combine, and our modern commercial cultivars are the result of many years of work with intensive apple breeding programmes. But what have we ended up with? Varieties that are bred for their consumer appeal and handling and storage requirements. None of these apples have been bred to enhance their nutritional or health giving properties.

This research will come as a shock to commercial apple breeders when they compare the levels of compounds in traditional (heritage) apples with those of the modern cultivars, and realise just how much is missing from the modern apple.

Both the flesh and skin of the traditional apple varieties have more antioxidants than commercial varieties, no matter how they are grown.

New Zealand Tree Crops Association, Apple Cancer Research Project, April 2004



“Breed low levels of sinigrin into the plants to produce the popular, milder-tasting sprouts and you risk reducing the health benefits and perhaps make the plants more vulnerable to certain pests as well ... There are hundreds of compounds, working through a whole range of mechanisms that we still hardly understand. What all this research is telling us is that vegetables are essential to health.” Ian Johnson, Institute of Food Research in Norwich, nutritional physiologist, *Nutrition and Cancer* (vol 18, p 1).

Attitude

Children who are disinclined to eat fresh foods may feel more motivated with produce they have helped to grow. It may be their first time. The objective with such children is to have them try a little bit. That said, threats and stand-offs with imprecations to “Eat your Greens!” will not work.

Use attractive presentations such as ‘pick-out platters’, fruit skewers and salad rolls. See next page.

We have found making a sense of occasion with harvest meals and other events also helps. Peer approval works wonders. When children see their mates enjoying fresh food, they invariably will try some.

Advances have been made in recent years with Jamie Oliver’s and others’ cooking programmes on television.

Challenging taste buds

The food garden is a critical tool for challenging children’s taste buds with natural and fresh food.

Children’s tastebuds that have been schooled with commercially grown bland fruits and vegetables and increasing amounts of processed foods need better tutoring. It may take persistence and a series of failures before you succeed, but it will be worth it.

More than half the food items available in a supermarket are artificially flavoured. This gives children a skewed impression of real flavours. For example wood shavings are routinely used to make strawberry flavouring and are still labelled as “natural flavour”.



Harvesting the garden

Harvesting rights

Who has the right to harvest?

If you want to restrict harvesting rights, assign beds to individuals, groups or classes and signify that it is only them who have harvesting rights. If you have a garden coordinator, that person may be in charge of picking, preferably with the children who were assigned ownership rights.

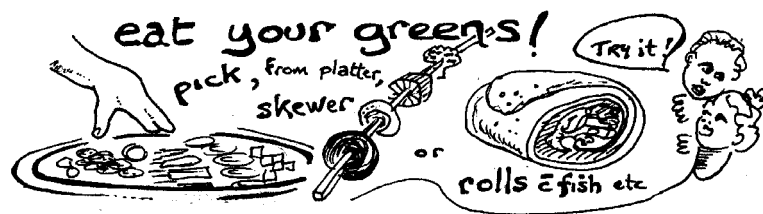
Beds that are meant for snacking can be labelled as such, while crops that are being saved for a special event can be labelled with taboo signs. Be careful not to contradict one set of rights with another.

Regular and continuous harvesting

The more time you spend in the garden the more you notice what is ripe and ready for picking. Regular harvesting keeps the garden well pruned and monitored. We do not advocate harvesting a crop all at once, but making it last for several weeks. However if you want to make a large quantity of food, say for an event, then the whole garden may need to be harvested, minus the plants reserved for seed.

The most important taste advantage of the garden over shop-bought food is its freshness, so give children the experience of eating directly from the garden. Peas or beans picked fresh from the vine are delicious.

Some garden dishes to tempt the undeveloped palate



Light dishes

Juices are very popular with children and a great way to introduce the real taste of fruits and vegetables.

'Pick out' platter This one satisfies the fussy eaters. Choose a wide range of produce from the garden, wash and arrange on a flat platter. The children love to make this and can choose what to eat from it.

Fruit platter Like the 'Pick out', but with fruits that the children pick and cut up. Fruit blocks can be threaded onto skewers for fun too.

Edible flower garnish Flowers from regular vegetables gone to seed, from herbs and from regular flowers make attractive garnishes. Examples are calendula, chives, garland chrysanthemum (*Chrysanthemum coronarium*), marigold, nasturtium, pansies, violets, and all herbs, legumes (peas and beans), Brassicas (rocket, mustard, cabbage, broccoli), and Apiaceae family (coriander, parsley, fennel, dill and chervil).

Edible Shoots The young shoots and buds before flowers form are tender and delicious. Examples are chives, nasturtium, legumes, Brassicas, Apiaceae (for members of these last three, see above).

Spring rolls Thin rice sheets are briefly wetted then wrapped around grated carrot, shredded lettuce, sprouts and other fine vegetables. These are dipped in sauces such as chives and soya, chilli or peanut sauce.



Salad cones These are made by rolling sticks of carrot, cheese, avocado or other tasty morsels in a lettuce leaf. Salad dressing, mayonnaise or pesto can be sluiced over and the lettuce leaf rolled into a cone shape. Herbs such as basil, parsley or little bits of thyme and flowers of vegetables and herbs can decorate the top of the salad cone.

Corn Always a favourite with children. Sweetcorn is easy to prepare, though avoid overcooking. Popcorn is straightforward to grow, dry and cook. The immature cobs are used as baby corn in Chinese cooking.

