



# TECHNICAL NOTES

## U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE MICHIGAN

Agronomy #17

SUBJECT: CONSERVATION TILLAGE

DATE: July 1981

TO: All Offices  
FROM: Robert R. Ditson  
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### Purpose

The purpose of this technical note is to clearly describe different types of conservation tillage.

Conservation tillage, is non-inversion tillage that leaves enough crop residue on the soil surface to prevent wind and water erosion throughout the year.

How effectively a particular conservation tillage system controls erosion depends on how much residue is left on the soil surface after planting. Adequate amounts of crop residue combined with little or no soil disturbance can reduce water erosion up to 90 percent. If the soil isn't disturbed, wind erosion can be eliminated with moderate amounts of crop residue.

Many factors must be considered when choosing the right conservation tillage system. Kind and amount of residue, equipment, soils, climate, crops to be grown and the degree of erosion protection needed are all considerations. Most failures with conservation tillage result from not matching these variables with the right resource management system.

Its possible for all the crop residue to be buried and the soil left bare when some tools are used (large disk, chisel plows) or too many tillage operations are made.

Conservation tillage is most effective when performed on the contour. Even with protective cover between the rows, the area disturbed during planting can be eroded if water is allowed to flow down the slope.



## NO TILL

No till is planting through the undisturbed residue left from the previous crop. Seedbed preparation and planting are done in one operation. There is no ground preparation ahead of planting. The seedbed is prepared with a fluted, ripple or smooth coulter, on the planter. Only a narrow band of soil in the planted row is disturbed. Not over 10 percent of the area may be disturbed.

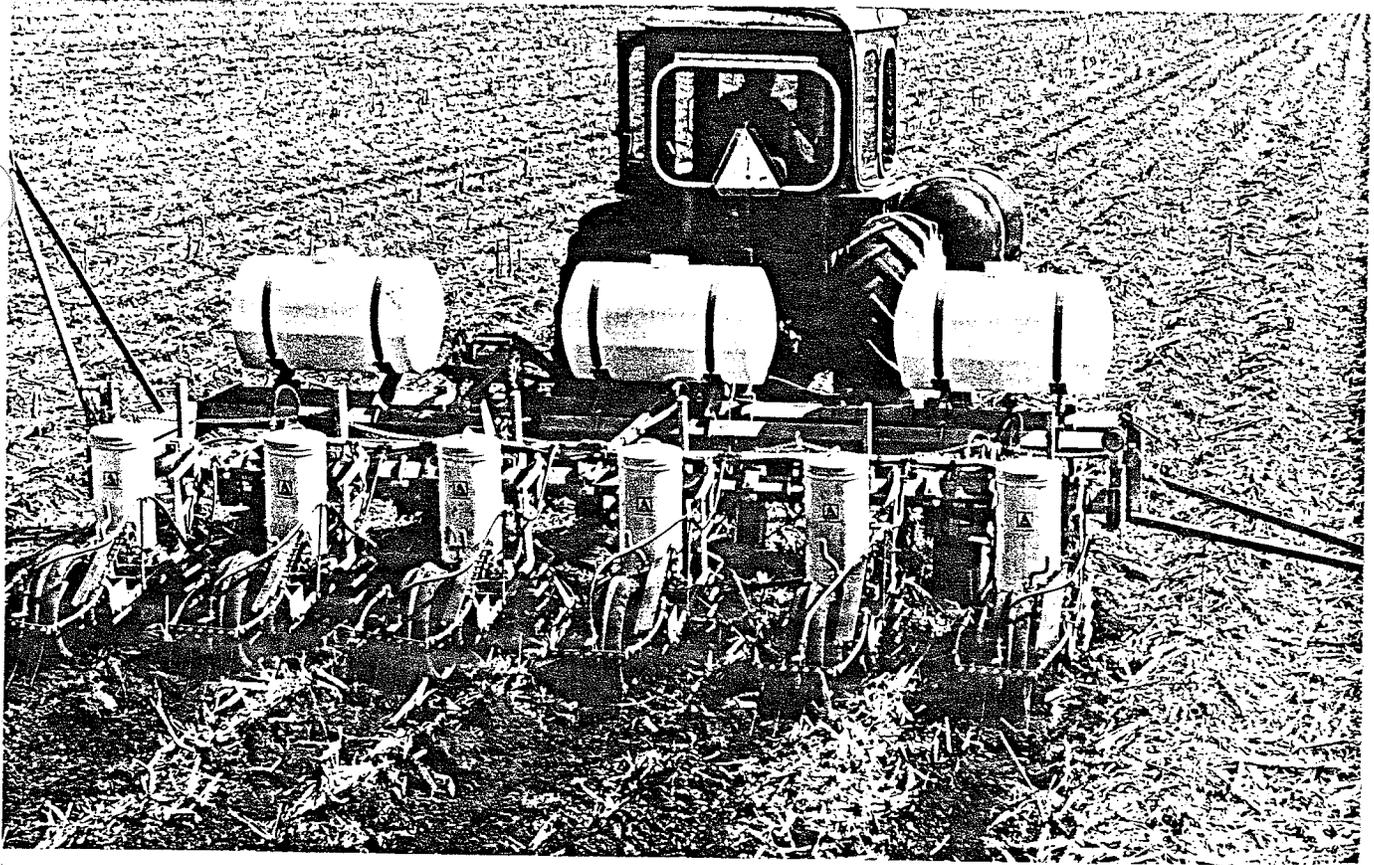
All residues from the previous crop are left on the soil surface. When sufficient amounts of residue are produced by the previous crop and left on the surface, no till can reduce soil loss up to 90 percent when compared with conventional tillage systems on similar soil conditions.



