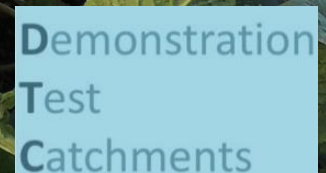
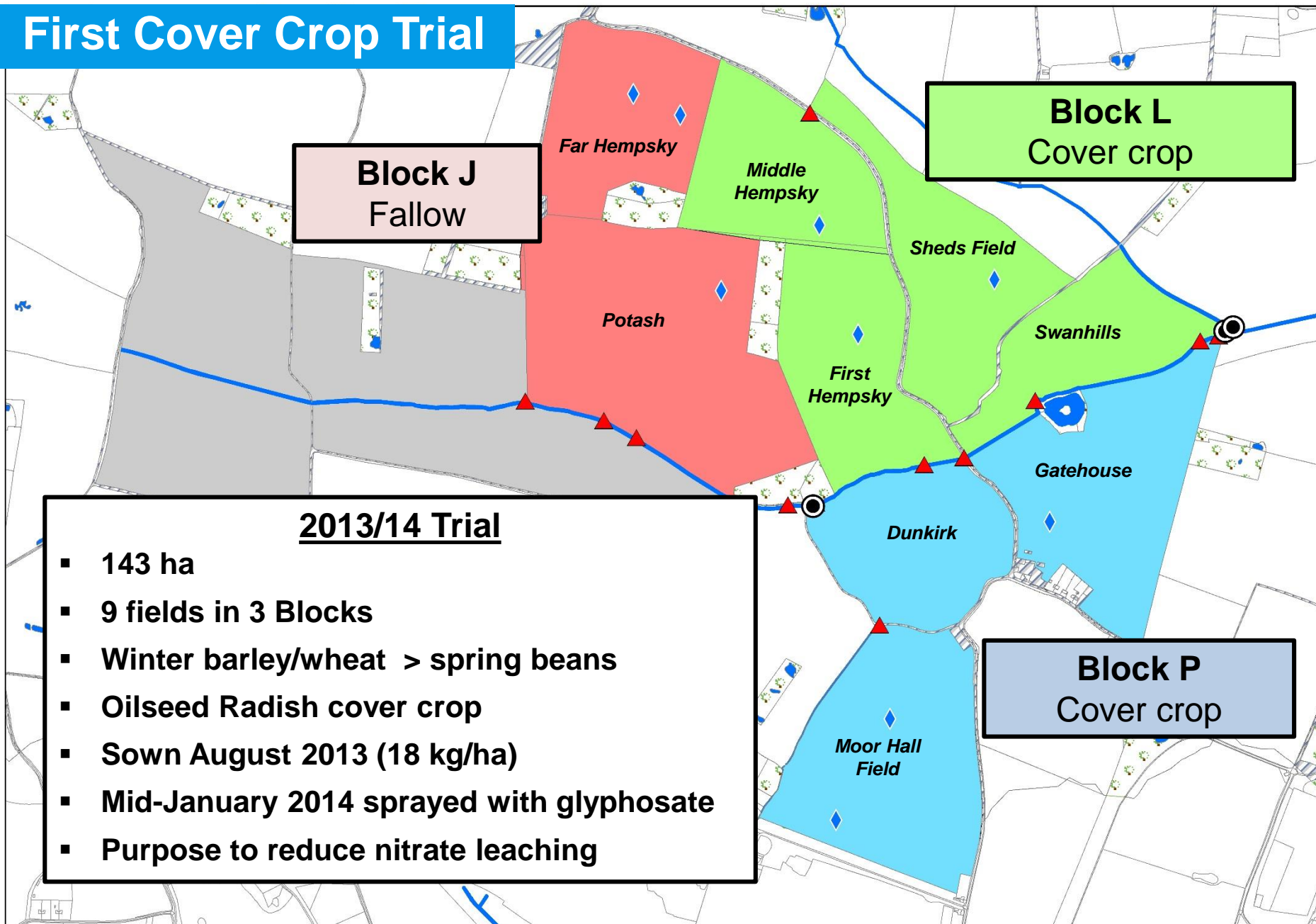


