Purdue Agronomy
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Global Maize and Soy Study

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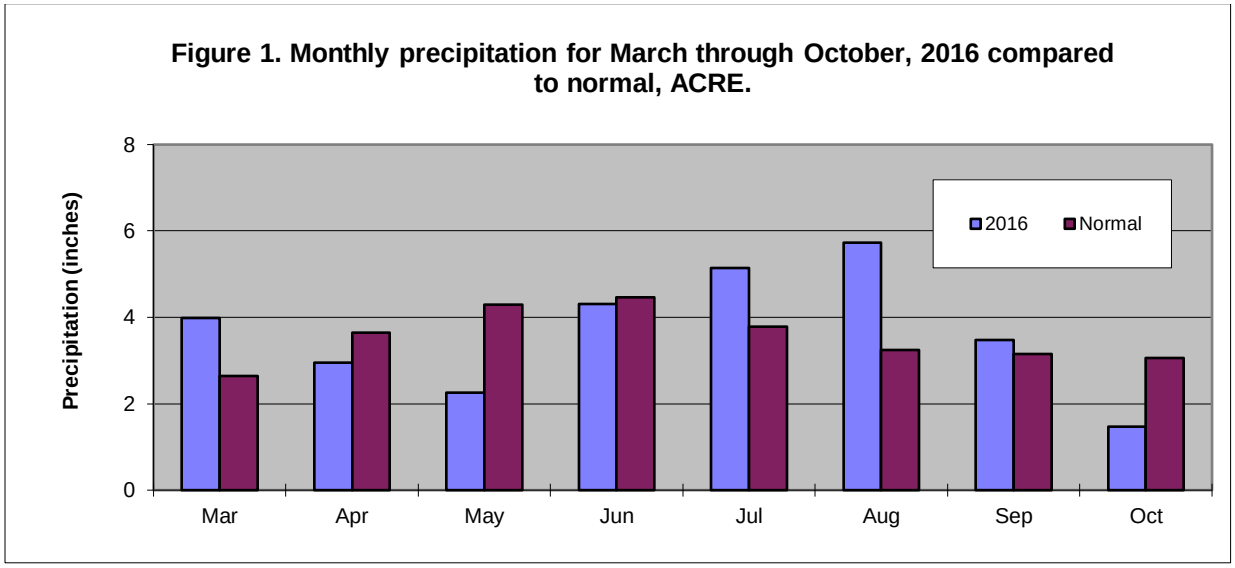
Global Maize and Soy Study, ACRE, 2016



Corn in 2016

Cultural Practices, 2016		
Field Operation	Date	Application Details
Tillage		No-till
Plot size		12-30”rows, 75-feet long
Replications		6
Trial plan		Included at end of this report
Planted	4/18	Planted with Vyn’s John Deere 1780 6-row planter
Hybrid		Pioneer P1417AMX
Starter Fertilizer w/planter		10-34-0 placed 2” x 2” from row @ 15 gallons/acre 10-34-0 in furrow @ 4 gallons/acre
Seeding rate		30,000 and 37,500 seeds/acre
Insecticide w/planter		None
Weed Control	4/19	<u>Pre-emergence:</u> Roundup PowerMax @ 22 oz/ac Class Act 1 gal/100 gallons water Interlock 1-4 oz/100 gallons water Bicep II Magnum 5 pt/ac
	5/18	Post-emergence: Callisto @ 3 oz/ac Class Act 1 gal/100 gallons water Interlock 1-4 oz/100 gallons water
Nitrogen	5/18	First application as per treatment
	6/09	Second application as per treatment.
Fertilizer	6/16	Broadcast Applied 150 pounds/acre of Assure fertilizer (0-0-60) on treatments 4, 5 and 6
Harvest	9/15	Harvest with Kincaid combine.
Harvest area		Four 30-inch rows, 75-feet
Fall Tillage	10/15	Strip-tilled for 2017 30-inch row soybeans. Used Remlinger strip-till machine set at 8-inches deep.

Table 2. Corn plant response to treatments, 2016.†

Treatment	Plant Population May 16	Plant Height June 1	Plant Height July 21	Days to 50% Silking	Grain Moisture	Grain Yield @ 15%
	ppa	in	in	days	%M	bu/a
FP Control N, 30000 ppa	32292c	21.2b	85.2b	85.0b	24.6c	103.3c
FP Intermediate N, 30000 ppa	32705c	21.3b	95.4a	83.0c	23.5d	198.5b
FP Normal N, 30000 pa	32375c	21.1b	94.5a	82.8c	24.5c	231.4a
EI Control N, 37500 ppa	39500ab	22.2ab	87.2b	88.2a	25.3b	88.6d
EI Intermediate N, 37500 ppa	38833b	23.3a	98.0a	83.2c	25.4b	230.3a
EI Normal N, 37500 ppa	40208a	23.3a	94.8a	83.0c	26.0a	238.8a
LSD @ 5%	1268	1.66	4.7	1.4	0.6	9.7

† Average of 6 replications

Table 3. Corn leaf SPAD and stalk diameter response to treatments, 2016.†

Treatment	Spad June 20	Spad July 1	Spad July 7	Spad July 12	Spad Aug 3	Stalk July 12	Stalk Aug 5
						mm	mm
FP Control N, 30000 ppa	49.6b	40.3b	43.9c	42.7c	35.5c	20.0b	24.9a
FP Intermediate N, 30000 ppa	55.6a	49.8a	58.6a	58.3a	56.8b	25.1a	28.5a
FP Normal N, 30000 pa	55.9a	51.5a	58.4a	57.3ab	60.3a	25.5a	28.8a
EI Control N, 37500 ppa	42.7c	35.1c	38.8d	38.3d	61.1d	21.1ab	19.1b
EI Intermediate N, 37500 ppa	54.1a	49.0a	56.4ab	55.0b	58.2ab	23.9ab	27.0a
EI Normal N, 37500 ppa	55.3a	48.3a	55.8b	57.5ab	59.1ab	23.6ab	27.3a
LSD @ 5%	2.4	2.4	2.3	3.2	2.4	4.4	3.9

† Average of 6 replications.

Table 4. Corn plant biomass and N responses to treatments at R6, sample size of 10 plants per plot, 2016.†

Treatment	Shoot DM	Shoot N	Cob DM	Cob N	Grain DM	Grain N	Total N Uptake	Total DM
	kg/h	%	kg/h	%	kg/h	%	kg/h	kg/h
FP Control N, 30000 ppa	7072b	0.40c	705c	0.67	6622b	0.80d	81.9d	14399b
FP Intermediate N, 30000 ppa	9279a	0.51b	1166ab	0.69	12259a	0.97c	155.2c	22704a
FP Normal N, 30000 pa	9527a	0.64a	1349a	0.64	14533a	1.09b	203.6b	25409a
EI Control N, 37500 ppa	6557b	0.40c	599c	0.73	6016b	0.84d	84.7d	13173b
EI Intermediate N, 37500 ppa	9493a	0.69a	1216ab	0.75	12761a	1.16a	226.7ab	23470a
EI Normal N, 37500 ppa	8787a	0.72a	1144b	0.75	12797a	1.18a	244.0a	22728a
LSD @ 5%	1269	0.09	192	1 rep	2452	0.05	27.7	3603

† Average of 6 replications

Table 5. Corn plant grain component response to treatments at R6, sample size of 10 plants, 2016.†

Treatment	Kernel Wt (200 kernels)	Kernels per plant	Harvest Index
	g	#	
FP Control N, 30000 ppa	41.8c	374d	0.46b
FP Intermediate N, 30000 ppa	53.5b	534ab	0.54a
FP Normal N, 30000 pa	59.6a	570a	0.57a
EI Control N, 37500 ppa	44.9c	244e	0.43b
EI Intermediate N, 37500 ppa	58.1a	466c	0.51a
EI Normal N, 37500 ppa	57.3ab	506bc	0.56a
LSD @ 5%	4.4	62	0.05

