EXTENDING KNOWLEDGE ›› CHANGING LIVES

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Controlled Drainage: One more tool to increase crop production

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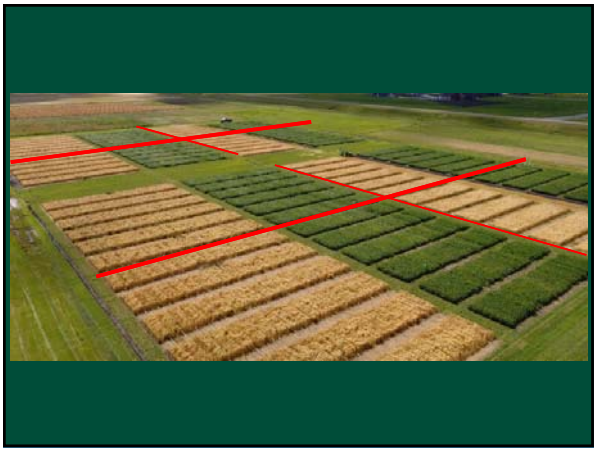
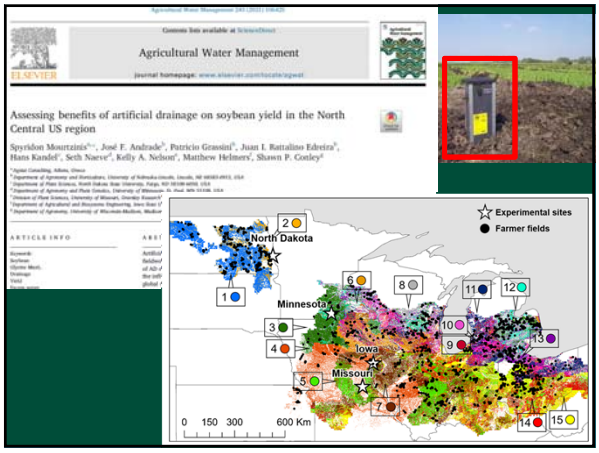
Research Location NW 22, Fargo

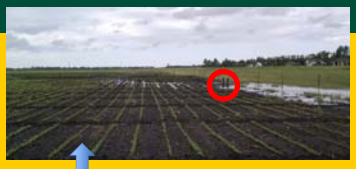




Conclusions

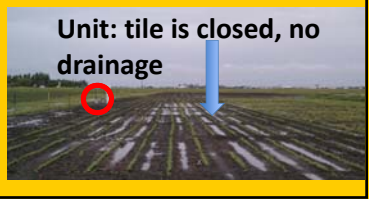
- Analysis of experimental and producer survey data revealed a 4 to 8% benefit of subsurface drainage in soybean yield in environments of the NC-US region.
- Part of the yield benefit is likely driven by earlier sowing as a result of water management adoption.

Water management structures



Unit: Tile is removing water

Unit: tile is closed, no drainage



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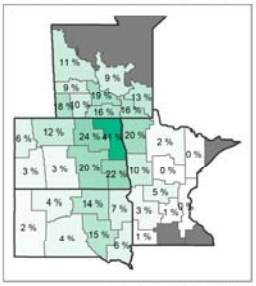
Soil samples with salinity above 1.0 dS/m (1:1) in 2021



1 dS/m = 1 mmho/cm

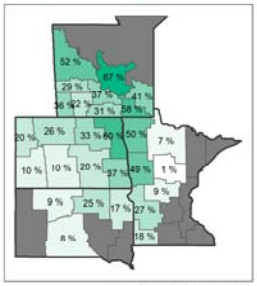
Percent of samples (0-6 inch)

40
30
20
10
0

Data not shown where n< 100
AGVISE Laboratories, Inc.

AGVISE LABORATORIES

Soil samples with high soybean iron deficiency chlorosis risk in 2021



Percent of samples (0-6 inch)

60
40
20

Data not shown where n< 100
AGVISE Laboratories, Inc.