Wensum DTC Mitigation Measures

Cover Crops: 2013/14 & 2015/16



First Cover Crop Trial



First Cover Crop Trial

Block J



Block P



Block L



**November
2013**

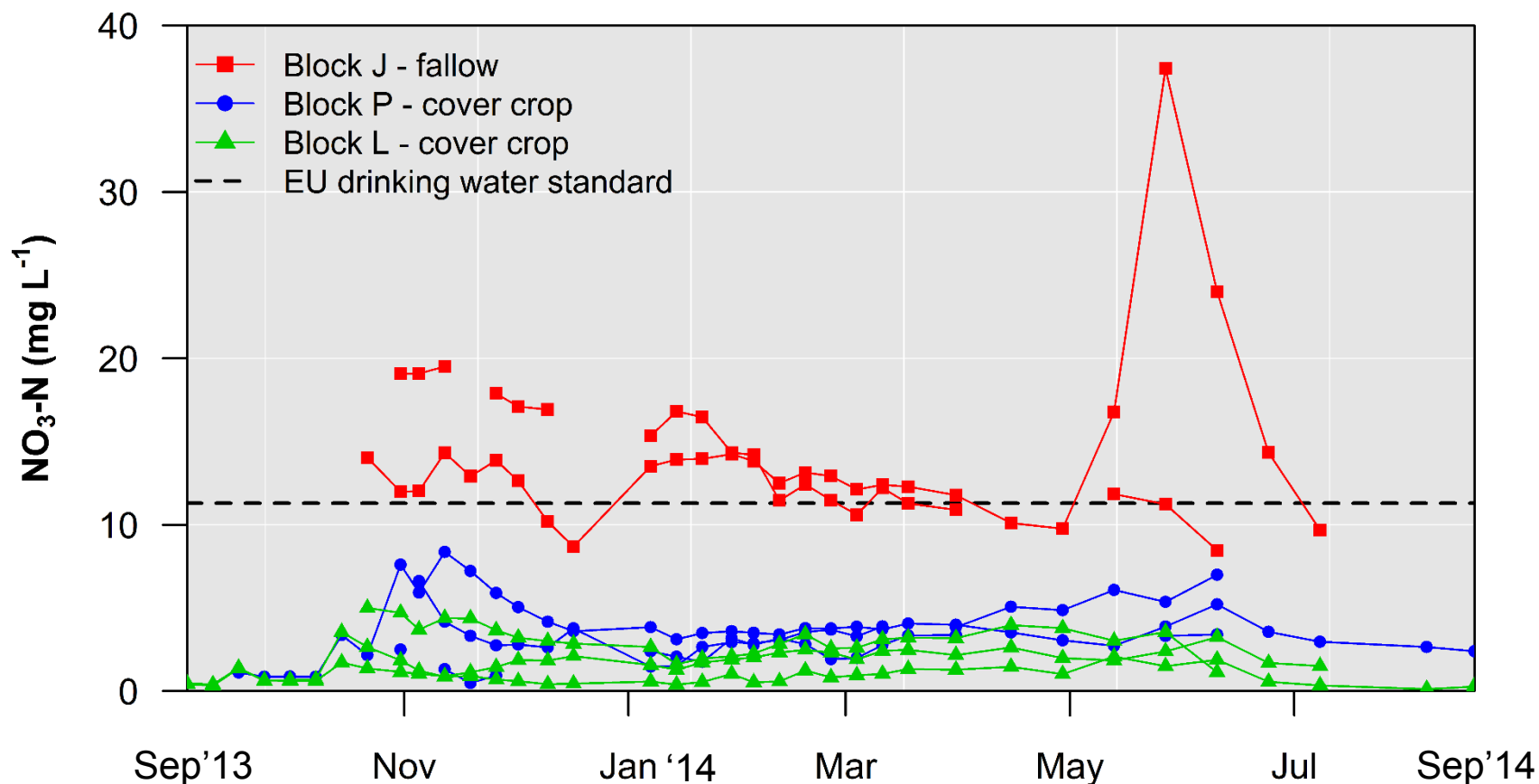




Field Drain Results

P = 75% reduction in N losses

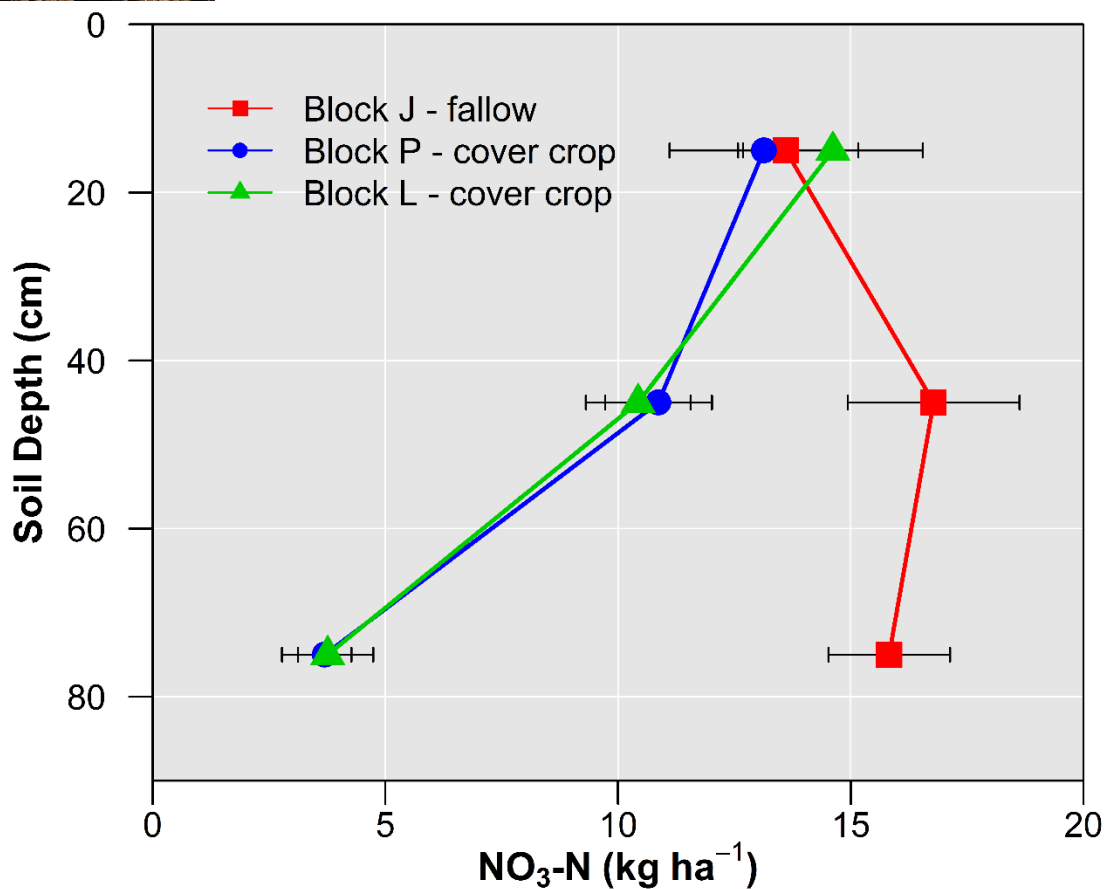
L = 88% reduction in N losses





Soil N Results (0–90 cm depth)

