



# CONSERVATION TILLAGE

CURRENT TOPIC

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The term *conservation tillage* refers to a number of strategies and techniques for establishing crops in a previous crop's residues, which are purposely left on the soil surface. The principal benefits of conservation tillage are improved water conservation and the reduction of soil erosion. Additional benefits include reduced fuel consumption, reduced compaction, planting and harvesting flexibility, reduced labor requirements, and improved soil tilth. Two of the most common conservation tillage systems, ridge tillage and no-till, are discussed below.

## Ridge Tillage

Ridge tillage is a form of conservation tillage that uses specialized planters and cultivators to maintain permanent ridges on which row crops are grown. After harvest, the crop residue is left until planting time. The planter places the seed in the top of the ridge after pushing residue out of the way and slicing off the surface of the ridge-top. Ridges are re-formed during the last cultivation of the crop.

Often, a band of herbicide is applied to the ridge-top during planting. With banded herbicide applications, two cultivations are generally used: one to loosen the soil and another to create the ridge (1). One cultivation may be adequate if the herbicide is broadcast rather than banded. Because ridge tillage relies on cultivation to control weeds and re-form ridges, this system allows farmers to further reduce their dependence on herbicides as compared to either conventional till or strict no-till systems.

Maintenance of the ridges is critical to a successful ridge tillage system. The equipment must accurately reshape the ridge, clean away crop residue, plant in the ridge center, and leave a viable seedbed. The ridge-tillage cultivator not only removes weeds but also builds up the ridge. To harvest grain in ridged fields, you may need to put tall, narrow, dual wheels on the combine. This modification permits the combine to straddle several rows, leaving the ridges undisturbed. Similarly, grain trucks and wagons cannot be driven randomly through the field. Maintenance of the ridge becomes a consideration for each process.

## No-Till

No-till systems, as the name implies, do not use tillage for establishing a seedbed. Crops are simply planted into the previous year's crop residue. No-till planters are equipped with coulters that slice the soil, allowing a double disc opener to place the seed at a proper depth. The slot is closed with a

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spring press wheel. Herbicides are typically used as the sole means for weed control in no-till systems.

Conventional no-till methods have been criticized for a heavy reliance on chemical herbicides for weed control. Additionally, no-till farming requires careful management and expensive machinery for some applications. In many cases, the spring temperature of untilled soil is lower than that of tilled soil. This lower temperature may slow germination of early-planted corn or delay planting dates. Also, increased insect and rodent pest problems have been reported.

On the positive side, no-till methods offer excellent soil erosion control and require fewer trips across the field. No-till methods take several years to prove themselves. It's best to allow at least five years and remember that some tweaking of the system will be necessary from time to time. Soil quality improvements will come slowly, as earthworms and other soil organisms increase in number.

A recent equipment introduction into the no-till arena is the so-called "no-till cultivator," which permits cultivation in heavy residue and provides a non-chemical option to post-emergent herbicide applications. Farmers have the option to band herbicide in the row and use the no-till cultivator to clean the middles as a way to reduce herbicide use.

At least one innovative farmer and several researchers in the northeastern U.S. have developed no-till systems that rely on very little herbicide either for burning down cover crops or for weed control. Steve Groff and his family produce vegetables, alfalfa, and grain crops on 175 acres in Lancaster County, Pennsylvania. When Groff took over operation of the family farm 15 years ago, his number one concern was eliminating soil erosion. Consequently, he began using cover crops extensively in his crop fields. Groff also uses a 10-foot Buffalo rolling stalk chopper to transform a green cover crop into an ideal no-till mulch without herbicide. Under the hitch-mounted frame, the stalk chopper has two sets of rollers running in tandem. These rollers can be adjusted for light or aggressive action and set for continuous coverage. Groff says the machine can be run up to 8 miles an hour and does a good job of killing the cover crop and pushing it right down on the soil. It can also be used to flatten down other crop residues after harvest. Groff improved his chopper by adding independent linkages and springs to each roller. This modification makes each unit more flexible to allow continuous use over uneven terrain.

