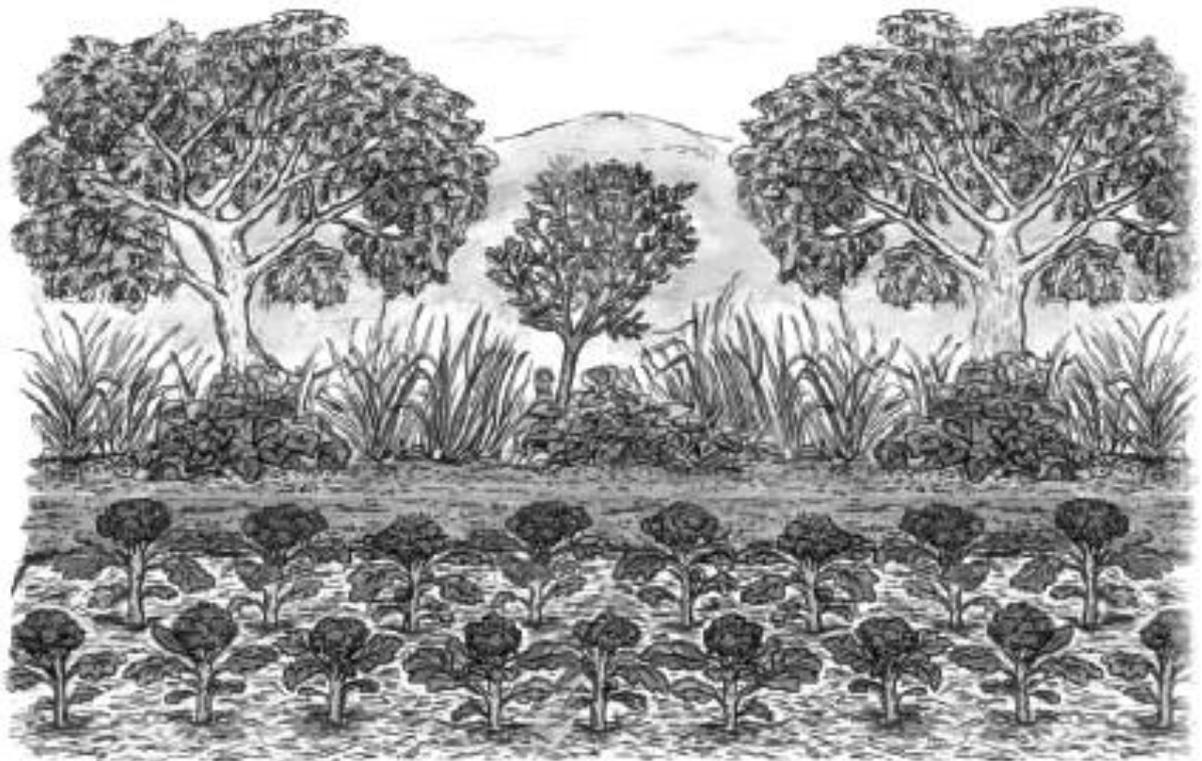


4. Wind and frost protection



Shelter belts or rows of different plants and trees grown together can protect your garden from wind and frost. A windbreak/shelterbelt is a physical barrier that we place across the path of the wind. It serves to slow the wind down and to make the negative effects of heat, cold and dust less. Above is an example of such a shelter belt that contains fodder species for livestock; the plants grown in these rows can all be used as feed for goats, cattle, sheep and chickens!! Shown here are cow peas climbing up the trees, napier fodder (grass), pigeon pea (the small tree) and Acacia karroo. These plants are also good for improving your soil fertility. The leaves of all these plants can be used as mulch. The leaves can also be included as green material in compost. They can be used in the making of trench and keyhole beds. (See the leaflet on Improving your Soil in this series).

Wind protection

The movement of air is important to plants. It prevents diseases caused by too much moisture/wetness and lack of air. It also helps to spread pollen (the male part of a fertilised seed) and seed themselves.

Wind can affect your plants in negative ways:

- ❖ Strong winds can blow over or break your crops and trees
- ❖ Dry winds cause the soil and plants to dry out.
- ❖ Very hot or cold winds can destroy crops.
- ❖ Dust carried by the wind scratches plants like sandpaper.
- ❖ Wind can also cause soil erosion, especially in the dry months. Your top soil can be blown away by the wind, leaving you with the less fertile sub soil.