Potato salad Fresh waxy potato varieties such as Kipfler or Mouse potatoes are combined with grated carrot, sliced spring onion and herbs and dressed while hot with mayonnaise.

Salsa verde This is the poorman's pesto, really just herbs crushed in oil. Basil, coriander, chervil, parsley, dill or any combination of these can be crushed in a mortar or blender with any good oil, such as olive, macadamia, walnut or safflower. Good in salad cones.

Pesto Here variations on the basil, pine nuts and parmesan regular pesto can be made with any of the herbs and oils mentioned above, garlic and any lightly roasted nuts such as macadamia, almond, pecan, walnut or cashew. Good in salad cones.

Tomato sauce This is a favourite with children and can be made with tomatoes, onions, spices and vinegar. Details are outside the scope of this guide, but available in many cookbooks.

Hearty Dishes

Tomato paste Place ripe pasting tomatoes into a bowl of very hot water for ten minutes and then drain and cool. This will make them easy to peel. Chop them roughly on a plate so you don't lose the juice and place in a deep thick-bottomed stainless steel or enamel pot. Bring to the boil and simmer for about half an hour, occasionally stirring, until very thick. Strain and bottle.

Pizza Make the base from sourdough, or yeast, and flour. Spread tomato paste thinly over and add toppings from the garden such as strips of capsicum and tomato, Mediterranean herbs and even thin slices of eggplant or pumpkin. If you have an olive tree, some preserved olives or tapenade are tasty too. Bake in a hot oven.



Spinach pies One way to have children eat spinach is to mix it with cheese and encase with pastry. Greek spinach pies are popular and fun to make. Please find recipes in cookbooks.

Baked vegetables Potatoes, pumpkin, onions, parsnips, eggplant, fennel, capsicum and sweet potatoes are delicious when baked with a little oil and dusted with a few chopped herbs.

Winter soups Boil the tops of onions, leeks and carrots and the bottoms of celery and parsley with a little salt to make a vegetable stock. Sieve the stock and make any vegetable soup with it. To make a thick soup such as pumpkin or sweet potato, fry chopped onions and pumpkin or sweet potato, add the stock and boil for 20 minutes. Add flavourings such as cream, nutmeg and pepper. Thin soups such as alphabet vegetable soup are a winner with children.

Seedy dishes

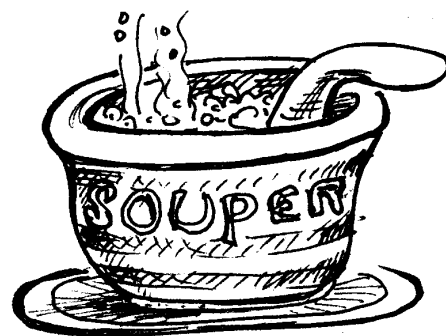
Curry powder To make curry powder dry-roast coriander, cummin, mustard and fennel seeds and grind them with dried chillis (from the garden!) and tumeric powder (made by boiling, drying and grinding fresh tumeric).

Bean soup or stew When you have picked dried beans for seeds, there may be undersized ones or some that are surplus to your needs. These can be soaked, boiled until soft and cooked in soups or in stews, say with the above curry powder.

Celery salt Grind celery and parsley seeds with salt to make a herb salt.

Dilled pickles Use dill seeds when pickling baby cucumbers.

Fennel seed breath sweetener Fennel seeds are chewed to sweeten the breath and can be ground and used as an ingredient in biscuits.



How to pick

It is not so straightforward how to pick some plants. For example, many greens, such as lettuce leaves, celery, silver beet and parsley should be picked at the base of their stems because if you just pick the leaf and leave the stem, this will cause rot and may attract disease. Open hearted lettuces, celery and endive are productive for longer if only a few medium-sized leaves are picked each time.

Beans and peas need to be twisted or nipped to ensure you don't pull down the vine or disturb flowers that will in turn make new beans and peas. Snake beans particularly have to be picked carefully, as the mature beans are right next to the embryonic ones.

Children need to be shown which are the mature fruits, say, of tomatoes, eggplants, capsicums, cucumbers, beans and peas. That said, cucumbers, squash and zucchinis need to be picked while still immature – before they become too large and tough.

Pick edible flowers such as calendula, pansy, marigold, borage and violets and check for creatures inside them before using them to decorate plates. Lastly, make sure you reserve the best plants for seeds. Stake and label them.

Eating the produce

Cooking and serving

If your school has a kitchen then you have an advantage over most schools. Many school garden teachers have to make do with a barbeque, portable gas cooker or electric frypan. The imagination is the only restriction here. Eating seasonally means light meals in summer, heavier in winter.

Ask parents to come in to help supervise cooking lessons. Some schools have the luxury of a specialist cooking teacher. In the small town of Bangalow, NSW, the Chamber of Commerce contracts a local cooking school to teach cooking at the local public school.

Take a strong ecological stand by serving food on leaves from the garden, such as banana or Queensland Arrowroot (*Canna edulis*), especially suited to Pacific or South Asian cuisines. Paper plates and disposable cutlery are quite wasteful. The school might invest in crockery and cutlery that can be re-used.

