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G88-884 Ecofarming: Selecting Corn and Grain Sorghum Hybrids, Planting Dates, and Planting Rates in a Winter Wheat--Row Crop--Fallow Rotation

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ECOFARMING: Selecting Corn and Grain Sorghum Hybrids, Planting Dates, and Planting Rates in a Winter Wheat--Row Crop--Fallow Rotation

This NebGuide discusses selecting corn and sorghum hybrids, factors that affect yield, plant populations, and more.

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Treating winter wheat stubble with herbicides after harvest, and then planting corn or grain sorghum in the untilled stubble the next spring, is a practice used for over 15 years in many parts of the Central Great Plains. The residue protects the soil from wind and water erosion.

This method of farming is one of the most effective soil and water conservation practices adapted in this century.

Corn or Sorghum

Many factors are involved in a farmer's decision concerning the crop to grow. No set formula works for everyone. Both corn and sorghum have worked well under ecofallow conditions, but each has advantages and limitations. Corn has the advantages of an earlier planting date, permitting spraying before weeds become well established in the spring, much better seedling vigor, a wider range of herbicides available, better herbicide tolerance, better stalk strength, ability to mature better in cool weather, and higher cash crop value.

Low tolerance to drought stress is a limitation of corn. When this occurs, silk development may be delayed enough to cause complete pollen shed before the silks emerge. Corn also does not have as much inherent capacity to recover once the crop is damaged at any time during its growth cycle.

The greatest advantage sorghum has over corn is the inherent ability to tolerate more drought and heat stress during most of its growth period, particularly during the critical flowering period. It also can recover when moisture is received. Sorghum may be harvested with small grain harvesting equipment without an additional header for the combine.

The average yield of the two crops is relatively close, but the relationship varies from year to year for most areas. In areas around Sidney and north of North Platte, corn yields have been superior to sorghum. A farmer's past experience, soils, climates, herbicides used, time of herbicide application, equipment, and which crop works best in each farming system will be the primary factors in deciding which crop to grow.

Hybrid Selection

Selection of the corn or sorghum hybrid is just as important with ecofarming, if not more important, as with conventional farming. Additional factors which must be considered when selecting hybrids for ecofarming include seedling cold tolerance and maturity. The residue protects the soil surface, causing the soil to be cooler at planting time and through much of the growing season. Soils also dry more slowly in the spring, so planting may be delayed.

With the cooler soil temperatures, germination and seedling development are slower in the spring. Sorghum is delayed more than corn. However, with both crops, the cool soil environment tends to make a mid-season hybrid under ecofallow about as late as a full-season hybrid under conventional conditions.

Crop producers must give as much thought to hybrid selection as any other management decision. Use of the wrong hybrid can wipe out all the potential gains from other correct decisions.

Items to Consider When Selecting a Hybrid

Maturity

Full-season hybrids have the greatest yield potential. A mid-season hybrid at one location may be a full season at another location as length of season varies greatly across the state. Length of growing season is affected not only by the number of days from the last frost in the spring until the first frost in the fall, but also by latitude and altitude. The field microclimate associated with residue cover greatly influences plant response to climatic conditions.

The biggest risk is selecting hybrids that are too extreme in maturity. A short-season hybrid has a lower yield potential in comparison with a long-season hybrid. Moisture limitations and/or frost may limit performance of the long-season hybrid in some years.

The most frequent problem is with corn and sorghum hybrids that are too full season. If a full-season hybrid has been used under conventional farming methods, it probably will be too late for ecofallow. A mid-season hybrid for the area probably will be preferred.

At planting time, the only real guide to the crop year is the amount of stored moisture in the soil profile. Within limits, it can be used to help decide how late the hybrid maturity should be. The more stored soil water available, the later you can stretch the maturity range in hybrid selection. But use this guide sparingly. Do not go to the extreme unless you are ready to assume the risk of a crop badly damaged by early frost or drought.

Full-season hybrids also are more risky if high populations are used. The better option with higher amount of soil moisture is to increase the planting rate. If full-season hybrids are used, the plant population should be reduced.

