Final 2009 Report of Orthman Manufacturing Research Farm Studies with BioGreenUSA.
December 16, 2009

Gentlemen,

Within this report you will read a brief outline of the project and then outcomes. It is my intention to offer you a look at what we accomplished with the varying In Furrow products tried on our irrigated corn near Lexington, Nebraska on the Orthman property. Even with the year as wet as it was and far below the heat units we thought necessary our outcome is very respectable.

2009 BioGreen/Orthman Project Outline

I. Strip-Till Comparison to No-Till
   A. Side-by-side hybrid comparisons into 2008 soybean stubble left undisturbed with Varying Pre-Plant fertilizer quantities
   B. Selection of 3 to 4 Seed Corn companies varieties to compare with tillage differences and fertility
   C. Comparison of Hybrids-Fertilizer and Row Direction (E-W vs. N-S)

II. Fertilization Component of the Comparison study
   A. With Strip-Till placed nutrition at 2 different depths
   B. With No-Till placed nutrition with seed at planting, then side-dressed with liquid at 8th leaf stage and remaining N placed through pivot

III. Root Studies – 3 times during the growing season depicting if InFurrow and Pre-plant had differences
   A. 25DAE – purpose to observe early root growth
   B. 55DAE – purpose to observe growth at high nutrient demand time prior to tassle
   C. 105DAE - purpose to observe growth at maturity

IV. Harvest
   A. Quality of grain, standability, bushel weight, moisture, stalk quality, yield
   B. Comparison of plant/root development against yield

V. Summary statements

Selection Criteria with Hybrids with Relative Maturity Dates

It was our intent to shorten the season to hopefully be harvesting corn for grain prior to Thanksgiving rather than the 2008 season of early December and questioning moisture because of drydown and longer season corn. Good intentions can be just that, good for talk. The 2009 harvest did not get started until December 3rd and went on for 4 more days allowing us to endure some cold and dismal weather. But we did harvest moisture between 14.9 and 15.9%. That gave us a leg-up on trucking our grain to storage and to sell.

Mark Griffith, our Farm Manager and I discussed the need to stay below 2650 heat units and 108 relative maturity days to hopefully harvest earlier, obtain lower grain moisture at harvest. We did plant two longer season varieties from the big two Seed Companies – Pioneer and Dekalb. Well, life and Nebraska's climatic conditions have ways of changing what we want and what does truly happen. At the end of August 2009, Growing Degree Days (GDD) from April 15th to August 31st had accumulated to 2255. In September we saw another 238 accumulate totaling 2493 days, adding up to be short by 157 days for the 108 day corn. We were over 300 GDD for the 113 RMD corns. From April 15 to the end of September we were very wet with 17.64 inches of rain officially recorded in the Lexington area.

Fertilization Component of the Comparison Study

We planted plots of 12 and 24 rows each of the following pre-plant + 32% N in the area we set aside in the 2008 soybean stubble between 1090 and 1150 feet in length.

On the North-South Rows:
ST – Pre-plant KQ663 @10gpa + 10gpa of 32% Nitrate into Bean stubble that was 25-32bpa in 2008 (residual of 15lbsN) then InFurrow(IF) 4gpa KQ1515 with planter
ST – Pre-plant KQ663 @20gpa +10gpa 32%N into Bean stubble, no MicroMax, 4gpa KQ1515 at planting
ST – Pre-plant KQ663 @20gpa + 10 gpa 32%N + 22oz KQ MicroMax, 4gpa KQ1515 at planting
ST – [Check plot] No Pre-Plant products, but did apply 4gpa KQ1515 IF at planting
ST – [Check plot] Pre-plant KQ663 @10gpa + 10gpa of 32% Nitrate with No IF products
ST - Pre-plant KQ663 @10gpa + 10gpa of 32% Nitrate with 4gpa KQ1515 IF products AND 6gpa KQ1515 IF at planting
ST - Pre-plant KQ663 @10gpa + 10gpa of 32% Nitrate with BioGreenUSA liquid fertilizer at 3gpa and 5gpa rates IF

Weed control was 1 application of 40oz Monsanto Power Max RoundUp® with surfactant and 4.5 oz BASF herbicide - STATUS® in early June. It was very good control throughout the season. A few escapes of late summer Texas tumble grass and some black nightshade where we had a shut off problem with sprayer for two rounds on the ends.

