IANR NebGuide
University of Nebraska Lincoln
Published by University of Nebraska–Lincoln Extension, Institute of Agriculture and Natural Resources

G1762

Ridge Plant Systems: Weed Control

Robert N. Klein, Extension Cropping Systems Specialist;
Robert G. Wilson, Extension Weeds Specialist; and
Paul J. Jasa, Extension Engineer

Advantages and disadvantages of the ridge plant system, weed control before and at planting, and economics of the system are discussed in this NebGuide.

Ridge planting combines tillage and herbicides to achieve improved weed control in row crops. Crop seed is planted into ridges formed during cultivation and/or ditching of the previous crop. In ridge planting, the planter follows the old row and ridge clearing sweeps or disks move the surface soil, residue and much of the weed seed out of the row. Weed seeds are deposited between the rows where, upon germination, they can be controlled with cultivation. Two cultivations generally are used for weed control. The first cultivation loosens the soil and the second rebuilds the ridge.

The ridge plant system is well suited to furrow-irrigated crops. It also works well with dryland crops or those under center pivot irrigation. On furrow irrigated land, corn or sorghum stalks may need to be shredded to assist in decomposition and hence irrigation because crop residue slows water advance in the furrow. Slowing the water may be a benefit, however, on soils which have a low water intake rate. With center pivot and dryland acres the need for shredding depends on how much residue the cultivator can handle.

Advantages of Ridge Planting

Advantages of the ridge plant system include:

1. *Improved weed control.* In the row annual weed density can be reduced nearly 80 percent with ridge plant compared to mulch-till systems. Herbicides are more effective at lower weed densities. Also, any weeds that have germinated or are about to emerge in the ridge at planting time will be cleared away by the planter. This gives the crop an even start with weeds in the row. By comparison, if a tandem disk or a rotary tiller is used to incorporate herbicides and prepare a seedbed, surface weed seed is "planted" in the row. This makes ridge planting one of the easiest systems to use with little or no herbicide, making it popular with organic producers. Ridge till is especially beneficial for reducing shattercane in corn.

2. *Warmer soil temperature.* Residue from the previous crop settles between the ridges, permitting the ridge to warm up sooner. The warmer soil speeds crop emergence, increases competitiveness with weeds and increases the likelihood of a good crop stand. The quick and improved crop emergence allows for earlier crop cultivation, which may control weeds between the rows better.

3. *Better soil moisture.* Without preplant tillage, ridge planting preserves soil moisture. Tillage can dry the soil to the depth of the tillage operation. In dry springs, especially in western Nebraska, soil moisture near the surface may be inadequate at planting for crop germination and growth if the soil was chiseled or disked. Realizing this, growers using tillage to prepare a seedbed often plant deeper or use a lister, which may reduce crop stands and allow excessive soil erosion.

In higher rainfall areas, water drains off the ridge so planting can be earlier than on level ground. Since the ridge dries out sooner, the system is well adapted to poorly drained soils.

4. *Volunteer crops reduced.* Ridge planting almost eliminates volunteer crops. The seeds, ears or heads are moved by the planter to the row middle where cultivation or a directed herbicide application can control seeds that germinate. Volunteer crops, especially herbicide resistant ones, often are the worst weeds in conventionally tilled fields.

5. *Reduced herbicide cost.* Band application of herbicides at planting works well with ridge planting because the system reduces weed seeds and clears the row of residue which may intercept herbicides. In general, banding reduces herbicide costs by two-thirds.

6. *Erosion control.* If ridge height is maintained and the land does not have more than a 4 percent slope, erosion will be reduced. With a 4 percent to 7 percent slope, it may be necessary to ridge plant on the contour.

7. *Controlled traffic pattern.* Soil compaction in the row is reduced if all equipment is designed to stay off the ridges.

Disadvantages of Ridge Planting

The disadvantages or inconveniences of the ridge plant system include:

1. *Early weeds, especially with late planted crops.* Weeds must be controlled prior to planting. The later a crop is planted the more likely that weeds may be present.

2. *Preplant incorporated herbicides inappropriate*. Preplant incorporated herbicide treatments should not be used because the tillage operation will destroy the ridge and mix weed seed into the soil. Also, unless the herbicide is incorporated extremely deep, which decreases its effectiveness, the herbicide will be moved out of the row with the soil during planting. The exception is where a ridge cleaning device is used in front of a tiller which incorporates the herbicide after ridge cleaning.

3. *Equipment changes*. The planter, cultivator and ditcher may need to be modified or new equipment may need to be purchased. Planting equipment must have a row cleaning device to push residue and weed seed to the row middles. The cultivator and ditcher need to be able to operate in crop residue. The ditcher also needs to be able to build a rounded or flat topped ridge. Special equipment may be needed to keep the planter on the ridge.

4. *Wheel spacing and tire size adjustment.* The wheel spacing of implements and the combine must be adjusted to the row spacing. Also tire size is limited because large tires may destroy the ridge. An alternative is to use duals with spacers to fit rows if extra load-carrying capacity is needed.

