

Solomon Islands

Kastom Gaden Association + Planting Material Network

Training Tools for

Pacific Island
Communities

COMMUNITY SEED SAVING

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Emma Stone

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Pacific Island Communities

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Emma Stone
2002

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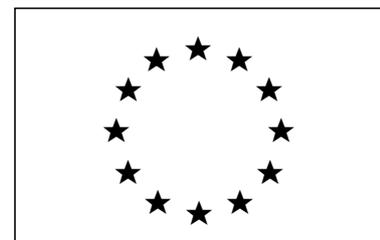
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The PMN/KGA acknowledges:

- the support of the Australian Agency for International Development (AusAID) in funding the production stage of the *Community Seed Saving* manual
- the support on the European Union Micro Projects Program in funding the printing of the *Community Seed Saving* manual.





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After training with Australia's Seed Savers' Network, Emma spent two periods—in 1998 and 1999—training seed curators from the Solomon Islands Planting Material Network and working with rural communities in seed saving and food production in the Solomon Islands.



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Preface

Quality seed is critical to maintaining village food security.

This manual is designed as a tool for small scale, community-based (local and regional) seed production and distribution centres. It may also be useful for village farmers to assist in producing high quality seed for their gardens.

This manual is based on the procedures used for producing seed at the Planting Material Network (PMN) seed centre at Burn's Creek, Honiara, Solomon Islands.

The Planting Material Network system ensures production and distribution of high quality seed and offers good organization of seeds during the different stages of processing.

This manual will assist you in understanding all these factors and help you with the skills you need to produce good quality seed and good quality food.

...Emma Stone



Emma Stone transplants seedlings at the Honiara seed centre

Introduction



Introduction

On the outskirts of Honiara, capital city of the Solomon Islands, there is a large garden in which a small number of people go about their work of harvesting and processing seeds. The garden belongs to the Solomon Islands Planting Material Network (PMN) and the gardeners are seed curators employed by the Network to maintain a flow of seeds to Solomon Island farmers.

A prolific garden with vegetables, herbs and tree crops, it is the successful outcome of collaboration between non-government organisations (NGOs) operating at the community level... NGOs in both the Solomon Islands and Australia. Its success proves that small scale development assistance projects and cooperation between organisations and individuals in developed and developing countries can work in the South Pacific.

People, as aid professionals know, are the crucial component necessary to the success of any development project. In this, the PMN is no different—it has been

the people who have worked with the organisation and those in the Solomon Islands and Australia who have voluntarily supported it who have made the PMN into what is probably the most successful seed production and exchange organisation in the region.

The author of this manual, Emma Stone, is an energetic and capable young woman. In 1998 Emma spent some months with the PMN training staff and improving the seed production, processing and distribution system.

In 1999 she returned to the Solomon Islands as a placement with the Australian government's Youth Ambassador scheme which was set up to give young Australians experience in developing countries. On this visit she further developed work started the previous year.

This manual is the outcome of Emma's work with the PMN and the rural farmers who participate in it.



The seed production garden of the Solomon Islands Planting Material Network in Honiara with the office of the Kastom Gaden Association in the background

Saving seed through use

The PMN conserves seeds by using them.

Seeds contributed by farmers or held by the PMN are multiplied in the garden and then distributed to farmers who are members of the organisation. Those farmers donate some seed from the crops they grow back to the PMN where they are planted out and their quantity again multiplied.

Unlike seed banks which hold seeds in storage for a long time, the PMN relies on the continual distribution and growing-out of seeds by member farmers and in its own garden to maintain supplies.

Continuing earlier work

The PMN started its work in 1995 as part of the Kastom Garden Program (KGP).

For its first six years, the KGP was supported by the Australian NGO APACE (Appropriate Technology for Community and Environment). To support the KGP, APACE—which had been involved in village micro-hydroelectric development in the Solomons since the late 1970s—accessed funding from AusAID, the Australian Agency for International Development, a federal government body that administers the aid budget and is part of the Department of Foreign Affairs.

APACE support underwrote the work of the PMN centre at Burns Creek, Honiara, which has served as the central link of the organisation in its work in the provinces. In 2001, the coup and subsequent conflict in the Solomon Islands stimulated the setting up of a more secure, second seed saving centre on the island of New Georgia, Western Province. By that time, the PMN had started to realise its ambition of establishing small, village-based seed centres throughout the islands.

In 2002, the KGP became an NGO in its own right after APACE made the decision to end its involvement in agricultural development. At the same time, the KGP transformed itself into the Kastom Gaden Association (KGA), an NGO based in the Solomon Islands.

An important role

For farmers in developing countries, a reliable supply of seeds is necessary if they are to achieve a reasonable level of food security. We can think of food security as the availability of a supply of food year-round... a supply that is diverse and plentiful enough to support a high standard of nutritional health. Nutritional health is important because, without it, communities lack one of the basic human needs critical



The Planting Material Network garden multiplies seeds that are processed and distributed to members

to any further development they might choose to take.

The availability of non-hybrid seed (seed that can be saved and planted to produce future crops) is also important in the approach to agricultural development used by the KGA. This approach is known as Low External Input Sustainable Agriculture (LEISA). It is used by development agencies and farming communities in many developing countries because it makes use of techniques and processes that are accessible to farmers who lack access to capital and credit.

Unlike wealthier farmers in developing and in developed countries, financially-poor farmers cannot afford the so-called 'improved' seeds supplied by the big seed corporations and the farming inputs—such as fertiliser, pesticide and herbicide—which are necessary to successfully grow these seeds. Complicating their predicament is the fact that poor farmers frequently cultivate marginal, low quality land unsuited to the type of farm mechanisation and irrigation that large scale commercial farmers make use of. In many cases, the world's marginal farmers produce first for subsistence—consumption by the family—and only then do they grow a surplus to sell at local markets. The availability of a local or regional supply of seeds is obviously crucial to such farmers.

A further benefit of using local varieties of non-hybrid seed is that the varieties can be conserved. Already adapted to local conditions of climate and soils, they remain available to farmers in the future who can continue to use them as food and for plant breeding.

One of the purposes of establishing seed saving and exchange networks is to improve both local and regional self-reliance in the supply of seeds. This is very important in countries where natural disaster, war or internal conflict could disrupt the availability of food and where agricultural production may have to be quickly boosted to cope with refugee movement or economic crisis.



Solomon Islands Planting Material Network staff use the blackboard to organise their weeks activities

Visitors inspect the Solomon Islands Planting Material Network garden



The Seed Savers' Network

To train the local women who are employed as seed curators in the PMN garden, Emma drew upon her own training in community seed saving as an intern with the Seed Savers' Network.

Based in Byron Bay on the NSW north coast, the Network is Australia's most successful community-based seed saving and exchange organisation.

Through internships and courses the Network has trained Australians who have later worked in community seed saving in developing countries. The Network also accepts as trainees people from developing countries who want to acquire seed saving skills and use them when they return home. Roselyn Kabu, Mary Timothy and Inia Barry, all from the PMN, completed training with the Seed Savers' Network.

The Network has assisted the PMN since its inception. Jude and Michel Fanton, directors of the Network, served as consultants on the first series of PMN workshops in 1995 and have maintained a close association with the PMN, both on a consultancy and voluntary basis, since that time.

The manual

Through generations, people in both developing and developed countries have saved the seeds of their food plants and of other useful species for planting in successive crops. The seeds, with other plants reproduced by cuttings and tubers, constitute part of a cultural heritage passed on through families.

Through modernisation, with its imported foods and seeds, this cultural heritage is being lost. This is unfortunate because a reliable supply of seeds adapted to soils and climate, seeds which can be collected, saved and replanted, provides security in the face of change.

The *Community Seed Saving* manual is designed to serve as a reference for agricultural trainers. It is a contribution by Emma Stone and the people and organisations she is associated with to a better future for communities in the South Pacific.

...Russ Grayson, Sydney, June 2002



Participants in the first Solomon Islands PMN workshop with Australian Seed Savers' Network trainers Jude and Michel Fanton. The KGA's Roselyn Kabu is in the centre.

A tool for community seed centres

This section covers the role of community seed centres and the bucket system of processing seeds.



A tool for community seed centres

Producing planting materials for gardening is a fundamental activity of Pacific Island food gardeners.

Small scale, decentralised seed production and distribution centres can play an important role in improving this activity. It will also conserve local varieties of crops.

Traditionally, planting material for Pacific Island food gardens was obtained by replanting a part of the plant after harvest. This is known as 'vegetative reproduction'.

Now, there is an increasing range of fruits and vegetables being used in the Pacific Islands that are grown from seed and which are an important part of the diet.

Drawing on the experience of the Solomon Islands Planting Material Network, the methods described in the following pages will help rural-based training institutions such as vocational training centres, community groups, schools and farmer groups grow, harvest, process and save the seeds of their food crops and distribute them among farming families participating in the seed centres.

Village agricultural centres or groups that specialize in seed production can:

- be a source of healthy and vigorous seed to replace degenerated or lost seed
- adapt different varieties to local conditions
- supply farmers with quality seed of new varieties
- educate farmers about on-farm conservation of their local crop varieties
- assist to spread seed through local networks based on family and clan relations and other community ties.

Seed production is easy

Seed production is a relatively easy process. By allowing the plant to go through its full life cycle and collecting the seed, you will have the planting material for the next season.

Saving seed from the healthiest of your plants and replanting the best of these seeds allows the plant to adapt to the local conditions.



Visitors to the PMN Seed Centre at Burn's Creek, Honiara, learn about drying seeds in the sun.

The centre demonstrates the gardening and seed saving techniques taught by its trainers.

By collecting the seed of the best plants you slowly improve the suitability and quality of this plant variety each time it is selected and regrown.

Things to think about

There are some things we should consider to keep our varieties of plant pure and healthy and able to reproduce the same quality of seed.

These factors include:

- collection and cleaning techniques that vary from plant to plant
- adequate drying and storage of the seed to keep it viable until planting
- awareness of cross pollination to keep a variety pure.

The bucket system

In the system described in this manual, the seed moves through a series of buckets from harvest to distribution. Each bucket contains seed at different stages.

This manual defines the process:

- for the handling of seed for each bucket
- the transfer process for moving seeds from one stage to the next.

If you put your equipment in boxes containing all the materials needed for each process, your work will be organised.

This manual will help you

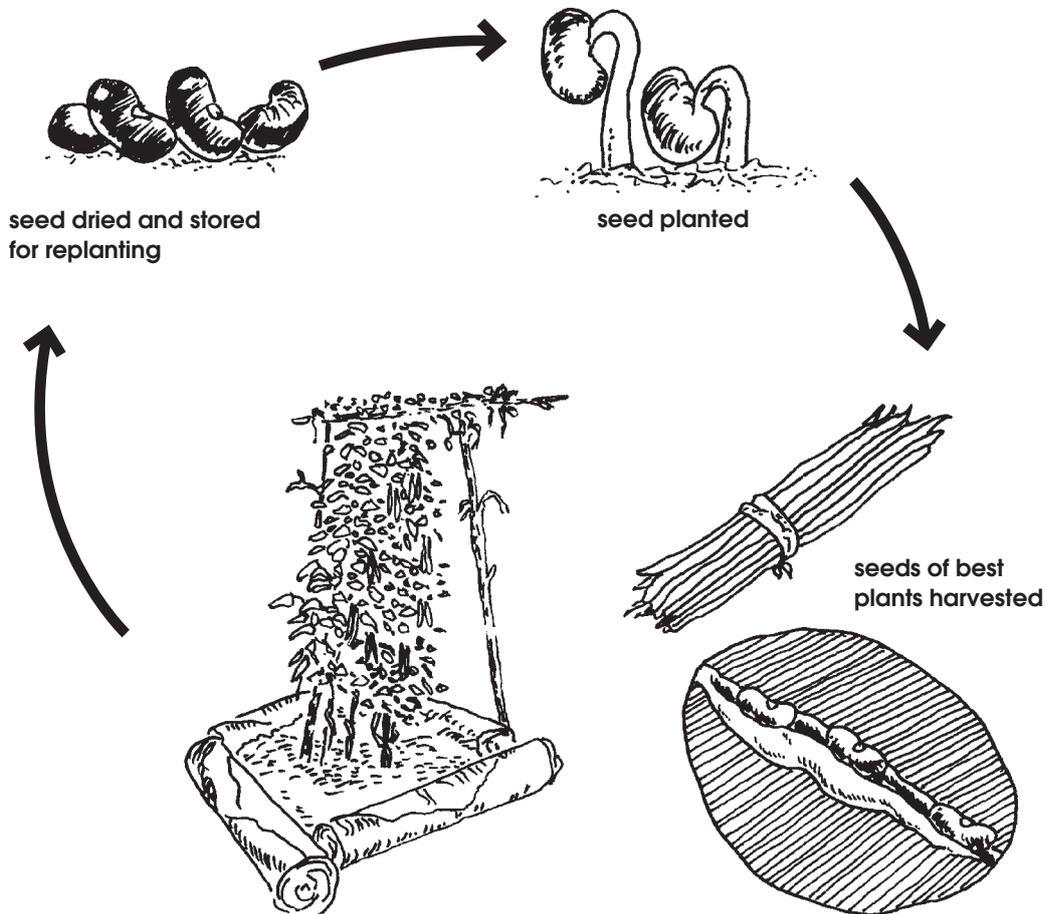
This manual will assist you in understanding all these factors and help you with the skills you need to produce good quality seed and good quality food.



