NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT NO TILL/STRIP TILL/DIRECT SEED

(Ac.)

CODE 329

DEFINITION

Managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting soil-disturbing activities to only those necessary to place nutrients, condition residue and plant crops.

PURPOSE

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Improve soil organic matter content.
- Reduce CO_2 losses from the soil.
- Reduce soil particulate emissions.
- Increase plant-available moisture.
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland and other land where crops are planted.

This practice includes planting methods commonly referred to as no-till, strip till, direct seed, zero till, slot till or zone till. Approved implements are: no-till and strip-till planters, certain drills and air seeders, strip-type fertilizer and manure injectors and applicators, in-row chisels, and similar implements that only disturb strips and slots. All others are considered to be full-width or capable of full disturbance and therefore not compatible.

CRITERIA

General Criteria Applicable to All Purposes

Residue shall not be burned.

All residues shall be uniformly distributed over the entire field.

No full-width tillage shall be performed regardless of the depth of the tillage operation.

The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities shall be no greater than 30, but the maximum may be less depending on the purpose.

Unless otherwise stated for a specific purpose, the minimum ground cover shall be at least 30% after the planting of spring crops.

Additional Criteria to Reduce Sheet and Rill Erosion

The amount of randomly distributed surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the current approved water erosion prediction technology.

Additional Criteria to Reduce Wind Erosion

The amount and orientation of standing and surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the planned soil loss objective shall be determined using the current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the management system.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service State Office or visit the electronic Field Office Technical Guide.

Additional Criteria to Improve Soil Organic Matter Content

An evaluation of the cropping system using the current approved soil conditioning index procedure shall result in a positive trend.

The minimum ground cover after planting a spring crop shall be at least 80%, and the practice will continue for a minimum of five consecutive years.

Additional Criteria to Reduce CO_2 Loss from the Soil

The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities in the cropping system shall be no more than 20.

An evaluation of the cropping system using the current approved soil conditioning index procedure shall result in a positive trend.

Additional Criteria to Reduce Soil Particulate Emissions

The amount and orientation of residue needed and the amount of surface soil disturbance allowed to reduce wind erosion to the tolerable soil loss value (T) shall be determined using the current approved wind erosion prediction technology. Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria to Increase Plant-available Moisture

The annual Soil Tillage Intensity Rating (STIR) value for all soil-disturbing activities in the cropping system shall be no more than 20.

Crop stubble height during the time evaporation losses can be expected to occur shall be:

- At least 10 inches for crops with a row spacing of less than 15 inches.
- At least 15 inches for crops with a row spacing of 15 inches or greater.

These stubble heights shall be present on at least 60% of the field.

Additional Criteria to Provide Food and Cover for Wildlife

The time that residue is present, the amount and orientation of residu, and the height of stubble needed to provide adequate food and cover for the target species shall be determined using an approved habitat evaluation procedure.

CONSIDERATIONS

General - Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plant and air resources.

Production of adequate amounts of crop residues necessary to achieve the purposes of this practice can be enhanced by selection of high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacing.

Using no till/strip till/direct seed for all crops in the rotation or cropping system can enhance the positive effects of this practice by:

- Increasing the rate of soil organic matter accumulation.
- Keeping soil in a consolidated condition, which provides additional resistance to sheet and rill erosion.
- Sequestering more carbon in the soil.
- Further reducing the amount of particulate matter generated by field operations.
- Forming root channels and other near-surface voids that increase infiltration.

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Increasing Soil Organic Matter Level and Reducing CO_2 Loss - CO_2 loss is directly related to the volume of soil disturbed, the intensity of the disturbance and the soil moisture content and soil temperature at the time the disturbance occurs. The following guidelines can make this practice more effective:

- Shallow soil disturbance (1-3 inches) releases less CO_2 than deeper operations.
- When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical slot created by these implements is closed at the surface.
- Planting with a single disk opener no-till drill will release less CO_2 than planting with

a wide-point hoe/chisel opener air seeder drill.

- Soil disturbance that occurs when soil temperatures are below 50° F will release less CO_2 than operations done when the soil is warmer.

Reducing Soil Particulate Emissions - Slower operating speeds generally produce fewer particulate emissions.

Dry soils will produce more particulates than moist soils.

Reducing the wind erosion rate will help reduce particulate emissions. This can be done by:

- Increasing the level of crop residue cover.
- Reducing the number of soil-disturbing operations.
- Installing other practices to reduce wind erosion, such as Herbaceous Wind Barriers (code 603) or Cross Wind Trap Strips (code 589C).

Managing Soil Moisture and Protecting Crops from Freeze Damage - The type, timing, and depth of soil-disturbing activities all influence moisture loss. Shallow operations (1-2 inches) or operations that do not invert the soil will reduce moisture loss compared to deeper operations or those that invert and mix the soil.

Soil-disturbing operations performed when the soil surface is moist will result in greater moisture loss than operations done when the top two to three inches of soil have dried.

Leaving stubble taller than the minimum required will increase the relative humidity close to the soil surface, which reduces the rate of evaporative loss from the soil.

Performing all field operations on the contour will slow overland flow and allow more opportunity for infiltration.

Wildlife Food and Cover - Leaving rows of unharvested crop standing at intervals across the field or adjacent to permanent cover will enhance the value of residues for wildlife food and cover. Leaving unharvested crop rows for two growing seasons will further enhance the value of these areas for wildlife.

Leave crop residues undisturbed after harvest (do not shred or roll) to maximize their cover and food source benefits.

Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria and Considerations described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

As a minimum, the following must be provided to the client:

- Purpose of the practice.
- Minimum ground cover required.
- Source of the ground cover (cover crop, crop residue, etc,).

OPERATION AND MAINTENANCE

Test soil to 4-inches every 2 to 3 years.

Remedial measures for surface rutting are to be developed in consultation with the local Field Office staff.

Ground cover determinations are to be made after spring plantings using the line transect method as described and illustrated in the job sheet for this practice.

REFERENCES

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