Seed Saving in WA

1.1 Why Save Seeds

Seeds grow plants, veggies seeds grow food, food security comes from having access to the capability to grow food as required. We might not be dependent on our home saved seeds now but in hard times the food in the shop may disappear or become unaffordable. Biodiversity of commercial food plants is declining rapidly.

Gardening is one of the main hobbies, a simple money saving, community building, and rewarding hobby is saving the seeds of the plants you grow. **Seeds** are living, hibernating embryos, touching the very heart of mother nature has never been easier, embrace this gift, grow and save seeds.

Local seeds are better. Source some already localised seeds or start to localise your own by saving seeds each year from the best plants that suit your needs. This is how we create our own Heirlooms.

1.2 How to Save Seeds

I think the practice of saving seeds is due for a revival. Seed saving is rewarding in so many ways. It's very easy. Even a little seed saving is an empowering and powerful thing to do.

Instead of pulling out your plants as they flower, let those flowers feed your insect friends and as the flowers fall the seed pods will start to form. Generally these pods will dry out and the seed will fall onto the ground. Before these seeds fall you need to harvest them. Place on a rack/open container to ensure they are thoroughly dry (a few weeks to be safe) and then you store them.

It's as simple to get started, but as you learn these skills there is more to learn.

Getting good seeds at the right time involves knowing the usual life cycle of a plant and whether a seed will stay true. The following terms provide a basic understanding of seeds and seed production. You don't need to know all these by heart but they do make understanding seed saving easier.

I recommend you get the great Aussie seed saving book, Seed Savers, by Jude and Michel Fanton, many of the tables and information in this workshop comes from that book.

1.3 Plants Growth Characteristics

Annual plants (such as lettuce and tomatoes) flower and mature seed in the same year.

Biennial plants (such as carrots and beets) are normally harvested as food in their first summer or winter but do not flower or produce seed until the next year. Most biennials become tall and bushy when going to seed, taking up more space than they did the previous year. They can be thinned or transplanted to twice the usual spacing. You might try tricking your carrots, harvest them, refrigerate them a week and then replant, they will often go to seed in the same year thinking they just endured winter in that week of chill.

Perennials live for more than 2 years and bear seed year after year. Often these plants are grown from cuttings instead of seed as it is more reliable propagation method. You also get a bigger plant faster.

Monecious plants produce single plants with separate male flowers and female flowers on the same plant.

Dioecious plants produce separate male flowers and female flowers on different plants.

1.4 What to Save and Grow

I always advise people to buy open pollinating seeds and grow their own seedlings. This is a little harder than buying seedlings but the results are often better. A cheap plastic greenhouse propagator can be bought at any garden store to make this easy. While it seems like the easy option seed packets in Bunnings all come from UK, these are not local or even Australian suited plants as they have adapted to northern hemisphere Temperate climates and are increasingly hybrid types. **Don't buy them.**

Open Pollinated Seeds – Those that you can save the seed of and if not cross pollinated will produce the same plant that the seeds where saved from. **Open-pollinated** varieties are stable varieties resulting from the pollination between the same or genetically similar parents. Not hybrid.

Heritage/Heirloom – These are open pollinated seeds, saved for generations by someone to produce a specific taste/look/growth, specifically for home gardens, not factory farms.

Locally Saved and Grown(generational) adapted Seeds are King - Better than purchased non local heirlooms, locally saved seeds have been genetically selected and evolved by nature to grow better in our gardens in WA. A Heritage/Heirloom plant from Tasmania has adapted to Tasmania's cooler climate, fertile soils and pests, there is no guarantee it will do well in Perth.

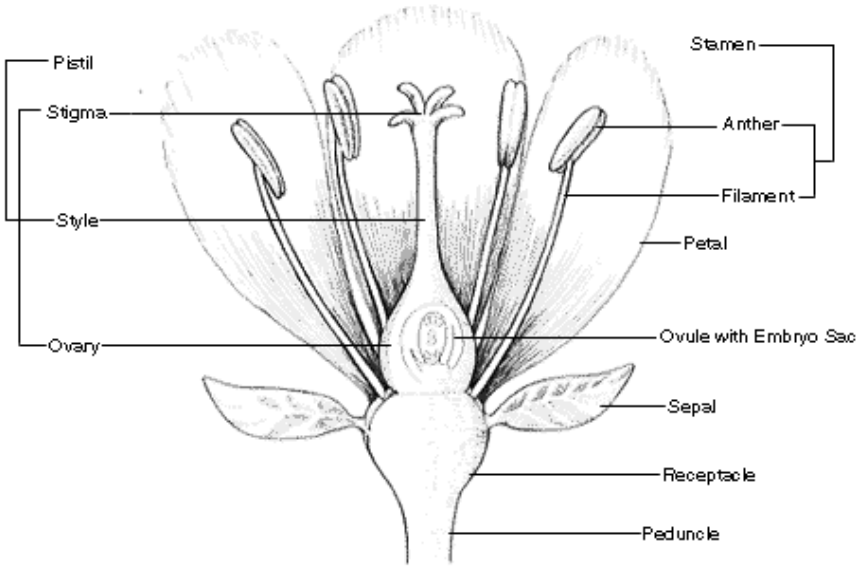
Hybrids are varieties resulting from pollination between genetically distinct parents. The "F" in F1 hybrid stands for filial, another name for offspring. F1 means the first generation offspring after pollination. Depending on their genetic complexity, F1 Hybrids can be sterile or produce a majority of offspring unlike themselves.

