Texas Cooperative EXTENSION
The Texas A&M University System

Texas Agricultural Experiment Station
THE TEXAS A&M UNIVERSITY SYSTEM

Dryland Corn in the Texas Panhandle

Brent Bean
Professor and Extension Agronomist

Dryland corn has been produced in the Texas Panhandle and upper South Plains over the last few years with moderate success. The question has arisen lately as to whether dryland corn in the region should be considered a 'good' farming practice. The answer is yes it can be, but it depends on the circumstances. This rather vague answer is also true for most crops planted in the Panhandle and South Plains. Historically the risk of producing a successful dryland corn crop has been considered too high compared to other crop alternatives. However, new technology, such as Bt, Roundup Ready, and more drought and heat tolerant corn hybrids have lowered the risks associated with dryland corn. It is important to remember that farming practices are continuously changing. A good example is the migration of cotton acres north of I-40. Cotton planted in this region was simply not done until the last few years as it was considered too risky due to a shorter growing season. In 2005, there were over 124,000 cotton acres planted successfully throughout the upper Texas Panhandle.

In 2004 and 2005, a high percentage (>81%) of the dryland corn planted in the northern and southern High Plains TASS districts were harvested (Table 1). The yield from these harvested acres was greater than the average yield of grain sorghum (more than double in 2004) in both 2004 and 2005. In 2006, the number of planted acres of dryland corn almost doubled compared to that planted in 2005. The year experienced a very dry spring and early summer. As a result, only 29% of the planted acres were harvested. The average yield, however, of the harvested acres was high at 93 bu/ac. More than likely these harvested acres were planted on fallowed ground that had good soil moisture at planting, and may have been planted later in the season allowing the crop to take advantage of late summer rains. Although in 2006 the average grain sorghum yield was not particularly good (29 and 25 bu/ac), 56% of the planted acres were harvested, supporting the argument that there is less risk associated with producing grain sorghum compared to corn during a dry year.

Table 1. Corn and Sorghum planted and harvested acres along with yield in 2004, 2005, and 2006 in the Northern and Southern Texas High Plains TASS districts.

		Corn			Sorghum		
Region	Year	Planted Acres	Harvested Acres	Yield, bu/ac	Planted Acres	Harvested Acres	Yield, bu/ac
N. High Plains	2004	7,300	6,900	72	315,000	270,800	39
S. High Plains		4,900	4,000	75	138,000	128,000	35
N. High Plains	2005	22,700	20,200	60	298,000	265,300	53
S. High Plains		2,100	1,800	77	82,000	79,000	45
N. High Plains	2006	42,200	12,400	93	342,500	187,200	29
S. High Plains		None	NA	NA	100,300	62,800	25

Southwest Kansas, which historically has an annual rainfall total similar to the Texas Panhandle, has been growing dryland corn successfully for a number of years. Research conducted by Norwood and Currie (1997) from 1991 to 1995 showed a significant yield advantage of dryland corn over dryland sorghum in 4 out 6 years in no-till, and 2 out of 6 years in conventional till (Table 2). Sorghum yielded more than corn in both the no-till and conventional till in 1991 only. The advantage shown with corn in no-till compared to conventional till was likely due to more stored soil moisture at planting under the no-till system. The data also tends to show that when yields were high with both crops corn out yielded sorghum. When yields were low, there was either little difference between the crops, or sorghum produced the higher yield. As the authors note in the paper, care should be taken in inferring these results to the Texas Panhandle since potential evapotranspiration (water use) increases north to south in the Great Plains.

Table 2. Dryland corn vs grain sorghum in southwest Kansas, 1991 - 1995.

		Yield, bu/ac		
Year	**Crop**	**Conv. Till**	**No-Till**	**Difference**
1991	Corn	19	34	15*
	Sorghum	45	63	18**
	Difference	26**	29**	
1992	Corn	143	148	4
	Sorghum	101	103	3
	Difference	42***	45***	
1993	Corn	85	98	13*
	Sorghum	97	93	4
	Difference	12	5	
1994	Corn	74	118	44***
	Sorghum	69	88	19**
	Difference	5	30***	
1995	Corn	77	110	33***
	Sorghum	50	52	2
	Difference	27**	58**	
Average	Corn	80	102	22***
	Sorghum	72	80	8*
	Difference	8	22***	

*,**,*** indicate significance at the 0.05, 0.01, 0.001 probability levels, respectively.

