2018 Eastern Crop and Pest Management School

# Soybean Production Issues

www.ag.ndsu.edu/CarringtonREC/

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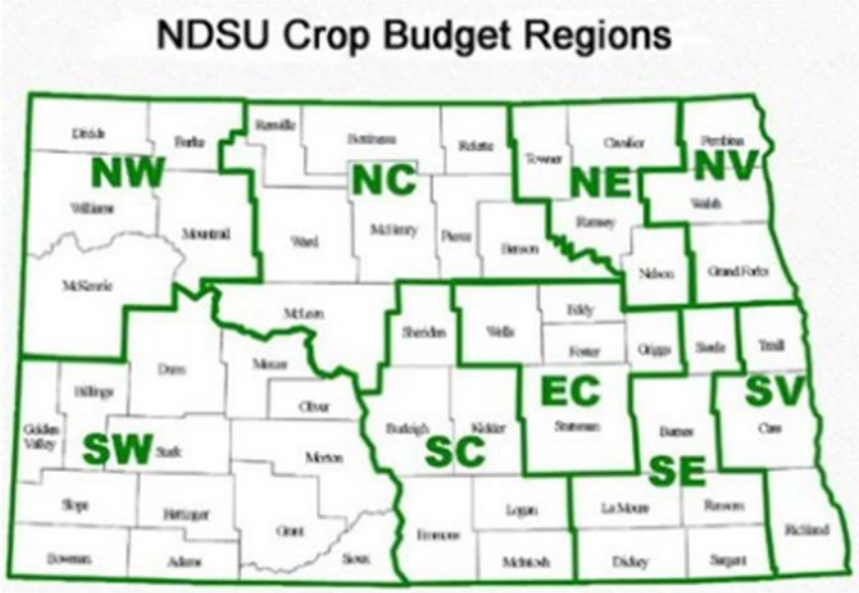
# South Valley ND crop budgets, 2018

