

Lec. 6 SOME SUB SYSTEMS OF AGRISILVICULTURAL SYSTEM

(viii) Shelter-belt:

These are belts/blocks consisting of several rows of trees established at right angles to the prevailing wind. The purposes are:

- a) to deflect air currents,
- b) to reduce the velocity of prevailing winds,
- c) to provide general protection to the leeward areas against the effects of wind erosion,
- d) to protect the leeward areas from the desiccating effects of hot wind,
- e) to provide food, fodder, timber etc.

The following are the main characteristics of shelter-belts:

i) Shape and composition: Shelter-belts have a typical triangular shape. This can usually be brought about by raising tall trees in the centre.

ii) Density and width: A certain degree of penetration by winds is planned as by raising a solid wall, the protection decreases very fast on the leeward side. Shelter-belts up to 50 m width are considered ideal under Indian conditions.

iii) Height and spacing: The ratio of height and width should be roughly 1:10. However, this figure may vary with local conditions.

iv) Orientation: Orientation of shelter-belts depends on the direction and velocity of the prevailing winds. Shelter-belts may be raised in quadrangles if the wind direction tends to change very often.

v) Length: Length is an important consideration as far as shelterbelts are concerned. The minimum length of a shelter-belt should be about 25 times its height,

vi) Choice of species: The following species are recommended:

Grasses: *Saccharum spontaneum*, *S. munja*, *Panicum antidotale*,
Cenchrus sp.

Shrubs: *Calotropis procera*, *Clerodendron phlomoides*, *Cassia auriculata*, *Dodonaea viscosa*

Trees: *Acacia arabica*, *A. leucopholea*, *Dalbergia sissoo*, *Lannea coromandelica*,
Eucalyptus spp., *Tamarix articulata*, *Parkinsonia aculeata*, *Prosopis juliflora*, *Prosopis Spicigera*, *Casuarinaequisetifolia*.

ix) Wind-break:

Wind-breaks are strips of trees and/or shrubs planted to protect fields, homes, canals or other areas from wind and blowing soil or sand.

The important reasons for which wind-breaks are planted include:

- ✓ to protect livestock from cold winds
- ✓ to protect crops and pastures from hot, drying winds
- ✓ to reduce/prevent soil erosion
- ✓ to provide habitat for wildlife
- ✓ to reduce evaporation from farmlands
- ✓ to improve the microclimate for growing crops and to shelter people and livestock,
- ✓ to retard grass fire
- ✓ for fencing and boundary demarcation

When properly designed and maintained, windbreaks reduce the speed of the wind and thus its ability to carry and deposit soil and sand. They also improve growing conditions by decreasing water evaporation from soil and plants and can be used to reduce evaporation from water surfaces, such as irrigation ponds, canals or streams. In addition, wind-breaks can provide wide range of useful products, from poles and fuelwood to fruit, fodder, fibre and mulch.

i) Permeability: A wind-break works by filtering and breaking the force of the wind. For most purposes, permeable wind-breaks which allow some wind to pass through are the most suitable. The slight movement of air through the wind-breaks forms a cushion of slow-moving air on both upwind and downwind sides. This deflects the main volume of wind upwards and prevents it from descending for some distance. Thus, the wind velocity in the protected area may be reduced to between 25 and 75 per cent of the wind speed.

Dense wind-breaks produce a small area of still air in a narrow strip behind the trees, but further downwind there may be considerable turbulence. However, dense wind-breaks may be desirable when a high level of protection is needed for small areas such as around homesteads and work areas or for vulnerable livestock such as newborn lambs, calves etc.

The desired permeability can be obtained by carefully selecting tree shrub species. Species such as *Eucalyptus* and *Casuarina* will form el wind-breaks but most native species are more permeable.

ii)Orientation: For best results, plant wind-breaks at right angles to winds from which protection is needed. Wind-breaks planted north-south are a good compromises as they provide protection from winds coming from the western quarter. They also give better shading of adjacent crops and pastures than wind-breaks planted east-west.

iii)Height: The wind-break height determines the size of the sheltered area. The taller the wind-break, the greater the area it protects. On level ground a windbreak will reduce the speed of wind for about 25 times the tree height on down windside. Maximum reduction of wind speed is in the area 5 to 15 times the tree height away from the wind break. On the upwind side some protection is gained up to a distance of 5 times the tree height away from the windbreak. Thus a wind break 20 m tall will give some protection from 100 m on the upwind side to 500 m on the downwind side.

iv)Length: Wind breaks are most effective when they stretch without major gaps for distances exceeding 12 times the mature height of the trees.

v)Number of rows: A single row wind break should be used only where land is so valuable that only a small amount of space can be spared for tree planting. If a single row wind break is to be planted, tree species that retain their foliage to the ground and give a fairly dense growth should be selected. ***Eucalyptus* are generally unsuitable as single-row wind-breaks** because of their habit of losing their lower limbs. The main disadvantage of a single row is that if one tree is lost, gap is created, which reduces the efficiency of the entire wind break. **Wind breaks of three to five rows are more effective** for most farm situations and are less affected by gaps caused by mission trees. Tall growing species should be planted in the centre rows and small bushy species in the outside rows

vi)Tree spacing: Distance between trees varies with the relative importance of the protective versus productive purposes of the wind break. Where the products of wind breaks have a high priority, then land-users may favour greater number of shorter strips and a higher proportion of small trees and shrubs which provide products such as fodder and fuelwood. If the by product is timber, the height of wind breaks and the intervals between them can be increased. When the interest is to protect valuable crops, the wind breaks should be as tall and as far apart as possible

to obtain the more protection. In dry areas, individual plants should be widely spaced so that they do not compete with each other for the available soil moisture.

vii) Gaps: Gaps are required for gates and tracks, but because of the funneling effect through gaps, wind velocity in these areas can be substantially increased. In multi row wind breaks this can be eliminated by angling the gap at about 45 degrees to the prevailing wind direction. Alternatively, a few plant, trees or shrubs can be used on either side of the gate or track to broaden the gap and reduce the funneling effect. Other solutions are to plant five or six trees at an angle to the main belt as a wing or to plant a second short row to cover the gaps .

viii) Species: In general, trees with narrow, vertical growth are ideal for wind breaks to minimise the land removed from crop production. Some fast-growing species should be used to establish the desired effect as rapidly as possible. Some of the tree species used for wind-breaks are *Eucalyptus*, *Cassia*, *Prosopis*, *Leucaena*, *Casuarina*, *Acacia*, *Grevillea*, *Syzygium*, *Dalbergia* etc.

(x) Soil Conservation Hedges: Trees can be planted on physical soil conservation works (grass strips, bunds, risers and terraces) wherein they play two roles: **ie.**, to stabilise the structure and to make productive use of the land they occupy. Stabilisation is through the root system. In some of sloping landscapes of the country, the risers or terraces are densely planted with trees, with multiple use being made of them for fruit, fodder and fuel wood . **In this system the major groups of components are:** multipurpose and trees and common agricultural species. The primary role of multipurpose trees and agricultural species is soil conservation and provision of various tree products. The following tree species are used for soil conservation: *Grevillea robusta*, *Acacia catechu*, *Pinus roxburghii*, *Acacia modesta*, *Prosopis juliflora*, *Alnus nepalensis*, *Leucaena leucocephala* etc.