### ROTARY STRIP TILLAGE

Rotary strip tillage is planting the crop in a seedbed prepared by mixing the soil and residue in the row area. Power driven rotors on the planter till a narrow strip (not over 33% of the area) for each row. There is no tillage ahead of planting. Seedbed preparation and planting are accomplished in one operation. Not over 1/3 of the area is disturbed.

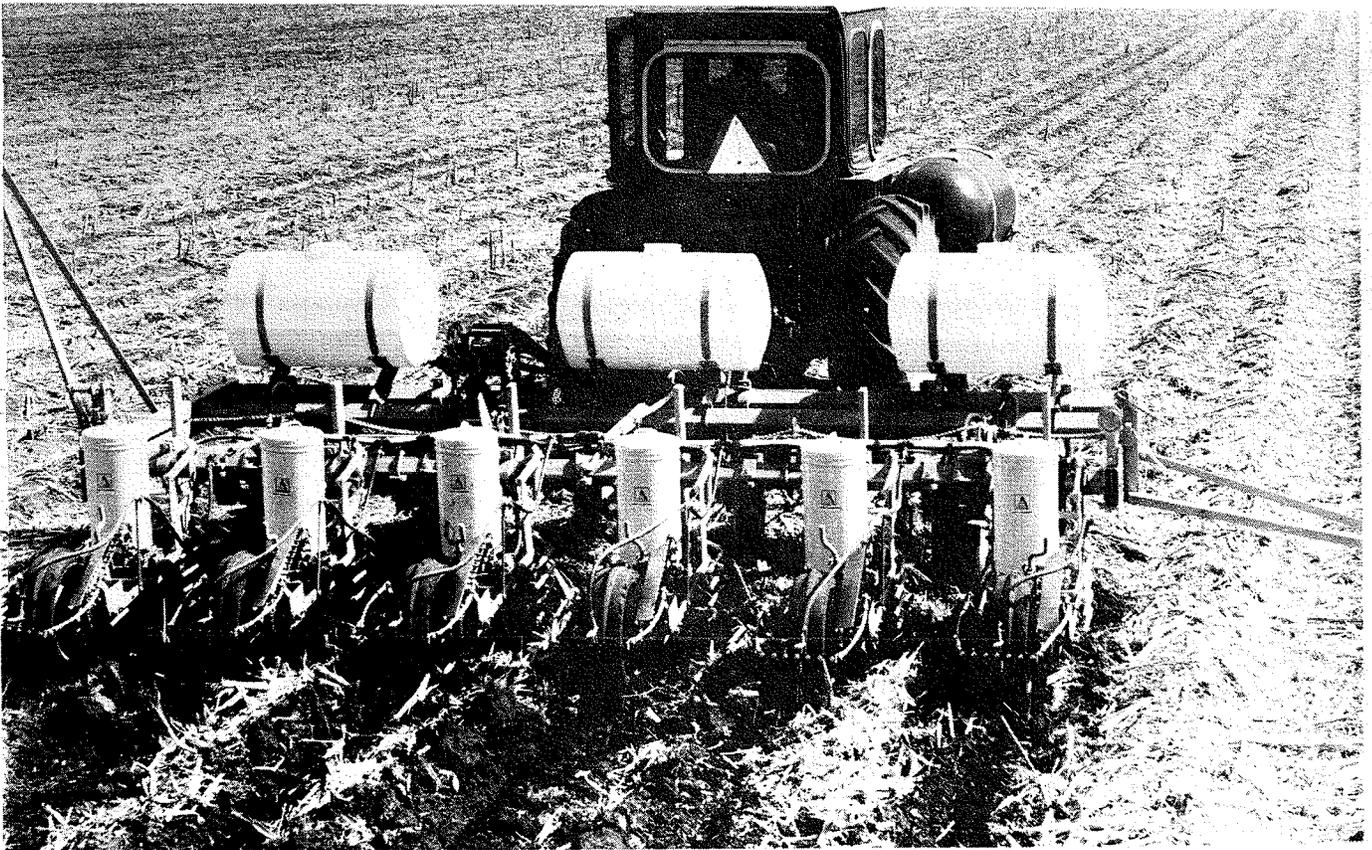
If sufficient crop residues are left on the soil surface after planting, erosion can be reduced up to 80% when compared to conventional tillage. Planting should be done on the contour on sloping land.



Ridge till planting is planting the crop on ridges built with a special cultivator during the previous growing season.

The seedbed is prepared with a sweep or disc that cuts the top of the ridge and pushes the crop residue between the rows. There is no other tillage ahead of planting. Seedbed preparation and planting are accomplished in one trip over the field. Crop residue from the previous crop is left on the soil surface. Only one-third of the surface area will be disturbed. Ridges are reformed during crop cultivation.

Soil in the ridges dries more quickly than soil between the ridges allowing earlier planting and faster germination on poorly drained fine textured soils. When adequate amounts of crop residues are left, erosion can be reduced as much as 75% when compared with conventional tillage systems. Till-planting should not be used on sloping land of 4 percent or more unless contoured.



#### RIDGE TILL PLANTING

As the name implies, ridge till planting is planting the crop on ridges built with a special cultivator during the previous growing season.

The seedbed is prepared with a sweep that cuts and pushes the ridge top and all crop residue between the rows. There is no other tillage ahead of planting. Seedbed preparation and planting are accomplished in one trip over the field. Crop residue from the previous crop is left on the soil surface. Not over one-third of the surface area may be disturbed.

