

Residue and Tillage Management, Ridge Till (Acre) 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 alternate with furrows protected by crop residue.

PURPOSE

- Reduce sheet and rill erosion
- Reduce wind erosion
- Maintain or improve soil *quality*
- *Reduce energy use*
- Manage snow to increase plant-available moisture
- Modify cool wet site conditions
- Provide food and escape cover for wildlife

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland.

This practice includes tillage and planting methods commonly referred to as ridge till or ridge planting. It does not include no-till planting on ridges, or bedding or listing operations that bury crop residues.

CRITERIA`

General Criteria Applicable to All Purposes

Following crop harvest, residues shall remain on the surface until planting with no additional disturbance except for normal weathering.

Maintain ridge height throughout the harvest and winter seasons by controlling equipment and livestock traffic.

Maintain residue in the furrows after planting, until the ridges are rebuilt by cultivation. Rebuild ridges to their original height and shape during the last row cultivation.

Stable Outlets. A stable outlet must exist where ridges direct runoff to areas of concentrated flow.

Maximum Row Grade. Row grades shall not exceed those given in the following table.

10-Year Storm Erosivity Index (EI)	Maximum Row Grade (%) ¹
<100	9
100 – 150	7
>150	6

¹ Based on existing water erosion prediction technology. (*climate database*).

Use the row grade limitation for the next higher 10-year storm EI value:

- *If sprinkler irrigation is used with this practice or*
- *Where residue cover is less than 30 percent, use the maximum row grade for the next higher 10-year storm EI value.*

Additional Criteria to Reduce Sheet and Rill Erosion

Move soil and residue removed from the top of the ridge into the furrow between the ridges.

After planting, maintain the top of the ridge at least 3 inches higher than the furrow between the ridges.

Shape the ridge top to direct runoff to the protected furrow area.

Use the latest version of the Revised Universal Soil Loss Equation (RUSLE 2) and the local field office

Moses Database found in Section 1 of the MI NRCS electronic Field Office Technical Guide (eFOTG) to estimate the Average soil loss for water erosion. Record the % residue cover needed each year in the National Ridge Till job sheet to reduce the soil loss below T of the predominate soil type or the most critical slope in a field.

Additional Criteria to Reduce Wind Erosion

Design ridges using the WEPS model and account for the effects of ridge height, spacing, and orientation to the direction of erosive winds.

The amount and orientation of residue needed and the amount of surface soil disturbance allowed to reduce wind erosion to the tolerable soil loss value (T) or other soil loss objective use the Wind Erosion Prediction System (WEPS) model found in section I of the MI NRCS eFOTG to compute the average wind erosion soil loss in tons/ac/yr.

Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria to Maintain or Improve Soil Condition

An evaluation of the cropping system using the current approved soil conditioning index (SCI) procedure shall result in a positive trend. Calculations shall account for the effects of other practices in the conservation management system.

Rebuild ridges with cultivation tools that maintain residues in the surface layer.

Additional Criteria to Manage Snow to Increase Plant-Available Moisture

During the time that significant snowfall is expected to occur, the minimum distance between the bottom of the furrow and the top of the stubble 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.

If this minimum distance cannot be achieved, ridges shall be oriented not to exceed 45 degrees from

perpendicular to the prevailing wind direction during periods of expected snowfall.

Additional Criteria to Modify Cool Wet Site Conditions

Rebuild ridge height prior to planting to 6 inches or higher.

Additional Criteria to Provide Food and Escape Cover for Wildlife

Determine the residue duration, amount, orientation and stubble height needed to provide adequate food and cover for the target species of wildlife population using the Michigan Wildlife Habitat Worksheet (MI Biology Technical Note 12) as guidance to develop a wildlife management plan. Also see the NRCS MI Biology Conservation Sheet (645) Upland Wildlife Habitat Management, Grain Food Plots.

CONSIDERATIONS

Ridge till is best adapted to a row width of 28 inches or greater.

Where soil compaction is identified as a resource concern caused by wheel ruts from equipment, use deep tillage to remove compacted layers prior to forming ridges. See the NRCS MI 324 Deep Tillage Standard and 324 job sheet Soil Compaction Symptoms, Causes, Correction and Prevention for guidance. *Also see the NRCS MI Agronomy Technical Notes 45-51 on using cover crops as biological tillage found in the MI electronic Field Office Technical Guide.*

Where additional plant or residue cover is needed to meet NRCS eFOTG Quality criteria pertinent to the identified resource concern (such as water or wind erosion) cover crops are recommended. See the NRCS 340 Cover Crop standard for guidance.

To reduce soil compaction all Farm equipment should follow a controlled traffic system for each operation.

Removal of residue such as baling or grazing can have negative impacts on resources. These activities should not be performed without full evaluation of impacts on soil, water, animal, plants and air resource concerns.

