

Pacific Open Pollinated Seed Learning Exchange Trip Report - Australia 25th October – 29th October 2016

DELEGATES TO THE LEARNING EXCHANGE			
Name	Organisation	Country	Arrival in BNE
Joanico Jose Ximenes	ANAPROFIKO	Timor Leste	24.10.16
Maria Linibi	PNGWiADF	PNG	24.10.16
Lasa Aioni	Fatu Pacifica Ltd	Samoa	25.10.16
Shanney Bilusu	Zai na Tina farm	Solomon Islands	25.10.16
Pitakai Tikai	AVRDC	Solomon Islands	25.10.16
Ella Kafalava	Nishi Trading	Tonga	25.10.16
Susana Yagoi	Tutu Rural Training Centre	Fiji	25.10.16
Joeli Nataki	Natures Way Cooperative	Fiji	25.10.16
Emma Stone – Tour coordinator	Terracircle	Australia	-

Day 1. 25 October 2016 – Arrivals in Australia

Arrivals at Brisbane Airport collected. Travelled to Maleny.

Stop over on route at Glasshouse Mountains. Acknowledgement of Country – respects paid to the traditional custodians the Gubbi Gubbi people. Brief discussion of traditional food sources of Indigenous Australians. Overnight accommodation at Maleny Hotel.



Day 2. 26 October 2016 – GREEN HARVEST – Maleny 9:30 am to 4:00 pm

Host Frances Michaels founder and owner of Green Harvest since 1992
www.greenharvest.com.au

Session 1 - Tour of seed storage facilities

Bulk seed in cool storage 18 C degrees.
Dry seed stored in moisture proof impermeable plastic bags. Bags taken from cool storage and left to settle to room temperature before opened for packaging.



Packeted seed ready for dispatch stored in well ventilated room - not air conditioned. Temperatures rarely above >25 C. Aim for quick turnover of seed from within this room. 4-8 weeks.

Demonstration of a range of storage systems using different containers.
Hygiene and prevention of contamination emphasised throughout facilities.
Clear and consistent labelling evident.



Bulk containers for large seed

Session 2 - Tour of nursery and seed gardens



Nursery for a range of vegetatively propagated plants. These plants are sold both through the shop front and through mail order.



Worm farm producing nutrient rich liquid fertiliser



Seed crops

Key points:

- Save seeds from the healthiest strongest plants.
- Plant care – maintain care throughout lifecycle. The protein content of the seed, the food storage within and its ability to maintain its germination is directly related to how healthy that plant was through its entire life. If plant is stressed (weeds / lack of water) this results in lower protein content within the seed, reduced viability, reduced vigour and seed will not store as well.
- Roguing – removing plants that don't look right, signs of disease, signs of different plant characteristics. If not true to type – remove from crop.
- Extra support / staking may be required for seed crops depending on weight of seed crop. Consider big winds.
- Discussion of maturity level of crop for seed.
- Only harvest dry seed. If big rainfall is expected and seed almost ready for harvest bring the seed crop indoors. Even if early harvest results in some loss of crop it is likely to achieve a greater proportion of quality seed than if the crop remains in the field through rain. Rain will damage ripe seed. In some cases, whole plant can be harvested and left to hang under shelter to enable seed to continue to mature.



Gardens also include:

- demonstration of exclusion netting
- an abundance of flowering plants to attract pollinators

Session 3- Marketing systems include shop front / mail order / online store

Key points:

- Alphabetical display of seed. Limited seed on display to preserve quality. Adapt varieties on display to season.
- Specialize in Sub-tropical and Tropical varieties.
- Small packets and bulk seed.
- Also sell propagation materials, grafting tools, organic pest controls, pH test kits, poultry goods, resource books.
- Large majority of sales through their online store

Seedlings available through storefront



- Explanation of import / export arrangements
– Phytosanitary certificates. Limitations of Green Harvest in exporting seed.
- GH aim to provide a range of varieties of varying qualities including rich in flavour, hardy for transport, those that continue to perform when conditions are poor (tolerate drought / heat stressors).
- Small range of F1 seeds. OP Chinese cabbage is so far from what is now commercially desirable and available through F1 varieties it is difficult to consider the OP's as a commercially feasible.
- GH has 165,000 people on their mailing list



Session 4 – Powerpoint presentation

Presentation covered the following topics:

- Why open pollinated seed
- What is hybrid seed
- Background to seed production in Australia
- Growing seed crops on a farm scale
- Controlling cross pollination
- Healthy plants – healthy seed
- When is seed ready for harvest?
- Methods of processing
- Seed treatments (fermentation, heat, freezing)
- Seed drying
- Accurate labelling
- Measures of seed quality (viability and purity)

Background context for seed production in Australia

During the 1920-1970's Australia had a thriving seed industry with global recognition of Australia's strengths particularly for corn and bean seed. The 1970's and 1980's saw small seed businesses bought up by larger seed companies with most of the production of seed taken overseas resulting in a major decline of seed growers in Australia. This also resulted in a decline of resources / equipment available to local seed growers and a vacuum of knowledge/skills. Australia now has very limited seed industry with the exception of the OP seed sector.

Green Harvest consider the best way of saving OP seed and achieving adaptive plant breeding is through it being commercially viable and companies paying to achieve quality and purity.

Packaging

Wide range of measuring spoons for packaging. Tables indicate which spoon to use for what seed based on target number of seeds per packet.