Strip-till operation was completed across the farm March 16-19th. Planting on both the Strip-till area and No-Till area on May 1st and 2nd, 2009. Soil temperature measured at the 2 to 3 inch depth at 1:00pm was 55-56°F., on both days in the strip-till zone and in the No-Till the soil temperatures were 50-52°F.

Hybrids selected to be in this portion of the study were Hoegemeyer 51-43VT3[108RMD], Pioneer 33P83[113RMD], and Dekalb 63-42VT3 [113RMD].

Strip-Tillage Comparison Plots to No-Tillage Plots

For the No-Till plots we applied no pre-plant products, applied KQ1515 at the 4gpa rate and then at 7-8th leaf stage applied 11gpa of 32% via a jet nozzle stream onto the ground surface and then irrigated in with 0.15 inch of water. The 105 lbs of N through the pivot also was applied as mentioned in the previous paragraph. We planted Hoegemeyer, Pioneer, Dekalb and Midwest Seed Genetics in these plots.

We wanted to compare IF fertility and tillage differences. There is a great deal of talk and much of it controversial how strip-till and No-Till (Direct Seeding) are night and day differences and the No-Till enthusiasts from the University institutions say we are terrible for advocating this systematic approach. That makes for an adversarial dialogue at best. Results will be in Table .

Root Studies – 3 times during the growing season

Our root studies are for several reasons; 1) gain knowledge of what the VT3 hybrids can do for depth of rooting to achieve a deeper penetration of the overall plant root, 2) access more water in the soil profile, 3) observe the rooting profile of the selected corn varieties in the Platte River Valley where water tables do reach up to the 2 to 2.5 foot level below the soil surface keeping the soils cool for a longer period which could be detrimental to growth and grain yield, 4) observe rooting differences during these three periods as mentioned in the outline (25DAE, 55DAE and 105DAE), 5) observe rooting differences between tillage types of No-Till and Strip-Till and 6) observe differences of IF fertilizer applications.

You were all sent a couple of reports during the growing season on rooting development so I am not repeating those in this report. I am sending you extra data sets to see what was accomplished.

Table 1. Root development at 25 days after emergence (DAE).

Root Observations at Lexington OMI Farm june 12, 2009

N-S Direction Component Study … Midwest Hybrids completed observations 6/12/2009

Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	
210-57VT3 - No-Till			208-72VT3 - No-Till			210-72VT3 - Strip-Till			208-57VT3 - Strip-Till			
10	8	6	10	8	10	10	10	10	12	10	12	Primary Roots
6	4	6	4	6	6	6	8	8	6	6	6	2nd Nodal Roots
0	0	0	0	0	0	3	4	5	0	2	0	3rd Nodal Roots
11.5	10	10	10.5	10	11	14	13.5	14	13	12	13	Plant Height (inches)
12	10	10	12	10.5	12.5	16	16	17.5	15	13.5	13	Root Depth(inches)
6	6	6	6	6	6	7	7	7	7	7	7	Leaf Stage(no.)

NOTES: All planted May 1st, 2009

N-S Direction Component Study … Competitor Hybrids completed observations 6/12/2009

Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	Plant 1	Plant 2	Plant 3	
Pioneer 33P83 Strip-Till			Pioneer 33P83 No-Till			Dekalb 63-42 Strip-Till			Dekalb 63-42 No-Till			
10	10	10	10	10	10	12	10	10	10	10	12	Primary Roots
8	6	8	6	8	6	8	8	8	8	8	6	2nd Nodal Roots
2	6	3	0	0	0	6	6	6	4	6	5	3rd Nodal Roots
16	15.5	15	10	12	12	14	15.5	17	14	15	15.5	Plant Height (inches)
17	16	16	12	13	11	16	16	17.5	15	16	14	Root Depth(inches)
7-8	7-8	7-8	7	7	7	7	7	7	6-7	7	6-7	Leaf Stage(no.)