Yield

Factors that Affect Yield. A hybrid which has good tolerance to stress is important in non-irrigationd conditions. This includes the ability to produce at least some yield under low soil water conditions and the capability to produce a high yield when adequate soil water conditions are present. Also, tolerance to seedling diseases, extended periods of hot weather, high winds and low humidity are important.

A hybrid that can produce good yields at lower plant populations also is critical. Because of limited moisture, ecofallow corn or sorghum is planted at lower plant populations than irrigationd crops, but the hybrids need to be able to respond when adequate moisture is present.

There are a number of other factors that need to be included in the selection of corn and sorghum hybrids. For corn these include plant and ear height, resistance to corn borer, resistance to stalk rot, stalk strength and strong root systems. For sorghum, consider stalk lodging, test weight, plant height, head exsertion and disease and insect susceptibilities.

Source of Yield Data on Hybrids. The most important source of data is a farmer's own yields under specific soil, climatic and management conditions. There are other ways to obtain comparative yield data on hybrids, as well.

One objective source is the latest report on the Nebraska Corn Hybrid Test or its counterpart, the Nebraska Sorghum Hybrid Test. Several of these tests are conducted annually across the state, and the results are published in Extension Circulars. Farmers can look at data from the sites closest to them to get an idea how various hybrids performed under comparable conditions.

Each company is limited in the number of hybrids it can enter in these tests. The data from the tests include yields, plant populations, moistures at harvest, broken plants and dropped ears. This information is most valuable if averaged over several years, since yields of only one year may be influenced by environmental extremes.

Seed company tests are another source of yield information. The closer the test conditions are to a farmer's conditions, the more reliable the data. These tests are most valuable in comparing hybrids within a company. Farmers should do some experimenting with hybrids on their own farms, as well.

Try one bag of each of several hybrids that have the potential to be grown on your farm. It is important to check the hybrid at least two years before planting a sizeable acreage. It is important to use every

available source of information to make this difficult decision.

Plant Populations

Corn Populations. Seeding rates of corn under ecofallow have ranged from approximately 8,000 to almost 20,000 plants/acre. Many agronomists feel that maximum production is reached with 0.5 lb. ear size. *Table I* lists the harvest plant population needed for yield goals from 40-100 bushels per acre. Under dryland conditions, an ear size of 0.6 lb. may be a more desirable yield goal. This would provide some insurance if a drought occurred.

Table I. Yield goal vs plant population at harvest.

Yield goal	Population 0.5 lb ears	Population 0.6 lb ears
bu/A	(plants/A)	
40	5,600	4,670
50	7,000	5,830
60	8,400	7,000
70	9,800	8,170
80	11,200	9,330
90	12,600	10,500
100	14,000	11,670

There has been a tendency for increased yields with the higher populations in favorable years, but as population is increased the risk of disaster also increases.

Plant population increases do not necessarily decrease the amount of moisture available to each plant by a proportional amount. The reasoning is that as plant population increases, the leaf canopy increases which reduces the amount of direct sunlight reaching the soil surface. There is also a restriction of wind movement within the canopy. Both help the growing crop. The shade reduces the soil temperature which in turn reduces surface evaporation. With high levels of winter wheat residue, this effect is reduced. Reduced wind movement also decreases surface evaporation and tends to keep the humidity in the canopy a bit higher, which lowers transpiration rate. The thicker population also creates some mutual shading of leaves, which keeps the leaves somewhat cooler. This, too, reduces the transpiration rate.

At present, corn plant populations of approximately 8,000 to 16,000 in 30 inch rows are recommended. See *Table II* for planting rates, row widths, and harvest population. With three feet of moist soil and an annual rainfall of 15 inches, a suggested plant population would be in the area of 8,000. With six feet of moist soil and annual rainfall of 20 inches, a plant population of 14,000 may be desirable. Adjust the rates depending on the normal rainfall in your area and the amount of water in the six foot soil profile at planting time.

Table II. Average planting rate, seed spacing in inches and projected harvest populations for corn.

