

Soybean Irrigation Considerations for the Texas Panhandle and South Plains

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Interest among farmers in the Texas Panhandle and South Plains in growing soybean has increased dramatically over the last two years. Soybean acres in Texas increased from 290,000 to 420,000 acres from 1996 to 1997. In just the two Texas Panhandle reporting districts, soybean acreage increased from 34,300 to 90,800 acres in these two seasons. Increase in acreage was due partly to the loss of cotton acreage in the South Plains due to poor early season weather conditions and boll weevil concerns. Interest has also been peaked because of the availability of Roundup Ready soybean varieties. Roundup can be used to effectively control and suppress weeds in soybean, and this has been a major factor in the decision to switch acres to soybean.

A few producers in the past two years have been successful in growing soybean under dryland conditions. Yields have generally ranged from 15 to 20 bu/a with an occasional 25 bu/a yield. With these kinds of yields, soybean will compete favorably in most years with wheat or sorghum. However, it should be noted that in 1996 and 1997 weather conditions were very favorable for soybean production. In 1996, over 16 inches of rain occurred from May 1 to September 31, with almost 5 inches received during August. Although 1997 was drier from May 1 through September 31, almost 3 inches of rain was received in the critical month of August.

Studies conducted in 1982 and 1983 by Dr. Harold Eck at the USDA Agriculture Research Laboratory at Bushland, TX shows the importance of rainfall and irrigation timing on soybean production. Seasonal rainfall in 1982 was 15.3 inches, but in 1983 it was only 6.4 inches. As a result, soybean yield was much higher in 1982 compared with 1983 regardless of irrigation. In the wet year of 1982, 30 bu/a was produced with no irrigation (Table 1, treatment 3). In contrast, in the dry year of 1983, only 6 bu/a was produced even when soybean was irrigated early in the season (Table 2, treatment 6). Both years show the importance of water to the soybean plant during grain fill which typically occurs in August. In both years rainfall was less than one inch during August. When irrigation was not applied during the critical grain fill period, yields were greatly effected. In 1983 missing a single irrigation during this period reduced yield 22 bu/a (treatment 5). And even in the wet year of 1982, when rainfall early in the season was abundant, yield was reduced 29 bu/a when one irrigation was omitted during grain fill (treatment 6).

Soybeans can be stressed early in the season without greatly affecting yield. However, if the soil profile is allowed to deplete, it may be difficult to provide the amount of water necessary to prevent soybean from being stressed later during the season. Soybean has a taproot system and is able to utilize soil water from a depth of five feet. This ability to use deep soil water diminishes the need for frequent irrigation scheduling. A study conducted by Dr. Bill Lyle at the Texas Agriculture Research Station at Halfway, TX indicated no difference in yield of soybean when irrigated on 3.5 day schedule compared to 14 days.

Furrow irrigation can be terminated when seeds have fully expanded in the pods and have turned green. At this stage soybean leaves will begin to yellow within a few days. In both the 1982 and 1983 seasons, very little yield was gained when soybean was irrigated after leaves began turning yellow. If the soil profile is full of water at this stage of development, it will likely not be

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economical to furrow irrigate.

The irrigation demand for fully irrigated soybeans as with any crop will vary from year to year. In 1995 Dr. Terry Howell and colleagues at the USDA Agriculture Research Laboratory at Bushland, TX produced 68 bu/a soybean yield by irrigating based on evapotranspiration demand. These fully irrigated beans required 20 inches of irrigation water which was about 85% of the irrigation water needed by corn. Because soybean peak water use occurs in August and early September, they can be d rotated with corn, particularly short-season corn. As the peak water demand for corn begins to decrease, irrigation resources can be diverted to soybeans. In addition, the use of soybean in rotation with corn provides an excellent opportunity to reduce weeds, and to break insect and disease cycles that tend to build up in a continuous corn system. A farmer in 1997 showed a 13 bushel increase in his corn yield on his half circle following soybeans compared to the half circle where corn was grown the previous year. Differences were attributed to less insect pressure in the corn following soybeans.

Soybean rotation with cotton or sorghum is not as appealing from an irrigation scheduling stand point since the maximum water use period will be similar for these crops. If adequate water is available, double cropping following wheat is a good option. Soybeans can be planted as late as July 5 and still produce a satisfactory yield. In 1996 and 1997, 40 bu/a soybean was produced when planted the first week of July. However, for every day past about June 20 that planting is delayed, yield will generally be reduced one bushel per day of delay. Potential also exist for an early freeze to dramatically reduce yield in late planted soybeans. For additional information on growing soybeans, contact your county extension office.

Table 1. 1982 Soybean Irrigation Study ¹⁾

Treatment	Soybean Growth Stage and Date of Irrigation					Yield bu/Acre
	Full Bloom 7/19	Early Seed Development 8/12	Mid Seed Development 8/19	Full Seed Development 8/26	Yellow Leaves 9/9	
1	X	X		X	X	63
2		X		X		60
3						30
4	X		X			64
5	X			X		54
6	X					35
7	X	X				50
8	X	X	X			72
Rain (inches)	June 4.0" July 6.6"	August 0.8"			Sept. 2.1"	
Total rainfall from May through September was 15.3 inches.						

¹⁾Conducted by Harold Eck, ARS Research Scientist at Bushland, TX.

Table 2. 1983 Soybean Irrigation Study ¹⁾

Treatment	Soybean Growth Stage and Date of Irrigation							Yield bu/Acre
	Emer- gence 5/12	Bloom 6/29	Full Bloom 7/13	Pod Development 7/27	Seed Development 8/10	Full Seed Development 8/24	Yellow Leaves 9/7	
1	X	X	X	X	X	X	X	47
2	X		X	X	X	X	X	40
3	X			X	X	X	X	41
4	X	X		X	X	X	X	43
5	X	X	X	X		X	X	25
6	X	X	X	X				6
7	X	X	X	X	X			16
8	X	X	X	X	X	X		43
Rain (inches)	May 2.9"	June 1.3"	July 1.7"		August 0.3"		Sept 0.3"	
Total rainfall from May through September was 6.4 inches.								

¹⁾ Conducted by Harold Eck, ARS Research Scientist at Bushland, TX.