All planted May 1st, 2009

Considering root studies……

To my surprise I observed much more as to what is happening with production of below ground biomass and what is happening with ear development at this period of root digs. I knew from reading and conversations with crop physiologists in the corn breeding world that 45-55 DAE is a period of rapid development. What I observed proved that out, but to gain data sets as to how the plants can have a better rooting profile and greater number of roots due to tillage and fertilizer placement really inspired me, as I hope it does you. As the No-Till and Strip-Tilled plots matured the root systems were

somewhat the same in total depth achieved and total cubic inches of soil volume explored was close – but the yield bore out a different story. Please look at the number of roots in the differing varieties, Dekalb and Pioneer had quite a large root number in Strip-Till compared to the No-Till seen in Table 2. Hoegemeyer was similar but the yield spreads were not quite as wide. Midwest had the smaller total root numbers differences at the 55DAE time frame.

It is my hope that we can follow this up next year to verify such differences with how the IF products worked and Orthman strip-till compared to Direct Seeding and you guys work with us. Please look at Table 4A to see how the products compared.

Table 2 Root development with No-Till vs. Strip-Till at 55 DAE.

Strip-Till vs.. Direct Seeding (No-Till) Root Studies at Orthman Research Farm

55DAE Root Observations made on July 10, 2009

Tillage Type	Seed Co.	Day Length	Max Rooting Depth(inches)	#Primary Roots	#1st Node Roots	#2nd Node Roots	#3rd Node Roots	#4th Node Roots	#5th Node Roots	Total No. Roots
No-Till	Midwest	110	36	8	8	8	6	8	6	44
No-Till	Midwest	108	31	8	8	8	10	8	4	46
No-Till	Hoegemeyer	108	32	8	8	6	7	10	--	39
No-Till	Dekalb	113	35	10	8	6	8	8	10	50
No-Till	Pioneer	113	27	10	8	6	8	6	6	44
Strip-Till	Midwest	110	30	10	8	8	10	10	6	52
Strip-Till	Midwest	108	37	12	8	8	8	10	6	52
Strip-Till	Hoegemeyer	108	33	10	8	8	8	10	7	51
Strip-Till	Dekalb	113	39	12	10	10	8	10	10	60
Strip-Till	Pioneer	113	33	12	10	8	8	8	8	54

Notes: Fertilizer Applic. Attempting to maintain equality in N application in Direct seeding plots
Water table depths at 7/08/2009 -- observed at 44 to 48 inches below soil surface

Table 3.

Strip-Till vs. No-Till 105DAE Root Data.

Corn Hybrid	Tillage Practice	RMD	Total N Inputs	Root Width@12"	Root Width@24"	Root Width@36"	Root profile Dimension cubic inches	Vol. 1st 85% of roots-depth	Mature Rooting Depth (max.)
Midwest 208-72	StripTill/N-Srows	108	164.0	19"	20"	16"	4445	22"	50
Midwest 210-57	StripTill/N-Srows	109	164.0	21"	18"	12"	4475	18"	59
Midwest 210-57	NoTill/N-S rows	109	164.0	19"	14"	13"	4330	17"	50
Midwest 208-72	NoTill/N-S rows	108	164.0	23"	18"	13"	4285	15"	58
Pioneer 33P83	StripTill/N-Srows	113	164.0	27"	20"	15"	5210	26"	64
Pioneer 33P83	NoTill/N-S rows	113	164.0	28"	14"	10"	4345	20"	51
Dekalb 63-42VT3	NoTill/N-S rows	113	164.0	21"	18"	11"	5010	24"	57
Hoegemeyer 5143	NoTill/N-S rows	108	164.0	20"	16"	15"	4400	19"	64
Hoegemeyer 5143	Still Chk N-S rows	108	176.7	24"	16"	11"	5025	25"	57

Table 4A: Corn Root Studies with Variable Fertility - BioGreenUSA and Kugler IF and/or Kugler KQ663+UAN preplant

Treatment of Fert.	Maturity	Max rooting (inches)	# Prim roots	1st Nodal	2nd Nodal	3rdNodal	4thNodal	5thNodal
BioGr 3gpa-IF: 10-10 PrePlant	108RMD	46	8	6	8	10	10	10
BioGr 5gpa-IF: 10-10 PrePlant	108RMD	47	8	10	10	8	10	10
Check no IF: 10+10 PrePlant	108RMD	33	6	8	8	8	8	6
Check No PrePlant: 5gpa IF Kugler 1515	108RMD	40	8	6	6	8	8	12
Check No PrePlant: 2.8gpa IF Kugler 1515	108RMD	31	10	8	8	6	6	8