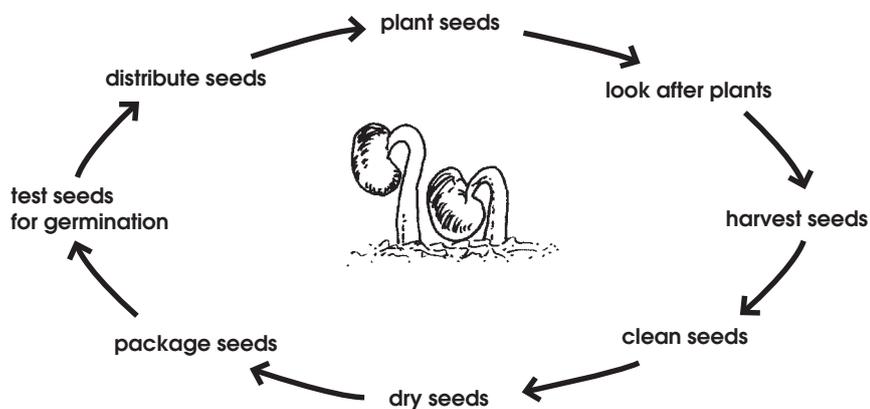
Seed room

Building a seed room is a good idea for community seed saving. A seed room can have a table where seeds can be removed from the fruit, a seed drying place and seed storage.

The seed saving cycle



Seed production flow chart



Tools and materials...

...for establishing seed production centres

Garden requirements:

- small garden area with good soil
- method of irrigation especially for nursery and garden (if area has a strong dry season)
- suitable materials for garden stakes (eg bamboo)
- basic garden tools, digging stick, bush knife, hoe, buckets or hose for watering.

Nursery equipment:

- source of old rotting coconut husk
- grater for coconut husk
- nursery boxes on raised table
- hose pipe
- buckets and tins with small holes in the bottom for watering
- weatherproof labels.

Stationery needs:

- small expandible file system or cabinet
- paper/notebooks
- pens
- stapler.

Seed bank equipment for production centres

- seed drying area in full sun on a table or dry area of stone/sand
- shelving area 3m x 2m
- desk space
- six large buckets (20L) with airtight lids for seed storage during processing
- boxes for storage of all equipment
- PVC or impermeable plastic bags
- airtight sealers for bags
- silica gel for moisture absorption
- seed cleaning sieves
- coconut shells or bowls
- absorbent material, calico or paper for village farmers
- small thatched house that is clean and dry for seed processing.

Ashes or rice can be used instead of silica gel to absorb moisture. Ashes, oil, lime, Neem leaves or castor leaves can be used to prevent insect infestation of stored seed. Tins or jars with a tight lid can be used instead of PVC plastic bags to contain seed.

Some materials expensive

Some materials mentioned are imported and may be expensive for the village farmer eg. silica gel, PVC bags.

These materials are recommended for centres specialising in seed production but there are other options that require only the simplest of materials that are available to any village farmer.

The seed saving process

The seed saving process goes through a number of stages.

This manual follows those stages.

1. Making your seed garden

Make a garden in which to grow plants for seed (page 25)



2. Looking after plants

Mulching, weeding, labelling etc (page 26)



3. Select the best seed

Choose seed from the healthiest, most productive, pest resistant and tastiest plants (page 35)



4. Collect seed

Harvest the best of the seed in your garden (page 36)



5. Clean seed

Clean husk and other material from your seed (page 39)



6. Dry seed

Dry your seed ready for storage (page 41)



7. Test seed germination

Work out the number of seeds likely to grow in the garden (page 47)



8. Packaging seed (page 55)



9. Store seed

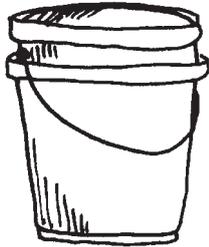
Store seed safely so it will not rot or be eaten by insects (page 57)



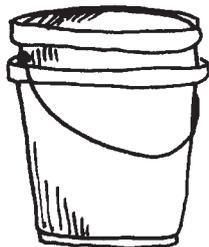
10. Distribute seed

Share seed with other gardeners so all benefit from a reliable supply of food

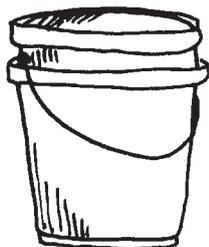
The bucket system



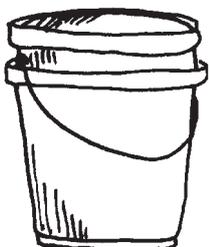
bucket #1 'Seeds for Drying'



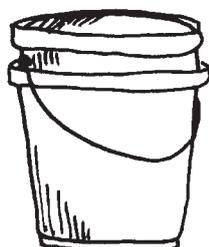
bucket #2 'For Germination Test'



bucket #3 'In Germination Testing'



bucket #4 'For Garden'



bucket #5 'For Packaging'



bucket #6 'Seeds for Distribution'

Making a garden:

This section contains important information about gardening.

- Make your garden
- Improving soil fertility
- Integrated pest management
- Pollination



Make your garden

Choose an area with good sun close to the seed processing house.

Make a fence

It is a good idea to have a fence around the garden to keep out animals.

You can plant a living fence with pineapples or other dense or spiky plants.

One of the best living fence plants is vetiver grass. If planted closely it will form dense clumps and stop anything from entering the garden.

Some people in the Solomon Islands have used other materials such as fishing net and old pieces of corrugated iron. This works very well if these materials are available.

Make as table garden

You can also make a table garden.

This is made on raised timber boards with a low wall around the outside. The box needs to be at least 15cm deep.

The box is filled with rotten coconut husks with a layer of soil on top. This works well for Chinese cabbage, peppers, even tomato and beans.

Placing your plants

To use maximum space in the sup sup garden:

- beans and snake bean can be grown on sticks or bamboo
- eggplant can be grown in the shade of other plants
- pawpaws can be planted around the boundary of your garden.

Living fence of vetiver grass

Vetiver grass is a stiff clumping grass which is planted close together to make a living fence.

The vetiver grass should be planted first and left to grow tall before planting any seedlings. This will take about six months.

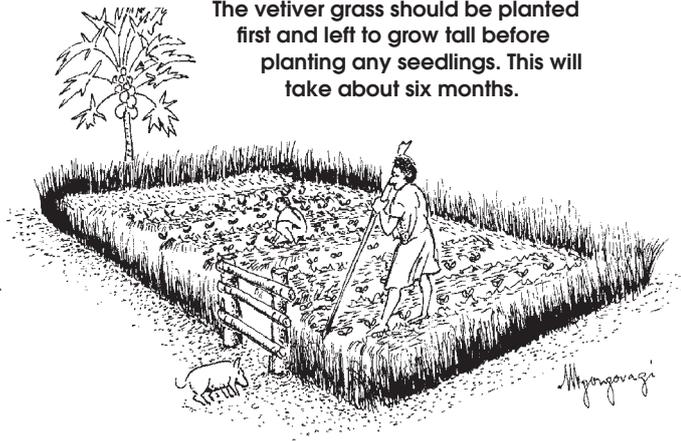
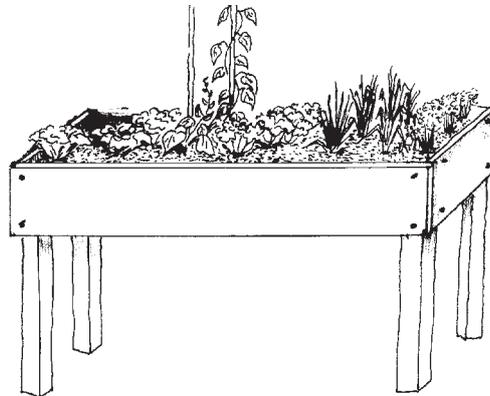


Table garden

The table garden lifts vegetables above the reach of chickens, dogs and pigs.



Improving soil fertility

Using one or more of the following methods in your garden will help to improve the fertility of your soil and your garden's health and productivity.

The sup sup/seed garden uses many different organic methods to maintain and improve the soil fertility.

The methods are simple, reliable and easy to use with local material.

Mulching

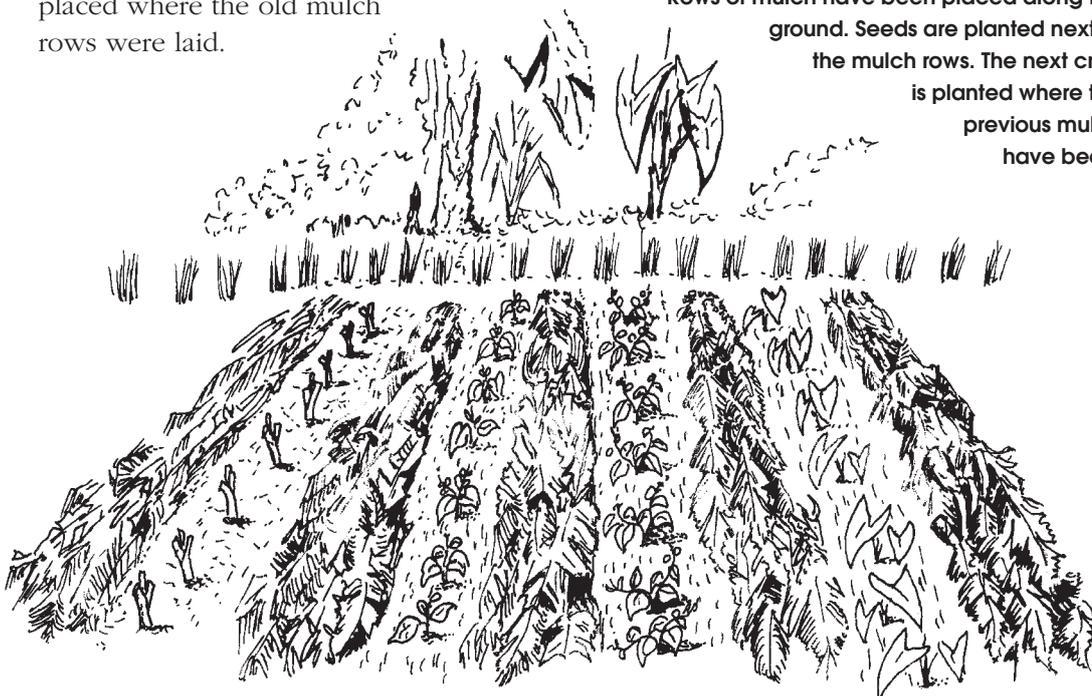
This is a way to make a row-mulched garden:

- organic material—mulch—is laid onto the garden in rows about 30cm high spaced about 1 metre apart
- seeds and cuttings are then planted into the soil along the edge of the mulch rows; as the mulch rots the organic matter feeds the plants
- for the next planting, the mulch rows are made where the previous crop was planted; the new rows of seeds are placed where the old mulch rows were laid.



A mulched garden with rows of Gliricidia trees planted across it (see alley cropping next page)

Rows of mulch have been placed along the ground. Seeds are planted next to the mulch rows. The next crop is planted where the previous mulch have been.



Mulching by alley cropping

Another method of mulching is alley cropping:

- rows of Glyricidia or other legume trees are planted into the garden two metres apart with one cutting every metre; they should be planted at an angle for a good striking rate; the legume trees are nitrogen-fixers and provide a nutrient-rich mulch
- as the trees grow the leaves are slashed and placed as mulch on the soil in the rows in between the Glyricidia trees
- food plants are planted into these rows.

These methods have been developed over a number years of field work in the Solomon Islands.

The benefits of mulching include:

- reduced soil erosion
- reduced water evaporation, therefore the need to water the garden is less
- adding organic matter to the soil.