Where to place a windbreak

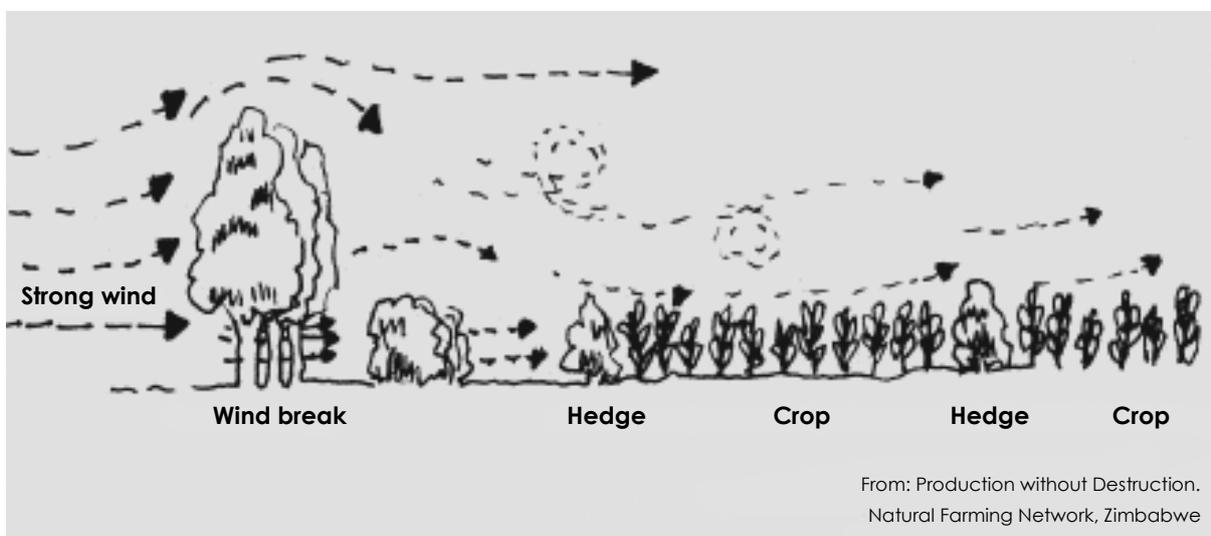
Windbreaks are planted across the path of the main hot, cold and dry winds in your area. Windbreaks are good around homesteads. They can also be planted along roads and paths and also as boundaries around your fields and gardens.

Some extra advantages of windbreaks

- ❖ Can provide firewood
- ❖ Can provide fruit
- ❖ Can be thorny for protection
- ❖ Can provide fodder of animals
- ❖ Can provide medicine

How to make a windbreak

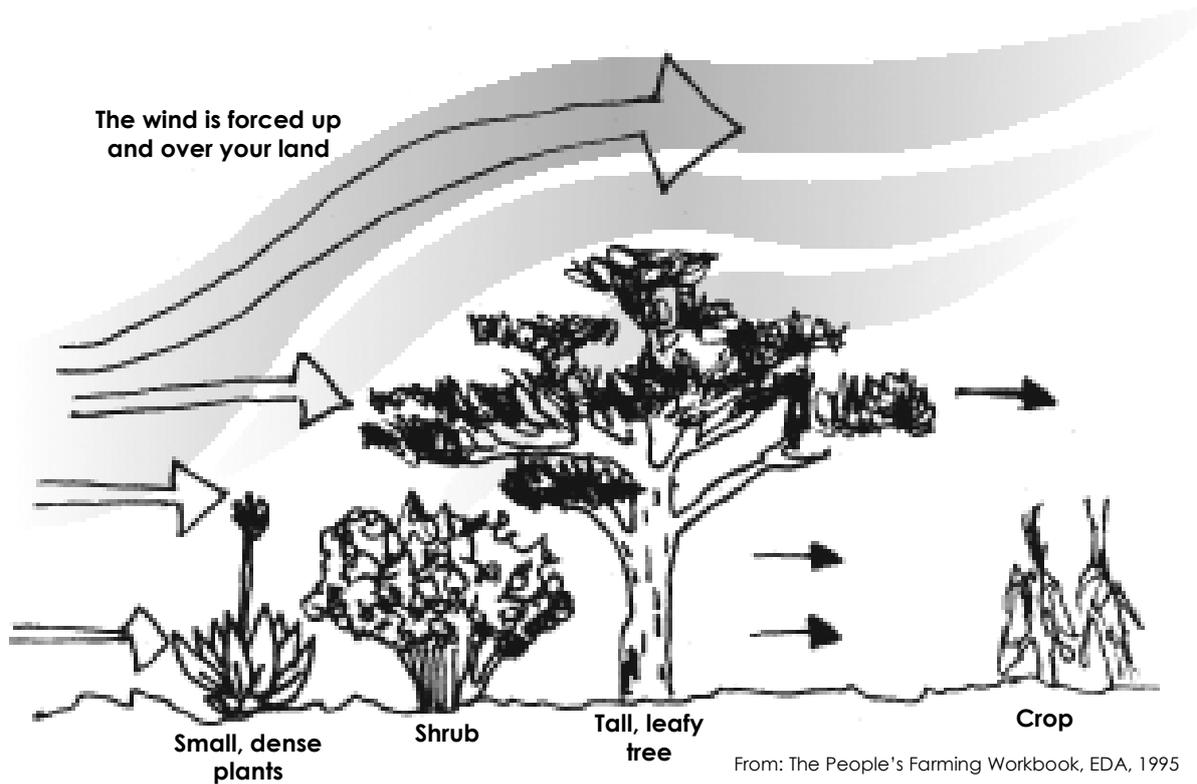
It consists of rows of trees and shrubs, usually of various kinds and heights. They are planted as a semi-solid barrier. This means that some air can still move through the windbreak, but it will be slowed down. The best windbreaks consist of at least three rows of shrubs and trees of different heights.



