Catchment Management for Water Supply Protection:

Green cover after maize & Wessex Water's cover crop work to date

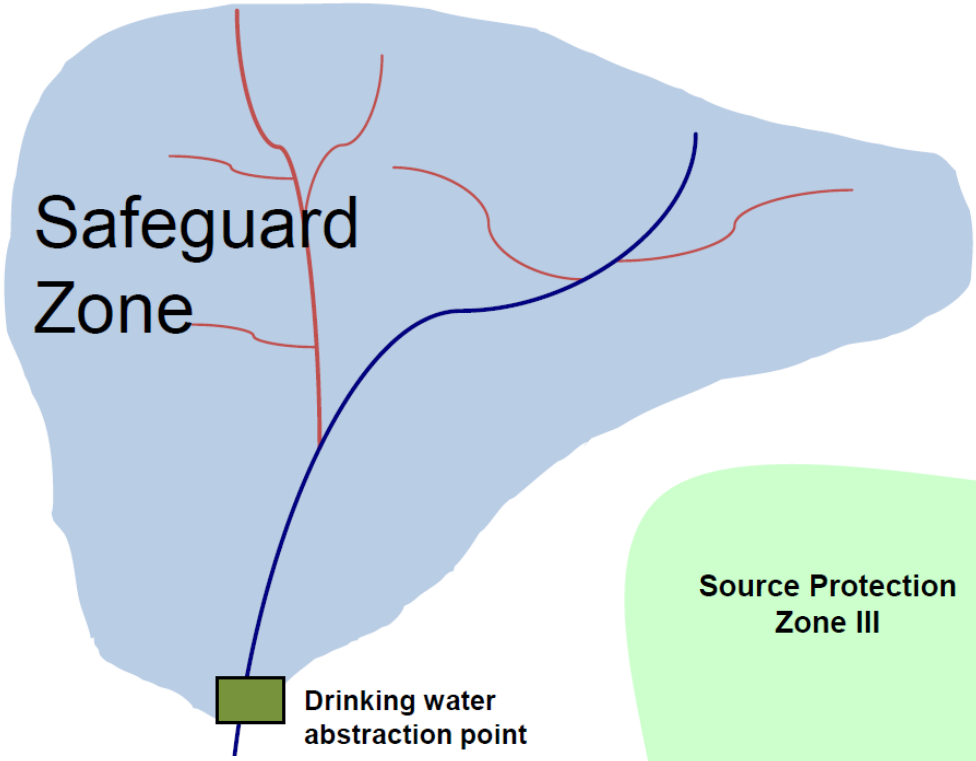
Tim Stephens

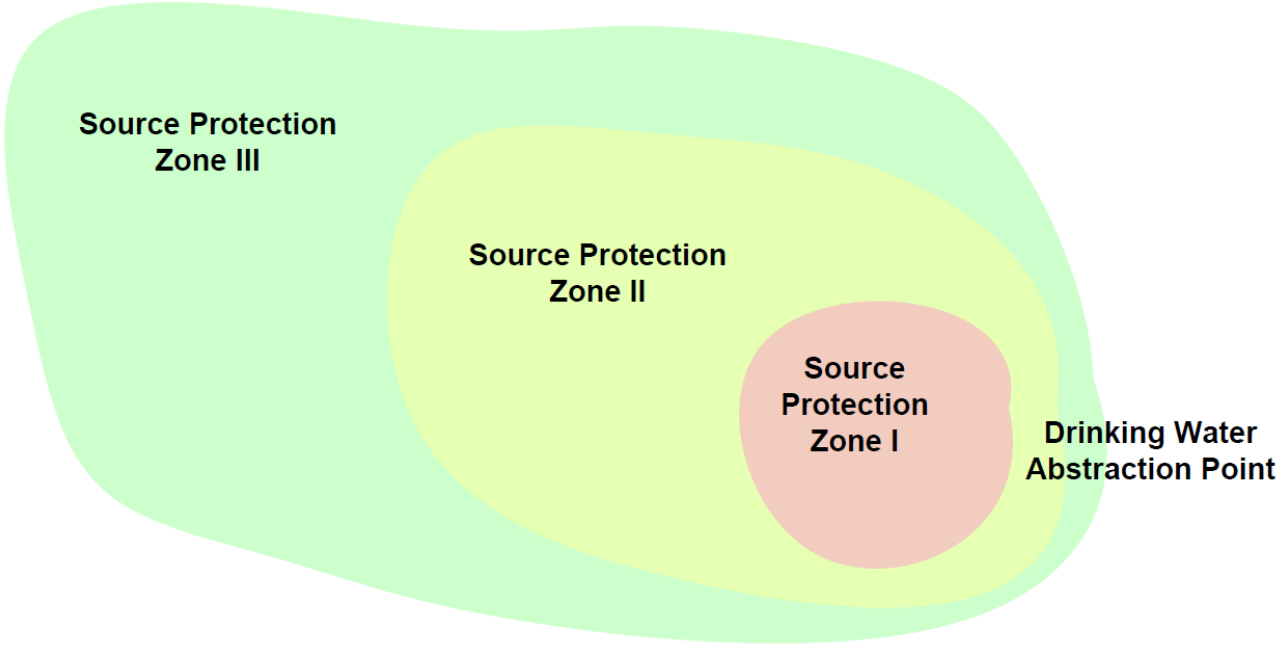
Senior Catchment Adviser, Wessex Water

February 2017

Where we are working

Safeguard Zones

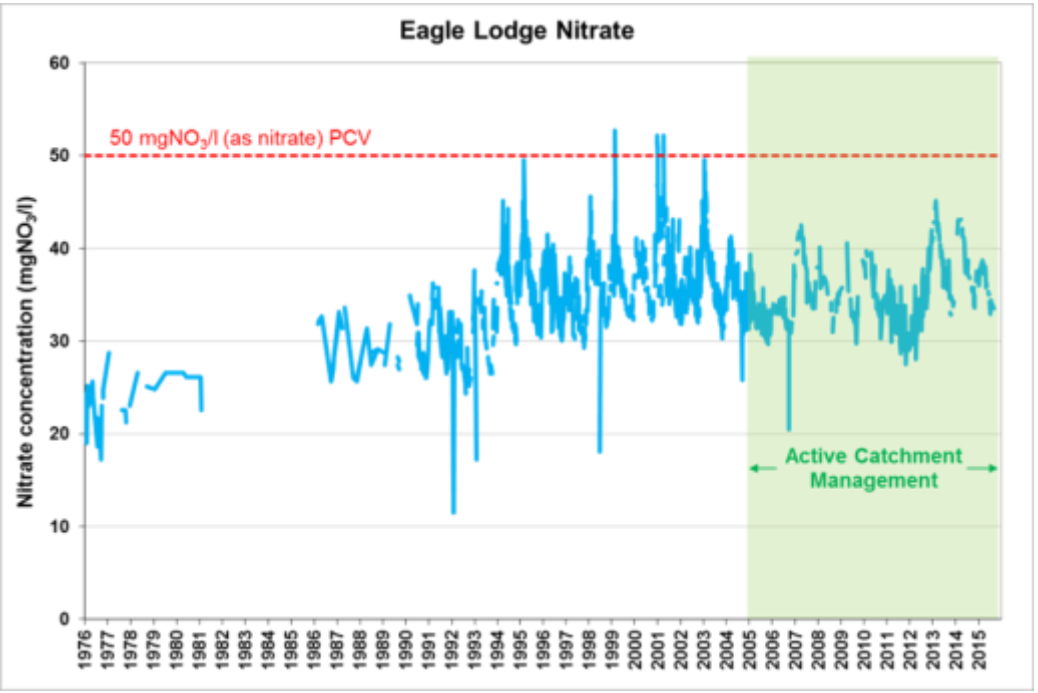




Source: Patrick Goldsworthy, VI

Nutrient enrichment causing algal growth >>>>>>>

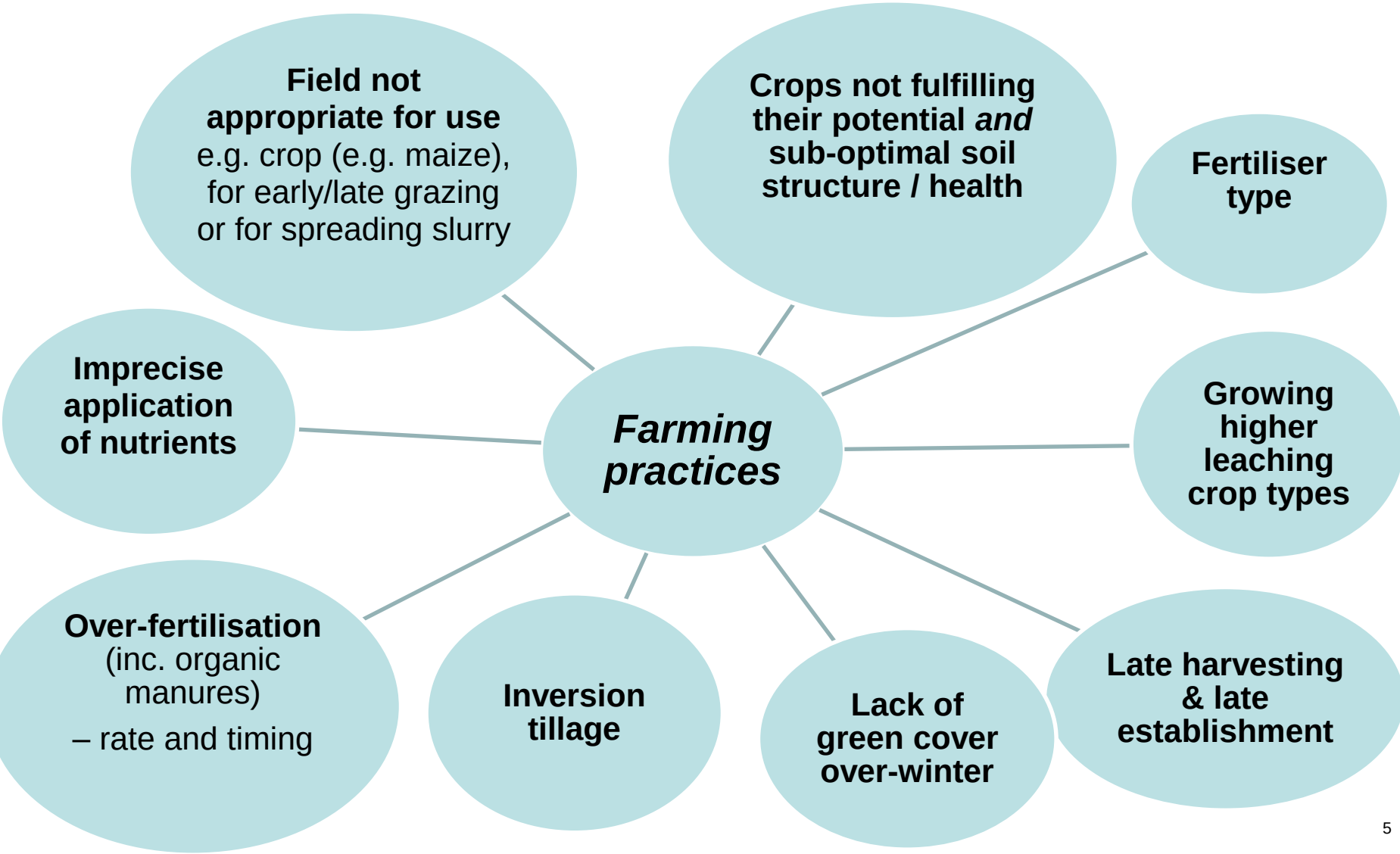
Habitat damage from sedimentation >>>



Silt laden River Frome at Waddock during heavy rainfall.
Douglas Kite, Natural England 2010.