Materials for mulching

USE: plants, leaves, grass, food scraps

DON'T USE: tins, bottles, plastic



Compost

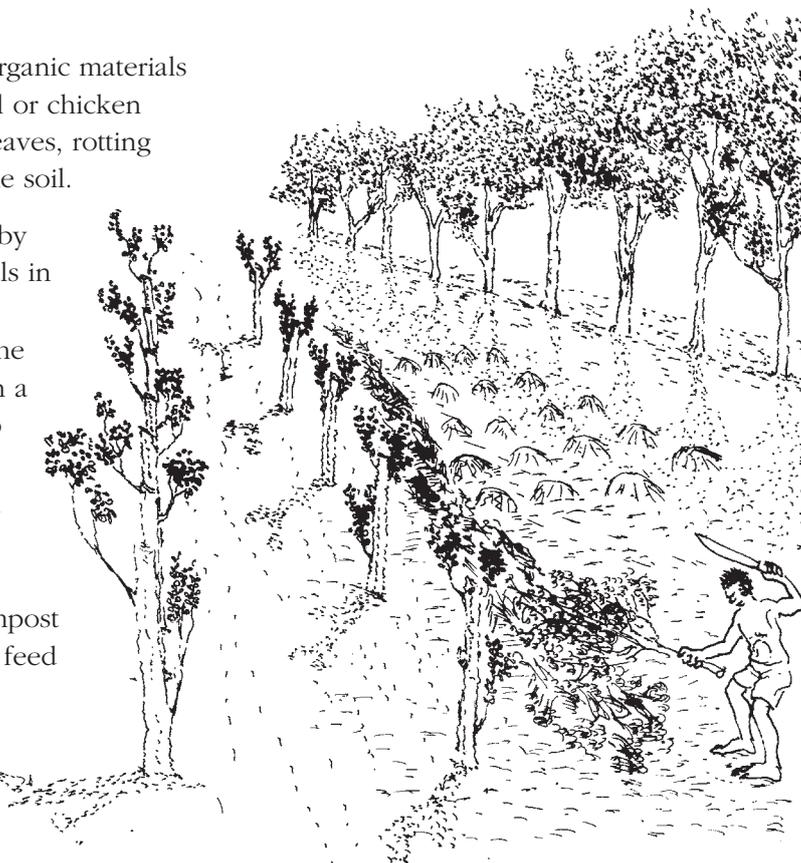
Compost is a mix of any organic materials such as food waste, animal or chicken manure, paper, sawdust, leaves, rotting weeds and plants and some soil.

When you make compost by mixing the organic materials in layers:

- blend some or all of the ingredients together in a large pile or in a deep hole
- the mixture will break down to form a rich organic fertilizer
- place the finished compost around your plants to feed them.

Mulching with Gliricidia

Gliricidia trees can be grown in rows with crops planted between them. The leaves can be cut and used as mulch.



Green manure crops

These are legume plants which feed nitrogen to your crops and include:

- most beans—soya bean, velvet bean, mung bean, peanut
- pigeon pea.

If you alternate a green manure crop with your food crop it will help to increase the soil fertility.

Liquid manure

To make a liquid manure:

1. Fill a large bag (25-50 kg size) with animal/chicken manure, food scraps, seaweed, ashes from the fire.
2. Hang the bag in a large drum of water.
3. Cover.
4. Leave for one to two weeks.

The water absorbs the nutrients from the organic contents. The water is then applied to your plants as a rich liquid fertilizer.

Information about making your soil fertile

Comprehensive information on organic gardening for the tropics can be found in the book:

SAPA—The natural way of growing food for the Solomon Islands

by Joini Tutua and Tony Jansen.

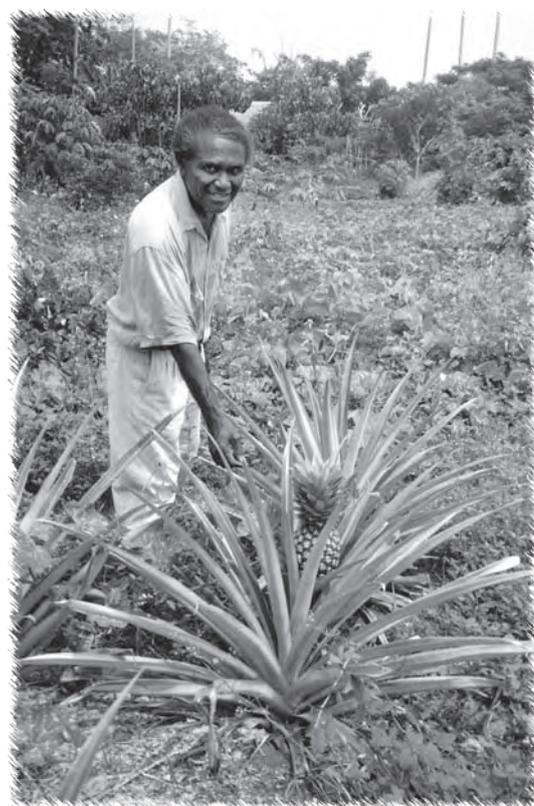
Published by APACE, University of Technology, Sydney Australia, 1994.

Available from:

Joini Tutua or Kastom Gaden
Association, PO Box 742, Honiara,
Solomon Islands. Phone 39551.



Legumes are good green manure crops



Honiara organic farmer and author of *Sapa*,
Joini Tutua

Integrated pest management

Integrated pest management uses a diverse range of natural methods to reduce the risk of insects attacking crops.

Healthy Soil

Healthy soil is the key to healthy plants.

If the soil is poor and deficient in nutrients then the plants will struggle.



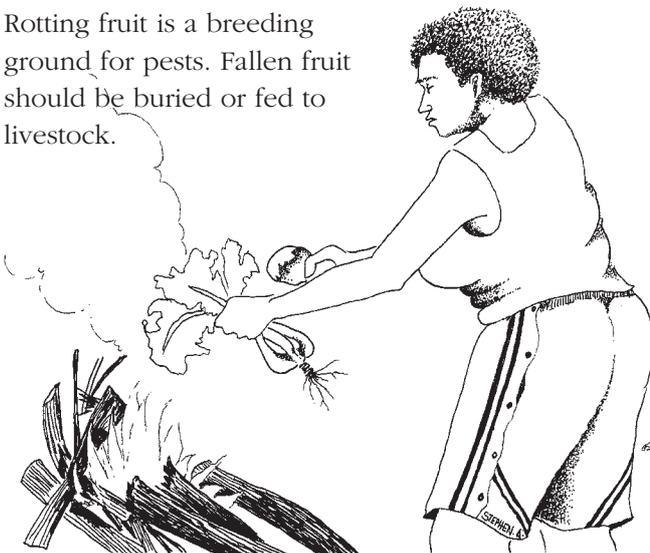
Adding mulch helps improve the soil

Garden hygiene

The garden should be kept clean of unhealthy and diseased plants.

Rouging—the clearing out of old, diseased and pest ridden plants—reduces the number of insect pests in our gardens.

Rotting fruit is a breeding ground for pests. Fallen fruit should be buried or fed to livestock.



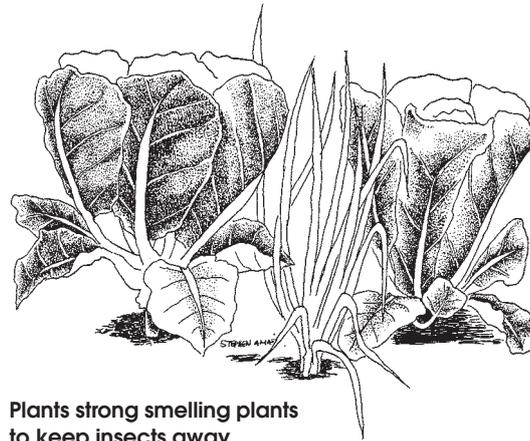
Removing dead and damaged plants helps to keep our gardens free of disease

Companion planting

If there is only one or two varieties of plants in the garden there is a high chance of insect attack.

Planting lots of colourful and strong-smelling plants will confuse and deter insect pests.

The wider the range of plants within one area, the less chance of insect problems.



Plants strong smelling plants to keep insects away

Choose appropriate Varieties

Start with plants that are suitable and well adapted to the climate of your garden.

Seeds and planting materials that have come from another climate may struggle to adjust and be less resistant to the types of insects in your area.

Picking Insects

The time-honoured way of controlling insects is to pick them off the plant by hand.

The insects can then be crushed and mixed with water and sprayed back on the plant as a natural bug spray. Pest insects will be deterred by the smell of other dead insects.

Natural Sprays

You can make insect sprays from plants grown in your garden.

Crushed chilli, tobacco and marigold, when fermented in water for a few days, can be sprayed onto the leaves of the pest-ridden plant as a control.



**Look for insect pests in your garden.
Pick them off your plants when you see them.**

Bagging

Fruits can be protected from insects that feed on them and lay eggs inside by making a bag out of paper or large flexible leaves and placing it around the fruit.

If using this techniques you need to make sure you make the bag large enough for the fruit to grow to full size.



Plants used to make botanical sprays for pest management

Tobacco

Ginger

Chilli

Marigold

Pollination

Pollination is the process a plant uses to reproduce.

During pollination, the male parts of a plant fertilize the female parts. These pollinating parts are usually found in the flower. The placement of these pollinating parts within the flower varies from plant to plant.

Cross Pollination

Cross pollination occurs when two different but closely related varieties pollinate each other. The result is a seed of mixed variety. Usually, the seed of a cross pollinated plant will be weak and lacking in consistent characteristics or may not germinate at all.

Controlling and preventing cross pollination requires an understanding of how plants pollinate.

Complete flowers

Complete flowers are plants with the male and female parts within the same flower.

Plants with complete flowers can sometimes pollinate themselves before the flower opens.

- you can grow just one plant with complete flowers and it will still set good, viable seed
- you can also grow more than one variety and they will have minimal chance of cross pollinating
- some plants like cabbage, chilli, peppers, eggplant, marigold and sunflower can cross pollinate (see page 32 about ways to prevent cross pollination).

Plants with complete flowers such as beans, lettuce and tomatoes are easy plants for beginners to save seed from.

Monoecious flowers

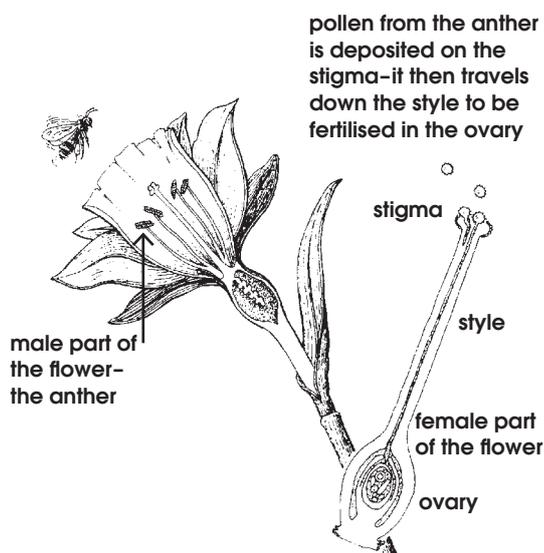
These are plants with both the male and female pollinating parts in different flowers on the same plant.

This is clearly seen in plants of the cucurbit family (pumpkins, melons, cucumbers). Corn is also monoecious. It is best planted in a block to ensure pollination.

These plants require either wind or insects to carry the pollen from one flower to the other.

They can:

- set fruit and reproduce if you grow just one plant
- if you grow more than one variety, there is a high chance that they may cross pollinate (see page 32 about ways to prevent cross pollination).



Complete flower

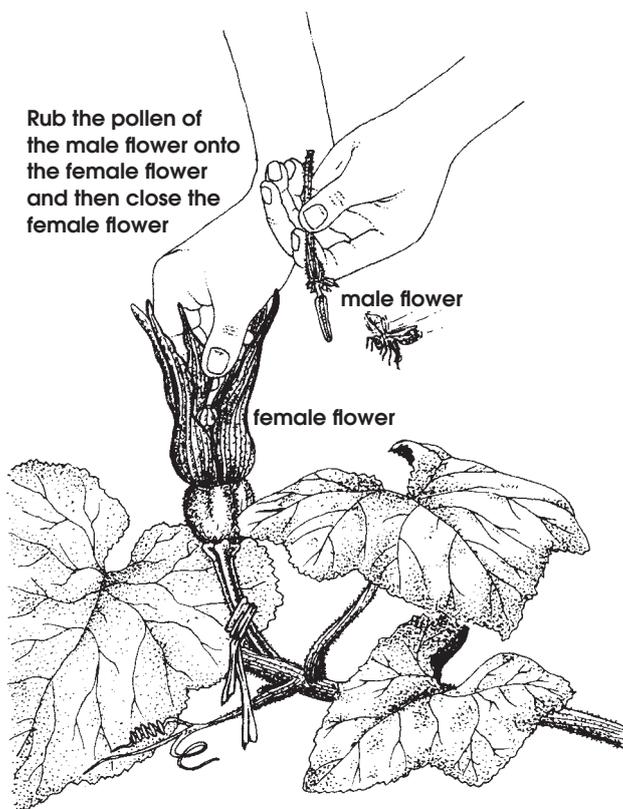
© Seed Savers' Handbook—
illustration by Alfredo Bonanno

Dioecious flowers

Dioecious plants are those which have the male and female pollinating parts on different plants.

These plants require more than one plant to fruit and seed and have a high chance of cross pollinating.

Fruit trees are often dioecious (for example pawpaw).



Hand pollination

© Seed Savers' Handbook—illustration by Alfredo Bonanno

Prevention of cross pollination

If you wish to collect seed from your plants it is necessary to prevent cross pollination to maintain those varieties that can cross pollinate.

There are a few strategies for doing this:

- **Grow one variety at a time**
This is the easiest method but insects and wind can carry pollen for a long way, so you must also consider what your neighbours are growing.
- **Grow them apart**
If you plant two similar varieties in different places in the garden with a lot of other plants in between this will reduce the chance of them crossing.
- **Bag or cage the plants that you want to prevent from crossing**
You can use a fine net such as a mosquito net to prevent insects from travelling from one variety to the other. Remember, though, that if the plant is dioecious you need both male and female plants
- **Hand pollination**
Rubbing the pollen of the male flower onto the female flower and then closing the female flower again until it wilts will ensure that the seed is true to type.
- **Assisting self-pollinators**
Tomatoes, peppers and beans, while self-pollinating, benefit from having bees and insects to assist with the pollination rate. High pollination rates in these plants usually improve the size, shape and number of seeds in the fruit.