All resources clearly labelled and organised



Key points:

- Cleaning - Winnowing, collection of seed sieves of varying sizes.
- Fermentation (of some seeds i.e. tomatoes / cucumbers) reduces bacterial, fungal and viral diseases.
- Drying - Silica gel has been used for decades to assist with seed drying and remains a useful product. However, this technology has recently been superseded by ceramic seed drying beads for both drying of seeds and pest control particularly in the humid tropics <http://www.dryingbeads.org/>
- Ensure viability through minimal exposure to moisture and heat. Highlighted ways to minimise moisture absorption.
- Cross pollination – distinguishing cross pollination potential for open pollinated vegetables (some are self-pollinating). Factors affecting cross pollination (wind direction, topography, surrounding vegetation. Importance of knowing botanical names to determine cross pollination potential. Hand pollination and bagging to protect against cross pollination. Alternatively, on a larger scale isolation cages are an option. GH introduced a range of materials and designs for bagging and caging.
- Producing sweet corn seed as a wind pollinated crop, select sight with good distance from other corn / maize crops. Where difficult to ensure isolation select site close to the ocean with an onshore breeze and collect from centre of crop. Maize traits are dominant to sweet corn traits.
- Differences in plastics (permeability of plastics). Where humidity is controlled lesser need for moisture proof plastics. Where humidity is not controlled use of plastics greater than 125 gsm (microns).
- GH shared a template of their Growers Contract see Appendix A. They also provided a four page seed production guidelines provided as Appendix B.

Display of germination testing methods



Demonstration of vacuum sealing

Green Harvest were extremely generous with sharing their knowledge and time and provided opportunity for knowledge exchange with all of their staff. GH provided their powerpoint presentation to those delegates that had available USB.



Travelled from Maleny to Gatton to be accommodated at the University of Gatton Halls of Residence.

Day 3. 27th October 2016 – GATTON DEPARTMENT OF AGRICULTURE QLD
9:30 am to 4:00 pm

**Host Zara Hall and Clinton McGrath
Research Scientists**

**Session 1 Seed processing and
treatment systems at the Research
Station**

Zara Hall displaying accession details
on seed packets



Demonstration of processing of tomato seed with hydrochloric acid

Key points:

- Promoted awareness and management of mechanically transmitted viruses such as Pepper Mild Mottled Virus – (PMMV) and Tomato Mosaic Virus. Know where/when viruses are present, know how they are spread (mechanically, through insect, through seed) and have a plan in place for how you are going to manage the risk of transmission.
- Sterilizing seed - To treat for PMMV use a 10% Trisodium Phosphate solution for 20-30 minutes (20grams for 200ml water), dissolve thoroughly, mix with seed, stir regularly, rinse seed to wash off Trisodium Phosphate and dry immediately. Trisodium Phosphate accessed through laboratories. Caution with eyes and respiratory – requires respiratory mask and eye protection
- Ensure good hygiene practices when handling seed – clear space and wash all equipment between samples to protect from contamination

Session 2 Field plots at Research Station



Trials of shallots with varying crop management

Capsicum grafted onto chilli varieties investigating yield improvements with differing rootstocks



Garlic yields from a field trial of varying conditions



Increase in garlic bulb size by 250% over 3 generations through selection of best for planting material.
4 tonne p/ha to 10 tonne p/ha

Clinton McGrath
delivering exercise on
consumer demand
influence over crop
varieties.



Session 3 Tour of vegetable production across the Lockyer Valley



Onion breeding trials aiming to achieve neutral day length onions

Display of variety assessment. Clinton introduced performance tables to guide assessments (see Appendix C)



Production of a range of lettuce varieties

Cucumber production – most successful grower in the Gatton region. Extends season by growing in greenhouse.



Discussion on maintaining genetics and prevention of inbreeding facilitated by Clinton McGrath

Day 4. 28th October 2016 EDEN SEEDS at Beechmont 10:00 am to 3:00pm

Host Alf Finch founder and owner of Eden Seeds since 1987 www.edenseeds.com.au

SEED SUPPLY - Over the 30 years of operation Eden seeds has, at times, produced large quantities of vegetable seed however in recent years their seed production has shifted to contractor arrangements to supply all seed. Currently seed is purchased in bulk and stored for up to 3 years (depending on type) before packaging and resale. Largely, seed is cleaned by the contractor but in some cases there is a requirement to clean seed on site. Eden seeds utilise different seed cleaning technologies depending on the quantities from hand huskers to commercial seed processors.



< Manual
corn husker

Mechanical
seed >
processor

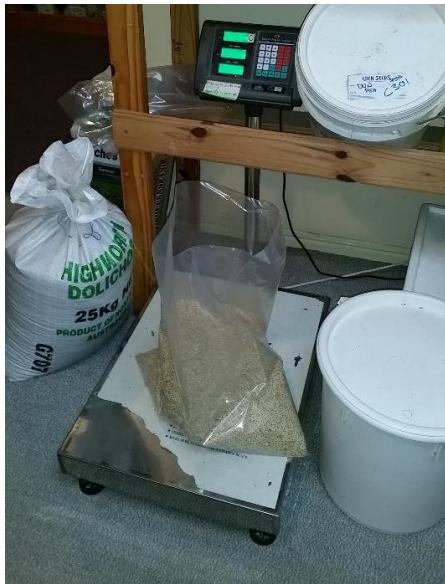


SEED STORAGE - Eden seeds use a range of containers for seed storage including cloth sacks and buckets. The containers to the left are used for bulk storage of legume seed in a humidity controlled room.

