2010 – In the Mid-Section of the Platte River Valley Corn Roots Have Struggled With the High Water Table – Have Yours?

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Our corn crop has not been in the position it stands for many years as it is right now towards the end of the summer of 2010. Some of the old timers that can remember the years during the last half of WWII and to 1946 which is 64 years ago, tell us that soils remained soggy until late, late summer and on into the fall with just so-so crops with the largess of rain.

What has the wetness done to the corn and soybean crops of 2010 in this geographical region and elsewhere in the United States? Roots nearly stopped growing during the months of June and July when the rain was so abundant and the soils remained near saturated in the upper 30 inches for 26 days. With our root digs we explored what was happening below ground from June 12th to July 15th ,we only measured an extension of 6 inches that is of vertical root development from the week of June 12th. The corn plants grew about 4 -10 inches higher than when we made measurements in June. As a soil scientist that has been digging roots, measuring and taking hundreds of readings since 1981 I have not seen anything like this. In figure 1 you can see what the common scene below ground was; in this diagram is what I measured of a corn root system at the Orthman Research Farm near Lexington, Nebraska. The water table was consistently observed at 28 to 30 inches in late July/early August as you can see in the figure with the blue horizontal lines. Corn roots spread out laterally more as the diagram depicts. The majority of the roots were in the upper 20 inches of the soil (1foot-2foot-3foot dimension denoted on left side of diagram).

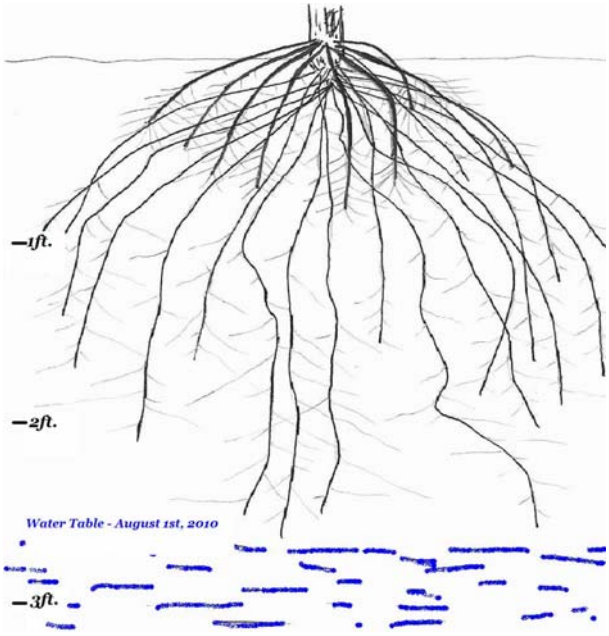

Fig. 1. Actual depiction of corn roots – Aug. 1, 2010 with water table at 28-30inches below surface.

Presently the water table has subsided to depths of 4 feet+ we are able to see with using a probe that roots have extended to depths of 42 inches and more. This year the area has received more than 26 inches of rainfall since April 15th. One may ask, how deep should roots be by the first of August? In deep to very deep soils, in mid-northern latitudes (40° to 43.75°N) of the United States we should normally see roots reaching 48 to 66 inches. In drier regions in western Nebraska, Wyoming, Eastern Colorado, Western Kansas and the northern Panhandle of Texas corn growers would observe roots 55 to 74 inches deep.

Update from the Orthman Research Farm:

To give you a picture of what has been observed this year I have a five tables on the next pages that will offer you a look at what we saw in late July in the Central Platte River Valley. We have one more set of root digs to accomplish in late September or early October. Look these over and then I will offer a summary of what we did see.

***Tables 1 & 2**. Root dimensions near Lexington, NE, 55 days after emergence, July 23, 2010*

Corn Hybrid	Tillage Practice	Root Profile Width@6"	Root Profile Width@12"	Root Profile Width@18"	Water Table Depth (in.)@55dae	Vol. 1st 85% of roots-depth	25DAE Rooting Depth (max.)	55DAE Rooting Depth (max.)	Total # Roots
Studies to Examine hybrid root strength									
Excell 54-37	NT	20	14	13	32	15	13	26	31
Excell 55-31	NT	20	22	10	32	13	14	29	33
Excell 58-57	NT	20	20	8	32	12	14	22	33
Excell 59-56	NT	20	21	12	32	13	15	26	34
Excell 54-37	ST	21	22	0	29	11	15	15	42
Excell 55-31	ST	16	19	8	29	12	14	20	42
Excell 58-57	ST	17	19	4	29	12	15	16	43
Excell 59-56	ST	12	11	4	29	10	13	16	38
DKC58-16	ST	17	15	8	32	15	18	31	43
DKC58-16	NT	18	16	8	33	14	13	30	38
Hoegemeyer 5353	ST	24	6	0	22	8	15	15	40
Hoegemeyer 5353	NT	23	3	0	24	7	16	14	41
Hoegemeyer 8042	ST	17	16	6	22	12	14	21	45
Hoegemeyer 8042	NT	20	21	9	26	11	14	19	33