† Average of 6 replications

Table 6. Soil analysis, 2016.†

Treatment	pH	OM	P	K	Mg	Ca	CEC	Nitrate	Ammonium
	(1:1)	%	ppm	ppm	ppm	ppm		ppm	ppm
	0-8”							0-12”	
FP Control N, 30000 ppa	6.0ab	4.6	26.7	161	668ab	2544ab	22.8ab		
FP Intermediate N, 30000 ppa	6.1a	4.4	23.4	159	692a	2568ab	22.9ab		
FP Normal N, 30000 pa	5.8b	4.5	28.2	158	619b	2393b	22.1b		
EI Control N, 37500 ppa	6.1ab	4.5	25.8	170	690a	2630ab	23.5ab		
EI Intermediate N, 37500 ppa	6.1a	4.5	24.9	168	702a	2698a	23.9a		
EI Normal N, 37500 ppa	6.0ab	4.6	28.3	174	693a	2703a	24.3a		
LSD @ 5%	0.2	0.3	9.6	24	69	243	1.7		
	0-2”							12-24”	
FP Control N, 30000 ppa	6.0a	5.0	35.8	234	620ab	2346ab	21.3ab		
FP Intermediate N, 30000 ppa	6.1a	4.9	32.5	227	655a	2375ab	21.6ab		
FP Normal N, 30000 pa	5.8b	4.8	37.5	228	582b	2209b	20.7b		
EI Control N, 37500 ppa	6.1a	4.9	35.3	248	648ab	2404ab	21.7ab		
EI Intermediate N, 37500 ppa	6.1a	4.8	32.7	243	674a	2542a	23.0a		
EI Normal N, 37500 ppa	5.9ab	4.9	38.7	257	635ab	2447ab	22.6ab		
LSD @ 5%	0.2	0.4	13.7	43	72	240	1.9		
	2-4”								
FP Control N, 30000 ppa	6.0ab	4.5	26.2	140	667ab	2493ab	22.5		
FP Intermediate N, 30000 ppa	6.0ab	4.4	21.7	143	703a	2616ab	23.8		
FP Normal N, 30000 pa	5.8b	4.4	27.5	132	621b	2419b	22.4		
EI Control N, 37500 ppa	6.0ab	4.5	24.8	150	693ab	2627ab	23.7		
EI Intermediate N, 37500 ppa	6.1a	4.5	24.8	150	703a	2687a	23.9		
EI Normal N, 37500 ppa	5.9ab	4.6	27.3	154	689ab	2632ab	24.1		
LSD @ 5%	0.3	0.3	10.2	24	80	259	1.9		
	4-8”								
FP Control N, 30000 ppa	6.0	4.2	18.2	110	718ab	2793abc	24.7abc		
FP Intermediate N, 30000 ppa	6.2	4.0	16.2	108	719ab	2713bc	23.5bc		
FP Normal N, 30000 pa	5.9	4.3	19.7	113	653b	2552c	23.1c		
EI Control N, 37500 ppa	6.1	4.1	17.3	111	729a	2858ab	25.1ab		
EI Intermediate N, 37500 ppa	6.1	4.2	17.2	112	730a	2863ab	24.9abc		
EI Normal N, 37500 ppa	6.1	4.3	18.8	114	755a	3030a	26.2a		
LSD @ 5%	0.3	0.3	6.3	18	74	286	2.0		

† Average of 6 replications

Table 7. Corn leaf nutrient concentration response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	1.54b	0.23c	1.49d	0.42b	0.41	0.12b	21.3c	32.2cd	86bc	6.17bc	5.83b	27.7
FP Intermediate N, 30000 ppa	2.45a	0.30ab	1.62bcd	0.48a	0.44	0.17a	29.2a	44.0ab	106a	9.50a	9.33a	27.3
FP Normal N, 30000 pa	2.63a	0.31a	1.67abc	0.43ab	0.39	0.17a	27.5ab	52.8a	100ab	8.00ab	9.17a	28.3
EI Control N, 37500 ppa	1.33b	0.20c	1.53cd	0.45ab	0.42	0.11b	18.5c	29.8d	78c	4.17c	5.33b	22.7
EI Intermediate N, 37500 ppa	2.27a	0.27b	1.76ab	0.45ab	0.43	0.15a	25.2b	32.3bcd	106a	7.33ab	8.83a	16.0
EI Normal N, 37500 ppa	2.57a	0.30ab	1.81a	0.46ab	0.40	0.17a	26.8a	43.8abc	104ab	8.83a	8.67a	31.0
LSD @ 5%	0.4	0.03	0.15	0.04	.06	0.02	2.9	11.8	20	2.32	1.85	15.5

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 8. Corn whole ear nutrient concentration response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	2.86c	0.57bc	2.13b	0.08b	0.31bc	0.23b	48.2bc	28.5b	48.8b	5.17bc	3.50	9.8
FP Intermediate N, 30000 ppa	2.98bc	0.57bc	2.17b	0.10ab	0.31bc	0.24ab	47.7c	30.5ab	65.2ab	6.17ab	4.50	14.5
FP Normal N, 30000 pa	3.14ab	0.59abc	2.22b	0.10a	0.32ab	0.24ab	50.0bc	36.5a	70.2a	6.67a	4.33	14.2
EI Control N, 37500 ppa	3.11ab	0.62a	2.42a	0.08b	0.34a	0.24ab	56.2a	28.3b	57.3ab	4.50c	3.83	18.7
EI Intermediate N, 37500 ppa	3.21a	0.60ab	2.41a	0.10a	0.33ab	0.25a	52.2ab	30.2ab	68.0ab	7.17a	5.00	12.5
EI Normal N, 37500 ppa	3.01abc	0.56c	2.28ab	0.09ab	0.30c	0.23b	48.2bc	34.7ab	68.7ab	7.00a	4.33	13.8
LSD @ 5%	0.23	0.04	0.17	0.02	0.02	0.02	4.6	6.5	20.3	1.35	1.60	15.6

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 9. Corn stem nutrient concentration response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.43de	0.14b	1.22ab	0.13cd	0.24b	0.05	20.8a	20.8b	18.0b	2.17cd	1.67	5.8b
FP Intermediate N, 30000 ppa	0.59cd	0.14b	1.15b	0.15bc	0.26ab	0.05	18.2ab	22.2b	27.0a	3.00ab	2.17	21.0a
FP Normal N, 30000 pa	0.83a	0.15b	1.32ab	0.17a	0.28a	0.05	19.0ab	30.0a	30.3a	3.67a	1.67	18.5a
EI Control N, 37500 ppa	0.35e	0.17a	1.46a	0.13d	0.24ab	0.05	21.5a	23.0b	19.5b	2.00d	1.83	12.8ab
EI Intermediate N, 37500 ppa	0.64bc	0.13b	1.40a	0.16ab	0.27ab	0.05	16.8b	20.3b	26.0a	2.83bc	2.17	13.5ab
EI Normal N, 37500 ppa	0.78ab	0.14b	1.44a	0.16ab	0.26ab	0.05	17.0b	24.7ab	28.0a	3.33ab	2.00	15.0ab
LSD @ 5%	0.16	0.02	0.24	0.02	0.04	0.007	3.8	6.7	4.6	0.71	0.81	9.9

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 10. Corn leaf nutrient uptake response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	42.8c	6.2b	41.2d	11.7d	11.4c	3.42c	0.06c	0.09c	0.24b	0.02b	0.02b	0.08ab
FP Intermediate N, 30000 ppa	88.3ab	10.8a	58.1bc	17.1ab	15.8ab	6.23ab	0.10ab	0.16ab	0.38a	0.03a	0.03a	0.10ab
FP Normal N, 30000 pa	88.7ab	10.4a	55.8c	14.6bc	13.2bc	5.67b	0.09b	0.18a	0.34a	0.03a	0.03a	0.09ab
EI Control N, 37500 ppa	37.1c	5.6b	42.5d	12.6cd	11.7c	3.02c	0.05c	0.09c	0.22b	0.01b	0.02b	0.06b
EI Intermediate N, 37500 ppa	87.5b	10.5a	66.1ab	16.9ab	16.2a	5.91ab	0.10ab	0.12bc	0.41a	0.03a	0.03a	0.06b
EI Normal N, 37500 ppa	105.8a	12.2a	74.8a	18.8a	16.5a	6.81a	0.11a	0.18a	0.43a	0.04a	0.04a	0.13a
LSD @ 5%	18.3	1.9	9.3	2.7	2.9	1.13	0.02	0.05	0.09	0.009	0.008	0.05

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 11. Corn whole ear nutrient uptake response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	3.08b	0.61b	2.27c	0.09b	0.33b	0.25b	0.0052b	0.0030	0.0055c	0.0005b	0.0004b	0.0010
FP Intermediate N, 30000 ppa	6.50a	1.25a	4.73ab	0.21a	0.68a	0.51a	0.0104a	0.0066	0.0140ab	0.0014a	0.0010a	0.0033
FP Normal N, 30000 pa	5.90a	1.10a	4.16b	0.19a	0.60a	0.45a	0.0093a	0.0069	0.0127ab	0.0012a	0.0008a	0.0028
EI Control N, 37500 ppa	1.45b	0.29c	1.13c	0.04b	0.16c	0.11b	0.0026b	0.0013	0.0027c	0.0002b	0.0002b	0.0009
EI Intermediate N, 37500 ppa	5.64a	1.04a	4.14b	0.18a	0.57a	0.44a	0.0089a	0.0054	0.0112b	0.0013a	0.0009a	0.0029
EI Normal N, 37500 ppa	7.19a	1.33a	5.43a	0.23a	0.70a	0.54a	0.0116a	0.0083	0.0164a	0.0017a	0.0011a	0.0031
LSD @ 5%	1.8	0.32	1.24	0.07	0.17	0.14	0.0027		0.005	0.0005	0.004	0.0031