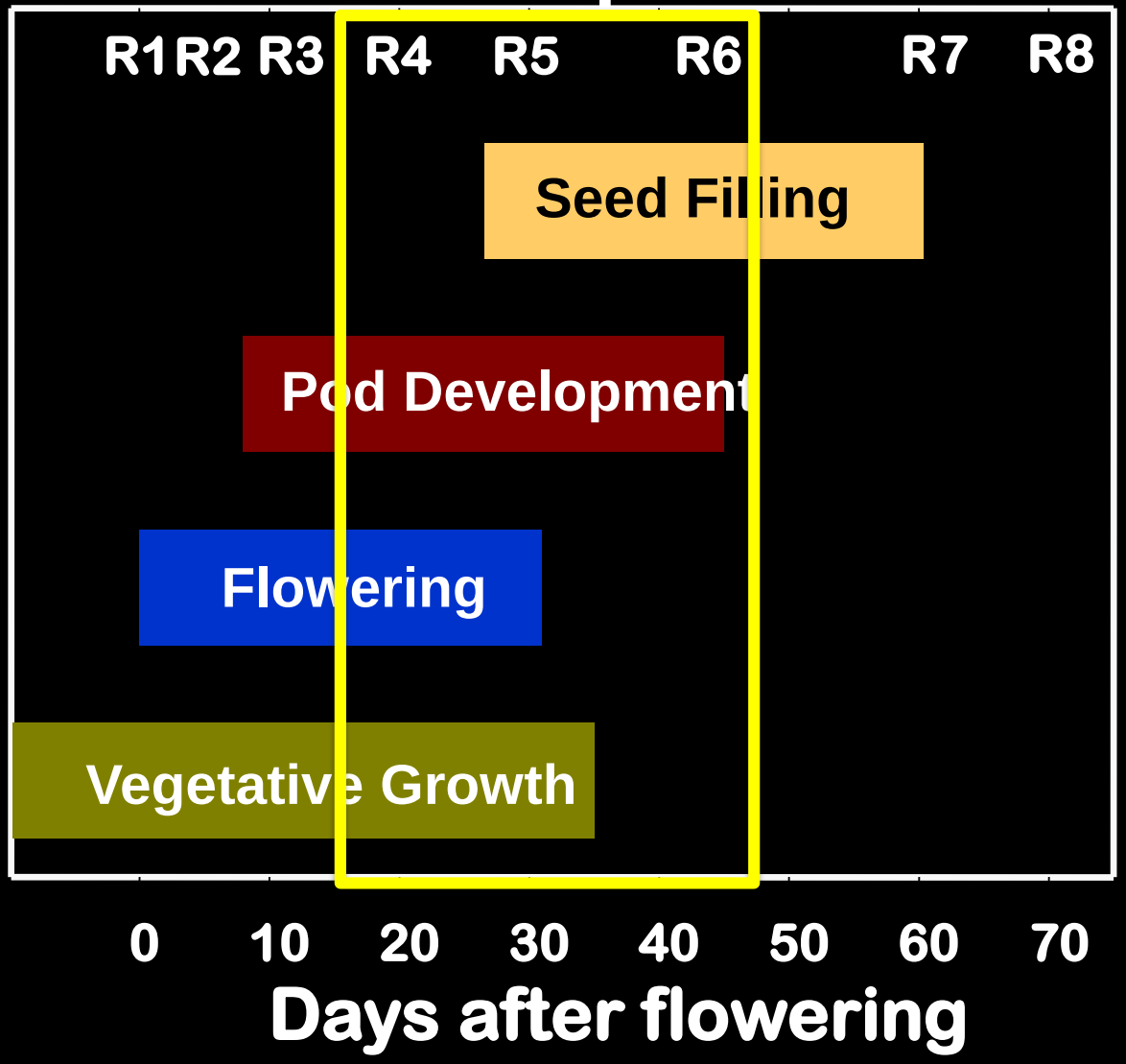



## Soybeans

| | Per Acre | Your Figures |
|---|---|---|
| Market Yield | 38 | |
| Market Price | 8.97 | |
| MARKET INCOME | 340.86 | |
| DIRECT COSTS | | |
| -Seed | 65.75* | |
| -Herbicides | 28.00 | |
| -Fungicides | 0.00 | |
| -Insecticides | 4.00** | |
| -Fertilizer | 2.96 | |
| -Crop Insurance | 10.20 | |
| -Fuel & Lubrication | 13.39 | |
| -Repairs | 19.20 | |
| -Drying | 0.00 | |
| -Miscellaneous | 1.50 | |
| -Operating Interest | 3.70 | |
| SUM OF LISTED DIRECT COSTS | 148.71 | |
| INDIRECT (FIXED) COSTS | | |
| -Misc. Overhead | 8.33 | |
| -Machinery Depreciation | 22.59 | |
| -Machinery Investment | 13.15 | |
| -Land Charge | 124.00 | |
| SUM OF LISTED INDIRECT COSTS | 168.07 | |
| SUM OF ALL LISTED COSTS | 316.78 | |
| RETURN TO LABOR & MANAGEMENT | 24.08 | |
| LISTED COSTS PER BUDGET UNIT | (bu) | |
| -Direct Costs | 3.91 | |
| -Indirect Costs | 4.42 | |
| -Total Costs | 8.34 | |

- Start with high yield potential
  - **Variety selection**
  - **Plant establishment and nutrition**
- Protect yield potential
  - Manage weeds, disease and insects

# Soybean Reproductive Development



# Main Factors in Variety Selection

- **Yield**
- Maturity
- Disease
  - Root rot and SCN
- Herbicide tolerance or conventional
- **Iron Chlorosis**
- Specialty markets

A843-17

# North Dakota Soybean Variety Trial Results for 2017 and Selection Guide

Hans Kandel, Ted Helms and Sam Markell (NDSU Main Station); Mike Ostlie, Blaine Schatz, Greg Endres, Ezra Aberle, Tim Indergaard, Cassidy VandeHoven, Steve Zwinger and Steve Schaubert (Carrington Research Extension Center); Kelly Cooper, Leonard Besemann and Heidi Eslinger (Oakes Irrigation Site); Eric Eriksmoen and Joe Effertz (North Central Research Extension Center, Minot); Bryan Hanson, Travis Hakanson and Lawrence Henry (Langdon Research Extension Center); John Rickertsen (Hettinger Research Extension Center); Jerry Bergman, Gautam Pradhan, Emma Link, Austin Link, Tyler Tjelde and Justin Jacobs (Williston Research Extension Center)

We thank all producer cooperators for contributing their time, labor, land and other material to the 2017 soybean yield trial program in the central and southern Red River Valley and other off-station sites.

Research specialists and technicians helped with the field work and data compilation. Several secretaries assisted with this document by typing information. A special thank you goes to Lisa Johnson, Extension Plant Sciences, for assisting in the compilation of this publication.

