2014 Agronomy Update

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IHARF Soil & Crop Management Seminar
February 4, 2014
White City, SK
IHARF Sources of Funding

- Grain revenues from approximately 1200 ac of cropland and in-kind donations comprise up to 50% of gross operating funds
- Approximately 40-50 research & demonstration projects funded annually by a combination of government (provincial & federal), producer groups & private industry

<table>
<thead>
<tr>
<th>Source</th>
<th>% of Outside Funding (Cash &amp; In-Kind)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>Industry</td>
<td>49%</td>
</tr>
<tr>
<td>Producer</td>
<td>36%</td>
</tr>
<tr>
<td>Government</td>
<td>15%</td>
</tr>
</tbody>
</table>
Winter Wheat 2014 Update
Seeding Rates, Treatments, Fungicides & Nitrogen

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Feb. 4, 2015, White City, Saskatchewan
# Growing Season Conditions

<table>
<thead>
<tr>
<th>Winter Wheat Factor</th>
<th>Indian Head 2012 / 2013</th>
<th>Indian Head 2013 / 2014</th>
<th>Scott 2013 / 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeding Date</td>
<td>- Sept. 15 (avg)</td>
<td>- Sept. 23 (late)</td>
<td>- Sept. 11 (avg)</td>
</tr>
<tr>
<td>Conditions at Planting</td>
<td>- extremely dry</td>
<td>- adequate soil moisture</td>
<td>- adequate soil moisture</td>
</tr>
<tr>
<td>Time of Emergence</td>
<td>- the next spring</td>
<td>- later that fall</td>
<td>- later that fall</td>
</tr>
<tr>
<td>Spring Stand</td>
<td>- poor / variable</td>
<td>- good / excellent</td>
<td>- good / excellent</td>
</tr>
<tr>
<td>Spring/Summer Moisture</td>
<td>- dry then optimal</td>
<td>- optimal to excessive</td>
<td>- optimal</td>
</tr>
<tr>
<td>Disease Pressure</td>
<td>- moderate / high</td>
<td>- moderate / high</td>
<td>- moderate / high</td>
</tr>
<tr>
<td>Yield Potential</td>
<td>- variable but very high in some cases</td>
<td>- average / above-average</td>
<td>- average / above-average</td>
</tr>
<tr>
<td>Maturity</td>
<td>- just earlier to later than spring wheat</td>
<td>- 7-10 days earlier than spring wheat</td>
<td>- 2 weeks earlier than spring wheat</td>
</tr>
</tbody>
</table>
Seeding Rates & Treatments

Indian Head (2013-14) and Scott (2014)

Seeding Rates
1. 200 seeds m\(^{-2}\)
2. 300\(^z\) seeds m\(^{-2}\)
3. 400 seeds m\(^{-2}\)
\(^z\)2013-14 only

Seed Treatments
1. Untreated
2. Treated (Raxil Pro)

Fungicide (2014 only)
1. Untreated
2. Treated (Twinline @ flag + Prosaro @ anthesis)
Seeding Rates & Treatments
Effects on Winter Wheat Establishment

Indian Head (2013)

F-tests (IH13)
SR: $P < 0.001$
ST: $P < 0.001$
SR*ST: $P = 0.019$

Plants / m$^2$

Seeding Rate

IH13-unt
IH13-trt

0 50 100 150 200 250 300 350 400

200 300 400

a
b

b

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Seed Treatment Effects
June 12, 2013 (Indian Head)

Raxil Pro Treated (left) vs Untreated (right)
200 seeds/m²
Seeding Rates & Treatments Effects on Winter Wheat Grain Yield

Indian Head (2013)

Yield (bu/ac)

Seeding Rate

IH13-unt IH13-trt

F-tests (IH13)
SR: $P = 0.002$
ST: $P = 0.004$
SR*ST: $P = 0.139$

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Seed Treatment Effects
August 2, 2013 (Indian Head)

200 seeds/m² – untreated seed

200 seeds/m² – treated seed
Seeding Rates & Treatments
Effects on Winter Wheat Establishment

Indian Head (2014)

F-tests (IH14)
SR: \( P < 0.001 \)
ST: \( P = 0.006 \)
SR*ST: \( P = 0.906 \)