<<<<< High and rising nitrate trends

Typical practices causing nitrate leaching

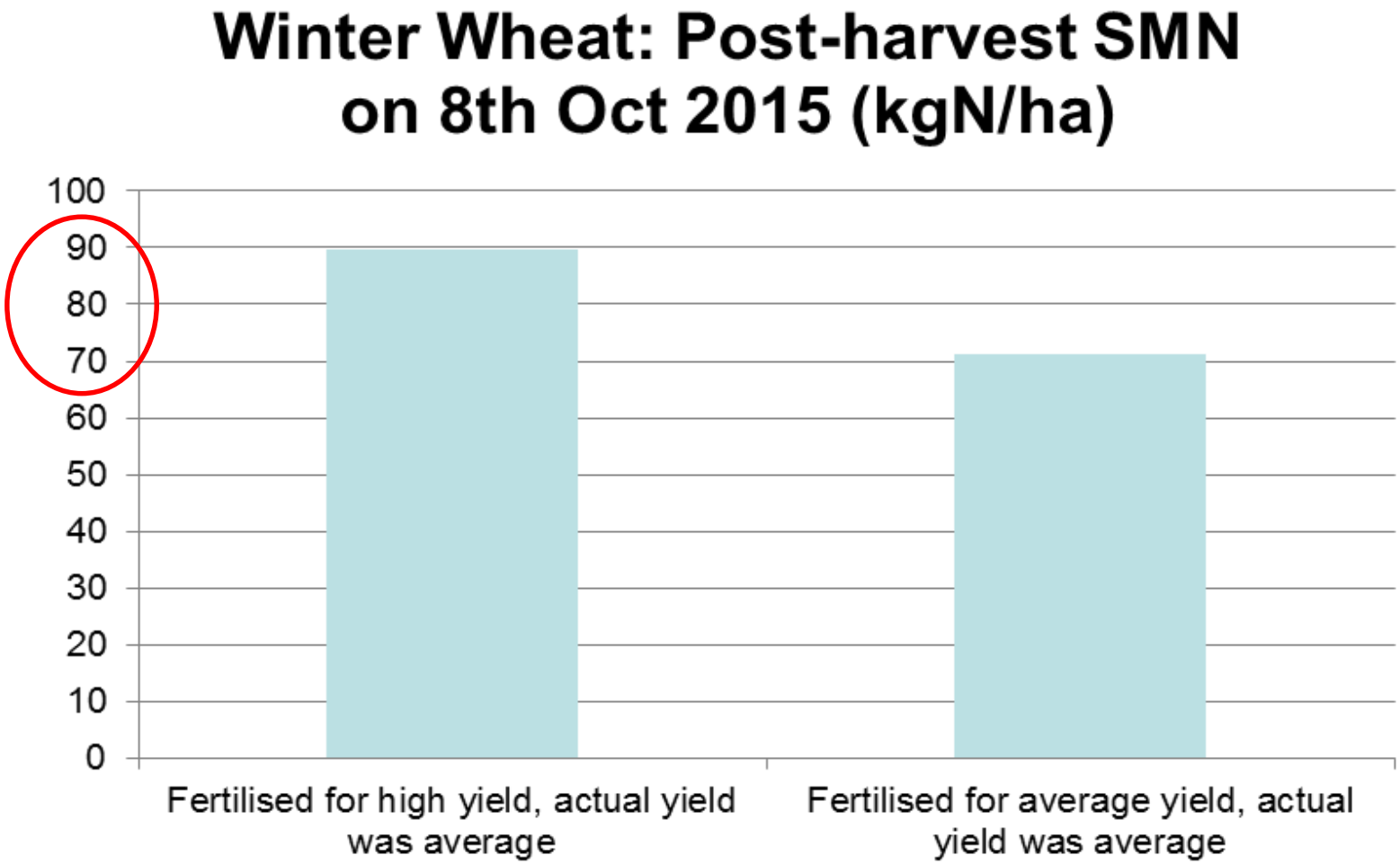


Typical livestock farming practices that can cause nitrate leaching

- Insufficient storage of livestock manures leading to untimely application
- Leaking slurry stores
- High stocking rates
- Over-feeding of protein
- Inappropriate out-wintering

Source: AHDB

The nitrogen challenge