Lesson and activity ideas:

■ Cook together and share food. Information from

<http://www.stephaniealexander.com.au/garden.htm>

<http://www.cookingwithkids.net>

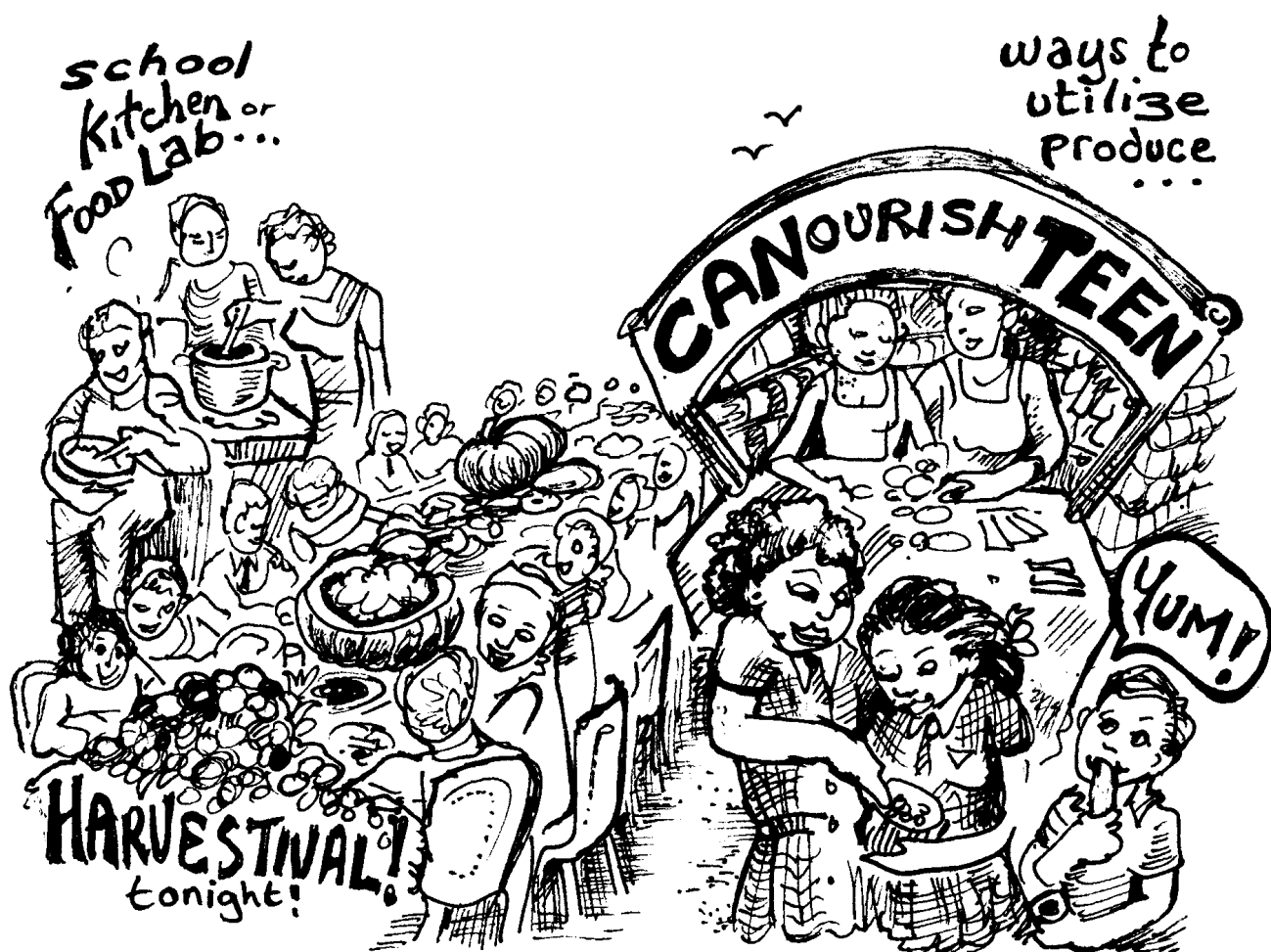
<http://www.jamieoliver.com/schooldinners/>

■ Cooking and preserving techniques. Information and lesson plans from

<http://www.solarcooking.org>

http://journeytoforever.org/edu_sc.html

<http://www.alldownunder.com/oz-u/food-recipes/damper.htm>



Using produce in the canteen

Arrange with the canteen organiser to promote produce from the garden one day a week or on special occasions. If your garden has fruit trees, once they are mature there will be surplus fruit that can be sold or distributed from the canteen.

Monitors can be assigned the task of picking produce for the canteen. Even if it is only a few herbs that are regularly used to decorate the sandwiches, this is a way that the whole school gets to enjoy the garden's produce.

Further down the track the canteen could rely almost solely on the garden for fresh produce.

Lesson and activity ideas:

- Prepare a harvest feast in spring or autumn. Lesson plans available from http://www.everythingsesl.net/lessons/harvest_festivals_around_world_79423.php
<http://www.familyculture.com/holidays/harvestlessonplan.htm>

Preparing harvest feasts

Harvest feasts will need planning well ahead. Ensure there is enough produce ready and enough time and helpers for preparations.

Invite parents along to taste what their children have grown and prepared. The feast can be timed to coincide with other school events such as a fete, fair or open day.

Pumpkins and other fruits of the vine may be the feature of an autumn harvest feast, while cabbages, broad beans and peas may feature in a spring feast. The cuisine of one or more cultures could be featured, depending on resources in the garden and in the community.

Beverages can be made from fruit grown in the garden.

Scarecrows, garden lanterns and garlands are fun to make to decorate such events.



Harvesting the garden is the best job.



Collecting potatoes from the mulch.