1.5 Purity and Production

In order to learn the pollination and breeding characteristics you will need to become familiar with a few of the following terms. While there are simple tables that tell you what to do it is nice to know why.

Flowers are the portions of plants where reproduction takes place and seeds are produced.

Peduncle: The stalk of a flower.
Receptacle: The part of a flower stalk where the parts of the flower are attached.
Sepal: The outer parts of the flower (often green and leaf-like) that enclose a developing bud.
Petal: The parts of a flower that are often conspicuously colored.



Stamen: The pollen producing part of a flower, usually with a slender filament supporting the anther.
Anther: The part of the stamen where pollen is produced.
Pistil: The ovule producing part of a flower. The ovary often supports a long style, topped by a stigma. The mature ovary is a fruit, and the mature ovule is a seed.
Stigma: The part of the pistil where pollen germinates.
Ovary: The enlarged basal portion of the pistil where ovules are produced

Pistils are the female reproductive organs in flowers made up of the stigma, style and ovary. The stigma is the opening in the pistil through which the pollen passes on its way to the ovary. The style contains the pollen tube between the stigma and the ovary through which the pollen is carried. The ovary contains ovules. When fertilized, ovules develop into mature seeds.

Stamens are the male reproductive organs in flowers. They consist of the filament, anther and pollen. A filament is the tube that supports the anther where pollen is produced. Pollen is the equivalent of sperm in plants. Pollen grains fertilize plant ovules.

Pollination is the process of sexual fertilization in plants. The different methods a flower uses for pollination will dictate the spacing or isolation necessary for plants to produce dependable seeds.

Self-pollination occurs without need for other flowers or plants because it takes place within the flower before it opens. Isolation distance to prevent cross -pollination is not necessary unless insects invade the flowers.

Perfect flowers contain the stamens which produce pollen and the pistil which receives the pollen. Some self-pollinate. Others are self-incompatible, meaning they will not receive their own pollen.

Cross-pollination takes place when pollen is exchanged between different flowers on the same or different plants. If not prevented, unwanted characteristics and traits may result in the offspring. For example, if your cabbage and your broccoli flower at the same time, the seed will produce few plants that look like either of them. Allowing only one variety of each potentially cross-pollinating vegetable to flower out eliminates the need to separate plants from each other. As well, barriers can be erected or planted, plantings can be staggered or crops can be covered with garden fabric.

Inbreeding Depression: With many seeds/plants a loss of vigor because of inbreeding. Vigor is a desirable characteristic that describes strong, vibrant germination and plant growth. Inbreeding can result from self-pollination or pollination between a small number of close relatives. Some vegetables show no signs of inbreeding depression even when self-pollinated for many generations and others show signs of inbreeding depression in first generation offspring.

1.6 Tricky Plant Breeding

You might not be here yet but to grow and save the trickier plants that readily cross pollinate (brassica's etc) you will need to consider how to keep 'heritage/heirloom' varieties pure if that is important to you.

Isolation distance to prevent unwanted cross-pollination is the distance between two different flowers necessary to prevent pollen from being exchanged. Wind pollination is pollen exchange caused by wind and insect pollination is pollen exchange caused by insects, primarily bees.

Caging is a separation technique where insects that might cause cross-pollination are prevented from reaching flowers by a fine net supported by wire or wood. If flowers in the cage are not self-pollinating, several plants must be included in the cage and pollinating insects introduced.

1.7 Selecting and Collecting

Selecting and breeding for your needs and wants.

Select the fruits and thus the seeds of the best crop. Its tempting to eat the best crop but to ensure you are always saving the plants producing your favourite and best producing produce you mush forgo ruining that seed (best food harvest value is normally before the seeds are properly mature). If we only save seed from the plants and fruits that are malformed and not attractive we will end up breeding plants with poor characteristics.

While your selection criteria can be defined personally and might seem very logical it is worth looking at seed saving books to get some advice on each plant species desirable characteristics.

In the interest of clarity we make a distinction between selection characteristics and selection traits.

Characteristics are general features attributed to unidentified complexes of genes. Complex and hard to define, characteristics are often ignored by commercial breeders and offer the most rewards for home gardeners. Characteristics on the priority list at include but are not limited to heat tolerance, short or long season, cold tolerance, regional adaptability, early maturation, vigor and flavor. Each home gardener can create his or her own list of selection characteristics.

Traits are specific features traceable to identifiable genes. For example, pea traits traceable to single genes include vine growth (bush or tall), seed texture (smooth or wrinkled) and disease resistance (fusarium, enation mosaic and powdery mildew resistance).

Viable seeds are seeds that germinate and produce vigorous plants. Seeds should not be harvested before they have matured enough to be viable.

Dehiscent seed capsules are open and discharging seeds. Seeds must be harvested before this stage takes place and seeds are lost. Seed capsules in some varieties literally explode at the point of maturity. It is not uncommon to have only a few capsules out of hundreds, mature at any one time.

