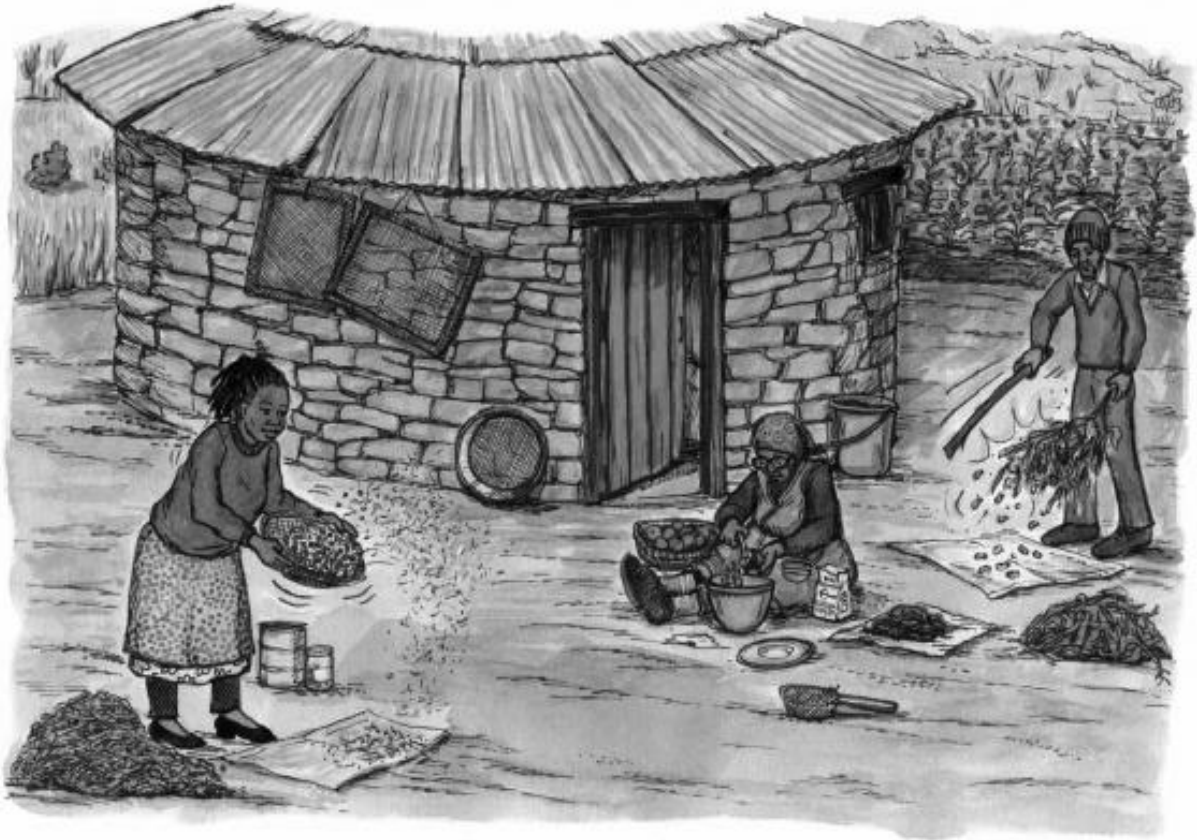


## 5. Seed saving



Keeping your own seed is central to your independence as a farmer. You can choose which crops you like and which varieties or types of crop. You do not need to go to the shop to buy seed.

There are still many varieties of seed that farmers keep or that you can buy from a shop that you will be able to keep for yourself once you have grown the crop.

Growing from seed to seed involves germinating seeds, transplanting seedlings and looking after selected healthy plants until they mature, so that their seeds can be collected and stored for the following year.

