

RESIDUE AND TILLAGE MANAGEMENT, MULCH TILL

CONSERVATION INFORMATION SHEET - Agronomy Series

345



Natural Resources Conservation Service

Michigan



What is Mulch Till?

Mulch till systems manage the amount, orientation, and distribution of crop and other residue on the soil surface year-round, while growing crops where the entire soil surface is tilled prior to or during the planting operation. Residue is partially incorporated using chisels, sweeps, field cultivators, or similar implements.

Purposes

Mulch till systems can be designed to accomplish one or more of the following conservation purposes:

- Reduce water erosion
- Reduce wind erosion
- Reduce soil particle emissions
- Maintain or improve soil condition
- Increase plant-available moisture
- Provide food and escape cover for wildlife

Secondary Benefits

- Water quality improves both on-site and off-site
- Air quality improves both on-site and off-site
- Sedimentation is reduced

Conservation Management Systems

Mulch tillage is normally used as a component of a conservation management system. It should be used in conjunction with Crop Rotation, Nutrient Management, Pest Management, the Buffer Practices, and other practices needed on a site-specific basis to address natural resource concerns and the landowner's objectives. Major roles of the mulch till component of a system include providing soil protection, reducing runoff, and improving soil tilth by allowing the soil to accumulate more organic matter.

Practice Specifications

Practice specifications are provided to assure the mulch till system meets the resource needs and producer's objectives. The specifications are based on the amount, timing, and orientation of crop residue left on the soil surface. These requirements are recorded in Table 1. Supporting information may be included in Tables 2 and 3. Residue retention calculations recorded in Table 3 are estimates to determine whether the planned number, sequence, and timing of farming operations will leave the specified amounts of residue. (Residue calculations are estimates highly dependent on such variables as operating speed, depth, field conditions, and adjustments.)

General Specifications *

- Residue to be retained on the field shall be uniformly distributed. Combines or other harvesting machines shall be equipped with spreaders capable of spreading residue over at least 80% of the combine header width.
- Secondary removal of crop residue by baling or grazing shall be limited to retain the amount of residue needed to achieve the intended purpose(s).
- Residue shall not be burned.
- Anhydrous injectors, manure injectors, and similar equipment may need to be modified to operate in high residue situations.
- Tillage implements, such as field cultivators, chisels, or similar tools should be selected and operated to leave a specified amount of residue on the soil surface.

* Apply to all practice purposes.

- Planting implements should be equipped with coulters and disk openers designed to cut through surface residue.
- Row cleaners may be attached to the planters to move residue out of the row area and help warm and dry the seedbed.

Additional Specifications *

Reduce erosion from wind and water, and improve water and air quality

The specified amount, timing, and orientation of residue will be in accordance with site-specific data recorded in Table 1. Current wind and water erosion technology will be used to establish minimum specifications.

Maintain or increase soil organic matter content

Tillage aerates the soil and increases decomposition of organic matter. Mulch till reduces tillage and leaves the necessary amount of residue on or near the soil surface for soil improvement. Specify the required amounts of residue cover for soil protection in Table 1. Tables 2 and 3 can be used to plan and record the crops, field operations, and management necessary to achieve a positive trend in soil organic matter content based on the Natural Resources Conservation Service (NRCS) Soil Condition Index (SCI) analysis using the NRCS water erosion prediction computer model - Revised Universal Soil Loss Equation (RUSLE2).

Maintain or improve soil condition

An evaluation of the cropping system using the soil conditioning index in RUSLE2 shall result in a positive trend.

Conserve moisture

Residue shall be evenly distributed and maintained on the soil surface during the growing season or fallow period to retain soil moisture for crop use by enhancing infiltration and reducing evaporation. A minimum of 2,000 lbs/acre or 60% surface residue cover is required all year long to significantly reduce surface evaporation.