The trees and shrubs can also be planted in 1 or 2 rows, if you can make sure that branches and leaves still grow close to the ground. With tall trees only, the lower branches die back over time. The wind will then "tunnel" past these bare stems and

damage your crops. The shorter shrubs and plants can be planted on the side the wind is coming from as well.

Here are some examples of plants, shrubs and trees that you can use!



Small plants	Shrubs	Trees
<ul style="list-style-type: none"> ❖ Aloes ❖ Comfrey ❖ Wormwood ❖ Herbs such as rosemary, thyme, lavender, ❖ Marigolds ❖ Fennel ❖ Runner beans ❖ Vines such as grapes and passion fruit 	<ul style="list-style-type: none"> ❖ Napier fodder ❖ Pigeon pea ❖ Buddleja or Sage wood ❖ Halleria or Tree Fuchsia ❖ Dovyalis or Kei-Apple ❖ Carrissa or Num-Num ❖ Euclea or Blue Guarri 	<ul style="list-style-type: none"> ❖ Casuarina or Beefwood ❖ Acacia or Sweet thorn ❖ Mulberry

More about some of the suggested small plants, shrubs and trees

Aloe

These are good for protection as they often are thorny. They also provide some protection against fire, as the leaves are fleshy and hold a lot of water. They can be used for medicine. A good kind to use is Aloe maculata. This is a low growing aloe

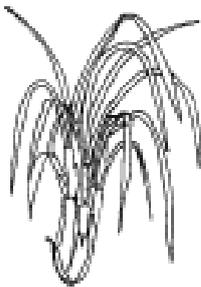
with white speckles on the leaves. The gel in the leaves is very good as a medicine for constipation and contains a trace element known as selenium. Selenium is a very important supplement for your immune system.

The aloe often grown around homesteads, *Aloe striatula*, which has long, thin leaves, can be a bit invasive.



Marigolds and Fennel

These are small strong smelling plants that help to protect your garden from insect attack. The white umbrella-like flowers of fennel help to attract insects (predatory wasps) that eat the pests in your garden (worms and aphids). Marigolds can be used to make a poison that will kill small worms (nematodes) in your soil.



Napier fodder

This is a tough, hardy fodder grass that can be used for hay and silage. It is also good for mulching. It grows fast. It is propagated by taking small rooted clumps from a "mother" plant. It is also possible to lay the canes/grass stems in shallow furrows. These will grow from the nodes/notches in the stem. In cold areas the plants will die back in winter (the dry leaves remain as a windbreak). They will re-shoot in spring.

Buddleja salvifolia; Sagewood; Lelothwane

These are tough, fast growing, evergreen shrubs. This means they do not lose their leaves in winter. They are frost resistant. They will need to be protected when young, but are robust when older. The flowers attract birds and bees. The leaves can be used as tea or as a medicine for eye complaints.