Planting rate/acre	Row width			Harvest population	
	30"	36"	40"	10% Loss	15% Loss
	Inches between seeds			Plants/A	
6,000	34.8	29.0	26.1	5,400	5,100
7,000	29.9	24.9	22.4	6,300	5,950
8,000	26.1	21.8	19.6	7,200	6,800
9,000	23.2	19.3	17.4	8,100	7,650
10,000	20.9	17.4	15.7	9,000	8,500
11,000	19.0	15.8	14.2	9,900	9,350
12,000	17.4	14.5	13.1	10,800	10,200
13,000	16.1	13.4	12.1	11,700	11,050
14,000	14.9	12.4	11.2	12,600	11,900
15,000	13.9	11.6	10.5	13,500	12,750
16,000	13.1	10.9	9.8	14,400	13,600
17,000	12.3	10.2	9.2	15,300	14,450
18,000	11.6	9.7	8.7	16,200	15,300

Grain Sorghum Populations. Seeding rates for sorghum have ranged from 50,000 to 150,000 seeds/acre. Grain sorghum population should be adjusted in accordance with a realistic yield goal or probable yield. Analysis of Nebraska data indicates that the average yield of single plants at harvest is approximately 1/10 pound of seed at 14.0 percent moisture. Sorghum weighs 56 pounds/bushel; therefore, 560 plants are required at harvest time to produce a bushel of grain.

If a realistic yield goal is 85 bushels/acre, then 85 x 560 = 47,600 plants at harvest. If 15 percent of the plants from the viable sorghum seeds planted will be lost before harvest, the number of seeds required per acre will be about 15 percent more than 47,600, or 54,700 seeds per acre. Early plantings have a greater chance for reduced emergence, so rates need to be increased.

In Nebraska, it is better to be on the low side of the desired population rather than the high side. Under heat and drought stress, plants at a lower population have more soil volume from which to draw water and can survive better than a thicker stand. High populations tend to force the crop into stress more quickly when moisture supply is limited.

Pay attention to the amount of moisture that is in the soil profile at planting time before determining the planting rate. Sorghum stands of 20,000 have produced yields of 80 bushel per acre. It is generally thought unwise to replant sorghum if the present stand is approximately 20,000 per acre or more.

The size of grain sorghum seed varies among hybrids and from situation to situation, depending on growing conditions. Some lots will have 12,000 seeds or less per pound and others 16,000 seeds or more. Seed number and spacing are important. Pounds per acre is not appropriate for determining

planting rate.

Table III. Yield goal populations and seed spacing in various row widths for sorghum.

Yield goal	Row width			Planting rate	Harvest population 15% Loss
	30"	36"	40"		
	Inches between seeds				
40	8.0	6.6	6.0	26,350	22,400
50	6.4	5.2	4.8	32,950	28,000
60	5.3	4.4	4.0	39,500	33,600
70	4.5	3.8	3.4	46,100	39,200
80	4.0	3.3	3.0	52,700	44,800
90	3.6	3.0	2.6	59,300	50,400
100	3.2	2.6	2.4	65,900	56,000

Planting Dates. Soils are cooler under residue than bare soils. Early plantings generally yield higher than later plantings, but the cooler soils early in the season must be kept in mind. If you want to plant corn in late April or early May, pay particular attention to the five day weather forecast. If the weather reporter says the forecast is for normal or above normal temperatures and sunny days, it probably will be fine to plant corn. If the prediction is for cloudy days and cool temperatures, you probably should leave the seed in the bag until more favorable weather occurs.

By mid-May, plant corn regardless of the predictions, since the periods of warmer temperatures are ahead and the cool soil shouldn't last long enough to damage germination too badly.

With sorghum, delay planting in early May, unless the prediction is for ideal conditions. A planter that opens a strip of bare soil is particularly important when planting through heavy straw residues.

After May 20, plant grain sorghum regardless of the forecast if soil conditions are dry enough. Planting dates are a judgment call by each farmer, but most successful farmers have been planting ecofallow corn and sorghum as early as practical.

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