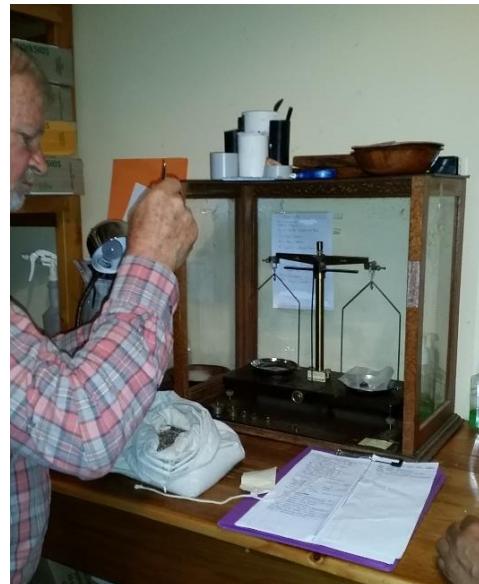
Bulk seed is stored in humidity controlled cool rooms of varying temperatures (14 – 20° C) according to the intended length of storage.



SEED PACKAGING - Eden Seeds supplies small packets of seed for the home gardener along with bulk qualities for the commercial farmer



For bulk packets of large seed electronic scales are used to determine the proportion of seed.



For bulk quantities of small seeds manual weight scales are used.



The large proportion of seed packets are pre-printed. However, where there are small quantities of a variety a stamp set / stamp pad is used for labelling packets with variety name.



Seeds are packeted into small retail packets using varying sized spoons for different sized seeds.



Alf offered hands on demonstrations of seed cleaning, processing and packaging techniques.

Eden Seeds supplies seed to a large number of retail outlets. Edens provides seed display stands supplied for all retail outlets and wherever possible negotiates the location of the stand to be fixed in the coolest part of the store.



Other insights:

- Where seeds show signs of insect attack Eden Seeds freeze seeds for 3 -4 days to kill off insects. Occasionally carbon dioxide gassing of seed in large tubs is also used for insects control. This method is used once only as repeated use can also damage the seed.
- Eden Seeds also provided a planting guide and contact list for seed resources – See Appendix D and E.



The visit to Eden Seeds provided a good opportunity for comparison with the systems in place at Green Harvest. Visiting both of these facilities offered complimentary insights into the practices of commercial seed distributors that are focused on open pollinated vegetables. Both organisations were very generous with their knowledge and provides templates to foster commercial seed operations in the Pacific. The study tour concluded at Eden Seeds and all delegates returned to Brisbane for travel to Honiara for the Open Pollinated Seed Roundtable.

SEED SUPPLY AGREEMENT

Green Harvest Organic Gardening Supplies
 PO Box 92, 9 Gumland Drive
 Maleny QLD 4552 Australia
 Phone: 07 5435 7000
www.greenharvest.com.au

Date:

Name of Grower:

Address:

Phone:

Email:

Green Harvest Organic Gardening Supplies aims to encourage Australian growers of Certified Organic and untreated seeds to grow a range of open pollinated and heirloom vegetables, herbs and flowers. We would like to offer you the opportunity to supply the following seeds to Green Harvest:

Seed Cultivar Name	Botanic Name	Acceptable Minimum Germination Rate	Distance required to prevent cross pollination	Starter Seed Provided by GH?	Qty seed required by Green Harvest	Offer Per Kilogram

This offer is valid for the harvest season 2016-17. The following conditions apply, should you decide to enter into an agreement with Green Harvest Organic Gardening Supplies Pty Ltd (Green Harvest). Please read carefully, then sign and return this document.

TERMS AND CONDITIONS

SEED QUALITY

Varietal Purity:

The genetic purity of each cultivar is essential. Green Harvest reserves the right to be fully refunded if the seed of any cultivar does not grow true to type. Seed crops that are known to cross-pollinate must not be grown in proximity to each other or must be protected following acceptable industry standards. More detailed information on this subject is available and will be provided if needed.

Physical Purity:

Seed must be properly processed, cleaned and graded. It must be free of contamination with other vegetable seeds or weed seeds. Seed must be free of debris and soil. Any insect-damaged, discoloured or broken seed must be removed.

Germination Rate:

Green Harvest reserves the right to refuse the purchase of seed that does not germinate when tested at the acceptable agreed rate. It is preferable that the grower provide results of germination tests before offering seed.

Drying:

Seed must be sufficiently dry, between 5% and 7% moisture content (by weight). As an indicator, when sufficiently dry, corn and beans will shatter when hit with a hammer, squash seeds will break instead of bending.

Quality control:

You will be notified if seed requires further processing including cleaning or drying. A handling fee of \$30.00/hour will apply if this is required. If seed is rejected due to its quality or failure to reach the agreed germination standard it will be returned.

Exclusivity:

If starter seed is provided by Green Harvest, the seed crop produced from the starter seed is to be provided exclusively to Green Harvest up to the maximum amount as stated in this agreement. Starter seed cannot be shared or distributed to other growers without the written permission of Green Harvest.

Maximum and minimum quantities:

The quantity of seed shown in the accompanying chart for each seed is the quantity that Green Harvest agrees to purchase. Any seed grown in excess of this amount will be offered to Green Harvest for a right of first refusal; the grower will communicate with Green Harvest in this instance. If a lesser quantity of seed is harvested, the grower will communicate with Green Harvest about whether or not the amount is acceptable for purchase before shipping.