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

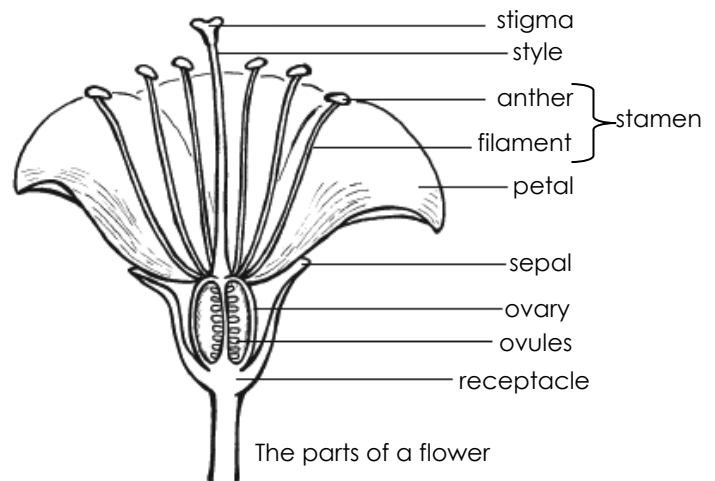
## Pollination

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

In some vegetables, herbs and flowers, the male and female part is in the same flower. These are called **complete flowers**.

Exceptions are:

- ❖ The cucurbits such as pumpkins, melons, gourds and cucumber and maize. Here the male and female parts are on different flowers, but on the same plant.
- ❖ Asparagus and papaya. Here male flowers are on one plant and the female flowers on another.



### ‘Open pollinated’ vs ‘Hybrid’ crops:

Originally all crops were open pollinated. Many plants propagate themselves like humans do. Pollen from the male parts of flowers needs to reach the female parts of the flower. This pollination usually occurs through wind or insects of various kinds: mostly bees.

Hybrid crops have been cross pollinated by humans in a controlled environment. These are crops that will NOT NORMALLY CROSS. This means that you cannot keep seed from a hybrid plant. The seed will either be sterile, or will produce many surprises. The plants grown from hybrid seed will not look like their parents and often are not very strong.

You know that a packet of seed contains hybrid seed when it has a sign on it that says:



### Self Pollination

Here, pollen is transferred from the male to the female part of **the same flower**.

Crops that self-pollinate are: tomatoes, lettuce, capsicum (green pepper) and okra. Beans and peas self-pollinate even before the flower has opened.

Generally, plants that self-pollinate can be grown quite close together without them crossing with each other. It is still a good idea however to separate different varieties of the same plant (e.g. different varieties of lettuce) from each other, as some crossing can still occur.

**Self pollinated crops:**

Green beans, dry beans, cow peas, peanuts, peas, tomato, lettuce and capsicum (green pepper)



**Cross Pollination**

Here, pollen is transferred from one flower to another on the same plant, or to the flower of another plant of the same type. Cross pollinated plants produce more varied offspring that are better able to cope with a changing environment.

Cross pollination occurs when the pollen is carried between flowers by the wind, bees, other insects, birds and bats. Honey bees are by far the most important pollinators.

Pumpkins are an example. If you have two different types of pumpkin, planted close together. They will cross with each other. The seed that is produced will grow and produce a plant with a fruit that is a mixture of the two types of pumpkin you have grown. This happens with all cross pollinated crops.

**Cross pollinated crops:**

Brinjal (eggplant), cabbage, carrot, chilli, kale, leeks, maize, mustard greens, onions, spinach (swiss chard)



**Pollinators**

Bees are the best pollinators of vegetables. As they fly around and collect the nectar (sweet juice) from the flowers of plants, pollen collects on the sticky hairs on their legs. When they visit the next flower

some of this pollen is rubbed off and cross pollination occurs.

***Insect pollinated crops:***

Brinjal (eggplant), cabbage, carrot, chilli, green pepper, kale, leeks, mustard greens, onions, spinach (swiss chard)



Many grains (such as sorghum and maize), grasses (such as Napier fodder and sweet reed or imfe) and trees are dependent on the wind for pollination. Pollen picked up by the wind can travel vary far (many kilometres) on air currents before coming to a rest.