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 12. Corn stem nutrient uptake response to treatments at R1, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	21.0d	6.96b	59.5c	6.44c	11.34b	2.18b	0.10	0.10c	0.09b	0.01b	0.008b	0.03c
FP Intermediate N, 30000 ppa	36.2c	8.40a	70.2bc	9.25b	16.25a	2.98a	0.11	0.14abc	0.17a	0.02a	0.013a	0.13a
FP Normal N, 30000 pa	47.8ab	8.64a	76.1bc	9.74ab	16.17a	2.99a	0.11	0.18a	0.18a	0.02a	0.010ab	0.10ab
EI Control N, 37500 ppa	17.7d	8.72a	73.8bc	6.50c	12.15b	2.37b	0.11	0.12c	0.10b	0.01b	0.010ab	0.07bc
EI Intermediate N, 37500 ppa	41.7bc	8.40a	86.6ab	9.88ab	16.91a	3.09a	0.10	0.13bc	0.17a	0.02a	0.014a	0.09abc
EI Normal N, 37500 ppa	53.3a	9.39a	98.2a	10.88a	17.29a	3.28a	0.12	0.17ab	0.19a	0.02a	0.014a	0.10ab
LSD @ 5%	11.4	1.39	17.2	1.39	2.78	0.57	0.02	0.04	0.04	0.005	0.005	0.06

† Only 1 replication.
* Indicates a non-significant overall F-test

Table 13. Corn ear leaf nutrient concentration response to treatments at R1 stage, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	1.85b	0.24b	1.60c	0.41bc	0.38ab	0.14b	22.5b	29.3cd	119bc	8.8b	5.8c	39.3
FP Intermediate N, 30000 ppa	2.74a	0.31a	1.73bc	0.46ab	0.42a	0.17a	28.5a	41.8b	141abc	12.3a	6.2bc	34.5
FP Normal N, 30000 pa	2.85a	0.32a	1.80ab	0.49a	0.43a	0.18a	28.2a	56.2a	149ab	12.7a	7.2ab	42.3
EI Control N, 37500 ppa	1.51b	0.22b	1.69bc	0.37c	0.34b	0.12b	20.5b	26.3d	112c	6.7b	5.3c	34.7
EI Intermediate N, 37500 ppa	2.53a	0.31a	1.95a	0.48a	0.43a	0.17a	27.8a	36.7bc	150ab	12.5a	7.5a	38.0
EI Normal N, 37500 ppa	2.80a	0.33a	1.94a	0.49a	0.41a	0.18a	29.3a	44.7b	166a	13.7a	7.7a	41.7
LSD @ 5%	0.40	0.04	0.17	0.07	0.07	0.02	3.4	9.8	36.4	2.4	1.2	17.3

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 14. Corn grain nutrient concentration response to treatments at maturity, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.80d	0.26d	0.49c	0.01	0.11b	0.08b	19.0d	3.33	13.8d	1.83c	1.00	2.8b
FP Intermediate N, 30000 ppa	0.97c	0.30cd	0.50c	0.01	0.12b	0.09b	19.3cd	4.00	18.7bcd	2.50b	1.00	16.7a
FP Normal N, 30000 pa	1.09b	0.33bc	0.53bc	0.01	0.13a	0.09b	21.8ab	4.50	20.2bc	2.67ab	1.00	8.0ab
EI Control N, 37500 ppa	0.84d	0.29cd	0.50c	0.01	0.12b	0.08c	21.2bc	4.33	16.0cd	1.83c	1.00	3.5b
EI Intermediate N, 37500 ppa	1.16a	0.37a	0.55ab	0.01	0.14a	0.10a	23.8a	5.17	27.8a	2.67ab	1.00	6.5b
EI Normal N, 37500 ppa	1.18a	0.36ab	0.57a	0.01	0.14a	0.09b	23.3a	5.17	23.7ab	3.17a	1.00	6.0b
LSD @ 5%	0.05	0.04	0.04		0.01	0.01	2.0	2.23	5.8	0.55		10.1

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 15. Corn shoot (stem plus leaves and husk) nutrient concentration response to treatments at maturity, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.40c	0.12b	0.88b	0.25b	0.28ab	0.06ab	24.83b	34.17bc	148.7a	2.83c	3.17	78.2
FP Intermediate N, 30000 ppa	0.51b	0.08c	0.95b	0.29a	0.28ab	0.07a	22.83bc	35.83bc	92.7bc	5.00b	3.50	44.8
FP Normal N, 30000 pa	0.64a	0.07c	1.17a	0.29a	0.25b	0.06ab	21.50bc	48.17a	73.7c	6.67a	2.83	40.7
EI Control N, 37500 ppa	0.40c	0.17a	1.23a	0.25b	0.30a	0.06b	30.33a	29.17c	119.2ab	2.00c	2.67	72.8
EI Intermediate N, 37500 ppa	0.69a	0.09bc	1.22a	0.29a	0.28ab	0.07a	21.83bc	32.50bc	69.0c	6.33a	3.67	27.3
EI Normal N, 37500 ppa	0.72a	0.08c	1.23a	0.32a	0.27ab	0.07a	20.67c	39.17ab	85.5bc	7.00a	3.50	40.8
LSD @ 5%	0.09	0.03	0.16	0.03	0.05	0.001	3.34	9.17	42.3	0.85	1.37	31.5

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 16. Corn cob nutrient concentration response to treatments at maturity, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.67	0.08	1.38	0.02	0.04	0.07	38.0	11.0	21.0	3.00	1.00	6.0
FP Intermediate N, 30000 ppa	0.69	0.05	1.08	0.02	0.02	0.06	20.0	7.0	18.0	3.00	1.00	5.0
FP Normal N, 30000 pa	0.64	0.04	1.02	0.01	0.01	0.05	17.0	7.0	24.0	4.00	1.00	17.0
EI Control N, 37500 ppa	0.73	0.09	1.24	0.04	0.05	0.07	37.0	11.0	16.0	2.00	1.00	15.0
EI Intermediate N, 37500 ppa	0.75	0.06	1.08	0.02	0.03	0.06	19.0	6.0	18.0	4.00	1.00	47.0
EI Normal N, 37500 ppa	0.75	0.06	1.20	0.02	0.02	0.06	20.0	1.0	38.0	4.00	3.00	8.0
LSD @ 5%												

† Only 1 replication
* Indicates a non-significant overall F-test

Table 17. Corn grain nutrient uptake response to treatments at maturity, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	51.4d	16.9c	31.4c	0.64c	6.73c	5.33c	0.12c	0.02c	0.09d	0.01c	0.006c	0.02b
FP Intermediate N, 30000 ppa	106.9c	32.6b	54.6b	1.10b	12.93b	9.43b	0.21b	0.05bc	0.21c	0.03b	0.011b	0.16a
FP Normal N, 30000 pa	143.6b	43.4a	70.0a	1.32ab	17.45a	11.66a	0.29a	0.06ab	0.27bc	0.04b	0.013ab	0.09ab
EI Control N, 37500 ppa	53.2d	18.6c	32.2c	0.64c	7.27c	4.93c	0.14c	0.03c	0.10d	0.01c	0.006c	0.02b
EI Intermediate N, 37500 ppa	151.9ab	49.2a	73.2a	1.31ab	18.33a	12.46a	0.32a	0.07ab	0.36a	0.04b	0.013ab	0.08ab
EI Normal N, 37500 ppa	167.9a	50.9a	81.6a	1.43a	19.47a	12.64a	0.33a	0.07a	0.34ab	0.05a	0.0143a	0.08ab
LSD @ 5%	22.1	8.45	13.4	0.24	3.02	1.94	0.06	0.03	0.08	0.01	0.002	0.10

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 18. Corn shoot (stem plus leaves and husk) nutrient uptake response to treatments at maturity, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	26.0d	8.29bc	58.4d	16.4c	18.3d	4.06c	0.16b	0.22cd	0.99a	0.02d	0.02b	0.52a
FP Intermediate N, 30000 ppa	41.1c	6.34bc	76.0cd	23.2b	22.4bc	5.27b	0.18ab	0.29bcd	0.76ab	0.04c	0.03ab	0.37ab
FP Normal N, 30000 pa	52.1b	5.84c	97.3ab	23.6b	20.5cd	5.23b	0.18ab	0.40a	0.61b	0.06b	0.02ab	0.33ab
EI Control N, 37500 ppa	26.8d	11.24a	81.3bc	16.4c	20.2cd	3.67c	0.20a	0.20d	0.76ab	0.01d	0.02b	0.45a
EI Intermediate N, 37500 ppa	65.4a	8.82ab	116.0a	27.1a	26.3a	6.62a	0.21a	0.31abc	0.65b	0.06ab	0.04a	0.26b
EI Normal N, 37500 ppa	66.5a	7.39bc	115.9a	29.5a	25.0ab	6.23a	0.19a	0.37ab	0.80ab	0.07a	0.03a	0.38ab
LSD @ 5%	8.2	2.80	19.1	3.5	3.9	0.93	0.03	0.10	0.30	0.01	0.01	0.19