The seed saving process:

This section covers the seed production process.

- Seed harvesting guidelines
- Cleaning seed
- Drying seed
- The seed transfer process
- Testing seed for viability
- Packaging seed
- Seed storage in the tropics



Seed harvesting guidelines

Selecting and harvesting seeds is the first stage of the seed saving process.

Seeds come in many different shapes and sizes. The harvesting and cleaning methods are different from plant to plant. The best way to determine how to harvest and clean each variety is by careful observation and thought.

Here are some general guidelines that are consistent for all plants...

Selecting seed for saving

Considerations for plant selection for seed saving include:

- overall plant health and vigour
- size and sweetness of fruit
- disease resistance.

It may be necessary to get rid of unhealthy and diseased plants so they do not affect the quality of the seeds you select.

How many seeds and plants?

If collecting seed to distribute to other farmers, bulk seed from many plants should be collected.

Estimate the number of people

It may be helpful to estimate the number of people you will distribute to and how many seeds to give to each farmer.

For farmers who are collecting for themselves, it is still a good idea to harvest more seed than needed and store in case of crop losses. Extra seed can always be shared with other farmers.



Eggplant harvested at the Planting Material Network garden ready for seed extraction and processing

Collect from many plants

The number of plants that you collect from is an important consideration.

It is advisable to collect seed from many different plants. If the sample size is too small there may be a loss of characteristics in the following generations of plants.

Particularly with cross pollinating varieties, different genetic traits may be carried by different plants within the crop.

Limiting the number of plants you collect from could weaken the genetic makeup of the plant; this is called 'inbreeding'. Inbreeding can lead to greater risk of damage to crops through environmental stress, pests and disease problems.

Select only healthy plants

For the high quality seed, the gardener must pay careful attention to the selection of the plants and fruits to take seed from.

Only the healthiest plants should be selected for seed and only the best fruits on those plants should be taken.

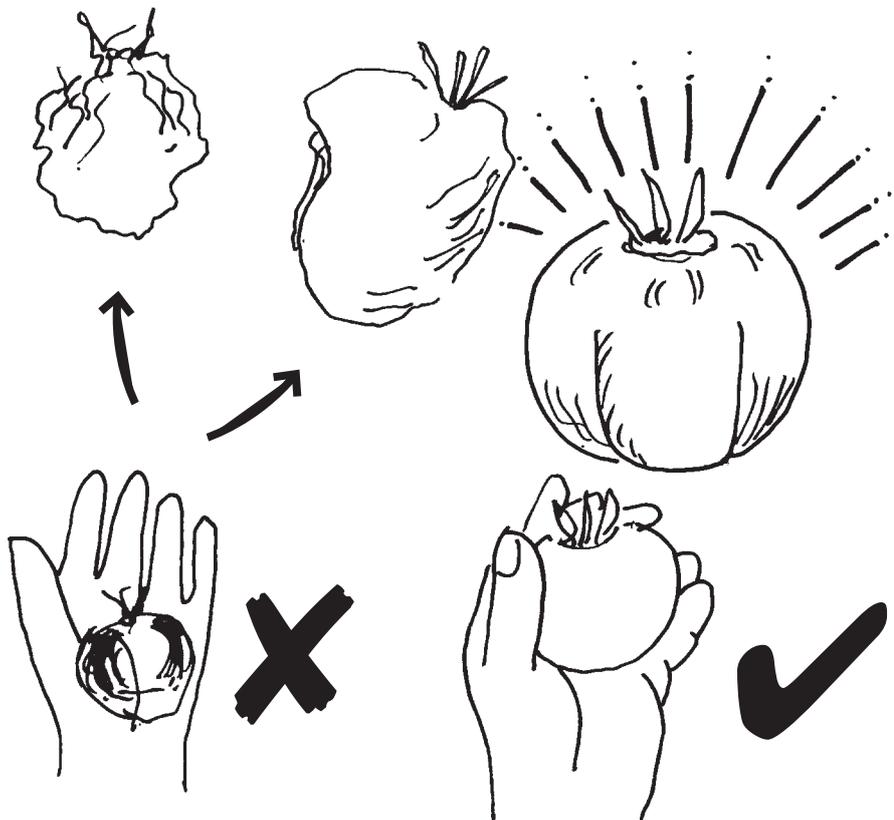
Label the best plants

It is a good idea to label the best plants that are specifically to be left for seed so that they are not harvested for food.

When to collect

The best time to collect seed from the plants is in the mid-morning or mid-afternoon on a sunny dry day.

Vegetable seeds reach their peak viability and vigour when they are left on the plant until they reach their maximum dryness. The most vigorous seeds at harvest time will keep the longest in storage.



Choose only the tastiest, disease-free, largest and most healthy fruit from which to save seed

Plants that have the seed inside a fleshy fruit

Harvest the fruit when ripe. This means leaving the fruit/plant until it has past the edible stage. Young fruit means young seed which may not germinate.

Tomato, eggplant

If tomatoes and eggplants are picked over-ripe, the seeds may start to germinate in the fruit.

Pumpkin, cucumber, melon

Pumpkins, cucumbers and melons should be left on a shelf for 2-3 weeks before removing seed to reach maximum viability.

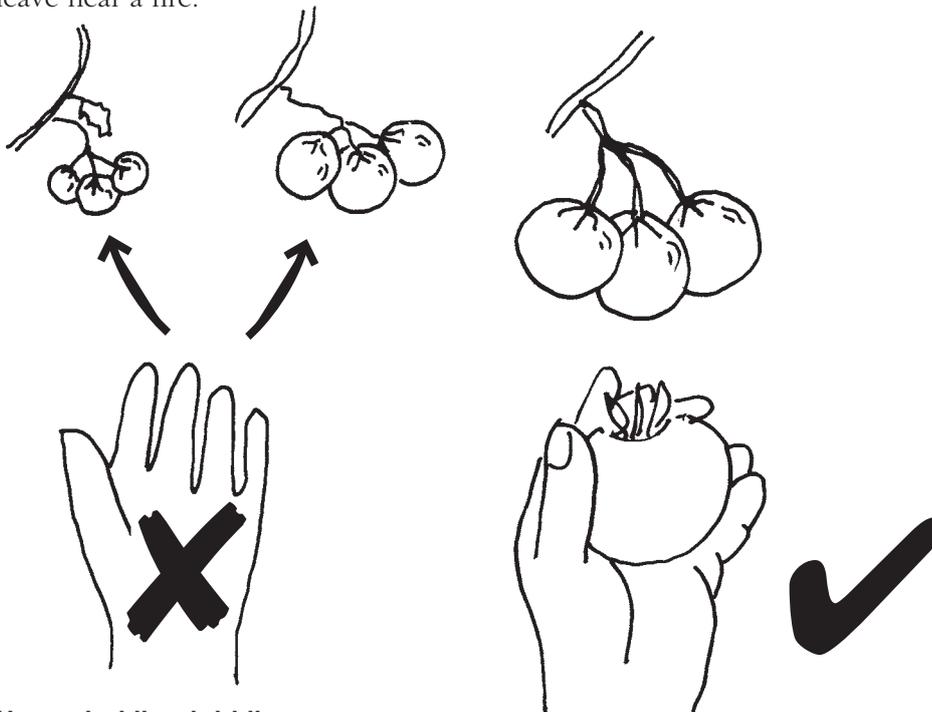
Capsicum, chilli

Capsicums and chilli are best when the whole fruit is dried before removing the seed.

Plants whose seeds are eaten

The seeds of these plants—such as beans, sunflower and corn—can be left on the plant until dry during the dry season.

Pick them earlier in the rainy season or leave near a fire.



Harvest at the right time

Harvest plants with the seed inside a fleshy fruit when ripe

Plants that drop ripe seed

The seeds of these plants, such as lettuce, land cress, sesame and Chinese cabbage, need to be harvested as they ripen, before they break open.

If a plant must be harvested before the seed is fully mature, the plant/fruit can be left to mature for a while longer before the seed is cleaned.

The whole plant can be hung upside down in a paper bag if small—lettuce, for example—or the fruit can be left to sit on a shelf or table—pumpkin, for example.

Collection techniques

Most seed or fruits with seed can be hand picked.

For very small seed or seed pods that shatter easily, you can put a paper bag over the top of the plant or stem and break it off. Then it can either be left inside the bag until the seed drops off, or shaken, rubbed and cleaned manually.



When to harvest seed

Harvest seed in the mid-morning or mid-afternoon of a sunny, dry day



Label plant

Label the best plants to leave for harvesting seed rather than for food



Cleaning seed

After harvesting, seed must be cleaned and dried before storing for later use.

There are different methods of cleaning, depending on the type of fruit.

How to collect seed

Most seed, or fruits with seed, can be hand picked.

For very small seed or for seed pods that shatter easily, you can put a bag over the top of the plant or stem and break it off.

Then the top of the plant can either be left inside the bag until the seeds drop off or shaken, rubbed and cleaned manually.

Plants with a seed inside a fleshy fruit

The seed and pulp can be scraped out and washed until the seed separates from the pulp.

A sieve and a bowl may be useful for this. Drain and rewash until the seed is clean.

Seeds that have a dry shell, husk or pod

These include seeds such as beans, corn, okra and lettuce.

They can be cleaned by:

- opening and separating by hand
- gently rolling or crushing the seed in a bag and then cleaning off the husk with a sieve or by winnowing.

Winnowing

Winnowing uses wind or breath to blow out the light husk:

- lay the seed in a finely woven flat basket or bowl
- toss gently while blowing through it as it falls back into the basket.

The seed can also be put in a dish and shaken until the heavier seed falls to the bottom, then the husk gently blown off.



Planting Material Network seed curator, Mary Timothy, separates seeds from husk

Cleaning seed inside a fleshy fruit



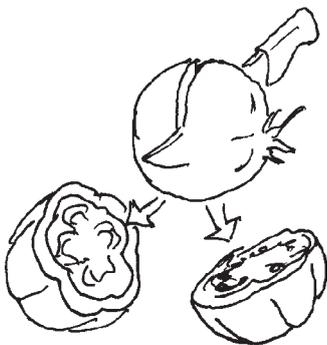
1. Collect fruit from the best plants



2. The pulp containing the seeds is removed from the fruit

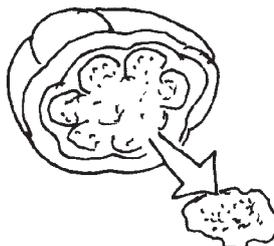


3. The seeds are separated from the pulp by washing in running water. The seed are caught in the sieve.

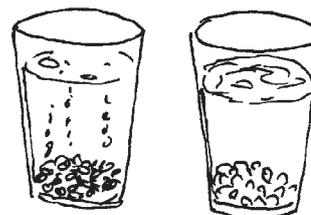


1. Allowing the seed and pulp of tomatoes to ferment for a day or two can assist in reducing fungus diseases in the plant.

Cleaning tomato seed

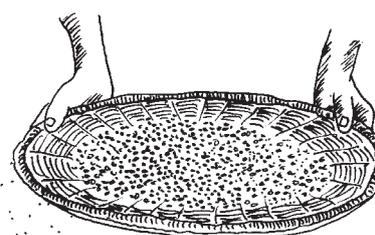


2. Cut tomato-scrape out seeds



3. Soak seeds in water until the seeds separate from the pulp. Then dry seeds and store.

Winnowing



Winnowing

1. The seeds are laid out on a flat basket or in a bowl.

Winnowing

2. They are then tossed gently while blowing through the seeds as they fall back into the basket or bowl.

Drying seed

This is a process of drying seeds and placing them overnight in bucket #1 'Seeds for Drying'.

Seeds are stored overnight so they do not absorb moisture from the air.

They are spread out for sun drying the next morning.

This process is repeated until the seeds are dry.

