Rotations and Break Crops: Setting the Scene

Dermot Forristal, John Carroll, Faisal Zahoor

Teagasc
Oak Park Crops Research
Outline

- Rotations/ break crops - why now?
- Teagasc Research 2014 / 2015
- Knockbeg Systems/Rotation Trial:
  - Effect of Break crops on Cereal yields
  - Crop Margins
- Lessons for future
Why Rotations/Breaks Now?

**Ireland Crop Production:**
- In the past: Grass rotations on 'Mixed' farms
- Sugar beet gone
- Break crops: 9.6% of arable area
- Continuous cereal production for 20-35 years

**Benefits of Rotations**
- Fertility
- Disease breaks
- Weed control (grass weeds)
- More crop / market choices

**EU regulations and support**
CROPQUEST
- DAFM funded desk study (2 year - half way through)
- Review opportunities for break crops.
- Including new market options.
  (F. Zahoor, J. Carroll, DF.)

Oilseed Rape  (part 'Grain levy' funded)
- Crop Establishment Systems
  - Conventional vs Min Till vs Subsoiler incl Row spacing etc.
  - Interaction with management, N requirement.
- Disease control
  (DF, JS, LG, GL, PhDs)
Teagasc: Break Crop Research

► Break Crop Agronomy (part Grain levy funded)
  ▶ Bean Agronomy (populations, disease etc)
  ▶ Expand beans from end 2015 (PhDs)
    (Establishment, Physiology of yield limitations.)
  ▶ Sugar Beet varieties
    (J. Carroll, JS, DF)

► Oats
  ▶ New Programme 2015: Yield, Quality, Lodging, Mycotoxins
    (J. Finnan)
Bean Trial Harvest Yesterday!

4.0 - 7.7 t/ha
Are Break Crops beneficial?

- Not that much relevant research!
- International review
- Systems / Rotation Trial in Knockbeg
YIELD Increase

- **North America:**
  - Legumes/Oilseeds: +16% (-50% to +60%)

- **Australia**
  - Legumes/Oilseeds: +33% (-25% to +187%)

- **Europe**
  - Legumes/Oilseeds: +24% (-27% to +224%)
## WW yield after break

<table>
<thead>
<tr>
<th>Region</th>
<th>★</th>
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<tbody>
<tr>
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<td><strong>Europe (Higher yield)</strong></td>
<td>Legumes</td>
<td>+4.1% (-27% to +28%)</td>
<td>7.3t/ha</td>
</tr>
<tr>
<td></td>
<td>OSR</td>
<td>+10% (0 to +39%)</td>
<td>7.5t/ha</td>
</tr>
<tr>
<td></td>
<td>Oats (1 study)</td>
<td>+38%</td>
<td>7.1t/ha</td>
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Knockbeg Systems Trial

• 1996 - 2011.
• Rotations and input levels
• Free draining loam (22% clay)
### Rotations and Monoculture

<table>
<thead>
<tr>
<th>Break Crop (BC)</th>
<th>Cereal Rotation (CR)</th>
<th>Mono</th>
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<tbody>
<tr>
<td>1 W. Wheat</td>
<td>W. Wheat</td>
<td>W. Wheat</td>
<td>S. Barley</td>
</tr>
<tr>
<td>2 S. Barley</td>
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</tr>
<tr>
<td>3 S. Oats</td>
<td>W. Oats</td>
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</tr>
<tr>
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</tr>
<tr>
<td>5 Beans</td>
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Systems Trial: Inputs

- **High:**
  - Commercial rates

- **Low:**
  - 80% Nitrogen rates
  - 50% Fungicides / Herbicides
Crops and measurements

- Comparing cereal crops grown in rotations
  - W. Wheat, W. Barley, S. Barley

- 7 years data: 2004 – 2010 inclusive

- Grain Yield (t/ha at 15% m.c.)

- Net Profit Margin
  - Standard costs (Inputs and machinery) 2011 prices
  - Individual Crop margins
  - Complete Rotation margins
Results: Yields and Margins
Wheat after Break (t/ha): all years

Break
+11% Yield
+ 1.1 t/ha
Wheat Margin (€/ha): all years

Margin (€/ha)

High
Low
All

Break
+36% Margin

After Break
Continuous
Sp. Barley Yield and Margin

BC: +3% Yield

Yield (t/ha)

Margin (€/ha)
Results: Complete Rotations
• All Years
Entire Rotations and Margin (€/ha)
Rotation crop element margins (€/ha)

- Wheat
- S. Barley
- S OSR
- W. Barley
- Beans
- W.Oats

- Break Rot
- Cereal Rot
- Cont WW
- Cont SB
Yield Variability

- **W. Wheat Low Input:** -10% to + 8%
  - **High Input:** -11% to + 16%

- **Spring OSR:** -10% to + 40%

- **Beans:** -34% to + 28%
Performance varies; particularly break crops.

Break crop benefits the following crop:
   W.Wheat and W.Barley

Rotation interacts with input levels
   - some scope to save costs.

Entire rotations must be considered:
   ➢ Individual crop performance important
   ➢ Suitability to site important
Practical considerations

- Performance from all rotation components vital
- Agronomy of 'break' crops must be optimised
- Build profitable rotations
  - Know: **Yield, Costs, Profits** for each crop on your soils
  - Know **short term** and **long term** rotation benefits
  - Due regard to market for break crops
  - Make decision based on Profit and long term benefits

E.g. for Knockbeg:
Conclusions

- Must balance agronomic requirements with profitability.
- Choose component crops wisely
- Research needed on Break crops
- Market needed for Break crops
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