**List of Tables**



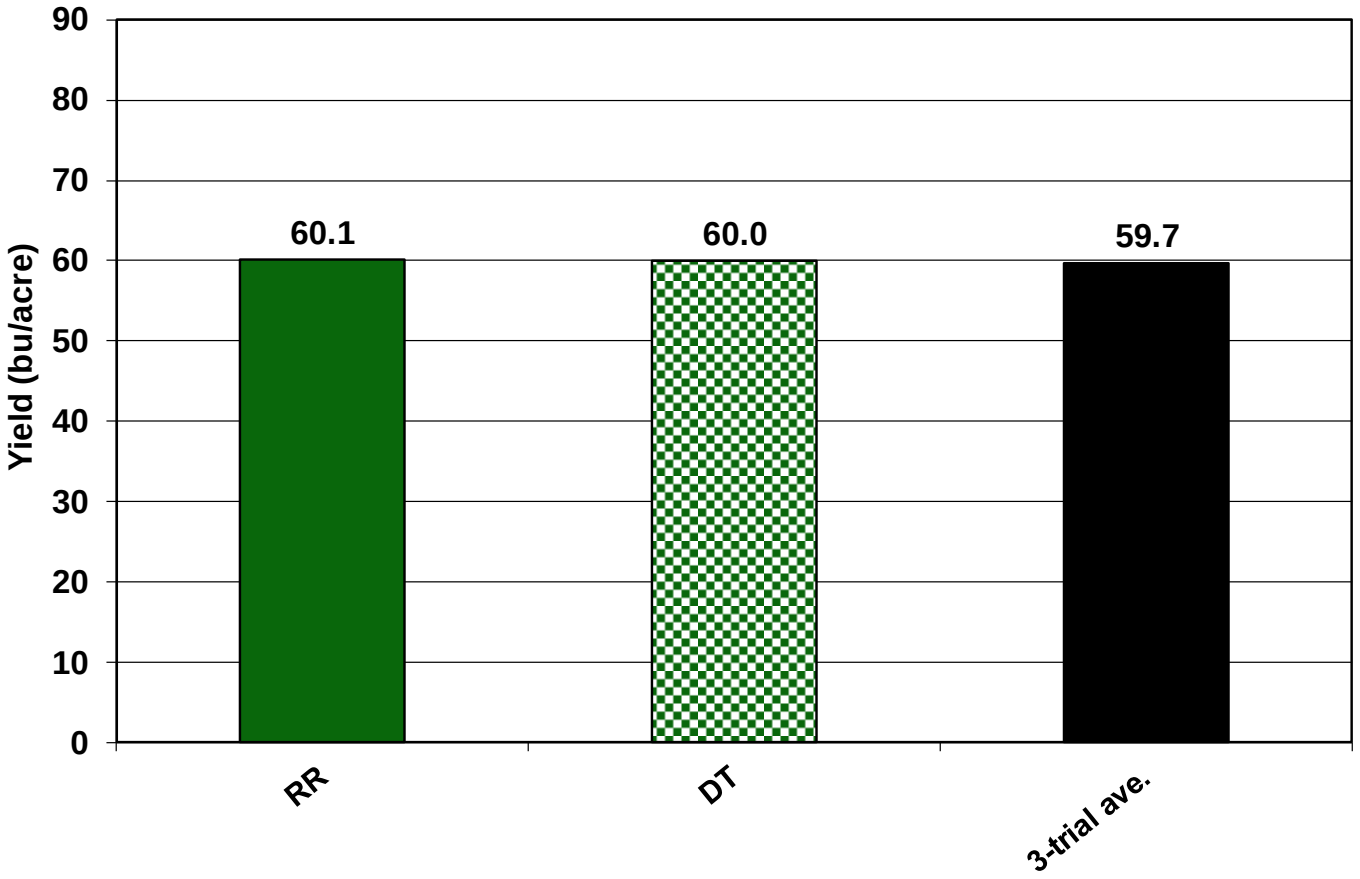
NDSU EXTENSION SERVICE
NDSU NORTH DAKOTA AGRICULTURAL EXPERIMENT STATION
Fargo, North Dakota

December 2017

# RR and Xtend soybean variety trial results, central RRV locations, 2017

| Arthur and Grandin | |
|---|---|
| Varieties | 48 |
| Companies | 15 |
| Seed yield (bu/A) | |
| average | 49.6 |
| **range** | **40.1-57.6** |

# Yield of RR versus RR/DT soybean varieties*, Carrington dry and irr, and Dazey, 2017




*Variety number: RR=58; RR/DT=70

# Iron Deficiency Chlorosis (IDC)

Symptoms occur usually in the newest leaves formed. The leaf looks yellow and the veins in the leaf stay green.

# Soil characteristics for IDC

- Carbonates
  - pH > 7 normally contain measurable carbonates
- IDC more severe when soils are:
  - wet and cool
  - soluble salts are high
  - soil N is high

