Cover crops- an Irish perspective

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Cover crops = multipurpose crops?

- Different objectives
  - Cover crops – cover the ground
  - Catch crops – ‘catch’ nutrients preventing them from being lost
  - Green manures – improve soil characteristics or benefit succeeding crop
  - Forage crops – provide overwinter forage

- Different species or mixtures of species
  - Each species will have individual advantages and disadvantages
  - Effect of any species likely to be proportion dependent
  - Makes general recommendations difficult

- Most work at Oak Park (and abroad) on single species
  - Limited information on benefit of mixtures over single species
  - Legume/non-legume mixtures have been investigated
Potential benefits

- Reduction of nutrient loss (mainly nitrate)
- Reduction of pests, diseases, weeds
- Prevention of erosion
- Improvement of organic matter/soil quality/health
- Improvement of soil structure
- Increased nutrient supply to next crop
  - Potential to reduce fertiliser inputs
- (source of forage)
- Yield benefits
Nitrate leaching reductions (compared to bare stubble)

<table>
<thead>
<tr>
<th>Overwinter cover</th>
<th>% reduction in N concentration in drainage water</th>
<th>% reduction in N load (kg NO$_3$-N/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustard</td>
<td>74 - 86</td>
<td>19.4 - 52.3</td>
</tr>
<tr>
<td>Natural regeneration</td>
<td>11 - 42</td>
<td>6.7 - 21.4</td>
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</tbody>
</table>

- Experiment had both plough based cultivations and reduced tillage cultivations
- Experiment was on a very high leaching risk site (light sandy soil)

Premrov et al. 2014
Effect of cover crops on earthworm numbers

Roarty et al. 2017
Effect of cover crops on fertiliser N requirement

- Many factors involved
- Somewhat comparable to organic manures
- Variable and difficult to predict
Repeated use of cover crops doesn’t always lead to increased soil N supply to succeeding crop.

Seasonal effect often greater than cumulative effect:
note greater growth of cover crop in year 6 (and greater soil N supply above) compared to year 5 in next slide.
Season effect on cover crop growth
Effect on yield 2004-2006 Light soil (relative to bare stubble)

SIGNIFICANT YIELD INCREASES ARE THE EXCEPTION RATHER THAN THE NORM

NR- > natural regeneration without stubble cultivation
NR+ > natural regeneration with stubble cultivation
Effect on yield 2004-2006 Light soil
(relative to bare stubble)

Yield (t/ha)

NR

Mustard
Effect on yield 2004-2006  Medium soil
(relative to bare stubble)
Small effects of sown species compared to NR (2014)
Legume cover crops may have bigger effect on yield
BUT benefit can vary between seasons

No fertiliser N applied
Conclusions

Cover crops

- Have positive environmental effects
  - Reduced N leaching (where leaching is a problem)
- Can improve soil structure/soil ‘quality’
- Can increase or decrease pests and diseases
- Effect on yield variable and often small
- Effect on N requirement small (exception of legumes)
- Invoke additional costs (seed, sowing, destruction)
- Direct economic benefits can be small or negative
  - dependent on management, crop choice and year
Time of sowing effect

Photos: December 23
Cover growth is dependent on available $N$

Excessive growth can indicate excessive fertiliser $N$ application to previous crop.