LAND MANAGEMENT

SUSTAINABLE LAND
Shelter Design for Horticulture and Cropping on the Plains

Main Points

Benefits of a well designed shelter belt include erosion control, protection for crops and buildings and a potential source of timber. Shelterbelts, however, can be expensive to establish, so it is important the principals outlined here are considered in the initial design plan to avoid costly mistakes.

Shelter Belt Density

The density of a shelterbelt affects wind velocity on the downwind side. The aim of a shelterbelt is to filter wind, but not stop it entirely. A solid obstruction or very dense belt tends to create turbulence and accelerates wind speed on the downwind side (refer to diagram 1).

A medium density shelter belt (40-60% porosity) will provide up to 50% reduction in windspeed eight to 10 tree heights downwind and some protection out to 20 tree heights away. This general rule of thumb can be used to work out appropriate spacing between shelterbelts. For horticultural crops which require total shelter, closer plantings will be necessary.

If you cannot see through a shelterbelt then it is too dense. Side trimming of the shelterbelt will help maintain the correct porosity.

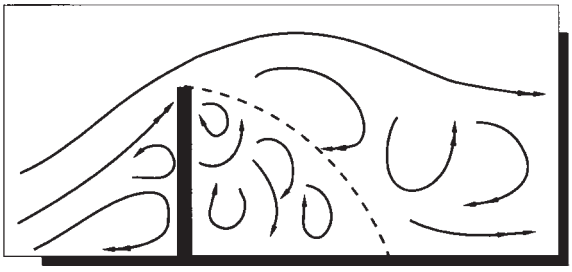

Diagram 1a: Solid Obstruction

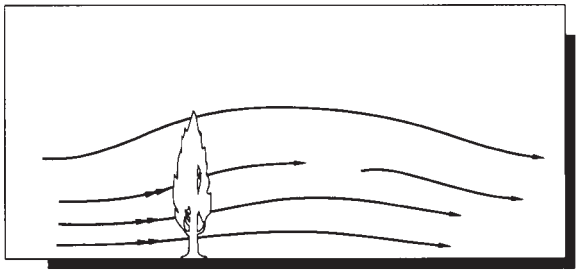

Diagram 1b: Permeable Shelterbelt

A well maintained Poplar Shelter Belt

Shelterbelt length
Turbulence occurs around the ends of shelter belts, so one long shelterbelt will be more efficient than a series of shorter ones. As a guide, shelter belts should be at least 12 times as long as their height. Turbulence will intensify as shelter belt density increases, as more wind will be deflected around the ends. On flat land, work with your neighbours to get the most effective coverage of an area.

Gaps in shelterbelts
Wind accelerates through gaps in shelterbelts. These can be caused by tree losses or gateways. Tree seedlings should be replaced as soon as possible after losses occur as the longer blanking is left, the greater the competition on the young seedling to survive.

Shelter Belt orientation
Damaging winds often come from more than one direction, so site the shelter belts carefully. Ideally, shelterbelts should be at right angles to the wind but usually some compromise is needed to use existing fences or avoid obstacles. Northwesterlies are the prevailing winds during the Hawke's Bay spring when cultivated paddocks on light soils are at most risk from wind erosion.

The wind effects can be magnified if belts are in the same direction as the prevailing wind. This happens more if the shelter belt is dense, as wind will deflect off the upwind side and accelerate down the full length.

Shading can be a concern for east-west shelter as the southern side of the belt will receive limited sunlight. This can be reduced by side trimming or using deciduous or light crowned species. Evergreens are more suited to shelterbelts which run north-south as they receive an equal amount of sunlight, minimising shading on surrounding crops (refer to diagram 2).

Hazards and regulations
The main hazards to shelter plantings are power lines, telephone lines and open drains. Trees should not be planted within 20m of overhead wires. Regulations say any part of a tree must be at least four metres from wires and up to 50m in some circumstances.

Landowners must ensure this clearance is maintained. If this responsibility is neglected, the landowner will be charged by the electrical distributor for maintaining the necessary clearance, and maybe liable for fines up to $10,000 (contact Hawke's Bay Power for further details).

Regional Council regulations limit how

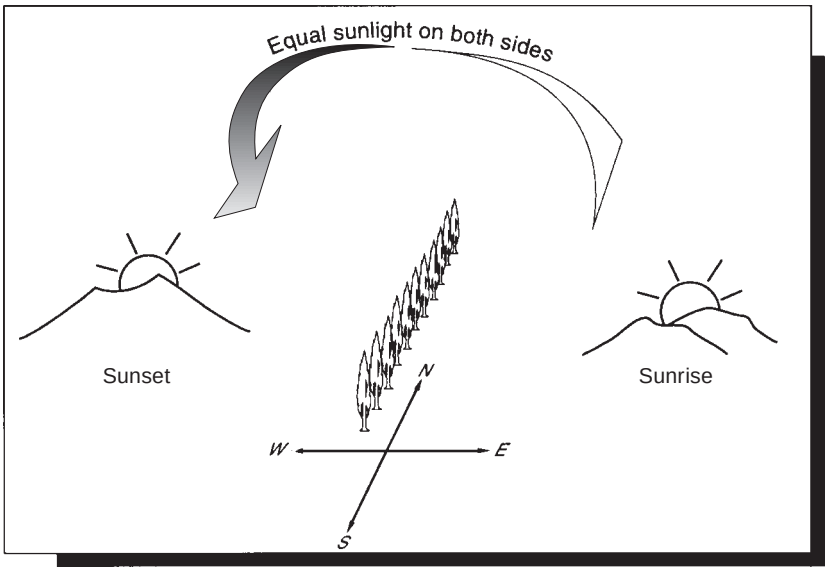

Diagram 2

close belts can be planted to community drains (usually 6m away to allow for maintenance access).

District Council by-laws state the distance of tree planting from property boundaries. For information regarding boundary planting regulations either contact your local district council or refer to the Environmental Topic entitled 'Tree planting on boundaries' in this series.

Crop Response

Shelter increases crop yield by reducing wind damage and plant transpiration, and increasing soil temperatures.

In Canterbury trials, protection from NW winds raised average yield of oats by 35% in the zone extending to six times their height. Yield of process crops was also greatly improved from shelter. MAF observations showed good shelter reduced the time required for kiwifruit to come into maximum production by two seasons.

In contrast, crop growth can be depressed directly adjacent to shelterbelts due to added competition for moisture and nutrients. Eucalyptus, Casuarina, willow and poplar are notorious species for having extensive root systems which compete with the surrounding crop and can invade tile drains and cause complete blockage.

Root pruning every two to three years will help alleviate both of these problems. Where sub-surface drainage crosses under a shelterbelt, the length of pipe 10 to 15m out from both sides of the row should be impermeable (unslotted).

Shelter can provide further problems for horticultural operations, particularly vineyards. Shelterbelts may impede cold air drainage and attract birds, increasing the risk of frost and bird damage to the crop. Well trimmed shelter will help minimise these problems.

Shelterbelts can also harbour pests and diseases detrimental to the crop. Scale, for example, can be found in a wide range of shelter species. Discuss this aspect with an industry consultant, or neighbours who already have the tree species you intend to plant.

For further information

For further information on shelter ask for the Environment Topic entitled Shelter Species Selection or contact Hawke's Bay Regional Council Land Management staff for advice.

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