1.8 Seed Harvesting

Seeds of most plants dry right down in field or garden. If maturity is looking dubious because of the weather or if birds are significantly munching on the seeds, you can dig up entire plants and bring them indoors to complete their drying. As long as the crop is close to maturity, the seeds will continue to ripen.

It is a good rule of thumb to let harvested seed dry for at least a few more days after being removed from the plant. The larger the seed, the longer the drying period required. Most seeds will dry adequately for home storage if spread on wax paper, newspapers, trays, plates or screens in an airy place for a few days to a week. They should be turned and spread several times during that period.

An equally good drying method is to let the seed heads or stalks dry in open paper bags for one or two weeks. The drying process can be hastened by spreading the seed in a sun-exposed room, in a non-humid greenhouse or in the sun outside if they are covered or brought in at night. Lacking sun and/or greenhouse, you can speed up drying with gentle heat so long as the temperature never rises above 38°C.

How Much Seed to Save - Enough to share and allow genetic diversity to exist.

You want to save enough seeds to grow for a few years without needing to save seeds again, and to have enough to share you seeds with others. A rule of thumb would be save ten times more than you think you need, the extra effort gone to save that 'just in case' seed is not much.

It is not so much the amount of seed you save but the diversity of the seeds you save, we want to be harvesting some seed from multiple plants rather than lots of seed from one plant.

Preservation, All Plants are Equal. In practical terms, this means that for conservation purposes you want to:

- nurture every plant into maturity (except for diseased or clearly off-type plants); and
- save equal amounts of seed from each plant.

These two practices together help to minimize genetic loss due to plants that perform poorly *in your garden*—they might be another gardener's best performers!

Also be aware of Genetic Loss caused by growing practices. You can accidentally change a variety as a result of the way it is grown, most have been covered but to recap:

- Plants intolerant of your particular growing conditions might die or produce few or no seeds—lowering their genes' representation in the variety's gene pool.
- Plants can be cross-pollinated by other varieties, resulting in permanent mixing of their genes.
- Even simply growing too few plants can make a seed batch's gene pool too small, weakening that population of seeds permanently

1.9 Cleaning Seeds

Each type, size and species of plant has different seeds requiring different methods or combinations of multiple techniques to harvest and clean the seeds. There are also wet and dry techniques.

Seed harvesting and cleaning techniques fall into two main categories according to whether the fruits and seeds are dry or wet when mature.

Dry Seeds

'Dry' seeds include beans, peas, okra, peppers, basil and members of the Onion and Carrot Families. Cleaning dry seeds usually involves simply drying and crumbling the pods or husks, then screening or 'winnowing' the seeds to separate them from the chaff.

Wet Seeds

'Wet' seeds are found in such plants as tomatoes, eggplants and many squashes. Cleaning wet seeds requires washing to clean the seeds and to separate them from the surrounding pulp.

In addition, in some cases wet seeds (such as tomatoes) are best fermented for several days to remove germination-inhibiting substances from the seed coats. Fermenting can also help such seeds as members of the Squash family by killing molds, mildews and other disease organisms that may be present on the seeds after growing.

Some families (such as the Cucumber family) include some plants that produce wet seeds (e.g., squashes and melons) and others that produce dry seeds (e.g., luffa and hard gourds).

Cleaning Dry Seeds

Harvest dry seeds from their plants when their pods or husks have dried. Some seeds can be picked before they are fully dried on the plants if rains threaten. Other plants, however, (i.e., Mustard family), will not finish ripening once they have been removed from the plant. Leaving seeds on the parent plant to full maturity and dryness is always preferable.

Once pods or husks have been harvested, store them in a dry place and wait until they are thoroughly dry. When the pods or husks are dry enough they will easily crumble between your hands. Crumble the pods or husks until all the seeds are released. Then place seeds and chaff in a bowl or box and swirl or shake gently. Most of the larger chaff pieces will rise to the top and can simply be removed by hand.

Seeds and finer chaff are easy to separate by a variety of methods. One way is to use two screens of varying mesh, one a little smaller than the seeds and the other a little larger. The first screen lets anything smaller than the seeds fall through, and the second lets the seeds through and stops anything larger.

Another method of separating seeds and chaff is to roll seeds down a gently sloping board, leaving chaff stranded near the top of the board. This simple method works well with round seeds, but is basically useless for flat seeds such as squashes.

A very ancient method of cleaning seeds is called 'winnowing.' In a gentle wind, drop the seed/chaff mixture from a height of several feet into a bucket or onto a sheet or tarp. With a little skill and some cooperation from the wind (a fan in an enclosed space can be used for better control), seeds will fall into the bucket or onto the tarp while chaff blows away to one side.

Another, very simple way to winnow small quantities of seeds is to swirl or gently bounce the seeds and their chaff in a shallow bowl while carefully blowing chaff away with your breath. It's a good idea to do this over a cloth or newspaper to catch seeds blown out of the bowl with the chaff. These can then be hand-cleaned or planted.

Cleaning Wet Seeds

Wet seeds are easy to clean, though some need the additional step of fermentation. Seeds which require fermentation should be cleaned *after*—not *before*—fermenting. Allow the fruits to fully mature on their plants before harvesting.

