Impact of Plant Establishment on Corn Production in Eddy, Foster and Wells Counties, 2013-15

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North Dakota State University conducted a statewide study in 2013-14, and continued in 2015 in a three-county area, to evaluate the impact of corn plant establishment on grain yield and quality. The study's main objective was to measure the yield response of late-emerging plants, plant doubles and plant skips compared to normally emerged and evenly spaced plants. This report summarizes highlights of the study conducted in Eddy, Foster and Wells counties using data from 10 commercial fields.

Three plots (replications) were located within each field and consisted of 12 or 16 rows with a length of 30 feet. Plant populations were measured at emergence and about 7 and/or 14 days after the initial emergence date. Plants emerging after general field emergence time were identified, as well as plant skips (plants with distance greater than 12 inches of one another within row) and plant doubles (plants within 2 inches of one another). In addition, corn rows were identified that had the most and second-most, and least and second-least plant variability based on number of established plants, doubles and skips. In the 2015 Foster and Wells County fields, UAN at 50 lb N/acre was post-emergence applied using stream nozzles treating two rows/plot of V6-7 stage corn. Overhead irrigation or rain occurred 1-2 days following N application moving N into the soil for plant use. At maturity, corn ears were hand harvested and grain mechanically threshed to determine seed yield, moisture and test weight.

Table 1 summarizes early season data during 2013-15 among the 10 corn fields. Planting dates ranged from April 30 to June 2. Planting rate ranged from 29,000 to 36,000 seeds/ac with a study average of 32,000 seeds/ac. Plant population about a month after planting ranged from 26,100 to 33,700 plants/ac with an average of 29,100 plants/ac. Early-season plant stand ranged from 4 to 25 percent below the targeted population and averaged 10 percent below the targeted population.

Table 1. Corn establishment study: Early season data, 2013-15.

	Planting		Established Stand	
County	Date	Rate (Seeds/ac)	Plants/ac	Change from planting rate (%)
2013				
Eddy	14-May	30,000	28,800 (14-Jun)	-4
Foster - 1	17-May	30,000	28,500 (17-Jun)	-5
Foster - 2[a]	24-May	35,000	33,700 (24-Jun)	-4
Wells	2-Jun	36,000	32,600 (3-Jul)	-10
2014				
Eddy	20-May	30,000	26,700 (13-Jun)	-11
Foster[a]	16-May	35,000	26,100 (12-Jun)	-25
Wells	15-May	31,000	27,300 (11-Jun)	-12
2015				
Eddy	2-May	31,000	26,700 (11-Jun)	-14
Foster[a]	30-Apr	35,000	33,100 (10-Jun)	-5
Wells	4-May	29,000	25,000 (Jun 15)	-14
Average		32,000	28,900	-10

[a]Irrigated field.

Table 2 summarizes harvest data during 2013-15 among the 10 corn fields. Each field contained plants that emerged at least one week after general plant emergence. Ear weight of these late-emerging plants was 7 to 100 percent less and averaged 49 percent less compared to ear weight of timely emerged plants. Ear weight from plant skips ranged from 13 percent greater to 11 percent less, and averaged 1 percent less than uniformly spaced plants. Plant doubles had ear weight 3 to 56 percent less and averaged 19 percent less than ear weight of uniformly spaced plants.

Tim Becker and Joel Lemer, Extension agents, taking notes during early June in an Eddy County corn field.

Table 2. Corn establishment study: Harvest data, 2013-15.

County	Weight of ear compared to normal ear (%)		
	Late emerged plants[a]	Skip (>12" between plants)	Double (<2" between plants)
	2013		
Eddy	-100	7	-56
Foster 1	-60	-11	-3
Foster 2[b]	-37	13	-3
Wells	-21	-5	-26
	2014		
Eddy	-67	6	-11
Foster[b]	-26	4	-12
Wells	-7	-10	-21
	2015		
Eddy	-42	-11	-13
Foster[b]	-57	2	-17
Wells	-70	-6	-30
Average	-49	-1	-19

[a]Days after normal plant emergence date: 2013 = ≤7 to 22; 2014 = ≤14 to 16; 2015 = ≤9 to 10.

[b]Irrigated field.

Across the three 2015 fields, plant skips, doubles and late emergence averaged 8, 4 and 2 percent, respectively, of total plants. Yield loss in 2015 from plant skips, doubles and late emergence averaged 5, 20 and 56 percent, respectively (Table 2). As an example, using 150 bu/ac corn field yield, $3/bu market price and the above numbers from the study, loss from the three plant factors would total 3.5 bu/ac and $10.50 acre.

Table 3. Corn establishment study: Harvest data, 2015.

Row factor	Ear number	Grain Yield (bu/acre)		
	Eddy County		Average	
Least variable	48	155.9		
Most variable	40	132.8		
	Foster County (irrigated)			
Least variable	59	207.5		
Most variable	56	203.6		
POST N	59	193.9		
	Wells County		2-county*	3-county
Least variable	49	141.8	174.9	168.6
Most variable	38	130.0	167.2	156.7
Post N	42	121.4	157.9	x

*Post N applied in Foster and Wells County fields.