Irrigation Water Management Research

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A two-year study of irrigation water management practices for potatoes, dry edible beans, and carrots was started in 1999. Field work was conducted using a new, high-capacity center pivot irrigation system capable of spatially-varied water applications. The objectives of the project were to: 1) develop fertility practices for appropriately-irrigated vegetable crops, 2) develop new cultivars of dry edible beans that optimize production under irrigation, and 3) develop evapotranspiration (ET) crop curves for representative cultivars of vegetable crops, dry edible beans, and potatoes.

Six main plots were used to apply high and low irrigation regimens for each of three replicates in each crop. The main plots or irrigation zones ranged in size from approximately 40'x80' for beans to 50'x100' for potatoes. Rain and irrigation amounts and soil moisture contents were measured in each zone to estimate crop water use. Irrigations for each zone were scheduled and applied independently from the schedules for the other zones.

Smaller plots, typically 10'x20' for beans and 12'x25' for potatoes, were used within each main plot to test fertility management practices and crop varieties. For the potatoes, the fertility treatments consisted of 14 combinations of nitrogen fertilizer amounts, nitrogen timing methods, and phosphorus fertility amounts. For the carrots, small-plot treatments consisted of combinations of four nitrogen amounts, two nitrogen timing methods, two potassium fertilizer levels, and two varieties. For the dry edible beans, two bean types and four nitrogen fertility levels were compared. Results are summarized in Table 1. For more information, see the website at http://www.ageng.ndsu.nodak.edu/crec/iwm_crec.htm.

Table 1. Average yields and irrigation amounts for potatoes, dry-edible beans, and carrots

	1999						2000					
	High Irrigation			Low Irrigation			High Irrigation			Low Irrigation		
Crop	Irrigation inches	Yield Total	Yield US#1	Irrigation inches	Yield Total	Yield US#1	Irrigation inches	Yield Total	Yield US#1	Irrigation inches	Yield Total	Yield US#1
Potato[1]												
Russet Burbank	5.8	378	292	1.5	393	305	6.1	324	274	3.1	310	285
Dry Bean[2]												
Norstar	0	2280		0	2280		4.9	2920		1	3180	
Othello	0	2340		0	2340		4.9	2390		1	2820	
Carrot[3]												
Prime Cut	5.3	34.2	20.2	3.5	33.5	22.7	-	-	-	-	-	-
Apache	5.3	32.6	22.7	3.5	33	23.6	8.9	22.2	15.3	2.3	21.1	15.7
Navajo	-	-	-	-	-	-	8.9	24.6	18.4	2.3	23.5	17.7

[1] Potato yields are in cwt/acre.

[2] Dry bean yields are in lbs/acre.

[3] Carrot yields are in tons/acre.