

Methodology of Seed Collection for Native Plants in Afghanistan Trainer Manual

Originally developed by Julie Firth from Yilgarn Consulting, Waggrakine, Western Australia (2016). Adapted for the Afghanistan context by Welthungerhilfe Afghanistan (2025).

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INTRODUCTION

Successfully growing or direct seeding native plants for revegetation projects requires several processes. The first step is finding 'The right species for the right environment'.

Some of your most valuable resources are in your local remnant bushland and your neighbour's plantings. Observe the bush and speak with your neighbours about their plantings on similar soils and microclimates to yours, find out how they performed throughout the 'extreme years' and where they sourced their seed. Listen to and take note of both their successes and failures. Combined with other supportive information from reference books, and internet tools you'll have access to the means to start building the base stone for effective and worthwhile revegetation projects.

Field seed collection requires more than just physically harvesting, you need to be able to:

- identify the required plants.
- find and choose the best plants to collect from.
- be around when the seed is ripe for harvest; and then
- have the facilities and knowledge to dry, clean and process it for storage or direct delivery to either the nursery grower or the direct seeder.

Ensuring all these processes are completed properly and at the right time of the year will dramatically increase the percentage of vigorous healthy plants produced giving them the highest chance of survival in the field.

PLANT IDENTIFICATION

"What Plant is that?"

'Common Names' are often used to refer to local plants, and most local people usually know which plants are being referred to. Common name confusions occur when books and people from different areas call the same plant different names or different plants the same name.

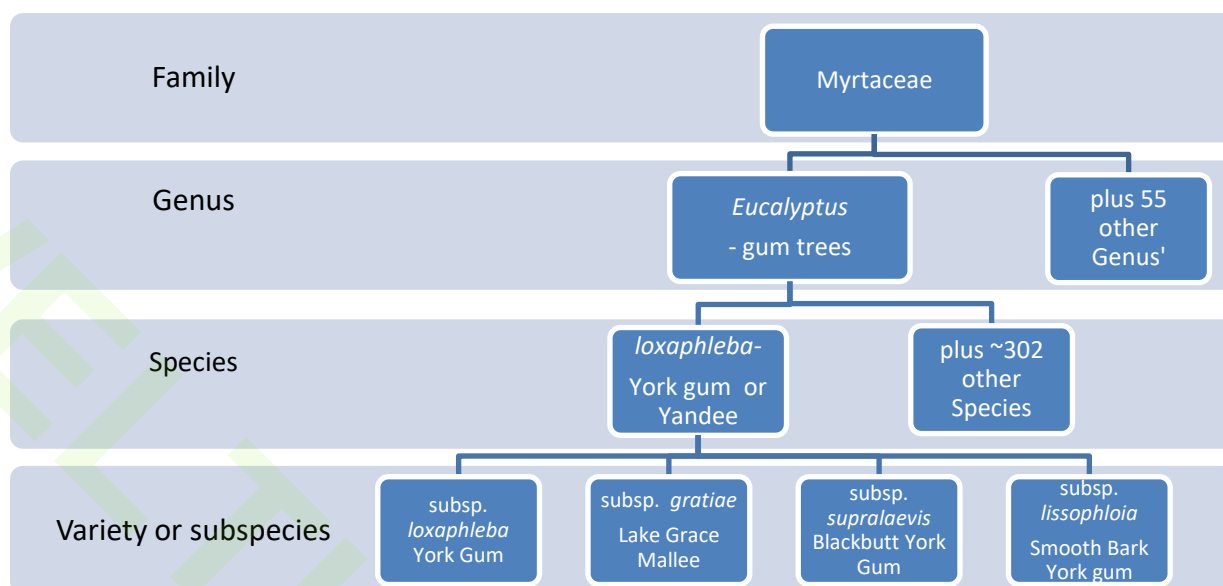
Using common names to refer to plant species allows them to be easily mixed up especially if seeds are being purchased rather than collected. Many hours have been wasted in the past by people growing the wrong species for their area due to having species names mixed up.

