

# Precision Farming - Growing to Remain Leaders in Sugar



## Agenda:

- Variable Rate Seeding Project
- Plant Pattern Spacing (Diamond Study)
- Effect of Wind on Seed Placement
- eSet Precision Planter Study
- JD i-Guide™ System
- Down Force Control – 20/20 Airforce
- Capstan Spray Drift Control System
- Truck Weight Monitor
- Ditches, Shelterbelts and Headlands
- Tile Drainage

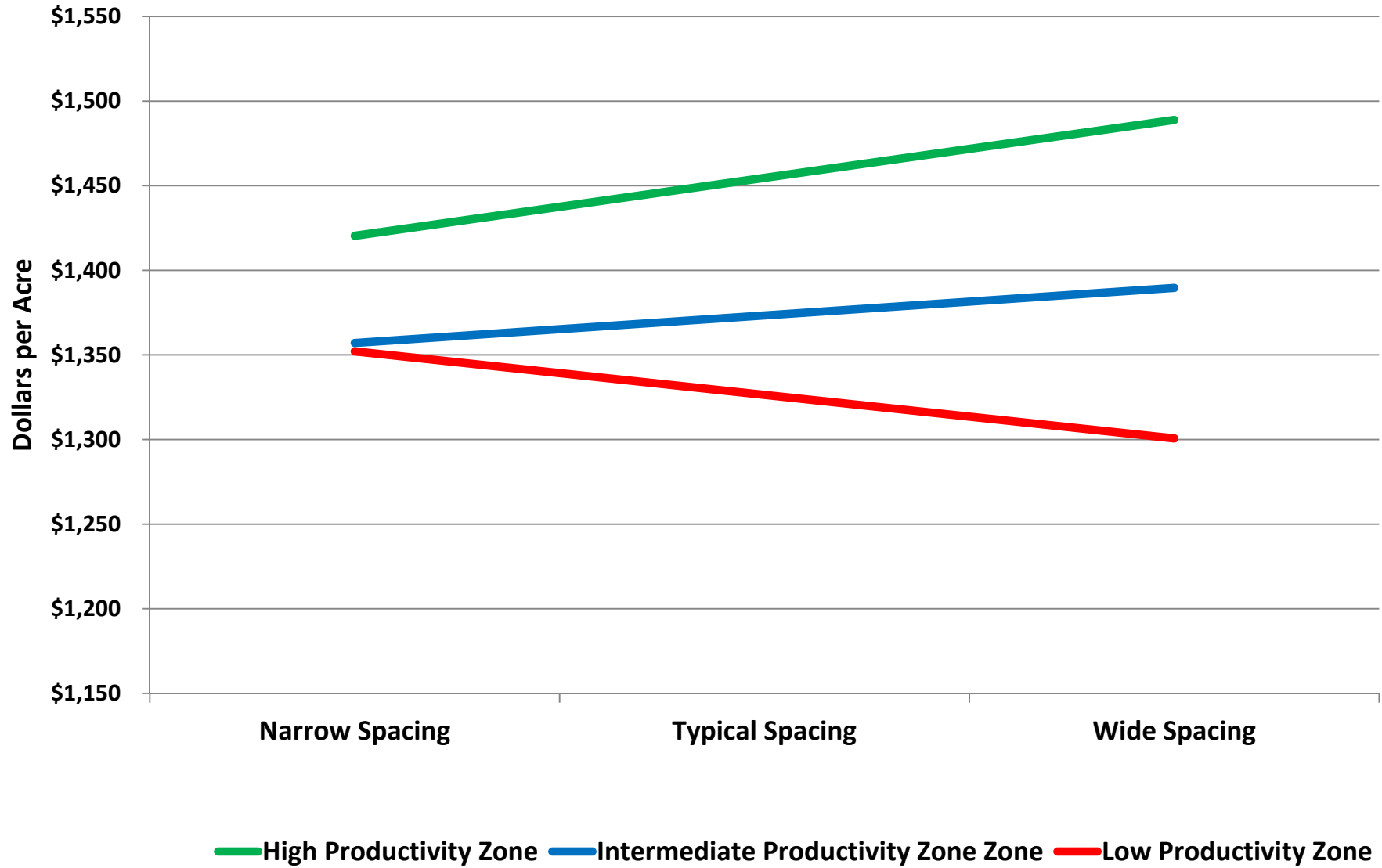
# Effect of Variable Rate Seeding on Sugarbeet Production