# IDC Remedies

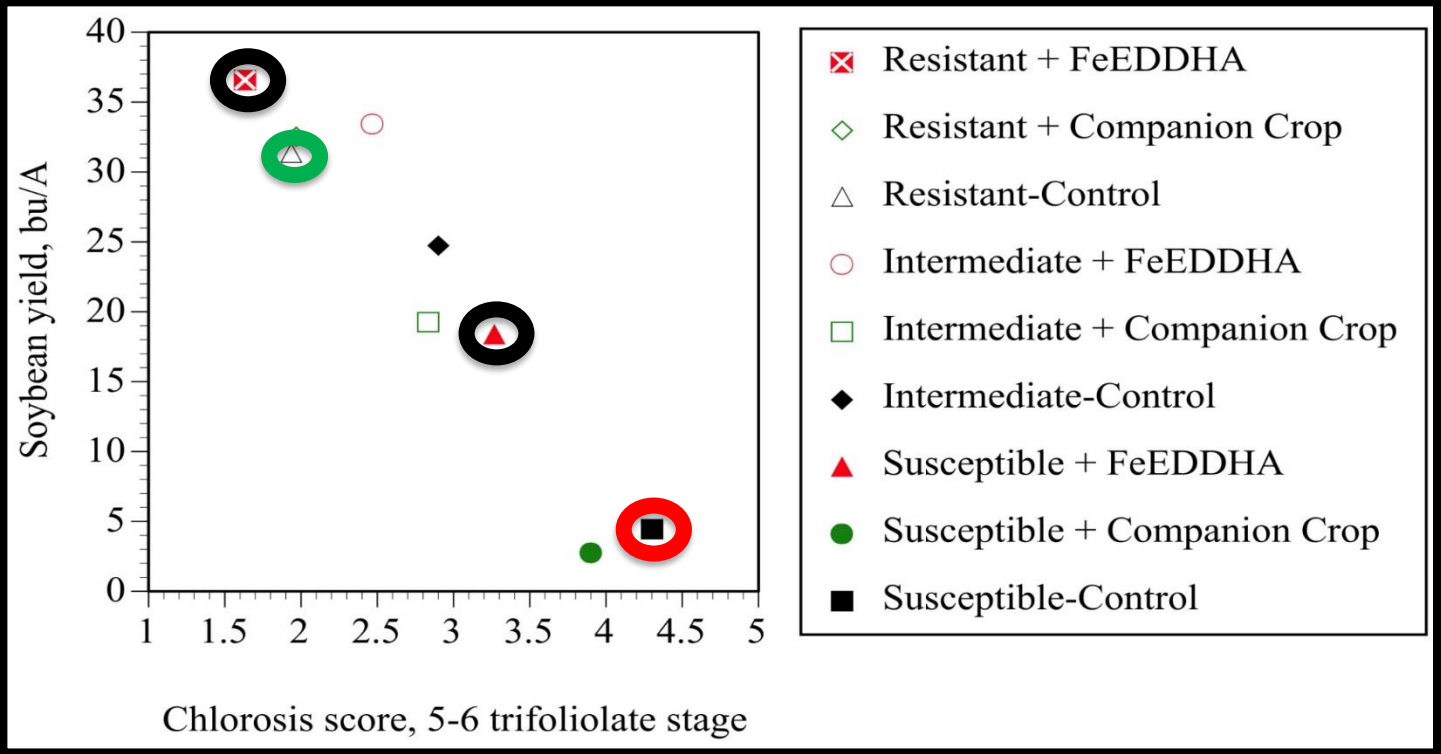

1. tolerant varieties
2. tolerant varieties
3. tolerant varieties
4. in-furrow ortho-ortho-EDDHA Fe chelate
   - e.g. 'SoyGreen'

**Table 3. 2017 NDSU Roundup Ready Soybean Iron-deficiency Chlorosis Trial - Author, T. Helms (Page 1 of 2).**

| Company | Variety | 4-site Mean IDC[1] | Company | Variety | 4-site Mean IDC[1] | Company | Variety | 4-site Mean IDC[1] |
|---|---|---|---|---|---|---|---|---|
| REA | RX0228 | 1.5 | Dyna-Gro | S01RY86 | 2.0 | Channel | 0317R2X | 2.1 |
| Channel | 0218R2X | 1.5 | Syng NK | NKS08-M2 | 2.0 | Hefty | H02R3 | 2.1 |
| Legend | 02R21 | 1.6 | NorthStar | NS 0072R2 | 2.0 | Legacy | LS-0635N RR2 | 2.1 |
| Pioneer | P008T22R2 | 1.7 | Legacy | LS-1134NRR2X | 2.0 | Legend | 03R22 | 2.1 |
| Dairyland | DSR-0418/R2Y | 1.7 | Mustang | 02356 | 2.0 | NorthStar | NS 60053XR2 | 2.1 |
| Integra | 20468 | 1.7 | Peterson | 17X009 | 2.0 | Hefty | H03X7 | 2.1 |
| NorthStar | NS 60092XR2 | 1.7 | Wensman | W1048NRX | 2.0 | Legacy | LS-00834RR2 | 2.1 |
| NuTech | 6048 | 1.7 | Legend | 007X756N | 2.0 | Legacy | LS-0438NRR2X | 2.1 |
| Dyna-Gro | S03RY36 | 1.8 | Channel | 00717R2X | 2.0 | Legend | 04X765N | 2.1 |
| Legacy | LS-009X852N | 1.8 | Dairyland | DSR-0807/R2Y | 2.0 | Peterson | 16R01 | 2.1 |
| Dyna-Gro | SX17005XT | 1.8 | Golden H. | GH0391 | 2.0 | Proseed | 30-20 | 2.1 |
| REA | RX1226 | 2.3 | REA | RX1027 | 2.6 | | | |
| Allegiant | 005X17 | 2.3 | Stine | 09BA02 | 2.6 | | | |
| Dahlman | 5601RR2Y | 2.3 | Peterson | 18X07N | 2.6 | | | |
| Dyna-Gro | S07XT28 | 2.3 | Channel | 1117R2X | 2.6 | | | |
| Mean | | 2.2 | Mean | | 2.2 | Mean | | 2.2 |
| LSD 0.05 | | 0.3 | LSD 0.05 | | 0.3 | LSD 0.05 | | 0.3 |
| LSD 0.10 | | 0.3 | LSD 0.10 | | 0.3 | LSD 0.10 | | 0.3 |

[1]IDC score was 1-5, with 1-green, 2-yellow, 5-dead tissue.