F - tests (IH14)
SR: \( P < 0.001 \)
ST: \( P = 0.006 \)
SR*ST: \( P = 0.906 \)

IH14-unt
IH14-trt

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Seeding Rates & Treatments Effects on Winter Wheat Grain Yield

Indian Head (2014)

Yield (bu/ac)

Seeding Rate

F-tests (IH13)
SR: $P < 0.001$
ST: $P = 0.044$
SR*ST: $P = 0.815$
Seed Treatment Effects
August 10, 2014 (Indian Head)

200 seeds/m² – untreated seed

200 seeds/m² – treated seed
Seeding Rates & Treatments
Effects on Winter Wheat Establishment

Scott (2014)

<table>
<thead>
<tr>
<th>Plants / m²</th>
<th>SC14-unt</th>
<th>SC14-trt</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>c</td>
<td>ab</td>
</tr>
<tr>
<td>300</td>
<td>bc</td>
<td>a</td>
</tr>
<tr>
<td>400</td>
<td>bc</td>
<td>bc</td>
</tr>
</tbody>
</table>

F-tests (SC14)
SR: $P < 0.001$
ST: $P < 0.001$
SR*ST: $P = 0.655$
Seeding Rates & Treatments Effects on Winter Wheat Grain Yield

Scott (2014)

Yield (bu/ac)

Seeding Rate

F-tests (IH13)
SR: P = 0.205
ST: P = 0.034
SR*ST: P = 0.815
Seed Treatment
Effects on Winter Wheat Yield

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Foliar Fungicide Effects on Winter Wheat Yield

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F-tests (fungicide)
IH14: $P = 0.014$
SC14: $P < 0.001$

Yield (bu/ac)

<table>
<thead>
<tr>
<th>Site</th>
<th>Yield (unt)</th>
<th>Yield (fung)</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>IH14</td>
<td>69.0</td>
<td>79.3</td>
<td>+ 15%</td>
</tr>
<tr>
<td>SC14</td>
<td>61.5</td>
<td>79.3</td>
<td>+ 29%</td>
</tr>
<tr>
<td>AVG</td>
<td>65.2</td>
<td>79.3</td>
<td>+ 21%</td>
</tr>
</tbody>
</table>
Timing of Foliar Fungicide
Indian Head (2013-14) and Scott (2014)

Treatments:
1) Check (no fungicide)
2) Twinline* (T1-flag)
3) Prosaro** (T2-head)
4) Dual (T1 + T2)

* Pyraclostrobin (65 g/ha) + metconazole (40 g/ha)
** Prothioconazole (100 g/ha) + tebuconazole (100 g/ha)
Timing of Foliar Fungicide Effects on Leaf Disease

Site: $P < 0.001$
Fung: $P < 0.001$
S X F: $P < 0.001$

Leaf Disease (0-12)

- CHECK
- FLAG
- HEAD
- DUAL

Site-Year

IH13
IH14
SC14
AVG
Leaf Disease at Indian Head
July 29, 2013

UNTREATED CHECK

FUNGICIDE APPLIED

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Leaf Disease at Indian Head
Aug. 6, 2014

UNTREATED CHECK

FUNGICIDE APPLIED
Timing of Foliar Fungicide Effects on Fusarium Head Blight

Site: $P = 0.001$
Fung: $P = 0.002$
S X F: $P = 0.013$

Site-Year

IH13  IH14  SC14  AVG

FHB Index (0-100)
Timing of Foliar Fungicide Effects on Grain Yield

- **Site:** $P = 0.035$
- **Fung:** $P < 0.001$
- **S X F:** $P = 0.170$

### Site-Year Results

**IH13**
- **CHECK:** ab
- **FLAG:** ab
- **HEAD:** a
- **DUAL:** cd

**1H14**
- **CHECK:** d
- **FLAG:** abc
- **HEAD:** bcd
- **DUAL:** abc

**SC14**
- **CHECK:** cd
- **FLAG:** cd
- **HEAD:** cd
- **DUAL:** B

**AVG**
- **CHECK:** A
- **FLAG:** A
- **HEAD:** A
- **DUAL:** A

**Grain Yield (bu/ac):**
- **IH13:** + 14%
- **1H14:** + 11%
- **SC14:** + 37%
- **AVG:** + 19%
Timing of Foliar Fungicide Effects on Test Weight

