Soybean acres on Prairies

Year


Acres

- 200,000 400,000 600,000 800,000 1,000,000 1,200,000 1,400,000

Manitoba
Saskatchewan
The Soybean Plant

*Glycine max.*

- Warm season
- Broadleaf
- Legume
- Indeterminate
- Branches
Outline

• Crop Rotation and Field Selection
• Fertility
• Seeding rate and row spacing
• Volunteer canola
• Insects and Diseases
• Seasonal Water Use
• Lessons from Manitoba
Crop Rotation

- Before soybean = cereal

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>Soybean</th>
<th>HRS</th>
<th>Barley</th>
<th>Oat</th>
<th>Canola</th>
<th>Flax</th>
<th>Sunflower</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soybean</td>
<td>95</td>
<td>106</td>
<td>106</td>
<td>105</td>
<td>98</td>
<td>100</td>
<td>92</td>
<td>103</td>
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<tr>
<td>HRS</td>
<td>103</td>
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<td>98</td>
<td>101</td>
<td>104</td>
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<td>101</td>
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</tr>
<tr>
<td>Barley</td>
<td>100</td>
<td>89</td>
<td>84</td>
<td>93</td>
<td>100</td>
<td>96</td>
<td>97</td>
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</tr>
<tr>
<td>Oat</td>
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<td>96</td>
<td>82</td>
<td>NSD</td>
<td>88</td>
<td>99</td>
</tr>
<tr>
<td>Grain Corn</td>
<td>107</td>
<td>100</td>
<td>101</td>
<td>106</td>
<td>104</td>
<td>NSD</td>
<td>112</td>
<td>87</td>
</tr>
</tbody>
</table>

Source: Manitoba Agricultural Services Corporation – 2007-2012
Crop Rotation

• What do canola and soybean have in common?
  o Sclerotinia
  o Roundup Ready = volunteers
  o Root rots

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Optimal Environment</th>
<th>Alternate Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pythium spp.</em></td>
<td>Cold (10-15°C) Wet soil</td>
<td>Wide host range including <strong>pulses</strong>, <strong>cereals</strong>, <strong>canola</strong>, <strong>alfalfa</strong></td>
</tr>
<tr>
<td><em>Rhizoctonia solani</em></td>
<td>Warm (20-27°C) Moist to wet soil</td>
<td>Wide host range including <strong>pulses</strong>, <strong>cereals</strong>, <strong>canola</strong>, <strong>alfalfa</strong></td>
</tr>
<tr>
<td><em>Fusarium spp.</em></td>
<td>Warm (20-27°C) Dry to moist soil</td>
<td>Wide host range including <strong>pulses</strong>, <strong>cereals</strong>, <strong>canola</strong>, <strong>alfalfa</strong></td>
</tr>
<tr>
<td><em>Phytophthora sojae</em></td>
<td>Warm (20-27°C) Wet soil</td>
<td>none</td>
</tr>
</tbody>
</table>

Source: Holly Derksen, MAFRD
Crop Rotation

• After soybean = flax, oats, barley, wheat

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Source: Manitoba Agricultural Services Corporation – 2007-2012
Field Selection – Soil factors

- Nitrate levels – low < 50 lbs
- Phosphorus – medium to high >10 ppm
- Salinity and Carbonates
- Tolerance to salinity
  
  - Barley
  - Wheat
  - Canola
  - Flax
  - Soybean
Assess Risk of Iron Deficiency Chlorosis (IDC)

RISK OF IRON CHLOROSIS IN SOYBEANS
BASED ON CARBONATE AND SALT LEVEL

<table>
<thead>
<tr>
<th>Carbonate Level (%)</th>
<th>Soluble Salts (mmhos/cm)</th>
<th>Risk of Iron Chlorosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-2.5%</td>
<td>&lt;0.5</td>
<td>Low</td>
</tr>
<tr>
<td>0-2.5%</td>
<td>0.51-1.0</td>
<td>Moderate</td>
</tr>
<tr>
<td>0-2.5%</td>
<td>&gt;1.0</td>
<td>High</td>
</tr>
<tr>
<td>2.6-5.0%</td>
<td>0.25</td>
<td>Low</td>
</tr>
<tr>
<td>2.6-5.0%</td>
<td>.26-.50</td>
<td>Moderate</td>
</tr>
<tr>
<td>2.6-5.0%</td>
<td>.51-1.0</td>
<td>High</td>
</tr>
<tr>
<td>2.6-5.0%</td>
<td>&gt;1.0</td>
<td>Very High</td>
</tr>
</tbody>
</table>

Source: AgVise
Varieties differ in their tolerance to IDC
Soybean Fertility - Nitrogen

- Inoculant required:
  - Liquid
  - Peat
  - Granular
- Most popular = Liquid + Granular or Liquid + Peat
- It’s not a matter of *which* inoculant you use,
- But that you use one!
- If using a seed treatment, make sure they are compatible
Soybean Fertility - Phosphorus