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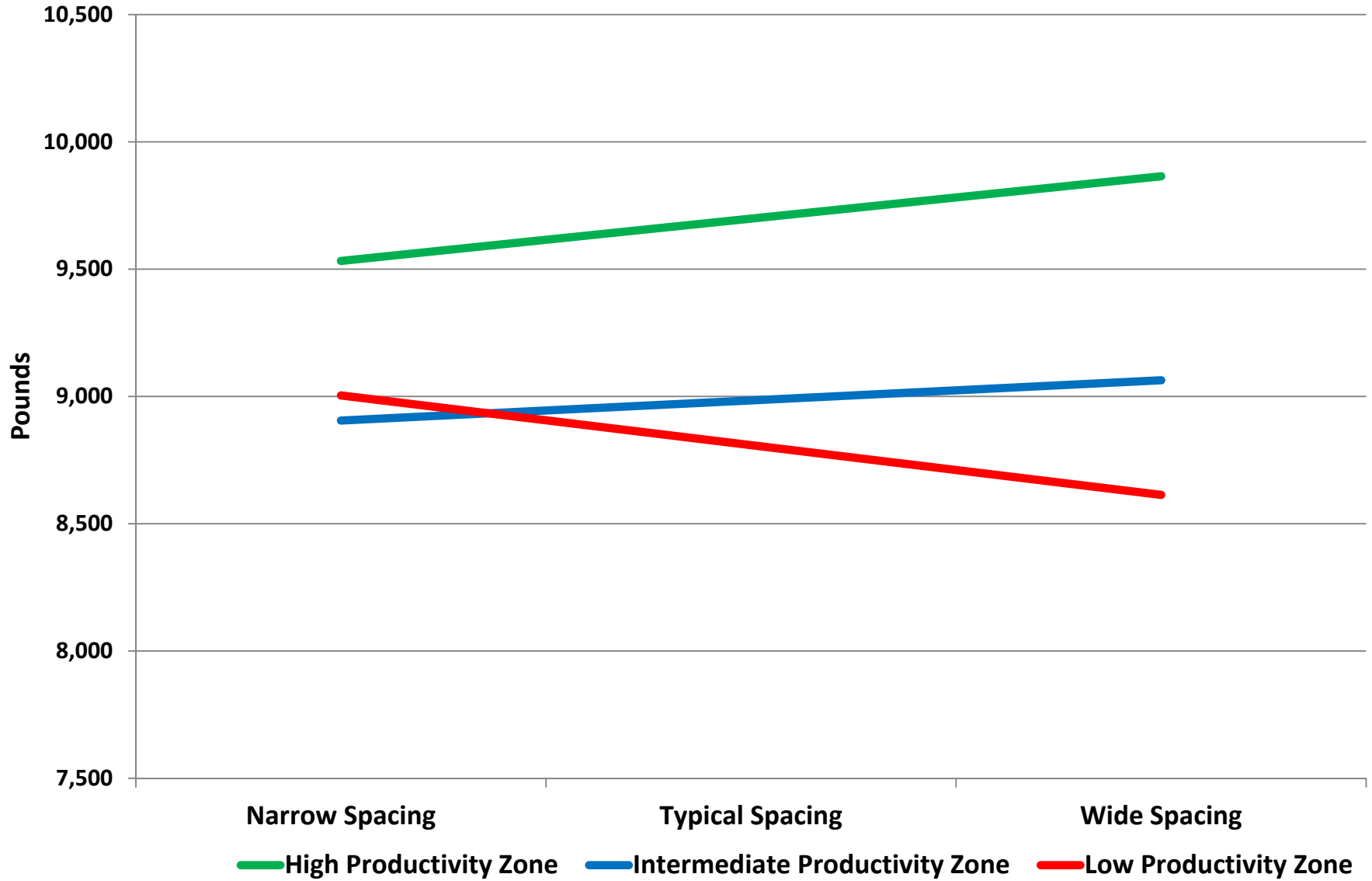
# Introduction & Objectives

- Establishing optimum plant populations...a critical factor for optimizing sugarbeet yield & quality
- Objective study conducted at 6 locations in 2008-2010 was to determine optimum plant populations for different management zones in commercial fields
- Optimum seed spacing trends for high, intermediate, and low productivity zones were observed for different management zones

### 3-Year Average Revenue Per Acre Trend (2008-2010) MHD & CRK



### 3-Year Average Recoverable Sugar per Acre Trend (2008-2010) MHD & CRK



### 3-Year Average Recoverable Sugar per Ton Trend (2008-2010) MHD & CRK



# 2010 Variable Rate Seeding Trial – HLB District

Green Zones = Hills  
Yellow Zones = Mid Slopes (Flat)  
Red Zones = Depressions

Treatment	RST	RSA	Rev/Acre
3.5G	329	9598	\$1,557
4.5G	331	9442	\$1,543
5.5G	322	9467	\$1,505
3.5 I	337	9543	\$1,584
4.5 I	337	9195	\$1,525
5.5 I	336	9537	\$1,578
3.5D	323	9082	\$1,450
4.5D	318	8040	\$1,264
5.5D	325	9366	\$1,475

\*Revenue Based on 2010 Crop Nov Payment Forecast



# Conclusions – Seed Spacing

Optimum seed spacing determined based on this study for productivity zones:

(Yellow)		
<u>High(Green)</u>	<u>Intermediate</u>	<u>Low(Red)</u>
4.9"-5.5"	4.3"-4.6"	3.5"-3.9"

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Optimum ranges for plant populations based on this study:  
(Plants per Acre)