# Chlorosis scores and yield of three soybean varieties as influenced by companion crop and FeEDDHA, ND, 2009 (3 sites)




Source: F. Podrebarac and R.J. Goos

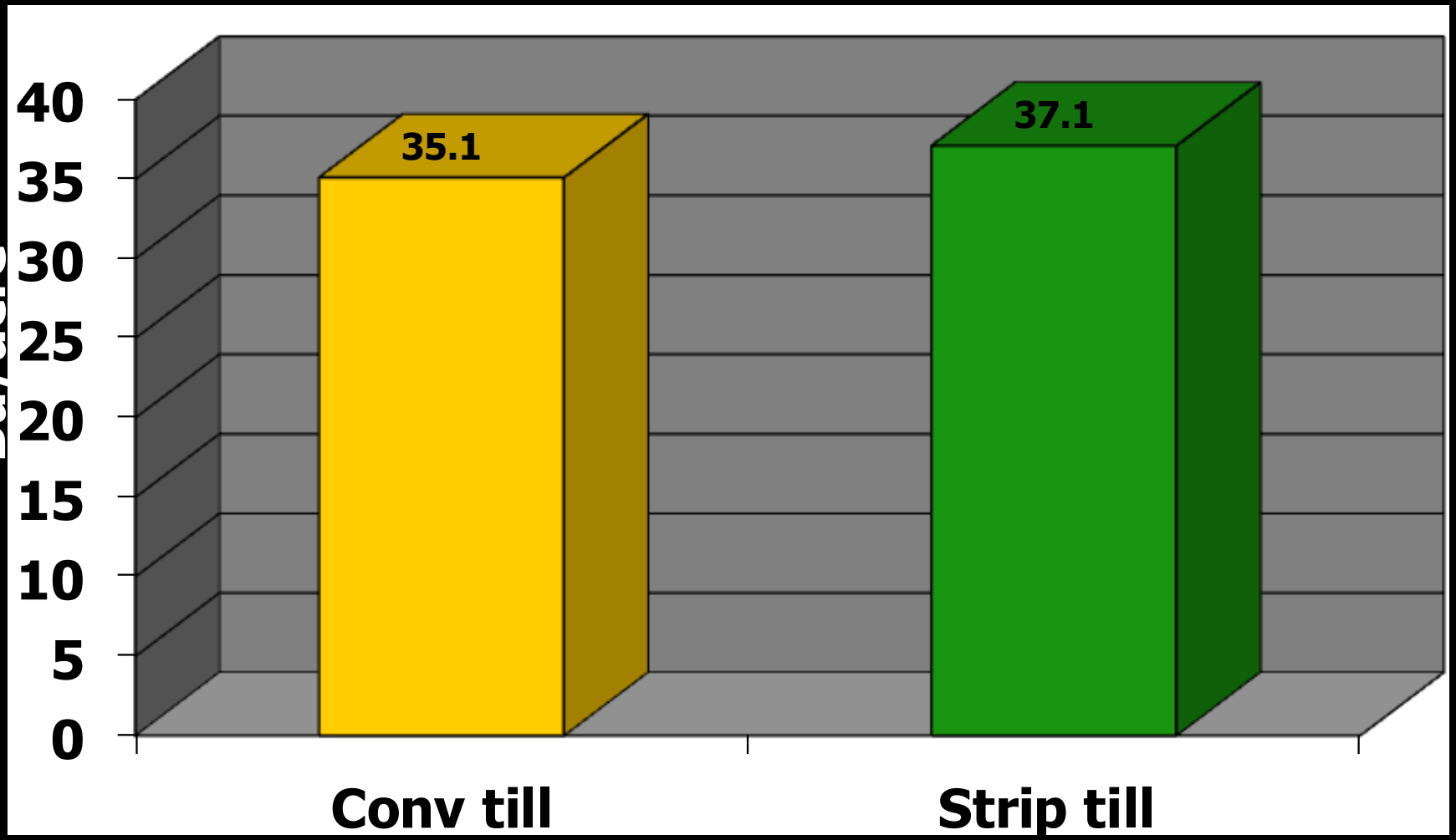
# Plant establishment and nutrition

# NDSU Research Summary of Soybean Plant Establishment Factors (Feb 2018)

| Factor | Option A | A Yield > B (%) | Option B | NDSU trials (conducted during 1999-2017) |
|---|---|---|---|---|
| **Tillage system** | reduced till | **4** | conventional till | 40 |
| **Previous crop** | wheat | **5** | soybean | 6 |
| **Planting date** (eastern ND) | ≤ early May | **9** | mid May | 10 |
| **Planting rate (pls/A)** | 150-175,000 | **6** | 100-130,000 | 43 |
| **Row spacing (inches)** | 14-21 | **4** | 28-30 | 25 |
| **Seed fungicide** | yes | **6** | no | 29 |
| **Seed inoculation with soybean history** | yes | **0** | no | 12 |
| **P app at planting time** | broadcast | **0.5** | band (away from seed) | 7 |
| **Timing of initial weed control** | at planting | **5** | early POST (2- to 4-inch weeds) | 8 |