Site: $P < 0.001$
Fung: $P < 0.001$
S X F: $P = 0.807$

Test Weight (lb/A bu)

<table>
<thead>
<tr>
<th>Site-Year</th>
<th>CHECK</th>
<th>FLAG</th>
<th>HEAD</th>
<th>DUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IH13</td>
<td></td>
<td>b</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>1H14</td>
<td>d</td>
<td>c</td>
<td>c</td>
<td>c</td>
</tr>
<tr>
<td>SC14</td>
<td></td>
<td>cde</td>
<td>cde</td>
<td>cd</td>
</tr>
<tr>
<td>AVG</td>
<td></td>
<td>C</td>
<td>C</td>
<td>AB</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Nitrogen Fertility Options
Indian Head (2013-14)

23 N fertilizer treatments:

Application Rates:
1) 0 N, 2) 75 kg N ha\(^{-1}\), 3) 115 kg N ha\(^{-1}\)

Nitrogen Source:
1) Urea, 2) ESN, 3) NSN/SUPERU, 4) UAN

Placement/Timing:
1) Fall side-band/surface dribble 2) Spring broadcast/surface dribble, 3) 40/60 split
Nitrogen Rate, Placement & Timing
Indian Head 2014

Yield (bu/ac)

- **Nil vs Rest**: 10.0
- **75n vs 115n**: 10.5
- **Fall vs SPR**: 10.1
- **Fall vs SPLIT**: 10.4
- **SPR vs SPLIT**: 10.7

Statistical significance:
- ***: Highly significant
- **: Significant
- ns: Not significant

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Nitrogen Fertilizer Forms
Indian Head 2013

Yield (bu/ac)

Nitrogen Form vs Urea (by timing)

<table>
<thead>
<tr>
<th></th>
<th>FALL</th>
<th>SPRING</th>
</tr>
</thead>
<tbody>
<tr>
<td>UREA</td>
<td>12.5</td>
<td>12.5</td>
</tr>
<tr>
<td>ESN</td>
<td>12.3</td>
<td>12.6</td>
</tr>
<tr>
<td>NSN</td>
<td>12.3</td>
<td>12.7</td>
</tr>
<tr>
<td>UAN</td>
<td>12.5</td>
<td>12.1</td>
</tr>
</tbody>
</table>

ns
Nitrogen Fertilizer Forms
Indian Head 2014

Yield (bu/ac)

<table>
<thead>
<tr>
<th></th>
<th>UREA</th>
<th>ESN</th>
<th>SUPERU</th>
<th>UAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>FALL</td>
<td>10.8</td>
<td>10.4</td>
<td>10.6</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>ns</td>
<td></td>
<td>***</td>
</tr>
<tr>
<td>SPRING</td>
<td>10.8</td>
<td>10.5</td>
<td>10.8</td>
<td>9.7</td>
</tr>
<tr>
<td></td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>*</td>
</tr>
</tbody>
</table>

Nitrogen Form vs Urea (by timing)

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Winter Wheat - Summary

- Winter wheat that doesn’t emerge in fall will still set seed & can yield well – assess stand May 15-25 to allow reseeding if needed
  - 200+ plants m\(^{-2}\) optimal but 90-100 plants m\(^{-2}\) usually viable with adequate fertility and weed control

- Using a seed treatment is recommended, especially when seeding into dry or cold soils (+9% yield increase averaged over 3 sites)

- Applying entire N fertilizer requirements at planting can be risky but banding some N at planting is recommended - particularly when dry
  - Split applications are more costly but perform well under all conditions
  - Slow release N forms (i.e. ESN, SUPERU) are a good fit for winter cereals, but actual benefits will be inconsistent depending on environmental conditions

- Foliar fungicides protect yields and quality under adequate disease pressure (20% yield benefit averaged over 3 sites)
  - If leaf disease is minor at flag-leaf stage, a single fungicide application at early heading is likely most economical
Soybean Agronomy Update
2014 Field Trial Results Summary