Pest Control

During the 25DAE root study I observed for any rootworm feeding, I observed none. When the corn had reached 13 to 14th leaf stage we did have Grey Leaf Spot *Pyricularia grisea*, showing from the 2nd leaf above ground to the 6th leaf above ground. We called our local company that sprays and had they sprayed with Headline™ and Bumper® just as the tassels were emerging. Seven days after the application of those two products we observed in the field that the advance of the Grey Leaf Spot was arrested.

Harvest

There will a couple different tables here to explain what we tried to observe and compare. The first table will depict what occurred in our fertility comparison plots that were E-W and N-S row direction specific. I think you will find some interest in what did come out of this. With any research we do not find our hypotheses just jump and shout we are super scientists and have it all in the right pile.

As for an example our check plots on the E-W rows with the Dekalb 58-16 was a bummer with weed pressure, poor stand, and overall blah! Secondly how did plot 49 compared to 52 and 53 (Table 5) not pan out to be exemplary with the MicroMax product added to the fertility components? Third, I expected the yields to be some better between plots 7 – 8 – 9 in Table 5. There shows an improvement between the KQ1515 4 and 6gpa rates. Maybe on a longer season hybrid we would have seen a larger jump? The 108 RMD Dekalb corn was a good yielder for us and had good dry down at 14.9 to 15.5 throughout harvest compared to the 113 RMD corns at 17.6 to 18.8%.

In Table 7, Mark and I made a stab at fertilizing for 250bpa corn yields, bumped the planting population to 32K, ended with 30.8 to 31.5K for a stand. It is likely we lost some nitrogen due to leaching; also the water table reaches 2 ft below the surface in the southern half of this portion of the field from neighbors' irrigation early. So we continue to learn.

Table 5. Fertility Comparison Plots at OMI Farm – Lexington, NE - 2009

Fertility Plots 2009 All 108 RMD Corn

All plots were fed with 3X 10.2gpa 32% thru the pivot during the growing season = 104lbs N

Plot #	Corn Hybrid	RMD	Tillage Type	# Rows	Plot Length	Corn Wt.	Acreage	Bushels/plot	Yield - bpa	Notes:
	Irrigated E - W row direction - cont. corn									
6	Dekalb 58-16 VT3	108	S.Till, Chk, 3gpaKQ15-15 IF,PPF-10gpa KQ663+10gpa-32% PPF	12	500	2240	0.344	40.000	116.28	Std count was <25K, weed pressure west side of 1420' plot, much better weed control & end pop. was 29,650
7	Dekalb 58-16 VT3	108	S.Till, Chk, 3gpa KQ15-15 IF; PPF-10gpa KQ663+10gpa-32%	8	500	2670	0.230	47.690	207.35	
8	Dekalb 58-16 VT3	108	S.Till, KQ15-15 IF-4gpa,10gpa KQ663+10gpa-32% PPF	8	500	2778	0.230	49.607	215.68	
9	Dekalb 58-16 VT3	108	S.Till, KQ15-15 IF, 6gpa,10gpa KQ663+10gpa-32% PPF	8	500	2882	0.230	51.460	223.74	
10	Dekalb 58-16 VT3	108	S.Till, Kugler No IF,10gpa KQ663+10gpa-32% PPF	8	500	2580	0.230	46.070	200.30	
11	Dekalb 58-16 VT3	108	S.Till, BioGreen 3gpa IF;PPF-10gpa KQ663+10gpa-32%	8	500	2858	0.230	51.030	221.87	
12	Dekalb 58-16 VT3	108	S.Till, BioGreen 5gpa, IF; PPF-10gpa KQ663+10gpa-32%	8	500	2568	0.230	45.860	199.39	
	Irrigated N - S row direction - 2008 area was in soybeans									
48	Hoegemeyer 5143VT3	108	S.Till, Chk, 3gpa KQ15-15 IF,No PPF	8	300	1776	0.138	31.714	229.81	
49	Hoegemeyer 5143VT3	108	S.Till, 4gpa KQ15-15 IF; 10gpa KQ663+10gpa-32%PPF	8	320	1982	0.147	35.393	240.77	
50	Hoegemeyer 5143VT3	108	S.Till, Chk, 3gpa KQ15-15 IF,10gpa KQ663+10gpa-32% PPF	8	340	1860	0.156	33.214	212.91	
51	Hoegemeyer 5143VT3	108	S.Till, Chk, No IF, 10gpa KQ663+10gpa-32% PPF	8	340	1904	0.156	34.000	217.95	
52	Hoegemeyer 5143VT3	108	S.Till, Chk, 4gpa KQ15-15 IFw/22oz/ac MMax, 10gpa KQ663+10gpa-32% PPF	8	340	1975	0.156	35.268	226.08	
53	Hoegemeyer 5143VT3	108	S.Till, Chk, No IF KQ15-15 IF,KQ663,20gpa+10-32% gpa PPF	8	445	2472	0.204	44.143	216.39	
46	Hoegemeyer 5143VT3	108	S.Till, BioGreen 3gpa IF KQ663-10gpa+10gpa-32%	8	300	1704	0.138	30.429	220.50	
47	Hoegemeyer 5143VT3	108	S.Till, BioGreen 5gpa, IF;10gpa KQ663+10gpa-32%	8	300	1728	0.138	30.857	223.60	

