What Drives Manitoba Crop Rotation

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MAFRI Oilseed Crop Specialist
Crops Knowledge Centre
Overview

• Manitoba Crop Rotations have changed in the past 10-20 years composition and specific crop frequency
  – How current acreage and rotations have evolved
  – What caused the shifts
Audience......From 1992 to 2012 Which Crop Type Has Declined the Most?

a. Barley
b. Flax
c. Field Pea
d. Sunflower
e. Wheat
Overview

• Current Rotation Decisions
  – Based in Net Returns?
  – Cropping Ease, Management Issues
  – Other
## Manitoba Crop Composition

<table>
<thead>
<tr>
<th>Crop Type</th>
<th>1992</th>
<th>2002</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Wheat</td>
<td>5,207,501</td>
<td>3,313,258</td>
<td>2,938,559</td>
</tr>
<tr>
<td>Barley</td>
<td>1,124,591</td>
<td>1,099,644</td>
<td>514,748</td>
</tr>
<tr>
<td>Oats</td>
<td>569,829</td>
<td>1,149,538</td>
<td>549,822</td>
</tr>
<tr>
<td>Grain Corn</td>
<td>120,042</td>
<td>154,869</td>
<td>299,858</td>
</tr>
<tr>
<td>Canola</td>
<td>1,599,325</td>
<td>2,199,041</td>
<td>3,546,920</td>
</tr>
<tr>
<td>Flax</td>
<td>369,759</td>
<td>429,780</td>
<td>159,809</td>
</tr>
<tr>
<td>Sunflower</td>
<td>159,809</td>
<td>209,950</td>
<td>109,915</td>
</tr>
<tr>
<td>Soybean</td>
<td>4,940</td>
<td>129,922</td>
<td>849,680</td>
</tr>
<tr>
<td>Dry Bean</td>
<td>79,500</td>
<td>631,000</td>
<td>270,000</td>
</tr>
<tr>
<td>Peas</td>
<td>124,982</td>
<td>199,576</td>
<td>54,834</td>
</tr>
</tbody>
</table>

Source: Statistics Canada
Audience......Why Have Crop Acreage Shifted?

a. Adaptation to area, improved genetics
b. Production Reliability, Ease and Machinery
c. Pest Pressure and Crop Protection Products
d. Pricing – Returns on Investment
e. Knowledge/Support
Canola
Soybean
Wheat

Seeded Acres

Year

1st severe FHB outbreak
Aug.22 FROST
Spring FLOOD

Source: Statistics Canada

Folicur Emergency Use
HT canola introduced
HT soybean introduced
Hyola 401 introduced

Canola
Soybean
Wheat

Year


0
1,000,000
2,000,000
3,000,000
4,000,000
5,000,000
6,000,000

Seeded Acres
Crop Composition/Rotation Drivers

- Yield Observations from Rotation Order
- Return on Investment
- Pest Pressures and Protection Products
- Soil Capabilities - water, nutrient, residues
Documented Rotation Effects on Yields and Patterns
# Yield Potential for Crop Planted on Stubble

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>HRS</th>
<th>Barley</th>
<th>Oat</th>
<th>Canola</th>
<th>Flax</th>
<th>Pea</th>
<th>Soybean</th>
<th>Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS</td>
<td>90</td>
<td>101</td>
<td>101</td>
<td>103</td>
<td>102</td>
<td>102</td>
<td>107</td>
<td>96</td>
</tr>
<tr>
<td>Barley</td>
<td>92</td>
<td>88</td>
<td>91</td>
<td>100</td>
<td>99</td>
<td>97</td>
<td>92</td>
<td>82</td>
</tr>
<tr>
<td>Oat</td>
<td>93</td>
<td>91</td>
<td>85</td>
<td>95</td>
<td>97</td>
<td>93</td>
<td>104</td>
<td>101</td>
</tr>
<tr>
<td>Canola</td>
<td>103</td>
<td>105</td>
<td>104</td>
<td>83</td>
<td>90</td>
<td>93</td>
<td>99</td>
<td>98</td>
</tr>
<tr>
<td>Flax</td>
<td>98</td>
<td>104</td>
<td>102</td>
<td>98</td>
<td>81</td>
<td>79</td>
<td>58</td>
<td>70</td>
</tr>
<tr>
<td>Pea</td>
<td>100</td>
<td>104</td>
<td>105</td>
<td>101</td>
<td>111</td>
<td>.</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Soybean</td>
<td>109</td>
<td>98</td>
<td>89</td>
<td>84</td>
<td>.</td>
<td>.</td>
<td>72</td>
<td>93</td>
</tr>
<tr>
<td>Corn</td>
<td>112</td>
<td>107</td>
<td>107</td>
<td>106</td>
<td>98</td>
<td>.</td>
<td>84</td>
<td>92</td>
</tr>
</tbody>
</table>

Yearly wheat records in Manitoba, 2000-2010:

- **Wheat on wheat**
- **1 year break**
- **2 year**
- **3 year**
- **4 year**

**Source:** MB Agricultural Services Corporation
Add yield cart of rotational sequence of wheat on wheat. Break 2 year = increase 0.4% Wheat on wheat = decrease 1%

Source: MB Agricultural Services Corporation
Using linear regression after 15 years (= 2015), the 3 year break had highest potential yields