5. *Limited traffic pattern.* All traffic must follow rows.

6. *Works best for continuous row crops.* With modification, small grains have been drilled on ridges.

Ridge Clearing Depth

The ridge clearing device should be run about 1 to 2 inches deep. A planter set too shallow may not remove weed seed and may ride on top of previous crop residue. A planter set too deep may create a furrow, and remove the old root stumps, which could contribute to soil erosion or crusting in the row. Also, the soil is wetter and colder down deep resulting in slower and uneven crop emergence. A preemergence herbicide is usually applied in a band over the row after ridge clearing and planting in a band over the row.

In addition to planters that use sweeps or disks (including horizontal rotating disks) to clear weed seed and residue from the crop row, some planters use a sweep or a furrowing shovel mounted on a tool bar ahead of a rotary tiller with planting units mounted behind. By removing all but two blades per row on the tiller, only the ridge is tilled. The furrowing shovel moves the crop residue and weed seed between the rows where any weeds that emerge can be controlled with cultivation. The rotary tiller also can incorporate herbicide in the row (band). Incorporated herbicides do not need rainfall or irrigation to move them into the soil.

Weed Control Before Planting

Weeds germinating before planting must be controlled. It is a mistake to plant through large weeds like tansymustard, kochia, lambsquarters, prickly lettuce, horseweed, smartweed and Russian thistle. If growing between the rows, these weeds probably will not be killed at planting time. Furthermore, they can quickly remove all the moisture in the seedbed.

Large weeds can keep the planter from operating at the proper depth. Since these weeds may not have been killed at planting time, they become more difficult to control at cultivation. At first cultivation these large weeds may not be cut off with the disks or sweeps. They will compete with the crop and present a harvest problem. Weeds growing on the side of the ridge at planting time also present problems. The trouble arises along the cutting edge of the planter sweep or disk, where large broadleaf weeds may not be uprooted or covered. Herbicides, such as atrazine, glyphosate, 2,4-D, or 2,4-D + dicamba can be applied in early April, before planting, to control winter annuals and early summer annual weeds. The atrazine rate depends on future crops that will be planted.

An early herbicide treatment should eliminate the potential for planting into emerged weeds. For information on herbicides, rates, and weed response ratings see the *Guide to Weed Management in Nebraska*, EC130.

Some operators who do not want to use an early preplant herbicide application have added wings or extensions along the back edge of the planter sweep for additional undercutting width across the ridge. This cleans out a bigger area and makes cultivation easier. The wings or extensions are sometimes used only on the outside unit to assist when "guess rows" are wider.

Broadleaf Weed Control

Most broadleaf weeds can be controlled effectively and economically in corn with 2,4-D. If kochia, smartweed or prickly lettuce are present, dicamba or bromoxynil must be used because 2,4-D alone has not always been effective in controlling these weeds. The application timing and rate depend upon weed size, weed population, time of planting and crop to be planted. The best time to apply postemergence herbicides is when the weeds are less than 1 inch tall. This may be two or more weeks before planting, depending on planting date. If 2,4-D or dicamba is applied during corn planting, attach the spray boom to the front or under the tractor rather than behind the planter. Postemergence herbicides applied behind the planter may be less effective because soil and crop residue may cover some weeds and prevent herbicides from reaching the weeds. With sorghum, apply the 2,4-D or dicamba treatments at least two weeks before planting. Dicamba or 2,4-D also can be applied with drop nozzles after crop emergence to control weed escapes when necessary in corn or sorghum.

For preplant weed control in soybeans, one option is to use glyphosate or paraquat. These nonselective herbicides do not have residual activity. Preplant applications of Pursuit Plus, Boundry, or Sencor + Dual II Magnum/Cinch or other treatments listed in the lastest *Guide to Weed Management in Nebraska* (EC130) also could be used for controlling weeds

in soybeans; however, the herbicide will be moved out of the row with the ridge cleaning device. A preemergence herbicide treatment is usually needed in the row after planting.

Grass Weed Control

Winter annual grasses, such as downy brome, need to be controlled by mid-April to prevent soil moisture loss.

Most grass weeds in row crops are summer annual grasses such as foxtail, barnyardgrass and sandbur. These weeds start germinating in late April and early May and will often be present when row crops are planted.

If considerable grass weed growth is present before planting, glyphosate could be used. Check the label for crop and waiting period before planting. Another option would be paraquat plus a residual triazine herbicide such as atrazine for corn and sorghum. In soybeans, several herbicides can be tank mixed with paraquat for grass weed removal and residual weed control.

Preplant Cultivation

Preplant cultivation can be used for inter-row weed control. Emerged weeds on the ridge top will be destroyed, if small, by the planter's row cleaning sweep or disks. This works extremely well on fields where corn was ensiled. Set the cultivator to control weeds between the rows without throwing soil to the ridge. Preplant cultivation has been tried to rebuild ridges which may have been damaged by harvest equipment or livestock tramping.