Chapter 7: Saving Seeds



When children observe the full life cycle of the plants it brings them closer to nature and provides a life-long lesson. They gain an idea of how plants in the wild reproduce from watching what happens when plants flower, go to seed and self-seed.

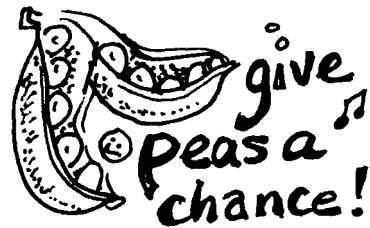
For the last 10,000 years farmers and gardeners have saved their seeds for planting. Even now 80 per cent of seeds sown around the world are home-saved. Saving seeds is simply a matter of letting a plant mount to flower and seed and keeping the seeds from ripe fruits, seedheads or pods.

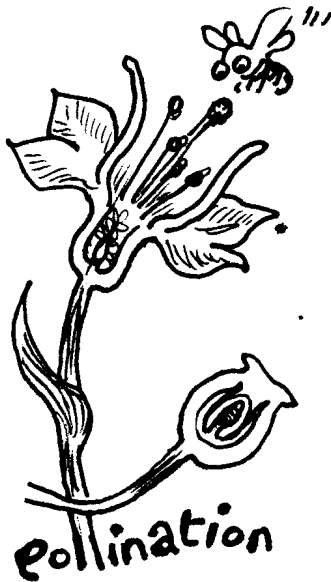
Allow space in the garden for plants to flower. Select the best plants for seed and rogue out the worst, making sure you label your selections as off-limits for picking.

Collect seeds at maturity and clean them up so they can be stored for re-sowing. If you have enough seeds sprinkle them around the garden to see when they come up again.

Dryness is critical when storing seeds.

On a practical note, producing and collecting your own seeds will save on seed costs. It will also ensure a garden that the children will be even more proud of next year.





Pollination

Pollination occurs in plants when pollen from the male parts of the flower is deposited on the female parts. Fertilisation occurs when the pollen grain reaches the ovum.

In most of our vegetables, herbs and flowers, the male and female parts are in the same flower. These are called complete flowers.

Exceptions to this are:

- the *Cucurbitaceae* family (pumpkins, melons, cucumbers, etc.) and corn where the male and female parts are on the same plant but in different flowers, called monoecious
- asparagus and papaya where the male flowers are on one plant and the female are on another, called dioecious.

Lesson and activity ideas:

- Observe or dissect large flowers, like pumpkins, apple, capsicum or nasturtium to see and draw their parts.

Self-pollinating plants

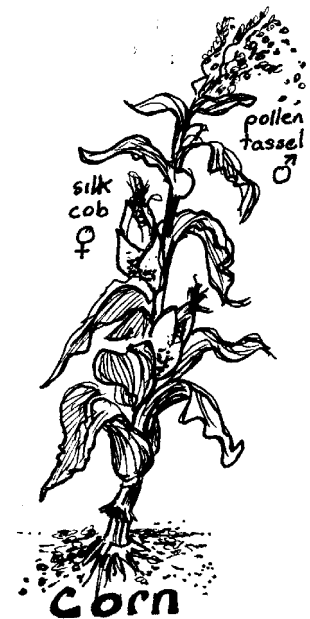
In some complete flowers, self-pollination occurs. Lettuce, tomato, capsicum, peas and beans have the female part so close to the male that the slightest breeze, even from a passing insect, causes the pollen to drop onto the receptive stigma (female part). It is easy therefore to keep the seeds of more than one variety of a self-pollinating plant in the same garden as they will not cross.

Cross-pollinating plants

Other types of complete flowers and all monoecious and dioecious flowers require cross-pollination. They need an external agent, such as an insect or the wind, to transport the pollen onto the female parts and thus create fertile seeds. Most vegetables, except those mentioned above, are cross-pollinating. This means if more than one variety of a vegetable is flowering in the garden at once, they may cross. All the same, seeing two different varieties cross, such as red corn and yellow corn, may be of interest to the children.

If you want to keep the varieties pure, use one of the following techniques:

- Isolate varieties. Grow two cross-pollinating varieties 500m or more apart. This is how far most insects will fly, though bees will fly up to four kilometres.
- Isolate varieties in time. Suitable for crops where all the plants flower simultaneously, such as corn and sunflower. If your growing season is long enough, grow an early, a mid-season then a late variety. Each will shed pollen at a different time.
- Cage different varieties. Put cages made of flywire, or nylon netting over flower stalks of different varieties of the same species. For example if you have two types of cabbages flowering at the same time, you will need either to rogue out one type or protect one of them from the pollen of the other.



Selecting best seeds

You will have to decide which are the most suitable plants to bear seeds from amongst the many individuals in the garden. Keep the best and eat the rest. Allow the most healthy, largest plants to run to flower and seed. Select the best seeds from the best fruits, the best seedhead or best pods.

Roguing out off-types

You must also cull out unwanted individuals. This is called roguing and involves taking out any plants with undesirable characteristics before flowering time. This ensures that the pollen of any unwanted off-types – or plants that are not true-to-type – does not fertilise the flowers of the plants you have chosen for seed.

You may need to carry out roguing at several stages, say taking out the slow growers when the plants are young, the diseased plants when they are full size and the early bolters (see below) as they send up the flowering stalk.



Characteristics to favour

Choose individuals that perform well under stress, such as a plant that has done well in extreme weather or that has resisted disease or insect attack.