77% reduction in N @ 60-90 cm



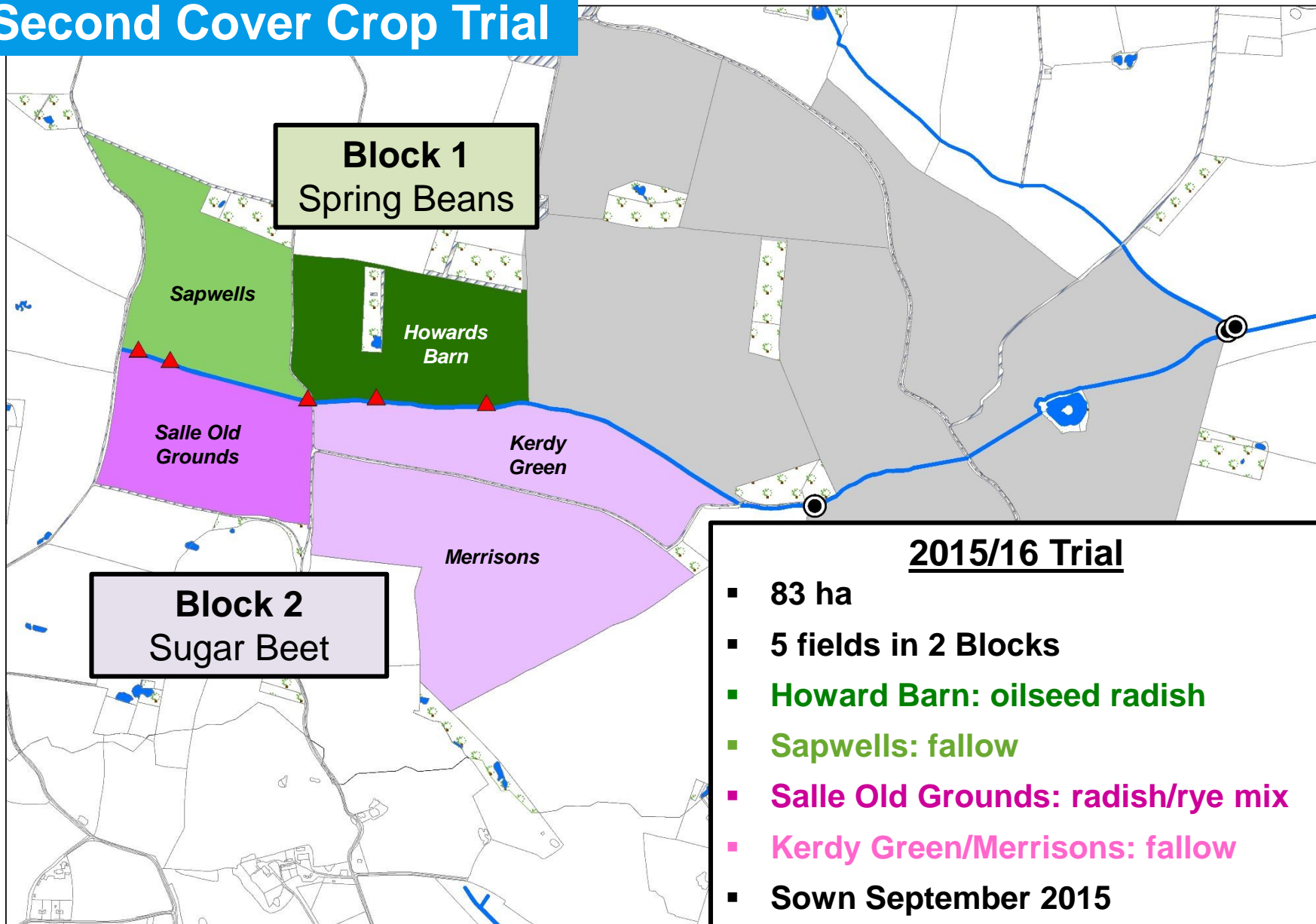
Financial Returns: 2013/14

	Block J	Block P	Block L	
	Fallow	Cover crop	Cover crop	
Gross output beans: Yield (t/ha)	5.80	6.55	6.24	8-12% higher
Output at £230/t (£/ha)	1334	1506	1435	
Costs: Establishment (£/ha)	96	128	67	£100–150/ha higher
Applications (£/ha)	90	120	120	
Variable costs (£/ha)	318	415	432	
Harvesting (£/ha)	85	85	85	
Total costs (£/ha)	589	748	704	
Margin (£/ha)	745	758	731	

Acknowledgement: Data supplied by Salle Farms Co.