<table>
<thead>
<tr>
<th></th>
<th>No break</th>
<th>1 year</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>96%</td>
<td>103%</td>
<td>101%</td>
<td>100%</td>
<td>99%</td>
</tr>
<tr>
<td>2005</td>
<td>90%</td>
<td>104%</td>
<td>101%</td>
<td>102%</td>
<td>99%</td>
</tr>
<tr>
<td>2010</td>
<td>85%</td>
<td>104%</td>
<td>102%</td>
<td>104%</td>
<td>99%</td>
</tr>
<tr>
<td>2015</td>
<td>80%</td>
<td>105%</td>
<td>102%</td>
<td>106%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Canola on canola = stable at 84-85% yield

3 year break = decrease 0.39%

Source: MB Agricultural Services Corporation
Using linear regression after 15 years (= 2015), Yield Potential for ALL Canola Rotations Dropping

<table>
<thead>
<tr>
<th>Year</th>
<th>No break</th>
<th>1 year</th>
<th>2 year</th>
<th>3 year</th>
<th>4 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>84%</td>
<td>108%</td>
<td>107%</td>
<td>106%</td>
<td>99%</td>
</tr>
<tr>
<td>2005</td>
<td>85%</td>
<td>106%</td>
<td>103%</td>
<td>104%</td>
<td>97%</td>
</tr>
<tr>
<td>2010</td>
<td>85%</td>
<td>104%</td>
<td>99%</td>
<td>102%</td>
<td>95%</td>
</tr>
<tr>
<td>2015</td>
<td>85%</td>
<td>101%</td>
<td>95%</td>
<td>100%</td>
<td>93%</td>
</tr>
</tbody>
</table>
Audience......What Drives Crop Rotation in Your Area?

a. Crop Adaptation (Reliable Yields)
b. Production Ease and Machinery Availability
c. Ability to Control Pests (weed/disease/insect)
d. Net Revenues per acre
e. Soil issues (erosion, residues, trash mgmt)
Economics, Returns and Seeded Acreage
Rotation Planning Beyond Commodity Prices

• In-crop contaminants from past crops
• Disease Issues
• Soil issues (water, salts, residues, nutrients)
• Good/Bad Crop Sequences in Fields
Rotational considerations when growing multiple HT crops

Source: Dennis Lange, MAFRI
## Disease Management

<table>
<thead>
<tr>
<th>Fusarium</th>
<th>Sclerotinia</th>
<th>Blackleg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring wheat</td>
<td>Canola</td>
<td>Canola</td>
</tr>
<tr>
<td>Winter what</td>
<td>Soybean</td>
<td>Mustard</td>
</tr>
<tr>
<td>Barley</td>
<td>Dry Bean</td>
<td></td>
</tr>
<tr>
<td>Oat</td>
<td>Flax</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>Sunflower</td>
<td></td>
</tr>
<tr>
<td>Rye</td>
<td>Field Pea</td>
<td></td>
</tr>
<tr>
<td>Some forage grasses</td>
<td>Lentil</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mustard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carrots</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Potato</td>
<td></td>
</tr>
</tbody>
</table>
### Previous Crop Stubble

<table>
<thead>
<tr>
<th>Previous Crop</th>
<th>Wheat</th>
<th>Canola</th>
<th>Pea</th>
<th>Alfalfa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola</td>
<td>None</td>
<td>RR:L2, DO:L1, SD:H4, BG:H3</td>
<td>RR:L1, DO:L1, SD:M3</td>
<td>RR:L2, DO:L1, SD:L3</td>
</tr>
</tbody>
</table>

**Key:**
- RR = root rot, DO = damping off, SD = sclerotinia, BG = blackleg
- L = low risk, M = medium risk, H = high risk

- After canola and field pea need to watch out for sclerotinia as medium to high risk for 3 years
- Sclerotinia also identified in risk after alfalfa
- Blackleg is the concern on canola-canola rotation
- Canola on Wheat = NO Disease Concern

*Source: Adapted “Manitoba Crop Rotation Chart” from Manitoba Agriculture, 1994*
Soil Residual Herbicides and Cropping

- Precipitation, soil type, pH, organic matter, soil temperatures and when product applied
  - all matter to the degradation of herbicides
  - what can be planted the following year
- If using residual product in the year, need to be conservative when planning for next year crop
  - See Guide to Crop Protection ‘Re-cropping Restrictions for Residual Herbicides’
Soil Issues Driving Crop Rotation

• Short vs. Long Season Crops = water use over time

• Crop rooting depth variation
  – Overall water-use, not just dry to certain depth
  – Deep rooted - also reducing salinity build-up and accessing deep nitrates

• Residues
  – Subsequent low residue crops = soil erosion
  – High residue = spring establishment issues next year
Sequences to Consider (or Not)

• Good After Soybean
  – Oats or flax: year after HT soybeans may have less weeds, not too many disease concerns, limited herbicide residues concerns

• Caution Crops After Canola
  – Flax and corn: need mycorrhizae for P uptake and after canola, the populations are reduced
  – Sunflower: need at least a 3 year break to reduce potential for sclerots in soil for basal rot and potential for later mid-stalk and head rots
Audience ... What is the most important factor for improving the sustainability and profitability of crop rotations?

a. more crop choices, genetics
b. improved cultural practices
c. higher rates, more types of commercial fertilizers
d. additional pesticide development and application
e. greater integration with livestock production (eg. manure and forage)
Acknowledgements:

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Grant Palmer – MAFRI Policy Economist