† Average of 6 replications
* Indicates a non-significant overall F-test

Table 19. Corn cob nutrient uptake response to treatments, 2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	4.55c	0.54b	9.38de	0.14c	0.27c	0.48c	0.026a	0.007b	0.014de	0.002c	0.001b	0.004d
FP Intermediate N, 30000 ppa	7.22b	0.52b	11.30cd	0.21b	0.21d	0.63b	0.021b	0.007b	0.019cd	0.003b	0.001b	0.005d
FP Normal N, 30000 pa	7.82b	0.49b	12.46bd	0.12c	0.12e	0.61b	0.021b	0.009a	0.029b	0.005a	0.001b	0.021b
EI Control N, 37500 ppa	4.74c	0.58b	8.06e	0.26a	0.32b	0.45c	0.024ab	0.007b	0.010e	0.001d	0.001b	0.010c
EI Intermediate N, 37500 ppa	9.37a	0.75a	13.50ab	0.25ab	0.37a	0.75a	0.024ab	0.007ab	0.022c	0.005a	0.001b	0.059a
EI Normal N, 37500 ppa	9.60a	0.77a	15.36a	0.26a	0.26cd	0.77a	0.026a	0.001c	0.049a	0.005a	0.004a	0.010c
LSD @ 5%	1.34	0.11	2.1	0.04	0.05	0.11	0.004	0.001	0.006	0.0001	0.001	0.004

† Only 1 replication.
* Indicates a non-significant overall F-test

Table 20. Corn total plant nutrient uptake response to treatments, 2016.†

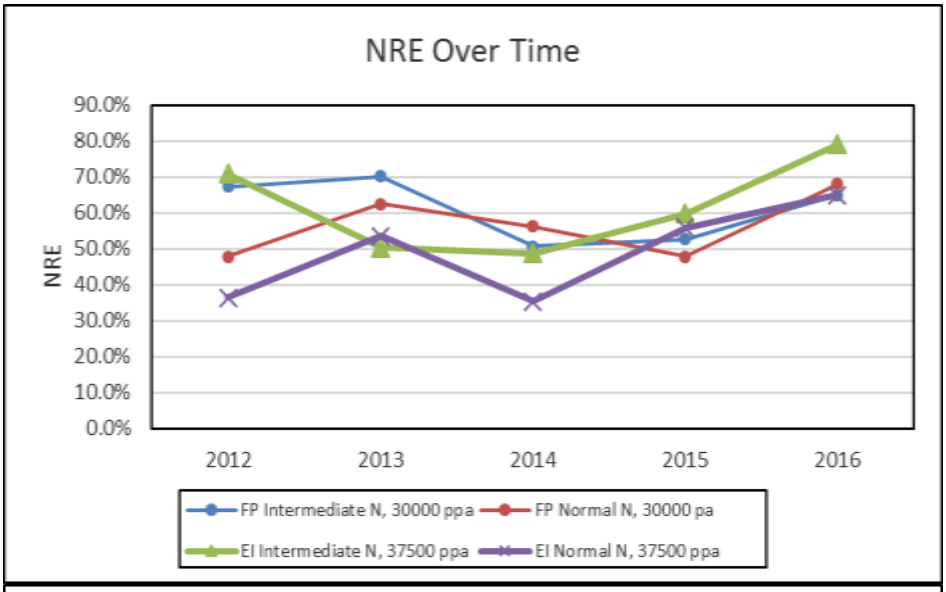
Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	82.0d	25.8c	99.2d	17.1d	25.3c	9.9c	0.310d	0.255c	1.096ab	0.033d	0.028bc	0.538
FP Intermediate N, 30000 ppa	155.2c	39.5b	141.8c	24.5c	35.6b	15.3b	0.420bc	0.342bc	0.984ab	0.072c	0.040ab	0.536
FP Normal N, 30000 pa	203.6b	49.8a	179.7b	25.0bc	38.1b	17.5b	0.487ab	0.472a	0.903ab	0.096b	0.038abc	0.446
EI Control N, 37500 ppa	84.7d	30.4bc	121.5cd	17.3d	27.7c	9.1c	0.360cd	0.234c	0.875b	0.027d	0.024c	0.481
EI Intermediate N, 37500 ppa	226.7ab	58.8a	202.7ab	28.7ab	45.1a	19.8a	0.546a	0.381ab	1.037ab	0.101b	0.049a	0.399
EI Normal N, 37500 ppa	244.0a	59.1a	212.8a	31.2a	44.7a	19.6a	0.554a	0.442ab	1.193a	0.116a	0.052a	0.468
LSD @ 5%	27.7	9.8	30.1	3.7	5.4	2.5	0.079	0.110	0.316	0.015	0.015	0.198

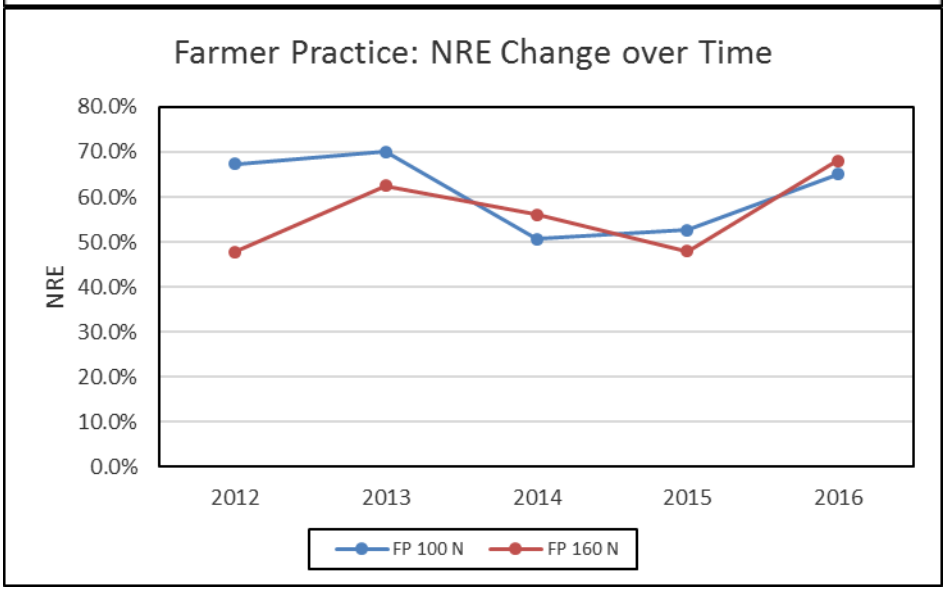
† Average of 6 replications
* Indicates a non-significant overall F-test

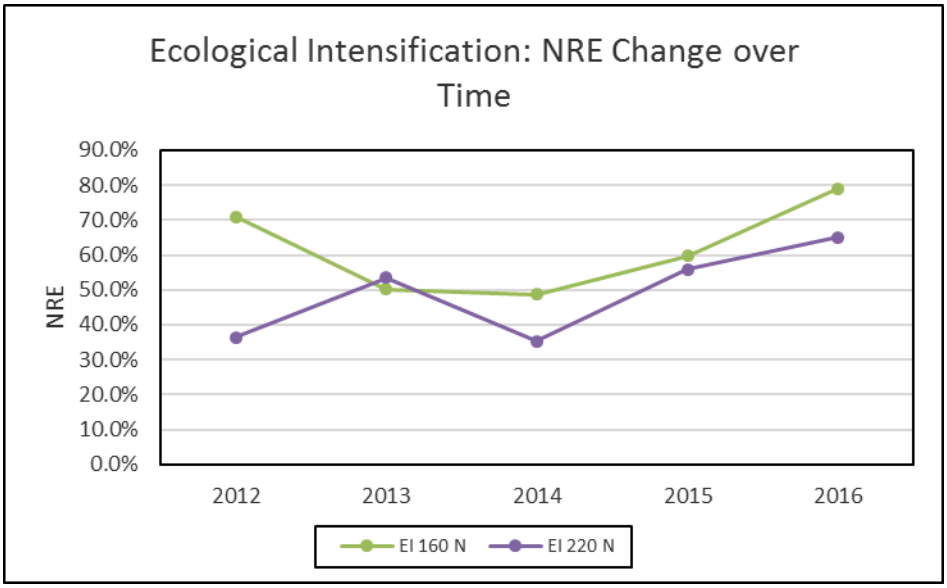
Table 21. Corn N relations response to treatments, 2016.†

Treatment	N to P	N to K	NUE	NRE	NIE
	1:1	1:1		%	
FP Control N, 30000 ppa	3.29b	0.84b			80ab
FP Intermediate N, 30000 ppa	3.95a	1.09a	53	0.65	82a
FP Normal N, 30000 pa	4.22a	1.15a	45	0.68	72abc
EI Control N, 37500 ppa	2.81b	0.68c			70bc
EI Intermediate N, 37500 ppa	4.00a	1.12a	50	0.79	65c
EI Normal N, 37500 ppa	4.20a	1.15a	38	0.65	62c
LSD @ 5%	0.49	0.13			11

