Atlantic Grains Council (AGC) and Perennia

2016 & 2017 AGC-NS Corn Plant Population & Nitrogen Fertilizer Rate Trial

Summary: Field scale trials comparing two corn plant populations (an average of 33,000 versus 37,000 plants/acre over all sites) with a combination of 120 lbs/acre or 150 lbs/acre of total nitrogen fertilizer (133 or 167 kg/ha N) were conducted on seven farms in western Nova Scotia. These sites did not have manure or a legume crop in the previous 12 months. Data was collected and analyzed for grain corn yield, grain protein, test weight, and harvest moisture. The same custom applicator & Kuhn broadcast spreader with Quanton E2 technology was used to apply the nitrogen fertilizer treatments at all seven sites. Nitrogen fertilizer split amounts, soil pH and plant population counts at each site are listed in Table 1. Grain corn harvest took place in November with the entire treatment plot harvested. All sites had 2 reps and the harvested area ranged from 0.5-1.0 acre treatment plots.

The results from the combined four site-2017 data analysis (Table 2) show there was no significant differences in grain yield between the lower and higher corn plant populations or two different nitrogen rate combinations. Grain yields, test weights and % moisture at harvest were all very good in terms of Nova Scotia corn performance. The 2016 combined results (Table 3) also showed no significant differences in yields for the 3 trial fields. An 'economic assessment' was done with the yield data from both 2016 & 2017 results. This assessment used the cost of the nitrogen fertilizer ($0.65/lb N calculated from 34-0-0 @ $486/tonne) and seed cost for the two plant populations ($0.0035/plant calculated from $252 per bag of seed that produces 72,000 plants). The N fertilizer & plant (seed) costs for each of the treatment combinations were subtracted from the gross $ return per acre which was calculated from the yield for that treatment x $250/tonne corn value. In looking at the 'return on nitrogen & seed costs' in both Tables 2 & 3 you can see there was a very slight $ advantage to using the higher population in 2017, but in 2016 the lower plant population had the slight $ advantage. This 'economic assessment' for either year did not show a statistical difference.

In Table 4 the grain yields at each of the four-2017 test sites are shown. Again there were no significant differences. It is interesting to note the varied yield 'trends' for all four trial fields. At Baker's in 2017 there seems to be a higher yield 'trend' from having 32,900 versus 29,625 plants per acre from the P7211HR hybrid (2050 heat unit rating) that was used. For Kinsman's-North field in 2017 (with P7958AM hybrid -2300 heat unit rating) there seem to be a positive yield 'trend' to using the higher 150 lb/acre nitrogen at both the 34,000 and 39,500 plants/acre populations that were in this field. For the Langelaan field trial in 2017 (with DKC 33-78RIB hybrid-2475 heat unit rating) there were identical high yields regardless whether the treatment was 120 or 150 lbs/ac of total nitrogen in combination with 34,000 or 37,500 plants per acre.

In conclusion, from this two year-7 field site trial, I don't think there is consistent evidence to show that you'll benefit from a final plant population of more than 33,000 plants per acre. Total nitrogen rates of 120 lbs/acre seem adequate for high grain corn yields providing you keep soil pH in the 6.2-6.6 range and the soil has some ability to provide a bit of nitrogen from

decomposition of the organic matter. Not all soils have the ability to release 10-25 lbs organic N/acre during the growing season though. I think that these 2017 Kinsman-North & South fields with only 1.8% & 2.8% organic matter, clay loam topsoil and imperfect drainage have very little organic N release, thus likely needing higher nitrogen fertilizer rates of 150 lbs/acre N to produce yields of 4-5 tonne per acre.

My only regret in this two year trial is that our final plant populations weren't closer to the intended 30,000 versus 34,000 plants per acre.

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Table 1: Nitrogen Fertilizer Rates & Plant Populations used in 2016 AGC-NS Corn Trials

Grower	Soil pH	Pre-Plant (kg N/ha)	Planter (kg N/ha)	Topdress* (kg N/ha)	Total N Applied (kg N/ha)	Plant Population Counts/ acre
Baker 2016	6.4	26	27	80 or 114	133 or 167	31,750 & 35,850
Kinsman 2016	6.6	0	46	87 or 121	133 or 167	35,000 & 39,750
Langelaan 2016	6.2	0	42	91 or 125	133 or 167	33,075 & 38,200
Baker 2017	6.0	38	40	55 or 89	133 or 167	29,625 & 32,900
Kinsman S- 2017	6.8	0	51	82 or 116	133 or 167	33,200 & 39,025
Kinsman N- 2017	7.2	0	51	82 or 116	133 or 167	33,825 & 39,575
Langelaan 2017	6.1	0	42	91 or 125	133 or 167	33,750 & 37,450
					Average>	**32,900 & 37,536**