Compiled by Greg Endres, Extension Area Agronomist

# Conventional vs. strip till soybean yield, NDSU, 2005-10 (12 site-years)*

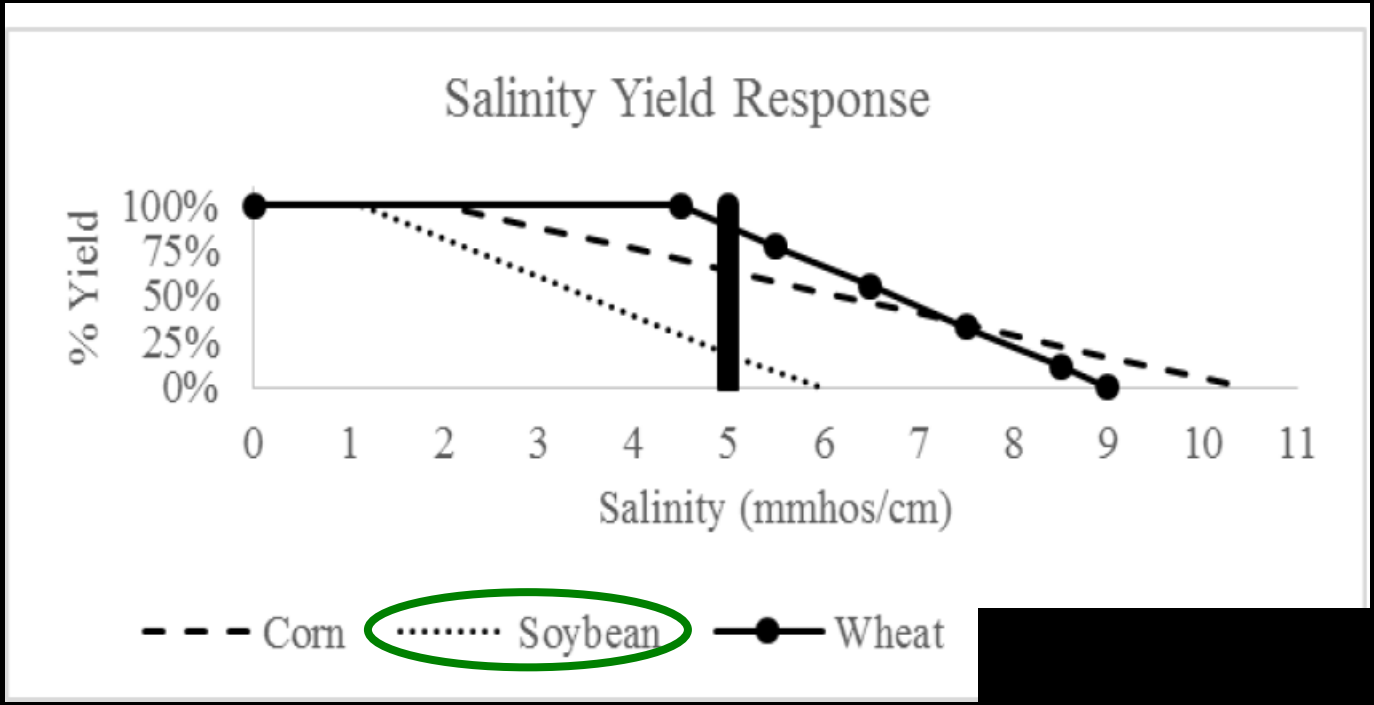



*Carrington, Prosper, Fargo and Moorhead, MN

Expense (2018 South Valley soybean budget = $149/A direct costs) with no return

# Soybean - soil EC threshold

| | Previous Studies | | NDSU Studies (2013-2016) | |
|---|---|---|---|---|
| | Threshold (mmhos/cm) | Slope (% decline) | Threshold (mmhos/cm) | Slope (% decline) |
| Corn | 1.3 | 12 | 2.0 | 12 |
| Soybean | 1.9 | 20 | 1.1 | 21 |




