Types of Crop Rotations

• Monoculture:
  – This is not a rotation
  – Continuous production of a single crop

• Short Rotation
  – A simple rotation consisting of 2 or 3 different crops grown, (Example= Corn-beans, or corn-wheat-double crop beans)

• Extended Rotation
  – Refers to multiple crops grown over many years (example=corn-oat-wheat-beans- corn-canola)
Crop Rotation Intensity

• Intensity is a relative term.
• I will refer to systems that produces more than one crop per year as being intensified.
• 3 crops in 2 years
  – Wheat-double crop- full season summer crop
• 4 crops in 3 years
  – Canola-wheat-double crop- full season summer crop
• There are a great many options in Oklahoma
Benefits of Crop Rotation or Detriments of Continuous Cropping

- Soil structure
- Soil erosion
- Nutrient management
- Disease and pest management
- Crop performance
- Water utilization
- Distribution of labor and equipment
  - However, complexity of system increases management requirements
Soil Structure

• Rotation can benefit soil structure in no-till cropping systems

• Inclusion of high biomass crops provides
  – Surface residues for prevention of erosion and surface crusts
  – Increased organic matter

• In contrast, monocultures of low residue crops such as cotton or soybeans can be detrimental

• Deep tap rooted crops can extend biopores deep into the profile and improve permeability of soil profile
Erosion Reduction Through Crop Rotation

- Crop rotation provides for improved success of no-till and reduced tillage system
- Rotating high residue crops with low residue crops provide for reduce erosion potential compared to continuous production of low residue crops
  - Soybeans rotated with wheat or corn is an improvement compared to
Nutrient Management

• Inclusion of deep rooted crops in rotation provides a potential for translocation of nutrients from subsoil
  – This is a theory with little research that quantifies the effect.

• Intensification of crop rotation can improve utilization of residual N.

• Inclusion of legumes in rotation provides the most evident benefits
Rotating Corn with Soybeans can Decrease Fertilizer N Requirements.

- Irrigated corn-soybean rotation in Western KS
- N requirements for corn were greatly reduced after soybeans

![Graph showing corn yield vs. N rate (lbs/acre)](image)

Schlegal et al.
Rotating Corn with Soybeans can Decrease Fertilizer N Requirements.

- Similar effects were observed for sorghum-soybean rotation.

Schlegal et al
Rotational Benefits to Pest Management

- Rotation breaks weed, insect, and disease cycles
- Rotations will allow for a diversification of weed control chemistries
- Alternating crops can remove hosts plants and/or residues need for insect and disease life cycles.
- However, it is important to evaluate pest lifecycles when developing a rotation in order to realize this benefit
Reductions in Weed Pressures

• Most often monocultures rely on 1 or 2 classes of weed control chemistries.
• Resistance can rapidly develop in a no-till system.
• Alternating the time of year for fallow periods and crops can increase the number of weed control options and minimize genetic and species shifts in weed populations
• Rotating the mode of action is critical to the prevention of weed population shifts.
Canola-Wheat Rotation As an Example

- Canola and wheat share very few common disease problems.
- Glyphosate resistant Canola allows producers to kill winter annual grasses.
- An ACCase inhibitor can be used during wheat production.
<table>
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<tr>
<th>Disease</th>
<th>Wheat</th>
<th>Canola</th>
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<td>✓</td>
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<tr>
<td>Sclerotinia stem rot</td>
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</tbody>
</table>
Effect of Crop Rotation in Spring Canola

Effect of Rotation on Blackleg Disease (Saskatoon, SK 1986)

![Graph showing the effect of rotation on blackleg disease](image1)

Effect of Rotation on the Incidence of Blackleg Disease in Canola (Manitoba 1999)

![Graph showing the average percentage of infection](image2)