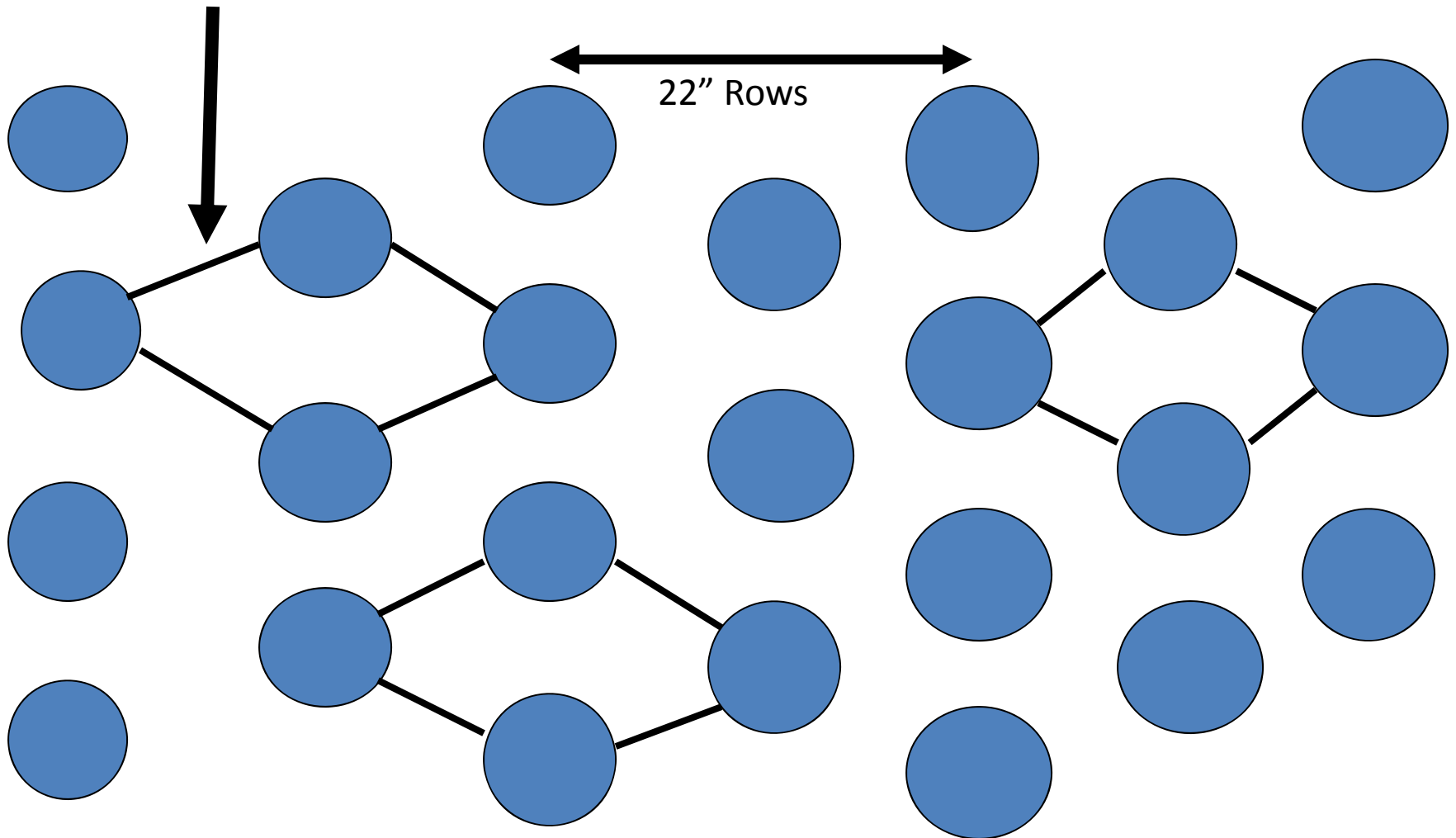
(Yellow)		
<u>High(Green)</u>	<u>Intermediate</u>	<u>Low(Red)</u>
35-42,000	42-47,000	47-55,000

# Conclusions

- Selecting the right seed spacing increased RSA:
  - 156 - 1,415 lbs. for high production zones
  - 325 - 737 lbs. for intermediate production zones
  - 103 - 1,326 lbs. for low production zones
- Harvest losses were greatest for higher plant populations required for maximizing yields in low productivity zones

# Effect of Plant Pattern Spacing in the Field on Sugarbeet Yield & Quality

- Diamond Pattern Example:



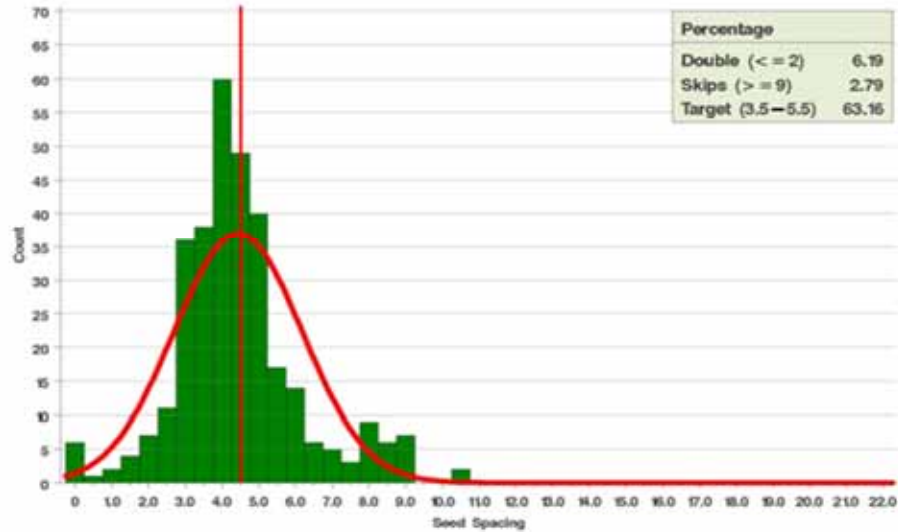
# Effect of Plant Pattern Spacing in the Field on Sugarbeet Yield & Quality