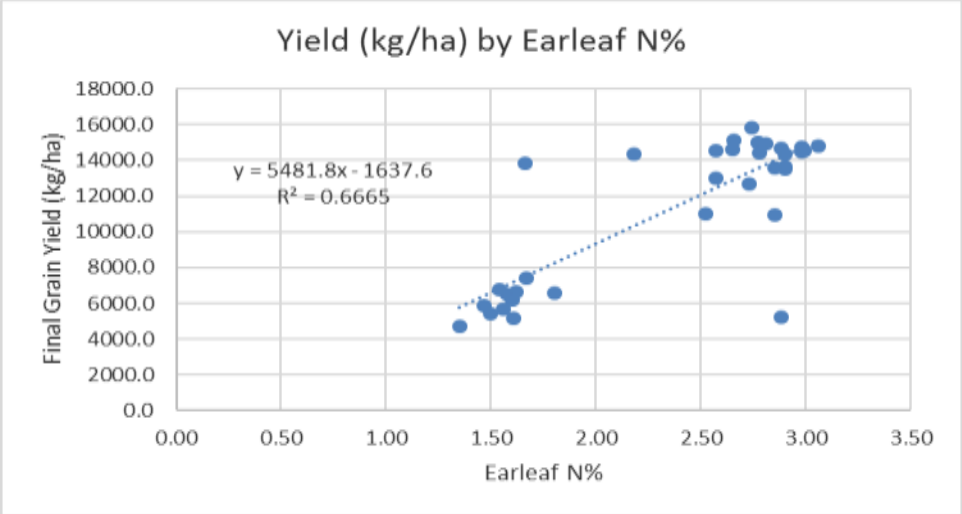
† Average of 6 replications
* Indicates a non-significant overall F-test

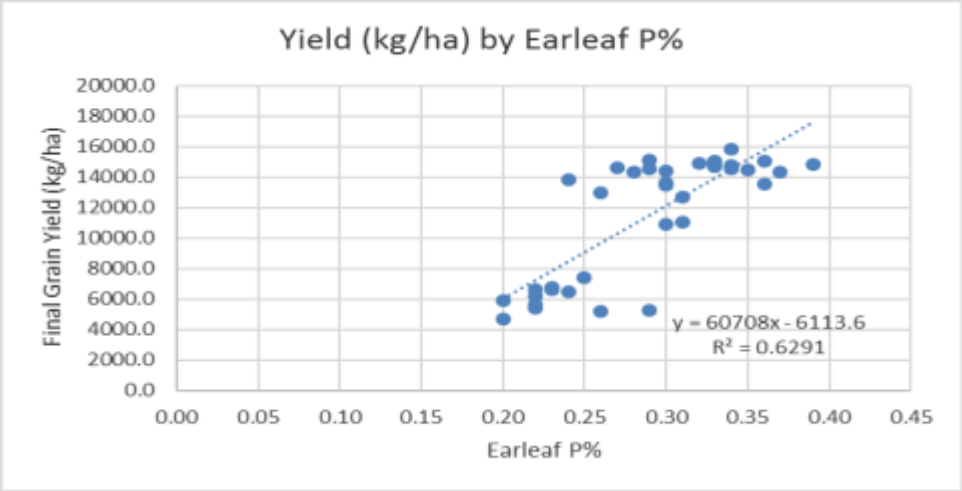

NRE Over Time
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
NRE
2012
2013
2014
2015
2016
FP Intermediate N, 30000 ppa
FP Normal N, 30000 pa
EI Intermediate N, 37500 ppa
EI Normal N, 37500 ppa

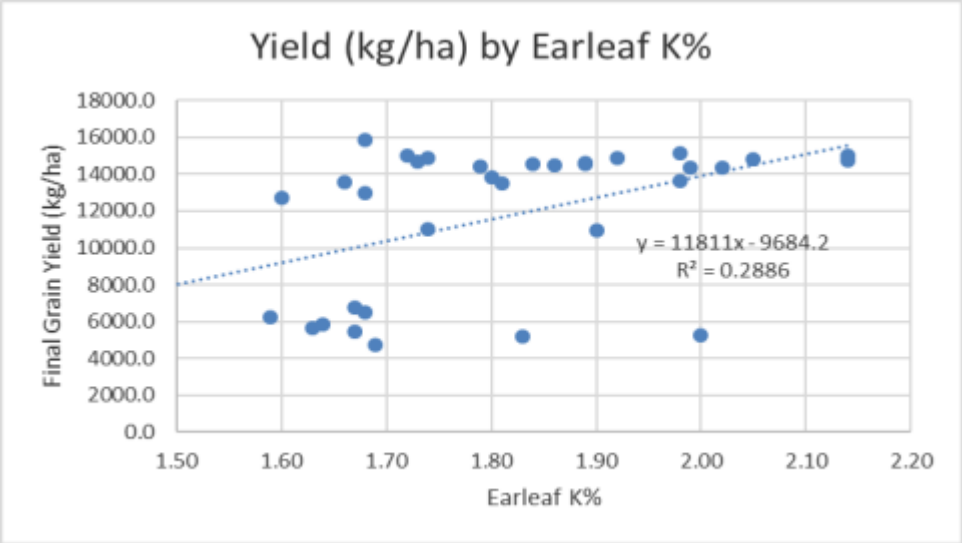

Farmer Practice: NRE Change over Time
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
NRE
2012
2013
2014
2015
2016
FP 100 N
FP 160 N

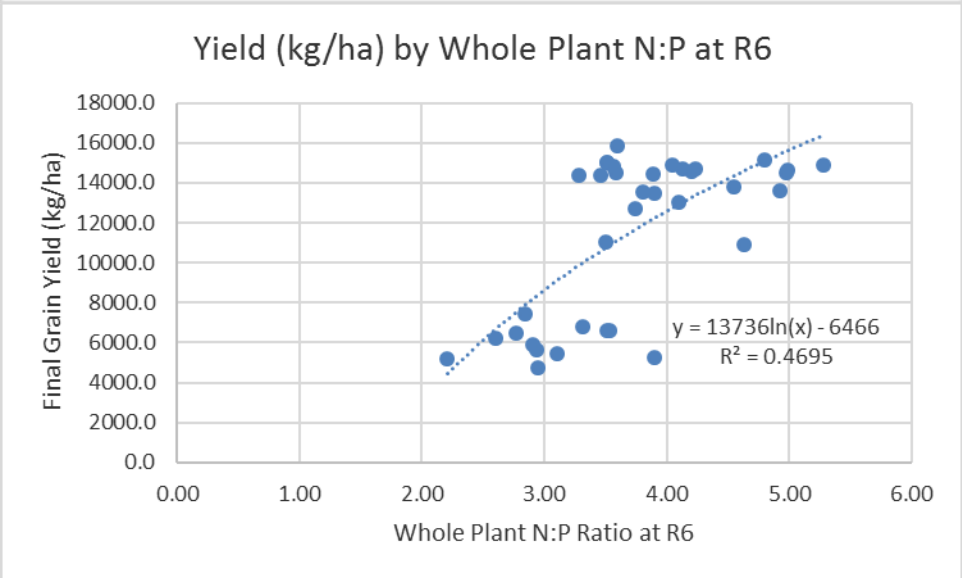


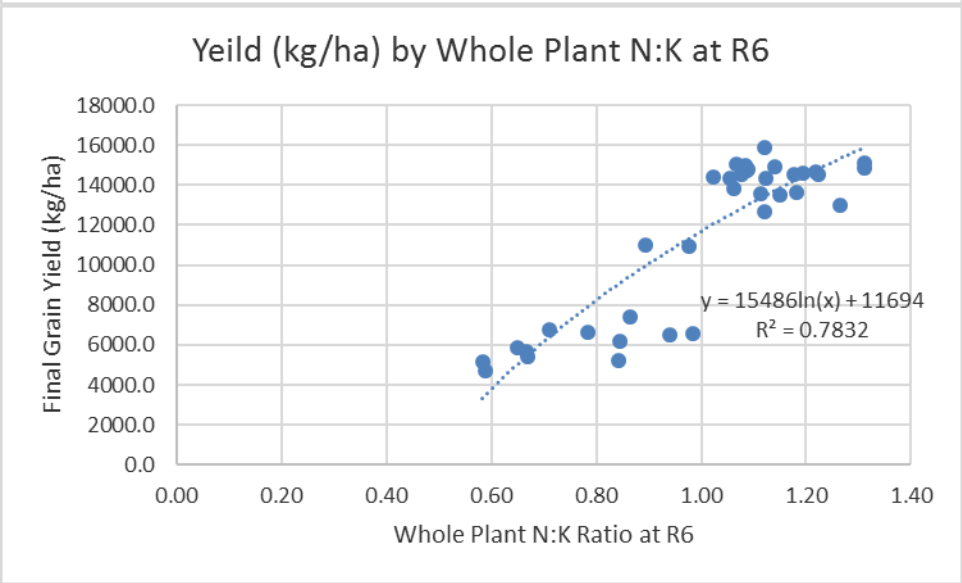
Regressions






Yield (kg/ha) by Earleaf K%
Final Grain Yield (kg/ha)
18000.0
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
1.50
1.60
1.70
1.80
1.90
2.00
2.10
2.20
Earleaf K%
y = 11811x - 9684.2
R² = 0.2886