Earlier harvest allows earlier establishment of the following crop

Wheat drilled after earlier maturing variety

Wheat drilled after late maturing variety (same farm, same date)

Crop nitrogen uptake of a cover crop and the amount of nitrogen prevented from leaching by that cover crop

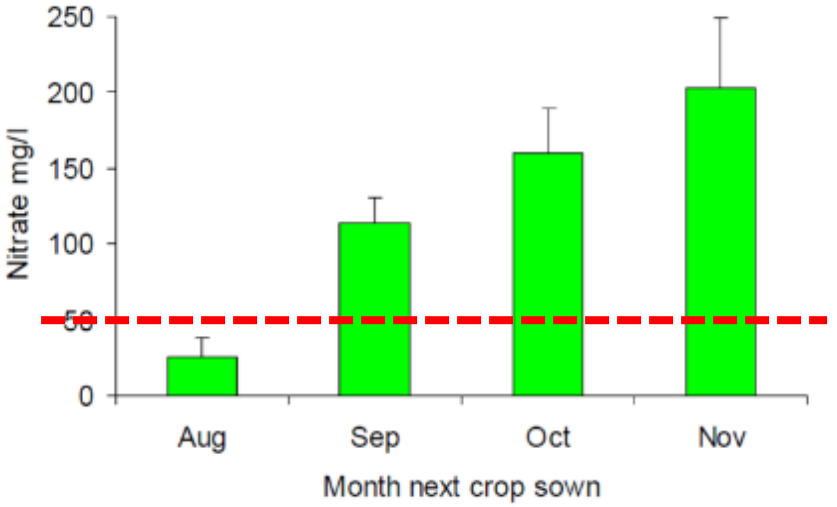
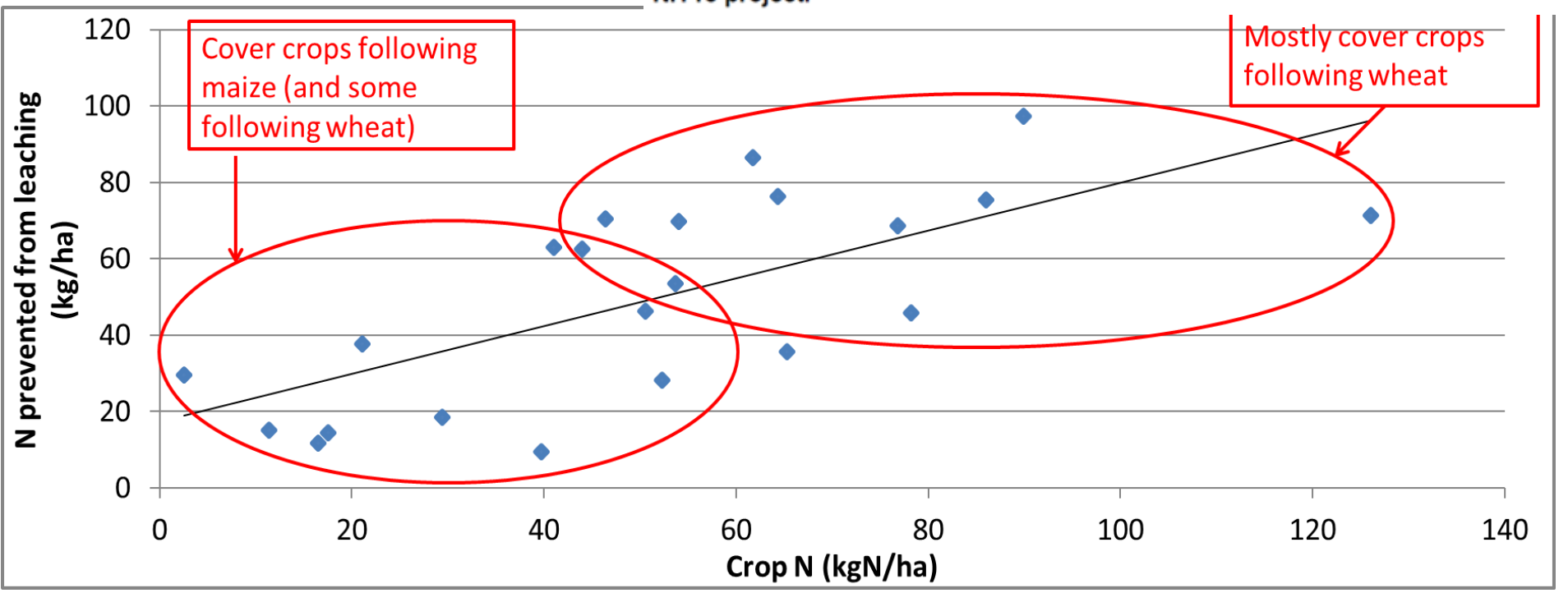
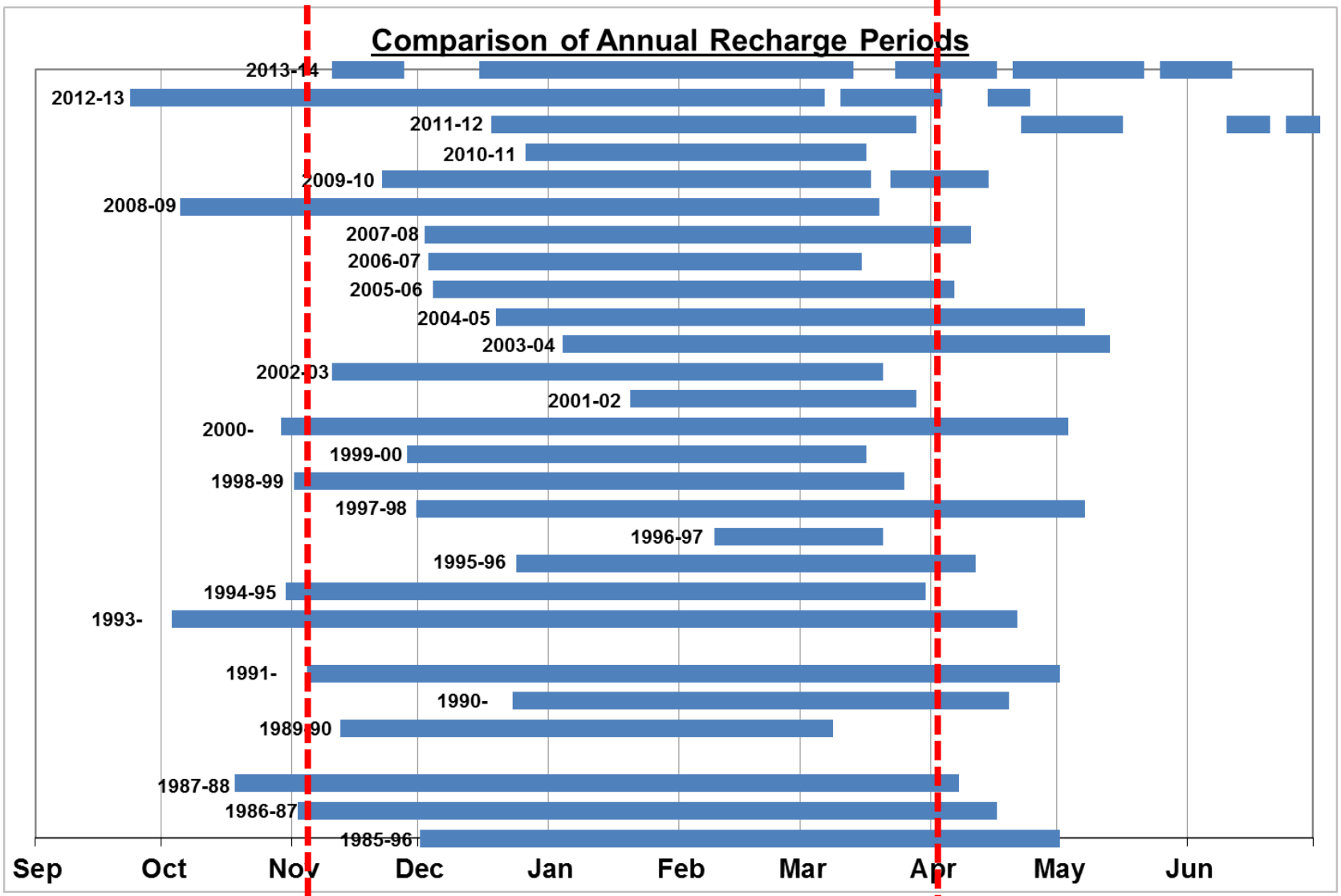


