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G75-282 Emergency Wind Erosion Control (Revised March 1992)

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Emergency Wind Erosion Control

This NebGuide covers temporary techniques for emergency wind erosion control, when time and prior planning don't allow soil or seedlings adequate protection using more desirable methods.

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Soil erosion by wind is a serious threat to growing crops, our land resource, and the air we breathe. The best solution to soil erosion is long-term planning.

Recommended practices include residue or crop cover, strip cropping, and windbreaks. These practices are known to substantially reduce wind erosion in even the most extreme conditions. However, conditions sometimes occur when serious soil erosion is imminent or has just begun, and corrective action is required to protect the soil and growing crops.

Several emergency techniques can lessen anticipated soil erosion, or slow wind erosion once started. These techniques are last resort options and should not be relied on for continued use or primary erosion control.

Emergency control measures are not as effective as long-term planned erosion control methods, and are generally inefficient as measured by inputs of fuel, materials, and labor.

Potential Emergency Control Methods

The following emergency control methods are available to reduce damage from wind-induced soil erosion that already has started or is anticipated:

- tillage to produce ridges and clods;

- addition of crop residue;
- application of livestock manure;
- irrigation to increase soil moisture;
- temporary, artificial wind barriers;
- soil additives or spray-on adhesives.

Choice of method, or combination of methods, depends on severity of erosion, soil type, soil moisture, type of crop, stage of crop growth, and equipment or materials available.

Control Erosion Early

Once started, wind erosion must be controlled as soon as possible. If a young crop is present, serious damage to seedlings can occur within a few minutes.

Be aware of and monitor highly erodible areas such as knolls, wheel traffic areas, blowouts, and areas where crop stand or crop yield was low. These areas are most vulnerable to erosion and probably will be the first needing treatment. Treat these areas, and the areas directly upwind, before they begin to erode.

Anticipating soil erosion is a valuable erosion-fighting tool. It is easier to control erosion before it starts than to stop it after it becomes a major problem.

Using Emergency Control Methods

Emergency Tillage: Tillage for wind erosion control should be viewed as a last resort, although it can be effective if done properly.

The purpose of emergency tillage is to provide a rough, ridged, cloddy surface more resistant to wind erosion. Surface roughness reduces wind velocity at the soil surface and helps trap windblown soil particles. Emergency tillage is only a temporary measure because clods readily disintegrate.

Where possible, use emergency tillage before soil blowing starts. Soil erodes more rapidly from abrasion by windblown soil particles than from wind that contains no soil particles. If erosion is anticipated because high winds are forecast, start emergency tillage on areas of the field most vulnerable to erosion before the wind reaches a critical speed. If soil blowing already has started, begin emergency tillage on the upwind edge of the eroding area. Tillage in a direction perpendicular to the expected wind direction is most effective.

The objectives of emergency tillage differ from seedbed tillage.

Seedbed tillage typically produces a level surface with no large clods. Emergency tillage provides the opposite -- both ridges and clods.

This difference generally requires a specialized implement for emergency wind erosion control, or at least the implement must be adjusted and operated differently than it would be for seedbed preparation.

An implement used for emergency wind erosion control should gently lift the soil, creating as many and as large of clods as possible. Disks and harrow-type implements with several ranks of closely spaced tines generally will not be effective, and should not be used.

In fine or medium textured soils, most types of chisel, lister, or broad shovel points create a ridge and

bring clods to the surface. The shank and/or point should produce a gentle lifting action to bring clods to the surface and to avoid breaking them. An angled, wide point which lifts the soil usually creates larger clods and a larger ridge than a point that has a straight, narrow, vertical shape.

Narrow points 2 to 4 inches wide require a shank spacing of about 24 inches for best results. Wider shovels or lister bottoms that create a larger ridge can be spaced 36 to 48 inches apart. Tillage depth to produce maximum roughness generally varies between 4 and 12 inches, depending on soil conditions.

Moist or heavy soils often provide good ridges and clods with tillage depths of 4 to 8 inches. Dry or sandy soils generally require deeper tillage.

Field speed for emergency tillage depends on the implement, soil conditions, and depth of tillage. In general, slow speeds produce more clods while faster speeds provide more ridging effect. Speeds of 3 to 4 mph usually result in the most effective surface. For best results, vary both implement depth and field speed to determine the combination producing maximum overall roughness.

It often is difficult to obtain effective clods and roughness in sandy soils, and the roughness is often short-lived. Wide shovels or lister bottoms spaced 40 to 50 inches apart usually provide the best combination of clods and ridges in sandy soil.

If more than one emergency tillage operation is anticipated, use a shallow depth (4 to 6 inches) the first time. Follow with a deeper tillage the second time, with new furrows spaced between the original furrows. Vary the face angle of the tillage tool, depth of operation, and field speed to obtain the best combination.

In sandy soils it usually is best to anticipate emergency tillage will be required, and time the operation to obtain the best roughness. Some operators obtain best results soon after a rainfall when the soil is moist and the implement shanks follow tractor tire tracks. Clods readily form in sandy soil when the soil surface is moist and has been lightly compacted.

Other operators prefer a soil ripper to bring up large, dry clods when subsurface soil is dry. Still others attempt to time the operation when the top two inches of soil is frozen, to bring up frozen clods. One danger is that the soil may freeze too fast or too deep before the operation is completed.