To be considered as Notes:

N-S rows of corn had a 25-32bpa soybean crop on it the year of 2008, some residual N from that crop

IF - applied at planting time 5/02/2009 w/CNH1200 planter

Herbicide program - Post-emerg, Power Max RoundUp 40oz + 4.5oz/ac BASF *STATUS* for control of broadleaf and grasses

Pesticide used - 68 days after emergence we sprayed Headline + Bumper for GLS

Summary Statements

In our preliminary walk through many of the plots I pulled back the ear shucks to see what might be the yield potential with kernel counts and final plant population. I was counting in the strip-till 28.5K to 29.2K plant/ear populations with 24.9K to 26.8K plant/ear populations in the No-Till. Predictive kernel counts looked like 174 to 245bpa in the strip-till and 158 to 174bpa in the No-Till in the Midwest hybrids involved in the study. The No-Till actually yielded 185 to 201bpa and the Strip-Tilled corn yielded 240 and 250bpa. That is the very best we have seen in the three years we have worked together. I tend to draw a conclusion that the Strip-Till plants were physiologically more advanced and put on my kernels per cob even with the final outcome of the roots nearly the same. During the fast growth period from 40DAE to 80DAE, the strip-tilled corn was

Ranking of the Crop Yields on OMI Research Farm Plot Work - 2009

Plot #	Corn Hybrid	Yield - bpa	Ranking
59	Pioneer 33P83	258.31	1
43	Dekalb 60-18RR2	252.90	2
61	Midwest Seed 208-72	250.23	3
44	Dekalb 60-18RR2	248.55	4
60	Midwest Seed 210-57	240.84	5
49	Hoegemeyer 5143VT3	240.77	6
39	Hoegemeyer 5143VT3	231.66	7
48	Hoegemeyer 5143VT3	229.81	8
62	Hoegemeyer 5143VT3	229.56	9
41	Hoegemeyer 5143VT3	227.80	10
40	Hoegemeyer 5143VT3	226.83	11
22	Dekalb 60-18RR2	226.71	12
5	Pioneer 33P83	226.30	13
52	Hoegemeyer 5143VT3	226.08	14
15	Pioneer 33P83	224.53	15
2	Pioneer 33P83	223.74	16
9	Dekalb 58-16 VT3	223.74	17
47	Hoegemeyer 5143VT3	223.60	18
21	Dekalb 60-18RR2	222.57	19
1	Dekalb 63-42 VT3	222.43	20

physiologically advancing beyond the No-Till.
In order to define these facts even more, I believe we must evaluate which roots were more in quantity. I suggest you look at Table 3. Also in the column, 'Vol. first 85%' you will see another difference that may be telling us what is happening below ground. I observed in the ST more root numbers on the 3rd, 4th, 5th nodes compared to the NT. In the NT the roots are quite a bit more shallow which may account for water uptake later in the season when the crop was finishing. It also was an observation on the Midwest and Hoegemeyer hybrids that the kernel row dimension was 18-20 around in the ST and with the NT it was only 14-18 around.

