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Irrigating Soybeans With Limited Water

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During the past three years we have evaluated soybean yields and lodging as influenced by irrigation amount and time. The results should help irrigators who want to use less water because of limited water supply, limited pumping capacity, limited time, increased cost of fuel for pumping, or other reasons. The study was on the Ashland Research Farm, approximately 8 miles southwest of Manhattan. The soil is a Muir silt loam developed from river sediments. Pertinent information on the soybean field plots is listed in Table 1. In early June each year, available water stored in the 5-foot soil profile exceeded 10 inches.

Tables 2 and 3 present soybean yield and lodging data for 1972 and 1973, respectively. The treatments consisted of an irrigation at vegetative, flowering, or podding stage when each of three predetermined soil-moisture depletion levels (percent of available water depleted) was reached. Then each plot was irrigated (until soybeans matured) when its soil-moisture depletion

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level was reached. A no-irrigation control was included.

Table 4 presents soybean yield and lodging for 1974. Treatments consisted of no irrigation; one 4-inch irrigation at either beginning bloom, beginning pod development, or beginning bean development; and three 4-inch irrigations, one at each of the three growth stages mentioned. Figure 1 presents the 30-year average rainfall pattern and rainfall received during the three study years.

The 3 years of data indicate that full-season irrigation does not increase soybean yields, but

Table 1.—Information on experimental soybean field plots, Ashland Research Farm.

	1972	1973	1974
Planting date	May 18	May 14	May 13
Variety	Calland	Calland	Williams
Population (plants/acre)	109,000	105,000	144,500
Row width (inches)	24	30	30
Plot size, ft.	16 x 42	25 x 42	25 x 40
Inches of available water in 5-ft. profile on date listed	(8 Jun) 10.7	(18 Jun) 11.8	(12 Jun) 11.6
Physiological maturity reached	Sept. 8	Sept. 10	Sept. 14

increases lodging over soybeans irrigated only during pod formation and filling (bean development). Limited in-season irrigation is most practical in soils with large water-holding capacity and nothing to restrict extensive root development; and if a moderate to large amount of soil water is stored before planting.

Table 2.—Soybean yield and lodging as influenced by irrigation in 1972.

Treatment				
Growth stage at first irrigation	Soil-moisture depletion (%)	Irrigation* (inches)	Lodging**	Yield (bu/acre)
Vegetative	20	21.7	3.3	55.9
	40	19.3	2.8	52.8
	60	14.2	2.3	56.1
Flowering	20	20.5	3.1	53.3
	40	17.5	2.3	49.3
	60	14.8	2.0	58.1
Podding	20	12.4	2.3	57.5
	40	12.3	1.9	56.8
	60	11.8	1.9	55.9
No irrigation		0.0	1.3	45.8
LSD				
0.05			0.6	7.3

* Water applied each time soil moisture was depleted to indicated percentage after first irrigation.

** Lodging score from 1 to 5; 1 = all plants standing erectly, 5 = no plants standing erectly.

Figure 1.—Thirty-year rainfall pattern and rainfall received during the three study years.

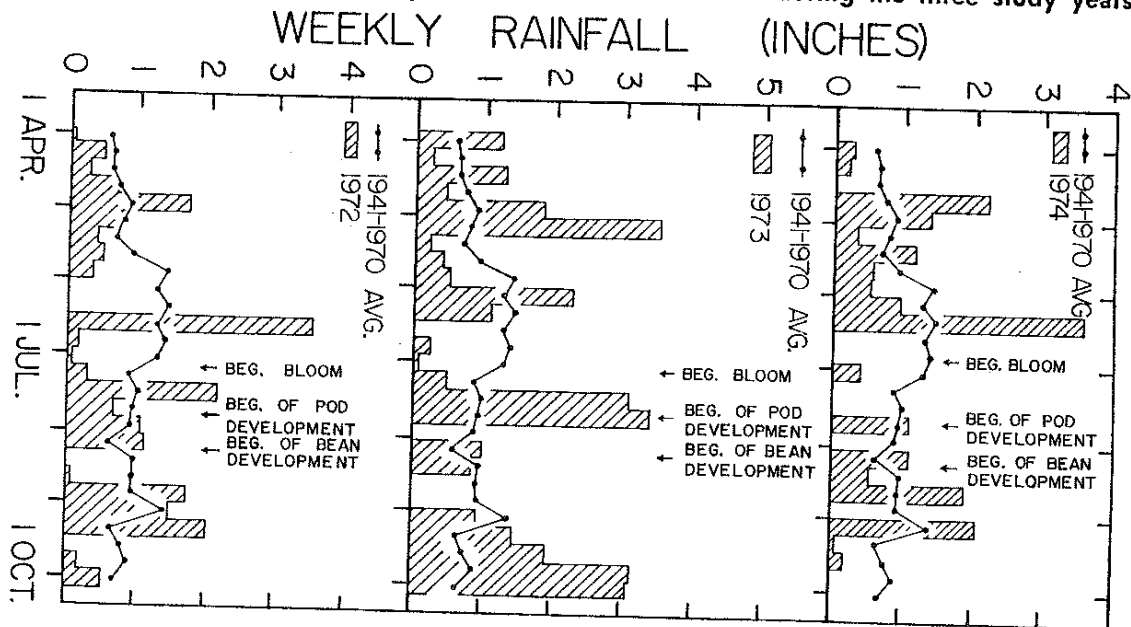


Table 3.—Soybean yield and lodging as influenced by irrigation in 1973.

Treatment				
Growth stage at first irrigation	Soil-moisture depletion (%)	Irrigation* (inches)	Lodging**	Yield (bu/acre)
Vegetative	40	16.0	3.2	49.0
	55	9.8	3.0	49.2
	65	5.2	1.8	49.2
Flowering	40	13.3	3.0	49.6
	55	10.4	3.1	50.2
	65	5.2	2.4	52.0
Podding	40	7.7	1.8	48.8
	55	5.2	1.9	50.7
	65	5.2	1.8	52.0
No irrigation		0.0	1.4	40.6
LSD				
0.05			0.7	4.3

* Water applied each time soil moisture was depleted to indicated percentage after first irrigation.

** Lodging score from 1 to 5; 1 = all plants standing erectly, 5 = no plants standing erectly.

Table 4.—Soybean yield and lodging as influenced by irrigation in 1974.

Time of irrigation	Irrigation (inches)	Lodging*	Yield (bu/acre)
Beginning bloom	4.0	1.4	38.0
Beginning pod development	4.0	1.2	38.7
Beginning bean development	4.0	1.2	42.9
Beginning bloom, beginning pod development, and beginning bean development	12.0	2.2	39.5
No irrigation	0.0	1.0	35.6
LSD			
0.05		0.5	4.5

* Lodging score from 1 to 5; 1 = all plants standing erectly, 5 = no plants standing erectly.

Information in this report is for farmers, producers, colleagues, industry cooperators, and other interested persons. It is intended to help in irrigation management, not to be an irrigation guide. It is not a recommendation but represents three years' research at one location.

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