With crops that send up a flower stalk after their edible stage, such as lettuce, silver beet, cabbage and root crops, it is important to choose plants that are slow to bolt. Select plants that remain in a prolonged leaf stage, rather than plants that send up a flower stalk early in the season. Otherwise you will be selecting for early bolting in future generations.

With root crops, choose the largest roots by sliding your finger down beside them to check on the size.

With plants that give a number of successive crops, such as green beans, leave the best bushes or vines to produce seeds and eat the rest.

With soft fruits, like tomato, capsicum, rockmelon and watermelon, you have the opportunity to select for the best tasting ones.

Labelling plants reserved for seeds

Mark the plants you and the children have selected by tying a bright ribbon or tape to them so everyone knows they are special. We use red-painted sticks and signs with "Save for Seeds". In this respect sweetcorn in particular is difficult to manage diplomatically. You will find it hard to convince the children that the earliest cobs to ripen contain the genes that in the future will contribute to more early cobs for all.



Lesson and activity ideas:

- Organise so that each group of children has a plot and must tag and label the best plants for seed (and the worst for roguing).

Life cycle of plants

Annuals

Annuals are plants that typically start from seed and produce their crop of flowers and seeds within one year of growth, then die. On average, they live for between six and nine months and the seeds then spend several months on or in the ground or in storage.

Usually annuals are planted in spring, run to flower in late summer and produce seeds in autumn, then die. However in the tropics and sub-tropics, annuals such as spinach, peas, broad beans and some winter lettuces that cannot support hot weather, grow through the mild winter and bolt to seed in spring.

Biennials

Biennials are plants that produce vegetative growth for the first, warm, period, then slow down through a period of cold weather and flower in the second warm period, typically spring. Most biennials originate in temperate climates where winters are severe and there is not time for the plant to produce seeds within one warm season.

Common biennials are the European Brassicas (cabbage, kale, cauliflower and Brussels sprouts) and many root crops such as carrot, parsnip, turnips, swedes and some radishes. You will need to wait about eighteen months for seeds from these.

Perennials

These are plants that survive from year to year. They form the backbone of a garden as they remain there permanently. See more on pages 42 and 49.

Some plants that are annuals or biennials can behave as perennials in warmer climates, and vice versa. Capsicums, chillies, eggplants and kale can last several years in the tropics. Yams, gingers and tumeric, perennials in the tropics, will last only during warm weather in temperate and sub-tropical areas and die down in winter.

Collecting seeds

The best time of day for seed collection is about 10am, when the dew has evaporated. Collect in dry, wind-free conditions.

Seedheads

For plants with seedheads, pick off the ripe seedheads one by one or ease the entire plant from soil and remove dirt gently. If seeds are not all fully mature, leave them on the whole stem to complete their maturation.

With seeds that shatter, that is their seeds fall to the ground when ripe (such as lettuces, carrots, parsnips and onions), collect seeds individually as they ripen.

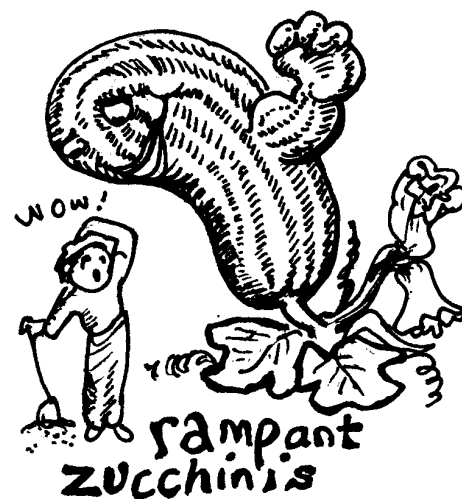
Seeds in fruits

Fruits (in this context a botanical term meaning a capsule containing seeds), such as tomatoes and eggplant, are best picked when they are rather overripe, a little after the table stage.

Fruits that have seeds in their cavity, such as pumpkins and capsicums, are picked a little riper than for the table and left for a couple of weeks to ensure the seeds are fully mature.

Those fruits that are normally eaten immature, such as zucchini, cucumber, okra and sweetcorn, will have to stay on the bush or vine until they are full sized and mature. Cucumbers can even grow to a metre in length, as can zucchinis, a fact not lost on most zucchini growers, as they can get away so quickly! Leave the fruit on the vine until they are fully mature, for example a cucumber will go brown and a zucchini quite yellow when their seeds have had time to mature inside.

Where the seeds are the part eaten, like maize, broad beans, peas and sunflowers, make sure the seeds are fully mature and dry on the plant. The most common mistake made by beginners is to pick seeds too immature. They simply will not be viable; that is they will not come up when sown.



Cleaning seeds

Collect ripe fruits, pods and seedheads in baskets, paper bags or buckets and keep them until you are ready to clean them in a dry airy place. This avoids mould and insect damage. Before cleaning, spread the seed pods and heads out in the morning sun on large flat baskets or tarpaulins for an hour or so to crisp them up.



Store seeds in readiness for cleaning in a dry airy place using buckets, barrels and baskets or tarpaulins.

Cleaning soft fruits

Scoop seeds from ripe fruits out of the flesh into a large container of water. Rub them to clean off bits of flesh and tip off water and refill several times until clean. Pass through a sieve and spread on a plate to dry.

Cleaning seedheads

Strip as many dry and dead leaves from the lower part of the plant as possible, without disturbing seedheads. Rub the seedheads together or on a sieve to remove the seeds.