To clean wet seeds, scoop the seeds from the fruit, pulp and all. Pour the seeds and pulp into a large, sloping bowl and add water. Healthy seeds will sink to the bottom of the bowl, while dead seeds and most of the pulp will float. Use your fingers to gently separate all the seeds from the pulp.

Then, to remove the pulp and dead seeds, carefully pour the extra water with the floating pulp and dead seeds from the bowl. Pour quickly enough for dead seeds and pulp to pour off the top, and slowly enough so that the heavier, good seeds remain safely on the bottom. By repeating this rinsing and pouring process several times, the seeds can be gotten very clean (getting seeds as clean as possible helps to keep them from sticking to whatever surface you dry them on).

Drying Wet Seeds After Cleaning

To initially dry your seeds after cleaning, drain them of excess moisture in a strainer. Pat the bottom of the strainer with a cloth towel to pull extra water from the seeds after they have drained. Then spread the seeds on a piece of glass or a shiny ceramic plate to dry (they will stick to paper, even waxed paper). Place the glass or ceramic plate in a cool, dry shady spot for several days.

After the seeds are dry, they can be carefully removed from the glass or plate and final-dried before being stored in jars

Hot Water Treatment - Fermentation has already been discussed as a way to kill bacteria and disease, but you can also use hot water bath. Basically that is maintaining the seeds in a continuous hot water treatment of exactly 50oC for 20-30 minutes. This kills the problems without damaging the seeds viability, just make sure you dry the seeds well again after this treatment before storage.

1.10 General Harvest and Storage Notes

Seed should always be stored under cool, dry conditions. The worst storage conditions are fluctuating ones, high to low humidity, high to low temperature changes. Seed left in a tin garden shed won't even last a year in Perth, as in summer the shed might reach 60oC.

Put seeds in plastic bags for separation and labeling before putting the plastic bags into air-tight, glass jars to be stored. Note: plastic bags alone do not protect against moisture, especially in potentially moist locations like refrigerators or freezers. Allow jars that have been stored in refrigerator or freezer to warm to room temperature before opening to prevent moist air from condensing on the inside walls of the jar.

Temperatures well below freezing will not harm seeds if they have been adequately dried. Further this is a great way to kill pests like weevils and other insects. Sealing most seeds from air, except in the case of beans and peas, which like some air circulation, prolongs viability.

Most sound vegetable seeds, if stored properly, will remain viable for many years, with the exception of short-lived onion, leek, corn and parsnip seed. The previous tables give a guide on each type. Put each kind of seed into its own envelope with the cultivar name and the date of storage. You can also put envelopes or just the seeds in airtight tins, glass jars or plastic containers that can be closed to make them moisture proof. Storing seed containers in the freezer will increase longevity.

1.11 Germination Tests

You might like to run a germination test of the seed you are about to save, and test your seeds from year to year to see how the viability (percentage of the seeds that will germinate) is travelling. Most seeds can be tested by taking 10 or so seeds and pacing them in moist paper towel or cocopeat and seeing how many germinate.

1.12 Beginner Seeds - Try these first.

Self-pollinating Annuals

These include lettuces, beans, tomatoes and peppers. It is easy to save a diversity of them and they are very significant crops to save.

Lettuce

A single lettuce can produce hundreds of small yellow flowers atop its stalk. The flowers become bunches of feathery little seed sites, each flower creating eight to fifteen seeds. The seeds are a miniature version of dandelion seeds, having a tiny parachute perfect for riding the breezes. They are little wedges about an eighth of an inch long and are either white or dark, depending on variety.

Someone wanting to have enough seed for the coming year could simply pluck two or three fuzzy seedheads to easily get a couple of dozen seeds. The seed can be rubbed between the fingers to release the fluff. Most of the fluff can be easily blown away if you're careful not to blow too hard. Sifting it through an appropriate screen can also clean the seed. For the amateur seed saver, it is not crucial for the seeds to be totally clean, just totally dry. Lettuce seeds keep a high viability for at least four years.

Tomatoes

Tomatoes are the best summer crop to grow and seed save from. Tomato flowers are self fertile and will rarely be crossed by insects. You can grow multiple varieties and save the seeds from each.

Pulp from a tomato can be squished onto paper towel for easy quick tear off seed sheet, but the better tomato seed saving method involves letting ripe tomatoes ferment for a few days to prevent bacterial and viral diseases from persisting through the seed. Fermentation also breaks down the gel that covers tomato seed. Two or three days later you'll observe a moldy, fermented brew, scoop off slimy top and the clear water and the seeds will be below, pour these onto a fine mesh screen that collects the seeds. Allow them to dry. Seeds also remain viable for 5 plus years making this an even better beginner project.

Beans/Peas

These include fresh green and yellow snap beans, peas, chickpeas, soybeans and lentils. In the process of drying down, all these legumes lose their leaves until only the pods are left. Most get to the point where the beans rattle in the pods if you shake them. Some beans pods twist open and spurt their seeds on hot days, so it's important to do daily checks when harvest is close. If your thumbnail can't make a dent in the seed, the beans are ready.