Offer per gram/kg:

The offer is shown as a per gram or per kilogram price. Offers are inclusive of GST. Payment will be made less any handling charges within 45 days of receipt of seed.

Crop progress:

In order for successful forward planning we require a digital image 8 weeks after planting of the crop. Green Harvest requires the grower to advise at the earliest opportunity if there is the possibility of crop failure.

Documentation:

When seed is shipped to Green Harvest the following documents are required:

- ❖ A tax invoice with ABN and bank details for direct deposit payment
- ❖ If no GST is to be paid and no ABN quoted, a copy of the exemption for hobbyists (Statement by a Supplier) will be provided
- ❖ A current organic certificate, if applicable

Delivery:

Seed may be delivered to Green Harvest or posted via Australia Post at your expense. Seed packaging must be done with care in the double airtight plastic bags provided to ensure protection of the seed from humidity. Seed must be labelled using the labels provided to include the cultivar, botanical name and date of harvest. Green Harvest will record the weight of seed when received, with payment based on a final, clean, dry weight after germination testing.

Organic Status:

Certified organic growers are required to provide documentation of current certification and abide by all conditions set by their certifier in the growing and handling of seed grown for Green Harvest.

All non-certified growers must guarantee the untreated status of the harvested seed. This means the seed must not be treated post-harvest with any pesticide, fungicide, preservative or chemical treatment of any kind.

I have read the above offer, and I hereby agree to all prices, terms, conditions, and quantities. I also agree that close attention will be paid to the pollination requirement for purity of the seed crop and no cross-pollination will occur. I understand that failure to meet the Terms and Conditions will render this agreement void.

Business Name: _____ **ABN if applicable:** _____

Name of Authorised Signatory: _____

Signature _____ **Date** _____

Certifying Organisation _____ **(if applicable)**

Organic Certification number _____ **Certificate Expiry** _____

SEED SAVING, PROCESSING AND STORAGE PRACTICES AT GREEN HARVEST

Green Harvest Organic Gardening Supplies has been helping Australians to grow organically since 1992. It is a family owned and operated Australian mail order business, it started out simply from our desire to share our passion for organic gardening and permaculture. Our aim is to make it easier for Australians to live in healthy, natural homes with a garden full of nutritious, chemical-free vegetables and fruit.

We are an organically certified seed business with ACO (Australian Certified Organic). We specialise in open-pollinated, heirloom seed.

Why Open Pollinated Seeds?

Our seeds are nearly all open-pollinated and so are able to be grown again from seed you save yourself. Open-pollinated seeds are genetically diverse treasures that have been passed on from generation to generation. When you buy and plant open-pollinated seeds you are helping to protect this valuable resource for the future. The loss of genetic seed diversity facing us today could easily lead to a catastrophe far beyond our imagining. The Irish potato famine, which led to the death or displacement of two and a half million people in the 1840s, is an example of what can happen when farmers rely on only a few plant varieties. "The Food and Agriculture Organization of the United Nations (FAO) reports that 75% of genetic diversity in food crops was lost in the past century." From Fatal Harvest, Andrew Kimbrell, Editor.

What is Hybrid Seed?

Hybrid seed is the result of cross-pollinating two or more different types of a variety to produce another. If seed is saved and planted from this hybrid plant, the germinated seed will generally not grow true-to-type.

Growing Seed Crops on a Farm Scale

- ❖ This is only possible with open-pollinated seed
- ❖ Careful attention needs to be paid before sowing on whether the type of vegetable seed e.g. corn, squash or tomatoes will cross-pollinate with another variety. If cross-pollination is likely this can determine either the timing or the spacing of the seed crop. A book such as the *The Seed Savers Handbook* by Michel and Jude Fanton is a valuable resource.

Controlling Cross-Pollination

There are several ways to isolate plants that cross-pollinate to keep the variety pure:

- ❖ plant the varieties far enough apart so that their pollen can't reach each other
- ❖ grow each variety in separate, screened cages
- ❖ cover individual flowers with bags after hand pollination
- ❖ time plantings so that different varieties are not flowering at the same time, and so cannot pollinate each other
- ❖ harvest a seed such as corn from the centre of a large planting

Healthy Plants Produce Healthy Seed

Only save seed from healthy, strong growing plants. Maintain plant care with weeding, watering and fertilising for the life of the plant. Remove any plants that do not appear true-to-type or have a suspected virus disease. As seed heads are forming the plant's need for watering is reduced. Support plants so that seed heads do not fall over in a strong wind.

When is Seed Ready to Harvest?

For seed to store well and retain a high viability and an ability to grow healthy, vigorous plants, it needs to be harvested at the correct time. Seeds should be large and fully mature. Larger seeds have more stored food to nourish the seeds once they are sown and will produce strong, vigorous seedlings. It is best to harvest dry seed; always try to avoid getting mature or nearly mature seed wet as this reduces its quality. If rain is expected try to get the seeds inside quickly for the final drying. Spread the harvested seedheads out on a large sheet or tarpaulin undercover to continue the drying process. Turn the seedheads over regularly to help the dry process. Air movement is also helpful for drying. Make sure the seed is clearly labelled as it changes in appearance as it dries and mistakes could be made.

Seed Cleaning and Processing

Once the seed is sufficiently dry it needs to be cleaned. This should happen as soon after harvest as possible.

beans will shatter when hit with a hammer, squash seeds will break instead of bending. A simple test to check if seed is dry enough, is to place a small quantity in a glass jar with a lid or in a plastic bag. Seal it up, place it in a warm place and keep an eye on it for the next few hours. If any moisture appears on the glass or inside of the plastic bag, the seed is not dry enough and will go mouldy if it is not dried more thoroughly. In humid areas it can be hard to get seed dry enough, using seed drying beads or silica gel can help the process.