Emergency tillage can be used in a field planted to winter wheat. If wind erosion occurs, it is better to control the damage early using emergency tillage, rather than risk losing the entire crop. Use narrow chisel points spaced 4 to 6 feet apart, 4 to 6 inches deep. Tillage direction should be perpendicular or at an angle to the wheat row to minimize plant injury.

Data from a five year study at two sites in Kansas suggests this type of emergency tillage has minimal effect on potential yield, but can reduce the damage to growing wheat and can reduce soil loss in moderate erosion situations. This study found emergency tillage caused the most damage to wheat yields when the wheat had just emerged. The least yield reduction was found when the tillage was done in fields with wheat plants already tillered. Emergency tillage is not effective if clods cannot be brought to the surface, and is not possible after the soil has frozen more than 2 inches deep.

Row crops just planted or just emerged often are vulnerable to wind erosion, and can be protected by emergency tillage. Growers often equip their planters with narrow, flat running sweeps to pull clods to the surface during planting. This is especially important between crop rows where tractor or planter tires leave smooth surfaces with no clods.

After planting, rotary hoes, strippers (implements with several rotary hoe type wheels between each crop row) and cultivators are used to create clods on the soil surface. These operations are carried out both in anticipation of wind erosion, and after erosion begins. The most effective time is often after a rain. A heavy rain will melt any clods present and create a soil surface that blows easily.

Effective clods can be created at the soil surface if emergency tillage is done soon after the rain when there is considerable moisture in the top 2 inches of soil. Although emergency tillage can be effective in row crop situations after the soil begins to erode, tillage in moist soil conditions in anticipation of erosion almost always will be better.

Addition of Crop Residue: Crop residue added to the soil surface reduces wind velocity at the soil surface and traps moving soil particles. Almost any kind of residue, such as hay, straw or cornstalks can be used. Approximately 2,000 to 4,000 lbs per acre of residue is required to control erosion in areas where erosion already has begun. Large stemmed residue is more effective and easier to maintain in place than fine material.

Residue can be distributed with a manure spreader, or even by hand if the area is small. A rotary hoe or mulch treader helps spread the residue uniformly. Normally the residue must be anchored in place with a stubble puncher or a disk with gangs set at a minimum angle and shallow depth. If a disk is used, take care to prevent burying too much residue, or its effectiveness will be reduced.

The direction of operation for residue distribution and anchoring should be perpendicular to the direction of the wind. Relatively heavy residue such as cornstalks might not require anchoring, but lighter material such as straw or hay quickly blows away if not securely anchored.

Addition of crop residue can be effective in stopping wind erosion if an adequate amount is applied, if it is anchored, and if it is not covered by soil from the upwind direction. Avoid introducing problem weeds by using residue free of weed seed.

This method normally is not used in entire fields or in fields with planted row crops. It is most practical as a spot treatment.

Application of Livestock Manure: Like crop residue, livestock manure can reduce wind erosion by slowing wind velocity at the soil surface and by trapping soil particles. It can be effective in growing wheat, fallow fields, and row crops.

Typically, 6 to 8 tons per acre of livestock manure effectively control wind erosion on vulnerable spots and prevent erosion from spreading to adjacent areas. Manure should contain sufficient moisture and ample particle size when spread so it will not be dislodged or broken into smaller-sized particles. Anchoring normally is not required.

A second application of manure can be made if erosion continues or begins again at a later time. If manure and manure spreading equipment are available, this is an effective emergency control method for small or large areas.

Concerns include introducing weed seeds and excessive or nonuniform addition of nitrogen.

Using Irrigation: Generally, irrigating to control soil erosion is impractical and wastes water. Once erosion starts, water application by center pivot is nonuniform and too slow to be effective.

The impact of large water drops from the sprinkler deteriorates soil structure at the soil surface and even encourages wind erosion once the soil surface has dried. However, if a high value cash crop is being severely damaged by wind erosion, irrigation might be a practical solution if enough water can be applied to keep the soil surface sufficiently moist. Applying irrigation water prior to emergency tillage might provide surface roughness to reduce wind erosion potential.

Temporary, Artificial Barriers: Temporary, artificial barriers can be used for emergency wind erosion protection if the eroding area is relatively small. For example, a stock watering area or a knoll can be protected by board fences, snow fences, or rows of bales. Protection can be expected for a downwind distance approximately 10 to 15 times the height of the barrier.

Soil Additives or Spray-on Adhesives: Soil additives or spray-on adhesives are generally expensive, temporary, and used only for high value cash crops such as vegetables. Several materials of petroleum or organic origin are available and have been used on a small scale. These materials are not compatible with all soils and often are made ineffective by subsequent rainfall or cultivation.

Prevention is Easier and More Effective Than Emergency Control

The single most practical and effective method of wind erosion control is maintaining sufficient live crop material or crop residue on the soil surface. Other good alternatives include crop rotation, strip cropping, wind breaks, and conservation tillage. Where wind erosion has been a problem in the current or a past year, take preventative measures for the coming year. Use the emergency control methods described in this NebGuide only as a temporary, last resort-- not on a continuing basis.

Suggested References and Sources of Information

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