

January 2006

EC196-12

## Skip-Row Corn for Improved Drought Tolerance in Rain Fed Corn

Robert N. Klein  
Extension Cropping Systems Specialist

The idea behind skip-row planting is to keep developing corn plants from using all of the available water too early in the growing season. Because water in the soil between widely spaced rows cannot be reached by the plants until later in the season, water is available to plants in July and August. Corn is very sensitive to drought in the silking to blister stage of development.

The first research with skip-row corn was started in Nebraska in 2003. In this trial, all rows of corn were planted and then plants were removed to reduce population, or one or two rows were removed on July 2. Corn by this time will have used 6 inches of soil water. A breakdown of yields from this trial follows: 1) Control (19,500 population): 41 bu/ac; 2) removing approximately every third plant (14,700 population): 41 bu/ac; 3) removing every other plant (11,200 population): 45 bu/ac; 4) series of two rows of corn followed by one row removed (equivalent to 13,800 population): 48 bu/ac (17 percent above the control); 5) a series of two rows of corn with the next two rows removed (equivalent to 9,500 population): 54 bu/ac (32 percent above the control).

In 2004 and 2005 research trials were conducted at several locations across Nebraska (Concord, Lincoln,

---

**Added profit: \$0 to \$82/acre<sup>a</sup>**

---

<sup>a</sup> Based on weather, up to a 41 bu/ac advantage in one field comparison, 40 bu/ac in another. No advantage expected with timely rainfall.

---

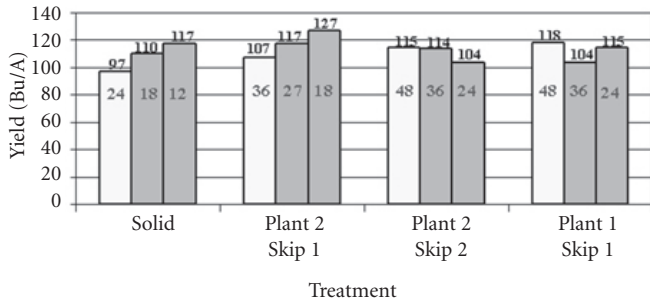
Clay Center, North Platte, Hayes Center, Ogallala, Sidney and Scottsbluff, *Figure 1a*) and Tribune, Kan., and Akron, Colo. (*Figure 1b*). The treatments consisted of three corn populations and four skip-row configurations. The skip-row configurations were: 1) no skip-rows (control), 2) a skip-row every two planted rows, 3) a skip-row alternating with a planted row (single-skip), and 4) two skip-rows alternating with two planted rows (double-skip). There was no irrigation except at Scottsbluff where a reduced irrigation trial was compared to a non-irrigated trial.

The results of the 2004 skip-row plots at North Platte are shown in *Figure 1a*. These are with very favorable precipitation during the growing season. June precipitation was 35 percent more than average, July was 88 percent above average, and August was average. Even with this very favorable precipitation the plant-two skip-one out-yielded the solid planting at all population levels.