Halleria lucida; Tree fuchsia; Lebetsa

This is a shrub, but can also grow into a small tree. It grows up to about 3-10metres high. It has multiple stems that can be cut for firewood, garden stakes and fencing. It has tubular orange/red flowers that attract birds and bees. The fruit is edible.

Euclea crispa; Blue guarri; Mohlakolo, Motsoella

It is a shrub or bushy evergreen tree that grows between 1 and 5 metres high. It has small, black pea-like berries that are edible. It grows wild in Lesotho.





Carissa bispinosa; Num-num

It is a branched, spiny evergreen shrub. The leaves are small, shiny and thick. Fruit are small oblong red berries that are good to eat and for making jams.

Cajanus cajan; Pigeon Pea

This is a small tree that is native to Africa. It fixes nitrogen in the soil and has deep roots. It can be used for firewood. It is frost tolerant, but needs to be protected when young. The young leaves can be eaten as spinach and the seeds are eaten as beans or "dahl". The leaves are also good fodder for animals; especially cattle and goats.



Dovyalis caffra; Kei Apple



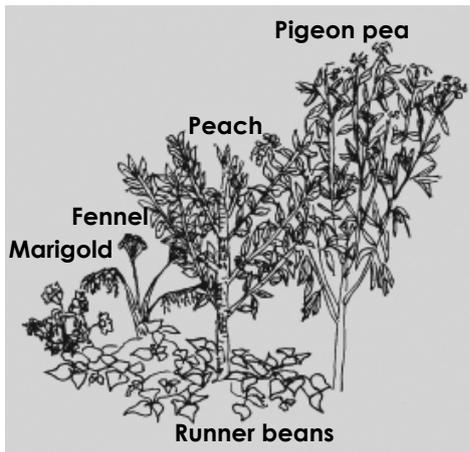
This is a very thorny small tree with fleshy leaves. It makes a good protective hedge. It grows a bit slowly. It is resistant to drought and frost. It needs to be protected from frost when young. The fruit is good to eat and can be made into jams and jellies. The flesh needs to be washed off the seed before planting.

Mulberry

These are large deciduous trees. This means they lose their leaves in winter. The leaves are good animal fodder. The small black berries are very sweet and can also be used for making jam. Mulberries are easy



to grow from cuttings. They can be pruned and these branches can be used for fences, stakes and firewood.



It is possible to plant fruit trees together with some of the trees and plants mentioned here. This helps to protect your fruit from pest attack and wind and frost damage. On the left is an example of a peach tree planted with runner beans, marigolds, fennel and Pigeon Peas. Different combinations of plants can be used.

Casuarina Cunningham; Beefwood

This tree originally comes from Asia and Australia. It is a large shady tree with leaves that look like pine needles. It grows very fast and can grow in poor soil. It provides good timber and firewood. It can be planted easily from seed. It is moderately frost resistant and should be protected when young.



