United States Department of Agriculture

Residue and Tillage Management

Missouri Job Sheet JS-MO329/345

Natural Resources Conservation Service (NRCS) Missouri Conservation Practice 329/345
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Definition

Residue management is managing the amount, orientation and distribution of crop and other plant residue on the soil surface throughout the year. It includes all soil disturbing activities like tillage, planting, nutrient applications, and harvesting of residue.

Purpose

Residue and Tillage Management should be used on all cropland fields especially where excess wind or sheet and rill erosion are a problem. Residue and tillage management is most effective when used with other conservation practices like cover crops, grassed waterways, contour farming, field borders, etc. Residue management systems can be designed to accomplish multiple purposes including:

- Reduce water and wind erosion.
- Maintain or increase soil organic matter.
- Increase moisture available for plant use.
- Cost savings from reduced fuel usage.
- Reduce soil particulate emissions and CO_2 losses.
- Provide food and escape cover for wildlife.

General Specifications

There are four types of residue management systems:

Mulch-till – Reduced Till –Practice Code (345):
Full width tillage which disturbs the entire soil surface prior to planting (spring or fall). Tillage tools such as chisels, field cultivators, vertical tillage tools, rotary harrows, disks, sweeps, or blades are used.

Weeds are controlled with herbicides and/or cultivation. The annual Soil Tillage Intensity Rating (STIR) value for all soil disturbing activities shall be no greater than 60 for mulch-till. The residue levels must be adequate to achieve the desired benefits specified in the conservation plan.

No-till Management

Ridge- till – Reduced Till - Practice Code (345):
Soil and residue is left undisturbed from harvest to planting except for nutrient injection. Plant in seedbed prepared on ridges with sweeps, disk openers, coulters or row cleaners. Residue is left on the surface between ridges. Ridges are rebuilt during cultivation. Control weeds with herbicide and/or cultivation. Residue levels remain adequate to achieve the desired benefit specified in the conservation plan. STIR shall be no greater than 60.

Ridge-till and Cotton

No-till - Practice Code (329)*:* Soil and residue is left undisturbed from harvest to planting except for nutrient injection. Planting, drilling or nutrient application is done in a narrow seedbed or slot created by coulters, row cleaners, or disk openers **No** full-width tillage operations are done. Vertical tillage is NOT part of a no-till system. Weeds are controlled with herbicides. Row cultivation should only be used for emergency weed control. The annual Soil Tillage Intensity Rating (STIR) value for all soil disturbing activities shall be no greater than 10 for no-till and the residue levels must remain adequate to achieve the desired benefit specified in the conservation plan.

Strip-till

Strip-till - Practice Code (329): Soil and residue is left undisturbed from harvest to planting except for strips up to 30% of the row width. No full width tillage operations are done. These strips are cleared of residue and tilled for warming and drying purposes either before or during the planting operation. This practice is also referred to as row-till, zone-till or fall strip-till. The annual Soil Tillage Intensity Rating (STIR) value for all soil disturbing activities shall be no greater than 15 for strip-till and the residue levels must be adequate to achieve the desired benefits as specified in the conservation plan.

Operation and maintenance

Residue and Tillage Management practice is considered to be applied when the residue levels and STIR levels specified in the conservation plan and practice standards are achieved. The critical time to maintain good residue cover is in the spring until a crop canopy covers the soil. **Start planning prior to harvest to accomplish this. Ensuring that crop residues are evenly distributed during harvest is important for residue management in the spring.**

When developing and implementing your tillage system, you may want to experiment with different tillage methods on a small acreage to work out the "bugs". Many types of tillage equipment are available. You'll need to shop around to determine which will best fit your operation.

No -till Planter

Your existing equipment may be adjusted to give the desired results.

NRCS uses tillage and planting operations along with the residue levels after the planting the current year's crop to determine if a farmer is applying his/her conservation plan. So managing residue from harvest through planting is crucial. When measuring residue, NRCS uses a line-transect method:

- Use any line that is equally divided into 100 parts. Fifty-foot cable transect lines are available for this purpose. Another tool is a 50 feet nylon rope with 100 knots, six inches apart. A 50 foot tape measure using the 6 inch marks also works well.
- Stretch the line diagonally across the rows. Count the number of marks (tabs or knots) that have residue under them when sighting from directly above one end of the mark. It is important to use the same point on each mark for accuracy. Don't count residue smaller than 1/8" in diameter.
- Walk the entire length of the rope or wire. The total number of marks with residue under them is the percent cover for the field. If your rope or tape has only 50 marks, multiply by 2; for 25 marks, multiply by 4.
- Repeat the procedure at least 3 times in different areas of the field, and average the findings.
- Crop residue and tillage management effects on soil erosion and organic matter can also be predicted using the Revised Universal Soil Loss Equation, Version 2 (RUSLE2).