Figure 3.15. Nitrate concentrations in leachate are smallest where the next crop is established early. (SMN was similar for all sowing dates). Source: NIT18 project.



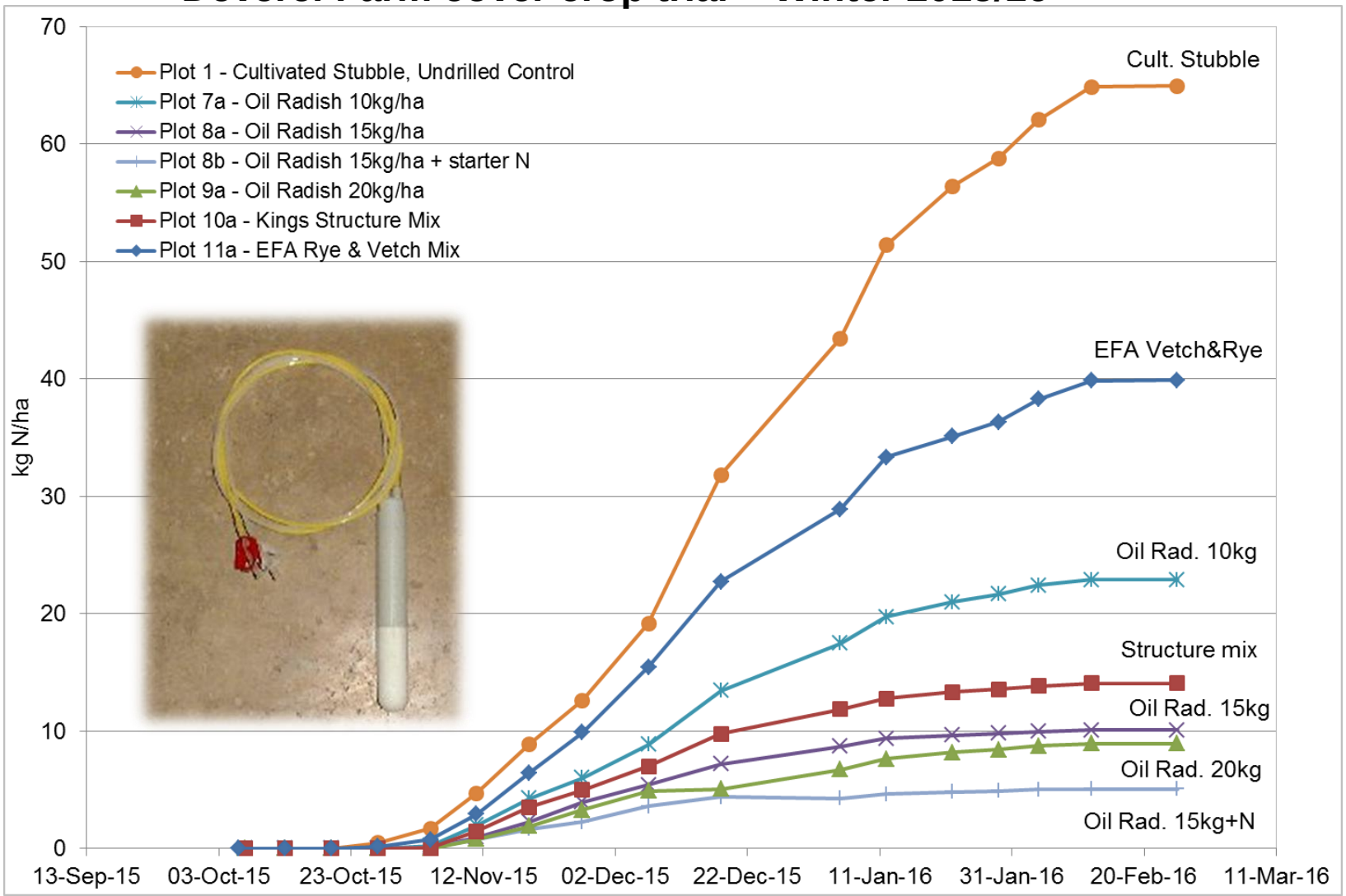
(*Source:* Wessex Water porous pot data from 17 Dorset farms in the winters of 2014/15 and 2015/16)