Seed drying beads are modified ceramic materials (aluminum silicates) that absorb water molecules and hold them very tightly in their microscopic pores. These beads remove water from the air, creating very low humidity inside of closed containers. Storing seeds inside of containers with the drying beads will remove water from the seeds and dry them without heating. The beads can be reused. Beads and silica gel are used in a similar way by placing them inside the tightly sealed jars of seed. For silica gel an equal weight in a perforated fabric bag is put with the seed into a well-sealed jar for 7 to 8 days. After this process remove the silica gel and transfer the seeds quickly into their final storage container.

Understanding Seed

In essence, understanding seed quality is understanding that seeds are living, breathing entities. Seeds are in dormant state and consist of an embryo and a food source. Maintaining seeds at a stable temperature and moisture levels keeps them dormant. If the seed absorbs moisture their hormonal processes kick in to activate life. If it is the wrong time for this seed to start growing because it is not being planted, some of the seed's stored energy is wasted. If this happens to the seed repeatedly then seed becomes non-viable.

Storage

Most seed has a storage life of approximately 3-5 years – some have less than 1 year, such as parsley and onions. Generally the thinner the seed coat the shorter the storage life.

Choose a seed storage container to:

- ❖ Keep out rodents and insect pests such as cockroaches and weevils
- ❖ Seal tightly to avoid humidity (moisture) affecting the seed
- ❖ Keep the seeds in the dark

Seed can be stored in a heat-sealed laminated foil bag, a non-permeable plastic bag, a tightly sealed plastic container, a vacuum sealed bag or a glass jar.

- ❖ Avoid using common plastic bags for seed storage by themselves as they are simply too thin and allow too much air exchange. Inside another tightly sealed container is better
- ❖ Plastic bags that are not gas permeable are available. The best ones for tropical conditions are 175 - 250 microns thick; these can also be heat sealed
- ❖ Fill containers completely with seeds to reduce air space, the less air inside the better
- ❖ If using a container with a screw top use grease or silicon to seal the opening, this will both insects and air from entering the container.

An ideal temperature for seed storage is 5°C. The best place to store seed containers is a temperature and humidity controlled room. The next best choice is a cold room or fridge but the seed needs to be tightly sealed to prevent moisture-laden air reaching it. The third best choice is a cool, dark cupboard. A combination of vacuum sealing and refrigeration is excellent but vacuum sealing alone is very effective.

Helpful aids: Diatomaceous earth, silica, Pantry Moth traps, vacuum sealer, heat sealer

Seed Quality

Seed quality is about 2 main criteria, viability and purity.

Viability

This is a measure of the seed's ability to germinate.

Viability can be impacted by:

- ❖ Age
- ❖ Seed handling
- ❖ Exposure to heat and moisture
- ❖ Damage by insects or rodents

Purity

Varietal purity is a measure of the seed's ability to grow true to type = cultivar (cultivated variety) or variety type.

Physical purity means the seed is properly processed, cleaned and graded. It must be free of contamination with other vegetable seeds or weed seeds; debris or soil. Any insect-damaged, discoloured or broken seed must be removed.

Accurate Labelling

Labels should include the following information:

- ❖ Vegetable name including variety
- ❖ Scientific name if known
- ❖ Source of seed
- ❖ Date of harvest
- ❖ Seed batch

Understanding Seed

In essence, understanding seed quality is understanding that seeds are living, breathing entities. Seeds are in dormant state and consist of an embryo and a food source. Maintaining seeds at a stable temperature and moisture levels keeps them dormant. If the seed absorbs moisture their hormonal processes kick in to activate life. If it is the wrong time for this seed to start growing because it is not being planted, some of the seed's stored energy is wasted. If this happens to the seed repeatedly then seed becomes non-viable.

Seed germination Trials

This allows you to test the viability of seeds before sowing. Usually 100 seeds are used to give an easy result as a %. Place the seeds between moist paper towel and keep in a warm place. Do not allow the paper towel to dry out. After a few days check for germination.

Handout:

Seed germination template

Seed Handling

Helpful aids: plastic bags, labels, scales, measuring spoons, funnels

You may choose one or more of these selections and/or add your own comments

Onion Assessment Sheet Explanations

Plant Vigour	Top Strength	Leaf Habit	Leaf Colour
<input type="checkbox"/> 1 Unacceptable <input type="checkbox"/> 2 Not as good as standard <input type="checkbox"/> 3 Equal to standard <input type="checkbox"/> 4 Better than standard <input type="checkbox"/> 5 Outstanding feature <input type="checkbox"/> Low <input type="checkbox"/> Medium <input type="checkbox"/> High	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Weak <input type="checkbox"/> Average <input type="checkbox"/> Strong	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Tangled <input type="checkbox"/> Branching <input type="checkbox"/> Average <input type="checkbox"/> Erect	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Green <input type="checkbox"/> Blue Green <input type="checkbox"/> Blue <input type="checkbox"/> Glossy <input type="checkbox"/> Waxy
Root System	Bulb Shape	Bulb Colour	Bulb Size
<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Weak <input type="checkbox"/> Average <input checked="" type="checkbox"/> Good <input type="checkbox"/> Excessive	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Grano (Top) [Gr] <input type="checkbox"/> Flat [F] <input type="checkbox"/> Thick Flat [TF] <input type="checkbox"/> Flattened Globe [FG] <input type="checkbox"/> Globe [G] <input type="checkbox"/> High Globe [HG]	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Dark Brown [DB] <input type="checkbox"/> Light Brown [LB] <input type="checkbox"/> Dark Straw [DS] <input type="checkbox"/> Straw [S] <input type="checkbox"/> Pale [P] <input type="checkbox"/> Dark Red [DR] <input type="checkbox"/> Red [R] <input type="checkbox"/> Light Red [LR] <input type="checkbox"/> White [W]	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Pickler <input type="checkbox"/> Small (50 - 70 mm) <input checked="" type="checkbox"/> Medium (70 - 90 mm) <input type="checkbox"/> Large (90 - 110 mm) <input type="checkbox"/> Jumbo
Bulb Firmness	Bulb Uniformity	Number of Skins	Skin Thickness
<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Soft <input type="checkbox"/> Average <input type="checkbox"/> Firm <input type="checkbox"/> Hard	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Poor <input type="checkbox"/> Average <input type="checkbox"/> Good <input type="checkbox"/> Excellent	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Enter No.	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Thin <input type="checkbox"/> Average <input type="checkbox"/> Thick <input type="checkbox"/> Brittle <input type="checkbox"/> Rubbery
Skin Retention	Single Centers	Adaption	Defects
<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Poor <input type="checkbox"/> Average <input type="checkbox"/> Good <input type="checkbox"/> Excellent	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Poor <input type="checkbox"/> Average <input type="checkbox"/> Good <input type="checkbox"/> Excellent	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Spindles <input type="checkbox"/> Thick Necks <input type="checkbox"/> Partial Bulbs <input type="checkbox"/> Bolting	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Greening <input type="checkbox"/> Purples <input type="checkbox"/> Skin Splits
Top Fall	Disease	Disease	Bolting % Sugars % Pungency Comment
<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature <input type="checkbox"/> Staggered Drop <input type="checkbox"/> Uniform Drop	<input type="checkbox"/> 1. Unacceptable <input type="checkbox"/> 2. Not as good as standard <input type="checkbox"/> 3. Equal to standard <input type="checkbox"/> 4. Better than standard <input type="checkbox"/> 5. Outstanding feature	<input type="checkbox"/> Absent <input type="checkbox"/> Trace <input type="checkbox"/> Medium <input type="checkbox"/> Severe	
Rating			
E - Excellent -G -Good (equal to or better than standard)		NA - No Advantage over Standard	
I Result Inconclusive (plot effect)		NS Not suited for Market	
RW - Retrial Winter	RSP - Retrial Spring	RA - Retrial Autumn	RS - Retrial Summer

Note you can use the bold letter on field assessment sheet

Onion Assessment Form

Assessment Date:

Variety:	Assessor: Greg Bragg		
Location:	Standard:		
Onion Type: Fresh	Type of Onion: Brown		
Planting Date:	Transplant Date:		
Harvest Date:	Season:		
Trial Comments:			
Plant Vigour Acceptable, Firm	Top Strength Acceptable, Strong	Top Habit Acceptable, Upright	Leaf Colour Blue Green, Blue
Leaf Diseases Absent, Traces	Root System Acceptable, Good	Plants at Establishment	Plants at Harvest
Additional Top Comments:			
Bulb Shape Goo	Bulb Colour Cream	Bulb Size Loose (60 - 75mm), Tense (75 - 95mm)	Bulb Firmness Acceptable, Firm
Bulb Uniform Acceptable, Good	Number of Skin 2	Skin Thickness Acceptable, Thick	Skin Retention Acceptable, Good
Single Centre Acceptable, Good	Adaption No issues, well adap	Top Fall Acceptable, Droop, Uniform, Drip	Sugars
Pungency Med, Average	Storage 3 Months Very Poor 40%+ ref	Storage 6 Months Very Poor 40%+ ref	Storage 9 Months Very Poor 40%+ ref
Defects None, Traces	Bolting%	Disease Absent, Traces	Yield/sq metkg
Additional Onion Comments:			
Rating in this trial: G - Good (equal to or better than standard)		Retrial: RSP - Retrial Spring	
Recommendation:			
General Comments			

Onion Assessment Summary Sheet

Assessor:	Grown:		Market		Standard:
	Location:	Date:	Planting Date:	Bulb	
Variety					
Bulb Comments	% Bolt, Pungency, %SS, %Shape, %Size	Established	Plugs/m	Harvest	Yield kg/ha
Storage	Storage 3 Months				Storage 9 Months
Recommendations:					
Bulb Comments	% Bolt, Pungency, %SS, %Shape, %Size	Established	Plugs/m	Harvest	Yield kg/ha
Storage	Storage 3 Months				Storage 6 Months
Recommendations:					
Bulb Comments	% Bolt, Pungency, %SS, %Shape, %Size	Established	Plugs/m	Harvest	Yield kg/ha
Storage	Storage 3 Months				Storage 6 Months
Recommendations:					
Bulb Comments	% Bolt, Pungency, %SS, %Shape, %Size	Established	Plugs/m	Harvest	Yield kg/ha
Storage	Storage 3 Months				Storage 9 Months
Recommendations:					
Rating:	Rating: E - Excellent / G - Good (equal to or better than standard) / NA - No Advantage over Standard / I - Result inconclusive (plot effect) J/RW - Retail Winter / RSP - Retail Spring / RA - Retail Autumn / RS - Retail Summer / P - Poor / NS - Not suited for Market				
Recommendations:					