The RUSLE2 program will also provide the Soil Conditioning Index (SCI) and Soil Tillage Intensity Rating (STIR). The SCI is a tool that can predict the consequences of cropping systems and tillage practices on soil organic matter. Organic matter is a

primary indicator of soil quality. The amount of soil disturbance that occurs also has a significant impact on soil and water quality. The STIR measures the amount of soil disturbance. The STIR value is used to determine the upper limits of the amount of soil disturbance allowed in the different tillage categories. The amount of soil disturbance that occurs also has a significant impact on soil and water quality.

Energy Savings

Using one of the Residue and Tillage Management systems described in this job sheet which includes: mulch till (345), ridge till (345), no-till (329), and strip till (329) can help save fuel also. For an estimate of the amount of fuel that can be saved using a Residue and Tillage Management system, visit the online energy estimator tillage at:
http://ecat.sc.egov.usda.gov/Default.aspx

Special Consideration

- Some plant varieties produce higher residue amounts.
- Higher plant populations and narrower rows increases residue at harvest.
- Slower tillage speeds and shallower tillage depths leave more residue on the soil surface.
- Adjusting equipment and adding sweeps can increase residue left on the surface.
- Evenly distribute residue so it covers more soil surface. Spreader and chopper adjustments will affect the distribution and size of the residue.
- Baling, grazing and burning will reduce crop residue cover.
- Using cover crops consistently between the main crops will also add additional plant residue. Plant residues protect the soil surface from water erosion, wind, and sun damage to soil biology.
- Additional cropping system diversity and residue can be gained by increasing the number of crops used in the crop rotation. (e.g. Corn – Soybean – Wheat) and using a cover crop between these crops. This can also help build soil organic matter in no-till and strip-till Systems.
- Quality No-Till systems depend on a healthy soil with active and diverse soil biology. Using cover crops, diverse crop rotations, and/or manure will aid in healthy soils.
- Surface residues in no-till and strip-till systems help protect aggregate stability and maintain the connected pore spaces resulting in increased water infiltration rates and reduced soil erosion.
- Manage soil compaction with floatation tires and/or controlled traffic. Maintain and/or improve drainage systems if installed in your fields.

Table 1. High Residue and Low Residue Crops

High Residue Crops 2/	Low Residue Crops
• Corn Grain • Millet • Milo/Sorghum • Oats • Popcorn • Cereal Rye • Sorghum/Sudangrass Hybrids • Triticale • Wheat • Cover Crops	• Soybean • Tomatoes • Melons • Corn Silage • Vegetables • Potatoes • Wheat Silage • Sorghum Silage

2/ Full season crops managed to leave 50% or more residue cover. Not harvested for silage or biomass.

Cover Crops in Corn

Producer Name:			Date:
FARM #	TRACT #	FIELDS#	Acres Planned/Applied:
Planned by:			Date:
RESOURCE CONCERN/PURPOSE FOR APPLYING PRACTICE:			

Planned Crop	Previous Crop	Tillage Method* And Field Operations (RUSLE2 Printout Adequate)	Applied Crop	STIR Value from RUSLE2	Target Percent Residue Cover After Planting

***NT:** No-Till **ST:** Strip-Till **MT:** Mulch Till **RT:** Ridge Till

Attach Photo(s) and Map(s) where practice was applied.

Upon completion of the practice, I certify that the above listed practice(s) were completed according to the NRCS specifications, design, and installation on the field and area identified above.

Practice(s) **(does)** or **(does not)** meet approved plans, standards and specifications.

_____ _____

NRCS Employee/SWCD Employee/ Signature **Date**

Comments/Changes from Planned to Applied information:

On NRCS copy only, attach required field notes, sketch of practice location on farm, designs, erosion (STIR value) computations, measurements, and quantities. Place this information in the field office case file with Job Sheet.

Residue Level Examples

30% Residue

Corn **Soybeans**

50% Residue

Corn **Soybeans**

70% Residue
Corn