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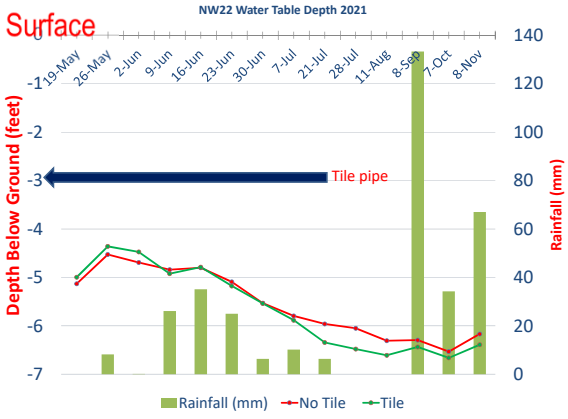
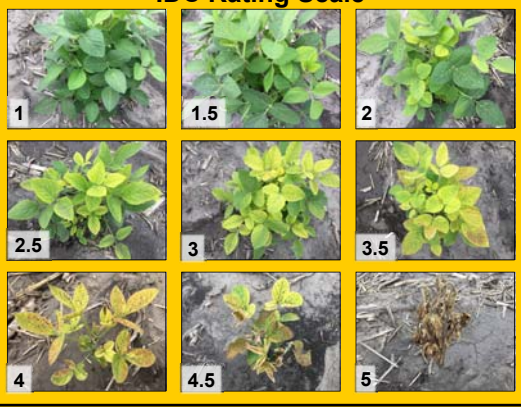
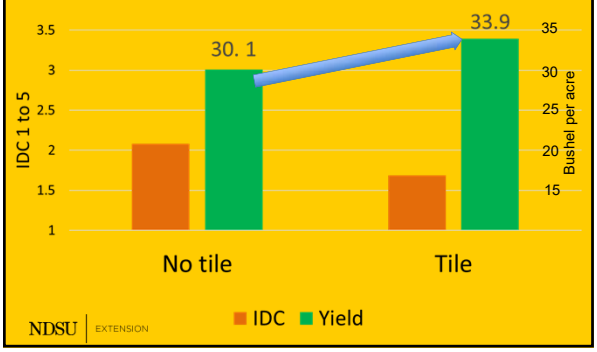
Surface



IDC Rating Scale



Average Soybean IDC score and yield 4 trials, NW22 2021



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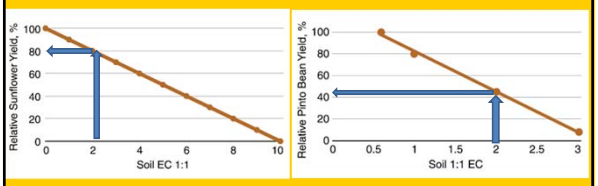
Sunflower and dry bean yield and salinity



Sunflower

Dry bean

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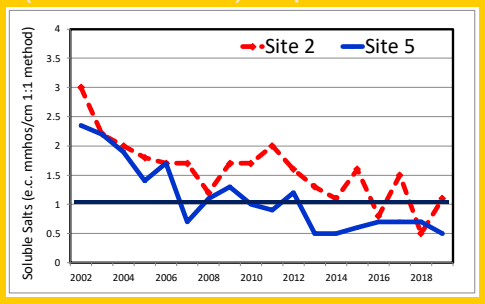
Salinity Trend of Two Sites Tile Drained Field (2002 – 2019) Topsoil



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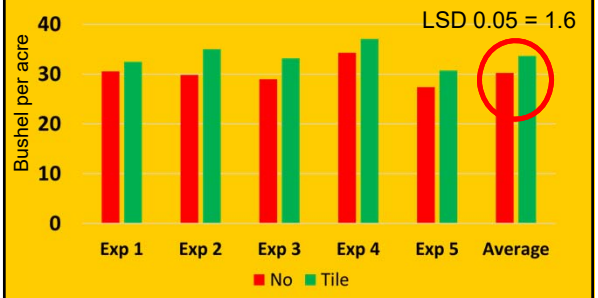
Soybean yields of 5 trials conducted at NW 22, 2021



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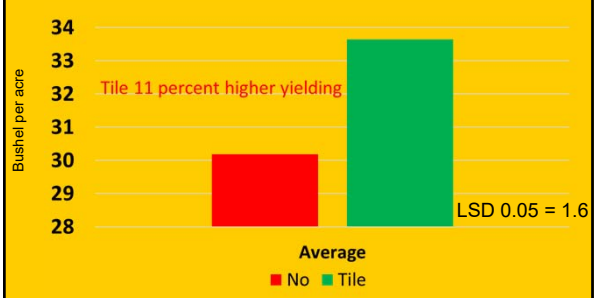
Soybean yields of 5 trials conducted at NW 22, 2021



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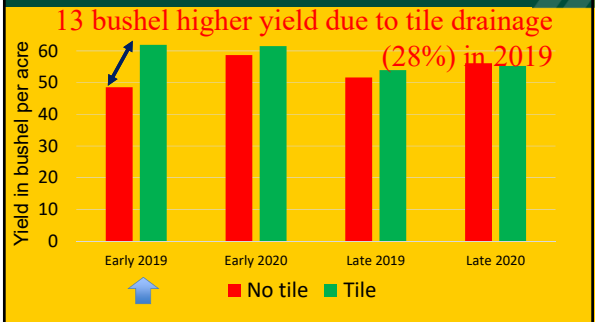
Planting as early as possible and two weeks later