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IHARF’s Recent Soybean History

2012: First recent industry funded variety trial on 2012
   – 1 trial
2013: Further industry funded variety & agronomy trials in 2013
   – 6 trials
2014: Extensive program of industry, producer, provincial and federally funded demonstrations and trials
   – 11 trials (~20% of small plot trials)

Seed Yield (bu/ac)

- NSC Reston
- NSC Vito
- NSC Anola

NorthStar Genetics

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Soybean Adaptation Trial
2014 Pulse Science Cluster - GF2

• 3 soybean varieties established along with one variety each of field pea, faba bean and canola
• 3 seeding dates ranging from early May to early June
• PKS blend side-banded to all treatments to supply 12-18-9-9 lb/ac of N-P$_2$O$_5$-K$_2$O-S (105 lb N/ac for canola)
• Granular inoculant applied for field pea and soybean, self-stick peat-based for faba bean
• Herbicide and fungicide applications along with harvest operations were tailored to specific crops & seeding dates
• Tracked development, maturity and seed yield for all plots
August 12 (early seeding)
Seeding Date / Crop Type Effects on Seed Yield

Indian Head 2014

* Preliminary - data not statistically analyzed

Crop Type

- Canola
- Field Pea
- Faba bean
- Sobyean

Yield (bu/ac)

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Soybean Seeding Date Study

Yield (bu/ac)

Source: Garry Hnatowich (ICDC)
Soybean Inoculation
2014 ADOPT Granular Inoculant Trial

- LS002R23 seeded into barley at 210K seed/ac on May 26
- All seed pre-treated with Primo CL inoculant and Cruiser Maxx Vibrance seed treatment
- 11-52-0 side-banded to supply 25 lb P₂O₅/ac
- Cell-Tech granular inoculant seed-placed at either 0, 2, 4, 7 or 14 lb/ac (0x, 0.5x, 1x, 2x & 4x label rate)
- 0.16 l/ac Headline E.C. applied to half the plots
- Early frost on Sept. 10-11, prior to pod colour change
- Straight-combined on Oct. 11-12
Inoculant Effects on Seed Yield

Indian Head 2014

Seed Yield (bu/ac)

Granular Inoculant Rate (kg/ha)

1x label rate

2x label rate

FUNG: $P = 0.922$
INOC: $P < 0.001$
FUNG*INOC: $P = 0.413$

no fung  fung  avg

-2  0  2  4  6  8  10  12  14  16  18
Soybean Fertility
2014 ADOPT N & P Fertility Trial

• LS002R23 seeded into barley at 210K seed/ac on May 24
• All seed pre-treated with Primo CL inoculant and Cruiser Maxx Vibrance seed treatment
• Cell-Tech granular seed-placed at 3.6 lb/ac (as per protocol)
• 11-52-0 side-banded or seed-placed to supply 0, 18 or 36 lb P₂O₅/ac (0, 20 or 40 kg ha⁻¹)
• 46-0-0 side-banded to supply either no additional N (0) or 50 lb N/ac total
• Early frost on Sept. 10-11, prior to pod colour change
• Straight-combined on Oct. 12
Contrast Results for Emergence

Indian Head 2014

Emergence (plants/m²)

Predetermined Contrast

SB vs SP (all)  SB vs SP (20)  SB vs SP (40)  OP vs 20P  OP vs 40P  20P vs 40P  ON vs 55N  55N vs 55N-un

ns  ns  ns  ns  ns  ns  ***  ns
N & P Effects on Seed Yield

Indian Head 2014

Yield (bu/ac)

Fertilizer Treatment

Trt: $P < 0.001$
Contrast Results for Yield

Indian Head 2014

Yield (bu/ac)

Predetermined Contrast

ns
ns
ns
***
***
ns
***
***
Soybean Seed Rate & Depth
2014 Pulse Science Cluster - GF2

- NSC Moosomin seeded into barley stubble on May 24
- Rates of 61k, 121k, 162k, 203k, 243k, 283k or 334k seeds/ac
- Target seeding depth of 3/4” (shallow) or 1.5” (deep)
- All seed pre-treated with Nodulator Pro inoculant and Cruiser Maxx Vibrance seed treatment
- 11-52-0 side-banded to supply 25 lb P₂O₅/ac
- Cell-Tech granular inoculant seed-placed at 3.6 lb/ac
- Early frost on Sept. 10-11, prior to pod colour change
- Straight-combined on Oct. 13
Soybean Seeding Rate & Depth Effects on Emergence