1. Soybeans require, take up and remove large amounts of P
   - Remove 0.8-1.1 lbs P$_2$O$_5$ / bu

2. Sensitive to seed placed P
   - Stand reduction

3. Respond differently to applied P
   - More efficient at extracting soil P than fertilizer P

(Heard, Grant and Flaten 2013)
Soybean Fertility - Phosphorus

4. Yields are greater on soils with healthy P reserves

5. Fertilization strategies
   - Guidelines are not clear-cut
   - Balance P removals within your rotation
   - Probability of profitable crop response to applied P is medium to low when soil test P is > 10 ppm

<table>
<thead>
<tr>
<th>Applied P (lb P₂O₅/ac)</th>
<th>Low P Soil</th>
<th>High P Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>34.5</td>
<td>49.1</td>
</tr>
<tr>
<td>25/20*</td>
<td>35.9</td>
<td>49.4</td>
</tr>
<tr>
<td>50/40*</td>
<td>38.7</td>
<td>48.9</td>
</tr>
</tbody>
</table>

*The higher rate was applied to the low P soil, the lower rate to the high P soil. Fertilizer was applied to the previous corn crop.*

(Heard, Grant and Flaten 2013)
Soybean Fertility - Potassium

1. Soybeans require, take up and remove a lot of K
   - 1.2 lbs K₂O / bu removed with seed (Heard, 2005)

2. Fields risk factors
   - Sandy soils
   - High frequency of soybean, alfalfa, corn
   - Drought can induce deficiency

3. Critical soil test level is **150-200 lbs/ac**

4. Scout in August when uptake rate can exceed 4 lbs/day
Row Spacing

• In Manitoba, 68% of soybeans are solid seeded
  o 20% - 30 inch rows
  o 8% - 15 inch rows
  o 5% - 20 inch rows w. drill

• #1 factor should be equipment availability

• YIELD?
Narrow rows have higher yield potential

(Preliminary results from Mohr et al. 2012)
### Pros and Cons

<table>
<thead>
<tr>
<th></th>
<th>DRILL</th>
<th>PLANTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seeding rate/cost</td>
<td>✔</td>
<td>✔ Lower</td>
</tr>
<tr>
<td>Emergence</td>
<td>✔</td>
<td>✔ i.e. soils prone to crusting</td>
</tr>
<tr>
<td>Canopy closure</td>
<td>✔</td>
<td>✔ Faster</td>
</tr>
<tr>
<td>Weed competition</td>
<td>✔</td>
<td>✔ Good</td>
</tr>
<tr>
<td>Disease risk</td>
<td>✔</td>
<td>✔ Lower</td>
</tr>
<tr>
<td>Yield potential</td>
<td>✔</td>
<td>✔ Higher</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can be similar i.e. long season areas</td>
</tr>
</tbody>
</table>

- Economics are similar between seeders and planters
- Use what you have available
- Ideal = narrow rows + precision of planter i.e. 15”
# Seeding Rate

<table>
<thead>
<tr>
<th>Row Spacing</th>
<th>Seeding Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid</td>
<td>200-210,000 seeds/ac</td>
</tr>
<tr>
<td>15”</td>
<td>175-185,000 seeds/ac</td>
</tr>
<tr>
<td>30”</td>
<td>160-170,000 seeds/ac</td>
</tr>
</tbody>
</table>

- Target plant stand is **150,000 plants/ac** (NDSU)
- Seed survival is low
  - 1st trifoliate 71%
  - Pre-harvest 62%
    - Germination
    - Seed cracks
    - Root rots/seedling diseases
    - Weed competition, intraspecific competition (Tone Ag 2012-2013)
100% of yield at 120-160,000 plants/ac

(Guelph, Purdue)

140,000 plants/ac vs. 180,000 plants/ac

Assess your plant population
Aim for 150,000 plants/ac or 3.5 plants/sq ft
Volunteer RR Canola #1 Weed

- High harvest losses
- Persistent seed bank
- Faster early season growth than soybean
- Matures earlier than soybean
# Herbicide Options

## PRE SEED

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>CleanStart</td>
<td>• Group 9 + 14, vol canola 1-3 lf stage</td>
</tr>
<tr>
<td>Express SG*</td>
<td>• Group 2, vol canola up to 6 inches</td>
</tr>
<tr>
<td>Heat*</td>
<td>• Group 14, vol canola up to 8 lf</td>
</tr>
</tbody>
</table>

*must be mixed with glyphosate*

## IN CROP

<table>
<thead>
<tr>
<th>Herbicide</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basagran Forte</td>
<td>• Group 6, <strong>do not tank mix with glyphosate</strong></td>
</tr>
<tr>
<td>Odyssey</td>
<td>• Group 2, be aware of re-cropping restrictions</td>
</tr>
<tr>
<td>Pursuit</td>
<td>• Group 2, be aware of re-cropping restrictions</td>
</tr>
<tr>
<td>Viper ADV</td>
<td>• Group 2 + 6, <strong>do not mix with glyphosate</strong></td>
</tr>
</tbody>
</table>
EARLY fall harrow stimulates germination

Narrow rows are better for weed competition

(Geddes and Gulden, 2013)

(Gregoire and Gulden, 2013)
Soybean Insects

Source: John Gavloski, MAFRD
Soybean Insects

Source: John Gavloski, MAFRD

2012

Source: John Gavloski, MAFRD

2008, 2011

Source: John Gavloski, MAFRD

2010, 2013
Soybean Leaf Diseases

- Septoria
- Bacterial Blight
- Downy Mildew
- Alternaria
Is a fungicide application warranted?