- After three years of trials...no consistent benefit to diamond pattern vs. planting to stand
- Equipment cost to plant diamond pattern could be excessive
- Beets tend to compensate well for skips & doubles
- Weed control: RR varieties better able to compensate erratic emergence, skips, and doubles than conventional varieties
- Smith & Cattanach reported limited benefit from completely uniform beet stands “Uniform vs. Variable in-row Spacing of Sugarbeet” 1989

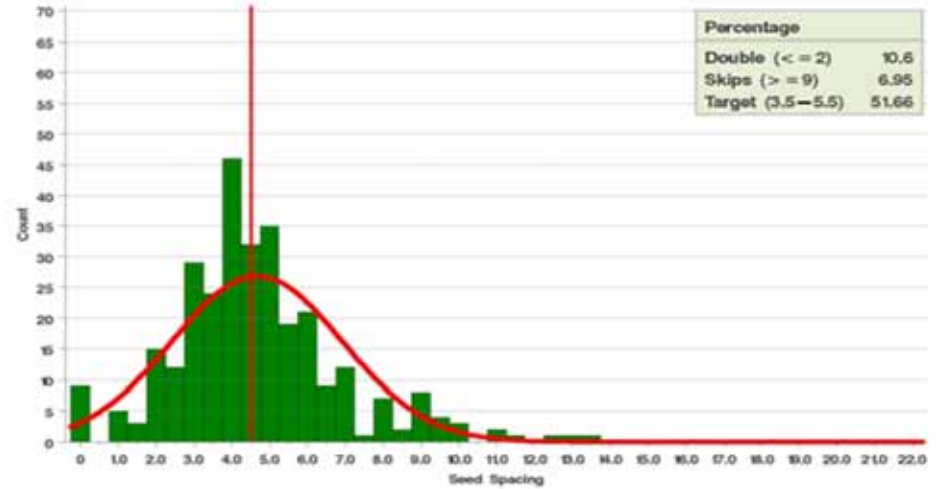
# Effect of Wind on Seed Placement in the Field – 3 Year Summary

- Larger seed effected less by higher than optimum wind
- Against wind - less negative impact on accuracy
- Wind shields benefit planting in windy conditions
- Wind shields provide more benefit traveling with wind
- Wind shields benefit smaller seed sizes
- Greatest benefit of shields...granular insecticides
- Wind shields benefit at-plant pre-emerge/banded herbicides

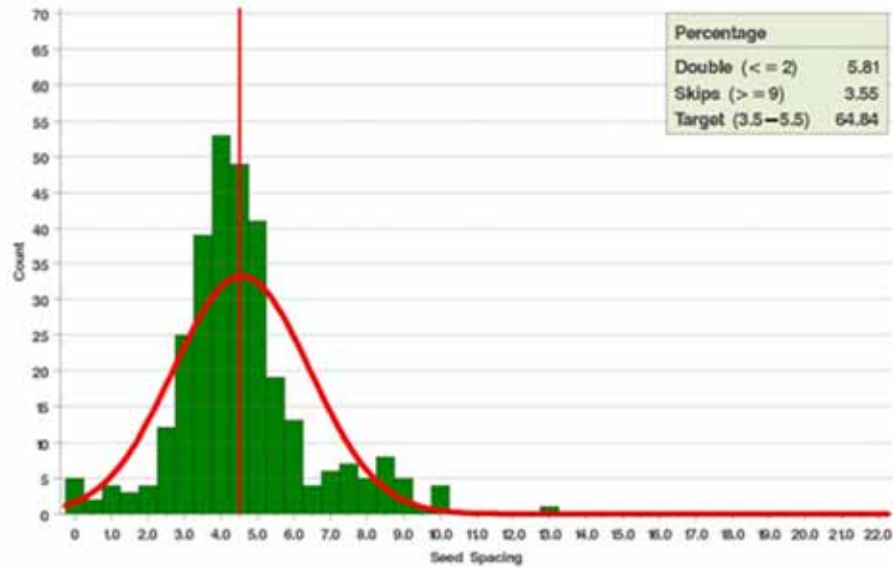
#14 — No Wind (Normal Planter Setup) — Xtreme  
2010 Crop