A difference of 40 bushel+ at harvest I believe has some value for all to take notice that each of these corn hybrids can punch out the yield with equal amounts of N in Strip-Till. We believe also that placement of P has some definite improvements in yield in a ST-pre-plant environment compared to No-Till.

I also wanted to give you a bit of comparative news on how hybrids that were in the 62 plots grown at the Orthman Research Farm turned out. I have ranked the top twenty plots. See for yourself in the last table where a favorite sorted out.

I tend to believe that where the Orthman Farm sits at 40 degrees 76 minutes North Latitude and 99 degrees 75 minutes West Longitude, we can and do gain from row orientation to maximize photo periodism and sunlight capture. We did plant of the Dekalb 108 RMD corn in the E-W row direction on the farm in 2009. However we did have corn oriented E-W vs. N-S and we did see corn yields in the N-S rows vary from 7 to 21 bpa increases over the E-W rows. The two 108 day corns were Hoegemeyer 51-43 and Dekalb 58-16 corn variety with similar fertility applied as what we did for the NT to ST comparison plots.

I have included in past reports how the roots extended and drawings of corn provided with BioGreen IF products applied and others both in soybeans and the corn.

I am sure you will draw some alternate conclusions and some ideas Mark and I have missed. Please feel free to study, compare and call if you so feel inclined. I am at your service.

Acknowledgements:

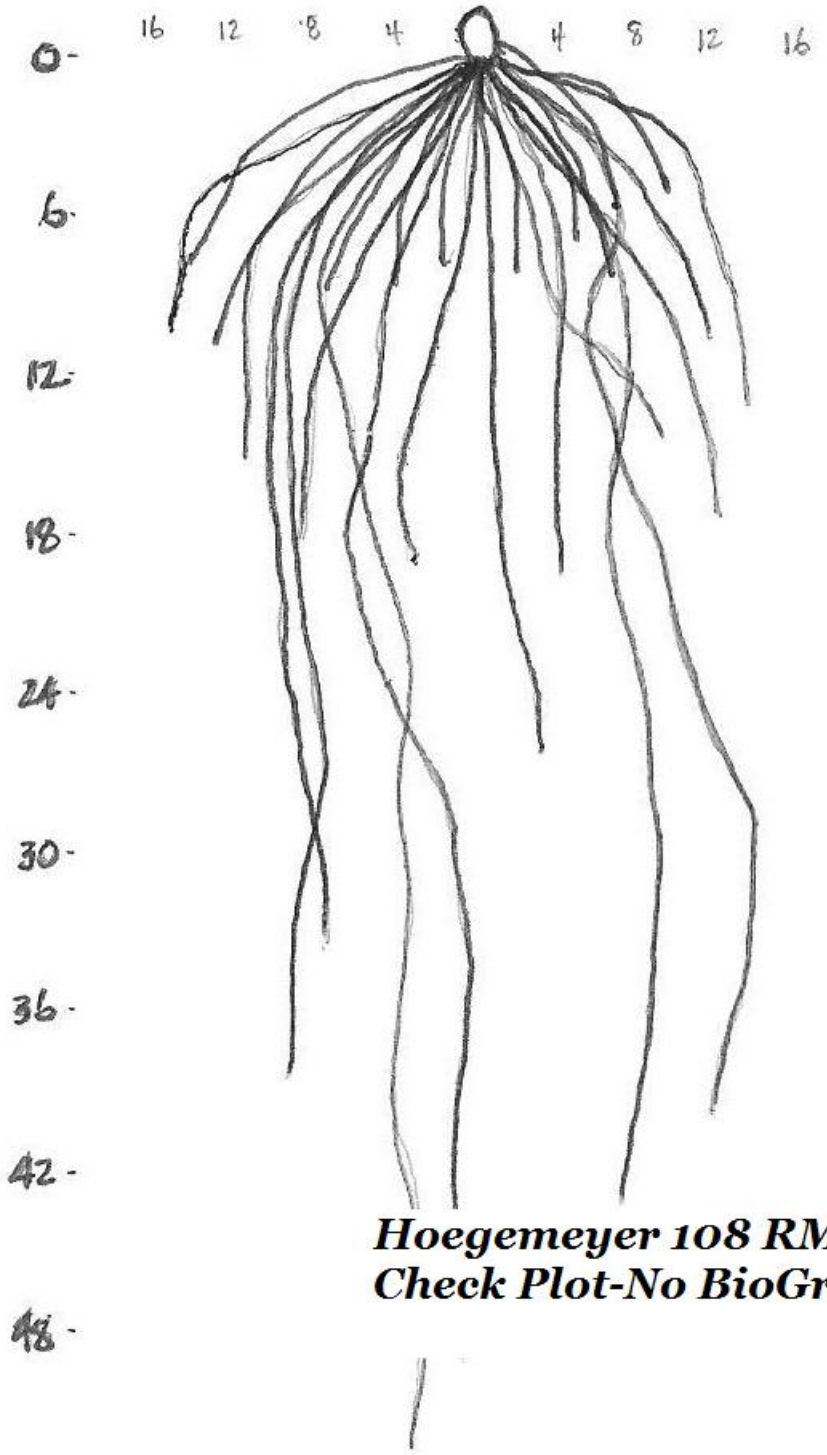
I do want to first thank our dedicated Farm Manager, Mark Griffith who is fully engaged in this project and committed to making it work all three years. Then my thanks go to the entire BioGreenUSA group of folks that were involved with this study. I do heartily thank Chad Petersen, John Perry, and Jerry Stithem for all of their advice and belief in what we are doing here to provide your company strong evidence that BioGreen products are of very high quality and can make a difference. Thanks to Randy Russ for making a special trip down from the Twin Cities to get a up close and personal look at roots, cold-wet weather and why rooting profiles tell us so much in fertility placement and reasons for such. The Orthman Agricultural Division is very appreciative of the cooperation and involvement of a future thinking company that wants to determine what makes their corn stand out and lead corn growers to the hybrids that will grow 2010 and beyond 300 bpa corn. The genetics are an incredibly important facet of raising top yielding corn. Here in the tillage world, we foundationally believe the right tillage practice and system will start the crop off right and get it to the finish strong.