Pick the pods by hand, gathering them in appropriate containers and take them to your drying space. Spread them onto screens or trays. Although they could be threshed immediately, giving them another drying day or two is good in case some seeds are not quite done. They dry better in the pod.

Opening the pods one by one can be a very exciting as well as mesmerizing activity and a great fun way to introduce kids to seed saving and gardening.

The above self-pollinating annuals are an excellent place to start seed saving.

A mentioned before the best seed saving book in Australia is, "The Seed Savers Handbook", (buy it online I highly recommend it). The following pages provide a summary of information on the rest of the species, but the book has a page of instructions on each plant.

For the beginner	** For the accomplished seed saver
* For the gardener with experience	*** For the expert seed saver

* Amaranth	Eschallot	* Peruvian Parsnip
* Artichoke	Fennel	* Poppy
* Asparagus	** Garland Chrysanthemum	* Potato
* Basella	Garlic	* Pumpkin
Basil	Garlic Chives	* Queensland Arrowroot
Bean	* Ginger	** Radish
** Beetroot	* Gourd	* Rhubarb
* Bitter Gourd	* Gramma	* Rocket
* Borage	** Guada Bean	** Rockmelon
Broad Bean	* Hibiscus Spinach	* Rosella
* Broccoli	* Hyacinth Bean	* Rosemary
*** Brussels Sprouts	* Jerusalem Artichoke	* Runner Bean
** Cabbage	** Kale	Sage
* Calendula	** Kohlrabi	Salad Burnet
* Cape Gooseberry	* Korila	* Salsify
* Capsicum & Chilli	* Leek	** Silver Beet
** Cardoon	Lemongrass	Snake Bean
* Carrot	Lettuce	* Sorrel
** Cassava	Lima Bean	* Soya Bean
** Cauliflower	* Luffa	** Spinach
** Celeriac	Marigold	* Spring Onion
* Celery	* Marjoram	* Squash
* Celtuce	* Mint	* Sunflower
* Chervil	* Mitsuba	Sweet Potato
* Chicory	* Mizuna	* Taro
Chilacayote	** Mustard	** Tarragon
* Chinese Cabbage	** Mustard Greens	* Thyme
* Chives	Nasturtium	Tomato
Choko	* New Zealand Spinach	* Tree Onion
** Collard	** Oca	* Tumeric
Coriander	* Okra	*** Turnip
*** Corn	** Onion	** Water Chestnut
** Corn Salad	** Orach	** Water Spinach
* Cowpea	* Oriental Cooking Melon	Watercress
** Cucumber	* Pansy & Violet	* Watermelon
* Dandelion	* Parsley	* Wax Gourd
Dill	** Parsnip	* Winged Bean
** Eggplant	Pea	Yam
** Endive	* Peanut	* Yam Bean

APPENDIX A

Pollination and Storage Table

Name of Plant	Annual, Biennial or Perennial	Manner of Reproduction – Vegetatively and, if by seeds also, Cross-pollinating and/or Self-pollinating	If Cross-pollinated are they Wind, and/or Insect-pollinated?	How many years the seeds last in good storage conditions	How many seeds to the gram
Amaranth	A	C	W	5	800
Artichoke	A,P	V,C	I	5	30
Asparagus	P	V,C	I	3-5	50
Basella	A,P	V,S		5	50
Basil	A,P	V,C	I	5	600
Bean	A	S		3	5-10
Beetroot	B	C	W&I	5	50
Bitter Gourd	A	C	I	5	12
Borage	A	C	I	5	65
Broad Bean	A	S,C	I	4	1
Broccoli	A,B	C	I	5	300
Brussels Sprouts	B	C	I	4	270
Cabbage	B	C	I	4	250
Calendula	A	C	I	2	100
Cape Gooseberry	A,P	S		3	400
Capsicum & Chilli	A,P	S,C	I	5	150
Cardoon	P	C	I	4	25
Carrot	B	C	I	3	1000
Cassava	P	V			
Cauliflower	B	C	I	4	500
Celeriac	B	C	I	5	2000
Celery	B	C	I	5	2000
Celtuce	A	S		5	1000
Chervil	A	C	I	1	450
Chicory	B	C	I	8	600
Chilacayote	P	C	I	5	5-8
Chinese Cabbage	A	C	I	5	350
Chives	P	V,C	I	1	600
Choko	A,P	C	I		
Collard	B	C	I	4	200
Coriander	A	C	I	3	90
Corn	A	C	W&I	2-10	3-8
Corn Salad	A	C	I	4	700
Cowpea	A	S		5	50
Cucumber	A	C	I	4-10	40
Dandelion	P	S		2	1000
Dill	A	C	I	3	900

KEY:

A–Annual	S–Self-pollinated
B–Biennial	W–Wind-pollinated
P–Perennial	I–Insect-pollinated
C–Cross-pollinated	V–Vegetatively reproduced

APPENDIX A cont'd.