Second Cover Crop Trial



Block 1
Spring Beans

Block 2
Sugar Beet

- 2015/16 Trial**
- 83 ha
 - 5 fields in 2 Blocks
 - **Howard Barn: oilseed radish**
 - **Sapwells: fallow**
 - **Salle Old Grounds: radish/rye mix**
 - **Kerdy Green/Merrisons: fallow**
 - Sown September 2015
 - Sprayed off February 2016



Cover Crop Fields: 3rd December 2015

Salle Old Grounds



Oilseed radish/rye mix (85 seeds/m²)



with turkey muck



without turkey muck

Howards Barn

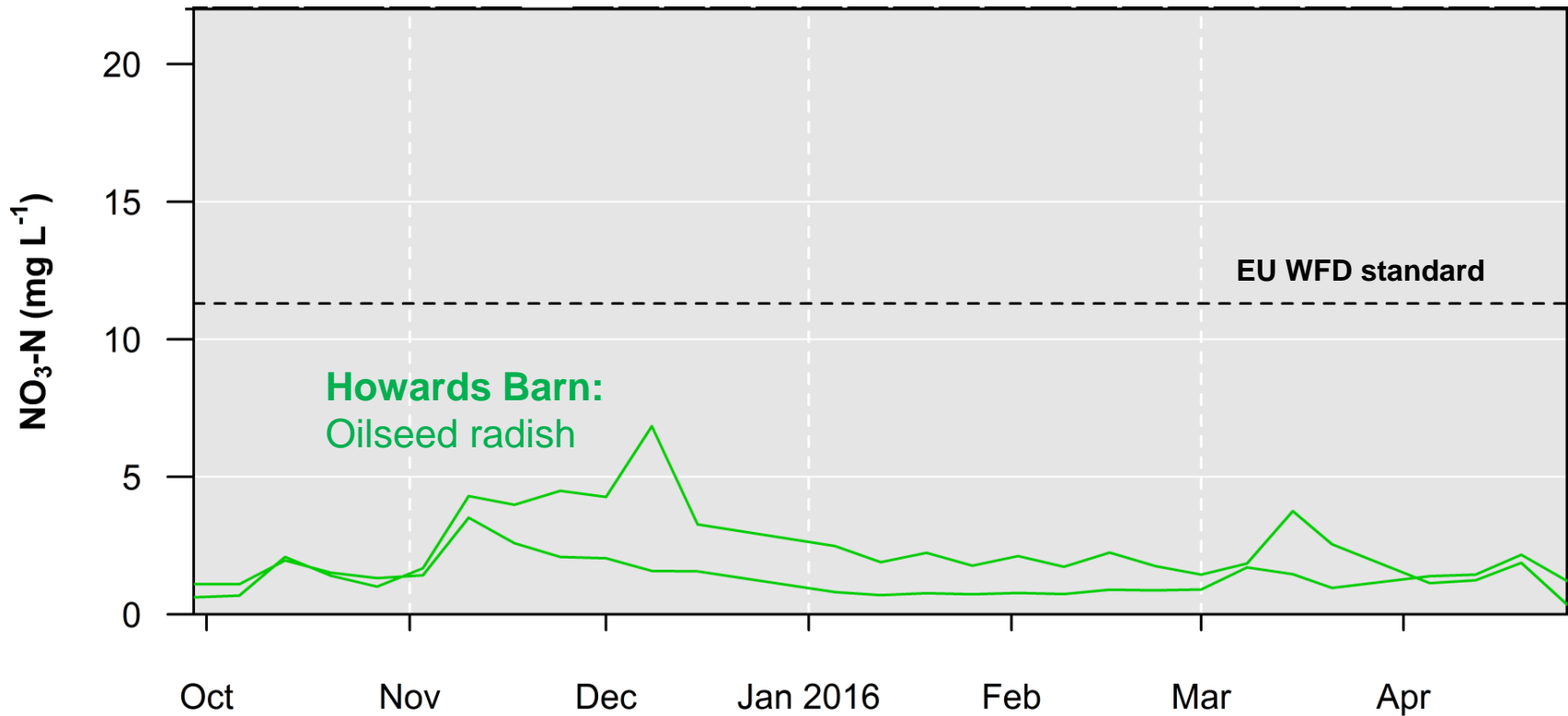


Oilseed radish (165 seeds/m²)