***Wind pollinated crops:***

Beetroot, spinach (swiss chard), amaranthus (imbuya)

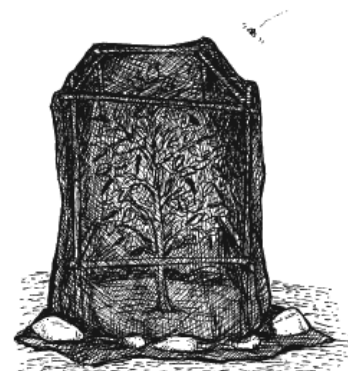


## Keeping them pure

Any **insect** or **wind pollinated** plant will need to be isolated from other varieties to stop them from crossing with each other. Below are four techniques you can try to achieve purity:

**Grow them apart:** Grow two varieties that cross pollinate at least 500 m or more apart. This is how far most insects fly, although bees can fly up to 4 km. Obstacles that deflect wind or insects such as hedges, buildings and ridges can greatly reduce cross pollination.

**Isolate them in time:** This is possible for crops where all the plants flower at the same time, such as maize and sunflowers. Crossing can be avoided by growing early, mid- and late season varieties that shed their pollen at different times.



Caging of a chilli plant

**Cage them:** Caging is needed for species that flower over a long period of time, such as cabbages and chillies. Put cages made of fly or nylon netting over the flower stalks of the different varieties to exclude all insects. Pollinate by hand.

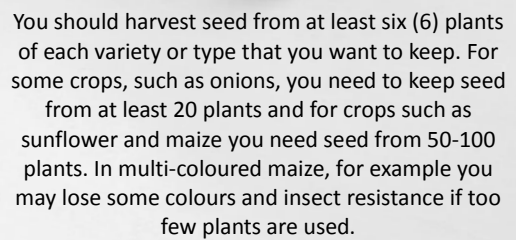
**Cage them on alternate days:** This can be used instead of hand pollinating varieties that are flowering at the same time. Cage one variety while insects pollinate the second variety. Then cage the second variety while insects pollinate the first one. Once they have been pollinated, both varieties should be caged until flowering has stopped.

## Selecting and collecting seed

### How long does it take?

#### *Annuals:*

These plants produce their crop and seed within one year and then die. This takes 6-9 months. Examples are tomatoes.



You should harvest seed from at least six (6) plants of each variety or type that you want to keep. For some crops, such as onions, you need to keep seed from at least 20 plants and for crops such as sunflower and maize you need seed from 50-100 plants. In multi-coloured maize, for example you may lose some colours and insect resistance if too few plants are used.

#### *Biennials:*

These plants grow during the first warm period, slow down through a period of cold weather, and flower and seed during the second warm period. Most biennials originate from the colder European climates where winters are severe and there is not enough time for a plant to produce seed in one warm season. This takes around 18 months. Examples are cabbage, cauliflower, carrots, parsnips, turnips and radishes.

#### *Perennials:*

These plants continue to grow, are permanent and survive from year to year. Few vegetables fall within this group. Examples are fruit trees and herbs such as comfrey, rosemary and thyme.

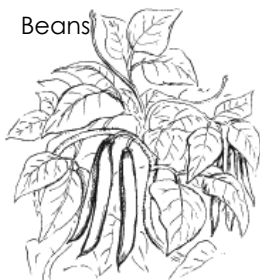
### Criteria for selecting seed

- ❖ The seeds should possess the same quality as the variety that was planted. If you planted a long, purple brinjal, collect seed from a long purple fruit. If the fruit looks different, the seed will also be different.
- ❖ Take out plants with undesirable characteristics before they start flowering. Examples are slow growers, sick/diseased plants or ones that bolt (start seeding) too early.