Name of Plant	Annual, Biennial or Perennial	Manner of Reproduction – Vegetatively and, if by seeds also, Cross-pollinating and/or Self-pollinating	If Cross-pollinated are they Wind, and/or Insect-pollinated?	How many years the seeds last in good storage conditions	How many seeds to the gram
Eggplant	P	S,C	I	5	200
Endive	A	S		5	900
Eschallot	A	V			
Fennel	A	C	I	4	500
Garland Chrysanthemum	A	C	I	3	300
Garlic	A	V			
Garlic Chives	P	V,C	I	1	250
Ginger	P	V			
Gourd	A	C	I	5	30
Gramma	A	C	I	3-8	5
Guada Bean	A	C	I	2	6
Hibiscus Spinach	P	S		3	70
Hyacinth Bean	P	S		4	4
Jerusalem Artichoke	P	V,C	I		
Kale	B	C	I	4	250
Kohlrabi	B	C	I	4	250
Korila	A	C	I	3	30
Leek	B,P	V,C	I	3	400
Lemongrass	P	V			
Lettuce	A	S		5	1000
Lima Bean	P	S		3	1
Luffa	A	C	I	5	20
Marigold	A	C	I	3	300
Marjoram	A,P	V,C	I	5	12 000
Mint	V,C	I	1	1	40 000
Mitsuba	A	C	I	3	500
Mizuna	A	C	I	2	600
Mustard	A	C	I	3-7	600
Mustard Greens	A	C	I	4	600
Nasturtium	A	V,C	I	3	30
New Zealand Spinach	P	V,C	I	6	20
Oca	P	V			
Okra	A	S		5	15
Onion	B	C	I	2	250
Orach	A	C	W	5	250
Oriental Cooking Melon	A	C	I	5	70
Pansy & Violet	A	V,C	I	7 days, 1	1-2000
Parsley	B	C	I	3	200
Parsnip	B	C	I	1	200
Pea	A	S		3	5
Peanut	P	S		1	12

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Peruvian Parsnip	P	V			
Poppy	A	C	I	2	10 000
Potato	P	V			
Pumpkin	A	C	I	3-10	4
Queensland Arrowroot	P	V			
Radish	A,B	C	I	4	100
Rhubarb	P	V,C	I	1	250
Rocket	A	C	I	2	500
Rockmelon	A	C	I	5	30
Rosella	A	S		3	70
Rosemary	P	V,C	I	1	900
Runner Bean	P	S		3	1
Sage	P	V,C	I	3	250
Salad Burnet	P	V,C	I	3	150
Salsify	B	C	I	3-5	100
Silver Beet	B	C	W	10	60-90
Snake Bean	A	S		3-8	5
Sorrel	P	V,C	I	2	1000
Soya Bean	A	S		3	5-10
Spinach	A	C	W	5	70
Spring Onion	A,P	V,C	I	2	250
Squash	A	C	I	3-10	6-8
Sunflower	A	C	I	5	10-20
Sweet Potato	P	V			
Taro	P	V			
Tarragon	P	V			
Thyme	P	V,C	I	5	6000
Tomato	A	S		4	400
Tree Onion	P	V			
Tumeric	P	V			
Turnip	B	C	I	5	300
Water Chestnut	P	V			
Water Spinach	A	V,S		3	150
Watercress	P	V,S		5	4000
Watermelon	A	C	I	5	6
Wax Gourd	A	C	I	3	10
Winged Bean	A,P	S		2	18
Yam	P	V			
Yam Bean	P	V,S		5	5

KEY:

A–Annual	S–Self-pollinated
B–Biennial	W–Wind-pollinated
P–Perennial	I–Insect-pollinated
C–Cross-pollinated	V–Vegetatively reproduced

1.13 Where to get Open Pollinated Seeds or Heirloom Seeds

There are lots of Australian companies, most are over east though so it's a mail order or online buying process. Three local sources are **Greenhouse Organic** (Seedlings and Seeds), Daisy Chain Nursery and **Yilgarn Drylands Permaculture Nursery** so try them first and support local. Seeds can be ordered online or look at Absolute Organic, Green life Soil company and other organic food outlets.

There are lots online. Basically put this in your search engine **"open pollinated seeds .au"**.

Phoenix seeds PO Box 207 Snug Tasmania (Australia) 7054 Tel : 03 6267 9663 Fax : 03 6267 9592

Diggers : http://www.diggers.com.au/ , Green Harvest: http://www.greenharvest.com.au/

Eden Seeds and Select Organic: http://www.edenseeds.com.au/ http://www.selectorganic.com.au/

The Italian Gardener: http://www.theitaliangardener.com.au/ Cornacopia: http://www.cornucopiaseeds.com.au/

The Lost Seed: http://www.thelostseed.com.au/

1.14 Propagation from Seed

This has been largely discussed already but a summary of the important points is below.

- Seed Viability – age, condition, storage
    - Seed should be clean, free of pulp or fruit residue, or chemical inhibitors
    - Fresh seed where possible, well stored, no mould
- Timing – seasonal suitability
    - Favourable weather approaching or greenhouse
    - Rising soil temperature or use bottom heat
- Stratification – pre-treating seeds before sowing
    - Soaking/abrading/clipping hard coated seed to improve water absorption
    - Smoke water treatment, simulation of bushfire conditions
    - Heat treatment to release seed, nuts, banksia etc
- Seed raising mix – 50/50 coarse sand and peat or compost, shredded manure
    - No added nutrient
    - Trays or pots not to shallow – drying out, deformed roots
- Propagation Area – mild shady humid conditions
    - Close by, visited daily
    - Nearby tap or water tank
    - Structures – shade-houses, greenhouses, cold frames

1.15 Growing Seeds and Seedlings

Make or purchase a seed raising soil mix. It should be reasonably light with drainage which is why vermiculite is often used to enable tiny roots to penetrate but it also needs to hold water (cocopeat, worm castings and fine compost). The mixture doesn't need to be rich in nutrients, as the seed raising mix is a short term growth medium. 1/3 sharp sand, 1/3 Cocopeat or vermiculite, 1/3 compost or worm castings should be fine.