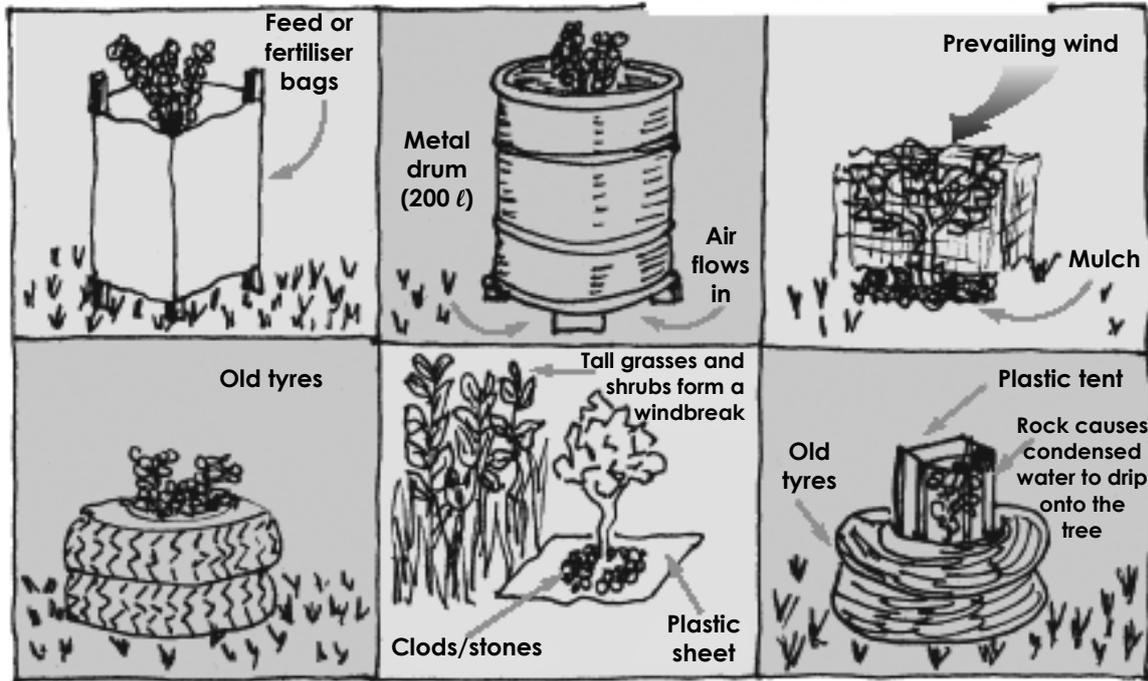
Acacia karroo; Sweet Thorn



These are very hardy, fast growing, very thorny trees. They are frost and drought resistant. They fix nitrogen into the soil. The tree provides good firewood. Leaves, flowers and pods are good animal fodder.

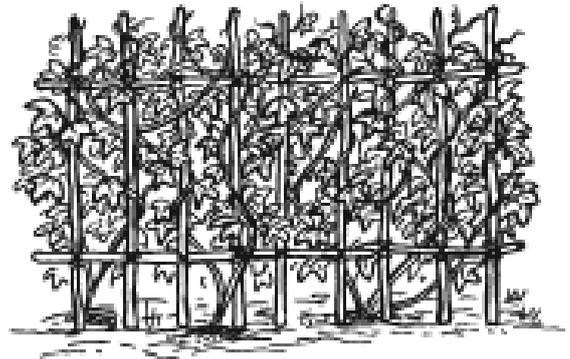
It may be difficult to find some of the plants described above. They will also need some water when they are young and some protection against frost. Below are some examples of how you can protect individual trees and plants in your windbreak.

From: Introduction to Permaculture



You can also use other materials as small windbreaks around your garden:

- ❖ A fence made of many thin sticks can help. You can use old maize stalks or even black jack stalks.
- ❖ It is also possible to grow vines or creepers on a fence to give more protection. It may be difficult to find vines that are highly resistant to frost. Passion fruit or granadilla can take some frost. This is called frost tolerant. It means that if you are expecting very heavy frost and your vine/plant is still young it will need some protection from the frost. Later, when the plant is older and stronger it will be able to tolerate the frost better. Other vines are deciduous. This means they will lose their leaves in winter. They can still offer some protection.



Examples are: Grapes, Kiwi fruit and climbing beans such as lima beans, seven year beans and red runner beans.

- ❖ Bundles of thatch grass or maize stalks for example can be tied to the fence, across the path of the main winds.



- ❖ Animal feed sacks or plastic orange pockets can be sown together and sown onto the fence to provide a screen.



Experimentation

You need to decide how much you need a windbreak and what it should be made from. Growing rows of plants and trees will take a few years, but it is the best kind of windbreak. It can also provide fruit, food for animals and firewood.

But perhaps you only need a windbreak for your seedlings or a small part of your garden.

You may want to experiment by using a temporary windbreak, like animal feed sacks sown onto a fence. If you do this, it will be hard to have a control for your experiment, because there will be nothing that you can compare your experiment with. But you may be able to see some differences between having a windbreak or not having one.

Questions to think about:

- ❖ Do your plants seem healthier because they have not been bent and damaged by wind?
- ❖ Do you have to water less because the wind has not taken so much moisture from the soil?
- ❖ Do you think you have put your windbreak in the right place? Is it in the path of the wind? Should it be closer or further away from your garden?
- ❖ What have been the advantages and disadvantages of a windbreak? You may want to make a list. But remember, some advantages might be hard to see at first. Maybe you are watering your plants less, or there is less soil erosion. (Mulching is also a good way of stopping soil erosion.) Other advantages of growing a windbreak are the wood for stakes, firewood, fruit and natural pest repellents that you get from them.
- ❖ What will you make your windbreak from? If you are going to use plants and trees, which ones will be best? Which ones can you get hold of easily? When they are fully grown, will they give rows of protection to stop the wind getting through, like in the picture on page 1? Think about how tall each will grow, whether it will lose its leaves in winter or not. Will the wind be able to get through? You need to plan your windbreak carefully.