Obtaining the right plant species to suit the area is essential and to ensure the correct plant is referred to, a botanical naming system is used. The wonderful thing about this naming system is that it is recognised worldwide and even individuals who can't speak the same language still know the plant species being referred to.

Plants are split into groups which help us recognise and identify them. For the purpose of seed collection and basic identification, it helps to be aware of their family, genus and species names. It is useful to note that the plant family botanical names all tend to end in the suffix 'aceae' (Pronounced 'a-see- a') e.g Fabaceae, the family of the flowers with seed pods.

The botanical system of naming plants branches out in a similar way to our own family trees.

Below is an example of how the botanical naming system splits the Myrtaceae family into subspecies for *Eucalyptus loxophleba* var. *loxophleba*, a gum tree that grows around the hill slopes of the Morsesby Ranges.



Numbers derived from Western Australian Florabase (2008).

The botanical names commonly used are 'Genus' and 'Species' names, although subspecies and variety names are important when you are looking for seed that comes from a particular region as these plants often have desirable characteristics that suit that environment. An example may be that they have a higher drought or water logging tolerance than other species, subspecies or varieties.

COMMON FAMILIES FOR REVEGETATION WORK

There are several important plant families found in rangelands that can be used in revegetation work. It is useful to know the characteristics of these families as plants within them tend to have similar collection and cleaning techniques. Common families include:

Annual flowers mostly with parachute seeds

- *Asteraceae* – Everlasting and daisy family

Annual, biennial, or perennial herbaceous plants

- *Brassicaceae* - commonly known as the mustards, the crucifers, or the cabbage family. Includes stock (*matthiola*) flowers.

Perennials with papery capsules

- *Chenopodiaceae* – Saltbush family

Perennial Legumes with seed pods

- *Fabaceae* – Cassia/Senna, Wattle and Pea flower family

A family of perennial flowering plants easily cultivated from stem cutting

- *Lamiaceae* commonly known as the mint, deadnettle, or sage family

etc

It is useful to record the characteristics of the plants you are collecting seeds from, using words and pictures in a table, such as the following template:

CHENOPODIACEAE – Saltbush family

Characteristics	
Flowers: Shape Colour Sex	
Leaves: Colour Shape Texture Smell	
Seed capsules: Shape Firmness Ripeness indicator Opening technique	
Seeds: Shape Chaff Efficient collection technique Best drying technique Easiest cleaning technique Germination pre-treatment	

METHODOLOGY OF SEED COLLECTION

SEED LICENSES

In many countries a seed collection license is required from the government.

Before collecting seed, make sure you have the permission to be on the land and to collect the seed.

TIMING OF SEED COLLECTION

Timing is of primary importance when seed picking. Collecting most seeds before maturity can make them worthless as many of them will not mature if picked too early.

Plants either shatter their seeds when ripe, or they remain on the plant until they are picked or damaged by branch break or fire.

Plant genus that shatter seed vary in their 'release time'. It could be as soon as they are ripe or 3-14 days later. Many seeds shatter in the first few hot days of spring and collection is easy to miss, in this case, seed needs to be harvested off the ground. Shattering seeds are best picked as soon as the first few pods have opened to maximise the harvest. If harvested too early they will be immature and not grow successfully. Immature pods often do not always fully open.

In general, species will release seeds during the dry season at slightly different time to each other. The exact times are best learnt by observation of plants in your area.

Some species can hold onto their seed for up to one month or more after fully ripe. Occasionally seed can be picked and left to mature on a cut branch.



SEEDS FROM OPEN DRY NUTS: *Allocasuarina* Species

Seasonal Influences on Seed Viability

Good rains during spring will usually provide enough moisture to 'fill out' and fully mature seeds providing they have been adequately pollinated. If not, there may be a percentage of unviable seeds (seeds that will not germinate). Unviable seeds may look collapsed and flat compared to any other swollen viable ones you may see. See notes on pages 15 -16 on other methods to determine viable seed.