1. Unacceptable 2. Not as good as standard 3. Equal to standard 4. Better than standard 5. Outstanding feature
Also see Onion Assessment Sheet Explanations

EDEN SEEDS Planting Guide

	Row spacing (cm)	Plant spacing (cm)	Depth (cm)	Cold/Frost Melbourne, Tasmania, Mountains	Mild Perth Sydney Adelaide	Subtropic Coastal Coffs Harbour to Rocky	Tropics	Number of seeds per gram	Best Soil Temp °C	Rate per Hectare	Average Days to Maturity
Amaranth (AF)	50-75	50	0.5	Sep-Nov	Sep-Mar	Aug-Apr	Feb-Nov	900	16-30	1.2kg	50
Artichoke (AF)	200-240	160-180	1-2	Sep-Nov	Aug-Nov	Aug-Nov	Feb-Nov	22	15-18	600g	300-400
Asparagus (AF)	90-120	20-35	1-2	Sep-Nov	Aug-Nov	Aug-Nov	Feb-Nov	23-28	16-30	1.5kg	2-3 years
Broad Beans	60-90	15-25	5	Feb-Sep	Mar-Jul	Mar-Jun	Mar-Jun	0.5-1	6-24	150-200kg	90-120
Bush Beans (AF)	50-60	8-15	2-3	Oct-Dec	Sep-Feb	Aug-Apr	Any	2-4	16-30	60-85	55-70
Climbing Beans (AF)	100	10-20	2-3	Oct-Dec	Sep-Jan	Aug-Apr	Any	3-4	16-30	50	65-80
Beetroot (AF)	45-60	5-10	2	Sep-Apr	Jul-Apr	Any	Any	50-90	8-30	7-9kg	55-70
Broccoli	50-60	35-50	0.5-1	Oct-Mar	Sep-Apr	Feb-May	Feb-Jun	175-330	7-30	400g	60-90
Brussels Sprouts	100	45-60	0.5-1	Oct-Feb	Dec-Apr	Feb-Jun	Feb-Apr	225-300	7-30	400g	85-95
Buckwheat	Broadcast	Broadcast	0.5-1	Sep-Mar	Jan-Oct	Feb-Oct	Apr-Jul	30		60-100kg	30-45
Burdock	60	50	1-2	Sep-Feb	Sep-Apr	Aug-May	Feb-Sep	50		6kg	120
Cabbage	50-75	35-60	0.5-1	Aug-May	Any	Any	200-380	10-35	300g	60-110	
Capicum (AF)	100-150	50-60	0.6	Sep-Nov	Aug-Dec	Aug-Mar	Any	120-160	18-35	400g	70-90
Carrot	25-30	2-5	0.5-1	Sep-Feb	Sep-May	Feb-Nov	Feb-Nov	600-900	10-30	3-4.5kg	65-90
Cauliflower	60-100	45-60	0.4-0.6	Oct-Apr	Dec-Apr	Jan-Apr	Feb-Apr	240-420	10-30	300g	110-155
Celeriac	45-80	15-30	0.2-0.5	Oct-Dec	Sep-Dec	Mar-Oct	Feb-Sep	2100-3000	8-21	300g	90-120
Celery	45-80	15-30	0.2-0.5	Oct-Dec	Sep-Dec	Mar-Oct	Feb-Sep	2100-3000	12-21	400g	120
Chilli	90-120	40-50	0.6	Sep-Nov	Aug-Dec	Aug-Mar	Any	130-190	18-35	500g	65-80
Collards	50-100	40-50	0.5-1	Jan-Apr	Feb-Apr	Mar-Sep	Apr-Sep	300	8-30	500g	60-80
Corn (Maize) (AF)	60-90	20-30	2-3	Oct-Jan	Sep-Feb	Aug-Mar	Any	2-4	16-35	8-10	100-150
Corn (Sweet) (AF)	60-90	20-30	2-3	Oct-Jan	Sep-Feb	Aug-Mar	Any	4-7	16-35	10-15kg	80-100
Cucumber (AF)	120-150	40-60	1	Oct-Dec	Sep-Jan	Aug-Mar	Feb-Sep	30-40	16-35	1-2kg	60-70
Eggplant (AF)	80-90	50-80	0.5-0.8	Sep-Nov	Aug-Dec	Aug-Mar	Any	200-250	24-32	250g	90-110
Gourd (AF)	150	90-120	2	Oct-Nov	Sep-Dec	Aug-Jan	Any	10	20-30	2kg	95-120
Herbs, Parsley	50-60	20-30	0.5-1	Oct-Apr	Sep-May	Feb-May	Apr-Sep	500-650	10-30	3.5-4.5kg	65-135
Kale	50-100	40-50	1	Jan-Apr	Mar-Apr	Mar-Jun	Apr-Aug	250-370	8-30	500g	50-65
Kohlrabi	35-40	10-20	0.5-1	Aug-Mar	Aug-May	Mar-Aug	Mar-Sep	250-350	8-30	2-2.5kg	55-70
Leek	30-75	10-15	0.5-1	Sep-Mar	Sep-Apr	Jan-Mar	Feb-Mar	350-450	8-30	2.5-3.5kg	105-130
Lettuce	35-50	20-30	0.6	Sep-May	Any	Any	Feb-Nov	600-1200	8-27	1-2kg	60-85
Luffa (AF)	150	45-75	3	Sep-Nov	Sep-Dec	Aug-Jan	Any	6	20-30	8kg	80
Marrow (AF)	100-120	90-120	2	Oct-Dec	Sep-Jan	Aug-Mar	Feb-Sep	6-8	20-35	2-4	90-120
Mustard	50-75	35-60	0.5-1	Any	Any	Any	Any	300	10-35	300g	40-60
Okra (AF)	90-120	35-60	1	Oct-Nov	Oct-Dec	Aug-Feb	Feb-Sep	15-25	20-35	8-9kg	80-98
Onion	30-40	5-10	0.5-1	Feb-Sep	Feb-Aug	Feb-Jul	Mar-Jun	240-400	8-30	3.5-4.5kg	180-240
Parsnip	35-50	8-10	0.5-1	Aug-Feb	Jul-Mar	Feb-Sep	Mar-May	230-400	6-21	5-6kg	120-140
