Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, NO TILL

CODE 329

(ac)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- Reduce sheet, rill and wind erosion and excessive sediment in surface waters. (Soil Erosion, Water Quality Degradation)
- Reduce tillage-induced particulate emissions. (Air Quality Impacts)
- Maintain or increase soil health and organic matter content. (Soil Quality Degradation)
- Increase plant-available moisture. (Insufficient Water)
- Reduce energy use. (Inefficient Energy Use)
- Provide food and escape cover for wildlife. (Inadequate Habitat for Fish and Wildlife)

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

Residue shall not be burned.

Distribute all residues uniformly over the entire field. Removing residue from directly within the seeding or transplanting area prior to or as part of the planting operation is acceptable.

This practice only involves an in-row soil disturbance operation during strip tillage, the planting operation, and a seed row/furrow closing device. There is no full-width soil disturbance performed from the time immediately following harvest or termination of one cash crop through harvest or termination of the next cash crop in the rotation regardless of the depth of the tillage operation. (Vertical tillage techniques like ‘turbo till’ are considered full width tillage.)

The soil tillage intensity rating (STIR) value, as calculated by current erosion prediction technology, must include all field operations performed during the crop interval between harvest and/or termination of a minimum of two production crops (all fallow periods and harvest and/or termination of the second production crop must be included in the STIR rating for the crop interval). The crop interval STIR value shall be no greater than 20.

Additional Criteria to Reduce Sheet, Rill and Wind Erosion, Reduce Excessive Sediment in Surface Waters, and Reduce Tillage-Induced Particulate Emissions

Use the current approved water and wind erosion prediction technology to determine the if field operations planned provide the amount of randomly distributed surface residue needed, time of year residue needs to be present in the field, and amount of surface soil disturbance allowed to reduce erosion to the desired level. Calculations shall account for the effects of other practices in the management system.

Additional Criteria to Maintain or Increase Soil Health and Organic Matter Content

The calculated soil condition index (SCI) for the planned crop interval must result in a positive rating using current erosion prediction technology. Also, the calculated SCI result must be equal to or increased from benchmark system to planned crop interval. SCI for longer periods that includes a complete crop rotation rather than the 'minimum' two production crops interval may be calculated and utilized to meet this criteria.

Additional Criteria to Increase Plant-Available Moisture

Maintain a minimum of 60 percent residue cover on the soil surface throughout the year.

Additional Criteria to Reduce Energy Use

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

Additional Criteria to Provide Food and Escape Cover for Wildlife

Use an approved habitat evaluation procedure, such as the NC WHEG, 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 and/or for general wildlife habitat improvements.

CONSIDERATIONS

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 crop residues to achieve the purpose(s) of this practice can be enhanced through the use of high residue crops and crop varieties, use of cover crops, double cropping, and adjustment of plant populations through seeding rates and row spacing.

When providing technical assistance to organic producers, ensure residue and tillage management, activities are consistent with the USDA Agricultural Marketing Service National Organic Program production and natural resource management requirements.

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

Using residue management - no till 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 and improved aggregate stability.
- 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 to Increase Soil Health and Organic Matter Content

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance and soil moisture content and soil temperature at the time the disturbance occurs. To 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 or slot opener no-till drill will release less CO2 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 CO2 than operations done when the soil is warmer.
- Maximizing year-round coverage of the soil with living vegetation (e.g., cover crops) and/or crop residues builds surface and subsurface soil organic matter and reduces soil temperature, thereby slowing organic matter oxidation.
- 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. Multispecies cover crop mixes provide greater benefits than single-specie cover crops.

Consider use of the Soil Condition Index (SCI) organic matter subfactor as a more specific metric to determine the potential impact of planned crop systems on the level of soil organic matter presented on the planned area. Soil organic matter levels have been shown to be a consistent indicator of the presence and extent of a broad array of ‘soil health’-related soil properties and characteristics.

Considerations to Increase Plant-Available Moisture

Leaving stubble taller than the 10-inch minimum will trap more snow.

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 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 (e.g., no shredding or baling) to maximize the cover and food source benefits for wildlife.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit. Record the specifications using the practice implementation requirements document. The specifications shall identify, as appropriate—

- Purpose for applying the practice.
- Planned crop(s).
- Amount of residue produced by each crop.
- All field operations or activities that affect—
    - Residue orientation including height (where applicable).
    - Surface disturbance.
    - The amount of residue (pounds/acre or percent surface cover) required to accomplish the purpose, and the time of year it must be present.

- Planned soil tillage intensity rating STIR value, soil condition index (SCI) value of the benchmark and planned crop systems, notation of improvement, and erosion rate.
- Target species of wildlife, if applicable.
- Benchmark and planned fuel consumption, if applicable.

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 10 percent of a planned 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.

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