

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
RESIDUE AND TILLAGE MANAGEMENT

RIDGE TILL

(Ac.)

CODE 346

DEFINITION

Managing the amount, orientation, and distribution of crop and other plant residues on the soil surface year-round, while growing crops on pre-formed ridges alternated with furrows protected by crop residue.

PURPOSES

- Reduce sheet and rill erosion
- Reduce wind erosion
- Maintain or improve soil condition
- Modify cool wet site conditions

CONDITIONS WHERE PRACTICE APPLIES

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

This practice includes tillage and planting methods commonly referred to as ridge till or ridge planting. This involves planting crops on ridges that were (a) formed by row cultivation in a previous crop and (b) left undisturbed since harvest of that previous crop. Therefore, this practice applies only when at least two row crops are grown in sequence with no intervening full-width tillage.

This practice does not apply to stand-alone bedding or listing operations used to form an elevated bed or ridge prior to planting. This practice also does not apply to no-till or strip-till planting on ridges or beds formed by such operations.

CRITERIA

General Criteria Applicable to All Purposes

1. A stable outlet must exist where ridges direct runoff to areas of concentrated flow.
2. Row grades shall not exceed 6%.
3. After planting, residues shall be maintained in furrows between rows until the ridges are rebuilt by row cultivation. Ridges shall be rebuilt to their original height and shape during the last row cultivation.
4. Following crop harvest, residues shall remain on the soil surface until planting of the next row crop with no additional disturbance except for normal weathering or broadcast / no-till seeding of cover crops or other solid seeded crops.
5. Equipment and livestock traffic must be controlled in order to maintain ridge height and integrity throughout the ridge-till portion of the crop rotation (including harvest and winter seasons). In particular, tire spacing and tire width for all equipment used in association with the ridge-till portion of the rotation must be chosen so that no crop rows or ridges receive wheel traffic. For example, in 30" row systems, tire spacings must be multiples of 30" on-center and tires must be narrow enough to occupy only the furrow area (no more than 20" to 22" wide).

Additional Criteria to Reduce Sheet and Rill Erosion

1. The ridge top shall be shaped to direct runoff towards the protected furrow area in order to prevent erosion due to water flowing along the row.

Conservation practice standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your Natural Resources Conservation Service [State Office](#) or visit the [Field Office Technical Guide](#).

2. Soil and residue removed from the top of the ridge during planting or associated operations shall be moved into the furrow between the ridges.
3. After planting, the top of the ridge shall be maintained at least 3 inches higher than the furrow between the ridges.
4. Immediately after ridge-till planting (i.e., from planting until two weeks after planting), the soil surface must be protected by an overall average of at least 30% raindrop-intercepting residue cover, as determined by the line transect method. Although residues may be concentrated in furrows after planting, this minimum residue target applies to the entire field, not just the furrows between ridges. Once row cultivation begins, this 30% cover requirement shall no longer apply.

In some cases, higher residue levels and/or less soil disturbance ahead of one or more ridge-till crops may be needed to achieve the site-specific sheet & rill soil loss objective for the overall cropping system. In these cases, use current Revised Universal Soil Loss Equation, Version 2 (RUSLE2) technology as the basis for planning more aggressive targets for residue cover and/or soil disturbance for ridge-till crops.

In other cases, it may be possible to achieve the site-specific sheet & rill soil loss objective for the overall cropping system with less than 30% residue cover for ridge-till crops. In these cases, plan residue targets below 30% only if complete analysis of the cropping system using RUSLE2 indicates that overall soil loss objectives can still be met.

RUSLE2 does not predict erosion caused by concentrated flow. Because the dominant type of surface water movement in some ridged systems will consist of concentrated flow running downhill in furrows, planners must carefully assess the proper approach to applying RUSLE2 to ridge till fields on a case-by-case basis.

Additional Criteria to Reduce Wind Erosion

Immediately after ridge-till planting (i.e., from planting until two weeks after planting), the soil

surface must be protected by an overall average of at least 30% residue cover, as determined by the line transect method. Although residues may be concentrated in furrows after planting, this minimum residue target applies to the entire field, not just the furrows between ridges. Once row cultivation begins, this 30% cover requirement shall no longer apply.