Very little citable research has been conducted to determine a set of best management practices for dryland corn production. This is because it would take several years of research to develop any meaningful data because of variability of in-season rainfall from year to year. For example, a farming practice such as an early planting date might be very successful one year and a complete failure the next, primarily due to timeliness of rainfall. Clearly in 2006, with significant rainfall not occurring until after July 1st, delayed corn or sorghum planting would have been the best practice. A second study conducted by Norwood and Currie (1996), compared three dryland corn planting dates, May 1, 15, and 31, over a four year period (data not shown). There was no clear advantage of one planting date over another. When looking at water use efficiency (grain produced per inch of water used) the late planting date was best one year, but the worst in the following year. In the other two years of the trial, there was no difference in water use efficiency between the three planting dates.

In lieu of conducting several years of research on a particular problem, researchers can run a computer simulation using weather data over multiple years. This was done by Adkar, Stewart, and Salisbury, at West Texas A&M University, in the mid 90s. In the simulation model, dryland corn was compared to grain sorghum using 50 years of historical climatic data from five locations (Dimmitt, TX, Bushland, TX, Boise City, OK, Tribune, KS, and Akron, CO). The findings from the computer simulation correlate fairly well with producer and agronomist field observations over the years. The following discussion includes a summary of the results of the computer simulation. The actual bulletin developed from the simulation can found at http://amarillo.tamu.edu on the agronomy/corn page of the website.

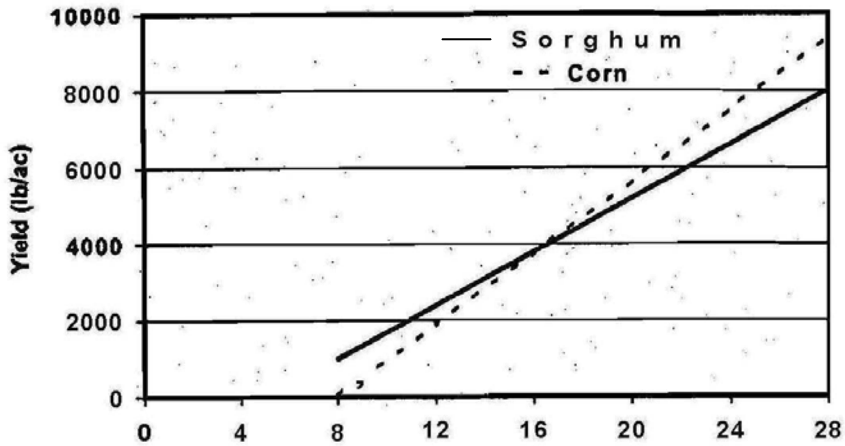
The planting dates used for the simulation for corn ranged from April 10 in the southern locations to as late as May 10 in the northern locations. For grain sorghum, the planting dates ranged from June 1 to June 10 as it moved north. It was also assumed that the soil profile was at 75% field capacity with water at the time of planting. The 50 years of simulated yields represented a wide range of rainfall amounts during the growing season. This is indicated by the range in yield of both crops at all five locations (Table 3). At Dimmitt, Bushland, and Boise City, on average, sorghum produced the higher yield, with corn being more productive at Tribune and Akron. All five sites receive on average 10 to 11 inches of rainfall during the growing season. However, the timing and amount of rainfall, as well as other climatic factors, is reflected in the yield variation from year to year of both crops.

Table 3. Average yields of corn and grain sorghum for five locations for 50 years of varying climatic conditions.

Location	Corn Pounds/ac	Range	Sorghum Pounds/ac	Range	Corn/Sorghum Ratio
Dimmitt, TX	3,150	630 – 7,020	3,780	1,620 – 6,390	0.88
Bushland, TX	2,340	450 – 4,860	2,610	990 – 4,860	0.89
Boise City, OK	2,610	540 – 5,940	3,060	1,170 – 5,400	0.85
Tribune, KS	3,690	1,080 – 6,210	3,420	1,710 – 5,130	1.07
Akron, CO	3,060	810 – 5,400	2,610	1,260 – 3,870	1.17

Figure 1 compares the relationship of corn and grain sorghum yields as they relate to seasonal water use. These relationships indicate for grain sorghum about six inches of water is needed before any grain can be produced, and for any additional water used, about 350 lbs of grain are produced. For corn no grain is produced unless at least eight

Figure 1. Relationship between corn and grain sorghum yields and seasonal water use.