- ❖ Harvest seed only from strong, good looking plants.
- ❖ Harvest seeds from plants that perform well under stress such as extreme weather conditions and plants that resist disease or insect attack.
- ❖ Harvest seed only from healthy plants; if the leaves or fruit have rotten spots or a mottled appearance, do not use seeds from these plants. These diseases are carried in the seed and will appear next time.
- ❖ Do not harvest seed from plants that have bolted. Bolting is when the plant goes to seed much quicker than it normally should. It could be due to stress, such as hot and dry conditions, but is also in-built. So if you take seed from plants that have bolted you are selecting for a plant that bolts, or goes to seed very easily. This is important for crops such as mustard spinach and lettuce where you are looking for a prolonged leaf stage.
- ❖ Harvest the seed when it is ready. Immature seed will usually not germinate as it has not fully formed. Over-mature seed tend to go rotten before you plant them.
- ❖ Do not harvest seed that has been damaged by insects or in any other way. They can only germinate if they are whole.
- ❖ Do not harvest seed that have diseases, such as brown blotches or mould growing on them.

## How to know where to find the seed?

Beans



### **Seed heads**

Some plants carry pods which contain the seed, like beans and peas. These are called **legumes**. They are mostly self pollinating, so you do not need to be too careful in separating different varieties.

Lettuce



**Leafy crops** like lettuce and swiss chard will send out stalks from the middle of the plant. The flowers and seeds will be produced on these stalks.

Cabbage plant and seed head

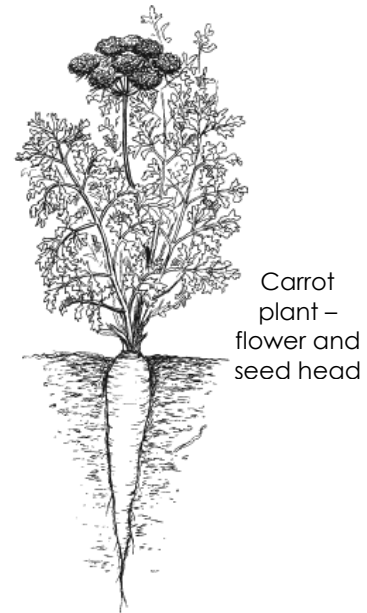


**Brassic**as (the cabbage family) will first make a head, or compact leaves.

Examples are cabbage, cauliflower, broccoli, kholrabi, kale, chinese cabbage and mustard spinach. Then, in the next warm season, a flower stalk will grow out and seed pods will be produced on these. This can take up to 18 months.

The cabbage family requires bees or other insects to carry pollen between plants. You need as many plants as possible to collect seed from (at least 6, but up to 20). One plant on its own will produce hardly any seed. Brassicas can cross with any member of the family. A cabbage can cross with a cauliflower or a broccoli or chinese cabbage!!! It is important to isolate different members of the cabbage family to obtain seed.

**Root crops like carrots:** With this type of root crop, the bulb will start to go woody and harder and send out a long stem on which flowers and seed will develop. This will take about 9 months. Wasps and flies carry pollen from one "umbel" to another or from one plant to another. Other crops in the **Umbelliferae** family (umbrella shaped flowers), behave in a similar way. Examples are celery, parsley, fennel and parsnips.



**Root crops like onions:** With this type of root crop, the flowering stalk develops in the second warm season, as the crop is biennial. This stalk is leafless, hard and hollow, and can grow very tall.

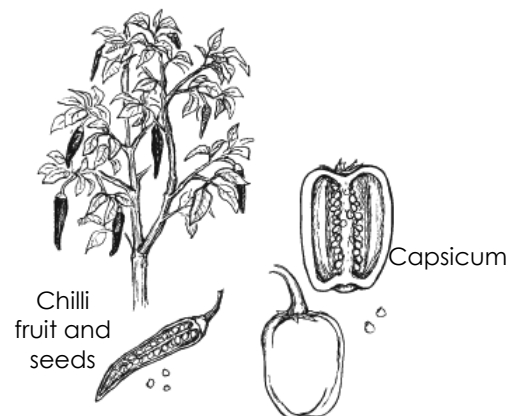
Other plants in this family (**Amaryllidaceae**) are leeks, shallots, garlic, spring onions, chives and garlic chives. These plants are pollinated mostly by bees. Pollination occurs between the little flowers on the same flower ball and between flowers from one plant to another. Seed from at least 20 plants needs to be kept to keep the variety strong. Seeds don't all ripen at the same time and they need to be harvested as they become ready, as they tend to shatter and are blown away by the wind.