**10 EASY WAYS TO BOOST PROFIT \$20/ACRE**

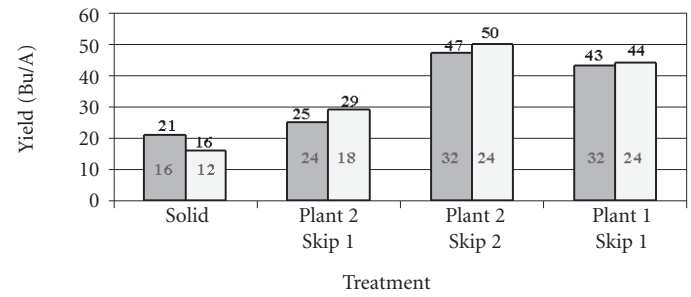




Yield  
In-row population in 1,000's

**1a. North Platte, Nebraska, in 2004.**

**Figure 1. Yields of skip-row rainfed corn.**



Yield  
In-row population in 1,000's

**1b. Akron, Colorado in 2004, a very dry year.**

**Table 1. Yield possibilities for skip-row corn in a plant-two, skip-one configuration.**

| Planted pop. in 2 rows/ac | Stand pop. in 2 rows planted/ac | Stand pop. in 3 rows (2 rows planted)/ac | Ear wt/lb yield/bu | Ear wt/lb yield/bu | Ear wt/lb yield/bu | Ear wt/lb yield/bu |
|---------------------------|---------------------------------|--|--------------------|--------------------|--------------------|--------------------|
| 20,000                    | 18,000                          | 12,000                                   | 0.5 = 86           | 0.6 = 103          | 0.62 = 106         | 0.7 = 120          |
| 24,450                    | 22,000                          | 14,667                                   | 0.5 = 105          | 0.6 = 126          | 0.62 = 130         | 0.7 = 147          |
| 28,900                    | 26,000                          | 17,334                                   | 0.5 = 124          | 0.6 = 149          | 0.62 = 154         | 0.7 = 173          |
| 33,333                    | 30,000                          | 20,000                                   | 0.5 = 143          | 0.6 = 171          | 0.62 = 177         | 0.7 = 200          |

**Table 2. Yield possibilities for skip-row in a plant-two, skip-two configuration.**

| Planted pop. in 2 rows/ac | Stand pop. in 2 rows planted/ac | Stand pop. in 4 rows pop. (only 2 rows planted)/ac | Ear wt/lb yield/bu | Ear wt/lb yield/bu | Ear wt/lb yield/bu | Ear wt/lb yield/bu |
|---------------------------|---------------------------------|--|--------------------|--------------------|--------------------|--------------------|
| 20,000                    | 18,000                          | 9,000  | 0.5 = 64           | 0.6 = 77           | 0.62 = 80          | 0.7 = 90           |
| 24,450                    | 22,000                          | 11,000   | 0.5 = 79           | 0.6 = 94           | 0.62 = 100         | 0.7 = 110          |
| 28,900                    | 26,000                          | 13,000   | 0.5 = 93           | 0.6 = 111          | 0.62 = 120         | 0.7 = 130          |
| 33,333                    | 30,000                          | 15,000   | 0.5 = 107          | 0.6 = 129          | 0.62 = 140         | 0.7 = 150          |

Table 1 lists the yield possibilities for skip-row corn in a plant-two, skip-one configuration and Table 2 lists plant-two, skip-two yield possibilities. In an Iowa study where six rows of corn were planted next to six rows of soybeans, the outside rows of corn yielded 20 percent more on the average. If we use 0.5 lb ears as the standard, we would expect the rows in a skip-row to be at least 0.6 lb ears and maybe 0.62 lb ears since there is no row next to them.

To maximize rainfed corn yields in Nebraska with no-till skip-row planting, keep the following points in mind:

No-till offers several advantages with appropriate levels of crop residue:

- Much greater moisture savings: After base needs are met (10 inches of soil water) corn yields can increase 12.5 bushels per acre with every one-inch increase in soil water available to the crop.
- Much faster soil infiltration of water\*
- Higher yields

The greatest benefits can be derived from ecofallow corn.

Maintaining a good crop residue cover is key to its success:

- Yield of the following corn crop increases with increasing wheat crop residue levels: 6,000 pounds residue per acre, approximately 60 bushels of grain per acre.
- Cut the wheat high to maximize stubble height, leaving 15-18 inches of standing stubble. Missing one average head, which has 22 kernels in every square foot, reduces harvested yield by about one bushel per acre, but the yield of the following crop can be increased significantly through the benefits of the taller stubble. Lots of the lower heads have only 7 to 15 kernels, and in many cases, it would take two or more heads per square

foot to equal one bushel. A Kansas State University study found a 2-bushel increase in corn yield for every inch of height increase in wheat stubble from 7 ½ to 15 inches.