The second sign of non-viable seeds are tiny holes. Often insects eat their way into seeds and lay a bundle of eggs which hatch out and devour as many seed embryos as possible.

Differential ripening

It is not unusual to find a plant species where individual seeds ripen at varying times. Seeds need to be harvested every few days or bagged ((where a bag is tied over the branch to catch the seed when it matures and falls). Often these plants release their seed within two days of ripening.

TIMING TIPS

1. The hotter and drier the weather, the faster plants will release their seed. Extremely hot weather can accelerate seed ripening by almost a month!
2. Seeds on the southern facing sides of plants and sides exposed to reflective heat or drying winds are most likely to mature first.

Signs of Seed Maturity

These are a few generalised rules:

Capsules: (*Bluebushes, some Saltbushes*) Become papery or like cardboard. They release easily from the plants when rubbed.

Fruits or Drupes: (*some Saltbushes*) Old fruit will appear dry and wrinkled like a sultana. This is very good quality seed at this stage but is often hard to clean if seed needs to be separated. Fresh fruits are easier to clean, these need to dislodge easily when held or gently pulled. The flesh should have softened and be at its deepest colour.

Grain heads: (*Grasses*) Seeds and their awns (tassels) turn brown. Seeds easily dislodge from seed heads when ripe.

Pods: (*Wattles, Sennas, Pea Flowers*) Turn brown and edges begin to open. Stalks should be crispy dry and brown, seed should feel hard and crack when the pod is squeezed.

Woody Cones: (*Sheoaks*) Cones lose their furry appearance, turn a grey brown colour when ripe and sometimes fall off the trees during spring to summer. Their valves split open to release seed.

Nuts: (*Gums and Teatrees, Myrtles and Bottlebrushes*) Nuts develop woodiness and don't secrete sap if the outside is scratched with your fingernail. When cut in half with secateurs the seeds inside should have turned brown, black or red in colour. Cream to light brown indicates immaturity. The star or triangle pattern on top of the nut turns brown or grey in colour. Once mature and dried valves shrink and open to release their seeds.

SEED HARVESTING

Provenance seed

What is it?

Provenance seed is native seed that is collected (from its natural environment) within a selected named area. It is usually named after the area or the closest village.



SEED PRODUCTION AREA: An 18 year old seed orchard of Northampton Provenance *Acacia acuminata* planted on the outskirts of Geraldton City.

Why is it important to know this?

Plants growing in their wild state or native environment over time have developed certain adaptations which have ensured their survival as a species over time. An example is a plant may have tuberous taproots which hold water for use during times of drought or a prolonged flowering period to ensure insect pollination.

As a seed collector you have a duty of care to maintain the best genetic representative of the species possible. This can be achieved by abiding by the following rules:

- Pick from large populations, if possible collect seed from up to 20 plants.
- Avoid collecting seed from isolated plants.
- Maximum seed collected from individual plants should be 10-20%.
- Limit the percentage of seed from any one plant to 10% of the total seed collected.
- Space out the trees/ plants you pick from and collect a little seed off many plants.
- Avoid collecting from plants that look unhealthy or have not grown well.

An exception to this rule is for native grasses, due to their 6-8 chromosomes structure seed can be harvested from one plant and the genetic pool still maintained.

What about using provenance seed from hardier areas for revegetation?

We have had the experience of planting drier provenance seed on our Geraldton farm. During the two year drought of 2006 and 2007, many of our local natives suffered from water stress and died. Our desert species thrived and performed extremely well both years with good seed set.

If you are thinking about introducing other provenance species into your area, be aware that your site will need to provide the following conditions to maintain plant health and its chances of reproduction.

- Pollination - adequate pollinators at the right time of the year.
- Soil type – same nutrients, drainage and soil biology as their mother soil.
- Microclimate - similar rainfall, annual temperatures and humidity levels.
- Seed ripening – timing of dry season coinciding with seed ripening
- Pests and diseases - These are likely to occur if your plant is under stress from the above conditions being inadequately addressed.