Frost protection

Frost is like cold water, as it flows downhill and collects in the lowest points. This freezing air is usually less than 1m (the length of a spade) deep. It is coldest closest to the ground.

Early frosts are usually only ground frosts. That means that the temperature only goes below freezing at ground level, but not at, say, 30 cm (the width of a spade) above ground, so only tiny seedlings will be damaged. Fully grown plants like peas, especially if staked, will survive. But later frosts will be air frosts, which means that the temperature drops below freezing at even 1,5 metres above the ground, thus affecting all crops. These are the killer frosts and are usually seen as coating everything with a crust of ice instead of dew.

In the Lowlands and Foothills in Lesotho, the first killer frosts are expected between 5-15 May and the last killer frosts usually occur around 15-25 August in the Lowlands. In the foothills this can be as late as 15 September.

Crops damaged or killed by frost	Crops affected by frost	Crops that can withstand frost	
tomatoes green beans peppers sweet potatoes chillies pumpkins	leaves of potatoes (but not the plant, which can re-grow) young peas (the flowers and pods)	spinach swiss chard some mustards carrots beetroot lettuce onions	broad beans cabbage kale turnips garlic leeks

Dealing with frost

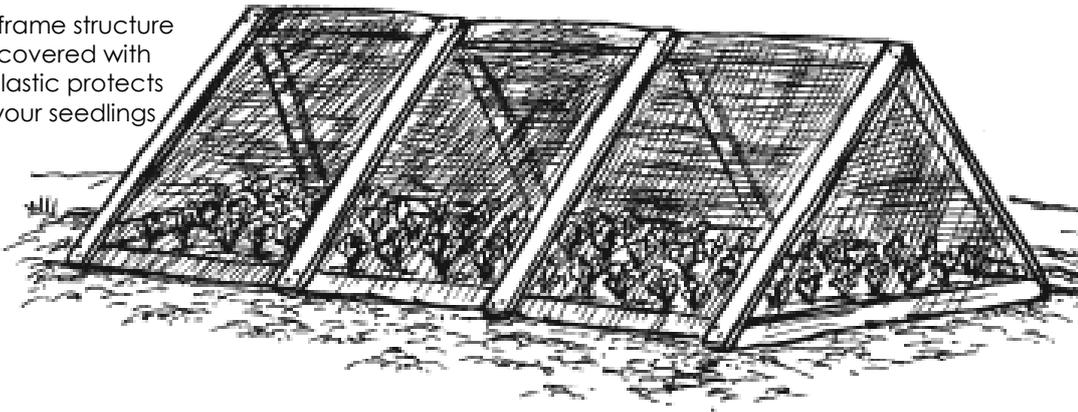
The only real way to deal with both kinds of frost is to protect your plants. There are a number of ways you can do this. All of them will need you to plan in advance. Some may even need you to design your garden in a different way.

1. Covering your sensitive crops

For the early frosts, you can cover your sensitive young plants with anything you can find which will act like a thin blanket. You can use grass, newspaper weighed down with stones, or old onion and orange pockets tied together. You can also use old livestock feed bags. It is possible to buy frost cover from your local nursery or Co-operative. This "cloth" is not very expensive and works very well. It can just be draped over your beds and pegged down using clothes' pegs. Make sure to put this "blanket" over your plants in the late afternoon.

It is also possible to cover your crops with structures made from greenhouse plastic or netting, placed over a wooden frame. This will protect your crops also from the severe winter frosts. One can buy shade cloth or special netting to deter frost from a garden centre or agricultural cooperative. This however is quite expensive.