source: NDSU Soil Health and Land Management – Economics of Soil Salinity

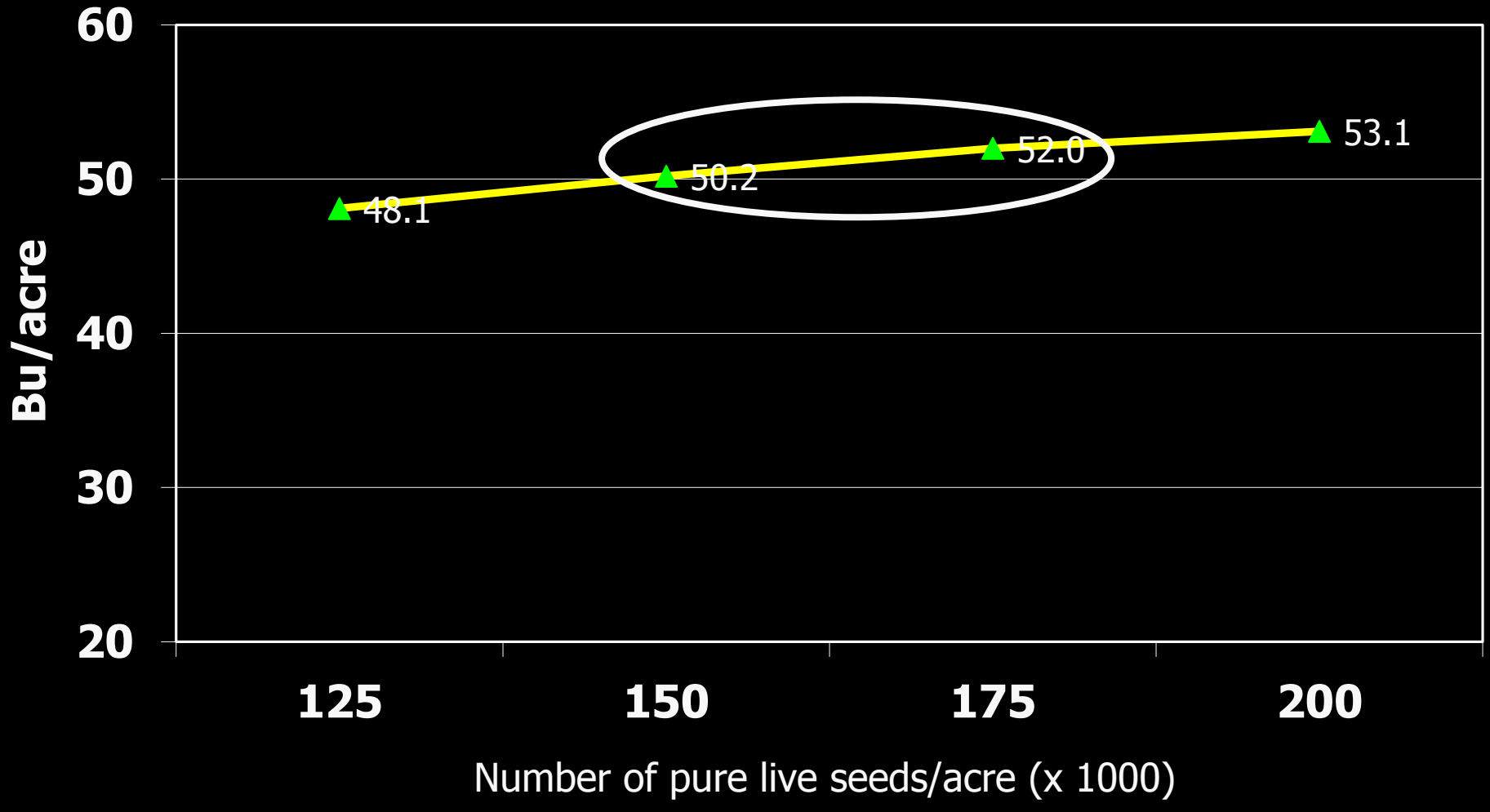
What potential yield advantage exists with **early planted** soybean?

- NDSU research in south central/east ND indicates yield increase with first week of May (or earlier) planting of **9-10%** > 3rd week of May planting.
  - When soil tilth is adequate and soil temperature 1-2 days following planting is near 50 degrees.

**NDSU recommends an established soybean stand of 150,000 plants/acre for any row spacing.**

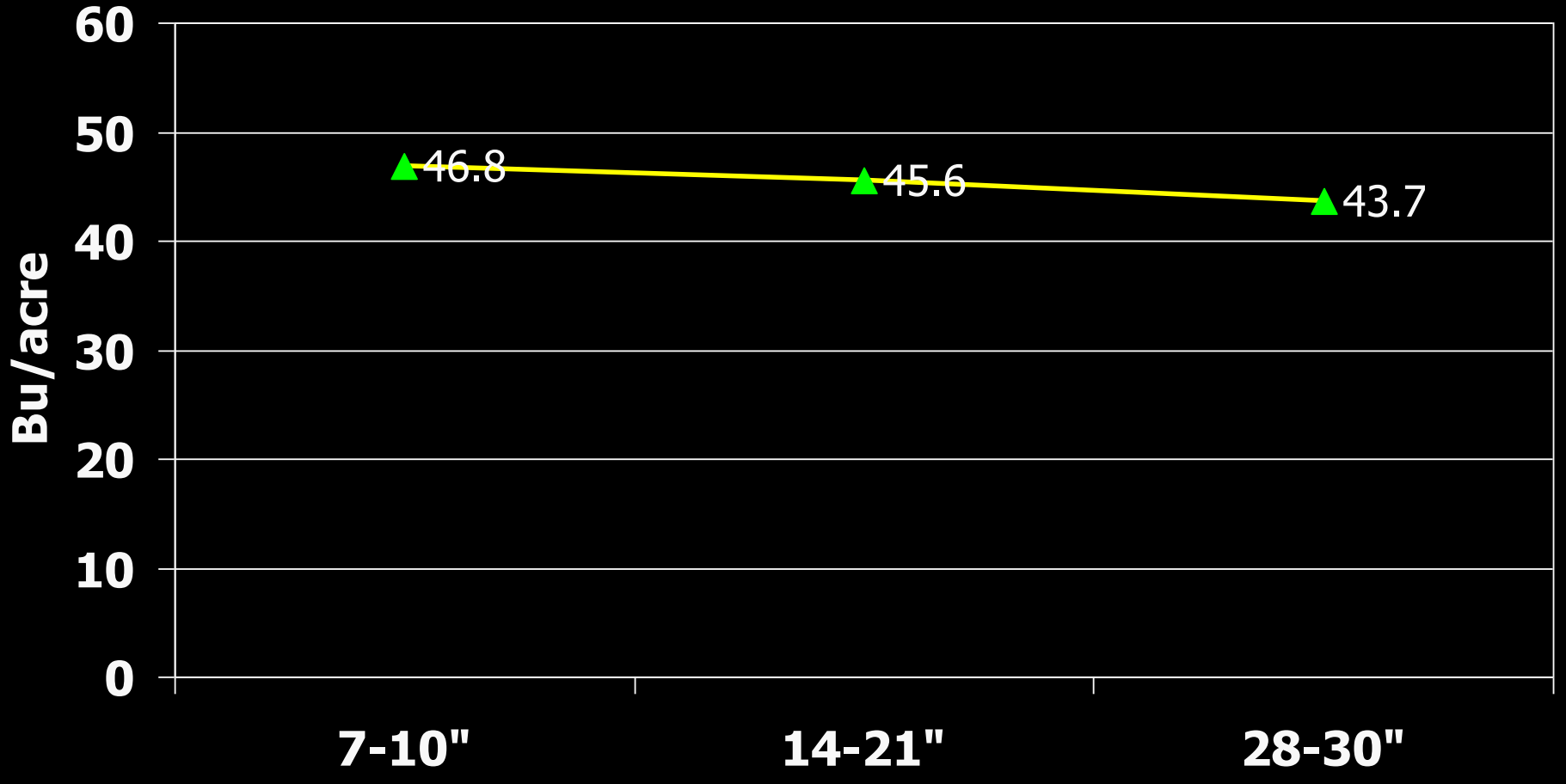
- Unlikely yield impact with variance of -10 to -15%