Hygiene**Vehicles and Weed Seed**

Weed seeds can be spread between sites from your footwear and clothing. They hide in crusted mud, hay and manures transported on vehicles, so stay vigilant, and clean vehicles and footwear between sites.

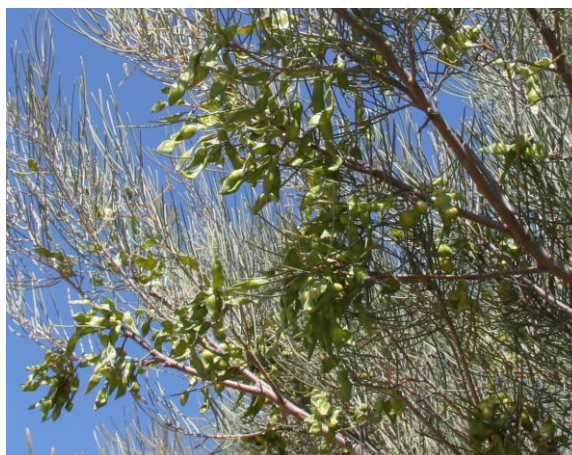
Pathogens on Cutting Equipment

Beware, virus, fungi, watermoulds, yeasts and bacteria can cause disease and can be easily spread from plant to plant by sap transmission. This means if you cut an infected plant, your secateurs may spread it to the next plant.

Avoid harvesting seed from unhealthy plants. Sterilise all your cutting tools if they have been used in another area.

TO STERILIZE CUTTING TOOLS:

Remove any soil or sap from tools and sterilize in one of the following ways:

**DRIER PROVENANCE PLANTINGS:**

Heavy seed set of desert *Acacia aneura* planted in a higher rainfall area on the coast.

- Spray tools with methylated spirits and allow it to evaporate.
- Soak tools in household bleach diluted at 1:20 for half an hour then rinse.

NOTE: Spray wet tools after treatment with a lubricant - CRC (or similar) to prevent rusting.



Seed Collection Techniques

Seeds can be collected a variety of ways. The techniques used depend on the quantity required, the type of seed and how dry it is.

Bulk Harvesting

- Branches cut with saws
- Mechanical tree shakers
- Specialist harvesting machinery
- Lawnmowers for groundcover perennials and annuals
- Petrol garden blower/vacuum

Small Scale Collection

- Hand stripping bunches of nuts or seeds into a container
- Individual hand removal of seeds
- Cutting off bunches of seeds or tips of branches with secateurs or loppers
- Shaking or raking seeds from plants onto ground mats
- Hand collection of bird manures or ant stockpiles can offer small quantities of seed to grow, although you will not know about the parent tree's form or health.



PRUNING BRANCHES: Collecting *Casuarina* Nuts

Seed Collection Equipment

Ideal Day Checklist:

- Books - for recording plant information and Plant identification books.
- Cutting tools and accessories - secateurs, saws, ropes and extension poles with hooks for bending down branches.

- Recording equipment - camera, labels and pens for labelling seed batches.
- Mapping equipment - GPS and maps.
- Mats – plastic or cloth to place under trees.
- Personal requirements: hat, drinking water and food.
- Safety equipment – First Aid kit, safety glasses, gloves, mobile phone.
- Seed collection containers – buckets, bags, large plastic bins, paper bags, sacks and ties.

SEED DRYING

The most important part of drying seed is to 'fry' any potential insect larvae in the seed and reduce moisture levels to ensure no mould grows before putting it into storage. Drying can also be used to 'crisp' the seed pods in order to remove the seeds easily and dry nuts so they shrink and split open to release seed.

TECHNIQUES AND ISSUES

Many seed cases need to become crispy dry before they will open and release their seed. If available, dry hot houses (without plants) are the best environment to do this in. During the summer, laying seeds on tarpaulins or cloth in the sun is also effective if it is hot and dry. Very small quantities can be dried in paper bags and hung on a line. Take care to cover them at night to avoid any early morning (moisture) dew.