Take care when drying seed

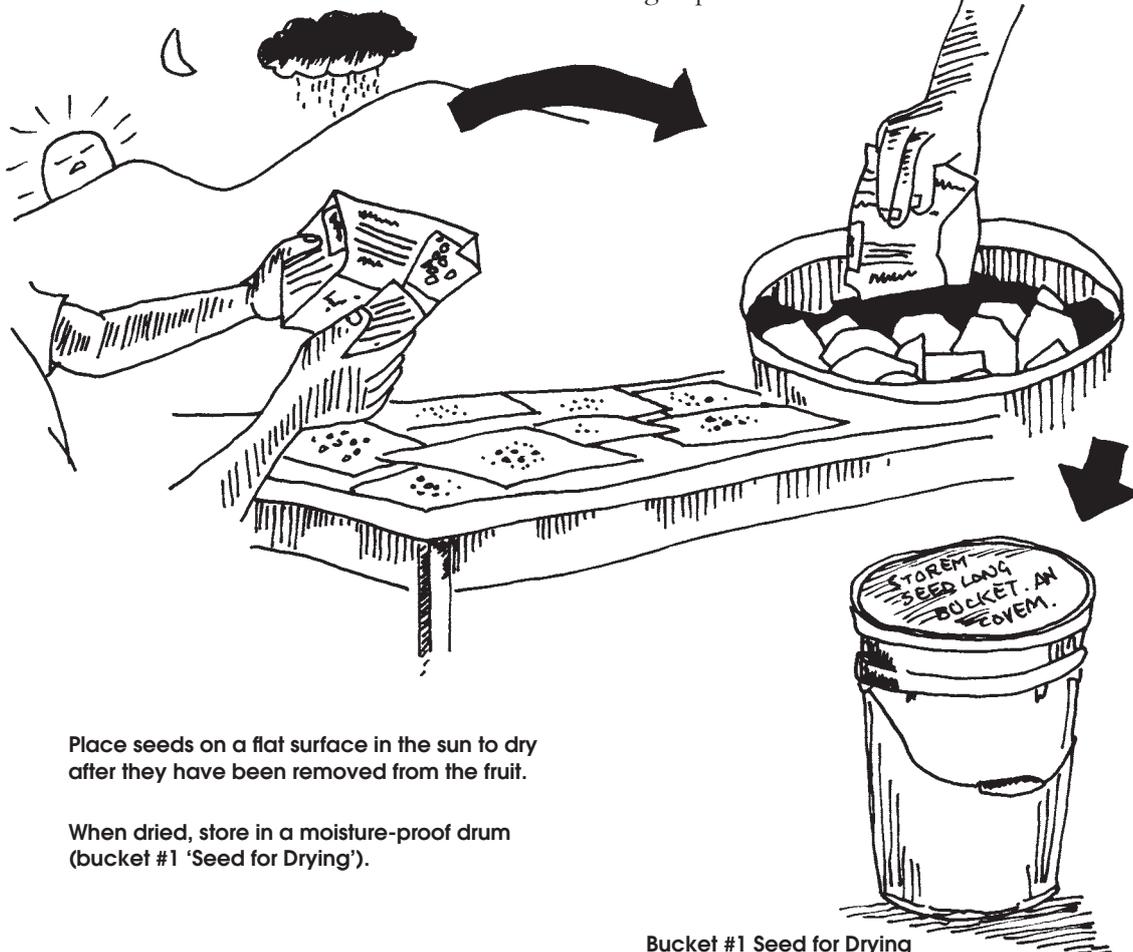
Careful attention is needed during the drying of seed.

High seed moisture at the time of storage is the greatest cause of loss of viability and vigour.

If seed is left wet in a container it will quickly rot.

Seeds need to be dried as soon as they are removed from the husk or pulp.

Some further cleaning may be required after the drying process. It is important to get the seed as clean as possible. The cleaner the seed the less chance there is for insect and fungus problems.



Place seeds on a flat surface in the sun to dry after they have been removed from the fruit.

When dried, store in a moisture-proof drum (bucket #1 'Seed for Drying').

Bucket #1 Seed for Drying



Step by step—drying seed

1. After cleaning, drain the seeds if necessary and press off any excess moisture with a cloth.
2. Write variety name and date harvested on a large piece of paper or calico; lay seeds out thinly.
3. It is advisable to first air dry, in the shade any large seeds that have a high moisture content or seeds that has been immersed in water; direct sunlight will make the seed dry too quickly and cause damage to the seed.

Equipment

1. Large piece of newspaper or calico.
2. Pens.
3. Flat surface for drying seeds in the sun.
4. Bucket #1 marked 'Seeds for Drying'
In this bucket each night wrap seed in newspaper with variety name and date harvested written on the newspaper.

Then...

4. Put on a flat surface in the sun; this place should be protected from the wind and needs good aeration; the best option is to put the paper on screens and raise them to allow air to circulate around them.
5. Stir seed during the day for equal drying.
6. In the late afternoon, fold the seed inside the paper/cloth and put into bucket #1 'Seed for Drying'; this is the first stage in the bucket system.
7. Seed must be put out again in the sun every morning until it is dry enough to store; this can take anywhere from two days to three weeks, depending on the size and moisture content of the seed.



The traditional method of laying seed thinly in the sun has proven to be the easiest and most reliable method to dry seeds.

These photographs shows seeds being sun dried on newspaper at the Planting Material Network garden in Honiara, Solomon Islands.

Hanging seed above the kitchen fire is another proven method for drying and storing small amounts of seed.



Seed drying house

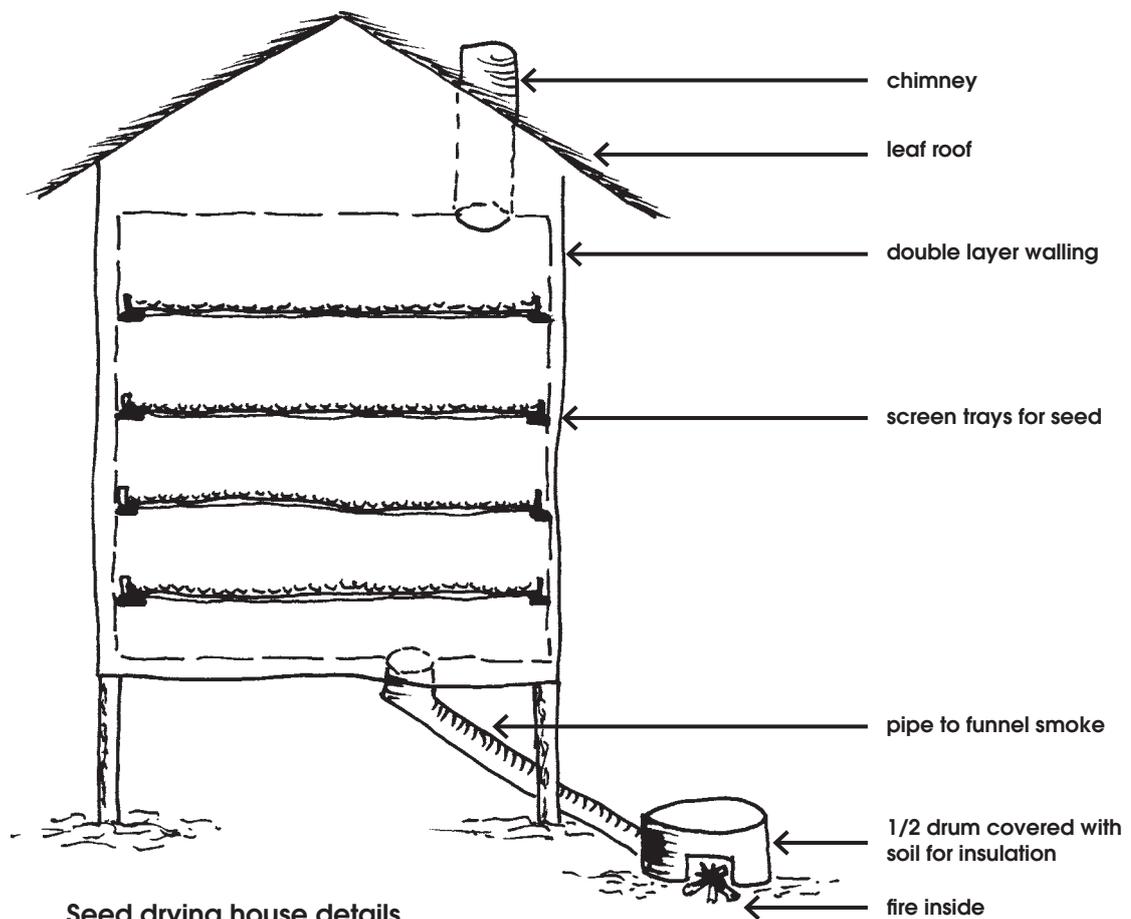
Seed drying houses are simple shelters to protect seeds from rain. They can be used during the wet season.

These drying houses use smoke or radiant heat to dry the seed.

Special consideration needs to be made to ensure the temperature does not get too high and that there is adequate ventilation.



A seed drying house is useful in the wet season



Seed drying house details

The seed transfer process

This is a process of transferring dry seeds from bucket #1 'Seeds for Drying' into bucket #2 'For Germination Test' in preparation for germination testing.

Check drying seeds

Check all seed in the bucket #1 'Seeds for Drying' at the end of the week.

All dry seeds can be moved onto the next process.

How to know if seeds are dry

Big seeds

These are seeds such as beans and corn.

They usually take 1-2 weeks to dry in the sun.

- test by biting lightly
- if they feel hard and strong and break instead of leaving an indent, they are finished drying.

Medium seeds

These are seeds such as pumpkin and chilli.

Drying for one week is usually enough.

The dry seed should be hard and snap when bent.

Small seeds

These are seeds such as eggplant, amaranth, basil and Chinese cabbage.

They may be dry enough after 2-3 days in the sun.

Step by step—seed transfer

The following procedure is used to move the dry seeds through to the next stage at which they are ready for germination testing.

1. To prevent mixing seed lots, always handle one variety at a time.
2. Check a number of seeds in each sample for dryness.
3. Pick out any small or damaged seeds; you can use a sieve or screen to clean off any dust or rubbish.
4. Put the good dry seeds in a PVC bag; only one variety in each bag.
5. Write a label with:
 - variety name
 - date harvested
 - seed variety number (if using them).
6. Put a small bag of silica gel in the bag with the seeds to absorb moisture.
7. Squeeze all the air from the bag.
8. Tape the top of the bag.
9. Put the remaining seed in bucket #2 'For Germination Test'.



Equipment

1. Box marked 'Seed Transfer Box'

In this box should be:

- PVC bags
- sealers
- small bags for silica gel
- pen
- scrap paper.

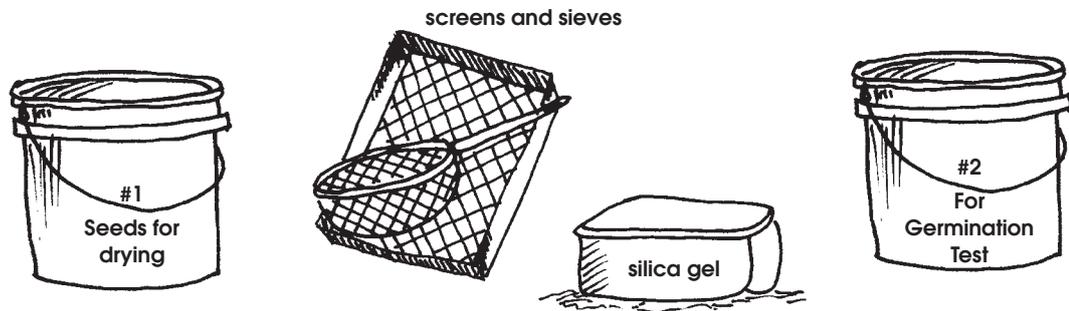
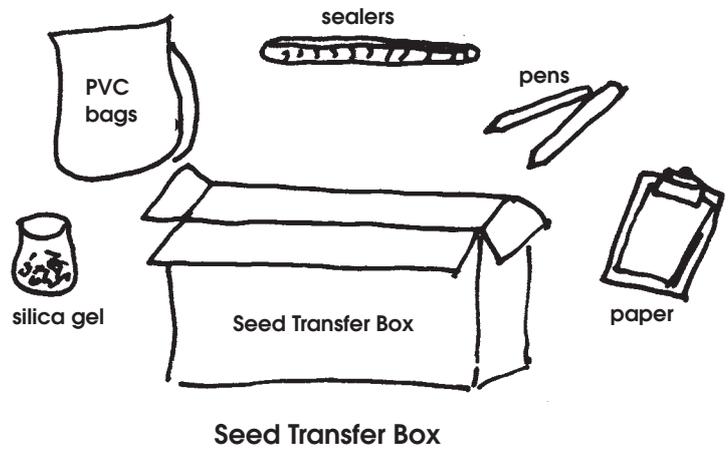
2. Bucket #1 marked 'Seeds for Drying'

In this bucket should be bulk seed samples wrapped in newspaper with variety name and date harvested written on the newspaper.

3. Bucket #2 marked

'For Germination Test'.

4. Silica gel (see 'How to handle silica gel' on page 59 before using).
5. Strainer or cleaning sieves.



Seed drying equipment

Testing seed for viability

This is a process of transferring dry seeds from bucket #2 'For Germination Test' to bucket #3 'In Germination Testing' with a label recording the date the germination test began.

You can choose any of the three different methods of seed germination testing:

- soil tests in the nursery
- bowl tests
- paper tests in plastic bags.

Good results of the germination test are written on the label and seed bags are moved to bucket #5 'For Packaging'.

Germination testing

Germination tests are a way of testing the potential of seeds to grow. This important stage of the seed production process is to make sure that all seed distributed is good quality and will grow.

Germination testing can be done in many ways, from simple techniques up to highly technical methods. This manual uses simple methods and basic equipment suitable for village seed saving.

For best results the person doing the test must also be reliable because seeds need to be checked, watered and counted every day. This is important as seeds are extremely vulnerable during the germination period. They may die if left to dry out for even one day.