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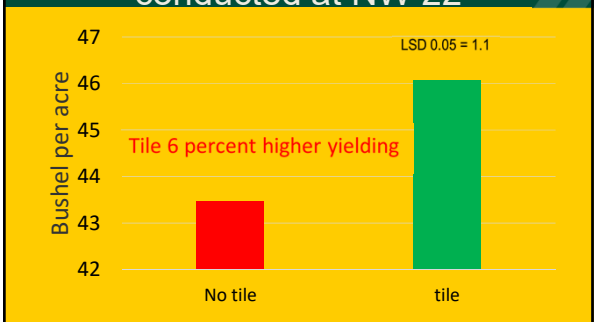
Soybean yields of 31 trials conducted at NW 22



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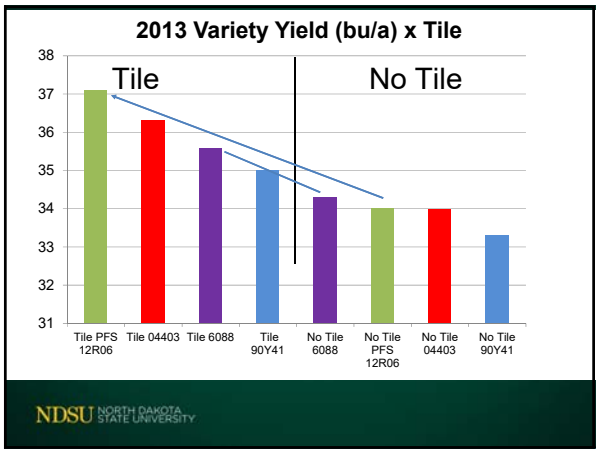
2013 Variety Yield (bu/a) x Tile
Tile
No Tile
38
37
36
35
34
33
32
31
Tile PFS 12R06
Tile 04403
Tile 6088
Tile 90Y41
No Tile 6088
No Tile PFS 12R06
No Tile 04403
No Tile 90Y41
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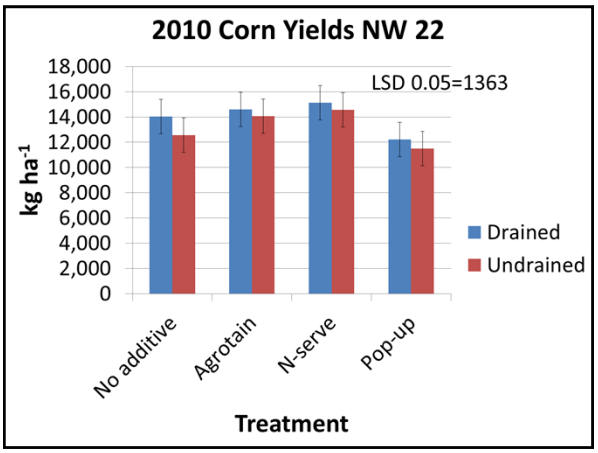
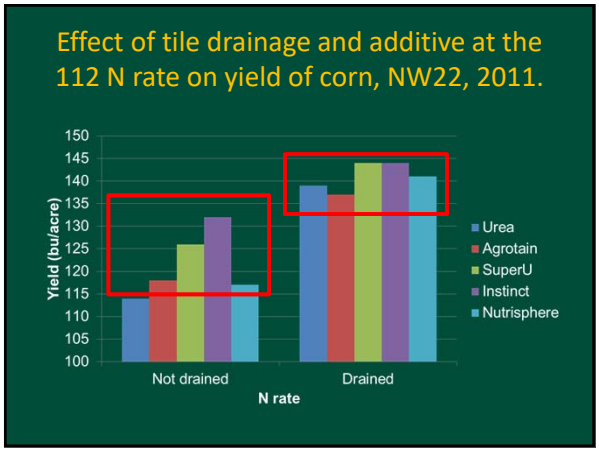
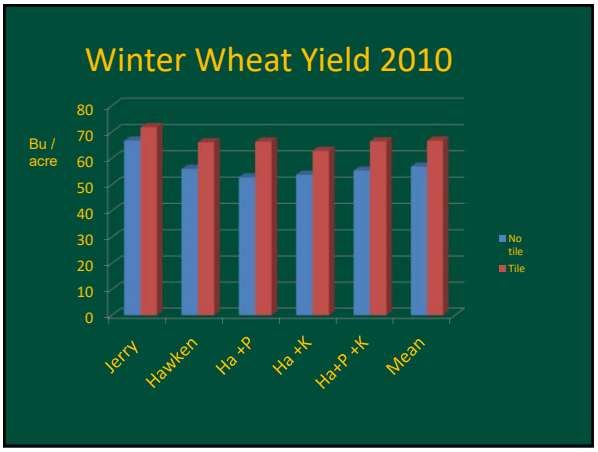
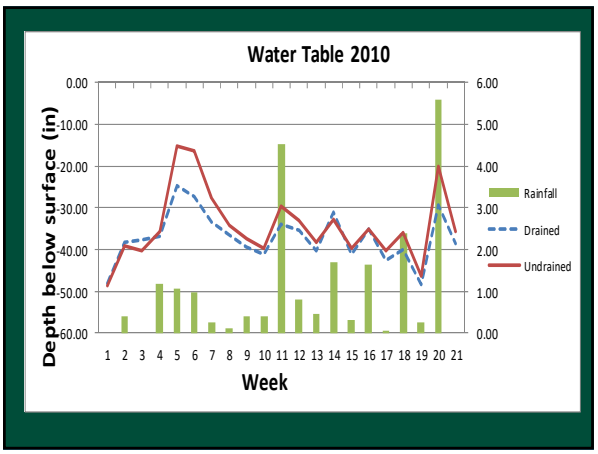
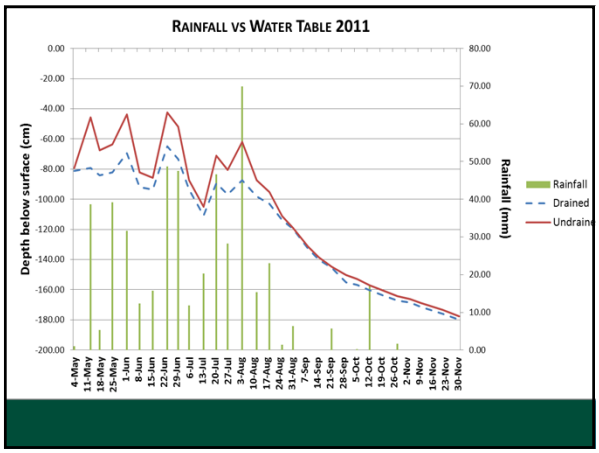
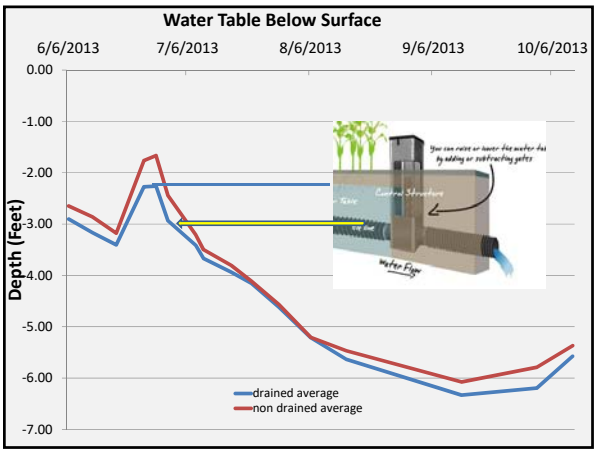