Separate seed from debris by sieving, winnowing and sorting using a white background, such as large sheets of butcher's paper, a white plate or paper. Use colanders and kitchen sieves of different gauges to separate the seeds from the chaff.

Winnow with a flat basket or plate either by blowing on the seeds or tossing them up and allowing a gentle breeze to take away the chaff. When winnowing use a large tarpaulin on the ground as a safety net to avoid accidental loss of seed.

Clean round seeds on a tray by tilting it at a 45-degree angle; the seeds will roll down leaving debris at the top of tray.

Cleaning pods

Peas and beans are easy enough to remove from pods. Place tougher pods and capsules in a strong bag and either flail firmly with a stick or have the children stomp over them. Avoid using too much force as seeds can crack.

Final selection

Select the best of the seeds, rejecting small misshapen or mouldy ones. This is particularly relevant for pumpkins, beans, peas and corn.

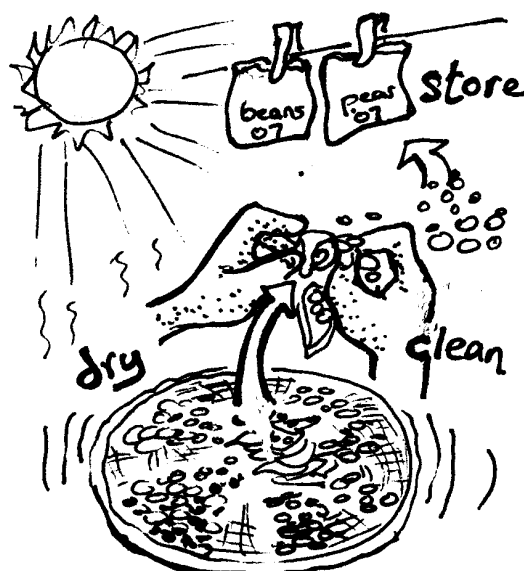
Dry seeds after cleaning

Dry seeds in labelled brown paper bags in an airy spot, out of the sun, for a further week or two before storage. We write the name of the variety, the month it was planted, the month it was harvested and the date it was cleaned.

Storing seeds

Seeds are alive but dormant so try and keep them that way by providing cool, dark and dry conditions. That said, if you want to store seeds in the classroom, try to put them in a spot where the temperature does not fluctuate as they will last longer with a constant temperature.

The most critical factor in storage is dryness. Seeds are hygroscopic meaning they absorb moisture. If they are exposed to moisture, fungus and insects can attack them. They have to be kept sealed from the air.





Clockwise, from top left: Label some plants as reserved for seed, here lettuces are flowering; opening a dry snake bean to reveal its seeds; after rinsing cucumber seeds, they are drained; broccoli seedheads can be dried on a mat; lettuce seedhead next to a pumpkin flower.



Put labelled packets of dry seeds into jars, keeping the airspace to a minimum. Use a desiccant such as silica gel, dry rice, ash or charcoal, which is also abrasive to weevils, then seal them up.

Botanicals are used in storage as insect repellents. These include well-dried cinnamon sticks, seeds of fenugreek and black pepper or leaves of Eucalyptus or neem.

Storing seeds for seasonal sowing

Store seeds for spring planting separately from those for planting in autumn. Within those, broad classifications can be made, such as Legume, Leaf, Fruit and Root crops.

Ensure you have a fast turnover

Vegetable seeds last for one to ten years, but their viability and vigour (ability to grow fast) deteriorate over time. It is best to grow them within two years. Send excess seeds home with the children.

Rituals can be followed, such as in one school, the year sixes grow sunflowers and each year pass on the seeds to the next year sixes to grow.

Lesson and activity ideas:

- Make seed envelopes and label them with varietal name, class and date and distribute to parents or sell at events.

Happy growing and re-sowing!



Winnowing seeds – best done on a mat or tarpaulin.

Resources



The Seed Savers' Network

The Seed Savers' Network, founded in 1986, is a non-profit organisation dedicated to maintaining the diversity of our cultural plants and promoting the preservation, free distribution and exchange of open-pollinated seeds. It is the umbrella organisation for dozens of Local Seed Networks.

The Seed Savers' Network works nationally and internationally to provide:

- Educational programmes for the preservation of open-pollinated (non-hybrid) seeds and the genetic diversity of plant varieties;
- Seed exchange programmes through Local Seed Networks;
- Local seed banks for locally-adapted non-hybrid plant varieties;
- Promotion to keep seed saving practices alive, currently through preparation of a film, "Guardians of the Seed".

You can subscribe to The Seed Savers' Network newsletter that comes out twice a year with contacts for seeds, news on seed issues and practical tips on seed saving. See www.seedsavers.net.

Local Seed Networks

The Seed Savers' Network has helped establish over 60 local seed networks in Australia and assisted community seed programmes in a number of other countries including Afghanistan, Cuba, Cambodia, East Timor, Ecuador, India, Japan, Solomon Islands and Papua New Guinea.

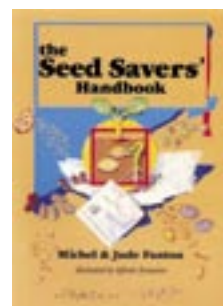
Local Seed Networks (LSNs) are an excellent way for groups of people to get together to swap seeds and cuttings to help preserve local and traditional plant varieties. A school food garden is an ideal base for an LSN. Already several LSNs are based in schools. Contact Seed Savers if you would like to establish a Local Seed Network and we will help get you underway. Please see the current list on www.seedsavers.net.