- Taller stubble traps more snow and takes much longer to disintegrate in the field than straw that has gone through the combine.
- Spread the straw and chaff uniformly.
- Spray wheat stubble shortly after harvest to control weeds.
- Do not harvest ecofallow corn for silage if you intend to plant corn in the same field the following year because the residue is critical to moisture savings. Also, don't cut the corn for silage if you plan to seed no-till winter wheat.

Fertilize appropriately:

- Fertilize according to your yield goal.
- Apply nitrogen over the entire area. Use UAN solution with pre-plant herbicides or apply urea before planting, the earlier the better. Later applications (urea, UAN or anhydrous ammonia) may not receive sufficient rainfall to move nitrogen into the root zone.
- Anhydrous ammonia application is also discouraged because the knives can increase evaporation loss from the soil and plant weed seeds.

Practice skip-row planting correctly:

- Follow the recommendations listed above for growing ecofallow corn.\*\*
- Select Bt, Roundup-Ready hybrids that perform well under ideal or stressful situations.
- Typically, on a 30-inch row system, two rows are planted and two rows are skipped. For higher rainfall areas and/or fields with large amounts of crop residue and a full soil profile, the plant-two, skip-one configuration may be the better choice. Also, the plant-two skip-one may be a better choice in short season areas and where corn does not get tall.
- Plant appropriate plant populations: 10,000 to 13,000 plants per acre in western Nebraska. On a plant-two, skip-two system, this translates to 20,000 to 26,000 plants per acre in the planted rows, but since every row is an outside row reduce these in-row populations by 20 percent. If you normally plant a population of 12,000 in

\*A study by Paul Jasa compared conventional and long-term no-till fields on the University of Nebraska–Lincoln Rogers Farm east of Lincoln, with the following results:

|                             | <i>Rainfall infiltration rates<br/>in inches per hour.</i> |                                   |
|-----------------------------|--|-----------------------------------|
|                             | <i>Wheel traffic<br/>areas</i>                             | <i>Soft rows<br/>(no traffic)</i> |
| Conventionally tilled field | 0.2  | .04                               |
| Long term no-till field     | 0.4  | >4.0                              |

\*\*Skip-row planting is not recommended for sorghum because of postemergence weed control concerns. Skip-row planting is recommended only for no-till, ecofallow corn, with good crop residue in place. Crop residue helps suppress weeds.

conventional no-till fields, that would compare with 24,000 in a plant two, skip-row system. Reduce that by 20 percent (4,800), to 19,000 plants in the two rows that are planted. In eastern Nebraska and in limited irrigation and/or where water may not be available later in the season, consider the plant-two skip-one system and plant about 19,400 seeds per acre. (This is about 29,000 in the two planted rows if you are trying for 150 bu/ac corn.)

- It usually works best to fill the outside seed box on each end of the planter, and skip the appropriate boxes from there.
- Apply a pre-plant or pre-emergence herbicide treatment. If weed populations are light, consider a two-thirds rate; however, remember that the chemical company will not stand behind reduced rates.

- Spray glyphosate postemergence, as needed, to control weeds. Always consult and follow pesticide labels.

Potential drawbacks of skip-row planting:

- Yields will be limited to 130 (plant-two, skip-two) and 160 (plant-two, skip one) bushels per acre (not a likely deterrent in western Nebraska).
- Crop insurance may not be available or only partially available.
- The Farm Service Agency may not count all acres as planted acres.
- Fields may be more attractive to corn borer because they are greener and healthier (plant Bt corn hybrids).

Extension is a Division of the Institute of Agriculture and Natural Resources at the University of Nebraska–Lincoln cooperating with the Counties and the U.S. Department of Agriculture.

University of Nebraska–Lincoln Extension educational programs abide with the non-discrimination policies of the University of Nebraska–Lincoln and the United States Department of Agriculture.

© 2006, The Board of Regents of the University of Nebraska on behalf of the University of Nebraska–Lincoln Extension. All rights reserved.