Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, REDUCED TILL

CODE 345

(ac)

DEFINITION

Manage the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round, while limiting soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting.

PURPOSE

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

- Reduce sheet, rill, wind erosion, and excessive sediment in surface waters (resource concern for soil erosion, sheet, rill, and wind)
- Reduce tillage-induced particulate emissions (resource concern for air quality impact, emissions of Particulate Matter (PM), and PM Precursors)
- Improve soil health and maintain or increase organic matter content (resource concern of soil quality degradation and organic matter depletion)
- Reduce energy use (resource concern of inefficient energy use in farming and ranching practices and field operations)
- Increase plant-available moisture (resource concern of insufficient water and inefficient moisture management)

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

CRITERIA

General Criteria Applicable to All Purposes

This practice includes tillage methods commonly referred to as “mulch tillage” or “conservation tillage” where the entire soil surface may be disturbed by tillage operations, such as chisel plowing, field cultivating, tandem disking, or vertical tillage. It also includes tillage and planting systems with few tillage operations (e.g., ridge till) but which do not meet the soil tillage intensity rating (STIR) criteria for Kansas Conservation Practice Standard 329, Residue and Tillage Management, No Till.

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

Do not burn residues.

Utilizing the current erosion prediction technologies, the STIR value shall include all soil disturbance field operations that are performed during the crop interval (i.e., from the time immediately following harvest, or termination of one cash crop through harvest, or termination of the next cash crop in the rotation, including

fallow periods). The crop interval STIR value rating shall be no greater than 80 and no primary inversion tillage implements (e.g., moldboard plow) shall be used.

Additional Criteria to Reduce Sheet, Rill and Wind Erosion, and Excessive Sediment in Surface Waters

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

In ridge-till systems, plan ridge height and ridge orientation to manage runoff and minimize erosion, with a maximum row grade not to exceed four percent.

Additional Criteria to Reduce Tillage-Induced Particulate Emissions

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

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

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

Additional Criteria to Increase Plant - Available Moisture

Maintain a minimum 70% surface residue or 2,000 pounds of residue per acre cover throughout the year.

Trapping Snow

Fall tillage operations shall leave the crop stubble in an upright position. Maintain a crop stubble height when 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. Maintain these heights over at least 50% of the field.

Conduct fall tillage as close as possible to perpendicular to the prevailing winds when significant snowfall is expected to occur.

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 Natural Resources Conservation Service (NRCS) tool for determining energy use to document energy use reductions.

CONSIDERATIONS

General 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.

Reduced till may be practiced continuously throughout the crop sequence, or may be managed as part of a residue management system that includes other tillage methods, such as no till. Selection of acceptable tillage methods for specific site conditions may be aided by the use of an approved STIR using the current erosion technology.

Production of adequate amounts of crop residue necessary for the proper functioning 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.

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.

Additional Considerations for Maintaining or Improving Soil Organic Matter Content and Soil Health

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance, 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.
- Use a diverse crop rotation by 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, when feasible, after every cash crop in the rotation. Multispecies cover crop mixes provide greater benefits than single-species cover crops.
- Using undercutting tools rather than burying tools will enhance accumulation of organic material in the surface layer.
- Conducting any soil-disturbing field operation when soil moisture is optimal, neither excessive nor too dry, will help maintain soil tilth and reduce the need for additional tillage in the future.

Additional Considerations for Increasing Plant - Available Moisture

The effectiveness of stubble to trap snow increases with stubble height. Increasing the stubble height beyond the minimum required will increase the amount of snow trapped.

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

Tillage and planting operations done on the contour will help low overland flow and increase infiltration, thus increasing the potential for increased water storage in the root zone.

Additional Considerations for Provinding Food and Escape for Wildlife

Avoid tillage, other soil, and residue/stubble disturbing operations during the nesting season and brood rearing period for ground nesting species.

Forgo fall shredding or tillage operations to maximize the amount of wildlife food and cover during critical winter months.

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.

Use an approved habitat evaluation procedure to determine the appropriate time and amount of residue and stubble needed to provide adequate food and cover for target wildlife species.

PLANS AND SPECIFICATIONS

Specifications shall be prepared for each site and purpose and recorded in the approved implementation requirements document.

- The resource concern to be treated, or the purpose for applying the practice
- Planned crop(s)
- Amount of residue produced by each crop
- All field operations or activities that affect:
  - Residue orientation
  - Surface disturbance
  - The field operations and amount of residue (pounds per acre or percent surface cover) required to accomplish the purpose and the time of year it must be present
- Planned STIR value, SCI value, and erosion rate
- Benchmark and planned energy consumptions

OPERATION AND MAINTENANCE

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

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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