Corn Hybrid	Tillage Practice	Root Profile Width@6"	Root Profile Width@12"	Root Profile Width@18"	Water Table Depth (in.)@55dae	Vol. 1st 85% of roots-depth	25DAE Rooting Depth (max.)	55DAE Rooting Depth (max.)	Total # Roots
Studies to Examine Rooting with Carbon Boost Products									
Hoegemeyer 7408 w/	ST	20	14	0	24	9	16	14	44
Hoegemeyer 7408 w/o	ST	20	13	0	23	10	13	13	39
Hoegemeyer 7041 w/	ST	21	16	0	23	10	16	14	52
Hoegemeyer 7041 w/o	ST	18	10	0	23	8	14	14	39
Hoegemeyer 7711 w/	ST	15	18	12	28	15	20	24	45
Hoegemeyer 7711 w/o	ST	20	12	3	30	13	15	23	40
Hoegemeyer 5143 w/	ST	18	20	8	30	15	21	24	40
Hoegemeyer 5143 w/o	ST	20	19	2	31	11	15	21	35

Note : Fertilizer identification - PP+CB/IF+pivot this is pre-plant N-P-K-Zn-S + Carbon Boost with liq 15-15-2 InFurrow@planting w/ follow up N thru pivotPP+IF/CB+pivot is pre-plant N-P-K-Zn-S with liq 15-15-2 InFurrow w/CarbonBoost + 32% thru pivot

Definition of Abbreviations:

NT – Direct Seeded

ST – Strip-Till

DAE – days after emergence

Carbon Boost™ -- FB Sciences product to accentuate early use of fertilizer

Root Profile Width – dimension of root side-to-side lateral root growth, between rows

Total # Roots – total number of roots on nodes 1 thru 5, below soil surface

***Table 3**: Root Studies to be Specific to Growing Degree Days in Strip-Till Environment*

Corn Hybrid	Tillage Practice	Root Profile Width@6"	Root Profile Width@12"	Root Profile Width@18"	Water Table Depth (in.)@55dae	Vol. 1st 85% of roots-depth	25DAE Rooting Depth (max.)	55DAE Rooting Depth (max.)	Total # Roots
DKC 62-54 NW-SE	ST	16	13	0	24	12	13	17	42
DKC 52-59 NW-SE	ST	16	16	4	23	14	15	19	38
DKC 55-24 NW-SE	ST	17	15	4	24	14	13	18	37
DKC 58-16 NW-SE	ST	17	15	5	26	15	13	20	42
NC+ 208-72 NW-SE	ST	19	14	0	25	11	15	16	43
NC+ 208-71 NW-SE	ST	17	14	0	22	10	15	16	46
Channel 209-77 E-W	ST	16	13	3	26	9	14	18	36
Channel 210-61 E-W	ST	19	12	8	25	12	14	19	35
Channel 214-77 E-W	ST	19	6	0	24	7	13	15	35

***Table 4**: Root Studies Specific to Pioneer Responses to Strip-Till and Fertilizer Placement*

Corn Hybrid	Tillage Practice	Root Profile Width@6"	Root Profile Width@12"	Root Profile Width@18"	Water Table Depth (in.)@55dae	Vol. 1st 85% of roots-depth	25DAE Rooting Depth (max.)	55DAE Rooting Depth (max.)	Total # Roots
Pioneer 751XR N-S	ST	22	24	5	27	10	15	22	35
Pioneer 751XR N-S	ST	24	14	6	27	12	17	23	44
Pioneer 541XR N-S	ST	23	17	4	24	9	13	20	37
Pioneer 541XR N-S	ST	20	21	9	26	12	14	23	42
Pioneer 751XR E-W	ST	20	11	2	25	11	14	17	40
Pioneer 125XR E-W	ST	21	17	3	22	11	13	18	41
Pioneer 541XR E-W	ST	20	15	0	23	12	15	18	42
Pioneer 125R E-W	ST	20	20	3	27	13	16	19	46
Pioneer 35F40 Nw-SE	ST	22	13	0	25	9	16	17	41
Pioneer 125XR Nw-Se	ST	21	15	0	24	8	14	16	40