Trapping snow

Any fall tillage operation shall leave the crop residue in an upright position. Fall tillage operations shall be done as close to perpendicular of the prevailing winter wind direction. See the NRCS-Michigan electronic Field Office Technical Guide (eFOTG), Section I-D, Wind Erosion, Wind Erosion Prediction and (E) Tables for I Values, Table 4a - Michigan County Climatic Factors, page 15 for predominant winter wind direction for your location.

Crop stubble height during the time significant snowfall is 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 heights shall be present over at least 50% of the field.

Provide food and cover for wildlife

The amount of residue, height of stubble, and time requirements to meet the minimum needs of the target wildlife species are specified in Table 1. This information is based on Biology Tech Note 12, Wildlife Habitat Evaluation (eFOTG, Section I-G, Michigan Technical Notes, Biology).

Record planned practice specifications in Table 1. Tables 2 and 3 and Figures 1 and 2 are for optional use when more detailed planning or design information is needed.

Figure 1 - Residue Pound/Percent Cover Conversion						
Percent Ground Cover	Alfalfa	Corn Grain	Soybeans	Dry Beans	Grain Sorghum	Small Grains/ Alfalfa Grass
10	150	250	250	250	300	150
20	350	600	400	400	650	350
30	600	950	600	600	1,050	600
40	875	1,400	850	859	1,550	875
50	1,200	1,850	1,200	1,200	2,100	1,200
60	1,550	2,400	1,600	1,600	2,700	1,550
70	2,175	3,300	2,100	2,100	3,600	2,175
80	2,990	4,400	2,800	2,800	4,800	2,990
90	3,850	6,050	3,900	3,900	6,750	3,850

Adapted from Table D-4 and Figure 5-4, ARS Ag Handbook 703 Notes and NRCS-MI eFOTG Section I-D, Wind Erosion.

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MULCH TILL DESIGN AND SPECIFICATION WORKSHEET

Landowner: _____

Tract or Farm Name: _____

Field (s) Location: _____

Table 1 - Practice Purpose (check one or more that apply)

	1	Reduce water erosion		5	Improve wildlife habitat (food and cover)				
	2	Conserve soil moisture		6	Manage snow cover for plant available water				
	3	Improve soil condition		7	Other				
	4	Reduce wind erosion							
Tract/ Field	Crop to be Planted	Previous Crop Residue	Orientation - Standing or Flat (S or F)	Height in Inches	Critical Season(s)	Row Width in Inches	Pounds or Percent Residue Cover *		SCI
							Planned	Applied	

* Per wind or water erosion prediction.

Figure 2 - Machinery Table *

Implement	Residue		Implement	Residue	
	Percent for Fragile (Ex. dry beans)	Percent for Non-fragile (Ex. corn)		Percent for Fragile (Ex. dry beans)	Percent for Non-fragile (Ex. corn)

* See Agronomy Tech Note 33, Crop Residue Systems for Conservation and Profit (eFOTG, Section I-G, Michigan Technical Notes, Agronomy).

MULCH TILL DESIGN AND SPECIFICATION WORKSHEET

Table 2 - Design Worksheet for Estimating Crop Residue Produced (for planned rotation)							
Column 1	Column 2	Column 3	Column 4	Column 5 *	Column 6	Column 7	Column 8
Crop	Harvest units	lb/unit	Yield	Residue/ yield ratio	Estimated pounds of residue/ acre	Estimated percent ground cover	Instructions to estimate values for columns 6 & 7
							Multiply columns 3x4x5 to estimate total lb of residue available after harvest. Figure 1 can be used to convert pounds of residue (column 6) to percent ground cover (column 7). Use local values for column 5.
Notes: Information in column 7 is used in Table 3 as an estimate of beginning ground cover for each crop in the rotation.							
* For local value, see Revised Universal Soil Loss Equation 2 (RUSLE2) (eFOTG, Section I-D, Erosion Prediction, Water Erosion, Conversion of Crop Residue Weight to Percent Ground Cover).							

Table 3 - Design Worksheet for Local Residue Budget						
Crop	Previous Crop	Beginning Residue Amount	Operation	Date	Residue	
					Percent retained *	Percent left
* Local residue retention values are recorded in Figure 2.						