Yield (kg/ha) by Whole Plant N:P at R6
Final Grain Yield (kg/ha)
18000.0
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Whole Plant N:P Ratio at R6
y = 13736ln(x) - 6466
R² = 0.4695


Yeild (kg/ha) by Whole Plant N:K at R6
Final Grain Yield (kg/ha)
18000.0
16000.0
14000.0
12000.0
10000.0
8000.0
6000.0
4000.0
2000.0
0.0
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
Whole Plant N:K Ratio at R6
y = 15486ln(x) + 11694
R² = 0.7832

Corn 5-year averages, 2012-2016

Table 22. Corn plant response to treatments, 2012-2016.†

Treatment	Plant Population	Plant* Height 1	Plant Height 2	Days to 50% Silking	Grain Moisture	Grain Yield @ 15%
	ppa	in	in	days	%M	bu/a
FP Control N, 30000 ppa	31494b	22.3	81.7b	81.0b	20.3e	102.3d
FP Intermediate N, 30000 ppa	31206b	21.9	93.2a	79.1de	20.5de	184.5c
FP Normal N, 30000 pa	31414b	21.9	93.7a	78.6e	21.0c	205.3b
EI Control N, 37500 ppa	38628a	22.6	80.1b	82.6a	20.7d	92.8e
EI Intermediate N, 37500 ppa	38231a	22.8	94.7a	79.7cd	21.4b	209.4b
EI Normal N, 37500 ppa	38281a	22.6	93.0b	79.9c	21.7a	214.7a
LSD @ 5%	581	1.0	1.9	0.7	0.3	4.2

† Average of 6 replications. *Average of 2013, 2014 and 2016

Table 23. Corn plant response to treatments, 2012-2016.†

Treatment	Spad 1	Spad 2*	Spad 3**	Stalk 1***	Stalk 2****
				mm	mm
FP Control N, 30000 ppa	41.2c	36.8c	33.7c	22.1cd	23.1b
FP Intermediate N, 30000 ppa	51.7ab	51.7b	49.2ab	24.5a	25.0a
FP Normal N, 30000 pa	52.0a	53.8a	50.7a	25.3a	25.3a
EI Control N, 37500 ppa	37.9d	35.0d	30.7d	21.1d	20.2c
EI Intermediate N, 37500 ppa	50.2b	51.2b	49.0b	23.2bc	23.4b
EI Normal N, 37500 ppa	50.5ab	52.9ab	50.7a	23.3b	23.5b
LSD @ 5%	1.6	1.7	1.7	1.2	1.1

† Average of 6 replications. *Average of 6 replications in 2012. 2015 and 2016, 3 replications in 2013.
** Years 2012, 2015 and 2016. ***Years 2012, 2013, 2015 and 2016. ****Years 2012, 2013, and 2016.

Table 24. Corn plant response to treatments, sample size of 10 plants per plot, 2012-2016.†

Treatment	Shoot DM	Shoot N	Cob DM	Cob N	Grain DM	Grain N	Total N Uptake	Total DM
	kg/h	%	kg/h	%	kg/h	%	kg/h	kg/h
FP Control N, 30000 ppa	6380d	0.48d	721c	0.61bc	5533c	0.96e	87.8d	12635c
FP Intermediate N, 30000 ppa	7673c	0.59c	1179b	0.57c	10488b	1.05cd	157.1c	19340b
FP Normal N, 30000 pa	7827bc	0.63ab	1379a	0.57c	12297a	1.10bc	187.1b	21503a
EI Control N, 37500 ppa	6629d	0.49d	667c	0.68a	4986c	1.02de	87.8d	12281c
EI Intermediate N, 37500 ppa	8505a	0.63b	1323a	0.62b	11915a	1.11b	193.8b	21743a
EI Normal N, 37500 ppa	8328ab	0.67a	1305a	0.59bc	12115a	1.18a	208.9a	21747a
LSD @ 5%	583	0.04	77	0.04	800	0.05	12.5	1194

† Average of 6 replications

Table 25. Corn plant response to treatments, sample size of 20 plants, 2012-2016.†

Treatment	Kernel Wt (200 kernels)	Kernels per plant	Harvest Index
	g	#	
FP Control N, 30000 ppa	43.9d	356d	0.44c
FP Intermediate N, 30000 ppa	52.8c	550b	0.54b
FP Normal N, 30000 pa	56.2a	577a	0.57a
EI Control N, 37500 ppa	43.8d	259e	0.39d
EI Intermediate N, 37500 ppa	53.9bc	487c	0.54b
EI Normal N, 37500 ppa	54.8ab	502c	0.55ab
LSD @ 5%	2.0	23	0.02

† Average of 6 replications

Table 26. Soil analysis, 2012-2016.†

Treatment	pH	OM	P	K	Mg	Ca	CEC	Nitrate	Ammonium
	(1:1)	%	ppm	ppm	ppm	ppm		ppm	ppm
FP Control N, 30000 ppa	6.02b	4.3	29.3bc	143	663b	2579b	22.9ab		
FP Intermediate N, 30000 ppa	6.10ab	4.2	27.2c	145	676ab	2600ab	22.9ab		
FP Normal N, 30000 pa	5.89c	4.2	31.6ab	142	619c	2456c	22.3b		
EI Control N, 37500 ppa	6.10ab	4.3	28.7bc	146	692a	2685a	23.5a		
EI Intermediate N, 37500 ppa	6.13a	4.3	27.8c	145	689a	2700a	23.5a		
EI Normal N, 37500 ppa	6.03b	4.3	33.7a	150	383ab	2689a	23.7a		
LSD @ 5%	0.09	0.2	3.4	9	25	104	0.8		

† Average of 6 replications

Table 27. Corn ear leaf nutrient concentration response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	1.72d	0.22c	1.75c	0.37b	0.27b	0.13c	19.5b	28.7c	68.2c	6.26c	4.67bc	14.1
FP Intermediate N, 30000 ppa	2.54c	0.28b	1.87b	0.46a	0.33a	0.17b	23.9a	43.3b	90.9b	9.30b	5.10ab	12.8
FP Normal N, 30000 pa	2.69b	0.29ab	1.87b	0.46a	0.33a	0.17b	23.9a	51.8a	92.8b	9.29b	5.29a	14.5
EI Control N, 37500 ppa	1.62d	0.22c	1.82bc	0.36b	0.26b	0.12c	18.1b	23.9d	64.4c	5.34d	4.47c	12.1
EI Intermediate N, 37500 ppa	2.67bc	0.29a	1.98a	0.47a	0.34a	0.18ab	24.5a	40.5b	97.7ab	9.51ab	5.44a	13.3
EI Normal N, 37500 ppa	2.86a	0.30a	1.95a	0.47a	0.33a	0.18a	24.6a	43.2b	101.6a	10.32a	5.19a	15.4
LSD @ 5%	0.13	0.01	0.07	0.02	0.02	0.01	1.4	4.0	8.1	0.84	0.50	4.8

† Average of 6 replications

Table 28. Corn grain nutrient concentration response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.96e	0.29ab	0.50a	0.01	0.11	0.086c	20.4ab	4.33	13.6d	1.53c	1.20	6.20
FP Intermediate N, 30000 ppa	1.05cd	0.28ab	0.47bc	0.01	0.11	0.090b	18.6bc	4.33	16.5abc	1.70bc	1.23	9.53
FP Normal N, 30000 pa	1.10bc	0.26b	0.44c	0.01	0.11	0.090b	18.0c	4.54	15.7bc	1.78ab	1.19	8.13
EI Control N, 37500 ppa	1.02de	0.30a	0.50ab	0.01	0.11	0.084c	21.6a	4.51	14.5cd	1.53c	1.20	5.83
EI Intermediate N, 37500 ppa	1.11b	0.27ab	0.45c	0.01	0.10	0.092ab	18.3c	4.05	18.0a	1.89ab	1.16	7.77
EI Normal N, 37500 ppa	1.18a	0.28ab	0.47abc	0.01	0.11	0.095a	19.6bc	4.35	17.7ab	1.97a	1.24	8.23
LSD @ 5%	0.05	0.03	0.03	0.00	0.01	0.003	1.9	0.76	2.1	0.21	0.17	3.87

† Average of 6 replications

Table 29. Corn shoot nutrient concentration response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.48d	0.12b	0.91cd	0.27c	0.25ab	0.06b	23.0b	35.5b	155a	2.72b	3.46	106b
FP Intermediate N, 30000 ppa	0.59c	0.07c	0.86d	0.32b	0.24ab	0.06a	18.2c	32.7bc	111b	4.80a	3.57	76c
FP Normal N, 30000 pa	0.63ab	0.06c	0.94bc	0.33a	0.24b	0.06a	17.2cd	40.3a	111b	5.25a	3.45	72c
EI Control N, 37500 ppa	0.49d	0.15a	1.02a	0.27c	0.26a	0.05b	26.1a	30.1c	164a	2.41b	3.48	120a
EI Intermediate N, 37500 ppa	0.63b	0.07c	0.91cd	0.32ab	0.25ab	0.06a	17.7c	31.4c	109b	5.30a	3.52	68c
EI Normal N, 37500 ppa	0.67a	0.06c	0.99ab	0.33ab	0.23b	0.06a	15.8d	30.8c	112b	5.43a	3.78	74c
LSD @ 5%	0.04	0.01	0.07	0.02	0.02	0.003	1.7	3.6	20	0.74	0.55	14