Ridge till may be practiced continuously throughout some crop sequences, or may be managed as part of a residue management system that includes other tillage and planting methods such as mulch till or no till. In mixed systems, ridges must be periodically re-established. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Intensity Rating. See MSUE bulletin E-1683, Till Planting on Ridges, 1983, in the local field office Agronomy Technical file.

Production of adequate amounts of crop residues 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 population and/or row spacing.

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

To reduce pesticide uses consider herbicide band applications with cultivations or cultivation with cover crops on organic farms.

A field border (see NRCS MI Standard 386) planted to permanent vegetation can assist in unobstructed turning, elimination of end rows, providing travel lanes *for farming operations and can provide habitat for beneficial insects and pollinators.*

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.

Maintaining or Improving Soil Condition and Reducing CO₂ Loss from the Soil - Continuous ridge planting will allow organic material to accumulate in the surface horizon. Reconstruction of ridges in the same row area year after year will maximize organic matter buildup and biological activity in the row.

CO₂ 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.

- Shallow soil disturbance (1-3 inches) releases less CO₂ than deeper operations.
- When deep soil disturbance is performed, such as by subsoiling or fertilizer injection, make sure the vertical tillage slot created by these implements is closed at the surface.
- Planting with a single disk opener no-till drill will release less CO₂ than planting with a wide-point hoe/chisel opener air seeder drill.
- Soil disturbance that occurs when soil temperatures are below 50° F will release less CO₂ than operations done when the soil is warmer.

Soil compaction may be reduced by controlled traffic, in which wheel traffic from all operations is limited to the area between designated rows or traffic areas.

Providing Food and Escape Cover for Wildlife - Avoid disturbing standing stubble or heavy residue during the nesting season for ground-nesting species.

Forgoing fall shredding or tillage operations will 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.

PLANS AND SPECIFICATIONS

Plans and specifications shall include:

- Field number and acres
- Purpose(s) for this practice
- Crops where this practice will be used
- The type and timing of soil disturbing operations
- Estimated surface residue following each operation

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit according to the Criteria, Considerations, and Operation and Maintenance described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan or other acceptable documentation.

OPERATION AND MAINTENANCE

Ridge Height- Maintain ridge height by building ridges at cultivation in the spring or fall on recently tilled land. It is best to start forming ridges at cultivation one year before planting the current crop.

Soil Compaction- *Before adopting the ridge till system, use deep tillage or bio-tillage to remove tillage pans.* Use controlled traffic by adjusting the wheels of tractors, harvesters, wagons, manure spreaders, and sprayers to always travel in the furrow and use the same rows. Do not drive on ridges if at all possible. Maintain controlled traffic patterns as 90% of Soil compaction occurs with the first trip over the field.

Slope-Ridge till is best suited to fields with 0-2% slope to prevent excessive water erosion up and down hill. If there are long steep slopes do not perform ridge till up and down hill.

Drainage- Ridge till is not a substitute for subsurface drainage. (Tile)

Nutrients- Base commercial fertilizer application rates on a soil sample taken from the side of the ridge. Surface band all recommended P & K on corn at planting to improve crop yield and fertilizer efficiency.

Weed Control – Cultivate to control weeds, bust up crusts, eliminate chemical use and rebuild ridges. Follow the current pesticide label and laws and regulations of the State of Michigan or the latest MSUE Field Crop Weed Control Guide bulletin (E434).

Excess drying on Sandy soil – Avoid spring construction of ridges on sandy soils previously planted to corn to prevent excessive drying of the seedbed at planting.

REFERENCES

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NRCS MI Agronomy Technical Notes:

21 Ridge Till Planting

24 Terminology and Definitions for Agricultural Tillage Implements

25 Terminology and Definitions for Soil Tillage and Soil Tool Relationships

32 Conservation Tillage Implements

33 Crop Residue Systems for Conservation and Profit

Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting soil erosion by water: A guide to conservation planning with the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture, Agriculture Handbook No. 703.

Robertson L. S., Erickson A.E., Till Planting on Ridges, 1983. MSUE Bulletin E-1683.

Shaffer, M.J., and W.E. Larson (Ed.). 1987. Tillage and surface-residue sensitive potential evaporation sub model. *In* NTRM, a soil-crop simulation model for nitrogen, tillage and crop residue management. USDA Conserv. Res. Rep. 34-1. USDA-ARS.

Skidmore, E.L. and N.P. Woodruff. 1968. Wind erosion forces in the United States and their use in predicting soil loss. U.S. Department of Agriculture. Agriculture Handbook No. 346.

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

“On-Farm Demonstration of Ridge Tillage for Sustainable Agriculture”:

http://www.pfi.iastate.edu/ofr/SARE_ridge-till.html