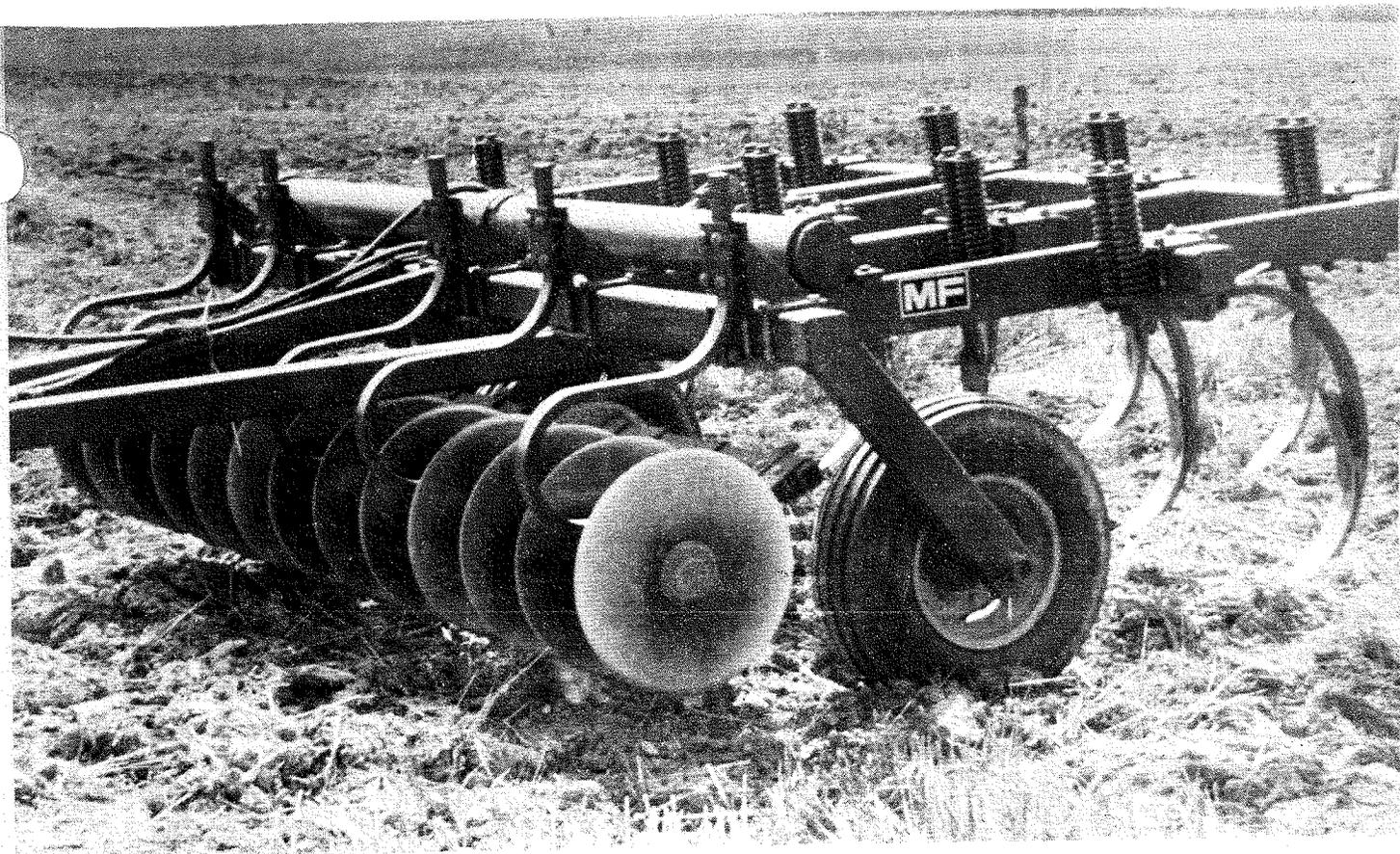
Soil in the ridges dries out more quickly in the spring allowing earlier planting and faster germination on fine textured soils. If adequate amounts of crop residues are left, erosion can be reduced as much as 75% when compared with conventional tillage systems. Planting should be done on the contour on sloping land if possible.



#### CHISEL TILLAGE

Chisel tillage prepares the seedbed without total inversion of the soil. The entire field surface is disturbed. Usually one chisel operation is made in the fall. Secondary tillage, usually a spring operation with a tandem disk or field cultivator, is used to level the field for planting.