† Average of 6 replications

Table 30. Corn cob nutrient concentration response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	0.61bc	0.06b	1.24a	0.02b	0.04b	0.05b	32.5v	8.63a	11.9b	2.14bc	1.14c	7.9c
FP Intermediate N, 30000 ppa	0.57c	0.04cd	1.02c	0.01cd	0.02c	0.04c	18.2c	5.36b	10.8b	2.27b	1.14c	11.3b
FP Normal N, 30000 pa	0.57c	0.03d	0.96d	0.01d	0.02c	0.04d	14.8d	5.13b	11.8b	2.64a	1.19c	10.4bc
EI Control N, 37500 ppa	0.68a	0.08a	1.19b	0.03a	0.05a	0.06a	36.3a	8.8a	10.9b	1.99c	1.49a	12.2ab
EI Intermediate N, 37500 ppa	0.62b	0.04c	1.00cd	0.02c	0.03c	0.04c	17.0cd	4.90b	11.0b	2.83a	1.27bc	15.1a
EI Normal N, 37500 ppa	0.59bc	0.04c	1.04c	0.02c	0.02c	0.04c	16.0cd	3.90c	15.5a	2.71a	1.44ab	7.9c
LSD @ 5%	0.04	0.01	0.05	0.002	0.01	0.003	2.3	0.91	1.8	0.22	0.19	3.4

† Average of 6 replications

Table 31. Corn grain nutrient uptake response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	52.6d	15.8d	27.6d	0.55c	6.0d	4.7d	0.11d	0.02c	0.07d	0.008d	0.007c	0.03b
FP Intermediate N, 30000 ppa	105.9c	28.2c	48.1c	1.02b	10.9c	9.1c	0.19c	0.04b	0.17c	0.018c	0.013b	0.09a
FP Normal N, 30000 pa	130.8b	31.9b	54.1b	1.20a	12.8b	10.8b	0.22b	0.05a	0.19b	0.022b	0.014ab	0.08a
EI Control N, 37500 ppa	50.3d	15.2d	25.7d	0.51c	5.8d	4.2d	0.11d	0.02c	0.08d	0.008d	0.006c	0.03b
EI Intermediate N, 37500 ppa	131.7b	32.7ab	54.5b	1.20a	12.6b	11.0ab	0.22b	0.05ab	0.22a	0.023ab	0.014ab	0.09a
EI Normal N, 37500 ppa	143.8a	35.4a	59.8a	1.24a	14.3a	11.6a	0.24a	0.06a	0.22a	0.026a	0.015a	0.10a
LSD @ 5%	10.2	3.34	4.6	0.08	1.3	0.7	0.02	0.008	0.02	0.003	0.002	0.04

† Average of 6 replications

Table 32. Corn shoot nutrient uptake response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	30.8c	7.55b	56.1e	17.5d	15.5d	3.52c	0.14bc	0.22cd	1.01ab	0.018c	0.022d	0.69ab
FP Intermediate N, 30000 ppa	44.7b	5.17cd	63.9d	24.1c	18.3bc	4.66b	0.14c	0.24bc	0.87b	0.036b	0.027bc	0.59bc
FP Normal N, 30000 pa	48.8b	4.65d	72.2bc	25.5bc	18.1bc	4.65b	0.13c	0.31a	0.88b	0.040ab	0.026bcd	0.56c
EI Control N, 37500 ppa	32.9c	9.55a	66.1cd	18.2d	17.1cd	3.61c	0.17a	0.20d	1.09a	0.016c	0.023cd	0.80a
EI Intermediate N, 37500 ppa	53.9a	5.69c	79.0ab	27.2ab	21.6a	5.36a	0.15b	0.27b	0.93b	0.046a	0.031ab	0.57c
EI Normal N, 37500 ppa	57.3a	5.39cd	84.6a	28.0a	20.0ab	5.23a	0.14c	0.26b	0.94ab	0.047a	0.033a	0.62bc
LSD @ 5%	4.3	0.84	7.0	2.2	1.9	0.39	0.02	0.03	0.15	0.006	0.005	0.11

† Average of 6 replications

Table 33. Corn cob nutrient uptake response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	4.38c	0.44b	8.6d	0.14d	0.28cd	0.35c	0.023ab	0.006abc	0.008d	0.001d	0.001d	0.006d
FP Intermediate N, 30000 ppa	6.53b	0.43b	11.6c	0.17c	0.24d	0.46b	0.020cd	0.006abc	0.012c	0.003c	0.001c	0.014b
FP Normal N, 30000 pa	7.53a	0.43b	13.0b	0.18bc	0.25cd	0.50b	0.019d	0.007a	0.015b	0.003b	0.002b	0.015b
EI Control N, 37500 ppa	4.57c	0.52a	7.8d	0.19b	0.35a	0.38c	0.024a	0.006bc	0.007d	0.001d	0.001d	0.009cd
EI Intermediate N, 37500 ppa	8.16a	0.57a	13.3ab	0.21a	0.32ab	0.57a	0.022abc	0.006ab	0.014b	0.004a	0.002b	0.020a
EI Normal N, 37500 ppa	7.77a	0.55a	14.0a	0.21a	0.29bc	0.56a	0.020bcd	0.005c	0.020a	0.004ab	0.002a	0.011bc
LSD @ 5%	0.68	0.06	0.86	0.02	0.04	0.04	0.002	0.001	0.002	0.001	0.0002	0.004

† Average of 6 replications

Table 34. Corn total nutrient uptake response to treatments, 2012-2016.†

Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
FP Control N, 30000 ppa	87.8d	23.8d	92.3d	18.2d	21.8c	8.6d	0.28c	0.25c	1.10	0.027d	0.029c	0.732ab
FP Intermediate N, 30000 ppa	157.1c	33.8c	123.6c	25.2c	29.4b	14.3c	0.35b	0.29b	1.05	0.056c	0.041b	0.688b
FP Normal N, 30000 pa	187.1b	37.0bc	139.3b	26.9bc	31.2b	16.0b	0.37b	0.37a	1.09	0.066b	0.042b	0.662b
EI Control N, 37500 ppa	87.8d	25.3d	99.6d	18.9d	23.2c	8.2d	0.31c	0.22c	1.17	0.025d	0.030c	0.836a
EI Intermediate N, 37500 ppa	193.8b	38.9ab	146.8b	28.6ab	34.5a	16.9a	0.40a	0.32b	1.16	0.073ab	0.046ab	0.678b
EI Normal N, 37500 ppa	208.9a	41.4a	158.4a	29.4a	34.6a	17.4a	0.40a	0.32b	1.19	0.076a	0.050a	0.732ab
LSD @ 5%	12.5	3.5	9.7	2.2	2.5	0.9	0.03	0.04	0.15	0.008	0.005	0.114

† Average of 6 replications

Table 35. Corn N relations response to treatments, 2012-2016.†

Treatment	N to P	N to K	NUE	NRE	NIE
	1:1	1:1		%	
FP Control N, 30000 ppa	3.91c	0.97c			75.0ab
FP Intermediate N, 30000 ppa	4.81b	1.29b	46.0	0.61	76.1a
FP Normal N, 30000 pa	5.47a	1.39a	36.2	0.56	70.0bc
EI Control N, 37500 ppa	3.69c	0.91c			70.1bc
EI Intermediate N, 37500 ppa	5.59a	1.41a	41.7	0.62	69.4bc
EI Normal N, 37500 ppa	5.64a	1.38ab	31.0	0.49	66.4c
LSD @ 5%	0.55	0.10			6.0

† Average of 6 replications
* Indicates a non-significant overall F-test

Soybean

Table 36. Soybean Cultural Practices Used, Field 131, ACRE, 2016		
Tillage		No-till
Plot size		12-30”rows, 75-feet long
Replications		6
Trial plan		Included at end of this report
Planted	5/23	Planted with Vyn’s John Deere 1780 planter
Variety		Pioneer P36T86R
Seeding rate		140,000 seeds/acre in 30” rows
Weed Control	6/2	Pre-emergence:
		Roundup PowerMax @ 32 oz/ac
		Class Act 1 gal/100 gallons water
		Interlock 1-4 oz/100 gallons water
	?	Post-emergence:
		Roundup PowerMax @ 32 oz/ac
		Class Act 1 gal/100 gallons water
		Interlock 1-4 oz/100 gallons water
Fertilizer	6/16	Broadcast Aspire on treatments 4, 5 and 6 @ 150 lbs/ac (8 lbs/plot)
Harvest	10/15	Harvest with Kincaid combine.
Harvest area		Four 30-inch rows, 75-feet
Fall tillage	10/15	Strip-till for 2016 corn crop. Used Remlinger toolbar set for 8-inches.
Fall broadcast fertilizer	10/25	MAP (11-52-0) @ 200 lbs/ac
Fall broadcast lime	10/30	Lime @ 2 tons/ac

