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 may be applied for one or more of the following purposes:

- Reduce sheet, rill and wind erosion and excessive sediment in surface waters;
- Reduce tillage-induced particulate emissions;
- Maintain or increase soil health and organic matter content;
- Increase plant-available moisture;
- Reduce energy use;
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

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. Do not burn residue.

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.

The soil tillage intensity rating (STIR) value shall include all field operations that are performed during the crop interval between harvest and termination of the previous cash crop and harvest or termination of the current cash crop (including fallow periods). 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 if the field operations planned will 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

Ensure the soil condition index (SCI) for the cropping system results in a positive rating (greater than zero).

Additional Criteria to Increase Plant-Available Moisture

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

Trapping Snow. Minimum crop stubble height during the time significant snowfall is expected to occur shall be at least 10 inches for crops with a row spacing of less than 15 inches, and 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 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 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.

Note: Specific programs may dictate criteria in addition to, or more restrictive than, those specified in this standard.

CONSIDERATIONS

General Considerations Applicable to All Purposes

Producers should be encouraged to minimize soil disturbance in order to maximize the benefits of this practice.

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 regulations.

NRCS, MD
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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 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;
- Reducing the amount of particulate matter generated by field operations;
- Reducing energy inputs to establish crops;
- Forming root channels and other near-surface voids that increase infiltration.

**Additional 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. 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. To make no till more effective, consider using the following practices:

- Maximizing year-round coverage of the soil with living vegetation (e.g., cover crops) and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation;
- Using a diverse crop rotation with multiple crop types (cool-season grass, cool-season legume/forb, warm-season grass, warm-season legume/forb) in the crop rotation;
- Planting a cover crop after every cash crop in the rotation. Multi-species cover crop mixes provide greater benefits than single-species cover crops;
- 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.

**Additional Considerations to Increase Plant-Available Moisture**

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

Leaving stubble taller than the 10-inch minimum will trap more snow. Variable-height stubble patterns may be created to further increase snow storage.

**Additional Considerations for Wildlife Food and Cover**

Leave rows of unharvested crops standing at intervals across the field or adjacent to permanent cover to 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**

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice and may be recorded in narrative form, on Implementation Requirements (IR) sheets, or other approved forms.

The completed 329 IR sheet and appropriate fact sheet(s) can serve as the plan and specifications for implementing this practice.

The following items shall be addressed, as appropriate:

- Purpose of the no till practice (identified resource concerns);
- For each field, the cropping sequence and acceptable implements to be used, minimum Soil Conditioning Index (SCI) and Soil Tillage Intensity Rating (STIR) values to be maintained, and minimum percent residue needed to address the identified resource concern(s);
- Desired wildlife species, if applicable;
- Benchmark and planned fuel consumption, if applicable.

**Supporting Data and Documentation**

The following is a list of the minimum data and documentation to be recorded in the case file:

- Location of the practice on the conservation plan map;
- Assistance notes. The notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom;
- If applicable, soil loss calculations (using the current approved NRCS erosion prediction tool);
- SCI and STIR calculations;
- Completed wildlife habitat evaluation worksheet, if applicable;
- Completed IR sheet, and copy of the appropriate fact sheet(s) or other specifications and management plans.

**OPERATION AND MAINTENANCE**

An Operation and Management (O&M) plan shall be prepared and is the responsibility of the client to implement. The IR sheet and appropriate fact sheet(s) may serve as the management plan, as well as supporting documentation, and shall be reviewed with and provided to the client.

At a minimum, the following components shall be addressed in the O&M plan, as applicable:

- Follow the specified crop rotation and implements to be used for each field. Contact NRCS before changing the cropping sequence and/or tillage methods, especially on HEL fields or when receiving financial assistance for this practice;
• Evaluate/measure crop residue 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 for spot treatment of weeds, leveling ruts, or similar purposes. No more than 10% of the field may be tilled for these purposes;

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

REFERENCES


USDA, Natural Resources Conservation Service. Conservation Practice Standards. Maryland Field Office Technical Guide, Section IV.