Generally you can follow seed packet instructions for seed planting. Don't plant them to deep, as a rule of thumb seeds should be planted 2-3 times as deep as the seed size. Thus many fine seeds are just scratched into the soil, and carefully kept moist. For carrots, rocket, lettuce and grain plants I cover the soil with shadecloth, if the soil surface dry's out in the midday sun and the seeds have germinated they will die in 1 hour, this cover over shallow seeds also spots doves from coming and eating your seed.

Choose seasonal seeds following the "what to plant when guides", Greenlife Soil has a great local Perth list on their excellent information rich website. www.greelifesoil.com.au , other options are Gardenate (online) or local gardening magazines and enews letters.

Perth has a tricky climate most things grow most of the time. I recommend people plant a few seeds/seedling of each type each month so that yearly/seasonal variations can be allowed for. Most plants are killed by 40oC summer peaks and if you have frosts this will also kill many (non winter) plants.

Essentially the plant will grow well when the season is right. As I save my seed and have plenty for trial and error my preferred method is sow a few of all your seeds in your open bed any time it and you are ready to water and care for them. Nature will take over and they will germinate when they are ready if not eaten by birds etc.

If you have limited seeds or are struggling to get plants to come up in your garden beds (insitu) you should set up a seed raising nursery. While not all plants like transplanting (avoid this with carrots and most root crops) many (as per the table below) can be carefully grown to a bigger stronger plant and then transplanted in a month or two. This is also great if you have slater, slugs and snails in your garden that eat a new seedling in one night. It can also speed up your summer crops to raise them in a warm nursery in early spring (when you get frosts and cold nights) and transplant them out after the last frost. This gives you a 1 month longer growing season before it gets too hot to garden (or at least start young plants) in mid summer (Jan/Feb/March). Seeds and seedling should be out in your garden 'sun hardening' by November, the hot days 36oG plus will kill most young seedlings out in the open.

Crop	Transplanting Tolerance	Time to grow (b) (weeks)	Frost Susceptibility
Broccoli	Survive well	5-7	Tolerant
Brussels sprouts	Survive well	5-7	Tolerant
Cabbage	Survive well	5-7	Tolerant
Cauliflower	Survive well	5-7	Tolerant
Cucumber	Seeded in container (a)	3-4	Very susceptible
Eggplant	Require care	6-8	Very susceptible
Lettuce	Survive well	5-7	Tolerant
Muskmelon	Seeded in container (a)	3-4	Very susceptible
Onion	Survive well	8-10	Very tolerant
Pepper	Require care	6-8	Susceptible
Squash	Seeded in container (a)	3-4	Very susceptible
Tomato	Survive well	4-7	Susceptible
Watermelon			
Regular	Seeded in container (a)	4-6	Susceptible
Seedless	Seeded in container (a)	6-8	Susceptible

(a) These crops are generally not successfully transplanted unless started in containers (such as peat pots), as any root disturbance checks growth.

1.16 Self seeding gardens and plants.

The more I read and experience the more it is clear that the **best seed bank is in the soil**, this is the seed bank that mother nature uses. Successive years of good seed saving (or just growing if they self seed) will create strong localized plants they will geminate as the call of nature dictate rather than we guess.

You will find that self seeded plants will generally do much better as long as they are fed and watered. A self seeded plant not only comes up when it needs to but often where it needs to so the benefit is twofold.

Growing guides are just that guides, and even local ones made the year before may not suit the following year due to large climate and yearly temp and rainfall variations in WA. Use them as a guide, document your own results at your location.

VEGETABLES Seed Growing (**Eden Seed's guide**)