Table 2: 2017 Combined Data for the three AGC-NS Corn Plant Population & Nitrogen Fertilizer Rate Trials (at Baker, Kinsman & Langelaan field sites)

Treatment	Grain Protein %	Test Weight kg/HL	Moisture %	Yield at 15% moisture (kg/ha)	Return on Nitrogen & Seed Costs ($/acre)
33,000 plants /acre & 120 lbs/ac Nitrogen (133 kg/ha N)	7.6 ab	69.8 ab (56.0 lbs/bu)	19.8 a	**9939 a (3.98 mt/ac)**	**$802**
33,000 plants /acre & 150 lbs/ac Nitrogen (167 kg/ha N)	7.7 a	70.2 a (56.3 lbs/bu)	19.8 a	**10,310 a (4.12 mt/ac)**	**$817**
37,000 plants /acre & 120 lbs/ac Nitrogen (133 kg/ha N)	7.4 b	69.6 ab (55.8 lbs/bu)	19.8 a	**10,494 a (4.20 mt/ac)**	**$843**
37,000 plants /acre & 150 lbs/ac Nitrogen	7.6 ab	69.6 ab (55.8 lbs/bu)	19.7 a	**10,629 a (4.25 mt/ac)**	**$836**

(167 kg/ha N)					

*Means followed by the same letter are not significantly different at $\alpha = 0.05$ The $$ analysis used a corn value of $250/tonne and the only costs we subtracted off was for nitrogen at $0.65/lb N & 'seed' cost of $0.0035/plant.

Table 3: 2016 Combined Data for the three AGC-NS Corn Plant Population & Nitrogen Fertilizer Rate Trials (at Baker, Kinsman & Langelaan field sites)

Treatment	Grain Protein %	Test Weight kg/HL	Moisture %	Yield at 15% moisture (kg/ha)	Return on Nitrogen & Seed Costs ($/acre)
33,000 plants /acre & 120 lbs/ac Nitrogen	8.08 a	73.1 a (58.7 lbs/bu)	21.7 a	**9551 a (3.82 mt/ac)**	**$762**
33,000 plants /acre & 150 lbs/ac Nitrogen	8.50 a	73.1 a (58.7 lbs/bu)	22.4 a	**9649 a (3.86 mt/ac)**	**$752**
38,000 plants /acre & 120 lbs/ac Nitrogen	8.09 a	73.1 a (58.7 lbs/bu)	22.0 a	**9475 a (3.79 mt/ac)**	**$737**
38,000 plants /acre & 150 lbs/ac Nitrogen	8.28 a	72.3 a (58.0 lbs/bu)	22.0 a	**9636 a (3.85 mt/ac)**	**$732**

Table 4: 2017 Corn Plant Populations & Nitrogen Rate Trial Results (at each site)

Treatment	Baker's Yield kg/ha @15%	Kinsman-N Yield kg/ha @15%	Langelaan Yield kg/ha	Kinsman-S Yield kg/ha @15%
lower # plants /acre & 120 lbs/ac Nitrogen (133 kg N/ha)	8356 a (3.34 mt/ac)	9067 a (3.63 mt/ac)	11,005 a (4.40 mt/ac)	11,327 a (4.53 mt/ac)
lower # plants /acre & 150 lbs/ac Nitrogen (167 kg N/ha)	8030 a (3.21 mt/ac)	9647 a (3.86 mt/ac)	10,971 a (4.39 mt/ac)	12,596 a (5.04 mt/ac)
higher# plants /acre & 120 lbs/ac Nitrogen (133 kg N/ha)	8982 a (3.59 mt/ac)	9354 a (3.74 mt/ac)	11,010 a (4.40 mt/ac)	12,630 a (5.05 mt/ac)
higher# plants /acre & 150 lbs/ac Nitrogen (167 kg N/ha)	9059 a (3.62 mt/ac)	9858 a (3.94 mt/ac)	11,068 a (4.43 mt/ac)	12,529 a (5.01 mt/ac)

***For corn plant populations at each trial site in 2017 refer to Table 1**.
Means followed by the same letter are not significantly different at $\alpha = 0.05$