Rodents, ants, birds and reptiles, wind and rain, are all problems that you are likely to encounter. Some seeds (e.g. *Casuarinas*) will be ruined if they are wet even once. Mould is also a potential problem if your drying area is enclosed and not ventilated.

Setting up your drying areas to avoid these problems is essential as it will minimise your seed losses. These are ways to use drying equipment to help protect your seed:

- Drying trays sealed with fly screen, shade cloth or material lids and bases to prevent insects and rodents.
- A rodent-proof hot house.
- Drying tables with legs sitting in water or ringed with a sticky grease to prevent ant movement.
- Windbreak fences around drying areas to slow wind.
- Overhead shelter for protection from rain, dew and frost.
- Decoys such as sugar, sprinkled outside of seed drying areas to decoy ants. Meat positioned away from the drying area for meat ants. Bait ants if necessary. Get your ant species identified and make sure you use the correct type of bait.
- If setting up a large seed drying area, consider getting a cat to keep rodents away.



SEED CLEANING

The main reason to clean seed is to reduce the amount of mass that has to be stored. Clean seed also eliminates the possibility of insects living in the chaff and damaging the seed and also makes it easier to handle when sowing. Different seeds need different cleaning techniques. Cleaning usually happens in several stages.

It can involve separating:

- Seed cases (capsules, flower heads, nuts, pods,) from brush or branches.
- Seeds from seed cases.
- Seeds from leaf debris, husks and chaff.
- Seeds from dust.

SEPARATING SEED CASES FROM BRUSH AND BRANCHES

Manual separation of nuts and pods from branches only needs to happen if the bark and leaves dry and break down to a similar size and weight as the seed. Being the same size and weight means they are difficult to separate once dry. It is easier to separate them individually either by hand or by cutting off with secateurs before drying.

SEPARATING SEED FROM SEED CASES

Woody Nuts

Nature uses fire and the baking of the summer sun to dry out and shrink nuts and cones forcing them to open and release seed. This is easily simulated by subjecting woody nuts to high dry temperatures by drying seed in hot houses during spring and summer.

Seed can be further dislodged by being shaken vigorously in a container (metal is best).

Some seed cones (Banksia) need to be exposed to fire, and some plants such as the Dryandra Banksia and some paperbark Melaleucas need their cones or nuts to be soaked in water and dried before they release the seed. This simulates seasonal rains.

Flower Heads

Asteraceae (the Daisies and Everlastings) are a common family with flower heads that can be gently rubbed by hand or shaken to release seed. Once the heads look fluffy, seed should dislodge easily.

Papery Capsules

Maireana and *Atriplex* (Saltbush) Seed is usually left inside the case.

Fruit/Drupes

If flesh is thin, this is usually left to dry around the seed. To separate fruit, they can be soaked in a small amount water (just covering the seeds) until they begin to ferment and a thin film of white bacterial mould sits on the water, this takes about 3 days in temperatures over 30C. They are then mashed, rinsed and drained through a sieve or cloth mesh. At this point seeds need to be redried on paper or cloth in the shade.

Pods

These sometimes shrink and split open and other times need to be crushed or threshed to get the seed out. Take care not to crush the seed in the process. Crushing of pods can be done by:

- Stamping with feet.
- A heavy roller. (machine or rolling pin)
- A threshing machine.
- Manually rubbing against metal sieve screens.
- Rubbing between hands.
- A concrete mixer with gravel stones.

SEPARATING SEEDS FROM LEAF DEBRIS, HUSKS AND CHAFF

To find the most efficient separation technique, you must first look at the seed and how it is different from the other particles it is mixed with. Look at the following techniques: -

Electrostaticity

Often seed or its impurities easily generate an electrostatic charge when shaken or swirled in a round sided plastic container. Usually the heavy seed will sit on the bottom of the container while the impurities remain stuck to the side of the container and can be blown or flicked away.

Size

Sieves are the best way to separate seed from debris. Many things can be adapted to use as sieves.

They can be made from metal mesh, shade cloth, lace, oil filters, or even old bed bases.