In some cases, higher residue levels ahead of one or more ridge-till crops may be needed to achieve the site-specific wind erosion soil loss objective for the overall cropping system. In these cases, use current wind erosion prediction technology as the basis for planning more aggressive targets for residue cover for ridge-till crops.

In other cases, it may be possible to achieve the site-specific wind erosion soil loss objective for the overall cropping system with less than 30% residue cover for ridge-till crops. In these cases, plan residue targets below 30% only if complete analysis of the cropping system using current wind erosion prediction technology indicates that overall soil loss objectives can still be met.

Additional Criteria to Maintain or Improve Soil Condition

1. Row cultivation to rebuild ridges shall be done using tools that maintain residues in the surface layer.
2. Immediately after ridge-till planting (i.e., from planting until two weeks after planting), the soil surface must be protected by an overall average of at least 60% residue cover, as determined by the line transect method. Although residues may be concentrated in furrows after planting, this minimum residue target applies to the entire field, not just the furrows between ridges. Once row cultivation begins, this 60% cover requirement shall no longer apply.

In some cases, higher residue levels ahead of one or more ridge-till crops may be needed to achieve the site-specific soil organic matter management objective for the overall cropping system. In these cases, use the current Soil Conditioning Index (SCI) procedure as the basis for planning more aggressive targets for residue cover for ridge-till crops.

In other cases, it may be possible to achieve the site-specific soil organic matter management objective for the overall cropping system with less residue for ridge-till crops. In these cases, plan residue targets below 60% only if complete analysis of the cropping system using the SCI procedure indicates that overall soil organic matter management objectives can still be met.

Use the following to guide interpretation of Soil Conditioning Index (SCI) results for purposes of implementing these additional criteria:

- A cropping system predicted to *maintain* total soil organic matter content should have an SCI score of 0.00 or greater.
- A cropping system predicted to improve total soil organic matter content should have an SCI score of +0.25 or greater.
- See “Considerations” for SCI targets for higher levels of performance.

Additional Criteria to Modify Cool Wet Site Conditions

When crops are ridge-tilled for the purpose of modifying cool wet site conditions, all performance criteria and planning guidelines listed in the subsection “Additional Criteria to Reduce Sheet & Rill Erosion” apply.

In addition, ridge height prior to planting shall be at least 6 inches.

CONSIDERATIONS

General

Ridge till or “RT” is best suited to level or gently sloping landscapes that can accommodate continuous row crop production.

Ridge till fits well in poorly-drained fields where “flat-planted” no-till is often less successful due to problems associated with cool wet soils at planting.

Ridge-till involves planting row crops on the tops of ridges formed by row cultivation of a previous crop. At planting, ridge tops are typically disturbed with sweeps or row cleaners in a narrow band no greater than one-third of the row width. These operations move soil and residue from ridge tops into furrows between rows, providing a warmer, lower-residue seeding zone

on ridge tops. After planting, row cultivation is used to control weeds and to throw soil from furrows back towards the row to rebuild ridges. This practice requires specialized equipment.

After harvest, ridges are left undisturbed by tillage until the next ridge-tilled row crop is planted. Although full width tillage in the interval between the two row crops is not allowed, broadcasting or no-tilling a solid seeded crop or cover crop during that interval is acceptable.

Ridge till may be practiced continuously throughout the crop rotation, or may be used only for one or more crops in a rotational tillage system that includes other tillage and planting methods such as mulch till or no till. In rotational tillage systems that include ridge till, ridges must be periodically removed by full-width tillage and re-established.

Adopting complementary practices like crop rotation and cover cropping can ease adoption of and improve the performance of conservation tillage practices like ridge till.

Soil compaction prevention should be recommended as a way to reduce the need for tillage. Key strategies for compaction prevention include:

- Staying off wet ground.
- Minimizing axle loads (e.g., keep haul trucks out of the field, etc.) and minimizing tire-to-soil contact pressure (e.g., keep road tires out of the field).
- Minimizing the percentage of the field tracked over time (e.g., use controlled traffic to keep tires in the same tracks on every pass).

Since a form of controlled traffic is required by this standard during the ridge-till portion of the rotation, this practice has the potential to reduce the percentage of the field compacted by wheel traffic as well as the percentage of row crops planted directly into compacted soil.