When does nitrate leaching happen?



Cumulative nitrogen leached during winter 2015/16 – Deverel Farm trial

Deverel Farm cover crop trial – Winter 2015/16



Cover crop trials – winter 2016/17

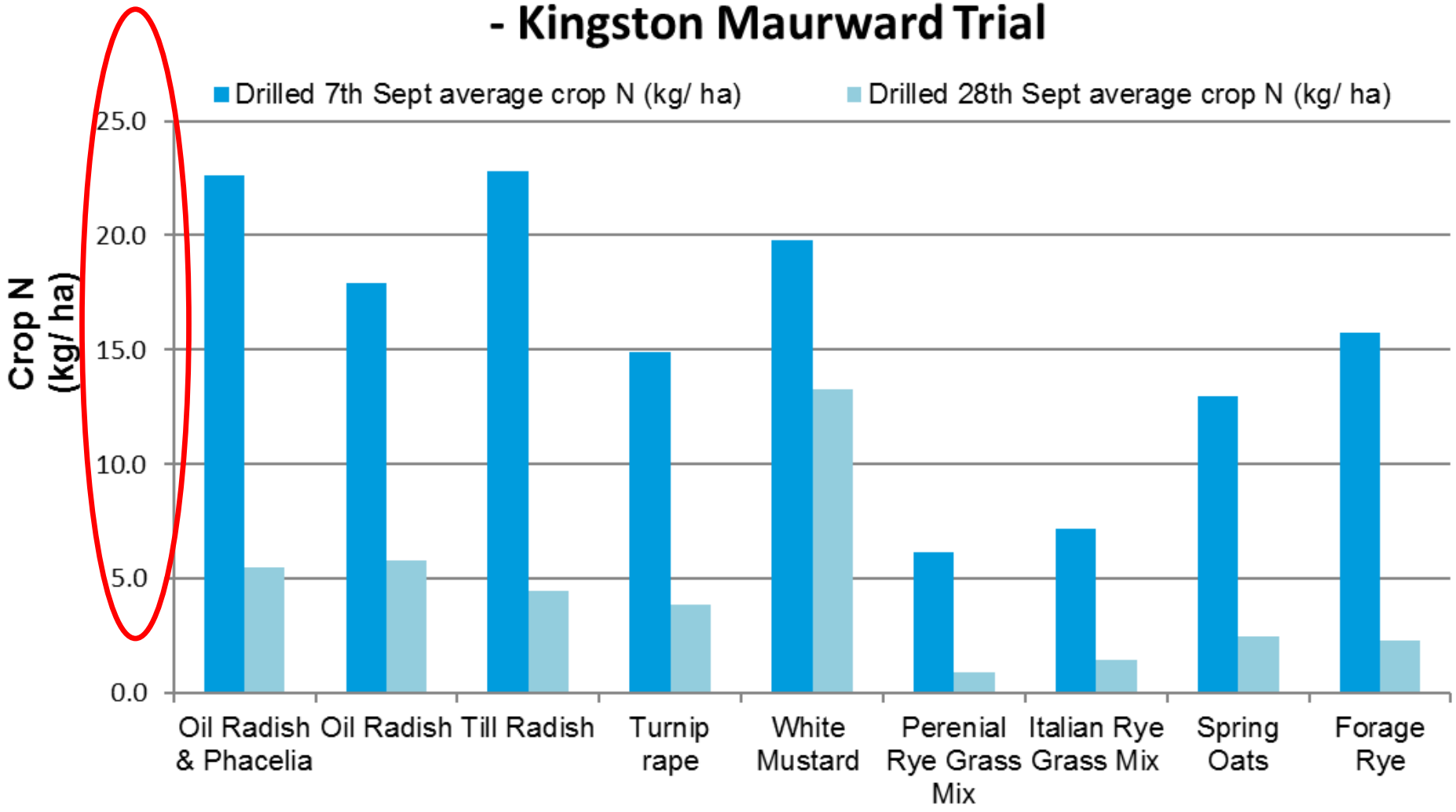
Kingston Maurward College, Dorchester

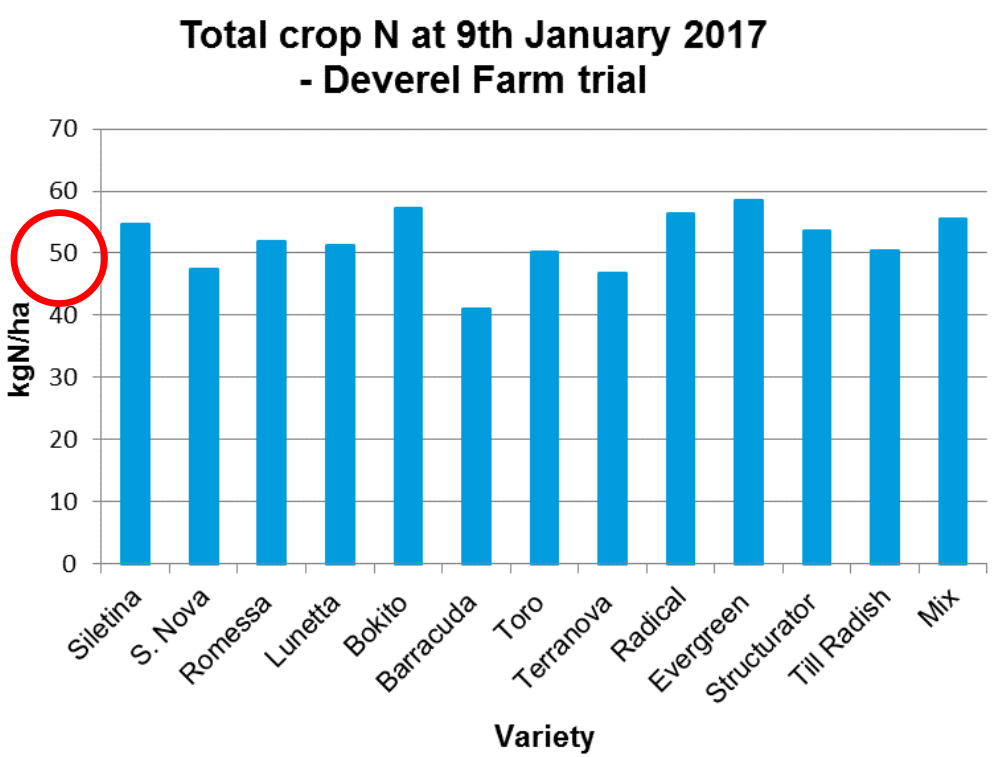
- multi-species comparison
- oil radish variety comparison
- drilling date comparison