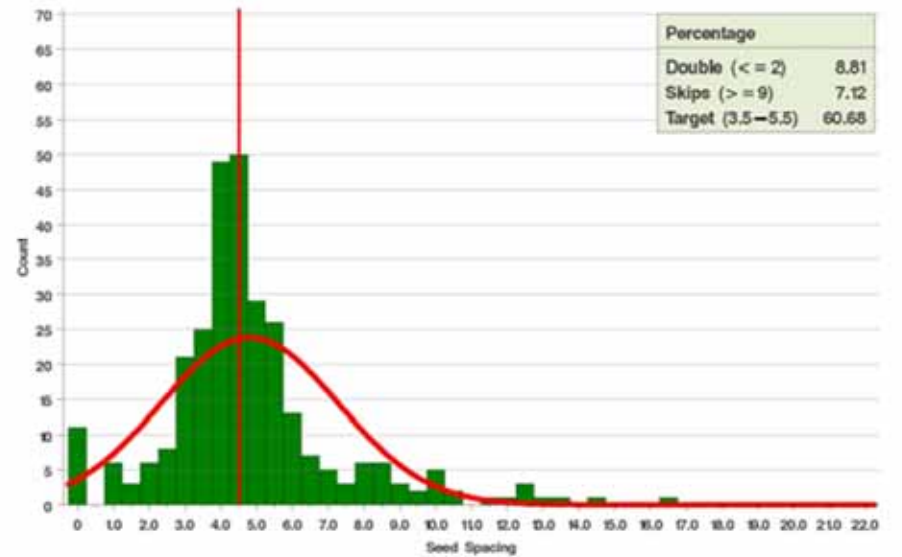
#2 — Plant w/Wind No/Wind Shield — Xtreme  
Wind: S/28 mph, Gusts to 39  
2010 Crop



#4 — Plant Against/Wind No/Wind Shield — Xtreme  
Wind: S/28 mph, Gusts to 39  
2010 Crop



#6 — Plant w/Wind w/Wind Shield — Xtreme  
Wind: S/28 mph, Gusts to 39  
2010 Crop



# Effect of Wind on Seed Placement in the Field – 3 Year Summary

- 20+ mph wind; significant negative impact on accuracy
- 20+ mph wind; negative impact on spacing even with shields
- Planting in wind speeds of 25+ mph cannot be recommended unless imminent rainfall may delay planting for significant period of time
- Planting with wind gusts 30+ mph; never advised
- Winds perpendicular to direction of planter travel reduced impact on seed spacing
- High wind planting causes erratic seed spacing; improper defoliation; higher SLM ; lower % sugar

# eSet Precision Planting System

- Growers very pleased with eSet systems uniform spacing in corn
- eSet sold mainly out of Hillsboro District
- Concerns:
  - Is this a profitable investment?
  - Seed grinding with Seed treatments (Poncho & Tach)
  - Recommended vacuum settings: 12 to 15 inches
  - Grinding coupled with high vacuum seems to cause doubles & triples





# eSet Evaluation

- eSet setup seldom performed better than standard JD configuration for spacing, yield or quality
- Seed grinding remains a problem
- Cost of eSet equipment cannot be justified based on NDSU evaluations in '09 and '10

# John Deere i-Guide™ System



2 Receiver Domes Used

# John Deere i-Guide™ System

- Automatically guides implement onto guidance line
- No steering components on the implement
- Tractor compensates for implement inaccuracies
- Implement on guidance line...tractor may not be
- Great application for planter, defoliator, or lifter
- [www.deere.com/servlet/com.deere.u90785.productcatalog.view.servlets.ProdCatProduct?tM=FR&pNr=0503\\_PC](http://www.deere.com/servlet/com.deere.u90785.productcatalog.view.servlets.ProdCatProduct?tM=FR&pNr=0503_PC)

# Row-unit Down Force

- Pneumatic down force systems available as factory-installed option on all JD planters & as field conversion bundle for all MaxEmerge™ XP, MaxEmerge Plus, & MaxEmerge 2 planters
- Gauge and/or display indicates how much down force the system is providing
- Down force is constant at all times during operation



# Row-unit Down Force

- John Deere developed down force assembly; measures amount of down pressure applied by planter units
- Measurements are sent to the Seedstar™ XP monitoring system
- Too little down force...V-opener will not penetrate soil, too much down force...side wall compaction (both result in poor stands)
- Will help minimize planter seed depth variation & maximize stand establishment

# Row-unit Down Force

“The down force sensor assembly is assembled with the gauge wheel depth adjustment handle and provides gauge wheel pressure information...”



See your local John Deere dealer for additional information about pneumatic down force and the down force sensor assembly



# 20/20 AirForce Control™

- Individually controls down force for each row
- Measures & adjusts down force as you travel across varying field conditions
- Standard JD system allows one constant down force setting



- <http://www.precisionplanting.com/Products/20-20-AirForce/How.aspx>

# Hydraulic Row-unit Down Force

- The Rfx™ system gives you in-cab, digital control over your planter row unit's down-pressure
- Allows you to instantaneously adjust your down-pressure as field conditions change
- Mounts directly to the JD pneumatic down-pressure cradle



[http://www.dawnequipment.com/FluidFX\\_select.html](http://www.dawnequipment.com/FluidFX_select.html)



# Capstan Ag Systems Inc. Sharpshooter®

- Available as after-market installation
- SharpShooter® is automatic "tip changer"
- Advances spray technology for sprayer performance
- Controls pressure independent of speed / rate

# Capstan Ag Systems Inc. Sharpshooter®

## Instant Boom On and Off Boom Tip Control:

SharpShooter controls the “ON” and “OFF” spraying function RIGHT AT THE TIP. Shut off is instantaneous.