Leave these seeds on the plant to dry. For those plants where the seed heads shatter and scatter seeds, you will need to collect them as they dry, rather than waiting until all the seeds are ready. Examples are lettuce, carrots, parsnips and onions.

### Seeds in fruit

Fruit is produced only after the fertilisation of the ovules has taken place. These ovules develop to produce the seeds inside the fruit.

- ❖ **Fruit** is picked when it is slightly over-ripe. Examples are tomatoes, chillies, capsicums (green peppers), gooseberries and brinjals.



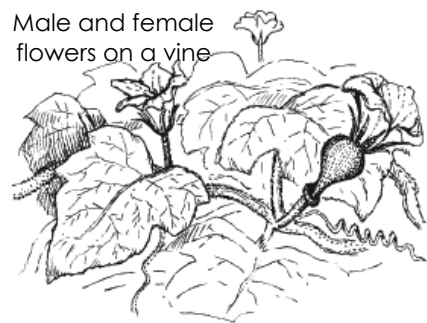
Tomatoes and capsicums are self pollinating. The other plants in the Solanaceae family like chillies and brinjals are cross pollinating. If you are growing more than one variety of chilli, they need to be isolated from each other. Otherwise you may get some HOT surprises!

**Pumpkins**, melons, gourds and squashes are picked when over-ripe and then left for a few more weeks for the seed to mature further.



There are many different kinds of pumpkin and melons. All different kinds of pumpkins will cross with each other, but they will not cross with melons, cucumbers or marrows which are all in the same family (Cucurbitaceae). In this family there is crossing in each species, but not between them. A cucumber for example will not cross with a pumpkin.

Male and female flowers occur. The male flowers grow on long thin stems and open before the female flowers, which grow on a short stem and have a small swelling at the base.



- ❖ Cucumbers and marrows are left on the plants until they are fully mature; cucumbers will go brown and marrows will go yellow (and VERY big!).

### Seeds that are eaten

Examples here are maize, beans, peas and sunflowers. These are left on the plants until they are mature and dry.

How to know when your seed is ready?

- ❖ The fruit has a **hollow sound** and/or is **disconnected** from the branch. *Examples:* pumpkins, cucumbers. For these fruits it also helps to leave the seed inside the fruit for several weeks after picking.
- ❖ **Colour, size and shape** of fruit. *Examples:* tomato and chillis (red), aubergines (purple or yellow). Green peppers need to be left until they go red. They are immature when green!!!
- ❖ **Shattering** of pods. *Examples:* beans, peas, cowpeas.
- ❖ **Dryness.** *Examples:* carrots, coriander, lettuce, swiss chard, cabbage (seed head goes brown and dry).





# Cleaning seed

## Winnowing

Chaff and stems need to be removed from seed, as they can hide insects that can attack your stored seeds.

- ❖ Seeds and chaff are tossed into the air and the chaff is wafted away with a gentle breeze. Elongated flat baskets work well.
- ❖ Or put the seeds in a bowl and shake them until the debris floats to the top. Gently blow the chaff away.
- ❖ Large quantities of podded seeds (peas, beans) can be placed in a sack and the seeds separated by stomping on the sack or beating it with a stick. The dried empty pods can then be winnowed out.

## Wet cleaning

This is used for plants that **carry their seeds in moist flesh or fruit** such as tomatoes, melons, pumpkin and cucumbers.

- ❖ Scoop the seeds out into a large container of water and rub vigorously. Pour off the water and place seeds on a flat surface to dry.
- ❖ Ferment the seeds of tomatoes and cucumbers. These seeds are encased in the flesh of the fruit and have a slippery jelly around them. This jelly needs to be removed before the seed will germinate. It also rids the seeds of unwanted seed-borne diseases.

