Rotation “B” & “C” at Scott: 100 years and still growing

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An Act Respecting Experimental Farm Stations, (June 1986)

- Established five experimental farms, Ottawa (ON), Napan (NS), Brandon, (MB) Indian Head, (NWT) and Agazzis (BC)

- Stated objectives were: “The testing of crops, livestock housing, nutrition and management of animals, and the use of manure as a fertilizer”

- First recorded long-term study (1886 – 1910)
  oat-barley-wheat-fodder beats–turnip-corn
“…in the soil, a large store of fertility has been laid up… which may … be continually added to and improved, but by careless and injudicious management may be prodigally wasted…”

W. M. Saunders - Director of Experimental Farms, 1893
Multiple Site Long-term Rotation Studies (est. 1911)

- Fallow – wheat (*2 year*)

<table>
<thead>
<tr>
<th>System</th>
<th>Average Yield</th>
<th>Average cost</th>
<th>Profit on Crop</th>
<th>Profit on Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fallow-Wheat</td>
<td>25.9</td>
<td>41.8</td>
<td>11.56</td>
<td>5.68</td>
</tr>
</tbody>
</table>

Source: Dominion of Canada Department of Agriculture Bulletin # 98 - 1928
### Average Crop and Input Values: 1911 - 1926

<table>
<thead>
<tr>
<th>Category</th>
<th>Value ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour</td>
<td>0.24 / hour</td>
</tr>
<tr>
<td>Horse labour</td>
<td>0.85 / hour</td>
</tr>
<tr>
<td>machinery</td>
<td>1.06 / acre</td>
</tr>
<tr>
<td>Land Rental</td>
<td>2.50 / acre</td>
</tr>
<tr>
<td>Wheat</td>
<td>1.18 / bus</td>
</tr>
<tr>
<td>Oats</td>
<td>0.40 / bus</td>
</tr>
<tr>
<td>Barley</td>
<td>0.56 / bus</td>
</tr>
</tbody>
</table>

Source: Dominion of Canada Department of Agriculture Bulletin # 98 - 1928
• Rotation C = fallow-wheat-wheat; Rotation B (re-established 1921) = fallow-wheat
• Grain threshing (1928?) with a combine retained crop residues in the field.
• 1930 the Rotation C plots split and P fertilizer added to wheat phases
• 1984 N fertilizer applications to wheat on stubble (1 in 3 years); P applications started to rotation B
• Chemical weed control, first broadleaf weeds (1948) and later grassy weeds (1970).
• No-till management (2000)
• New wheat varieties were adopted every 4 to 6 years.
• 20 to 50% of year to year variability related to early season precipitation

• fertilizer increased yield by 22% & 50%
• Input and Export of N not balanced ~ -10 lbs of N (300 lbs in 30 yrs); unfertilized -20 lbs on N (about 600 lbs in 30 yrs)

• SON levels in 1916 ~ 0.28%; in 1940 ~ 0.20%; in 2013 ~ 0.18% (comparisons across time very approximate)

• Based on differences between fertilized vs. unfertilized then SON would have been draw down of 325 kg but no measurable difference in 2013….????

• Apparent N recovery (fertilized grain N – unfertilized grain N /fertilizer N applied) approximately 70%.
• Input and Export of P approximately balanced for P fertilized treatements (unfertilized ~ 500 lbs of P in 83 yrs)

• Results from Lethbridge “sister study” indicate no significant impact on grain quality (micro-nutrient concentrations) status

• Results from Lethbridge “sister study” indicate that continuous wheat cropping with N fertilizer has higher microbial biomass than continuous wheat no N and rotation C

• N functional gene abundances higher where N fertilizer applied (genes involved in key N transformations)
Thanks for your attention!!!