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Understanding Wind Erosion And Its Control

Wind erosion is a serious hazard on millions of acres of land in the United States, most of which are in the Great Plains.

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Wind erosion may occur when the wind at one foot above the ground surface blows greater than 12 mph. It is a serious hazard on millions of acres of land in the United States, most of which are in the Great Plains. However, larger fields and fall plowing has spread the potential for winter and spring wind erosion to a larger part of the country.

There are a number of things an individual can do control wind erosion but basically they all point to accomplishing one or more of the following objectives:

1. *Reduce the wind velocity at the soil surface*. This is done with windbreaks, crop residues, cover crops, surface roughness, and wind stripcropping.
2. *Trap soil particles.* This is accomplished by ridging or roughening the soil surface to trap moving soil particles.
3. *Increase size of soil aggregates.* This is accomplished by using crop rotations that include grasses and legumes, by growing high-residue crops and returning crop residues to the soil, and by emergency tillage, which creates clods on the soil surface. Increasing the size of aggregates means that it takes a stronger wind to move the soil.

Factors that affect the quantity of wind erosion that takes place include soil erodibility, soil ridge roughness, climate and weather, the unsheltered distance across a field along the prevailing wind erosion direction, and residue or vegetative cover.

Different soils erode at different rates because of their inherent characteristics. Soil texture and cloddiness are the primary properties in determining soil erodibility.

Soil erodibility can be altered by growing different crops. Some crops, such as hay, will normally help increase the size of soil aggregates more than wheat, corn, or soybeans whereas tillage operations break down the aggregates. The bigger an aggregate is, the less chance of blowing. Some types of tillage equipment, such as the disc, reduce aggregate size more than other types, such as the chisel. Early melting of snow or a lack of snow cover exposes the soil surface to alternate freezing and thawing: in the daytime, dark surfaces absorb more heat then the white snow, and at night the soil surface may again freeze. This can occur daily in the late winter and early spring, reducing the size of soil aggregates and increasing the chances of wind erosion. Growing crops that produce a large amount of crop residues and using conservation tillage can result in larger

soil aggregates than when conventional practices are followed.

Producing a crop in a ridged field will reduce wind erosion. The ratio of ridge height to distance between the ridges is very important. The most effective ratio of height of ridge to distance between rows is 1:4. For example, to be most effective the ridge should be at least 2 inches high if the distance between the ridges is 8 inches. The ridge is usually formed with a tillage tool before planting or during cultivation of the crop in the growing season.

Dry climates are more subject to wind erosion than humid climates. High wind velocity contributes to increasing wind erosion.

The unsheltered distance across a field or strip along the prevailing wind erosion direction is an important factor; a factor that can be changed by man. Soil flow across a field is directly related to the width of the unprotected area and may be likened to an avalanche moving down a mountain. Soil flow or erosion increases with distance until the wind becomes saturated or is carrying its maximum load. The more erodible the soil surface, the shorter the distance at which maximum flow occurs and the narrower the fields must be to keep the soil loss at a tolerable level. Therefore, an effective means of wind erosion control is to reduce field width. It is also important to work fields as close to perpendicular to the prevailing wind erosion direction as possible.

Residue or growing vegetation on the soil surface reduces wind velocity at the ground surface. As the quantity of residue on the surface increases, the wind velocity decreases. Pound for pound, residues with a stem of a smaller diameter result in more surface area of residue and therefore produce more friction. The greater the friction, the greater the reduction in wind velocity. Standing residues reduce wind velocity more than those lying flat.

Therefore, residues are more effective in reducing wind erosion if:

1. Large quantities of residues are left on the soil surface.
2. Stalks are small in diameter or have a large surface area per unit of weight.
3. The residue is left standing or nearly so.

In summary, when designing a wind erosion control system, one should consider cropping and management that will:

1. Result in large soil aggregates;
2. Include ridging;
3. Establish narrow fields, wind stripcropping, and, where feasible, windbreaks that are as nearly perpendicular as practical to the prevailing winds during the critical wind erosion periods;
4. Leave large amounts of residue on the surface--standing if possible--at least during the most critical periods.

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