### *Method:*

Place the seed in a container. Cover with water. Add one to two tablespoons of sugar and stir until it is dissolved.



Now leave this mixture for 3-5 days (NOT LONGER!!!). A foam or crust will form showing that the fermentation has occurred and the jelly has dissolved.



Rinse the seeds with large amounts of water.



Spread them out to dry them in a cool place and store in an airtight container like a glass jar.



## Drying seed

Large seeds need longer to dry than smaller seeds. A simple test for large seeds (such as beans) is to try to bite one of the seeds. If no impression is made on the seed (tooth marks) it is ready.

- ❖ You need to dry seeds away from the sun in a dry and breezy, airy place.
- ❖ In wet or cold weather, place seed on screens for fly netting and place them high up on racks in a warm room, such as the kitchen.
- ❖ Hang up small quantities in paper bags in a breezy spot.
- ❖ Lay larger quantities on screens or hang them up in hessian sacks. Do not use plastic bags.

## Storing seed

The length of time that seed can be stored depends on:

- ❖ The seed type;
- ❖ The quality of the seed; and
- ❖ The storage conditions.



### Storage conditions

#### **Darkness**

Find a way to keep the seeds in darkness. Use paper bags, dark coloured plastic and galls jars and place them in cupboards. DO NOT place the seeds on a shelf in clear glass jars.

#### **Moisture**

Even if the seeds are dry, if you store them in a damp environment they will absorb

Most seed can be stored for a period of 3-5 years and remain viable. **Viability** is the ability of the seed to germinate. Your seed may look perfect, but if it is not viable, it will not grow!

that moisture/water. This seriously affects how long your seeds will be viable. Mostly we can only dry our seeds in the air. Do not dry them in the sun, but in a shady place where the air can move (ventilated). When the weather is very wet with a lot of rain and mist, it will be difficult to dry seeds, especially the larger ones, like beans and peas.

**The life of seed doubles when the moisture content is lowered by 1%.**

### *Temperature*

Seeds last longer in cold, but not freezing conditions. Choose a cold place such as near a river, under trees, under the ground or inside a clay jar.

If you store your seed in hot, light (sunny) and wet conditions they will lose their viability very quickly. You may even not be able to plant them in the following season. They like cool, dark and dry conditions to germinate.

**The life of a seed doubles when the storage temperature is lowered by 5°C.**

### **Pests**

Storage weevils, fungi and bacteria shorten the life of seeds.



- ❖ Weevils begin to multiply when the moisture content gets high enough (10% or more). The eggs are laid inside the seed, under the seed coat, and the insects hatch from there.
- ❖ Storage fungi/ moulds begin to grow when the moisture content is high enough (around 13% or more) and bacteria start growing around (20% moisture). Mostly we cannot measure the moisture content of our seed. All we can do is keep our seed as dry as possible.

Store your seeds in dry, clean, airtight glass jars or other airtight containers. **AND LABEL THEM – Give them names!!** By next year you will not remember what it was.

Materials that stop the growth of pests can be used:

- ❖ **Dry ash:** this absorbs moisture inside the container and also prevents the growth and increase of weevils. Add ½ kilogram ash to 1 kilogram seed.
- ❖ **Lime:** can be used in the same way as dry ash. Mix 15 teaspoons (50 grams) with every kilogram of seed.
- ❖ **Cooking oil:** mix cooking oil with your seeds to prevent increase of weevils. Use only 1 teaspoon of oil for every kilogram of seeds.
- ❖ **Dried and powdered leaves of different aromatic plants:** weevils are sensitive to aromatic or strong smelling plants. Try the following:

- CHILLI: mix 4-6 teaspoons of chilli powder with 1 kilogram of seed.
  
- WORMWOOD (MHLONYANE): Dry and crush the leaves and mix with seed. Use 4-6 teaspoons for every kilogram of seed.
  
- ALOE: As above.