Seed Savers' Handbook

The Seed Savers' Handbook is a complete reference for growing, preparing and conserving 117 traditional varieties of vegetables, culinary herbs and edible flowers. It is written especially for Australian and New Zealand conditions with 180 pages of essential information and useful illustrations.

Written in 1993 by Michel and Jude Fanton, the Seed Savers' Handbook is translated into Spanish, Italian, Japanese, Khmer and Bulgarian (has sold 45,000 copies worldwide). Order online at www.seedsavers.net for \$25 post paid or through Seed Savers Network, Box 975, Byron Bay, NSW, 2481.



Posters

Posters suited to schools available for \$20 per tube: Saving Cucumber Seeds one 70x50cm; Help us Grow: two 50x35cm; Give Peas a Chance: two 50x35cm, three 35x25cm; Lettuce Be: two 50x35cm, two 35x25cm. Set of 12 posted in a tube. \$20. See next page for samples.

Sample Seed Savers posters



Every year more plants become extinct. Without their seed vital food crops are lost, forever. Increasingly we rely on pesticides and other chemicals to sustain fewer varieties. And we cannot trust the survival of species to genetic engineering. Only biodiversity guarantees the survival of plants and the nutrition, taste and pleasure they give us. See what you and your school can do to save seeds. Seedsavers PO Box 975 Byron Bay NSW 2481. Phone: 02 6685 7560. www.seedsavers.net.

seedsavers



Australians once planted 65 varieties of peas. Now its less than ten. Yet the future of our food crops, let alone the nutrition, taste and pleasures they give us, can only be guaranteed by biodiversity. Help preserve plants. Join Seedsavers now. PO Box 975 Byron Bay NSW 2481. Phone: 02 6685 7560. www.seedsavers.net

seedsavers



Artist Kathleen Browne

Let your lettuce be in the garden until it flowers. Collect Seeds, sprinkle about and watch them grow. Support Seed Savers' Network preserving traditional seeds. Phone: 02 6685 7560. www.seedsavers.net

seedsavers

Non-hybrid seed suppliers

Eden Seeds

P: 07 5533 1107 F: 07 5533 1108

Free call 1800 188 199

info@edenseeds.com.au

www.edenseeds.com.au

Green Harvest Organic Supplies

P: 07 5494 4676 F: 07 5494 4674

inquiries@greenharvest.com.au

www.greenharvest.com.au

Greenpatch Organic Seeds

P/F: 02 6551 4240

enquiries@greenpatchseeds.com.au

www.greenpatchseeds.com.au

The Diggers Club

P: 03 5987 1877 F: 03 5981 4298

www.diggers.com.au

Yilgarn Traders

333 David Road, Waggrakine, WA 6530

08 9938 1628

yilgarn@midwest.com.au

Bay Seed Gardens

Box 1164, Busselton, WA 6280

08 9752 2513

Gourmet Gardens

Box 1892, Esperance, WA 6450

08 9071 6512

New Gippsland Seeds

Box 1, 181 Queens Road, Silvan, Vic 3795

03 9737 9560

newgipps@bigpond.com

Phoenix Seeds

Box 207, Snug, Tas 7054

03 6267 9663

phnxseed@ozemail.com.au

Books

Ecological Literacy: Educating Our Children for a Sustainable World
Michael K. Stone and Zenobia Barlow (Editors)
Sierra Club Books ISBN: 1578051533

Edible Gardens In Schools
Rachel Sykes
ISBN: 9-781857-411065

Gaia's Garden: A Guide to Home-Scale Permaculture
Toby Hemenway
Chelsea Green Publishing ISBN: 9781890132521

Growing Naturally: A Teacher's Guide to Organic Gardening
Maggi Brown
Southgate Publishers ISBN 185741022X

Jackie French's Guide to Companion Planting in Australia and New Zealand
Arid Books

Learning About Lifecycles Using An Organic Garden
Allan Randall and Ian Mitchell
Southgate Publishing ISBN: 1-85741-079-3

Lasagna Gardening: A New Layering System for Bountiful Gardens: No Digging, No Tilling, No Weeding, No Kidding! and Lasagna Gardening for Small Spaces: A Layering System for Big Results in Small Gardens and Containers
Patricia Lanza, Rodale Organic Gardening Books

Manual For Teaching Permaculture Creatively
Robin Clayfield and Skye
www.eco-logicbooks.com

Permaculture Teachers' Guide
edited by Andrew Goldring with WWF-UK and the Permaculture Association
www.permaculture.co.uk

The Growing Classroom - Garden and Nutrition Activity Guide
Life Lab
www.lifelabstore.org/activity.html

The Soul of Soil
Grace Gershuny
Chelsea Green Publishing ISBN 9781890132316

Worm Books
Shields Publications
www.wormbooks.com



Gardening with kids

Allergy-Free Gardening
www.allergyfree-gardening.com

BBC Gardening with Children
www.bbc.co.uk/gardening/gardening_with_children/

Biblical Gardens
www.biblicalgardens.org

California School Garden Network
www.csgn.org

Cooking with Kids
www.cookingwithkids.net

Duchy Originals Garden Organic for Schools
www.gardenorganic.org.uk/schools_organic_network/index.php

Eartheasy
www.eartheasy.com

Evergreen
www.evergreen.ca/en/

Florida School Garden Competition
http://hort.ifas.ufl.edu/ggk/school_gardens/index.shtm

