

Studies regarding the activity of Wetsol® and other soil amendments on soil compaction, crusting/surface compaction, and soil salinity, 2007.

**D.W. Franzen
North Dakota State University, Fargo, ND**

This study was established at three locations in 2007 to investigate the activity of Wetsol®¹ and gypsum on three soils, each with a different problem. The Fargo site is a location with a high clay soil (Fargo silty clay loam; fine smectitic, frigid, Typic, Epiaquerts). This site was investigated for compaction during the growing season. The Prosper site is a location with a heavy soil (Perella, fine-silty, mixed, frigid Typic Haplaquolls) and has a reputation for crusting early in the season. The Grand Forks site has a problem with salts (Bearden silty clay loam; fine-silty, frigid Aeric Calciaquolls), and is a more medium-textured soil.

Four treatments were imposed at each of the three sites as follows-

Treatment number	Treatment description
1	Check- no additives
2	Wetsol, 1 pt/a
3	Wetsol Gro, 1 gal/a
4	Gypsum, 250 lb/a

Each experiment was designed as a randomized complete block, with four treatments and five replications. This design provides twelve degrees of freedom for the analysis of variance error term. Wetsol and Wetsol Gro treatments were applied with a bicycle spray boom fitted with nozzles suitable for application with water at a 20 gal/a total spray volume rate. Treatments were applied to the surface and were not incorporated.

Rainfall Fargo, 6/5-6/10	0.9 inches
Rainfall Prosper, 6/11-6/18	2.5 inches
Rainfall Grand Forks 6/20-7/10	0.9 inches

Individual plots were 8 feet wide and 10 feet long. The plots at Prosper and Fargo were fallow, with weeds controlled, except at the 8/29 sampling date at Fargo. The plot at Grand Forks was cropped to soybean.

Treatments were applied at Fargo 6/05; Prosper 6/11; Grand Forks 6/13.

Penetrometer readings were obtained using a Spectrum SC500 Field Scout® digital cone penetrometer that records pressures every inch in soil depth. The unit has a radar depth sensor and saves values to an internal chip that can be downloaded to a remote computer following field measurements. The values recorded are psi. Penetrometer readings were obtained at the date of application at Fargo and Prosper. Additional readings at Fargo were taken on 6/25 and 8/29. Additional readings were obtained at Prosper 6/27 and 7/27. Soil EC data was obtained at Grand Forks from twin 0-6 inch soil cores taken and composited from each plot on the application date (6/20) and repeated 7/20. Soybeans were in the third trifoliolate stage when treatments were applied.

Results

There were no differences in soil density readings at Fargo due to treatment between the 6/05 and 6/25 sampling date ([Table 1](#)). There were also no differences in soil density readings between the 6/05 and 8/29 sampling dates due to treatment ([Table 2](#)).

¹ Use of a product name does not constitute endorsement of the product by the authors.

Table 1. Penetrometer readings, Fargo, difference between readings on 6/05 and 6/25 (6/25 – 6/05).

Depth inches	Treatment				F*	P<**
	1	2	3	4		
	psi					
0	24.6	-6.0	15.4	9.4	1.24	0.34
1	59.0	33.6	46.0	34.6	0.25	0.86
2	65.2	71.6	64.2	6.0	0.06	0.98
3	24.2	33.8	14.0	22.4	0.37	0.77
4	9.0	12.2	-5.2	16.6	1.31	0.32
5	7.0	3.2	-8.0	7.0	0.69	0.58
6	2.8	-3.0	-7.0	14.8	1.27	0.33
7	3.8	-15.4	-4.0	8.0	1.26	0.33
8	6.0	-20.2	-8.0	-3.2	2.26	0.13
9	-2.0	-25.2	-16.2	7.2	0.91	0.46
10	8.0	-23.4	9.4	0.2	0.56	0.65
11	5.0	-31.4	2.2	1.0	0.64	0.60
12	6.0	-29.4	3.0	5.0	0.72	0.56

* F values are the result of division of treatment sum of squares by ANOVA mean squares.

**P is the probability of an incorrect finding that treatments are different.

The accepted P value where treatments are said to be significantly different is 0.05.

Table 2. Penetrometer readings, Fargo, difference between readings on 6/05 and 8/29 (8/29 – 6/05).

