

Land & Water

Conserving Natural Resources in Illinois

University of Illinois at Urbana - Champaign, College of Agriculture, Cooperative Extension Service

Ridging

The Pros and Cons of Ridge Till

Adopting Ridge Till

The adoption process was slow in the beginning, but ridge till has now emerged as a well-accepted sibling to other conservation tillage systems.

Ridge till, or "till-planting" as some call it, was described by researchers as long ago as 1955; and it was probably used well before the publication of those research findings. But it wasn't until the 1980s that ridge till began to be adopted in the Midwest.

Despite the attention it has received, questions still surround the ridge till system. Here are some of them:

What Is Ridge Till?

Ridge till is a system in which seeds are planted into a seedbed that is prepared by scraping off the top of a ridge. The scraped-off ridge usually provides an excellent environment for planting. Ridges are formed during cultivation of the previous year's crop.

Ridge till operations consist of planting in the spring and at least one cultivation to re-create the ridges for the next year. Rows remain in the same place each year, and any crop residue on the ridges at planting is pushed between the rows.

Why Use Ridge Till?

Briefly, here are some of the advantages of ridge till:

1. On poorly drained soil, seeds are planted in a warmer, better-drained seedbed than with most other tillage systems.
2. Ridge till can greatly reduce erosion when compared to conventional tillage, especially when ridges are on the contour.

3. Fuel, equipment, and labor costs are all less with ridge till when compared to conventional tillage.

4. Ridge till often allows earlier planting than conventional tillage, especially on poorly drained soils.

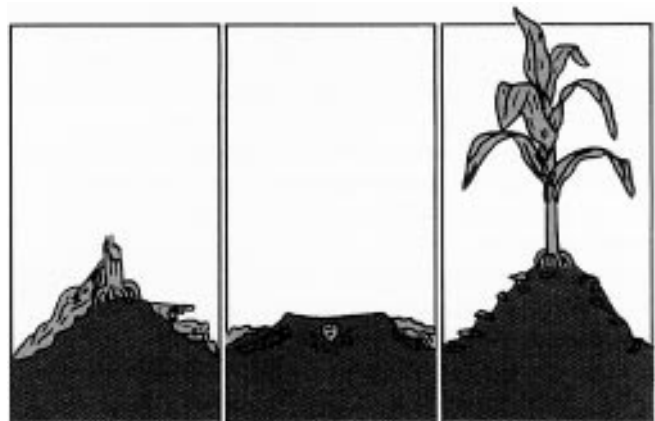
5. Ridge till may not present as many weed-control problems as no-till. Weed seeds on the soil surface, including volunteer corn kernels, are pushed to the middle of the rows where they can be destroyed by cultivation.

What Are The Disadvantages?

If ridge till is used in situations where its advantages are not utilized, the disadvantages can be serious.

On sloping ground when planting on the contour, for example, it is difficult to keep planter units on the ridges. Special guidance systems or guide wheels are available to help keep planter units on the rows.

Also, if ridges are oriented up and down a slope, the area between rows can provide a channel for water to flow downhill, thereby reducing the erosion-control benefit of ridge till (especially following soybeans). Although residue between the rows will slow water velocity, there is a potential for excessive erosion to occur. In fact, the erosion from a large storm might be as great with ridge till up and down the slope as with conventional tillage. However, this problem is likely to occur only on slopes of 3



**Before
Planting**

**After
Planting**

**After
Cultivation**

Ridges provide a good environment for seed germination and growth. They help keep the soil well-drained and warm.

percent or more.

One other point: If too much soil is scraped off the ridge during planting, the ridge may be destroyed and seed may be planted into a furrow instead. If this happens, the residue-free furrow can become a channel for flowing water, resulting in severe erosion.

Where Should Ridge Till Be Used?

Research shows that a ridge till system is best suited to medium-to-heavy textured soils with gentle slopes and a continuous corn or corn-soybean cropping system. Because corn and soybeans predominate in the state, and many of the agricultural soils in Illinois are medium-to-heavy and gently sloping, ridge till is a viable system in Illinois. Perhaps it should be used much more throughout the state.

What Equipment Is Needed With Ridge Till?

Two implements are essential for ridge till: a cultivator, capable of forming ridges and operating on undisturbed soils in heavy residue; and a planter, designed to plant on ridges.

In addition to the cultivator and planter, most ridge-till farmers have a stalk chopper, which they use before planting into corn residue.

When evaluating your equipment, here are some considerations:

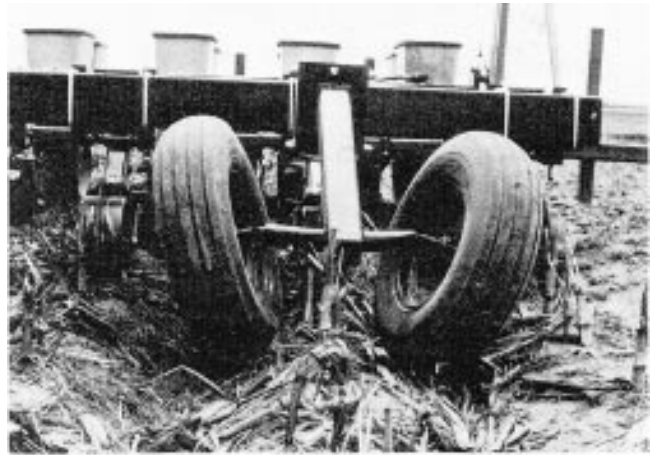
Cultivator. The purpose of the cultivator is two-fold. It helps to control weeds and is used to form ridges. Cultivators for ridge till usually have two vertical disks (one on each side of the row) and a large sweep between each row. The disks and special sweep (perhaps equipped with ridging wings) push soil toward the growing plants to form a ridge. A rolling cultivator may also be used.

