

ESTIMATES OF RESIDUE COVER REMAINING AFTER SINGLE OPERATION OF SELECTED TILLAGE MACHINES

**Developed jointly by the Soil Conservation Service, U.S.D.A. and the Equipment
Manufacturers Institute**

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The following information was developed from available research data, SCS Field Office Technical Guides and from farm equipment manufacturers. Each tillage or planting operation leaves a percent of the residue that was present just prior to that operation. The numbers in Table 2. represent these remaining percentages.

Crop residues have been generally classified as being either Non-Fragile or Fragile in Table 1. This is a subjective classification based in part on the ease in which crop residues are decomposed by the elements or buried by tillage operations. Plant characteristics such as composition and size of leaves and stems; density of the residue; and relative quantities produced were considered.

Many factors effect the amount of residue left after a pass with a tractor and tillage or planting machine. Residue levels are sensitive to depth and speed of equipment operation and to row spacing. When selecting values from the ranges in Table 2. for a specific machine, consider the following general rules of thumb. (1.) At shallower operating depths, greater amounts of residue are left on the surface, while at deeper operating depths, more residue is buried. (2.) Slower operating speeds tend to leave more residues on the surface while at faster speeds, more residue is buried. Under some conditions field cultivators and other finishing tools with field cultivator gangs and some planters and drills may return as much as 20% of the residue incorporated at shallow depths by recent previous operations. Excess wheel slippage caused by improper ballasting of tractor tires can destroy valuable residues in the wheel tracks.

Use the figures as a guide in selecting the types of equipment and types of blades, points or sweeps to be used in the tillage system. Measure the actual amount of residue being left by the operation and make adjustments accordingly.

Table 1.
NON-FRAGILE

RESIDUE TYPES

FRAGILE

Alfalfa or legume hay
Barley*
Buckwheat
Corn
Cotton
Flaxseed
Forage seed
Forage Silage
Grass hay
Millet
Oats*
Pasture
Pineapple
Popcorn
Rice
Rye*
Sorghum
Speltz*
Sugarcane
Tobacco
Triticale*
Wheat*

Canola/Rapeseed
Dry Beans
Dry Peas
Fall seeded cover crops
Flower seed
Grapes
Green peas
Guar
Lentils
Mint
Mustard
Peanuts
Potatoes
Safflower
Soybeans
Sugar Beets
Sunflowers
Sweet Potatoes
Vegetables

* If a combine is used with a straw chopper or otherwise cuts straw into small pieces in harvesting small grain then the residue should be considered as being fragile.

IMPLEMENT**PERCENT RESIDUE REMAINING
NON-FRAGILE FRAGILE****DRILLS:**

Hoe opener drills	50-80	40-60
Semi-deep furrow drill or press drill [7"-12" spacing]	70-90	50-80
Deep furrow drill with > 12" spacing	60-80	50-80
Single disk opener drills	85-100	75-85
Double disk opener drills (conventional)	80-100	60-80

**No-till drills and drills with the following
attachments in standing stubble:**

Smooth no-till coulters	85-95	70-85
Ripple or bubble coulters	80-85	65-85
Fluted coulters	75-80	60-80

**No-till drills and drills with the following
attachments in flat residues:**

Smooth no-till coulters	65-85	50-70
Ripple or bubble coulters	60-75	45-65
Fluted coulters	55-70	40-60

Air seeders: (Refer to appropriate field cultivator or chisel plow depending on the type of ground engaging device used.)

Air drills: (Refer to corresponding type of drill opener.)

ROW PLANTERS:**Conventional planters with:**

Runner openers	85-95	80-90
Staggered double disk openers	90-95	85-95
Double disk openers	85-95	75-85

No-till planters with:

Smooth coulters	85-95	75-90
Ripple coulters	75-90	70-85
Fluted coulters	65-85	55-80

Strip till planters with:

2 or 3 Fluted coulters	60-80	50-75
Row cleaning devices (8-14" wide bare strip using brushes, spikes, furrowing disks, or sweeps)	60-80	50-60

Ridge-till planter

40-60	20-40
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CLIMATIC EFFECTS:**Over winter weathering:****

Following summer harvest	70-90	65-85
Following fall harvest	80-95	70-80

** In northern climates with long periods of snow cover and frozen conditions, weathering may reduce residue levels only slightly, while in warmer climates, weathering losses may reduce residue levels significantly.