Depending on the type of seed, it may take anywhere from four days to four weeks to complete germination testing.

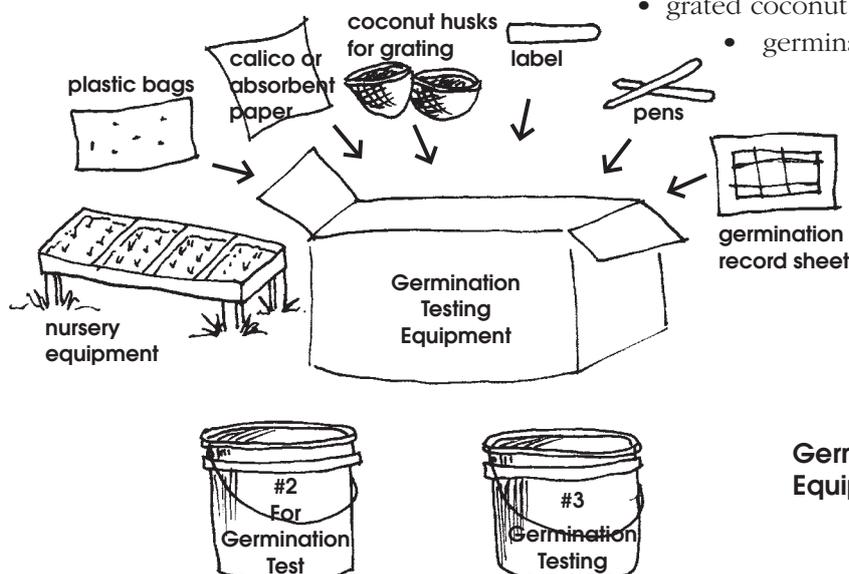
Equipment

- bucket #2 'For Germination Test'
- bucket #3 'In Germination Testing'
- bucket #4 'For Garden'
- bucket #5 'For Packaging'.

Also collect all equipment needed for germination testing and keep it in a box labelled 'Germination Testing Equipment'.

In this box you put:

- labelling materials (small tags)
- pens
- calico or absorbent paper
- bowls (eg clean, dry half coconuts)
- plastic bags (eg bread bags)
- nursery materials
 - grated coconut husk; nursery boxes
 - germination record sheet.



Germination Testing Equipment

Step by step— germination testing

1. How to select varieties for germination testing

Select seed samples to be tested from bucket #2, 'For Germination Test'.

The sample should be of a quantity so that when germination testing is complete there will still be lots of seed left to distribute. If there is not enough seeds to make packets then the seed sample can be planted out in the garden to multiply.

Seeds that have been in packets for a long time (1-2 years) can be tested occasionally to see if they have lost their germination potential during storage.



The following steps (2-5) should be done for one variety at a time

You also need:

- bucket #2 marked 'For Germination Test'—in this bucket there should be bulk seed samples in sealed plastic bags with silica gel and labels
- bucket #3 marked 'In Germination Testing'
- a place for leaving **bowl and paper tests** that is in the shade with good aeration, but not in full wind, and has protection from rats and insects.

2. Count the seeds

Mix the seeds inside the bag so that the selected sample is not just from the seeds at the top of the bag.

Count out the number of seeds for testing:

- for **bowl tests** (usually for beans and corn): 12-20 seeds.
- for **soil or bag test** (smaller seeds)—30-60 seeds.



3. Write information on the test record sheet

Record:

- the date the test begins
- the PMN number and variety name
- the number of seeds.

4. Make labels

All germination tests must have a label.

- write the same information you put on the record sheet on the label
- place the label with the test sample (either in bowl, bag or beside row in nursery soil).

17/2/2000 PMN No: 20
0 WHITE EGGPLANT
30 SEEDS

A label records information about the seed.

5. Seal remaining seed

- put seed back in the bag with remaining seed and silica gel
- reseal the bag and place in bucket #3 'In Germination Testing'
- on the label, write the date the germination test began.

Reminder:

Do not let silica gel sit in open air.

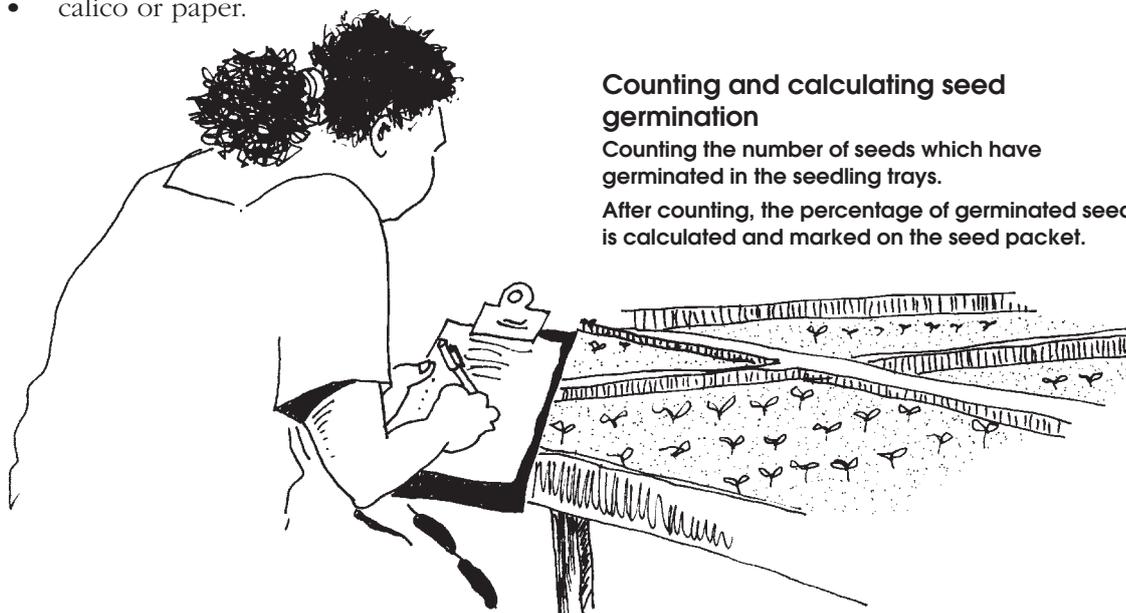


6. Begin seed test

If seeds have a strong coat (such as beans, okra) or are slow to germinate, they can be soaked for a few minutes in hot water or salt water to speed up the germination.

Carry out one of these seed tests:

- soil tests in the nursery
- bowl test
- calico or paper.



7. Water the seeds every day

During early stages of growth seeds are very vulnerable and need to be well cared for.

It is important to maintain a damp moisture level. If seeds get too dry or stay too wet they will die.

8. Count the number of seeds that have germinated

At the end of each week, count all germinated seeds and record on the test sheet.

9. Calculate the percentage of seeds that have germinated

The test is finished when no more seeds will germinate (some varieties take a long time to germinate).

Recount all germinated seeds then calculate the percentage of germinated seed and record on the test sheet.

Example:

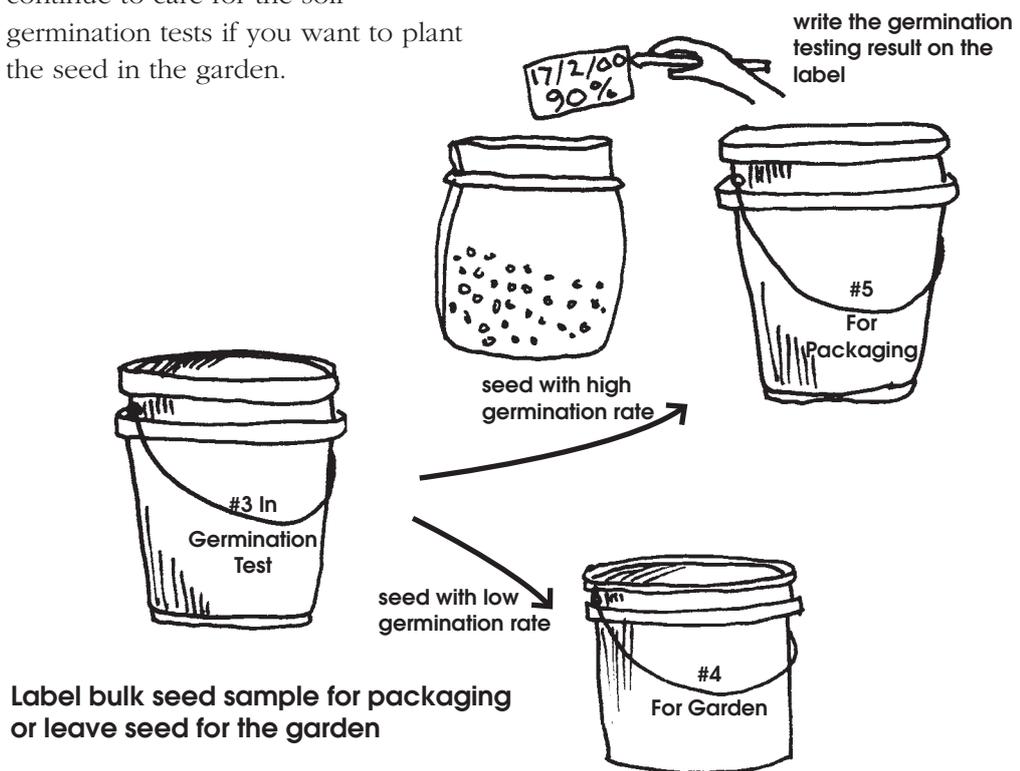
If there were 20 seeds in the test but only 18 germinated...

$$18 \div (\text{divided by}) 20 = 0.9$$

$$0.9 \times (\text{times}) 100 = 90\%$$

10. Label bulk seed sample

- take bulk seed sample from bucket #3 'In Germination Testing'
- write the result (percentage of seed which germinated) on the label inside the bag; if the germination result is low (below 40%) put inside bucket #4 'For Garden'; seeds which show a high percentage germination (above 40%) put inside bucket #5 'For Packaging'
- continue to care for the soil germination tests if you want to plant the seed in the garden.



Seed saving bucket #5

Soil test in the nursery

All seeds can be tested in the nursery.

Growing medium

We suggest using 100% grated coconut husk because it holds moisture well and has no weed seeds.

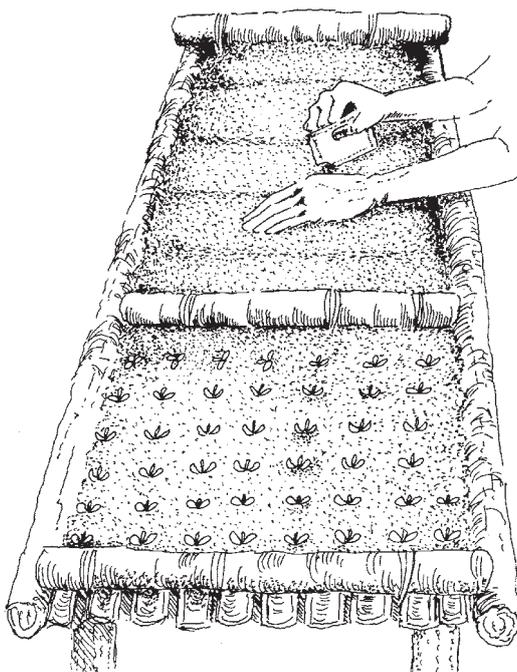
Soil can be used at the ratio of 2:1 with coconut husk if sterilized by pouring boiling water over it.

Procedure

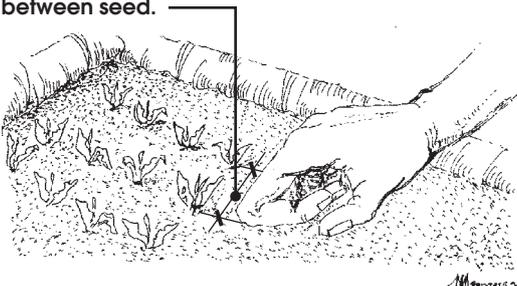
- fill nursery box with grated coconut husk/soil
- make a shallow line or row to sprinkle seeds in (see sketch below)
- don't plant seeds too deep; planting depth is twice the width of the seed
- cover the seed lightly with grated coconut husk
- put your label in nursery tray
- water seed tray lightly
- maintain moisture and encourage germination by placing a wet copra bag over the tray after soaking the bag in boiling water first to kill any insects or diseases; remove the bag after two days.



Mary and Gwendolyn carry out germination testing at the Solomon Islands Planting Material Network garden



Planting out seeds into propagating trays. Use your finger to measure the distance between seed.



Grating rotting coconuts to make seed raising medium



Tony Jansen demonstrates how to use stiff wire mesh on a wooden frame to scrape rotting coconut husk to mix with soil for the nursery.

Rotting coconut can be collected from a plantation.



Filling the seed trays with growing mix made from scraped coconut. The trays are filled almost to the top.

The picture shows one long tray divided into smaller trays.



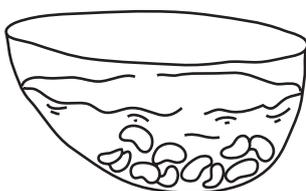
Participants in a training workshop plant seeds into seed boxes filled with scraped coconut husk.