# Planting rate influence on soybean yield, Northeast ND, 2011-16 (8 site-years)*




*Cavalier, Lakota, Langdon, Park River, Pekin, Vesleyville, and Voss. Bryan Hanson, Langdon REC

# Row spacing influence on soybean yield, Carrington, Minot and Oakes, 1999-2016 (8 site-years)



# Soybean Plant Nutrition

- **Do not apply Nitrogen**
  - inoculate seed (*Bradyrhizobia japonicum*)
    - field with no soybean history = yes; history = ?
- **Apply Phosphorus with < medium-testing soils**
  - yield response greater with broadcast vs band application
  - no fertilizer directly with the seed
- **Apply Potassium if indicated by soil test**
- **Yield response unlikely with other secondary or micro nutrients**

SF882 (Revised)

# North Dakota Fertilizer Recommendation Tables and Equations

**D.W. Franzen**
NDSU Extension Soil Specialist

The following soil test recommendation tables are based on field research data obtained in North Dakota, South Dakota, western Minnesota and the Canadian Prairie Provinces. In the case of some crops, data in the literature also were used to supplement data available from this area.

**This publication contains major changes from previous publications. Please dispose of older editions. Changes to tables were based on new or re-evaluated data.**

This publication contains several major changes from previous versions, including revised potassium recommendations for alfalfa, corn and sugar beet, and the elimination of yield-based nutrient recommendation formulas.

## Recommendation Tables

Fertilizer needs should be determined after evaluating the current fertility level of the soil through soil testing, preferably using a site-specific zone sampling approach, as well as the nutrient needs of the crop to be grown, and knowing the historic productivity of the soil.

The most important reason for abandoning yield goal as a consideration in fertility recommendations is that the data from modern fertilizer rate trials indicate that a similar rate of nutrient results in the highest yield regardless of the maximum yield in any experiment. In other words, the rate of nutrient resulting in the highest yield in a low-yield environment was similar to the rate that resulted in the highest yield in a high-yield environment.

A logical way to explain this is that in a low-yield environment resulting from too wet or too dry conditions, nutrient use efficiency is quite low, so a greater rate of nutrient is required to produce a unit of yield. In a high-yield environment, nutrient use efficiency is quite high because release from the soil is maximized, root growth is maximized and the movement of nutrient to the root is maximized, so a lower rate of nutrient is required to produce a unit of yield. Therefore, the recommended N-rate table values should be utilized regardless of what yield a grower believes will result from the barley cultivation.

Several of our N recommendations are "capped" at a maximum rate. In years that support higher yields, our data indicate that greater N release from the soil and greater ability of crops to capture available soil N will support these higher yields without requiring supplemental N fertilizer greater than capped rates. In addition, sunflower N recommendations are capped due to greater lodging risk as the N rate increases.

### Nitrogen

Nitrogen (N) recommendations for most crops except some legumes are based on the amount of nitrate N ($NO_3$-N) in the top 2 feet of soil and the yield potential. Omission of the 2-foot nitrate-N analysis results in random numbers for the N recommendation.

**The 2-foot nitrate-N soil test is extremely important in this region for optimal N recommendations and to promote N-use efficiency, greater farm profitability and environmental stewardship.**

NDSU EXTENSION SERVICE
February 2018

## Table 23. Soybean.

| Olsen Soil Test Phosphorus, ppm | | | | | Soil Test Potassium, ppm | | | | |
|---|---|---|---|---|---|---|---|---|---|
| VL | L | M | H | VH | VL | L | M | H | VH |
| 0-3 | 4-7 | 8-11 | 12-15 | 16+ | 0-40 | 41-80 | 81-120 | 121-150 | 150+ |
| ---------- lbs/acre $P_2O_5$ ---------- | | | | | ---------- lbs/acre $K_2O$ ---------- | | | | |
| 78 | 52 | 52 | 26 | 0 | 90 | 90 | 60 | 30 | 0 |

# Soybean summary

- Do your homework on variety selection
- Use reduced tillage system and manage salt-affected soil areas
- Plant early and narrow at adequate rate
- Keep plant nutrition simple

# Questions?