2010 Corn Yields NW 22
LSD 0.05=1363
kg ha-1
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
Drained
Undrained
No additive
Agrotain
N-serve
Pop-up
Treatment


Effect of tile drainage and additive at the 112 N rate on yield of corn, NW22, 2011.
Yield (bu/acre)
150
145
140
135
130
125
120
115
110
105
100
Urea
Agrotain
SuperU
Instinct
Nutrisphere
Not drained
Drained
N rate

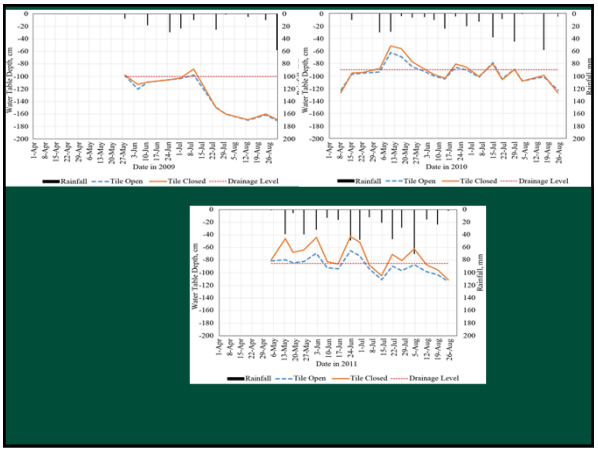

Winter Wheat Yield 2010
Bu / acre
80
70
60
50
40
30
20
10
0
No tile
Tile
Jerry
Hawken
Ha +P
Ha +K
Ha+P +K
Mean