Indian Head 2014

Emergence (plants/m²)

Seeding Rate (1000 seeds/ac)

RATE: \( P < 0.001 \)

DEPTH: \( P = 0.113 \)

RATE*DEPTH: \( P = 0.350 \)

Linear: \( P < 0.001 \)
Soybean Seeding Rate & Depth Effects on Seed Yield

Indian Head 2014

Seed Yield (bu/ac) vs. Seeding Rate (1000 seeds/ac)

- 0.75" depth
- 1.5" depth
- Linear (0.75" depth)
- Linear (1.5" depth)

Statistical significance:
- **RATE:** $P < 0.001$
- **DEPTH:** $P < 0.001$
- **RATE*DEPTH:** $P < 0.001$
- Linear (0.75"): $P < 0.001$
- Linear (1.5"): $P < 0.001$

Note: ns indicates non-significant difference at the 0.05 level.
Soybean Seeding Rate & Depth Effects on Minimum Pod Height

Indian Head 2014

**Rate:** $P < 0.001$

**Depth:** $P = 0.105$

**Rate*Depth:** $P = 0.411$

**Quadratic:** $P = 0.021$

Seeding Rate (1000 seeds/ac)
Soybean Seeding Rate & Depth Effects on Seed Size

Indian Head 2014

Pod Height (cm)

0.75" depth

1.5" depth

100.0 g/1000 seeds (A)

96.3 g/1000 seeds (B)

Seeding Rate (1000 seeds/ac)

RATE: P = 0.871
DEPTH: P < 0.001
RATE*DEPTH: P = 0.407
Soybean Row Spacing & Seed Rate
2014 Pulse Science Cluster - GF2

- P002-T04R seeded into barley stubble on May 24
- Seeding rates of 162K, 203K or 243K seeds/ac
- Row spacing of 10”, 12”, 14”, 16” or 24”
- All seed treated with PPST 120+ inoculant and Evergol Energy seed treatment
- 11-52-0 side-banded to supply 25 lb P$_2$O$_5$/ac
- Cell-Tech granular inoculant seed-placed at 3.6 lb/ac
- Early frost on Sept. 10-11, prior to pod colour change
- Straight-combined on Oct. 12
Soybean Row Spacing & Seed Rate Effects on Emergence

Indian Head 2014

Emergence (plants/m²)

Row Spacing (inches)

- 162K
- 203K
- 243K
- avg
- Linear (avg)

SPACE: $P = 0.014$
RATE: $P < 0.001$
SPACE*RATE: $P = 0.679$
Linear: $P = 0.008$
Soybean Row Spacing & Seed Rate Effects on Seed Yield

Indian Head 2014

Yield (bu/ac) vs. Row Spacing (inches)

- 162K
- 203K
- 243K
- avg
- Poly. (avg)

SPACE: $P < 0.001$

RATE: $P < 0.001$

SPACE*RATE: $P = 0.148$

Quadratic: $P < 0.001$
10” spacing /243K rate

24” spacing /243K rate
Soybean Plant Population Study

Yield (bu/ac)

- Red dots: 20 inch
- Blue dots: 10 inch

R² = 0.9962
R² = 0.9337

Source: Garry Hnatowich (ICDC)
Soybeans in SK - Take Home Messages

- Choose a very early maturing variety, many are available
- Don’t seed too early (May 15-30 and > 10 °C soil)
- Seed < 1” deep at 220-240K seeds/ac – use a land roller
- Well adapted to wider (>12”) rows, should perform well within range of 10-24” row spacing (inoculate accordingly)
- Inoculate well – liquid inoculant plus ≥ 2x rate of granular
- Large phosphorus users – highest yields in high P soils, but soybeans respond well to P fertilizer in cool, low P soils
- Starter N? Unlikely to be beneficial under most conditions & with adequate inoculation...more research required
- Expect to harvest in early October