	Row spacing (cm)	Plant spacing (cm)	Depth (cm)	Mild Perth,	Subtropics Costal	Number of seeds per gram	Best Soil Temp °C	Average days to maturity
Amaranth	50-75	50	.5	Sep-Mar	Aug-Apr	900	16-30	50
Artichoke	200-240	160-180	1-2	Aug-Nov	Aug-Nov	22	15-18	300-400
Asparagus	90-120	20-35	1-2	Aug-Nov	Aug-Nov	23-28	16-30	2-3 years
Bean, Broad	60-90	15-25	5	Mar-Jul	Mar-Jun	5-1	6-24	90-120
Bean, Bush	50-60	8-15	2-3	Sep-Feb	Aug-Apr	2-4	16-30	55-70
Bean, Climbing	100	10-20	2-3	Sep-Jan	Aug-Apr	3-4	16-30	65-80
Beetroot	45-60	5-10	2	Jul-Apr	Any	50-90	8-30	55-70
Broccoli	50-60	35-50	.5-1	Sep-Apr	Feb-May	175-330	7-30	60-90
Brussels Sprouts	100	45-60	.5-1	Dec-Apr	Feb-Jun	225-300	7-30	85-95
Buckwheat	Broadcast	Broadcast	.5-1	Jan-Oct	Feb-Oct	30		30-45
Burdock	60	50	1-2	Sep-Apr	Aug-May	50		120
Cabbage	50-75	35-60	.5-1	Any	Any	20-380	10-35	60-110
Capsicum	100-150	50-60	.6	Aug-Dec	Aug-Mar	120-160	18-35	70-90
Carrot	25-30	2-5	.5-1	Sep-May	Feb-Nov	600-900	10-30	65-90
Cauliflower	60-100	45-60	.4-.6	Dec-Apr	Jan-Apr	240-420	10-30	110-155
Celeriac	45-80	15-30	.2-.5	Sep-Dec	Mar-Oct	2100-3000	8-21	90-120
Celery	45-80	15-30	.2-.5	Sep-Dec	Mar-Oct	2100-3000	12-21	120
Chilli	90-120	40-50	.6	Aug-Dec	Aug-Mar	130-190	18-35	65-80
Collards	50-100	40-50	.5-1	Feb-Apr	Mar-Sep	300	8-30	60-80
Corn, Maize	60-90	20-30	2-3	Sep-Feb	Aug-Mar	2-4	16-35	100-150
Corn, Sweet	60-90	20-30	2-3	Sep-Feb	Aug-Mar	4-7	16-35	80-100
Cucumber	120-150	40-60	1	Sep-Feb	Aug-Mar	30-40	16-35	60-70
Eggplant	80-90	50-80	.5-.8	Aug-Dec	Aug-Mar	200-250	24-32	90-110
Endive	45-60cm	20-30cm	.5-1cm	Sep-Apr	Mar-Jul	700-1000	15-25	70
Gourd	150	90-120	2	Sep-Dec	Aug-Jan	10	20-30	95-120
Herbs, Parsley	50-60	20-30	.5-1	Sep-May	Feb-May	500-650	10-30	65-135
Kale	50-100	40-50	1	Mar-Apr	Mar-Jun	250-370	8-30	50-65
Kohl Rabi	35-40	10-20	.5-1	Aug-May	Mar-Aug	250-350	8-30	55-70

Leek	30-75	10-15	.5-1	Aug-Apr	Jan-Mar	350-450	8-30	105-130
Lettuce	35-50	20-30	.6	Any	Any	600-1200	8-27	60-85
Luffa	150	45-75	3	Sep-Dec	Aug-Jan	6	20-30	80
Marrow	100-120	90-120	2	Sep-Jan	Aug-Mar	6-8	20-35	90-120
Mustard Greens	50-75	35-60	.5-1	Any	Any	300	10-35	40-60
Okra	90-120cm	35-60cm	1cm	Oct-Dec	Aug-Feb	15-25	20-35	80-98
Onion	30-40	5-10	.5-1	Feb-Aug	Feb-Jul	240-400	8-30	180-240
Parsnip	35-50	8-10	.5-1	Jul-Mar	Feb-Sep	230-400	6-21	120-140
Pea	45-60	5-8	2-3	Feb-Sep	Mar-Jul	3-5	8-24	65-80
Pumpkin	250-300	90-120	3	Sep-Dec	Aug-Feb	5-12	20-32	105-140
Radish	25-35	3-5	1-2	Any	Any	100-140	8-30	40-50
Rhubarb	60-70	40-50	1.2	Aug-Jan	Aug-Feb	60		
Rockmelon	120-150	40-60	1-2	Sep-Dec	Aug-Feb	25-40	20-32	75-115
Rosella	90-120	45	1	Oct-Feb	Sep-Mar	50-70	24-32	175
Salad Greens, Endive	45-60cm	20-30cm	.5-1cm	Sep-Apr	Mar-Jul	700-1000	15-25	70
Salsify	20-40	5-10		Aug-Mar	Mar-Oct	60-80		110-180
Shallots	20-30	2-3	.5	Feb-Sep	Feb-Sep	350-480	8-30	85-105
Silverbeet	50-60	15-30	1.5-2	Sep-May	Any	50-60	10-30	50-85
Squash, Button	90-120	60-80	2-3	Sep-Jan	Aug-Mar	7-12	21-35	50-60
Sunflower	50-100	20-30	1-2	Aug-Jan	Aug-Apr	7-15	15-30	70-80
Swede	45-70	10-20	1	Jan-Apr	Jan-May	380-480	15-30	70-75
Tomato	60-150	40-60	.5	Aug-Dec	Aug-Apr	250-400	16-35	60-120
Turnip	30-50	12-20	1	Sep-Apr	Aug-May	400-500	12-30	45-65
Watermelon	150-200	60-75	2-3	Aug-Dec	Aug-Feb	10-20	21-35	68-100
Zucchini	90-110	50-90	2-3	Sep-Jan	Any	6-12	21-35	44-63

Greenlife Soils "what to Plant When Guide" – Check out their great website – Search "Greenlife Soils"

These notes were compiled by: Terra Perma Design permaculture education & design *For the PermacultureWest Seed Project*