Table 37. Soybean plant response to previous year corn treatments, 2016.†

Previous Year Corn Treatment	Plant Population June 3	Pod Count	Plant Height R6	Grain Moisture	Grain Yield @ 13%
	ppa	Per plant	Inches	%M	bu/a
FP Control N, 30000 ppa	122995ab	40.4	48.4a	15.2a	65.8
FP Intermediate N, 30000 ppa	121658b	39.1	45.5b	15.0abc	64.6
FP Normal N, 30000 pa	128342a	38.0	46.4ab	14.9abc	66.0
EI Control N, 37500 ppa	126114ab	38.5	47.9ab	15.01ab	65.6
EI Intermediate N, 37500 ppa	127005ab	40.7	46.6ab	14.5bc	65.0
EI Normal N, 37500 ppa	127451ab	39.6	46.2ab	14.4c	66.1
LSD @ 5%	6210	5.2	2.6	0.6	2.3

† Average of 6 replications

Table 38. Soybean trifoliate leaf nutrient concentration response to previous year corn treatments, 2016.†

Previous Year Corn Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	Ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	5.54ab	0.385b	1.67b	1.17ab	0.43ab	0.300bc	44.5c	39.2ab	95.0b	14.0ab	49.7c	15.5
FP Intermediate N, 30000 ppa	5.64a	0.4112a	1.62b	1.06c	0.43ab	0.325a	48.2ab	39.7ab	97.8ab	14.5a	55.2b	6.3
FP Normal N, 30000 pa	5.27c	0.390ab	1.66b	1.23a	0.44a	0.295c	47.7abc	38.0b	97.8ab	14.5a	53.8b	8.3
EI Control N, 37500 ppa	5.53ab	0.385b	1.89a	1.12bc	0.39b	0.302bc	46.0bc	41.7ab	91.2b	13.7b	56.2ab	13.8
EI Intermediate N, 37500 ppa	5.31bc	0.378b	1.74ab	1.12bc	0.40ab	0.307bc	49.5a	45.2a	125.7a	14.3ab	57.3ab	19.2
EI Normal N, 37500 ppa	5.57a	0.390ab	1.75ab	1.14bc	0.42ab	0.315ab	49.3ab	44.3a	101.0ab	14.5a	59.8a	8.7
LSD @ 5%	0.25	0.025	0.16	0.09	0.04	0.018	3.4	6.3	30.0	0.7	3.7	14.8

† Average of 6 replications

Table 39. Soybean seed nutrient concentration response to previous year corn treatments (at maturity), 2016.†

Previous Year Corn Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	6.3	0.54	1.69	0.28	0.30	0.33	38.0	23.6	57.6	15.2	42.0	35.4
FP Intermediate N, 30000 ppa	6.3	0.55	1.73	0.29	0.31	0.34	38.0	22.0	59.8	14.5	44.0	18.0
FP Normal N, 30000 pa	6.3	0.56	1.71	0.30	0.31	0.32	39.0	23.0	57.0	15.0	43.0	24.5
EI Control N, 37500 ppa	6.2	0.57	1.78	0.31	0.32	0.32	40.0	24.3	64.7	15.7	45.7	19.0
EI Intermediate N, 37500 ppa	6.1	0.56	1.81	0.30	0.31	0.32	40.0	26.0	61.5	15.5	44.8	23.8
EI Normal N, 37500 ppa	6.1	0.56	1.76	0.28	0.29	0.31	37.3	22.3	56.3	14.8	43.5	29.5
LSD @ 5%	No statistical analysis due to rodent damaged samples.											

† Average of 3, 4, or 5 replications due to rodent damage to stored samples.

Soybean 4-Year Average, 2013-2016

Table 40. Soybean plant response to previous year corn treatments, 2013-2016.†

Previous Year Corn Treatment	Plant Population	Plant* Height 1	Grain Moisture	Grain Yield @ 13%
	ppa	inches	%M	bu/a
FP Control N, 30000 ppa	130437ab	31.8	13.9a	59.3
FP Intermediate N, 30000 ppa	127181b	31.8	13.9a	58.7
FP Normal N, 30000 pa	133569ab	31.9	13.8ab	58.6
EI Control N, 37500 ppa	136690a	31.4	13.9a	59.4
EI Intermediate N, 37500 ppa	136554a	32.8	13.7b	59.0
EI Normal N, 37500 ppa	134611a	31.4	13.7b	59.5
LSD @ 5%	6845	1.7	0.2	1.6

† Average of 6 replications. *Years 2013, 2014, and 2015.

Table 41. Soybean trifoliate leaf nutrient concentration response to previous year corn treatments, 2013-2016.†

Previous Year Corn Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	5.19a	0.395ab	2.12	1.11b	0.44	0.298bc	37.5b	50.3ab	93.3	10.7	57.6a	19.5ab
FP Intermediate N, 30000 ppa	5.20a	0.404a	2.04	1.10b	0.45	0.308a	39.3a	49.3ab	96.4	10.9	60.6a	15.4b
FP Normal N, 30000 pa	5.02b	0.393b	2.08	1.16a	0.47	0.292c	38.9a	47.5b	92.9	10.9	60.0a	16.0ab
EI Control N, 37500 ppa	5.21a	0.394ab	2.09	1.11b	0.46	0.302ab	38.1ab	50.1ab	95.9	11.4	60.1a	23.4a
EI Intermediate N, 37500 ppa	5.10ab	0.389b	2.06	1.11b	0.46	0.297bc	38.2ab	48.1b	99.1	10.8	60.0a	17.4ab
EI Normal N, 37500 ppa	5.16a	0.397ab	2.10	1.12b	0.45	0.299bc	39.0a	51.7a	94.4	10.7	60.9a	14.1b
LSD @ 5%	0.14	0.011	0.10	0.04	0.02	0.008	1.3	3.6	8.7	0.8	1.6	7.5

† Average of 6 replications

Table 42. Two year soybean seed nutrient concentration response to previous year corn treatments (at maturity), 2013 and 2016.†

Previous Year Corn Treatment	N	P	K	Ca	Mg	S	Zn	Mn	Fe	Cu	B	Al
	%	%	%	%	%	%	ppm	ppm	ppm	ppm	ppm	ppm
FP Control N, 30000 ppa	6.0	0.56	1.82	0.26	0.28	0.33	38.6	23.4	65.6	14.9	43.7	19.4
FP Intermediate N, 30000 ppa	6.1	0.55	1.82	0.26	0.28	0.34	37.4	22.6	65.2	13.8	45.2	10.3
FP Normal N, 30000 pa	6.1	0.55	1.81	0.27	0.28	0.33	38.2	22.8	65.5	14.5	44.7	12.2
EI Control N, 37500 ppa	6.0	0.56	1.87	0.27	0.28	0.34	39.2	23.2	69.0	14.8	45.6	10.6
EI Intermediate N, 37500 ppa	6.0	0.56	1.85	0.26	0.28	0.33	38.3	23.9	67.3	14.7	45.7	14.5
EI Normal N, 37500 ppa	6.0	0.57	1.86	0.25	0.27	0.33	39.1	23.0	66.7	14.5	46.0	16.6
LSD @ 5%	No statistical analysis due to rodent damaged samples from 2016.											

† Average of 3, 4, 5 or 6 replications due to rodent damage to stored samples in 2016.

(Soybean in 2016, trmt numbers are for corn 2015)
Border
Trmt
Plot
401 402 403 404 405 406
501 502 503 504 505 506
601 602 603 604 605 606
101 102 103 104 105 106
201 202 203 204 205 206
301 302 303 304 305 306
Notes:
For 30000 ppa, plant 31500
For 37500 ppa, plant 39500
Use insecticide (Force 3G)
Hybrid: Pioneer ? in plots.
Abbreviations:
FP = Farm Practice
EI = Ecological Intensification
Watchdogs:
Treatments:
1 FP Control N (0 lbs N/a.), 30000 ppa
2 FP Intermediate N (100 lbs N/a.), 30000 ppa
3 FP Normal N (160 lbs N/a.), 30000 ppa
4 EI Control N (0 lbs N/a.), 37500 ppa
5 EI Intermediate N (160 lbs N/a. + Instinct + ThioSul), 37500 ppa
6 EI Normal N (160 lbs N/a. + Instinct + ThioSul, additional late sidedress 60 lbs N/a.), 37500 ppa
Instinct at 36 ounces/a.
ThioSul at 384 ounces/a. (3 gallons/a.)
Acre Base Station on Bauman's Field Pump: Absolute 1.
Latitude: 40.4855246 North
Longitude: -87.0006963 West
Altitude: 718.0071 feet
Soybean border for PK Soybean Study
N
660 feet
75 feet
60 feet
210 feet
60 feet plus