Disadvantages of preplant cultivation include: (1) the weed seed may be incorporated deeper into the ridge than the planter row cleaning devices will remove; (2) the seedbed may not be firm unless the row cleaning device removes all the added soil and the planter places the crop seed in soil not disturbed in rebuilding the ridges; and (3) controlling planter depth can be difficult when a preplant cultivation is used.

If the soil in the spring is too wet for preplant cultivation, herbicides may be a better option. While preplant cultivation of row middles for weed control means an extra trip over the field and extra labor and fuel costs, it may be a better option than preplant disking. Unless operated very shallow, disking will remove the ridge. Then when using a planter with row cleaning devices, the result is similar to shallow listing into cool wet soil. The use of a mulch treader or rolling harrow is another possibility to control emerged weeds. It will not destroy the ridge but may incorporate some weed seeds deeper than the ridge cleaning device will remove.

Weed Control at Planting

Use a band herbicide application behind the planter to control weeds in the crop row. With light to moderate weed density a broadcast application probably is not needed. However, where heavy weed density is expected or with hard to control weeds like velvetleaf, a broadcast herbicide may be necessary. If the grower anticipates that the first cultivation will be more than four weeks after planting, a broadcast application may be appropriate. Some producers band herbicide where they are able to perform timely cultivation and broadcast herbicide on the remaining acres. After several years of continuous ridge plant system use, weed density may be reduced and it may be possible to only apply herbicides every other year.

Shattercane Control Research

At the University of Nebraska–Lincoln South Central Agricultural Laboratory near Clay Center, a ridge plant system using disk furrowers displaced 81 percent of the shattercane seeds from the crop rows to the middles. When combined with a preemergence application of Lasso at 4 lb/acre, 94 percent control of shattercane was achieved. A broadcast application of Eradicane that was incorporated with a rotary tiller gave 90 percent shattercane control the first year and 69 percent control the second year. Thus, ridge planting compared favorably with conventional systems for shattercane control in corn even though the soil-applied herbicide was not incorporated. A distinct advantage of the ridge plant system was that there was no decline in shattercane control with continued use.

Economics

Budgets for disk-disk plant and ridge plant systems are in *Table I.* Yields are reduced instead of including insurance for hail, etc. With ridge plant always having better moisture at planting the estimated yield used was 180 bushels per acre compared to 175 bushels per acre for the disk-disk plant. The atrazine 2,4-D preplant treatment in ridge plant should be used only when weeds are present. This reduces ridge plant costs approximately $.03 per bushel. Each producer will have different costs than those used in the budgets, therefore, these should only be used as a guide.

Summary

Ridge planting moves up to 80 percent of the weed seeds out of the crop row — setting the stage for economical and effective weed control. Ridge planting is particularly adapted to furrow irrigation where the ridges are formed for irrigation. Ridge planting may make it possible to lower crop production costs by implementing a weed control program which includes both mechanical and chemical weed control methods.

Table I. Estimated 2006 costs per acre, in a central Nebraska corn plot with electrical gravity irrigation, 225 ft. head. Expected yield per acre 175 bushels for disk-disk plant and 180 bushel for ridge-plant.

	Fuel and repair costs per acre	
Job	*Disk-Disk plant*	*Ridge plant*
Stalk Shredder	$ —	$ 3.45
Tandem Disk	5.24	—
Sprayer	1.93	0.39*
Bicep II Magnum	23.63	—
1.5 qt on 20% 2,4-D	—	0.56*
Tandem Disk	5.24	—
Anhydrous Applicator	5.62	5.62
200 lb Nitrogen, NH_3	48.00	48.00
Planter	7.00	7.76
0.39 or 0.40 bag seed	59.25	60.76
6 gal 10-34-0	9.72	9.72
Herbicide Band	—	9.45
Insecticide 80% Bt ECB and RW	4.65	4.65
Herbicide	13.60	—
Sprayer	4.80	—
Row Crop Cultivator	6.01	6.32
Ditcher	6.32	6.32
Combine, Corn Head	27.16	27.16
Dryer	45.50	46.80
Haul Custom	17.50	18.00
Cart	4.36	4.48
Total	**$295.53**	**$259.44**
Crop Insurance, Interest, Overhead, Management, Scouting		
Total	**$ 55.35**	**$ 50.69**
	Fuel and Repair	
Irrigate 18 in	$ 90.76	$ 90.76
Machinery, Taxes, Housing, Insurance and Interest	22.89	20.96
Land and Irrigation System	120.00	120.00
Cost Per Acre	584.53	541.85
Cost Per Unit of Production	3.34	3.01

*Use only when weeds are present.

Acknowledgment

The authors would like to acknowledge the work of Gail A. Wicks, Alex R. Martin, Russell S. Moomaw and Fred Roeth, former UNL Extension Weed Specialists and authors of a previous version of this publication.

Index: CropProduction/Field Crops
Cropping Practices
Issued September 2007