

Controlling Wind Erosion

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CONTROLLING WIND EROSION¹

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Erratic rainfall and high winds characterize the semiarid Central Great Plains. Thus, soil erosion by wind is a yearly threat somewhere in the region, and in some years, such as 1977, the threat includes some fields throughout the entire area. The condition is aggravated by some of the tillage practices used. Much of the crop production in the area is on summer fallowed land. Wind erosion is not limited to fallow areas, but fallowing is a major contributor to wind erosion. In wheat-fallow or wheat-sorghum-fallow rotations, wind erosion usually does not occur during the fallow periods, but after wheat is planted where little residue remains and wheat doesn't grow enough to protect the soil from spring winds.

It takes careful planning and careful soil manipulation to maintain enough crop residue and soil clods on the soil surface to reduce the wind erosion hazard.

Several objectives must be met for any fallow and subsequent crop production program to be successful. They include: (a) preserving crop residues to reduce wind, and to some extent, water erosion; (b) controlling unwanted vegetation and creating conditions favoring moisture storage during the fallow period; and (c) establishing a satisfactory seedbed for planting the next crop. Those objectives can be realized by judiciously using proper tillage tools. Also, proper use of herbicides may reduce the number of tillage operations required and, thus,

leave more residue on the soil surface.

Erodibility of soil is a complex interaction of several factors. Moisture content at the soil surface, soil texture (sand, silt, clay, etc.), size of clods, and vegetative cover are among the most important. For example, more vegetative cover is required to protect loamy sand than silty clay. As the percentage of nonerodible clods increases, the amount of cover needed to prevent wind erosion decreases. Fine textured soils are particularly subject to structural changes caused by freezing and thawing. Thus, fine textured soils often are susceptible to wind erosion in late winter and early spring. Differences in soils make it difficult to give precise guidelines on the amount of vegetative cover or the size and number of clods needed to prevent wind erosion.

Fortunately cleanly plowed fields free of all "trash" are no longer considered marks of a good farmer.

Wind erosion control should start when a crop is harvested. A systems approach is required for success. Well managed stubble mulch systems effectively control wind erosion. Unfortunately these systems have some inherent limitations. Repeated tillage, even with sweep-type implements, reduces or destroys surface residue. Thus after long periods of fallow, only a small amount of residue may remain. Many farmers have been unable to accomplish consistently satisfactory weed control using only sub-surface tillage. That led to a return, at least occasionally, to a moldboard plow or disk implements. Further, a series of generally favorable years with little wind erosion damage lulled some farmers into a false sense of security. Now

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hundreds of thousands or perhaps millions of acres with little or no protective cover are planted to wheat. Unless the crop makes substantial fall growth, the soil surface may be highly erodible through the winter and early spring.

A currently popular concept suggests the possibility of crop production with zero tillage. Certainly that would be the best way to preserve residues on the soil surface. Active research throughout Kansas and in surrounding states indicates reduced or minimum tillage systems may be more practical than zero tillage. Information for sorghum production with one such system is available in Circular 477, "Grain Sorghum Production with Minimum Tillage after Wheat in Central Kansas", available from county extension offices. Reduced tillage systems to control erosion involve substituting herbicides for tillage to control weeds. The question arises--is tillage necessary? The answer, over-simplified, is no, provided weed control, seedbed preparation, conditions for moisture storage, etc. can be met without tillage. Although farmers often are concerned about the amount of "trash" remaining at the end of a minimum tillage or zero tillage fallow system, planting equipment, generally speaking, is available for planting into heavy residues. The objective that is usually most difficult to achieve is preparing a satisfactory seedbed for wheat without tillage. Fine textured soils, in particular, often become very hard and dry near the surface. Presently-available planting equipment may penetrate such soil, but the resulting cloddy soil is an unsatisfactory seedbed. Conversely, untilled soil can usually be easily planted to spring seeded crops. The "mellowing" process over winter often creates a better seedbed than any mechanical manipulation does.

Active research with reduced tillage continues, but at present most wheat will continue to be planted on tilled land. This does not mean wind erosion cannot be controlled. It does mean that to control erosion, there must be less reliance on moldboard plows and disc implements.

Despite its shortcomings, stubble mulching or crop residue management is the best presently available way to reduce wind erosion.