Environment

In Northern growing regions, there is rarely significant disease pressure

Fungicide applications are not warranted
White Mold of Soybean
*Sclerotinia sclerotiorum*

- Same pathogen that affects canola, sunflower etc.
- Soybeans are not like canola
  - Naturally more tolerant
- Highest levels observed in 2013
  - 40% of soybean fields surveyed in Aug/Sept had white mold
  - Majority at <10% incidence
- How is it affecting yield?
3.2 - 5.0 bu yield loss with 10% white mold

Levels in Manitoba in 2013

Yield = 53.546 - 0.378*Incidence

R² = 0.72 (P < 0.0001)

(Michael Wunsch, NDSU)
Soybeans use more water

TABLE 3. Mean seasonal water use, growing season length, and daily water use rates of crops studied in 1977 and 1978 crop water use comparisons in eastern North Dakota

<table>
<thead>
<tr>
<th>Crop</th>
<th>Seasonal Water use inches</th>
<th>Days from emergence to maturity</th>
<th>Daily water use rate inches/day</th>
<th>Water use efficiency lb/a inch H₂O used</th>
</tr>
</thead>
<tbody>
<tr>
<td>dry edible bean</td>
<td>10.2a³</td>
<td>71</td>
<td>0.14ab</td>
<td>218.7</td>
</tr>
<tr>
<td>spring wheat</td>
<td>11.9b</td>
<td>74</td>
<td>0.16c</td>
<td>128.1</td>
</tr>
<tr>
<td>barley</td>
<td>12.6b</td>
<td>86</td>
<td>0.15b</td>
<td>222.1</td>
</tr>
<tr>
<td>flax</td>
<td>13.7bc</td>
<td>102</td>
<td>0.13a</td>
<td>41.5</td>
</tr>
<tr>
<td>sunflower</td>
<td>14.9c</td>
<td>110</td>
<td>0.14a</td>
<td>119.7</td>
</tr>
<tr>
<td>corn</td>
<td>16.3d</td>
<td>113</td>
<td>0.14b</td>
<td>307.3</td>
</tr>
<tr>
<td>soybean</td>
<td>16.9d³</td>
<td>131</td>
<td>0.13a</td>
<td>139.2</td>
</tr>
<tr>
<td>sugarbeet</td>
<td>20.4e</td>
<td>140</td>
<td>0.15b</td>
<td>1.0</td>
</tr>
</tbody>
</table>

*Average across years and locations for each crop.
*English tons raw beets/a/in H₂O; equal to 0.1 tons extractable sugar/a/in H₂O.
*Values in the same column followed by the same letter(s) do not differ significantly at the 10% probability level, according to Duncan’s Multiple Range Test.

(Bauder and Ennen, 1978)
Water use is highest in August
25 mm = 2.5 bu soybeans  (Lindsey and Thomison 2012)

Monthly Precipitation (mm)

<table>
<thead>
<tr>
<th></th>
<th>Wynard</th>
<th>Regina</th>
<th>Brandon</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>49</td>
<td>53</td>
<td>50</td>
</tr>
<tr>
<td>J</td>
<td>75</td>
<td>75</td>
<td>74</td>
</tr>
<tr>
<td>J</td>
<td>67</td>
<td>64</td>
<td>76</td>
</tr>
<tr>
<td>A</td>
<td>50</td>
<td>43</td>
<td>69</td>
</tr>
<tr>
<td>Total</td>
<td>241</td>
<td>235</td>
<td>269</td>
</tr>
</tbody>
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Climatological Aspects of Irrigation Design Criteria in Mississippi
MAFES Technical Bulletin 138
1 inch of rain in August
Lessons from Manitoba

• Variety selection is key
  o Look at days to maturity, choose earliest variety

• Soybeans are not a “no-input” crop
  o Monitor soil nutrients

• Few insect or disease concerns... so far
  o Fungicides not warranted

• White mold often looks worse than it is

• Volunteer RR canola an important weed
  o Cultural and herbicide options
Lessons from Manitoba

• Good fit for wet conditions
• Break in wheat-canola rotations
• Limitations – moisture, cool temperatures
• Harvest equipment is important
  o Flex > Rigid headers
• Research underway for Canadian zero till systems
  o Residue management
  o Effects of cool, wet soil in spring
In Every Issue.... Crop Conditions

Soybean harvest got underway last week but has been interrupted by periodic rainfall and it looks like it will be on hold this week in many parts of the province as thunderstorms roll through. A killing frost swept across parts of the province on the mornings of Sept 16 and 21, although some parts of Western Manitoba remain unaffected.
Thank you
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