Different sized mesh and commercial seed sieves are available in various sizes.



SIEVES: Many things can be adapted to use as sieves

A suggested range of mesh hole sizes would be 0.5, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0, 5.0, 7.5, 10.0 mm. Alternatively kitchen colanders, tea and rice strainers can be helpful for small scale cleaning.

Weight

There are a few different ways to separate particles with different weights.

Vacuuming

Suction is an excellent way of removing or collecting light and small particles. A vacuum cleaner is a useful tool. By attaching different sized mesh over the nozzle, you can vary the size of the material sucked into the vacuum cleaner. The distance you hold the vacuum cleaner from the seed will also allow you to alter weights sucked up.

Immersion in Water

Nuts and most large hard seeds can be immersed in water allowing the debris that floats to be scooped off. This is a good time to remove non-viable seeds as these will also float. Sometimes viable seeds float so inspect before discarding. They should be full size, hard, and with no holes. The cut test on page 16 show a method to determine healthy seeds.

Gravity

Heavy seeds will slide down a 'shaker table', reaching the base of the table before the lighter debris. A shaker table is an angled table attached to its legs by springs or rubber mounts, this allows it to be shaken easily. Slits or holes can be also cut into the table which will allow it to double as a sieve.



SEED WINNOWING: A fan is a valuable & adaptable tool to blow chaff from seed.

Winnowing

Winnowing is a particularly good way to separate light and heavy particles by blowing lighter particles away. You can use your own breath, the wind, a mechanical fan or a commercial threshing /winnowing machine. Blowing seeds through a tunnel of different sized sieves can be effective. Dropping the seeds and debris in front of a fan will separate the various weights.

The distance they are dropped from the fan will give you control over the wind strength hence the distance they are blown. Variable speed fans are good for this purpose.

SEPARATING SEEDS FROM DUST

Sieving through a fine sieve, blowing or sucking are the best ways to remove dust. Another technique is to swirl the seeds in a container causing the dust will settle on the bottom allowing you to scoop the seeds off the top.

Dust particles can also be removed using a vacuum cleaner with a mesh tied over the nozzle to prevent seed from being sucked up.

WHICH IS THE SEED?

Sometimes the seed from nuts appears to be two colours and shapes, most of the time, one is seed and the other is chaff or seed packing. You can use the paper bag technique below to tell them apart.



SEED AND CHAFF: In this case the chaff is long and thin.

The Brown Paper Bag Trick

This technique will show you how to distinguish seed from chaff. Lay a paper brown bag out on a table, scatter a small amount of the seed mix inside the bag, and roll a glass or rolling pin over the bag to crush the seeds. When the seeds are crushed they will produce an oil stain in the places where they lay.

The Cut Test

To determine if your seed is viable you can cut them in half with a sharp knife or crush with a vice or hammer. A good seed has (had, in this case as you will have just killed it) a crisp embryo which is usually creamy white or sometimes a shade of yellow. Tan or brown embryos are often dead. Very small or no embryo at all means they are not viable. If the seed is very small, a magnifying glass or microscope may be necessary to view the embryo. Random checks of approximately 10 seeds will give you an idea of a seed batch quality and what colour a healthy embryo should be.

STORAGE

There are several important things to note when storing seeds:

- Use an airtight tin or glass container. If choosing to use plastics, take care as they can degrade and crack over time. Plastic bags are also risky for storage as insects can eat their way out of a batch of seed and contaminate other batches and rodents can eat their way in.
- Keep them in a constantly cool dark area. Some people store their seed in the fridge or freezer. Ensure the seeds are thoroughly dry before storing and never pack them away on a humid day to avoid mould growth. Always let them come to room temperature before opening the container to avoid any condensation forming.
- Incorporate sachets of silica gel. If this is not available, an alternative moisture absorber is a few spoonfulls of rice or salt tied in a small cloth and placed in the storage container; this will reduce the chances of mould.
- An organic grain protectant such as 'Diatomaceous Earth' (not swimming pool grade) will absorb wax from insect's bodies and dehydrate them. "DRYASIDE" (non toxic) is a commercially available brand obtainable from farm suppliers. Large quantities of seed can be mixed with a small amount of this product in a concrete mixer. The rates to use are on the bag. Use a respirator when creating air borne dust from this product.
- Always use two labels. One inside the jar or bag, the other outside on the side or lid. It is easy to get lids mixed up if you are using similar jars or the labels fall off.