Bowl test

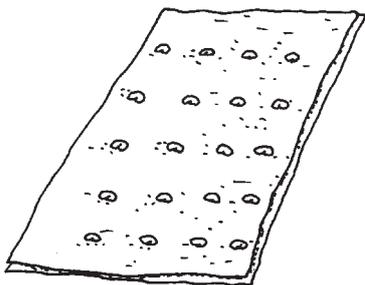
Use this test for large seeds like beans and corn.

Procedure:

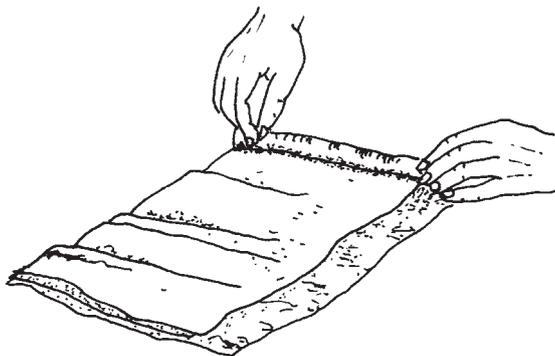
1. Soak seeds in water for a few hours or overnight.



2. Drain water from bowl and place seeds on absorbent paper.



3. Fold seeds in paper and sprinkle with water until just damp.



4. Return seeds to bowl with label.
5. Check seeds two times a day; water when needed to maintain dampness.
6. Moisture level is important—not too wet, not too dry.



Seeds soaking on absorbent paper

Calico/paper test

The paper test used for seed germination needs close observation and careful attention.

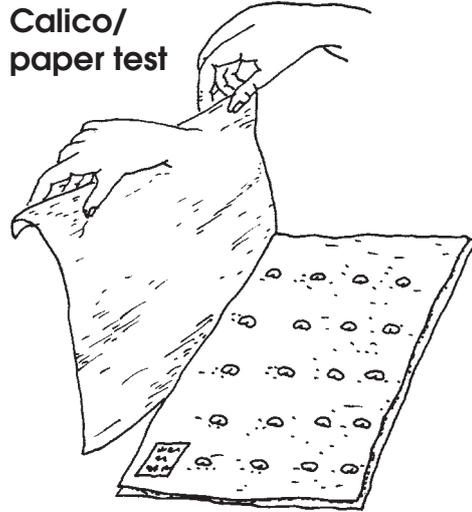
It is the most likely method for the seeds:

- to dry out
- to rot if paper or calico is too wet.

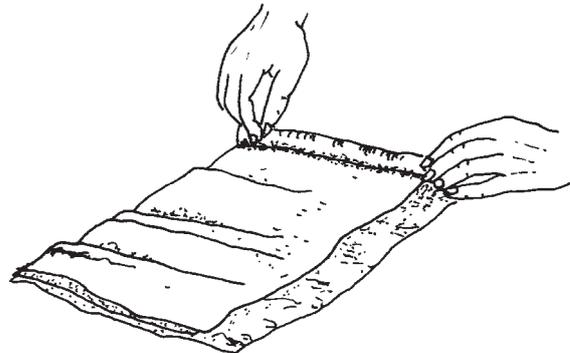
Procedure:

1. Place seeds on calico or absorbent paper.
2. Fold three times.
3. Fold in the edges.
4. Spray calico/paper with water until just damp.
5. Place damp, folded paper in a rack (or hang in a place out of direct sunlight and wind) inside a plastic bag which has holes in it for aeration.
6. Uncover seeds and check twice daily. Water when needed to maintain dampness.

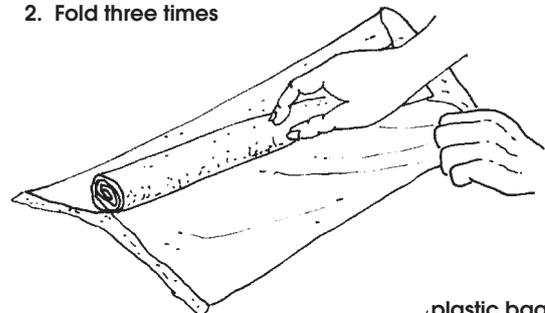
Calico/ paper test



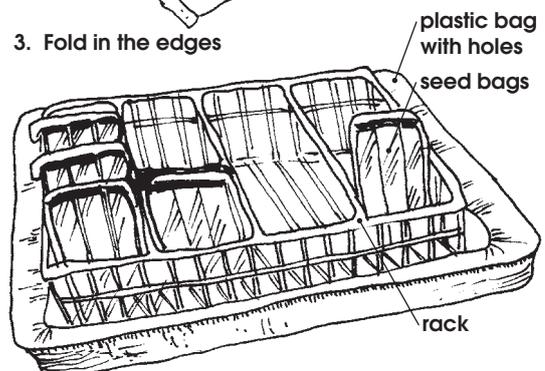
1. Seeds laid out on calico or paper sheet.



2. Fold three times



3. Fold in the edges



5. Stand calico/paper bags in a rack (or hang in a place out of direct sunlight and wind) inside a plastic bag which has holes in it for aeration.
6. Uncover seeds and check twice daily. Water when needed to maintain dampness.

Packaging seed

Packaging seeds is useful if, as a seed bank, you are distributing seed to other farmers or selling your seed.

If the seed is only for the village farmer then see page 57, 'Seed storage in the tropics', for details of how to store your own seed.

Equipment

1. Box marked 'Seed Packaging Box'
This box should contain:
 - stamp with your logo, name and address
 - seed packets (you can make them yourself)
 - glue
 - pens
 - spoons
 - large paper (eg. newspaper).
2. Seed Packaging Record Sheet.
3. Bucket #5 marked 'For Packaging'.
4. Bucket #6 marked 'Seeds for Distribution'.

Step-by-step—seed packaging

1. Take out seed, test for dryness.
2. Spread seeds out on large paper; pick out any bad, damaged seeds or small seeds.
3. Calculate number of seeds for each packet of that variety:

Method:

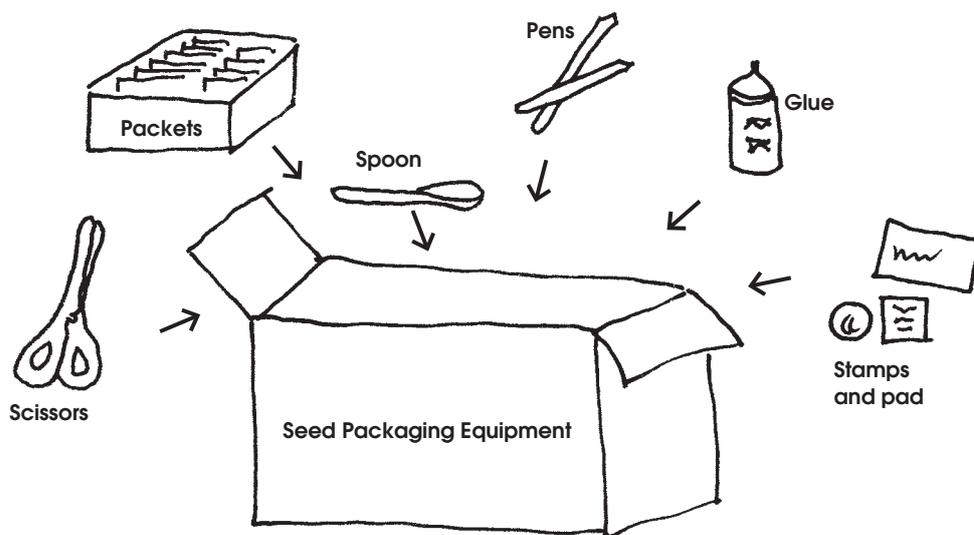
the number of plants for garden
÷ (divided by) percentage of seed
germinated = number of seeds per
packet.

Example:

Number of plants = 15
Germination % = 75%
 $15 \div (\text{divided by}) 0.75 = 20$ seeds
per packet.

Number of plants for garden:

This is based on an estimate of how many plants people usually have in their sup sup garden.



Seed packaging equipment box



- melon, luffa, pumpkin, snake bean—10
 - eggplant, okra, peppers, basil, chillies—15
 - beans, cucumber, tomato, watercress—20
 - chinese cabbage, lettuce, soya, mung bean—30
 - marigold, sunflower, sesame, corn, rice, sorghum—50.
4. Estimate number of packets needed for that variety.
 5. Stamp packet.



Using a rubber stamp to mark logo and information on seed packets

6. Write details on packet.
For example:
Number of seeds = 15
Germination % = 75%



Packaged seed with information recorded on the seed packet

7. Measure on a spoon the number of seeds needed for each packet (flat dessert spoon or heaped teaspoon).
8. Put seeds in packet using spoon to estimate.
9. Glue top of packet.
10. When finished packing one variety put elastic band around all seed packets.
11. Put seeds in PVC bag with silica gel; seal and put in bucket #6 'For Distribution'.
12. Record number of packets on seed packaging record sheet.



Using a spoon to measure seed into packets

It is important to remember that once seed is packaged it must be stored well as the packet does not stop insect or moisture damage.

| Date packed | PMN number | Variety name | Germination result | No. of packets |
|-------------|------------|------------------|--------------------|----------------|
| 01/01/98 | 57 | White Eggplant | 75% | 45 |
| 08/01/98 | 10 | Isabel Pink Bean | 80% | 38 |
| | | | | |

Seed Packaging Record Sheet

Seed storage in the tropics

The climatic conditions in the tropical Pacific islands are a challenge to seed storage. The high temperatures, high humidity and insect attack cause rapid loss of viability of seed.

It is possible to keep seed for a number of years if the method of storage is properly considered.

High temperature

With the exception of the initial drying process, at all other stages of processing and storage, seeds should be kept in the coolest place possible.

Where there is no refrigeration a sheltered area out of direct sunlight and heat is sufficient.

High humidity

The humid air of the tropics causes seeds to rot and die in a short period of time.

Creating a seed storage environment that is free from moisture is not as hard as it sounds.

Find the right containers for your seeds

The first step is to use an airtight container with a strong seal. Searching out a good source of buckets is an important start for any seed production centre.

- tight-sealing tins and jars are the best option for the village farmer
- bamboo and gourds can also be used if they are well sealed with a resin or wax.

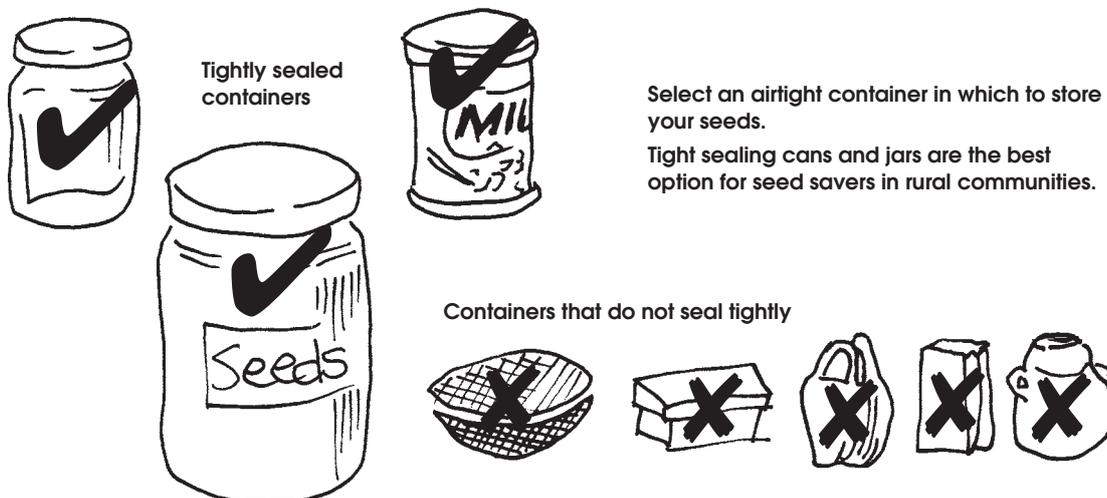
Fill the container as much as possible with seed to reduce the amount of air inside.

Absorbing moisture in your seed container

Ashes, rice and milk powder are a few materials found in most villages that can be used to absorb moisture from the seed and air inside the container.

Using ash

Fresh ash from the fire is the most effective of the materials that absorb moisture.



Select an airtight container in which to store your seeds.

Tight sealing cans and jars are the best option for seed savers in rural communities.

It is important to let the ashes cool first. Do not put ash straight from the fire into the seed container.

It will be necessary to replace the ash with fresh ash every few months as, over time, it loses its effectiveness.

Using silica gel

Silica gel, while an expensive and imported product, is an invaluable material for seed production centres.

All storage containers should have a thick layer of ash on the bottom, even when using silica gel.

Controlling insects in stored seed

Make sure that the seed has been dried well in the sun. This process will kill off any insects or eggs that are in the seed sample.

Ashes from the fire are also useful in controlling insects. The small particles of the ashes are harmful to the shell and bodies of insects.

If the seed variety has an insect problem a layer of ash can be placed on top of the seeds in the packet as well.

Some plants may prevent insect attack—mixing dried neem and guava leaves with the seed in storage is a useful experiment.