Water Table 2010
Depth below surface (in)
0.00
10.00
20.00
30.00
40.00
50.00
60.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Rainfall
Drained
Undrained
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Week





Spring Wheat Study 2009-2011



Spring wheat yield

Manage-ment	2009	2010	2011	2009-2011
	----------Bushel acre^{-1} -------			
Limited management	67.0a	61.8a	35.4a	54.8b
Best water management	69.9a	62.7a	37.6a	56.7a

Soybean Productivity on Raised Seedbeds

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Soybean Productivity on Raised Seedbeds

How Raised Beds and Fe-Chelate Affect Soybean Iron Deficiency Chlorosis and Yield

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Abstract

Water-logging and the inability to take up sufficient iron (Fe), causing iron deficiency chlorosis (IDC) in soybean (*Glycine max*; L. Merr.), can be major yield reducing factors in certain soils in the northern USA and Manitoba, Canada, soybean growing regions. The objective of this research was to evaluate soybean IDC, biomass production, and yield with seeding on raised beds and seed application of the Fe-chelate compound ortho-ortho-Fe-EDDHA. In six environments, soybean were seeded on raised beds and conventionally prepared seedbeds (flat) and with a factorial arrangement of five cultivars (within adapted maturity group 0.1 to 0.9 and variable IDC tolerance) and seed applied Fe-EDDHA using rates of 0 kg·ha^{-1} and 3.36 kg·ha^{-1}. There were no significant interactions between the factors tested. The plant population was 27% higher on the raised beds compared with flat, and yield was 6.3% higher (2893 kg·ha^{-1} vs. 2722 kg·ha^{-1}). Total dry plant biomass on raised beds was

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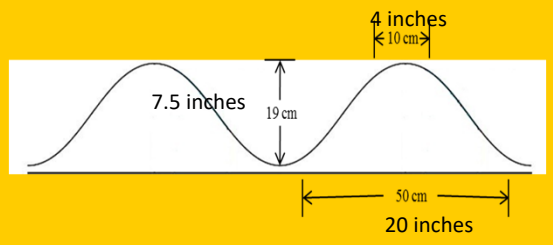
Ridge or raised seedbed



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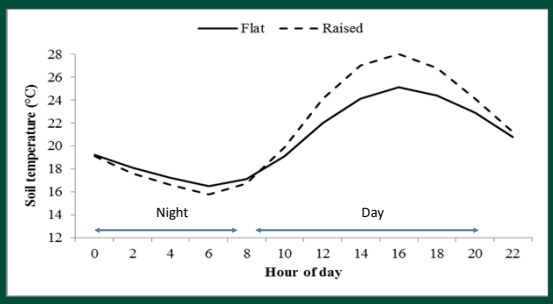
Hourly soil temperature for flat and raised seedbeds at Hitterdal, MN, in 2012.



Soybean Productivity on Raised Seedbeds

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Soybean Stand, Vigor and Yield

Tillage	Stand	Vigor	Yield 13-14
	Plant/acre	(1-9) [9= best]	Bu/acre
Flat	105,650b	4.4b	40.4b
Raised bed	134,050a	5.9a	43.0a

6.4 percent higher yield

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Cadillac water management water harvesting and control drainage

Picture taken after approximately 2.5" of rainfall near Barnesville, MN. Water can be seen standing in the furrows between the raised seedbeds.

Five State Managed vs Open Tile

State	% Yield Crop Increase
Ohio	4.9
Indiana	1.4
Illinois	1.3
Iowa	0.3
Minnesota	-0.5
All	1.3

Advantages sub-surface management

- Higher yields resulting from subsurface drainage will increase a producer's APH, providing benefit in future years

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External Benefits $

- N retained per rainfall event
- Value added by increased organic matter
- Possibility to leave more residue
- Less blowing soil
- Reduced cleaning of ditches
- More efficient use of equipment for seed bed prep, seeding, harvesting

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External Benefits $

- Timely application of herbicides, fungicides, etc
- Better crop quality
- Harvest efficiency
- Less "hassle"
- Less compaction

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Long term investment

- Land value will increase
- Land rental rate will increase

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Additional cost

- Fertilizer?
- Hauling
- Drying
- Storage
- Cost of maintenance on the drain

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