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;
- Reduce tillage-induced particulate emissions;
- Maintain or increase soil quality and organic matter content;
- Increase plant –available moisture and precipitation storage efficiency;
- Reduce energy use;
- Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

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

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

Residue shall not be burned.

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

No full-width tillage (entire soil surface is disturbed by tillage operations such as chisel plowing, field cultivating, tandem disking, or vertical tillage) shall be 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.

The Soil Tillage Intensity Rating (STIR) value shall include 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). The STIR value shall be no greater than 20.

Additional Criteria to Reduce Sheet/Rill Erosion; Reduce Wind Erosion and Tillage Induced Particulate Matter.

To reduce erosion, use high residue producing crops as often as possible. The amount of randomly distributed surface residue needed and the amount of surface soil disturbance allowed to reduce erosion to the tolerable soil loss value (T) shall be determined using the current approved erosion prediction technology.

Minimum residue requirements for this practice will be reflected by leaving all crop residues from row crops on the field following harvest. When residues such as corn stalks or soybean residue are removed, a cover crop will be used to supplement cover lost from residue removal. Calculations shall account for the effects of other practices in the management system.

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 higher.

Additional Criteria to Increase Water Use and Precipitation Storage Efficiency.

To reduce evaporation from the soil surface, 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 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 energy tool to document energy use reductions.

Additional Criteria to Provide Food and Cover for Wildlife

An approved habitat evaluation procedure shall be used to assess the time that residue is present, the amount and orientation of residue, and the height of stubble needed to provide adequate food and cover for the target species.

Note: Specific cost-sharing programs or other funding sources may impose criteria in addition to, or more restrictive than, those specified in this standard.

CONSIDERATIONS

General

"No-till" refers to planting crops into a narrow slot or opening in the soil created by coulters, row-openers, or other devices for the purpose of inserting seed or transplants.

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.

When providing technical assistance to organic producers, residue management, and tillage activities should be consistent with the USDA-Agricultural Marketing Service National Organic Program standard.

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 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, 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.

Improving Soil Organic Matter Content

Soil Conditioning Index (SCI) rating must result in a positive rating.

To help increase an SCI rating, consider some of the following:

- Raise crops that produce high amounts of residue that are retained on the field.
- Utilize cover crops when possible to increase organic matter.
- Utilize manure or crop mulch to add organic matter to the soil.
- Limit the number of tillage operations.
- Limit the amount of soil disturbance each operation created.
- Minimize the amount of wind and water erosion occurring on the field.
- Use production techniques that will increase crop and residue production

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 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 and/or crop residues builds organic matter and reduces soil temperature, thereby slowing organic matter oxidation.

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 provide greater benefits than single-species cover crops.

Reducing Soil Particulate Emissions

To reduce particulate emissions, consider operating at slower speeds and avoid operating on dry soils.

Reducing the wind erosion rate below the tolerable soil loss will help reduce particulate emissions. This can be achieved by increasing the level of crop residue cover and reducing the number of soil-disturbing operations.

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.

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 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

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.

Documentation shall be in accordance with the section “Supporting Data and Documentation” in this standard.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be prepared for this practice. Appropriate job sheets may be used to serve as the management plan as well as supporting documentation, and shall be provided to the land user.

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

- Crop rotation for each field;
- 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.
- Minimum Soil Conditioning Index (SCI) and Soil Tillage Intensity Rating (STIR) values to be maintained, as applicable, and acceptable activities to maintain those values;
- 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.

SUPPORTING DATA AND DOCUMENTATION

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

- Identify the resource concern to be treated or the purpose for applying the practice;
- Identify the field location and extent of practice in acres, and complete the assistance notes. Assistance notes shall include dates of site inspections, name or initials of the person who made the inspections, specifics as to what was inspected, alternatives discussed, decisions made, and by whom;
- Ensure that field number, acreage, crop rotation, SCI, STIR, and percent residue needed to address identified resource concern(s) are recorded as needed in the conservation plan or on an applicable job sheet;
- Operation and Maintenance plan or job sheet that includes the crop rotation, SCI & STIR values and minimum percent residue needed to address identified resource concern(s);
- Soil loss calculations.

REFERENCES

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