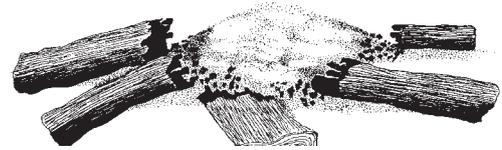
If at any stage during storage the seeds look contaminated with insects, put them in direct sunlight for a few hours.

Seeds are dried, then placed in paper envelopes, then put into the seed storage container with wood ash or silica gel.

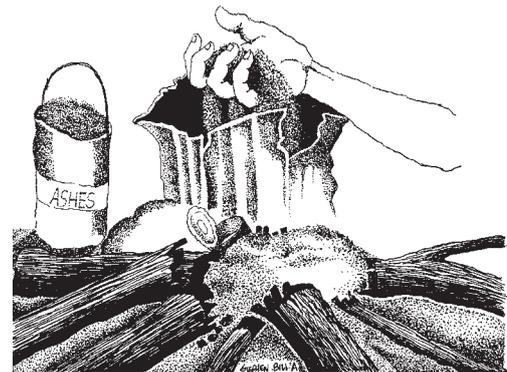
Here seeds are stored with wood ash to prevent damage from moisture in the air.



Step 1:
Burn some wood

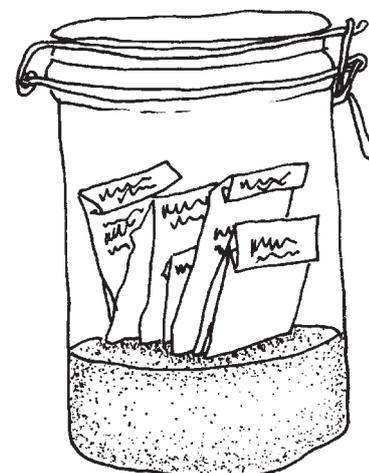


Step 2:
Ashes from the fire are ready to be collected when cool



Step 3:
Ashes collected and are ready to be placed into seed storage containers

Wood ash absorbs moisture when placed in the seed storage container



How to handle silica gel

Silica gel crystals are a valuable resource if seed is needed to be stored for a long period of time, particularly in tropical areas of high humidity and heat. It is an expensive, imported product so is suggested only for seed production centres that produce, store and distribute seed to others.

Silica gel crystals absorb moisture from the air and help to maintain a dry storage environment for the seed. The crystals can also continue to draw out any remaining moisture from the seed. The colour indicator of the silica gel can also show how effective the container is at keeping out the air.

Equipment

- large bucket of silica gel
- small ziplock bags
- large PVC bags or airtight containers
- sealers
- spoon.



Using silica gel

Using silica gel requires careful attention.

If it is exposed to the open air it will quickly absorb the moisture and will not work when it is placed with the seed.

Procedure for use

The following procedure should be followed closely when using the silica gel crystals:

1. Open the large bucket of silica gel; take out a small amount of silica gel (one small container full).
2. Close large bucket again; this bucket has two large plastic bags inside to keep out the moisture; each one must have all the excess air pressed out and then sealed tightly with an elastic band; seal the lid properly.
3. Take a small ziplock bag and fill it to 3/4 full with the fresh silica gel with the spoon.
4. Close the ziplock bag and put it in the PVC bag; always keep the PVC bag folded to keep the moisture out.
5. Continue to fill and seal the small ziplock bags until you have all you need.
6. When finished, make sure all filled small bags are in the PVC bag; press out any excess air; fold over the top of the large bag and seal.
7. Any extra loose silica gel should be put back in the large bucket and sealed properly.

Seeds are stored with silica gel or wood ash in airtight container to prevent damage from moisture in the air

Reactivating silica gel crystals

Silica gel is a re-useable product. The colour of the crystals indicate how much moisture they have absorbed.

If the crystals are:

- dark blue—they are fresh and dry
- pink—they have a high moisture content and need to be heated and dried out before they can absorb more moisture.

To reuse silica gel, it is necessary to drive out the moisture it has absorbed. This is done when the crystals are a pink colour.

The crystals are heated—ideally at 175 degrees C—in an oven or are heated in a solar oven. This drives out the absorbed water and reactivates the crystals.

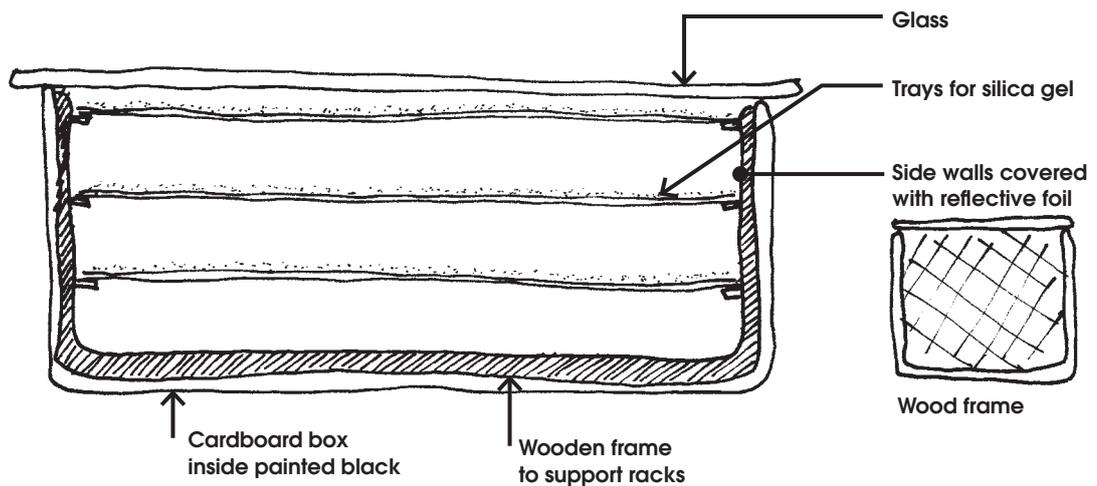
Procedure

- 1 Lay the pink silica gel in a thin layer on a tray.
- 2 Place in an oven or in a solar dryer.
- 3 Heat until the crystals turn dark blue.
- 3 Transfer quickly to the large silica gel bucket.

Lay pink silica gel crystals in a thin layer on a tray and place on fire to be reactivated

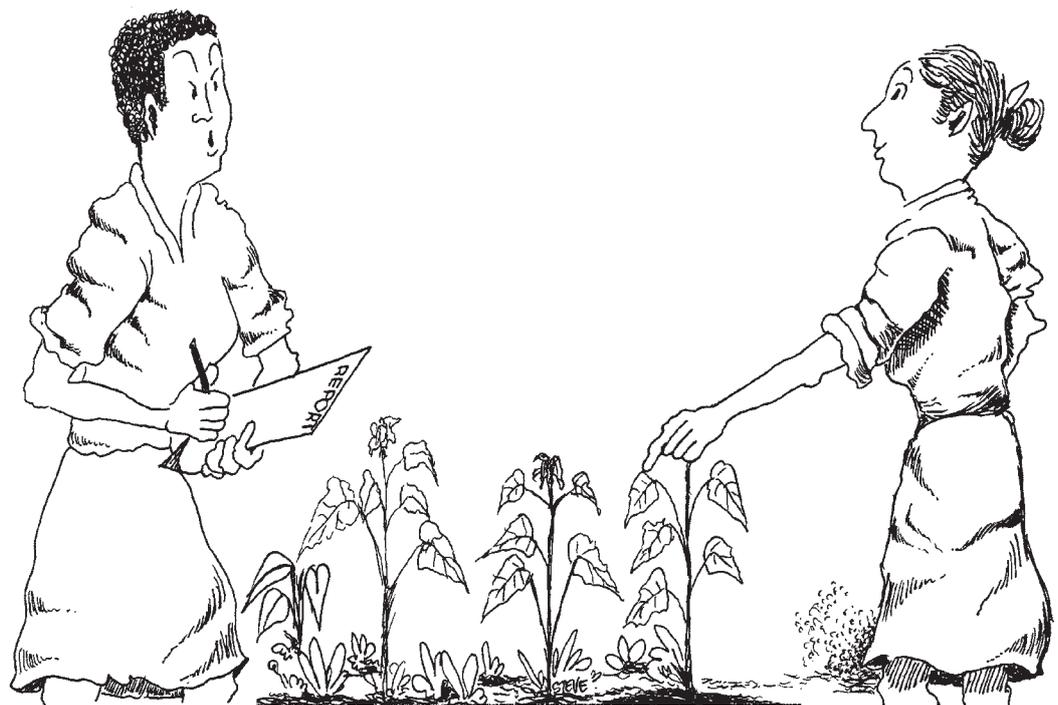


Silica gel crystals are heat-dried to reactivate them for reuse. The crystals turn from pink to blue when dry.



A solar drier for reactivating silica gel crystals can be easily made

Community plant register



Community plant register

The community plant register is a document recording information about the local agricultural biodiversity—the range of edible and otherwise useful plants used by the community.

The register is preferably made by local farmers.

Valuable information in a community seed register includes:

- name of the local variety
- botanical name
- plant family (the group of related plants to which the variety belongs)
- plant description (such as whether a tree, shrub, vegetable or root crop)
- growth habit (such as whether the plant grows as a tall/medium/short tree, shrub, ground cover)
- time to fruiting (how long after planting as a seed until the plant bears fruit)
- yield (whether the plant produces a large or small quantity of food)
- eating quality (is the edible part sweet, sour or bitter tasting; whether it is considered good to eat)
- other uses (such as medicine, building material, food for chickens, food for young babies)
- insect and disease resistance.

It may not be necessary to include all categories. However it is clear that the more that is recorded the greater the understanding and benefit.

Process

The process of documenting such details of each plant assists to:

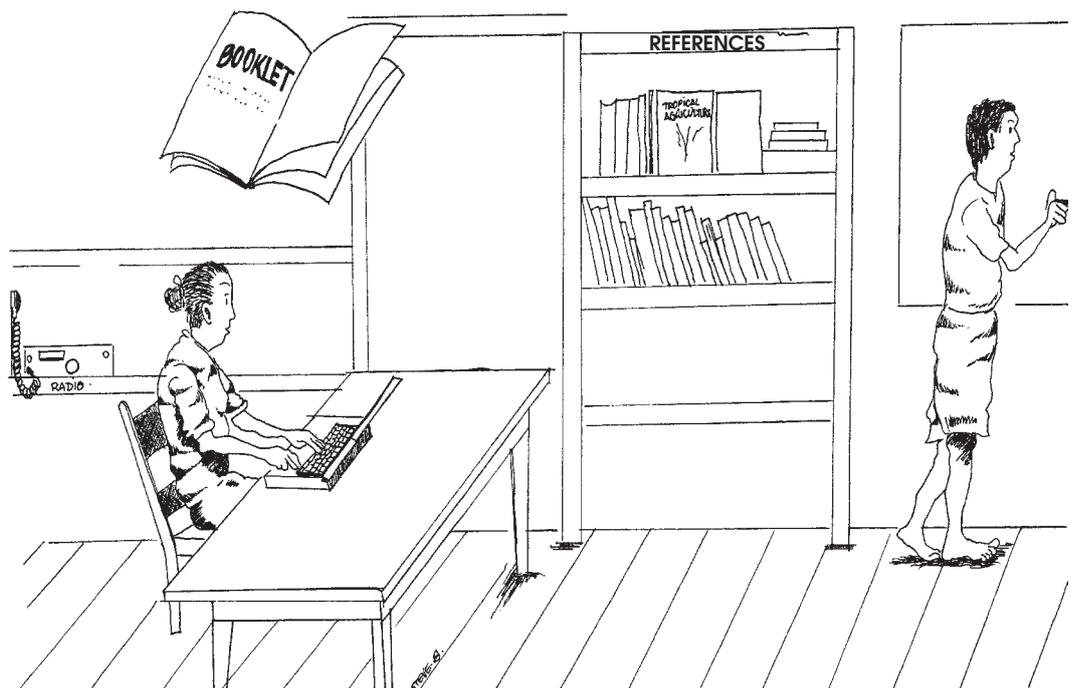
- identify differences in plant varieties
- identify the range of qualities of varieties (which demonstrates the importance of diversity)
- teaches botanical classification through practical use
- identify site suitability for different varieties—which plants do best in which locations.



The distribution of seeds to village farmers during a Solomon Islands Planting Material Network workshop

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Sources of useful information



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The Research Foundation for Science,
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NAVDANYA, 1997.

More information

Solomon Islands

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The Planting Material Network is an association of farmers, agricultural extension agencies and non-government organisations active in seed saving and agricultural training.

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The Kastom Gaden Association, based in the Solomon Islands, is a non-government organisation providing training in small scale agriculture.

The Association works closely with the Solomon Islands Planting Material Network.

The Seed Savers' Network

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The Seed Savers' Network supplies training and support for the Solomon Islands Planting Material Network.

Courses in community seed saving and training internships for seed savers from Australia and other countries may be available at the Network's Byron Bay premises.



Community seed saving is a key element in improving the security of community food supplies and in giving farmers control over their own source of seeds.