Following his chopper, Groff transplants vegetable seedlings, or direct-seeds sweet corn or snap beans, into the killed mulch. Since conversion to a cover crop mulch system, his soils are protected from erosion and have become much mellower. For more information on his system, order Groff's video entitled *No-till Vegetables* (2). The vegetable video describes selection of the proper cover crop mix, planting, and taking out cover crops with little or no herbicide. The video also includes comments from leading researchers working with no-till vegetables. Groff's other video, *Cedar Meadow Farm, A Model for Clean Water and Healthy Soil*, was filmed on his farm during a huge rain event. Eight inches of rain fell during a 12-hour period, putting Groff's no-till system to the test. The video shows clean water running off his fields in contrast to the muddy rivers of water leaving adjacent conventionally-tilled fields. At Groff's Web site you can read a number of conservation-till articles, see photos of his cover crop roller and no-till transplanter in action, and view test plot results comparing flail mowing, rolling, and herbicide-killing of cover crops. Though Groff's system is not organic, he uses much less pesticide than most farmers raising the same crops. For information on the potential for organic conservation tillage, request the ATTRA publication [Pursuing Conservation Tillage for Organic Crop Production](#).

There are several good sources of information on cultural methods, equipment, and management for designing a sustainable no-till cropping system. The Conservation Technology Information Center (CTIC) is a clearinghouse for information on tillage practices, soil conservation, water conservation, and water quality practices on cropland (3). CTIC publishes the *Partners* newsletter, available for \$25.00 a year to individuals, and free to conservation districts. Back issues may be viewed from their Web site. Additional information offered by the CTIC includes pamphlets, brochures, reference guides, audio-visual materials, and fact sheets. Many of these items can be ordered through their on-line catalogue (3). Their Web site offers a wealth of information on conservation tillage and many related subjects. CTIC can also answer specific questions and refer farmers to resource specialists and networks of practitioners in their area.

A leading information source on no-till farming systems is the *No-Till Farmer* (4). This newsletter, published 17 times a year by Lessiter Publications, contains a wide variety of information about no-till and reduced-tillage systems. It features information from university research, private chemical and equipment companies, and farmers utilizing reduced-tillage practices. This publication and the Proceedings from the National No-till Conference are available on-line (4).

Lessiter Publications also publishes *Strategies, Techniques, and Tactics Guaranteed to Increase Your No-Till Profits* (5). This 320-page book is updated annually and contains information on all aspects of no-till farming, including crop rotations, fertilizing, equipment, pests, weed control, insect control, rodent control, and more. They also have 30 more books on no-till farming. See their Web site for more information (4).

## References:

- 1) Dickey, E.C., et al. 1986. Tillage Systems for Row Crop Production. NebGuide G80-535. Cooperative Extension Service, University of Nebraska-Lincoln. 4 p.
- 2) *No-till Vegetables* and *Cedar Meadow Farm*, both by Steve Groff. 1997. Order these videos for \$21.95 + \$3.00 shipping each from:  
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- 3) Conservation Technology Information Center  
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- 4) Lessiter Publications  
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- 5) Anon. 2003. Strategies, Techniques and Tactics Guaranteed to Increase Your No-till Profits. Proceedings of the National No-tillage Conference. 338 p.  
*Available from the No-till Farmer (reference 4 above) for \$119.95, plus standard shipping.*

## **Enclosures:**

Anon. 1993. Think things out before ridge tilling. Farmer's Digest. August-September. p. 33-36.

Dirnberger, J.M., and J.M. Larose. 1997. No-till saves dairy farm by healing the harm that tillage has done. National Conservation Tillage Digest. Summer. p. 5, 7-8.

Grisso, R.D., et al. 1991. Cultivators for Conservation Tillage. Conservation Tillage. CTNC-3. Conservation Technology Information Center, West Lafayette, IN. 2 p.

Hackett, T. 1998. No-till, cover cropping sustain vegetable, row crop operation. National Conservation Tillage Digest. Summer. p. 4-5, 8-9.

Hofstetter, B. 1994. Farmers lead the way to no-till covers. The New Farm. September-October. p. 20-23.

Marking, S. 2002. Never enough no-till. Soybean Digest. December. p. 14.

Marking, S. 2002. No-till fights compaction. Soybean Digest. November. p. 24.

Melvin, S.W. 1991. Benefits of Conservation Tillage. Conservation Tillage. CTNC-1. Conservation Technology Information Center, West Lafayette, IN. 2 p.

Moncrief, J.F., and D.D. Breitbach. 1991. Management Considerations in a Ridge Till System. Conservation Tillage. CTNC-8. Conservation Technology Information Center, West Lafayette, IN. 2 p.

Pfost, D.L. 1991. Drills. Conservation Tillage. CTNC-4. Conservation Technology Information Center, West Lafayette, IN. 2 p.

Thompson, R., and R. Exner. 1992. Practical Farmers of Iowa Reducing Weed Pressure in Ridge-Till. Sustainable Agriculture. Iowa State University Extension, Ames, IA. 4 p.

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