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No-Plow Tillage

Purdue University Cooperative Extension Service
The no-plow systems for rowcrop production that leave the soil surface well protected with crop residues and/or rough and porous, will greatly reduce water and wind erosion. Rolling, well drained soils and sandy, well and excessively drained soils are especially well adapted. No-plow tillage reduces soil and fertilizer losses from crop yields and allows more intensive cropping without increasing pollution of our water resources by sediment.

Other possible advantages of no-plow tillage include equal or increased yields, improved timeliness of operations and reduced costs. Remember, however, that good management is very important with these systems.

There are some wet, poorly drained soils where no-plow tillage does not work effectively. There are also still some unanswered questions dealing with fertilizer placement and weed, insect and disease control.
WHAT IS NO-PLOW TILLAGE?

A METHOD OF PLANTING ROW CROPS WITHOUT USING THE MOLDBOARD PLOW.

NEWER EQUIPMENT MAKES IT POSSIBLE TO PLANT ROW CROPS WITHOUT TURNING THE SOIL WITH A MOLDBOARD PLOW. DIFFERENT TYPES OF EQUIPMENT HAVE BEEN DEVELOPED FOR THIS PURPOSE. ALL OF THE METHODS LEAVE SOME PLANT RESIDUES ON AND/OR MIXED INTO THE SURFACE SOIL TO REDUCE SOIL LOSS CAUSED FROM WIND AND WATER EROSION.

SYSTEMS AVAILABLE FOR NO-PLOW TILLAGE...

The CHISEL PLANT SYSTEM normally includes fall chiseling and the use of the same machine to prepare a seedbed and plant in one operation in the spring.

The TILL PLANTER uses flat sweeps to remove a shallow layer of soil and residues which are deposited between rows. With the same operation, seed is planted, firmed and covered with loose soil. This system works most effectively when used on pre-formed ridges prepared with cultivation.

ROTARY STRIP TILLAGE employs a rotary tiller to work a seedbed in rows and to plant the crop in one trip. Residues from last year’s crop may or may not be shredded before planting.

The COUNTER-CUTTER PLANTER is a type of strip tillage machine which prepares a narrow seedbed, plants the seed and firms the soil around the seed in one pass over the field. Residues from the previous crop may or may not be shredded before planting. Fall chisel plowing, or discing, is sometimes used in conjunction with this method.

All four systems leave a protective crop residue on or mixed into the surface soil layer to protect it from water and wind erosion. In addition, systems using chisel and till planters leave the soil surface rough (cloudy), which increases water intake and reduces runoff.
BENEFITS OF NO-PLow TILLAGE . . .

1. REDUCES SOIL EROSION BY WATER AND WIND

Research has shown that these systems reduce soil losses from water erosion by as much as 80 percent as compared to moldboard plow-disc methods. The effectiveness depends on the amount of surface cover and surface roughness.

The same conditions that control water erosion also reduce wind erosion. Row direction as related to slope is more important for some systems than others. For example, the wind plant system is much more effective when used on or near the contour. Contour tillage is not as important with the strip coulter method.

2. INCREASES WATER INTAKE

Residues protect the soil surface from puddling and thus improve water intake. Surface roughness or cloddiness also improves intake and increases surface storage.

3. IMPROVES SOIL MOISTURE CONSERVATION

Mulch from the previous crop decreases evaporation thus conserves moisture for increased plant growth. Soil moisture in the root zone can be as much as 19 percent greater under some conditions.

4. DECREASES PEAK LABOR LOAD

Planting is the only operation needed during the ideal planting period whereas plowing, seed-bed preparation and planting are all necessary with the spring plowed moldboard system.

5. IMPROVES TIMELINESS OF PLANTING

Benefits of early planting are realized. Corn yields may be reduced 1 to 2 bushels per acre per day if planting must be delayed past mid-May.

6. LESSENS TOTAL PRODUCTION AND LABOR COSTS

In most no-plow systems the power requirements, time and labor are reduced. Fewer operations allow more acres to be handled by one operator. In some cases total equipment investment is also less.

7. LESSENS RISKS IN DOUBLE CROPPING

Where double cropping is practiced, some of the no-plow methods allow immediate planting behind the combine. Soybeans or sorghum can follow small grains without loss of growing season days. Moisture losses normally associated with plowing or discing are almost eliminated.
Where soybeans follow wheat, beans are planted immediately after the combine with a fluted coulter planter. Wheat straw residues reduce evaporation and conserve moisture for the bean crop.

8. MAKES INTENSIVE CROPPING SAFER ON EROSIIVE LAND

A mulched, rough surface can reduce erosion to acceptable limits on some fields which would erode excessively if plowed.

9. ALLOWS PLANTING OF ROW CROPS IN ESTABLISHED SOD

Row crops can be planted in sod that has been killed by herbicides. This sod mulch offers maximum erosion control and moisture conservation. Sod planting looks especially good on the rolling areas in southern Indiana.

DISADVANTAGES AND POSSIBLE PROBLEMS OF NO-PLOW TILLAGE . . .

1. Poorly drained soils are not well suited to no-plow tillage. Surface residues can intensify the wetness problem and cause colder soil temperatures, thus delaying germination and plant growth.

2. Weed control can be a problem. Without plowing, weed control is more dependent on herbicides. Use of a disk ahead of the planter kills early weed growth and increases the effectiveness of herbicides.

3. Plant food distribution is difficult. Since tillage is done in narrow strips or at shallow depths, most of the fertilizer stays in the upper 2-3 inches of soil. However, if the surface has residue cover, roots extract plant food well from the upper soil layers.

4. Disease and insect problems may become more severe than with plowing. Trashy surfaces offer better habitats for diseases and insects. However, most of these problems are controllable by pesticides. More research is needed in this area.

Dead grass still mulches soil after corn planted in sod has matured.