Seedbed preparation and planting are done in different operations. A protective cover of crop residue is left on the soil surface after planting. The amount of residue left on the surface depends on the depth of tillage, soil, moisture, soil texture, tractor speed, and the type of chisel used. Chisels with straight shovels can reduce erosion as much as 75%. The use of twisted shovels can reduce as much as 65% of the erosion from conventional tillage. Work on the contour if possible.



#### DISK CHISEL TILLAGE

Disk chisel tillage prepares the seedbed by mixing the soil and residue without total inversion of the soil. The entire field surface is disturbed. Secondary tillage, usually a spring operation with a tandem disk or field cultivator, is used to level the field for planting. Seedbed preparation and planting are done in different operations.

A disk chisel consists of one row of coulter blades in front of one or more rows of chisels. The blades are usually straight and used mainly to cut up the crop residue.

Compared to conventional tillage, erosion can be reduced up to 65% when a protective cover of previous crop residue is left on the soil surface after planting. Work on the contour if possible.

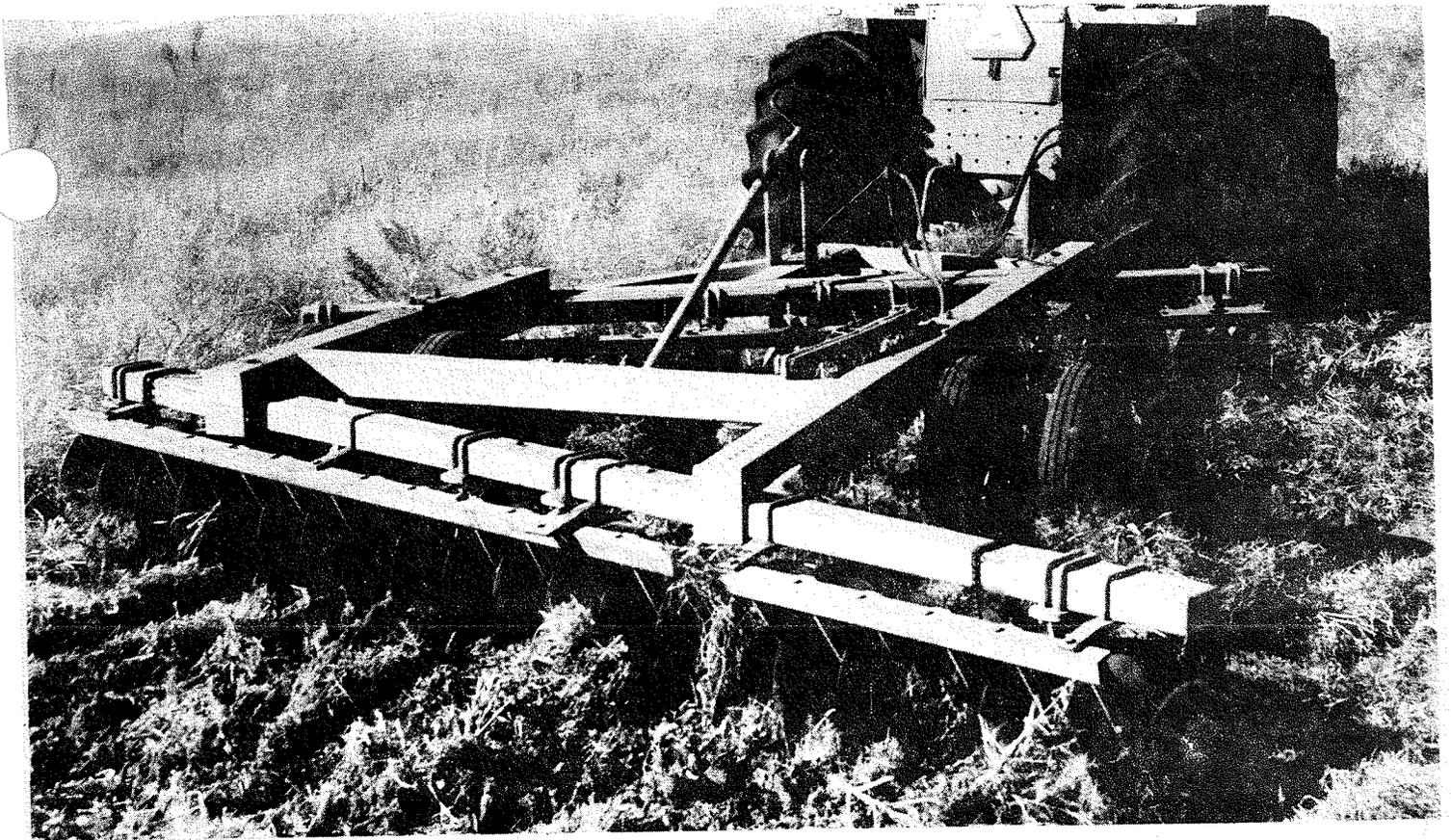


### TANDEM DISK TILLAGE

Tandem disk tillage prepares the seedbed by mixing the soil with crop residue. Tillage can be done in the fall or spring. The entire field surface is disturbed. Secondary tillage, usually a spring operation, with the tandem disk or a field cultivator, is used to level the field for planting.

A tandem disk, consists of four gangs of coulter blades. Tandem disks are usually used for secondary tillage but under some conditions can be used as the primary tillage tool.

A protective cover of crop residue must be left on the soil surface after planting. Work on the contour if possible.



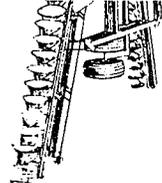
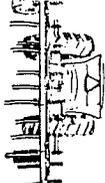
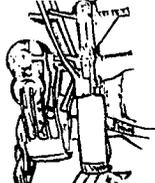
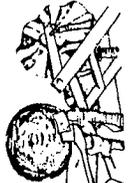