Deverel Farm, Blandford Forum

- Oil radish variety comparison

Interim results from Kingston Maurward replicated cover crop trial

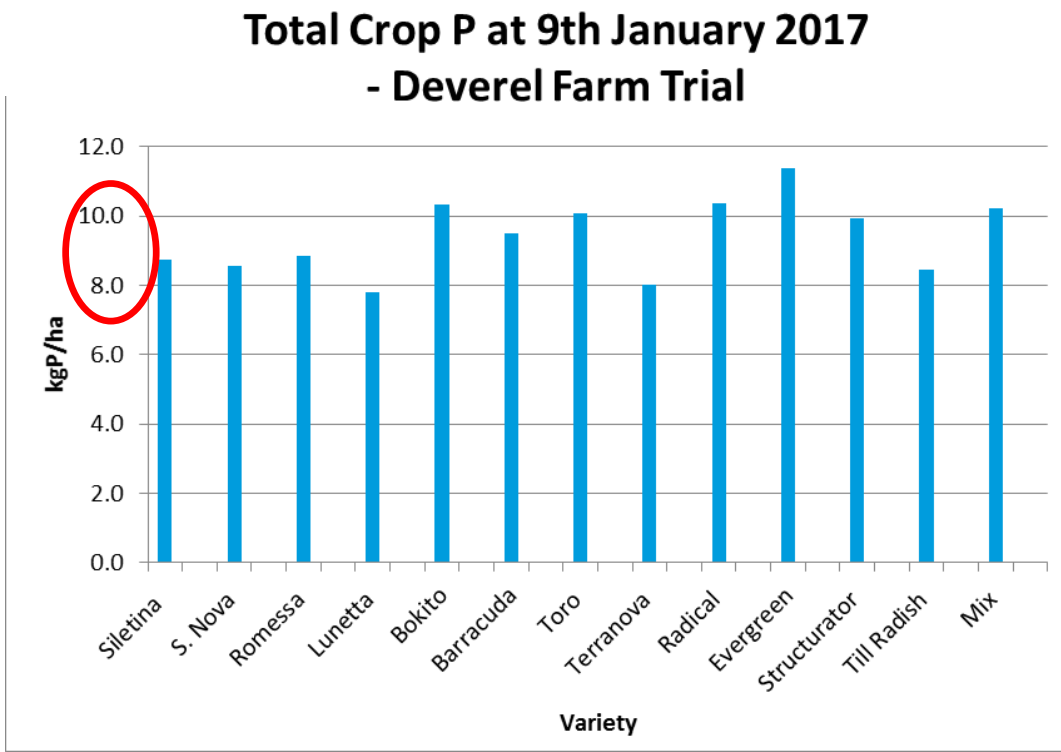




c. 60% of N in leaf, 40% in root

Yeffex Safer
a YTL company

Interim results from Deverel Farm replicated oil radish trial



c. 40% of P in leaf, 60% in root

18-25 kg crop N/ha on 3rd Jan

27 kg crop N/ha on 3rd Jan

Maize undersowing trial. Hurst Farm, nr Dorchester

IRG in slurry >>>>>>>>>

IRG with Einbock <<<<<<<<<

Fovant, Wiltshire. Early Nov 2016. Grass seed broadcast into fairly late-drilled maize. The grass took well and generally did what was required

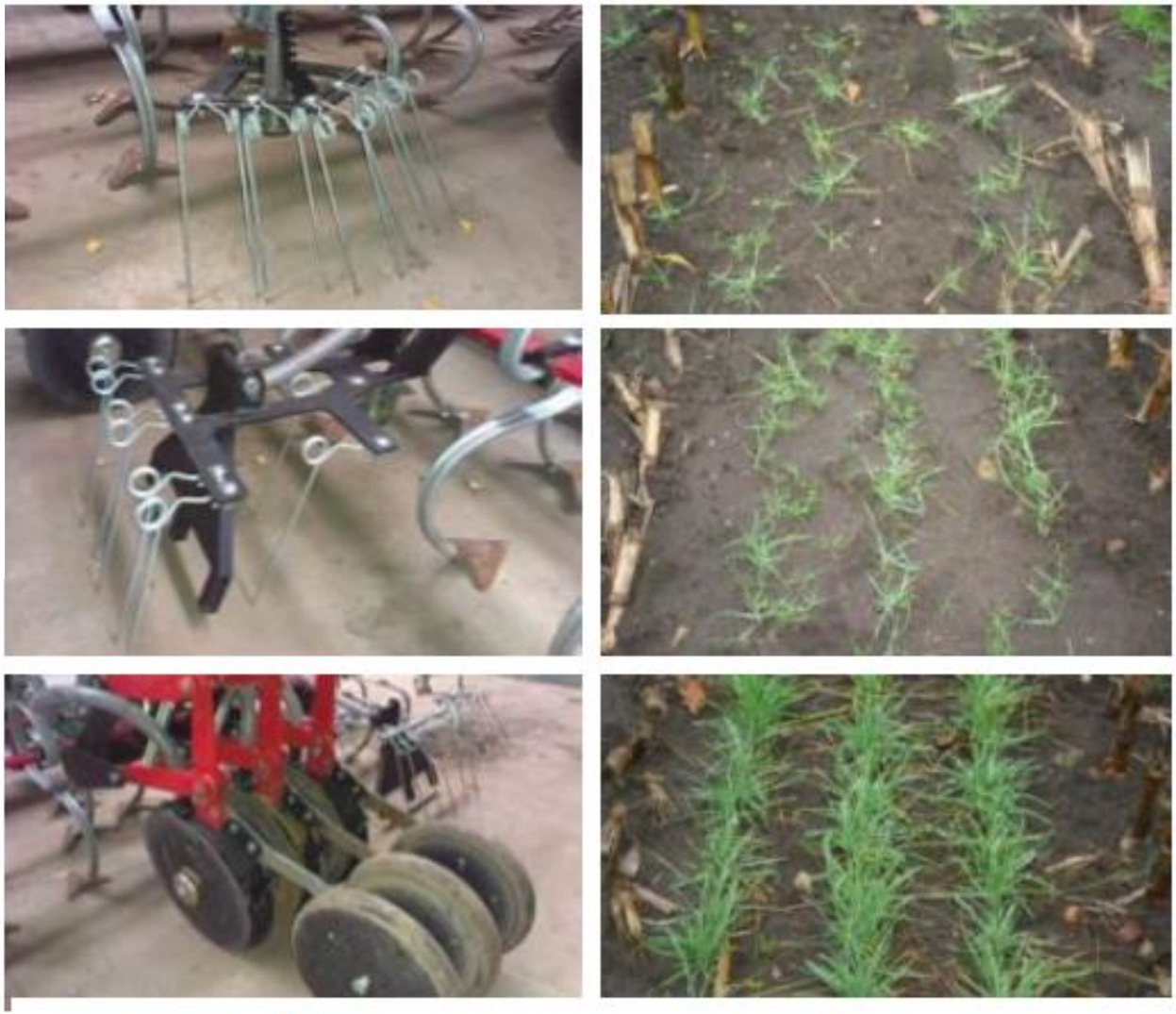
Pearce Seeds cover crop trials between crops of continuous maize (near Taunton)