Whenever tillage is used, special emphasis should always be placed on delaying tillage operations until soil is sufficiently dry. Tilling wet soil causes compaction, cloddiness, and significant damage to soil structure.

Adopting practices that result in significant reductions in tillage and/or increases in residue

levels may trigger the need for adjustments to nutrient and pest management practices. Maintaining a diverse crop rotation will often facilitate such adjustments.

Since row cultivation is typically used for weed control and to reform ridges, this practice has the potential to reduce herbicide requirements

A field border planted to permanent vegetation can assist in unobstructed turning, elimination of end rows and providing travel lanes for farming operations.

Reducing Sheet & Rill and/or Wind Erosion

Runoff concentrating in furrows in a ridge-till system may develop sufficient energy to detach and move soil through concentrated flow processes characteristic of gully erosion. Therefore, any ridge till farming system should include adequate contouring and residues to offset the risk of both sheet & rill and concentrated flow erosion in ridge-till furrows.

Increasing residue cover beyond the minimum targets in this standard should be encouraged, even if soil loss and SCI objectives are met by a lower residue level.

Production of adequate amounts of crop residues necessary for this practice can be enhanced by selection of high-residue producing crops, use of cover crops, etc.

Living vegetation as well as dead plant material may be counted towards meeting the minimum cover targets in this standard.

Maintaining or Improving Soil Condition

Use the following as a guide for setting Soil Conditioning Index (SCI) targets above +0.25, which is the minimum target under this standard for soil organic matter improvement:

Soil Conditioning Index (SCI) Score	Performance Level – Soil Organic Matter Improvement
+0.25 to +0.49	Minimum
+0.50 to 0.74	Intermediate
+0.75 or greater	Optimum

Minimizing soil disturbance can enhance soil quality in ways that are not fully accounted for by SCI. Soil Tillage Intensity Rating (STIR)

provides a useful measure of soil disturbance to complement SCI. Strive to minimize soil disturbance, with a STIR value of 10 or less representing an optimum to strive for.

PLANS AND SPECIFICATIONS

Specifications for implementation of this practice shall be prepared for each field or CMU (Conservation Management Unit).

Customize the language and level of detail in specifications as needed for each particular case. Focus above all on providing the client with the practical guidance needed to effectively put the practice on the ground.

Specifications shall be recorded and conveyed to the client using approved job sheets and/or narrative statements in the conservation plan.

Specifications shall at a minimum include all of the following elements:

1. A list of the field(s) and/or CMU(s) where crops will be ridge-tilled.
2. A list of the purpose(s) for which the standard is being implemented (sheet & rill erosion, wind erosion, etc.).
3. A list and/or description of the crops that will be ridge-tilled.
4. A statement of the five general criteria that must be achieved in all cases for all ridge-till crops (i.e., maximum row grade, controlled traffic requirement, etc.).
5. A description of targets for residue cover for ridge-till crops (30%, 60%, etc.), based on additional criteria in the standard and plan objectives.
6. A description of additional limits on soil disturbance, if any, for ridge-till crops (e.g., description of implements to be used, etc.), based on additional criteria in the standard and plan objectives.
7. A description of any additional requirements for ridge-till crops (minimum ridge heights, etc.), based on relevant additional criteria in the standard.

8. In those cases where analysis of the overall cropping system is used to adjust residue cover targets for ridge-till crops, a description of any complementary practices (crop rotation, cover crops, etc.) that must be carried out in order to achieve planned overall conservation objectives.

In those cases where site-specific analysis of the overall cropping system is used to adjust residue cover targets, document planned conservation objectives as well as inputs and outputs for the decision-support tools used (RUSLE2, SCI procedure, etc.). This is especially important when planned residue cover targets are less protective than those in relevant additional criteria.

REFERENCES

Reeder, R. et al. 1992. Ridge Tillage: An Alternative System. The Ohio State University, Agricultural Engineering Department Factsheet AEX-505

Reeder, R., et al. 2000. Conservation Tillage Systems and Management: Crop Residue Management with No-till, Ridge-till, Mulch-till, and Strip-till, 2nd Ed. Midwest Plan Service.

U.S.D.A. Natural Resources Conservation Service. 2002. National Agronomy Manual. 190-V. 3rd ed.

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