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39

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Limited Irrigation of Grain Sorghum

Frank Ohmes, research engineer (irrigation)
Paul Penas, research agronomist (irrigation)
Garden City Branch Experiment Station

There are many reasons for an irrigator to supply only a limited amount of water to a crop. He may have too many acres to fully irrigate all of them with his water supply and equipment. His water supply may be so limited that limited irrigation is the only alternative. Perhaps he feels his pumping costs are too high to justify applying more than a minimum necessary amount of water to his crops.

During 1973 to 1977, we conducted a study at the Garden City Branch Experiment Station to determine yields that could be expected from limited irrigation of grain sorghum and the effect of plant population on yields (Table 1).

Soil on the test site is a silted Richfield; a deep, nearly level silty clay loam with high moisture-holding capacity. Plots were irrigated before planting each year except 1977, when spring rains filled the root zone before planting. Sorghum was planted on 30-inch beds during early June each year with flex planters. Planters were adjusted to obtain plant populations of

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AGRICULTURAL EXPERIMENT STATION
Kansas State University, Manhattan
Floyd W. Smith, Director

25,000, 50,000, 75,000, and 100,000 plants per acre under normal germination and emergence (1974-1977). A single seasonal irrigation was applied when plants were in the late boot stage of growth.

Table 1. Grain yields of sorghum under limited irrigation 1973-1977, Garden City Branch Experiment Station.

Plant population per acre	Yield (bu/acre @ 12.5% moisture) ¹					4 yr avg
	1977	1976	1975	1974	1973	
25,000	83 c	101	80 d	72 c	84
50,000	89 bc	94	89 c	76 bc	87
75,000	94ab	96	91 bc	84ab	91
100,000 every-row irrigation	98a	104	98a	90a	91	98
100,000 alternate-row irrigation	98a	100	98a	91a	88	97

¹ Yields followed by the same letter within a given year are not significantly different.

Results are contrary to the popular recommendation to use a "dryland" seeding rate when limited irrigation is planned. In three of the four years, grain yield increased as plant population increased. The four-year averages clearly show this trend. The 100,000 plants per acre population (normal recommended "full irrigation" population) averaged 13 bushels per acre more than the 25,000 plants per acre population (normal recommended "dryland" population).

This study also compared every-furrow irrigation with alternate-furrow irrigation under limited irrigation. Irrigating every furrow during the single seasonal irrigation gave a 5-year average of only 1-bushel per acre more than from alternate-furrow irrigation. Alternate-furrow irrigation under limited irrigation can provide further water saving with little loss in yield.

Results of another study during 1976 and 1977 involving planting rates of 5 to 10 pounds seed per acre showed no advantage for the higher seeding rate under limited irrigation. Both seeding rates averaged 122 bushels per acre, substantially higher than expected. We will continue to study limited irrigation of grain sorghum.

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