Plot No.	Crop	Sowing rate (kg/ha)
1	Winter Wheat	75
2	Forage Rye	150
3	Early English Vetch	125
4	Vetch & Festulolium	75
5	Berseem Clover	6
6	Westerwolds	25
7	Festulolium	25
8	Tetraploid Ryegrass	25

PEARCE SEEDS

Source: MGA Technical note Apr 2015 *(Photos from Hans Spelling Oester-graard, SEGES, Denmark)*

GOOD SOWING TECHNIQUE NECESSARY



3 trials in 2014
Per cent germination

12

27

45

SEGES

Establishment varies significantly based on method of sowing seed.

Maize Under-Sowing Service

Specialist Drill + Seed + **£5/ac Grant from WUF**

Complying with GAEC regulations (Good Agricultural, Environmental Condition) will probably prohibit farmers from leaving maize stubbles over winter in the future. Planning to establish a crop or cover after maize harvest is often not realistic because of autumn soil conditions and problems of late sowing. Under-sowing maize with grass, legumes and other species is, however, becoming a practical option. Grass can also count as an 'ecological focus area' option.

Field Options Ltd +
Wye and Usk Foundation

Maize Under-Sowing
Price Stucture

Spring 2016

Prices below are per acre; drilling and seed included.

Price is dependant on the species to be sown, the area to be drilled and the round trip the drill has to make for each job. Select from tables below.

Farmers can order a combination of species.

Deduct £5.00/acre from the prices below to give the net price.

This will be subject to VAT and terms below.

No. 1. IRG Option **Cost/acre ex VAT**

	10-20 Miles (Avg.15)	21-30 Miles (Avg.25)	31-40 Miles (Avg.35)	41-50 Miles (Avg. 45)	51-60 Miles (Avg. 55)	61-70 Miles (Avg. 55)
10-20 acres	£31.36	£32.36	£33.36	£34.36	£35.36	£36.36
21-40 acres	£30.26	£30.76	£31.26	£31.76	£32.26	£32.76
40-100 acres	£29.19	£29.44	£29.69	£29.94	£30.19	£30.44
>100 acres	£28.66	£28.80	£28.94	£29.07	£29.21	£29.35


The
Wye & Usk
FOUNDATION


Field
Options

Field Options

The Wye & Usk FOUNDATION

Photos taken:
Herefordshire, 30th January 2017

Drilled + press wheel drill

Broadcast + grass rake (next door field)

Undersowing methods conclusion

- There is an optimum time to undersow, typically in June
  - Too early = competes with maize and could be affected by residual herbicides
  - Too late = maize canopy closes preventing grass from establishing
- Broadcasting and harrowing in seed between rows is too inconsistent
- Drilling is the solution
  - Without depth control and pressure wheel - better
  - Depth control and pressure wheel - the best, especially for small seed species
- Higher seed rates do not always secure the best establishment

AHDB Cover Crops Research Review

December 2016

AHDB CEREALS & OILSEEDS

Research Review No. 90

A review of the benefits, optimal crop management practices and knowledge gaps associated with different cover crop species

White, C.A.[1], Holmes, H.F.[2], Morris, N.L.[3], and Stobart, R.M.[3]

[1]ADAS Gleadthorpe, Meden Vale, Mansfield, NG20 9PD
[2]ADAS Boxworth, Cambridge, CB23 4NN
[3]NIAB TAG, Morley Business Centre, Morley, Wymondham, Norfolk, NR18 9DF

This review was produced as the final report of a 9 month project (21140001) which started in November 2015. The work was funded by a contract for £26,347 from AHDB Cereals & Oilseeds.

Typical over autumn/winter N uptake, N release for the following crop and C:N ratio for cover crop species

Species	Typical autumn / winter N uptake (kgN/ha)	Typical N release for following crop (kgN/ha)	C:N ratio
Oil radish	70-127	10-50	13-20
White mustard	57-116	30-40	14
Rye	30-61	24	82
Hairy vetch	154	132	11
Crimson clover	28	60	11-25

Source: *AHDB Research Review No. 90, Dec 2016*

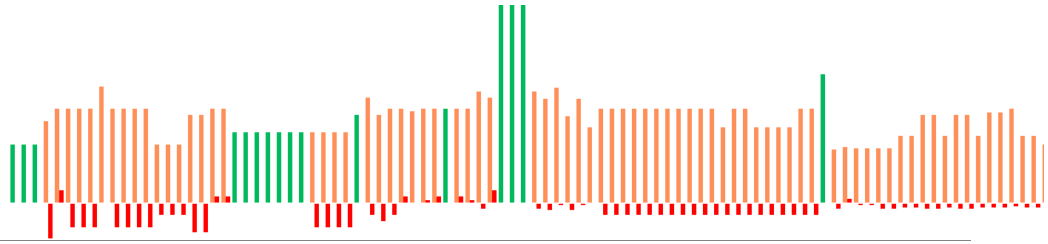
COSTS		BENEFITS	
Seed	£30-100/ha	Saving from reduction in N fertiliser for following crop	£20-£30/ha
Establish-ment costs	£30-100/ha	*OR*	
Destruction / spraying off	£0-10/ha	Extra income from yield boost to following crop	£40-60/ha
Total costs:	**£60-210/ha**	**Total in-year benefits**	**£20-60/ha**
		PLUS OTHER POTENTIAL BENEFITS:	
		Forage value (grazing or silage)	£40/ha estimate
		Reduced establishment costs for next crop	£35/ha estimate
		Long term benefits to soil, prevention of soil erosion etc.	£?/ha
		As Ecological Focus Areas	£?/ha
		Weed/pest suppression	£?/ha
		Countryside Stewardship / other funding	Up to £114/ha