Inches of Water Used

inches of water is used, but for every inch of additional water the return is about 450 pounds of corn. Yield response to water of both crops is in line with what the Texas Cooperative Extension has observed in farm demonstrations the last few years. The relationship suggests that in drier years grain sorghum will be a better choice with corn being more productive in wetter years. The point that grain sorghum and corn are equal in production is about 17 inches of water. If average rainfall during the season is 10 inches then for corn to be as productive as grain sorghum at least seven inches of water must be available for use in the soil at planting. This also assumes that the 10 inches of seasonal rainfall will be timely and that it is all used by the crop. This, of course, is a rarity. It also supports the general recommendation that significant stored soil moisture should be present before corn is planted.

The computer simulation also suggests that there is more risk associated with growing corn, particularly at the Dimmitt and Bushland locations. This is evident by the wide range in corn yields at the two locations (Table 3). At Dimmitt, corn had a greater yield, or was about equal to grain sorghum, in only 17 of the 50 years (data not shown). At Bushland, corn yield was greater or about equal to grain sorghum in only 14 of 50 years. In the dry years, at these two locations, grain sorghum only yielded less than 2,000 lbs/ac an average of 13 times and corn yielded less than 2,000 lbs/ac an average of 27 times over the 50 years.

The computer simulation, as well as the experience of producers, indicates that there are years where corn can be as, if not more, profitable than grain sorghum. Although corn is a more expensive crop to grow because of seed costs, producers generally can sell corn for 10 to 15% more than grain sorghum. Also, a severe grass infestation, as well as certain broadleaf weeds, can be very difficult to control in grain sorghum. If these grasses and broadleaf weeds are not controlled, grain sorghum yield will be substantially reduced. Corn provides more options for effective weed control. Grain sorghum also tends to be more sensitive to soils deficient in iron and zinc, two problems that can be very difficult to correct. Under these conditions, dryland corn may very well be a more viable crop than grain sorghum.

After visiting with growers and agronomists who have attempted to produce dryland corn, some general guidelines for growing a successful dryland corn crop have been developed. These are as follows:

1. Plant only when 2.5 to 3 ft or more of soil moisture is present. A successful dryland crop can be produced without significant soil moisture at planting, but the crop will be much more dependent on timely in-season rainfall.
2. The likelihood of success will be greater when minimum or no-till practices are used in order to store as much soil moisture as possible prior to and during the growing season.
3. Choose a corn hybrid with the best drought and heat tolerance as is available. In general, shorter maturing hybrids will be a better choice, however, some longer maturing hybrids do have good drought and heat tolerance. The use of a Bt hybrid is also an important consideration, particularly if planting date is delayed.
4. Keep seeding rate low, preferably no more than 15,000 seed/acre.
5. Narrow rows may also provide an advantage by providing early season shading that reduces soil water evaporation.
6. The conventional wisdom has been to plant dryland corn as early as possible. However, as the Kansas study showed, as well as producer observations, this may no longer be the case. Consider delaying planting until significant soil moisture has been stored. This is similar to what is currently recommended for grain sorghum.

In summary, dryland corn can be grown successfully in the Texas Panhandle. Are the risks likely greater than grain sorghum? At this point the answer is still yes. However, Bt and Roundup Ready technology, along with more drought and heat tolerant hybrids have narrowed the risk gap, especially in those fields where grass and hard to control broadleaf weeds are a problem. Timely rainfall is important with both crops, but particularly corn.

References:
National Agricultural Statistics Service. http://www.nass.usda.gov.

Norwood, C.A. and R.S. Currie. 1996. Tillage, planting date, and plant population effects on dryland. J. Prod. Agric. 9:119-122.

Norwood, C.A. and R.S. Currie. 1997. Dryland corn vs. grain sorghum in western Kansas. J. Prod. Agric. 10:152-157.

Akbar, M.A, B.A. Stewart, and C.D. Salisbury. 1997. Evaluation of dryland corn and grain sorghum production in the southern plains using computer simulation. WTAMU Research Report 97-4.