Field Windbreaks Provide

- Protection from wind erosion
- Increased crop protection
- Improved moisture management
- Improved crop yields
- Wildlife habitat
- Carbon storage
- Alternative crops
- Natural control of insects
- Biological diversity

Possible Alternative Crops

- Nursery stock production
- Fuel wood
- Decorative wood
- Posts and poles
- Animal bedding
- Fruits and nuts
- Floral products
- Special-purpose wood products

For more information contact the South Dakota Division of Resource Conservation & Forestry

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Field Windbreaks

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Division of Resource Conservation
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Agricultural producers face many challenges as they try to balance efficient production systems with increasing environmental demands. These systems must optimize the balance between inputs and final production. Field windbreaks are one way to increase yields, reduce inputs, and improve both environmental quality and production efficiency all at the same time.

Field windbreaks reduce wind erosion and crop damage from wind-blown soil. They improve water use efficiency, reduce risks associated with drought, and manage blowing snow. In addition, field windbreaks provide opportunities to enhance natural insect controls, provide wildlife habitat, and add quality and biological diversity to agricultural systems.

Wind Erosion

Historically field windbreaks have been planted to control wind erosion and protect crops. Wind erosion occurs primarily on large, open fields where the soil is loose, dry and finely granulated and where the soil surface is smooth and vegetative cover is sparse or absent. These conditions most often occur when fields are being prepared for planting. Windbreaks reduce wind erosion by reducing wind speed, reducing field width, and creating a stable area where the erosion process is interrupted.

Improved Crop Yields

Numerous studies indicate the positive effect of windbreaks on crop yield (See Table 1). Crop yields will improve from 5 to 45 percent depending on the year and weather conditions. Most yield increase is due to better use of water by protected crops. Increased temperatures in the protected area leads to increased crop development, earlier maturity, and earlier marketing opportunities. Wind protection also improves crop quality which may increase the value of the crop.

One of the more common handicaps of field windbreaks is the competition between the windbreak and the adjacent crop. There is no question that under conditions of limited moisture, competition between the windbreak and the crop results in a loss in yield in the area next to the trees. In most cases, the increased yield from the rest of the protected field will make up for this loss of yield.

Crop	Yield Increase (%)
Spring wheat	6 to 10
Winter wheat	20 to 25
Barley	23 to 25
Oats	5 to 7
Rye	18 to 20
Millet	40 to 45
Corn	10 to 15
Soybean	12 to 17

Table 1. Average, net yield increase of common grain and oilseed crops in response to shelter. (based on world wide data.) University of Nebraska Cooperative Extension EC-00-1778-X

How a Field Windbreaks Works

As wind approaches a windbreak, some wind moves through the barrier, but most of it moves up and over the windbreak. This leads to wind speed reduction on both the windward (side toward the wind) and leeward (the side away from the wind). The wind protection zone on the windward side is 2 to 5 H (where H is the windbreak height). Generally the wind protection zone on the leeward side is 10 to 20 H and may extend as far as 30 to 40 H downwind. Within these two protection areas, the microclimate is changed. Sheltered areas within 10 H on the leeward side tend to be slightly warmer and evaporation decreases as humidity increases. Overall, crop growth conditions are improved, reducing plant stress and improving crop yields.

Field Windbreak Design

The purpose of a field windbreak is critical to its design. Windbreaks designed for snow management are different from those designed to control wind erosion or summer crop protection. Field windbreaks need to accommodate the cultural practices, equipment and land situation of the individual farm operation. In general, field windbreaks should be oriented perpendicular to the prevailing or problem winds to maximize the protection zone.

The ideal design for maximum crop production should consist of one or two rows composed of tall, long lived species with good growth rates, deep roots systems and similar growth forms. Overall windbreak density should be 40 to 60 percent during the growing season.

Windbreaks designed to reduce wind erosion should have a density of 40 to 60 percent during the period when soils are exposed. Normally this is at planting time when most deciduous plants have no leaves. Typically, this means that the windbreak needs either a coniferous species or a dense shrub understory.

Field windbreaks designed exclusively for uniform snow distribution should have a winter density of 25 to 35 percent. Planting a single row of tall deciduous trees on a wide spacing (16 to 20 feet between trees) perpendicular to the prevailing winter wind direction will provide good snow distribution.

Field Windbreak Economics

A financial analysis of the impact of an investment in a field windbreak system on grain production in the Great Plains indicates positive return over the life of the windbreak. For example, if a corn/soybean farmer with 160 acres established four single row, equally spaced parallel field windbreaks across the field, the cost of establishment and costs associated with land planted to the windbreaks would be recovered with in 10 years. By year 15, the net return on investment would be several thousand dollars. By year 30, the return would be over $30,000. (University of Nebraska Cooperative Extension EC-00-1778-X).

Windbreaks are living systems and require care and management to function at their best.