Depth inches	Treatment				F	P<
	1	2	3	4		
	psi					
0	1.8	16.4	20.6	9.4	0.85	0.49
1	13.4	52.2	61.2	35.8	1.10	0.39
2	99.6	91.6	128.2	101.6	0.36	0.78
3	151.6	92.8	136.2	132.2	0.54	0.67
4	171.8	129.2	179.8	170.0	0.37	0.78
5	186.4	173.2	209.6	145.6	0.23	0.88
6	160.6	154.6	195.4	161.6	0.10	0.96
7	145.4	145.4	202.4	148.6	0.25	0.86
8	127.2	116.8	167.8	155.2	0.26	0.85
9	115.0	95.8	153.6	171.8	0.54	0.67
10	110.8	78.2	164.0	145.4	0.80	0.52
11	100.8	73.2	142.6	119.8	0.63	0.61
12	98.6	82.2	133.4	135.4	0.70	0.57

At Prosper, the penetrometer readings were lower for the Wetsol, Wetsol green and gypsum treatments than the check ([Table 3](#)). This suggests that perhaps these additives might help surface crusting at least for a couple weeks during seedling emergence. At the 7/27 date, the gypsum treatment was superior to the other treatments at the 2-inch depth in reducing penetrometer readings ([Table 4](#)).

Table 3. Penetrometer readings, Prosper, difference between readings on 6/11 and 6/27 (6/27 – 6/05).

Depth inches	Treatment				F	P<
	1	2	3	4		
	psi					
0	79.4	73.4	57.2	32.0	0.28	0.84
1	222.0	100.0	90.0	93.0	2.88	0.08*
2	191.0	112.0	153.0	90.0	1.69	0.22
3	91.0	62.0	92.0	62.0	1.60	0.24
4	59.0	48.0	58.0	42.0	0.25	0.86
5	47.0	26.0	47.0	19.0	1.08	0.39
6	18.4	9.2	46.0	9.2	1.34	0.31
7	20.4	1.4	40.6	10.2	1.06	0.40
8	16.4	12.2	36.4	8.2	1.00	0.42
9	20.4	11.8	20.4	1.0	0.47	0.71
10	19.4	19.2	14.4	-1.2	0.53	0.67
11	29.6	20.4	1.0	-0.2	1.49	0.27
12	34.6	13.2	6.6	-6.2	1.40	0.29

* Treatments 2, 3 and 4 are less than the check, P<10%. Bold type indicates depth at which treatment differences were recorded.

Table 4. Penetrometer readings, Prosper, difference between readings on 6/11 and 7/27 (7/27 – 6/11).

Depth inches	Treatment				F	P<
	1	2	3	4		
	psi					
0	3.0	43.8	7.4	4.0	1.27	0.33
1	19.4	69.2	36.6	31.8	1.37	0.30
2	47.0	76.0	70.0	30.0	2.99	0.07*
3	39.0	78.0	68.0	87.0	0.45	0.72
4	14.0	66.0	50.0	66.0	1.31	0.32
5	11.0	52.0	43.0	50.0	0.72	0.56
6	18.0	32.0	37.0	47.0	0.45	0.72
7	26.0	27.0	38.0	29.0	0.17	0.92
8	21.0	12.0	24.0	19.0	0.12	0.94
9	16.4	3.0	15.2	12.2	0.17	0.91
10	16.6	13.2	3.0	8.2	0.19	0.90
11	16.4	12.2	-13.4	12.4	1.38	0.30
12	3.2	-9.4	-4.8	-24.2	0.52	0.67

*Treatment 4 is lower in penetrometer difference P<10%. Bold type indicates depth at which treatment differences were recorded.

At Grand Forks, soil EC analysis at the 0-6 inch depth showed no differences between treatments between the initial soil sampling and the later season sampling ([Table 5](#)).

Table 5. Soil EC differences due to treatment, Grand Forks, ND.

Treatment	EC1	EC2	Differences in EC, mmho/cm
1	0.49	0.52	0.03
2	0.48	0.54	0.06
3	0.50	0.57	0.07
4	0.53	0.62	0.09

F = 0.40
P < 0.75, non significant

Summary-

Three studies were conducted in 2007 to examine the effect of Wetsol, Wetsol Gro and gypsum on soil compaction, soil crusting and soil salinity in soils where those properties have been suspected of being found. At Fargo, the treatments had no effect on soil density as measured by a soil penetrometer. At Prosper, where crusting is often a problem, the Wetsol, Wetsol Gro, and gypsum treatments reduced penetrometer readings at the 1 inch depth, suggesting that the treatments might reduce crusting. The gypsum treatment extended the lower penetrometer readings into the July measurement date. At Grand Forks, in an area of a field where salinity can be a problem, there was no reduction in soil EC due to treatment. The positive results at Prosper cannot be represented as an endorsement of possible use in problem crusting soils; however, the results form a foundation for addition research that might consist of repeating the procedures used in 2007 and a sugarbeet emergence study on these soils with these amendments.

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