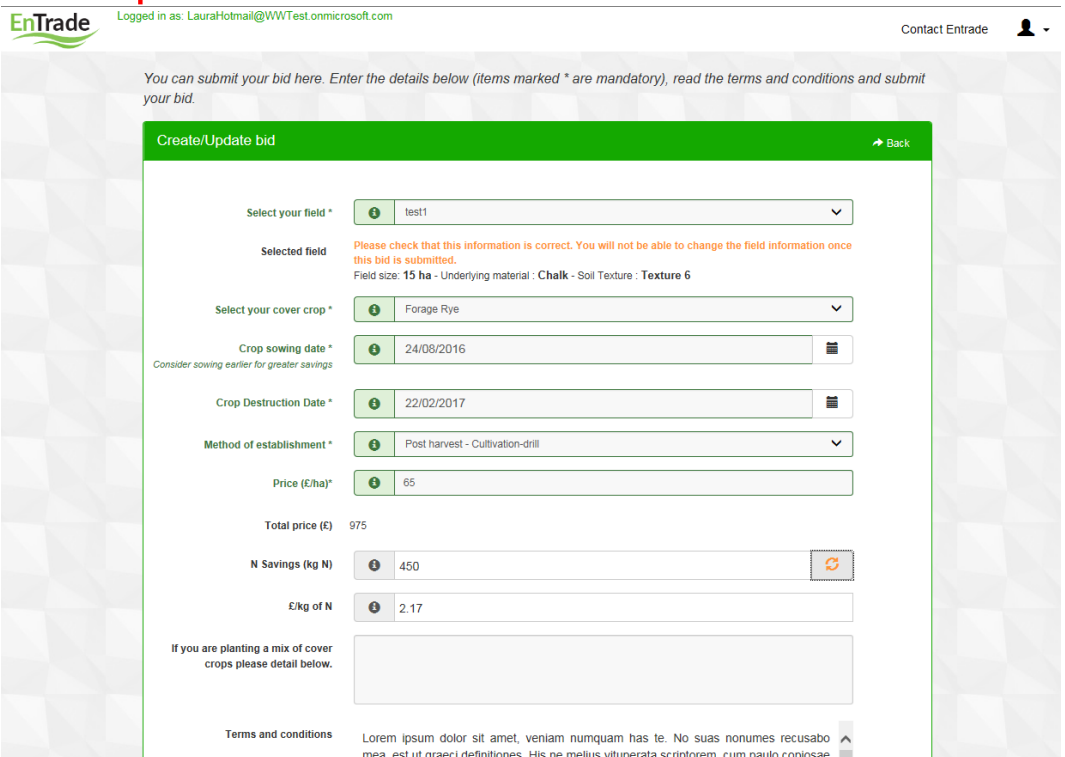
Why an online auction?

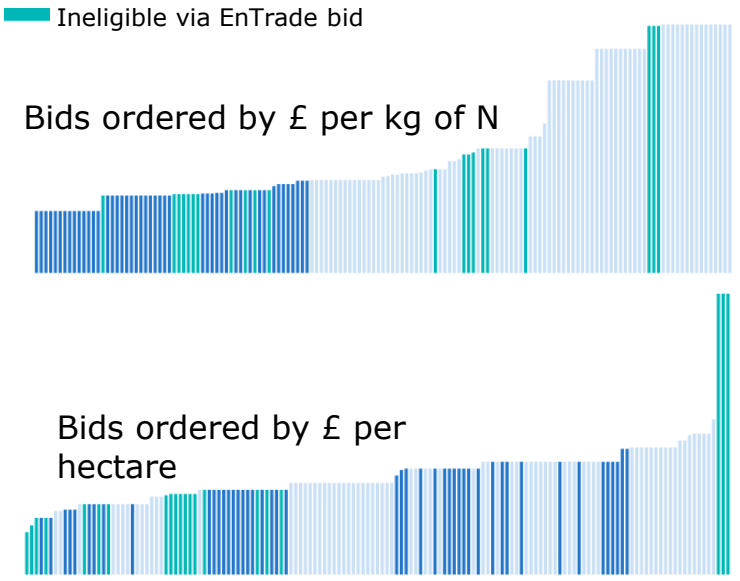
- An administrative tool to assist in reaching Wessex Water's catchment management objectives
- Move the focus to **£/kg of N not £/ha**
- **Farmers set their price**, not Wessex Water

Bidding revisions

Last 36 hours of auction – bid price in £ per ha







A clear solution for farmers
CATCHMENT SENSITIVE FARMING

mga

Essex Water
a YTL company

Table 1 – Field Specific Maturity Scores for your farm

Field Name/Number	Hungry Hill	Smugglers
Field Score	11	12
Field Name/Number	**South Close**	**Lwr Barn Grd**
Field Score	10	8

Post Harvest Commitments

What was done: During the farm visit active management of post-maize crop field management was discussed. Options discussed included:

- Crop rotation
- Winter cropping
- Undersowing
- Post-harvest cover crops
- Post- harvest cultivation

Recommendations –

- Scores 6-12 – Choose varieties with maturity scores equal to, or one point above or below the score generated during the field visit.
- Scores 13 or over – These fields are very high risk in terms of maize growing. Your options are to:
  - Continue growing maize, ideally choosing a very early >11 MGA maturity score, prioritising early drilling, harvest, and post-harvest stubble management on these fields over lower scoring, less risky, fields.
  - Consider growing early >11 MGA maturity score varieties under plastic film. Plastic film tends to speed up maturity by between 2 and 3 weeks compared to the same variety grown in the open.
  - Consider alternative crops such as whole-crop cereal or grass silage on these very high-risk fields.

What can farmers and agronomists do to reduce nitrate leaching?

What can farmers and agronomists do to reduce nitrate leaching?

Move away from inversion tillage unless necessary

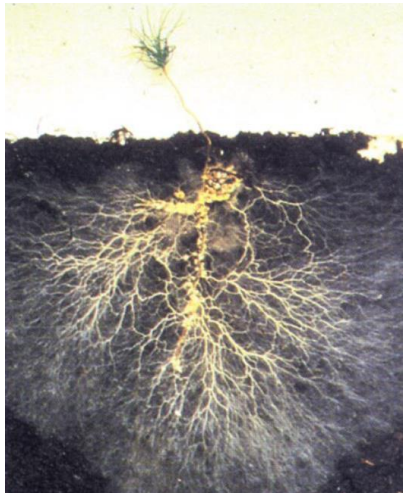
Ensure accurate and timely nutrient application

Grow good, even crops with good NUE*:

- Good soil health and balanced fertility
- Earliest autumn drilling possible
- Appropriate variety and field selection

Apply no more N than the crop's realistic requirement, allowing for N from organic manures

Maximise green cover over-winter



**Nitrogen Utilisation Efficiency*

Conclusions

- Early harvest gives you more options
- Undersowing is inconsistent unless you can drill it
- Best species for post-harvest establishment are grasses and cereals
- If you aren’t going to be able to get good green cover then cultivate to at least ensure water infiltration
- Beware over-cultivation
- Organic manures need careful planning and management. Allow for their nutrients when calculating NPK inputs
- Legislation may make pro-active management of maize stubbles mandatory in future

For more information, please contact:

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www.wessexwater.co.uk/catchmentmanagement