The flow and pressure are retained in the boom at the tips so when the boom is turned “ON” there is instantaneous flow at the proper pressure.



# Capstan Ag Systems Inc. Sharpshooter® On-Demand Drift Control



- Utilizes drift reduction tips
- Provides “On-Demand” drift control
- Operator dials control to lower pressure
- Lower pressure provides bigger droplets; fewer drift-able fines
- Application rate & speed are maintained independent of pressure change
- Once drift concern is past, operator dials pressure back to original setting
- [www.capstanag.com/agchem\\_full.php?SharpShooter-for-AG-2](http://www.capstanag.com/agchem_full.php?SharpShooter-for-AG-2)

# Drift Control Summary...

Why consider this technology?

- no crop revenue loss
- no litigation
- no field abandonment or quarantines
- good neighbor relationships

# Truck Weight Monitoring System

- Monitor collection system
- Bogie wheels on boom mounted on load cells
- Speed sensor mounted on shaft collar, calculates weight (lbs./sec)
- Junction box collects and sends data to display



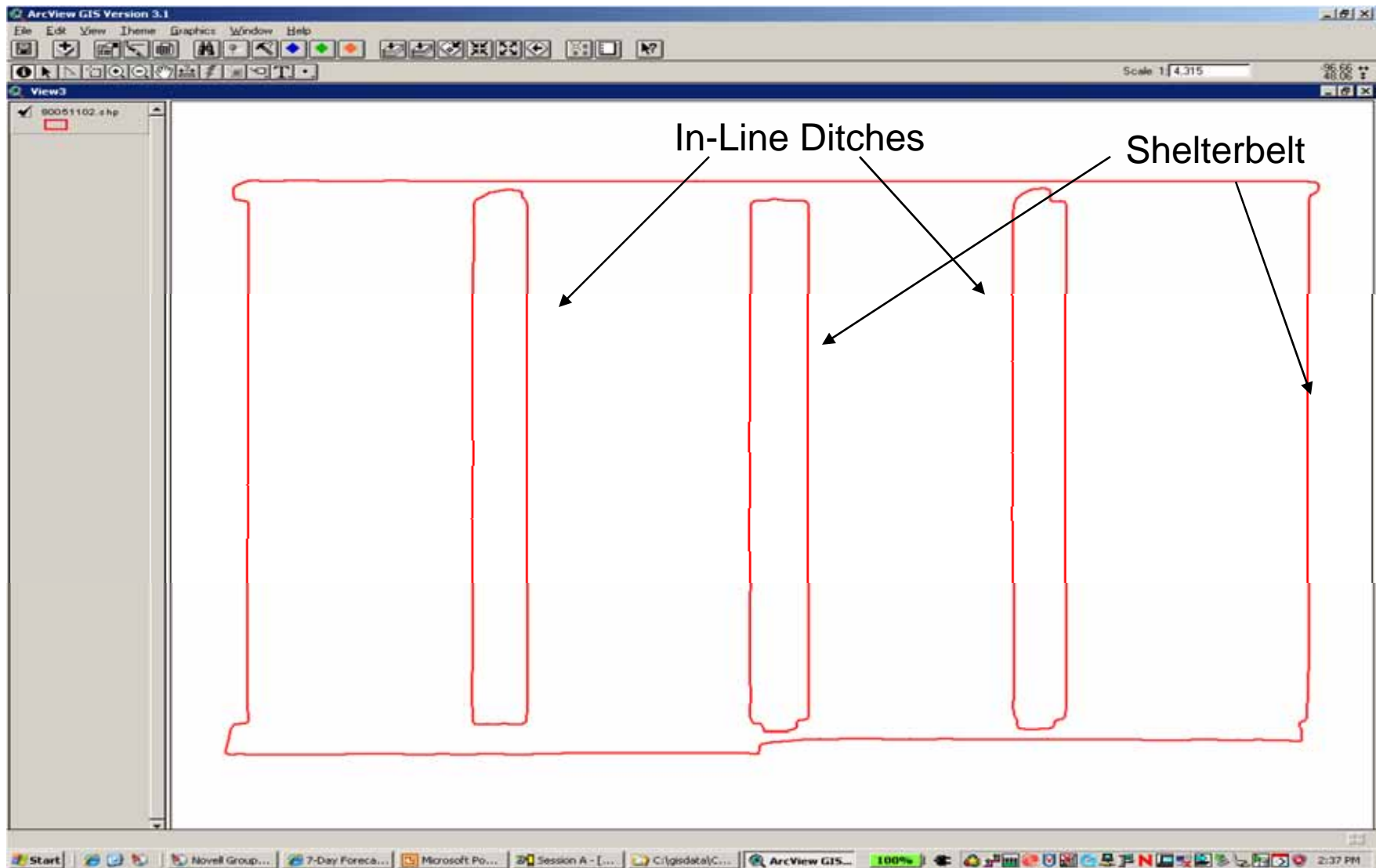
# Yield Monitor / Truck Weight Monitoring System

- Potential Uses:
  - Yield monitoring in field
  - Maximizing truck load weight
  - Reduce potential for DOT overweight fines
  - Reduce damage to highway surface
- Compensates load size by:
  - Root density fluctuation
  - % tare fluctuation
  - Soil type variations

