Corn N Rate Studies in Producer Fields

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The effect of fertilizer nitrogen-rate on yield and plant-soil nitrogen relationships was studied in six irrigated corn fields (fields *p*-*v*), on two farms at Oakes, North Dakota, in 2008. The goal was to compare the results of the field N rate to a strip within each field where 40 lbs./acre extra N was applied. Some additional N rates higher than the field rate were also tested. Therefore, N rates above the field rate ranged from 30 to 105 lbs. N/ac. These strips and the field rate were then compared by yield, soil nitrate-N, chlorophyll meter readings at silking, end of season stalk nitrate-N test, grain protein, starch and oil content as well as test weight. The nitrate-N content in mature corn stalks was determined on 8-inch stalk sections taken at 6 inches above the soil surface. Stalk test criteria states that N is deficient at nitrate-N contents of 0-250 ppm, marginal at 250-700 ppm, adequate at 700-2,000 ppm and excessive when over 2,000 ppm. The return to fertilizer N applied above the lowest N rate for each field was also calculated for a corn price of $3.50/bu and a fertilizer N price of $0.55/lb of actual N.

Table 1. Irrigated Corn Nitrogen Rate Studies in Producers Fields at Oakes, ND, in 2008

	Fertilizer	Spring-07 Soil	Fall-08 Soil	Combine	Chlorophyll readings		Stalk	Grain			Test Weight	Return to N Above	Crop
Field	N Rate	Nitrate-N	Nitrate-N	Yield	Near Silking	Mid-Aug	Nitrate-N	Oil	Protein	Starch	lb/bu	Low N Rate[1]	2007
	lb/ac	lb/ac	lb/ac	bu/ac			ppm	%	%	%	lb/bu		
p	170	--	12	203	50.2	58.3	146	3.3	8.1	73.4	57.5		corn
p	210	--	32	210	50.7	56.7	1968	3.0	8.5	73.7	57.5	2.50	corn
q	130	--	32	--	53.0	59.8	634	--	--	--	--		potato
q	170	--	36	--	55.8	58.3	608	--	--	--	--	--	potato
r	130	--	32	236	52.3	58.0	477	2.8	7.1	73.9	57.3		B. Turtle
r	170	--	32	231	52.4	57.9	1544	2.4	7.3	74.5	57.4	-39.50	B. Turtle
s	170	--	--	211	--	--	--	--	--	--	--		potato
s	200	--	--	207	--	--	--	--	--	--	--	-30.50	potato
t	170	--	36	203	59.5	59.3	468	1.9	7.8	75.2	58.2		corn
t	210	--	28	204	57.6	59.2	556	2.2	8.0	74.7	58.6	-18.50	corn
u	184	37	76	199	49.1	54.5	6176	3.3	7.9	72.4	58.8		potato
u	250	37	84	199	50.1	57.5	8424	2.8	7.6	73.7	58.6	-36.43	potato
u	250	37	112	204	49.5	55.7	8030	3.0	7.6	73.1	57.6	-18.93	potato
u	289	37	176	206	50.4	55.6	8921	2.8	7.6	73.6	58.4	-33.18	potato
v	181	54	36	213	49.1	54.5	1061	2.6	7.1	74.1	58.6		corn
v	209	54	52	209	50.0	54.0	6902	2.7	7.6	73.5	57.7	-29.18	corn
v	209	54	64	215	51.5	54.9	5955	2.7	7.5	73.6	58.7	-8.18	corn
v	250	54	64	215	51.0	54.5	5419	2.9	7.5	73.2	59.3	-30.95	corn

[1]Return to fertilizer N above the low rate in each field was calculated using $3.50 per bushel corn and $0.55 per lb of actual N.