NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, NO TILL

(Ac.)

CODE 329

DEFINITION

Limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year around.

PURPOSE

- Reduce sheet, rill and wind erosion (Resource concern: Soil erosion - Sheet, rill, & wind erosion).
- Reduce tillage-induced particulate emissions [Resource concern: Air quality impacts – Emissions of particulate matter (PM) and PM precursors].
- Maintain or increase soil quality and organic matter content (Resource concern: Soil quality degradation – Organic matter depletion).
- Reduce energy use (Resource concern: Inefficient energy use – Farming/ranching practices and field operations).
- Increase plant-available moisture (Resource concern: Insufficient water – Inefficient moisture management).
- Provide food and escape cover for wildlife (Resource concern: Inadequate habitat for fish and wildlife – Habitat degradation).

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

This practice only involves an in-row soil tillage operation during the planting operation and a seed row/furrow closing device. There is no full-width tillage performed from the time of harvest or termination of one cash crop to the time of harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation.

CRITERIA

General Criteria Applicable to All Purposes

Do not burn residue.

Distribute residues uniformly over the entire field. Removing residue from the row area prior to or as part of the planting operation is acceptable.

Do not perform any full-width tillage from the time of harvest or termination of one cash crop to the time of harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation. The Soil Tillage Intensity Rating (STIR) value includes all field operations that are performed during the crop interval between harvest or termination of the previous cash crop and harvest or termination of the current cash crop (includes fallow periods and cover crops). Maximum allowed STIR value is 20.

Additional Criteria to Reduce Sheet, Rill and Wind Erosion

Use the current approved water and/or wind erosion prediction technology to determine the:

- amount of randomly distributed surface residue needed;
- time of year the residue needs to be present in the field, and
- the amount of surface soil disturbance allowed to reduce erosion to the desired level.

Additional Criteria to Reduce Tillage-Induced Particulate Emissions

Reduce or modify tillage operations that create dust, especially during critical air quality periods.

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Adopt tillage practices that reduce particulate emissions.

Additional Criteria to Improve Soil Quality and Organic Matter Content

Ensure that an evaluation of the cropping system using the current approved soil conditioning index (SCI) procedure results in an SCI rating of zero or positive.

Additional Criteria to Increase Plant-Available Moisture

Reducing Evaporation from the Soil Surface. Maintain a minimum of 2000 pounds per acre or 60 percent residue cover on the soil surface throughout the year.

Maintain crop stubble height on at least 60% of the field during the time of expected evaporation losses:

- 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.

Trapping Snow. Maintain the following crop stubble height on at least 50% of the field during the time significant snowfall is expected to occur:

- 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.

Additional Criteria to Reduce Energy Use

Reduce the total energy consumption associated with field operations by at least 25% compared to the benchmark condition. Use the current approved NRCS tool to document energy use reductions.

Additional Criteria to Provide Food and Cover for Wildlife

Use an approved habitat evaluation procedure to determine when residue needs to be present, and the amount, orientation, and stubble height needed to provide adequate food and cover for target species.

CONSIDERATIONS

General Considerations - Removing 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 crop residues to achieve the purpose of this practice can be enhanced through the use of high residue crops and crop varieties, the use of cover crops, and adjustment of plant populations through seeding rates and row spacing.

Residue should not be shredded after harvest. Shredding residue makes it susceptible to movement by wind or water, and areas where residue accumulates may interfere with planting the next crop.

Using the practice 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 the erosive forces of water and wind.
- Sequestering additional carbon in the soil.
- Further reducing the amount of particulate matter generated by field operations.
- Reduce energy inputs to establish crops.
- Forming root channels and other near-surface voids that increase infiltration.

Considerations for Improving Soil Organic Matter Content - Carbon 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:

- 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 and oxidize less

organic matter than planting with a wide-point hoe/chisel opener seeder drill.

- Soil disturbance that occurs when soil temperatures are below 50° F will oxidize less organic matter and release less CO_2 than operations done when the soil is warmer
- Maximizing year-round coverage of the soil with living vegetation and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation.

Considerations for Improving Soil Health/Quality - To achieve major improvements in soil health requires more than no-till alone. The following activities/practices are needed to make significant changes in soil health:

- Use a diverse crop rotation, incorporating multiple crop types (cool-season grass, cool-season legume/forb, warm-season grass, warm-season legume/forb) into the crop rotation.
- Plant a cover crop after every cash crop in the rotation. Multi-species cover crop mixes may provide greater benefits than single-species cover crops.

Considerations for 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.

Leaving stubble taller than the 10-inch minimum will trap more snow and provide better protection to plants from freezing or desiccation.

Variable-height stubble patterns may be created to further increase snow storage.

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

Considerations for Providing Food and Cover for Wildlife - 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 bale) to maximize the cover and food source benefits for wildlife.

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

PLANS AND SPECIFICATIONS

Prepare and record specifications for establishment and operation of this practice for each field according to the Criteria, Considerations, and Operation and Maintenance described in this standard. As appropriate identify:

- The resource concern to be treated or the purpose for applying the practice
- Planned crop(s)
- The amount of residue produced by each crop.
- The amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year it must be present
- The maximum STIR value allowed to accomplish the purpose, and the time of year that soil disturbance is allowed
- The minimum soil conditioning index value required to accomplish the purpose
- All field operations or activities that affect:
    - Residue cover
    - Residue orientation
    - Surface disturbance

OPERATION AND MAINTENANCE

Evaluate/measure the crop residues cover and orientation after each crop to ensure the planned amounts and orientation are being achieved. Adjust management as needed to either plan a new residue amount and orientation or adjust the planting and/or harvesting equipment.

Limited tillage is allowed to close or level ruts from harvesting equipment. No more than 25% of the field may be tilled for this purpose.

If there are areas of heavy residue accumulation (because of movement by water or wind) in the field, spread the residue prior to planting so it does not interfere with planter operation.

REFERENCES

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