[www.geektechforag.com/Products/BYM/Beet\\_Yield\\_Monitor.aspx](http://www.geektechforag.com/Products/BYM/Beet_Yield_Monitor.aspx)



# Let's Consider a Fairly Common Field Boundary...at Planting Time



# Consider a 152 Acre Quarter With...

- 2 in-line ditches (33 feet wide each by  $\frac{1}{2}$  mile long) = 4 acres
  - 2 shelterbelts (33 feet wide by  $\frac{1}{2}$  mile long) = 4 acres
  - 2 headlands (48 rows on each end = 176 feet by  $\frac{1}{2}$  mile wide) = 10.7 acres
- Total                      18.7 acres
- 18.7 acres / 152 acres = 12 %



## Let's Consider...

- Estimate that these acres (12%) produce only 50% of their yield potential
- This is the same as saying 6% of these acres produce 0% of their potential
- Of the 100% of the sugarbeet acreage planted for this field  $(100\% - 6\%) = 94\%$

# Let's Consider...

- The maximum potential for this field, BEFORE the beets are planted, is 94%
- If the yield potential is 30 tpa without shelter belts, ditches or headlands, then with these structures, it is 28.2 tpa
- In this example, 1.8 tpa loss on 152 acres totals 273.6 tons. At \$57 per ton, the cost for planting these poorer producing areas is \$15,600
- The decision to maximize production on a piece of land like this begins at planting with the person running the planter

# Tile Drainage



# Tiling Benefits

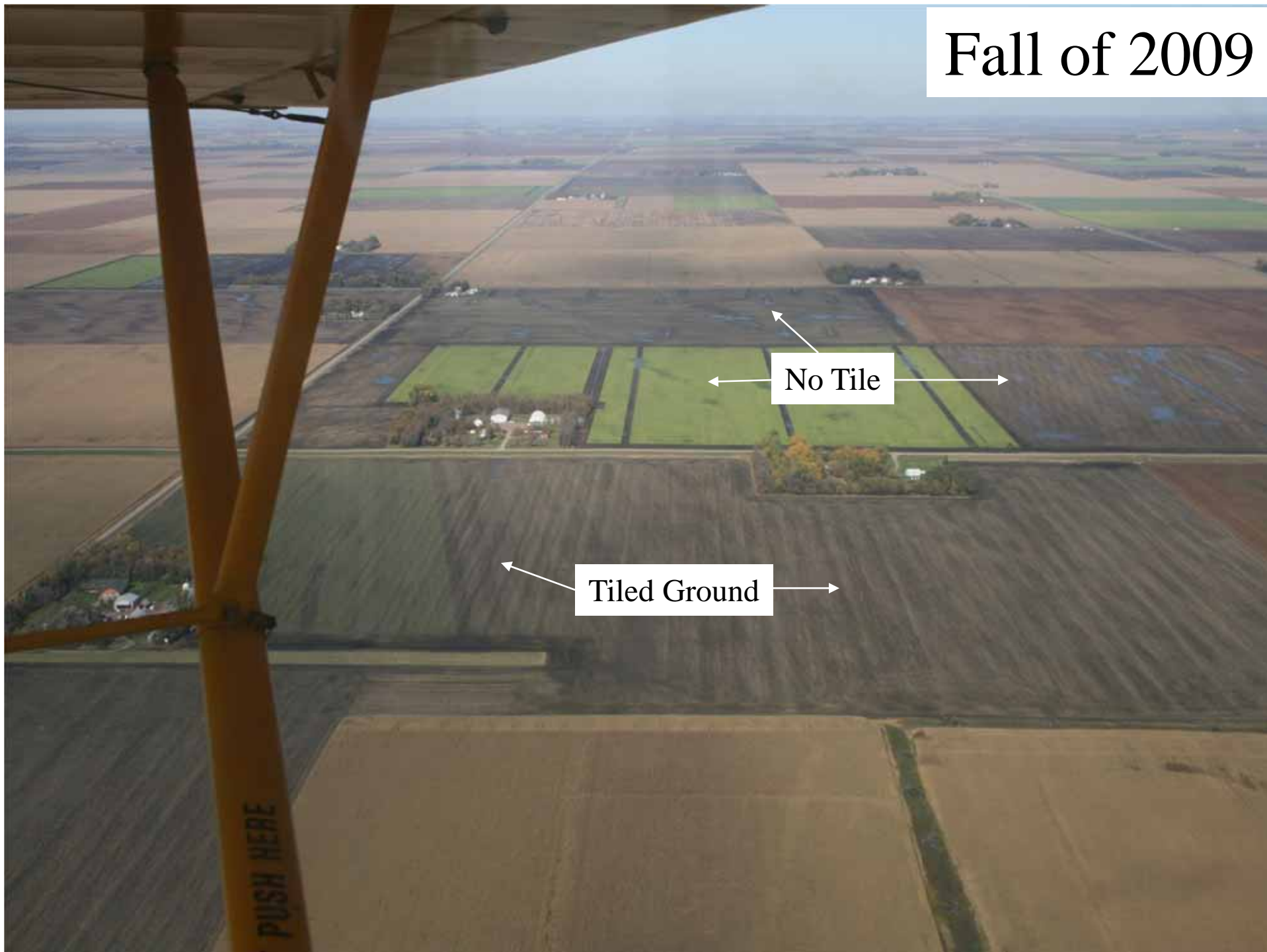
- Yield Benefits - All Crops
  - Earlier planting
  - Increased stand establishment
  - Reduced soil compaction
- Cost Benefits - All Crops
  - Reduced wear & tear on equipment
  - Less wheel slippage and horsepower needed
  - Consistent production...stable inputs