Growing Grub
www.growinggrub.co.uk

Handmade Projects Journey to Forever
http://journeytoforever.org/edu_garden.html

Gardening with Kids
www.kidsgardening.com

Square Foot Gardening
www.squarefootgardening.com



Resource centres

Cultivating Community
an organisation to promote and support the development of community garden projects across the entire community.
www.cultivatingcommunity.org.au

Australian City Farms and Community Gardens Network
Edible Classrooms
www.communitygarden.org.au/schools/index.html

Centre for Ecoliteracy
Getting Started: A Guide for Creating School Gardens as Outdoor Classrooms
www.ecoliteracy.org

CERES Community Environment Park
www.ceres.org.au

Ecology Centre
www.ecologycenter.org/bcgc

Global Lead Advisory Service
www.lead.org.au

Life Lab
Garden Based Learning that promotes a sustainable future
www.lifelabstore.org

Seed International
www.seedinternational.com.au/Schools.html

Soil Foodweb Institute Australia
www.soilfoodweb.com.au

Teacher Net
www.teachernet.gov.uk/growingschools/news/detail.cfm?id=82

University of Illinois Extension
The Great Plant Escape Teacher's Guide
www.urbanext.uiuc.edu/gpe/index.html

School and community garden case studies

ABC Gardening Australia
Creating a School Garden Fact Sheet
www.abc.net.au/gardening/stories/s1914677.htm

Centre for Ecoliteracy
Case studies/exemplars
www.ecoliteracy.org/education/exemplars.html

Collingwood College Kitchen Garden
www.collingwood.vic.edu.au/kitchenpgrm.php?t1=teaching&link=7
www.stephaniealexander.com.au/garden.htm

Edible Schoolyard Project
www.edibleschoolyard.org

Eco Schools
Edible Gardens and Mini Farms
www.ecoschools.com

Organic Pathways NZ
Kids Edible Gardens
www.organicpathways.co.nz/keg/

Funding

Australia's Open Garden Scheme
Community Grants Program
www.opengarden.org.au

Commonwealth Government
Australian Sustainable Schools Initiative
www.environment.gov.au/education/aussi/index.html

Gould Group
www.gould.edu.au

Landcare Online Australia
www.landcareonline.com/page.asp?pID=86

The Stephanie Alexander Kitchen Garden Foundation
www.kitchengardenfoundation.org.au

NB: Check Commonwealth, state and local government policies and programmes as funding opportunities supporting the establishment of school vegetable gardens vary from year to year.

Appendices

Occupational health & safety

by Russ Grayson, Australian City Farms and Community Gardens Network

Tool Use

1. Take tools to the garden in receptacles, such as boxes, buckets, baskets or a wheelbarrow so there is a predetermined place to put tools when not in use and at the end of the gardening session.
2. Before using a spade, garden fork, rake or other tool, look to make sure there is nobody behind or beside you that you could hit with the tool.
3. When you have finished using a garden tool or you put a tool aside for a moment, place it out of the way of people.
4. Never lay a tool across a path or place it in long grass where it is hidden and where people could trip over it.
5. Lean a garden rake against something when you put it aside. If you have to lay it down, place it away from where people might walk. Place it with the pointed tangs on the ground, not pointing up.
6. When putting a garden spade, shovel or fork aside, push it into the soil so that it remains upright and visible.
7. Carry tools such as spades, garden forks and rake in your hand rather than over the shoulder. Carried on the shoulder, it is easy to hit someone accidentally with the tool if you turn around and they are close by.

Avoid sunburn and dehydration

1. Wear a hat to avoid sunburn.
2. If you sunburn easily, consider wearing a lightweight shirt with long sleeves and long trousers.
3. Use a sunscreen cream to avoid sunburn on exposed skin.
4. If in the garden for some time, remember to drink water to avoid dehydration.

Care with creatures

1. Do not try to pick up bugs, spiders and other creatures you come across. They might defend themselves by biting, stinging or scratching.
2. Look before lifting buckets, watering cans, boxes and other things. Redback spiders sometimes nest in them and a bite can be dangerous.
3. If gardening near bushland, do not interfere with any snakes or goannas you see in the garden.

Lifting

1. When lifting something heavy, bend your knees and crouch down, then lift it by straightening your legs.
2. To avoid back injury, do not bend over to pick up something that is heavy.

Other precautions

1. If you suffer breathing difficulties or asthma, consider wearing a dust mask when making or turning compost or spreading mulch.
2. Consider wearing gardening gloves to protect your hands and avoid blisters from handling garden tools.
3. Wear enclosed shoes to protect your feet. Do not garden in sandals.

Storage

1. Designate an area of the garden for storing materials.
2. Store materials so that they are unlikely to fall over or spill. Place heavier materials close to the ground and the lighter on top of these.
3. Stack and store materials neatly so that they are easily accessible and out of the way of paths and places where people walk.

Other considerations

1. Keep paths clear and level. Never dig a hole in a pathway or place where people walk.
2. Make garden bed edges strong so that they will not collapse or trip gardeners.
3. If digging a hole, make your work visible to gardeners passing by so they do not trip in it. Mark the excavation with coloured tape or a barrier, especially if you are leaving it for a while.
4. Cover standing water, such as in a pond, to reduce the incidence of mosquito breeding. Water plants such as azolla and duck weed reduce the surface area available to mosquitoes. Species of small native fish that eat mosquito wrigglers can be obtained.

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Notes