***Table 5**: Soybeans at Orthman Research Farm-Lexington, NE – July 24, 2010*

Soybeans	Tillage Practice	Root Profile Width@6"	Root Profile Width@12"	Root Profile Width@18"	Water Table Depth (in.)@55dae	Vol. 1st 85% of roots-depth	45DAE Rooting Depth (max. in.)	*Nodule Development (numbers of/plant)*
Pioneer92MY70	NT	12	7	0	28	6	17	none
Pioneer92MY70	NT	12	6	0	28	8	16	<5
Pioneer92MY70	NT	12	8	1	27	9	21	<5
Pioneer92MY70	ST	10	10	8	28	13	20	none
Pioneer92MY70	ST	13	3	0	26	8	16	5-10
Pioneer92MY70-Chk	ST	12	8	4	26	10	18	none

Discussion and Summary:

Soybean plots*….*

First, take a look at the soybean data in Table 5. These are 2.7 maturity beans and wonderfully bushy. The beans were planted at 104 to 110K per acre in the week of May 20th. Our soybeans are on 30 inch centers. The root profile at the three depths offers you a look at how far the lateral roots developed as it was just starting to flower. Maximum rooting depth is in the column 45DAE Rooting in each of the strip-till and Direct Seeded plots that have some differences in liquid fertilizer types and location below the seed vs. timing.

In the third NT plot and first ST plot (lines 3 & 4) of table 5, we dual placed fertilizer and applied a fertilizer "In-furrow" which depicts some deeper overall rooting and more roots at the 18 inch depth. The column entitled; nodule development indicates the number of nodules I observed that are associated fixing nitrogen nodules on the near surface roots.

What does this all indicate? With all of the cool weather and rain we are seeing slowed root development. The Volume to 1st 85% column is data in these 1000ft x 16 row plots indicating that the early root profile is slightly deeper and slightly more robust in the strip-till compared to Direct seeded (NT). Later observations which have not been compiled at this writing, gives us hope in the strip-till plots because of higher per plant pod counts compared to the NT soybean plots. Observed 15 to 25% more pod numbers per plant in the strip-till (55-76 pods/plant with Strip-Till compared to 44-57 pods/plant in the NT plots).

Corn Plots…..

Secondly the corn plots; this data is found in Tables 1, 2, 3 & 4. In Table 1 the differences are small due to the water table. Every plot at 25DAE was limited significantly from growing any deeper than 15 inches no matter whether it was strip-tilled or direct seeded. When you look at the growth between the 25DAE dig compared to the 55DAE dig the growth was 0 at the poorest development to 17 inches with the best rooting development. Why? I have asked myself 101 times just that. Because corn does not like wet feet and cold soils (<50°F) the roots did extend laterally within the surface 10 inches, we saw stalled corn development and corn that looked yellow and sickly. Nitrogen was leached down just ahead of the corn development and in late July the corn seemed to jump and grow. Plants caught up, reached into the downwardly moved N materials and evened out in color and size. Ear development is all over the board, size of 14 to 18 kernel rows around; most 14 and 16 rows are our counts. Length of the ear, we cannot find a real average kernel-in-length count to report at this time at 31 to 32,300 plant population the first week of September.

Wet years are perplexing to any of us farming and doing field research. We assume to place a portion of our fertility with the strip-till implement and gain a fantastic start to the rooting profile compared to broadcast fertilization methods. With 25"+ of rain, we have clearly seen N losses and depressed growth below and above ground. Having the right approach to fertilizing in a near soil saturation level early and a prolific rainfall year is challenging to say the least. Timing the application of fertilizer, placing those products and hoping to keep it where the roots will exist in the presence of those products really do take on-the-ball management and decisions. The "heat units" have been good this season but we believe the root system was not in place to make this crop year worthy of big smiles. But I am open to pleasant surprises when we run the combine.

What we did come away with for gained perspective – fertilizer products and additives that will slow the conversion of N-sources to nitrates has a real place in the fertilizer management program. Especially in cool to colder and wetter soils I am convinced we will use these products in the future with our residues and soils remaining wet into the winter months and catching snow. The products that slow P release appear to have some worth also. Using the liquid products with slowed release N components are another management alternative for us in the Central Platte Valley of Nebraska and locations to the east.

It is a belief of what we have observed at the Orthman Farm and in numerous other locations

I offer a suggestion; as we benefit from more residues after harvest, managing fertilizer amounts, placement and fertilizer types and additives, we see definite changes in the picture of how we fertilize in high residue row crop systems. Broadcast spreading products over the top of the residues are not the wisest choice due to the lack of getting material into the rootzone of the next crop, using fertilizer efficiently, and potential to product losses. It is another suggestion to consult your Soils Extension Specialist or agronomic consultant as to how to handle fertilizing in wet years to carry your crop through the entire season. Can we afford to shoot on 35 to 50% more products when the price per ton is high when losses are very real?

We will be providing a complete rundown in October 2010 with the final root observations, watch for those.