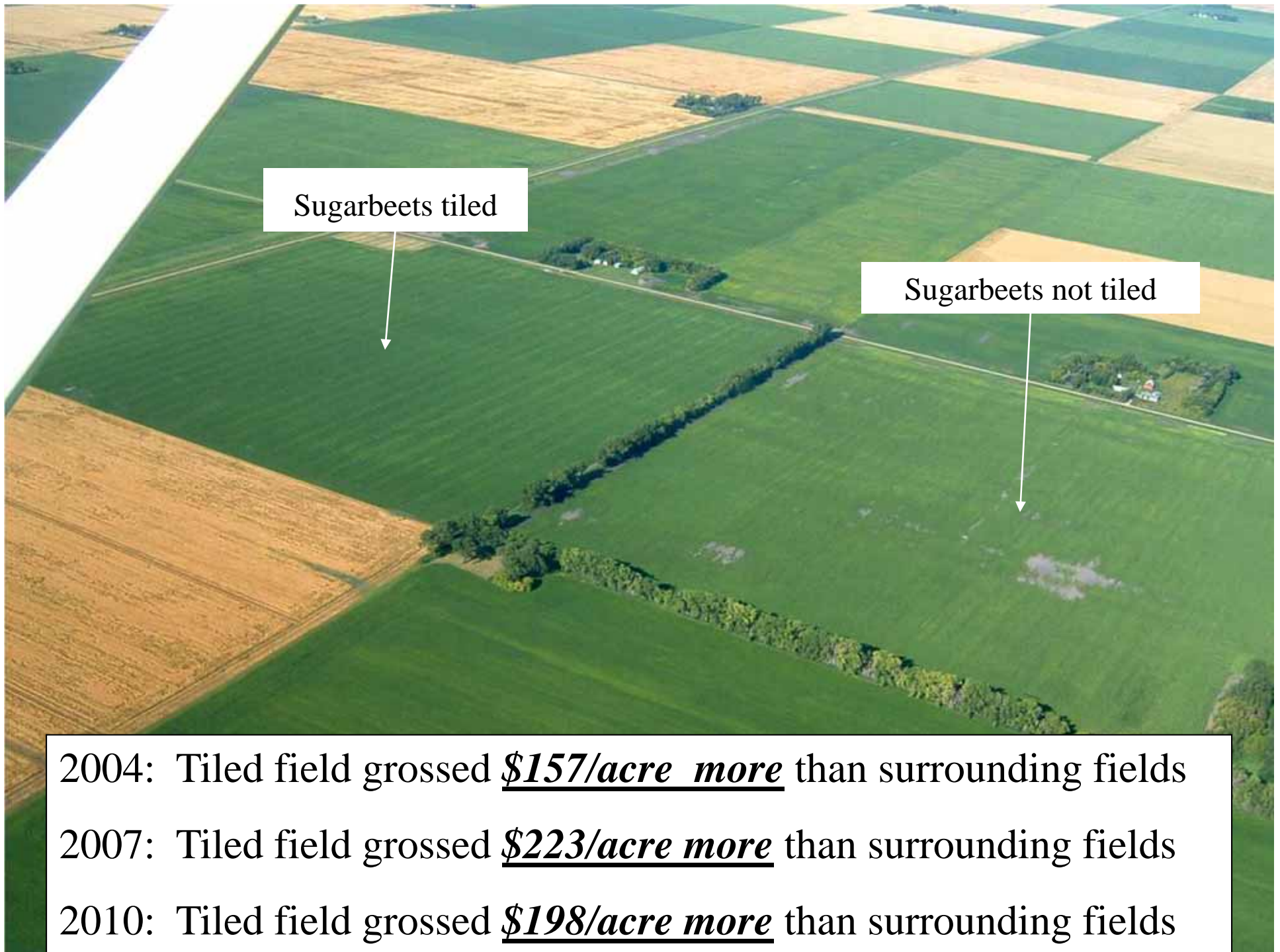
Fall of 2009





Fall of 2009





Sugarbeets tilled

Sugarbeets not tilled

2004: Tiled field grossed **\$157/acre more** than surrounding fields  
2007: Tiled field grossed **\$223/acre more** than surrounding fields  
2010: Tiled field grossed **\$198/acre more** than surrounding fields

# Take Home Message

- Variable Rate Seeding has increased RSA within production zones
- Diamond study has shown no consistent benefit to sugarbeet profitability
- Planting perpendicular to the wind reduces negative impacts on seed spacing
- Cost of sugarbeet eSet system cannot be justified based on NDSU evaluations
- Tile Drainage can increase sugarbeet profitability by up to \$200/acre



# Questions