The cultivator should be the same width as the planter, or else slight errors in cultivation will cause problems when planting the next crop. When the planter and cultivator are not the same width, some of the planter units occasionally may operate slightly off the ridge. When this occurs, the entire planter is likely to be forced off the ridges.

Planter. Each manufacturer has its own planter design, but ridge-till planters usually are equipped to remove 1 to 2 inches of soil from the ridge top, pushing this soil and crop residue between the rows. Seed is then planted into the flattened portion of the ridges.

Be careful not to remove too much of the ridge or else the advantages of a warmer, drier environment for the seed will be lost. It is not necessary to remove complete root clumps when ridge planting in corn residue.

A conventional corn planter can be converted to plant on ridges. To do this, mount an attachment such as a sweep or disk furrower ahead of each planter unit to remove the ridge top.



Guide wheels are sometimes necessary to hold the planter units on the ridge.

These attachments may have to be special-ordered, so plan ahead. Also, be aware that ridge planting attachments should be added only to planters with a sufficiently heavy frame to handle the extra load. The "extra load" includes the weight of the attachment and the forces that develop on the ridge-cleaning device.

Stalk Chopper. When ridge till is used following corn, stalks usually are chopped prior to planting. As a result, long stalks will not be pushed to the middle of the rows during planting. Too many long stalks can interfere with cultivation.

Chopping is not necessary following soybeans.

Will I Need To Adjust My Combine?

The combine used on ridge-till fields may need to have its wheel spacings adjusted. It is important that the combine wheels be spaced to operate between rows. That way, the wheels will not compact the ridges formed during cultivation for the next year's crop. Research has shown a significant yield decrease in rows driven upon by a combine.

Also, a spreader or chopper is desirable to distribute the residue more uniformly across the field. Residue left in the windrows may hamper subsequent operations.

What About Fertilizer Application With Ridge Till?

Although ridge till is much like conventional tillage in its fertilizer requirements, placement may not be the same.

Phosphorus and Potassium. Phosphorus (P) and potassium (K) can be broadcast in the fall or spring. However, compaction may occur between the ridges, so there may be an advantage to injecting P and K into the ridge where the majority of actively feeding roots will be found. This can be accomplished by combining the P and K with an injected preplant application of nitrogen or by injecting them with the planter at planting time.

Nitrogen. Nitrogen can be applied in liquid or dry forms, or as anhydrous ammonia. Anhydrous ammonia can be applied in the fall or spring, or sidedressed after planting.

If anhydrous ammonia is applied in corn residue, the applicator will need coulters to operate through the residue. However, if you try to inject anhydrous when the residue and soil are wet, the coulters may not cut through the residue.

Researchers at the University of Nebraska have found that it might be better to inject anhydrous ammonia on the sides of each ridge, rather than between the ridges. But if you attempt this, it may be necessary to stagger the applicator knives to reduce their tendency to plug. Also, injection is recommended on *both* sides of the ridge to help maintain a balanced ridge shape.

If you broadcast urea or 28 percent solutions, they should be applied in the spring, within two days of planting. The planting operation will incorporate the nitrogen and prevent losses. However, if rain delays planting beyond the two days, there is no need for concern. As the rain soaks into the soil, it will incorporate the nitrogen.

Ammonium nitrate also should be applied in the spring. When applied in the spring, it does not need to be specially incorporated.

How Are Lime Recommendations Affected?

Lime will not be incorporated as deeply with ridge till as with conventional tillage (2-3 inches with ridge till compared to 7-9 inches with conventional tillage); therefore, you should reduce the rate of lime to one-third the conventional tillage rate.

Also, because of the shallow incorporation with ridge till, it is possible that an acid layer may develop at the depth that nitrogen fertilizers are applied. To check for an acid layer, as well as for proper distribution of P and K, consider taking soil samples at different levels.

Normally, soil samples for fertility analysis are taken to a depth of 7 inches. With ridge till, it is a good idea to take a few samples from the upper 2 or 3 inches in addition to the samples taken to the 7-inch level. If the pH or P and K values from the upper few inches are considerably different from the normal samples taken to a 7-inch depth, a year of conventional tillage may be necessary to mix the lime, P, and K.

What About Pesticide Application With Ridge Till?

The methods and application rates for pesticides in ridge till are similar to those for conventional tillage.

Herbicide incorporation, however, is not an option with ridge till. For corn planted early (before weeds emerge), a band application of herbicide at planting time, along with

two cultivation passes, often gives adequate control of weeds.