SEED STORAGE: Glass and metal containers are easily available, durable to use and vermin proof.

STORAGE TEMPERATURES

Generally, lowering the moisture content of seed and the temperature it is stored will lengthen the time it remains vigorous and viable.

Storage can be at room temperature (in a perfect world at 18-20C), in a fridge (3-5C) or a freezer (-18C). Usually short term storage (1-2 years) is adequate at room temperature. The longer you intend to store your seed, the colder you need to go to keep it healthy and vigorous.

With all storage, ensure your seed is dried adequately and sealed in airtight containers. Remember different genus' are likely to need different drying times although species with the same size seed should be similar. The higher the seed's oil content the longer drying is needed.

To freeze seeds, moisture levels need to be dropped otherwise the seed's cells can burst during freezing. We freeze seed in airtight jars with tape around the lids (we use packing tape) for one week to kill insects, larvae and eggs. We don't use a moisture meter and instead use this rule of thumb 'moisture reduction' technique. If you are freezing large quantities of seed you should trial a small batch and do a germination test on the seed after a week to see if it is still viable before you freeze it all.

Moisture Content Reduction Technique

On a dry day, layer one part of silica gel crystals with one part of thoroughly dried seed (Florabank recommends using 10x the weight of the seed) into a container and seal. Leave for 3 days at room temperature, remove the silica gel then freeze.

When defrosting seed, do not open the container until it has come to room temperature, this will avoid condensation forming which will potentially turn your seeds mouldy. Avoid opening your freezer when freezing seed unless absolutely necessary in order to prevent fluctuating temperatures. More details on these types of storage are covered in Florabank Guidelines 3. This is available through the internet. <http://www.florabank.org.au>

STORAGE LIFE

Room Temperature Storage

It is good practise to test seed annually in a nursery for percentage germination and vigour. Different species have different seed viability times. However, most seeds stored in dark containers in the most temperature stable part of the house or office should have a maximum seed viability of 3-5 years.

آب خیلی شور؛ گیاهان "مقاوم" به نمک

سایر محصولات

جو



پنبه



ارزن



گندم**



درخت‌ها/میوه

زیتون روسی



انار



محصولات گیاهی

قابل کشت
نیست

در خاکی که میزان نمک آن (EC)
کمتر از ۵۰۰ باشد، این محصولات
قابل کشت هستند.

** الی ۲۵٪ کاهش محصولات

آب شور؛ گیاهان "نسبتاً مقاوم" به نمک

سایر محصولات

آفتاب پرست



گندم



جو



لوبیای سفید



پنبه



درخت‌ها/میوه

انجیر



انار



زیتون



خریزه**



محصولات گیاهی

کدو سبز



بادنجان سیاه**



کرم**



پیاز**



سیر**



در خاکی که میزان نمک آن (EC) بین ۲۵۰ تا ۵۰۰ باشد، این محصولات قابل کشت هستند.

آب با شوری متوسط؛ گیاهان "نسبتاً حساس" به نمک

سایر محصولات



درخت‌ها/میوه



محصولات گیاهی



در خاکی که میزان نمک آن (EC) بین ۸۰ تا ۲۵۰ باشد، این محصولات قابل کشت هستند.

آب کم نمک؛ گیاهان "حساس" به نمک

سایر محصولات

کنجد



ماش



لوبیای سیاه



درخت‌ها/میوه

ناک



سیب



زردالو



آلوچه



محصولات گیاهی

فاصلیه



زردک



شلغم



در خاکی که میزان نمک آن (EC) بین ۰ تا ۸۰ باشد، این محصولات قابل کشت هستند.