Table 2.
IMPLEMENT

PERCENT RESIDUE REMAINING
NON-FRAGILE FRAGILE

PLOWS:

Moldboard plow	0-10	0- 5
Moldboard plow-uphill furrow (Pacific Northwest Region only)	30-40	-----
Disk plow	10-20	5-15

MACHINES WHICH FRACTURE SOIL:

Paratill/Paraplow	80-90	75-85
"V" ripper/subsoiler 12-14" deep 20" spacing	70-90	60-80
Combination Tools:		
Subsoil-chisel	50-70	40-50
Disk-subsoiler	30-50	10-20

CHISEL PLOWS With:

Sweeps	70-85	50-60
Straight chisel spike points	60-80	40-60
Twisted points or shovels	50-70	30-40

COMBINATION CHISEL PLOWS:

Coulter Chisel plows with:		
Sweeps	60-80	40-50
Straight chisel spike points	50-70	30-40
Twisted points or shovels	40-60	20-30
Disk Chisel plows with:		
Sweeps	60-70	30-50
Straight chisel spike points	50-60	30-40
Twisted points or shovels	30-50	20-30

UNDERCUTTERS:

Stubble-mulch sweep or blade plows with:		
Sweep/"V"-Blade >30" wide	85-95	70-80
Sweeps 20"-30" wide	80-90	65-75

DISKS HARROWS:

Offset		
Heavy plowing > 10" spacing	25-50	10-25
Primary cutting >9" spacing	30-60	20-40
Finishing 7"-9" spacing	40-70	25-40
Tandem		
Heavy plowing > 10" spacing	25-50	10-25
Primary cutting >9" spacing	30-60	20-40
Finishing 7"-9" spacing	40-70	25-40
Light tandem disk after harvest, before other tillage	70-80	40-50
One-way disk with:		
12"-16" blades	40-50	20-40
18"-30" blades	20-40	10-30
Single gang disk	50-70	40-60

IMPLEMENT

**PERCENT RESIDUE REMAINING
NON-FRAGILE FRAGILE**

FIELD CULTIVATORS:(Including leveling attachments)

Used as the primary tillage operation:

Sweeps 12-20"	60-80	55-75
Sweeps or shovels 6-12"	35-75	50-70
Duckfoot points	35-60	30-55

Field cultivators as secondary operation following chisel or disk:

Sweeps 12-20"	80-90	60-75
Sweeps or shovels 6-12"	70-80	50-60
Duckfoot points	60-70	35-50

FINISHING TOOLS:

Combination finishing tools with:

Disks, shanks and leveling attachments	50-70	30-50
Spring teeth & rolling basket	70-90	50-70

Harrows:

Springtooth (coil tine)	60-80	50-70
Spike tooth	70-90	60-80
Flex-tine tooth	75-90	70-85
Roller harrow (cultipacker)	60-80	50-70
Packer roller	90-95	90-95

Rotary Tiller:

Secondary operation 3" deep	40-60	20-40
Primary operation 6" deep	15-35	5-15

RODWEEDERS:

Plain rotary rod	80-90	50-60
Rotary rod with semi-chisels or shovels	70-80	60-70

STRIP TILLAGE MACHINES:

Rotary tiller, 12" tilled on 40" rows	60-75	50-60
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ROW CULTIVATORS:(30" and wider)

Single sweep per row	75-90	55-70
Multiple sweeps per row	75-85	55-65
Finger wheel cultivator	65-75	50-60
Rolling disk cultivator	45-55	40-50
Ridge Till cultivator	20-40	5-25

UNCLASSIFIED MACHINES:

Anhydrous applicator	75-85	45-70
Anhydrous applicator with closing disks	60-75	30-50
Subsurface manure applicator	60-80	40-60
Rotary Hoe	85-90	80-90
Bedders, listers & hippers	15-30	5-20
Furrow diker	85-95	75-85
Mulch Treader	70-85	60-75