#### OFFSET DISK TILLAGE

Offset disk tillage prepares the seedbed by mixing the soil with crop residue. The entire field surface is disturbed. Secondary tillage, usually a spring operation with a tandem disk or field cultivator, is needed to level the field for planting.

Offset disks consist of two rows of coulter blades set at an angle to each other. The coulters may have notched or straight edges. The front gang of coulters throws the soil one way and the rear gang throws it the other way.

The degree of erosion protection depends on how much crop residue is left on the soil surface after planting. Work on the contour if possible.

TILLAGE SYSTEMS

SYSTEM	Plow	Chisel	Disk	Planter	Culti- vator	Corn (1) Residue Remaining	Water (2) Erosion Reduction	Cost Reduction	Conservation Comments
 MOLDBOARD PLOW	●		●	●	○	0 pounds	0%	0%	Least effective for erosion control.
 OFFSET DISK			●	●	○	1400 pounds	40%	15%	May not leave sufficient surface residue. Buries approximately 75% of residue per trip over the field.
 CHISEL PLOW twisted shovel		●		●	○	2800 pounds	65%	35%	Roughens surface, covers up to 50% of residue per trip over the field.
 CHISEL PLOW straight shovel		●		●	○	3640 pounds	75%	35%	Roughens surface, covers approximately 35% of residue per trip over the field.
 TILL PLANT				●	●	4480 pounds	75%	60%	Planting covers approximately 20% of the residue per trip. Cultivator must be used for ridge forming.
 NO TILL				●	●	5640 pounds	90%	70%	High dependency on herbicide for control of weeds-special cultivator capable of operating in heavy residue may be needed.

● Indicates equipment needed

○ Optional equipment that may be used

○ Specialized or modified equipment needed

(1) Residue left after one operation. Pounds per acre based on 100 bushels per acre yield. Actual residue left will vary with tractor speed, machinery settings, and moisture conditions and soil texture.

(2) An approximation, soil type, percent and slope, rainfall and cropping system may vary. Figure.

# **Conservation Tillage Benefits:**

- **plant earlier**
- **save soil**
- **save time**
- **save energy**
- **save moisture**
- **save money**

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