If weeds have emerged at planting time, a knockdown herbicide such as paraquat or Roundup can be used in addition to preemergence herbicides.

To control insects, soil-applied insecticides can be banded or placed in-furrow at the same rates as for conventional tillage.

Be sure to calibrate your equipment carefully.

What About Erosion-Control With Ridge Till?

In a 1985 University of Illinois study, ridge till on the contour controlled erosion more effectively than either conventional tillage or no-till when soybeans followed corn on a Tama silt loam soil near Monmouth, Illinois. When corn followed soybeans, erosion-control with ridge till on the contour was second to no-till on the contour. (See Table 1.)

With the ridge up and down the slope (8 to 12 percent slopes), ridge till was much less effective in controlling erosion than no-till; in fact, when corn followed soybeans, ridge till up and down the slope was not even much better than conventional tillage performed on the contour.

On the basis of this and other research, it is recommended that ridge till *not* be performed up and down slopes when slopes are greater than 3 percent.

Table 1. Soil Loss From 10-by-35-foot Plots Under Simulated Rainfall of 2.5 Inches Per Hour for One Hour After Planting, Tama Silt Loam Soil.

Crop*	Tillage					
	Conventional		Ridge Till		No Till	
	UD	Cont.	UD	Cont.	UD	Cont.**
(soil loss in tons per acre)						
S-C	7.07	1.55	0.60	0.01	0.25	0.16
C-S	13.48	4.84	3.91	0.69	1.51	0.09

*Crop codes: S-C is soybeans after corn; C-S is corn after soybeans

**Tillage directions:UD is up and down slope; Cont. is on the contour

Note: The site was the Northwest Illinois Agricultural Research and Demonstration Center near Monmouth, Illinois.

How Do Yields With Ridge Till Size Up?

Research results indicate that ridge-till yields are comparable to those of other tillage practices. (See Tables 2, 3, and 4.)

One factor that gives ridge till better performance than no-till is soil temperature. Purdue University studies have shown that the daily maximum temperature after planting in a residue-free ridge is 4 to 5 degrees warmer than with no-till planting into corn residue. The warmer temperature

Table 2. Historical Perspective on Corn Yields in Illinois, 1968-71

Tillage System	Continuous Corn, Drummer Silty Clay Loam Soil	Corn-Soybean Rotation, Thorp Silt Loam Soil	Continuous Corn, Thorp Silt Loam Soil
(corn yields, bushels per acre)			
Moldboard Plow	136	141	139
Chisel Plow	132	136	136
Disk	128	136	139
Ridge Till	126	137	137

Note: Drummer silty clay loam is a poorly-drained soil; Thorp silt loam is a somewhat poorly drained soil.

Table 3. Yields in Illinois, 1985-86, Drummer Silty Clay Loam Soil

Tillage System	Corn	Soybeans
	Following Soybeans	Following Corn
(yields, bushels per acre)		
Ridge Till	183	51
Subsoil-Ridge	189	57
Strip-Ridge	181*	55
Conventional Tillage	186	57

*Planted one week late

Note: Ridge till is the same as the ridge till system described in the text; subsoil-ridge utilizes a subsoiler with ridges being formed in the fall; strip-ridge uses a subsoiler in the row and forms a slight ridge before planting; and conventional tillage consists of moldboard plowing following corn and chisel plowing following soybeans.

Table 4. Average Long-Term Corn Yields Under Four Tillage Systems on Well-Drained and Poorly Drained Soils at Various Indiana Locations.

Tillage System	Northern Indiana		East-Central Indiana	Southern Indiana
	Tracy Sandy Loam Soil	Runnymead Loam Soil	Blount Silt Loam Soil	Bedford Silt Loam Soil
(yields, bushels per acre)				
Plow-disk-disk-plant	122	134	119	93
Chisel-field cultivate-plant	125	130	107	102
Ridge till	138	133	106	107
No-till	124	115	78	100

Note: This table is adapted from *A Guide to Till-Planting for Corn and Soybeans in Indiana*, by D.R. Griffith, J.V. Mannering, D.B. Mengel, S.D. Parsons, T.T. Bauman, D.H. Scott, F.T. Turpin, and D. H. Doster, 1982. Purdue University Cooperative Extension Service tillage publication ID-148, 8 pages.



During ridge-till planting, crop residue is pushed between the rows to protect the soil from erosion.

provides for more rapid seed germination and seedling emergence. Further yield benefits could be due to good weed control because of the cultivation used to re-create the ridges for the next year's crop.

Does Ridge Till Affect Costs?

In a 1982 Purdue study, Agronomist Don Griffith analyzed the costs involved in two "well-managed" systems—ridge till and moldboard plowing. He determined that machinery costs for the moldboard plow system were over \$12 per acre more than for the ridge till system.

Anything Else?

In conclusion, ridge till is a viable tillage practice for Illinois that can control erosion and maintain yields on many soils in the state.

However, it should not be used up and down the slope when slopes are greater than 3 percent. The best use for ridge till is on level or gently sloping, medium-to-heavy textured soils.

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