Stubble mulch farming is a year around system of managing plant residues so tilling, planting, cultivating, and harvesting operations are performed to keep sufficient residues to protect the surface soil at all times. A sweep machine is the basic tool used. It is the most effective machine available for the initial tillage operation. Rod-weeders and other machines may be used for secondary operations with good success on some soils.

Stubble mulch tillage may be used with early fallow, that is, starting tillage immediately after harvest and controlling weed growth to decrease water loss during the fall; or with delayed fallow where the stubble is left undisturbed until about the first of May when the first tillage operation is performed.

If there are only a few weeds in the stubble at wheat harvest, the stubble is usually left erect and in place with no tillage until the next spring. But abundant late summer and fall weed growth will remove stored water from the soil. Then post harvest weed control will pay. Tillage with a sweep machine about 4 inches deep will control weeds and leave most of the stubble standing. Standing stubble controls wind erosion and collects snow much more effectively than stubble in a horizontal position on the surface. Post harvest tillage also favors the growth of volunteer wheat. If

not controlled, it also may deplete soil moisture.

Satisfactory operation of the V-sweep is the most important consideration in a successful stubble mulch program. The big sweeps (5-6 feet) on a flexible frame that allows each sweep to operate more or less independently are improvements over older rigid machines. The greatest objection to sweeps is poor weed control in moist soil during cool, wet weather. That objection can be partially overcome by properly adjusting and operating the sweeps.

Set the blades to cut as near as possible the same depth from point to wing and still keep the blade in the ground. For maximum weed control, work as shallow as possible. Speed of operation is also important for maximum soil shattering to promote weed kill. Speeds of less than 4 miles per hour are often not satisfactory.

The rodweeders work well in some soils and under some moisture conditions. They cannot be used for initial tillage on most soils, but may provide excellent seedbed preparation. Rodweeders tend to firm the soil and effectively kill weeds. Rods modified to include chisel points give better penetration and control of depth.

Mulch treaders can be used much the same way as rodweeders. Treaders kill small weeds without destroying all of the surface residue. They do, however, flatten the stubble and thus hasten its decomposition. As with a rodweeder, the treader has some firming action and may be used for seedbed preparation.

Even with the best management other machines may have to be used, but their use should be kept to a minimum. Oneway disks have been used for many years in the Great Plains. They are durable, economical implements but because they tend to cover crop residues and pulverize the soil,

they are seldom a good tool for conservation tillage farming. Their disadvantages can be partially overcome by altering the operating speed and angle of draft. A oneway can be used very successfully for special purposes to deal with heavy stubble or excessive weed growth. Offset or tandem disks have some of the same capabilities and limitations as oneways.

Other erosion control measures include wind barriers, strip cropping, and possibly, in the future, chemical soil stabilizers. In areas with highly erodible soils (sandy loam, etc.), strips of trees, shrubs, perennial grasses, or even annual plants may be the best available answer, but such plantings have never been popular on the vast acreages of the Great Plains. Strip cropping is practiced in some areas, and may be regarded as a particular type of wind barrier, although it has never been widely used in Kansas.

EMERGENCY TILLAGE

Growing crops and preserving crop residue provide the best protection from wind erosion. However, when residues are lacking or become inadequate, emergency tillage may become necessary. The basic aim of emergency tillage is to create a rough, cloddy soil surface to resist the force of wind. Several types of tillage implements can be successfully used for emergency operation. Narrow chisels are most widely used and have proved effective. They require less power and destroy less of a growing crop than lister-type implements.

The effectiveness of emergency tillage depends on many factors including soil, moisture and texture, speed of travel, depth of tillage, and spacing between chisels. Operate the machine to give maximum surface roughness consistent

with halting erosion while salvaging part of the crop, if possible. If erosion is severe, solid tillage with chisels spaced close together may be necessary, but in cases of moderate erosion, wider spacing (44 to 54 inches) and stripping a field may permit salvaging much of the crop.

Emergency tillage is most effective when performed perpendicular to the

prevailing wind. Timeliness of control measures is important and one should be prepared to apply emergency tillage when condition of the topsoil shows susceptibility to blowing. Cooperative community action is needed to avoid extensive losses to large areas. Wind erosion control on any farm may be wasted and of short duration if surrounding land is allowed to go unattended.