Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

RESIDUE AND TILLAGE MANAGEMENT, REDUCED TILL

CODE 345

(ac)

DEFINITION

Managing 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 field crops in systems where the surface is tilled prior to planting.

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)
- Reduce tillage-induced particulate emissions (air quality impact)
- Improve soil health and maintain or increase organic matter content (soil quality degradation)
- Reduce energy use (inefficient energy use)

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/planting systems with few tillage operations (e.g., ridge till) but which do not meet the soil tillage intensity rating (STIR) criteria for conservation practice Residue and Tillage Management, No-Till (Code 329).

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. Except for O & M on floodplains when residue is too thick to incorporate by normal tillage operations.

The STIR value shall include *all* 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).

No primary inversion tillage tools (e.g., moldboard plow) shall be used.

The crop interval STIR value rating shall be no greater than 80

For example, reduced tillage systems that will meet the desired planned residue cover for a purpose, see MI NRCS Agronomy Tech Note 33, SCS Bulletin, *Crop Residue Systems for Conservation and Profits,*MI NRCS FOTG, Section 1, References, Technical Notes, Agronomy,

*Certify*that the Reduced Tillage System applied meets the planned percent residue cover for crop protection or soil loss (T) using the NRCS MI Job Sheet: *Line Transect Residue Cover Estimate*procedure or equivalent.

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

Use the current approved water and wind erosion prediction technology to document/determine the field operations to:

1. Achieve the amount of randomly distributed surface residue needed
2. Determine the time of year residue needs to be on a field,
3. Plan field operations to reduce erosion to the desired level.
4. Calculate the effects of other management practices in the reduced tillage system
5. *In ridge-till systems, plan ridge height 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.

For critical slopes used in the conservation planning process, use on site soil test SOM data, yield monitor data and the critical slope along with the OSUE SOM Calculator to determine if SOM Gains => SOM Losses.

Where some residue is harvested for bio-energy as part of the Residue Management Reduced Tillage System or other purposes use the OSUE SOM Calculator. The OSUE SOM Calculator is available by request from the OSU South Campus, Piketon, OH or free to all MI Corn Growers Association members.

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. See the NRCS RUSLE 2 or WEPS models to calculate the before and afterenergy use. For example, use the RUSLE 2 Simple SCI and Fuel use template.

CONSIDERATIONS

General Considerations

Removal of crop residue, such as by baling or grazing, can have a negative impact on resources. Do not perform these activities 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.

Enhance crop residue amounts by selecting: 1/ high residue producing crop varieties in rotations-2/ high residue producing cover crops, 3/ higher plant populations or 4/ narrower 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 rules and regulations.

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

Carbon loss is directly related to the volume of soil disturbed, intensity of the disturbance and soil moisture content and temperature at the time the disturbance occurs. The following guidelines can make this practice more effective:

- When subsoiling, fertilizer injecting or other deep tillage tools are used, make sure the vertical slot created 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.
- Tillage or planting 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.
- Planting a cover crop after every cash crop in the rotation. Multispecies (cocktail) cover crop mixtures provide greater benefits than single-specie cover crops.
- Using undercutting tools (sweeps) 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 Providing Food and Escape Cover for Wildlife

Avoid tillage and 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. 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 shall be determined using Biology Tech Note 12, Wildlife Habitat Evaluation (FOTG, Section I-G Michigan Technical Notes.)

Residue height, amount, and time period shall be determined using NRCS Michigan Biology., Grain Food Plots for Wildlife (FOTG, NRCS MI)

Harvest or tillage operations that disturb or cover the entire field shall not be performed during the nesting and brood-rearing period of the target species.

PLANS AND SPECIFICATIONS

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

- 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/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/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.

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 RUSLE2 (FOTG, Section I-D, Erosion Prediction, Water Erosion) or WEQ (FOTG, Section I-D, Erosion Prediction, Wind Erosion). Also, refer to Michigan Agronomy Technical Notes (found in FOTG Section I):

8 Transitioning to Organic Resources,

9 No-Till Alfalfa MSU Bulletin,

15 The Influence of Organic Matter on Herbicide Reaction,

16 Visual Benchmark References and Estimates: Crop Residue Measuring Techniques,

17 Conservation Tillage

18 Crop Residue

22 No-Till on Fine Textured Soils,

29 Understanding SOM changes

30 Nutrient Stratification in No-Till

33 Crop Residue Systems for Conservation and Profit

34 Residue and Tillage Management Mulch till planting information.

41 Narrow Strip-cropping

42 Effect of Controlled Release N on Corn in Narrow Strip cropping

48 Using Cover Crops to Convert to No till.

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