Pea	45-60	5-8	2-3	Jan-Oct	Feb-Sep	Mar-Jul	Mar-Jun	3-5	8-24	100-120kg	65-80
Pea (Snow)	60-100	6-8	2-3	Jan-Oct	Feb-Sep	Mar-Jul	Mar-Jun	3-5	8-24	50-80kg	60-74
Pumpkin (AF)	250-300	90-120	3	Oct-Dec	Sep-Dec	Aug-Feb	Feb-Sep	5-12	20-32	1.5-2.5kg	105-140
Radish	25-35	3-5	1-2	Any	Any	Any	Any	100-140	8-30	15-25kg	40-50
Rhubarb	60-70	40-50	1.2	Sep-Dec	Aug-Jan	Aug-Feb	Feb-Sep	60			
Rockmelon (AF)	120-150	40-60	1-2	Oct-Dec	Sep-Dec	Aug-Feb	Feb-Sep	25-40	20-32	1.8-2.5kg	75-115
Rosella (AF)	90-120	45	1	Nov-Dec	Oct-Feb	Sep-Mar	Aug-Mar	50-70	24-32	2.2-2.5kg	175
Salad Greens, Endive	45-60	20-30	0.5-1	Sep-Mar	Sep-Apr	Mar-Jul	Mar-Jul	700-1000	15-25	600-1kg	70
Salsify	20-40	5-10		Aug-Feb	Aug-Mar	Mar-Oct	Mar-Aug	60-80		1kg	110-180
Shallots	20-30	2-3	0.5	Feb-Oct	Feb-Sep	Feb-Sep	Mar-Jul	350-480	8-30	3-4.5kg	85-105
Siliverbeet	50-60	15-30	1.5-2	Sep-Mar	Se-May	Any	Feb-Sep	50-60	10-30	8-20kg	50-85
Spinach - Bush	30-40	12-20	1-2	Feb-Oct	Feb-Oct	Mar-Jun	Apr-Jun	50-70	8-24	14-18kg	39-50
Spinach - Climbing	100-150	15-30	1-2	Sep-Dec	Aug-Jan	Aug-Mar	Any	13-30	16-30	1.5-2kg	50-70
Squash (AF)	90-120	60-80	2-3	Oct-Dec	Sep-Jan	Aug-Mar	Feb-Sep	7-12	21-35	2.5-5kg	50-60
Sunflower (AF)	50-100	20-30	1-2	Oct-Dec	Aug-Jan	Aug-Apr	Any	7-15	10-12kg	70-80	
Swede	45-70	10-20	1	Any	Jan-Apr	Jan-May	Feb-May	380-480	15-30	2kg	70-75
Tomato (AF)	60-150	40-60	0.5	Sep-Dec	Aug-Dec	Aug-Apr	Feb-Aug	250-400	16-35	300-400g	60-120
Turnip	30-50	12-20	1	Sep-Apr	Sep-Apr	Aug-May	Mar-Sep	400-500	12-30	2.5-4kg	45-65
Watermelon (AF)	150-200	60-75	2-3	Sep-Dec	Aug-Dec	Aug-Feb	Any	10-20	21-35	3-4kg	68-100
Zucchini (AF)	90-110	50-90	2-3	Oct-Dec	Sep-Jan	Any	Apr-Sep	6-12	21-35	2.5-5kg	44-63

(AF) = After Frost.

We are not a farming advisory service. For commercial advice please contact your local Agricultural Department. We supply Traditional Open Pollinated seed for home gardeners and information supplied is done so in good faith. We take no responsibility for its accuracy. This seed planting guide is only a general reference. For more information consult gardening books or magazines; local knowledge is invaluable. A handy book is YATES "GARDEN GUIDE" available at libraries and newsagencies, though you may wish to seek information on fertilizing from other publications.

Seed depth is governed by the size of seed. Usually one to two times seed thickness. For spacing try to imagine the space taken up by mature plants. Sow accordingly or more thickly and thin out later. Some, mostly small seeds, require raising as seedlings and transplanting; others, mostly large seeds, prefer to be direct sown.

Variables such as soil types, fertility, soil temperature, climatic conditions and cultural practices all have different effects on growth response of seeds. Local knowledge is invaluable. In milder climates, in sheltered town gardens and by the sea, where there are milder conditions including no frost, allow plantings later and earlier.

HERBS require similar conditions to vegetables. We can give no one ideal set of growth conditions. As a general guide most require a sunny position, moist and well drained, mulched, mostly fertile weed-free soil, protected from frost and wind.

All seed is guaranteed to the value of the original purchase price.

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