I am convinced as we have partnered in this study, that there could be a great deal more determined from future work to understand when roots make the difference in tillage and placement of fertilizers. These kinds of data can assist your company know why 'verticality'or shallowness of root systems make a difference and how that can sell better grades of fertility in 2010 and beyond. Here at Orthman we make that part of our marketing campaign to explain Strip-Till especially in the Western Corn Belt.

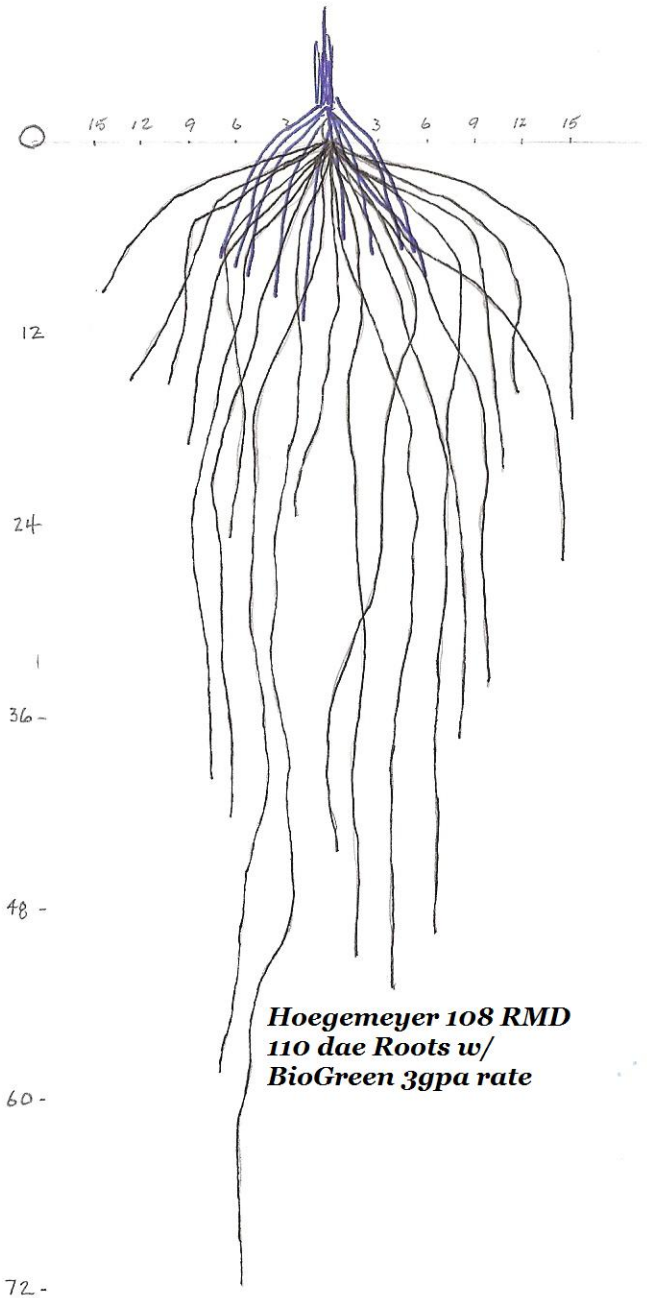
As you evaluate the function and information in this report, please feel free to contact myself or Justin Troudt, V.P. Agricultural Sales and Marketing for Orthman Manufacturing if questions arise. We are at your service. We also look forward to conversations about how we can assist you in your training if you desire and how we can be thinking about 2010.

Sincerely,

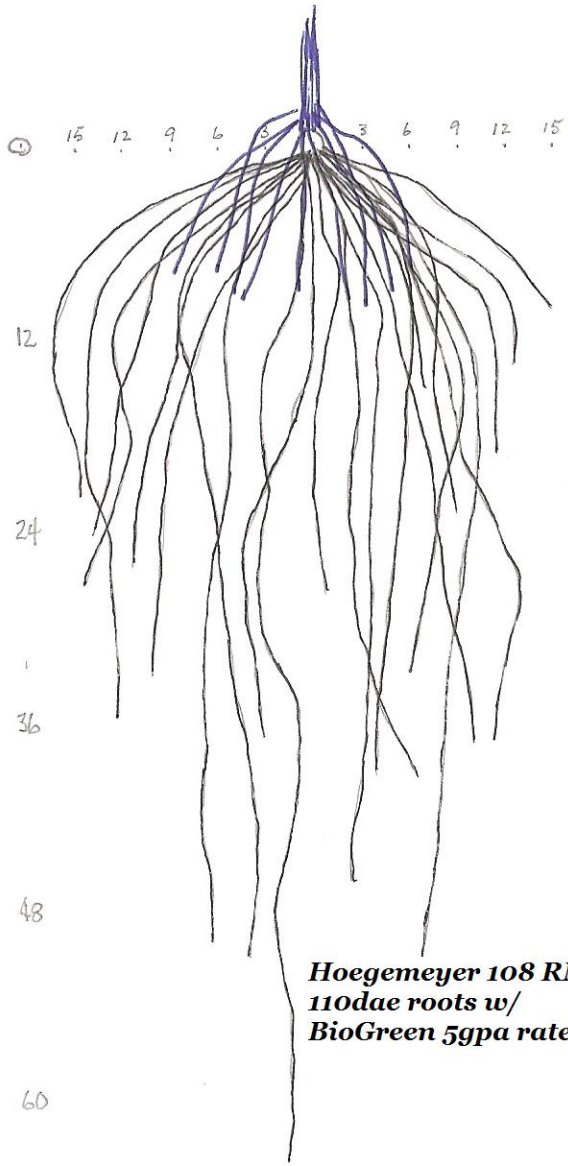
Michael L. Petersen, Orthman Precision Tillage Agronomist



Hoegemeyer 108 RMD
Check Plot-No BioGreen



Hoegemeyer 108 RMD 110 dae Roots w/ BioGreen 3gpa rate



Hoegemeyer 108 RMD 110dae roots w/ BioGreen 5gpa rate