A frame structure covered with plastic protects your seedlings

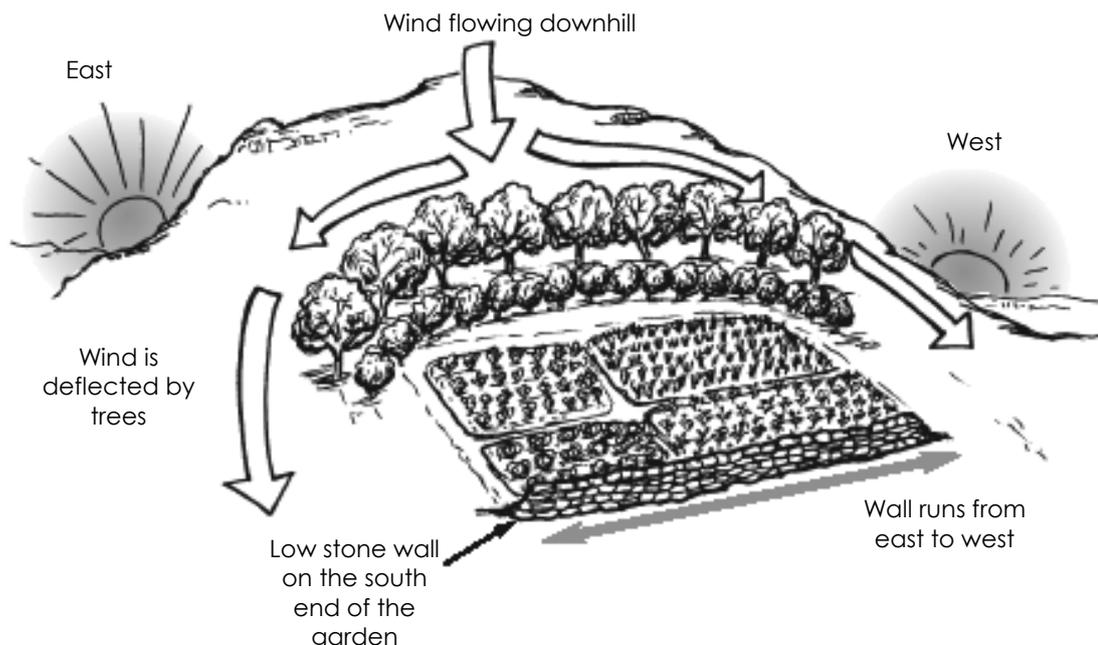


2. Siting/placing your garden

The best place to have a garden is on the top part of a north facing slope. It will get the most sun and will not be so cold at night as land at the bottom of a slope.

If your land is on a slope, put plants which may be affected at the top of the slope.

A low wall of stones, built roughly east-west across your garden and on its southern edge will catch the sun during the day and warm up. It will then act like a stove at night giving off the day's heat.

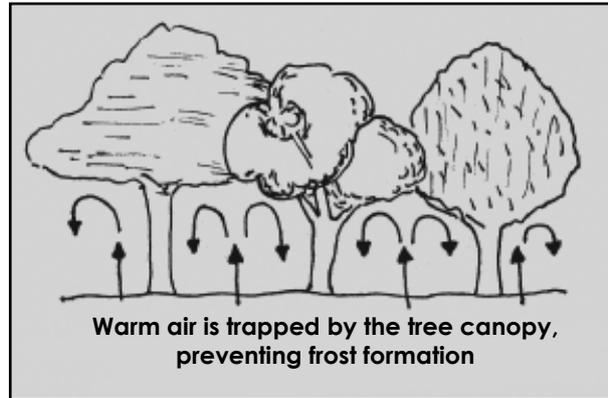


3. Hotbeds

These will help in autumn and into winter. Put soil back on top of a trench full of rotting weeds, grass and manure and then plant on top of that, keeping the whole bed well wetted. (See the bed design pamphlet in this series).

4. Trees and bushes

Trees and bushes help to prevent frost by trapping the heat as it is lost from the ground. They will also radiate some heat into the air at night.



5. Movement of water and air

If there is a lot of water on and around your plants, it is sometimes less likely that frost will form. Here you can try watering your plants well, late in the afternoon. This will sometimes reduce the amount of frost formed on your beds and plants.

You can also make little conical hats from paper for each seedling. This involves quite a lot of work, but may be worthwhile in protecting sensitive plants and seedlings.

Then, it can also help to water the frozen plants in the morning early, before the sun comes up and heats up the environment. This reduces the damage to plants that have been frosted.

Some people make fires in their gardens at night. The movement of the air reduces the settling of frost on plants.



If you have a nice big rock that faces the sun, you can use this as a "heater" for a small seedling bed. Make the small bed in front of the rock. Make a small structure of wattle sticks around your bed. Then drape some clear plastic over your structure. It is easy to get large pieces from furniture shops in the area. This will create a small "greenhouse" for your seedlings. It will be much warmer inside the structure than outside.