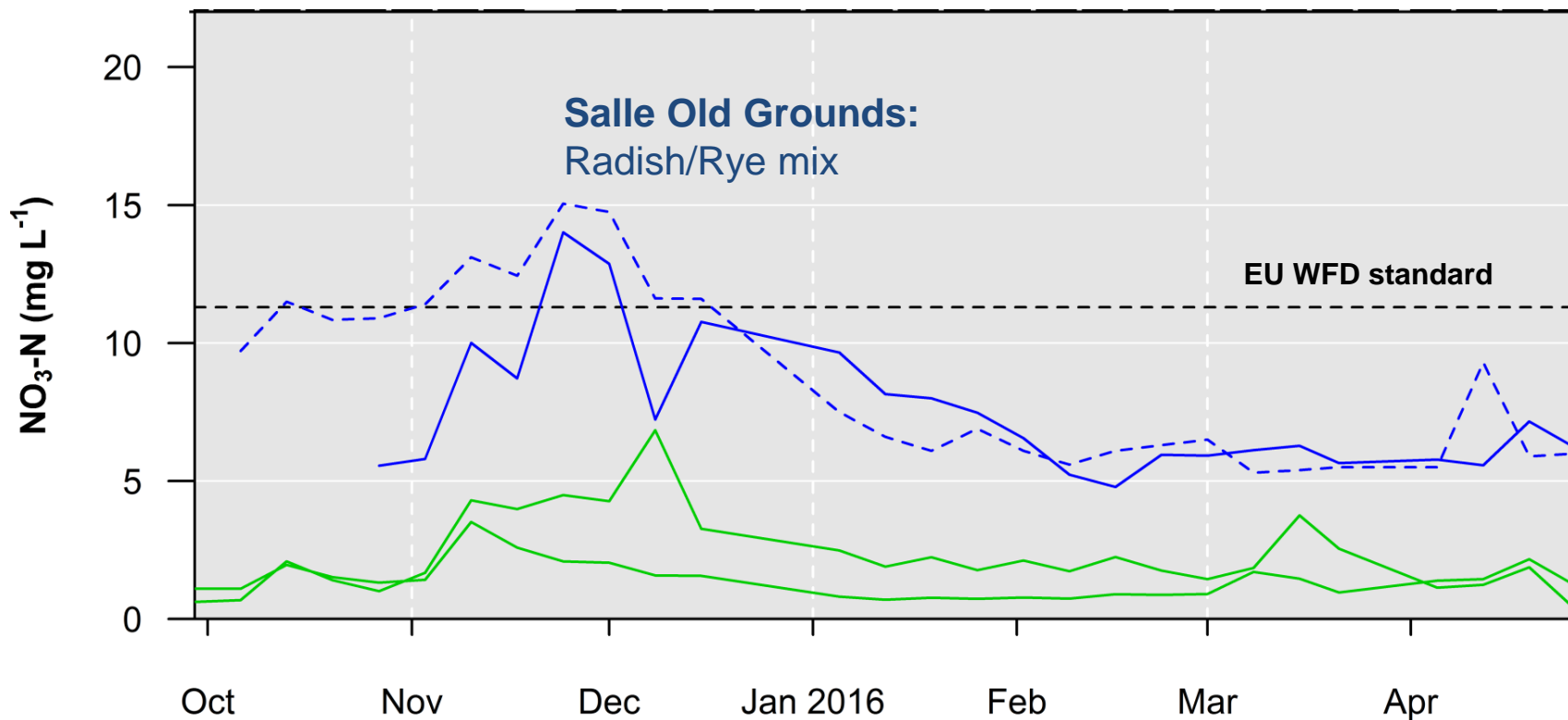


without turkey muck

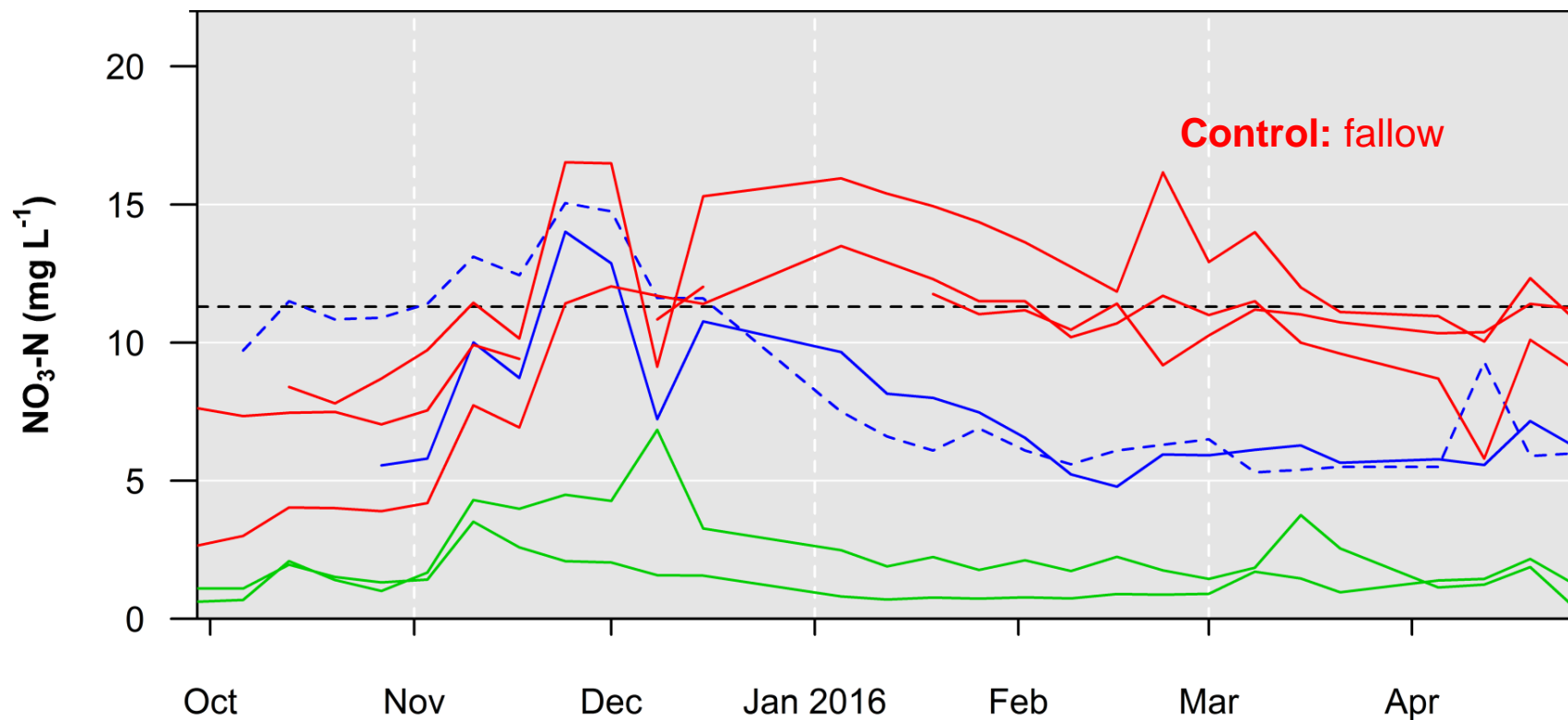
Field Drain Nitrate: winter 2015/16



Field Drain Nitrate: winter 2015/16



Field Drain Nitrate: winter 2015/16



SOG
Radish/rye
-17%

SOG
Radish/rye + TM
-29%

Howards Barn
Radish
-82%



Financial Returns: 2015/16

	Block 1	Block 1	Block 2	Block 2
	Spring Beans		Sugar Beet	
	Fallow	Cover crop OS Radish	Fallow	Cover crop mixture
Gross output: Yield (t/ha)	5.9	4.7	64.3	85.6
Bean output @ £230/t (£/ha)	1,355	1,090		
Beet Output @ £25/t (£/ha)			1,606	2,141
Costs: Establishment (£/ha)	107	143	158	147
Applications (£/ha)	94	85	105	102
Variable costs (£/ha)	293	338	562	592
Harvesting (£/ha)	85	85	200	200
Total costs (£/ha)	580	650	1,025	1,041
Margin (£/ha)	775	440	260	672

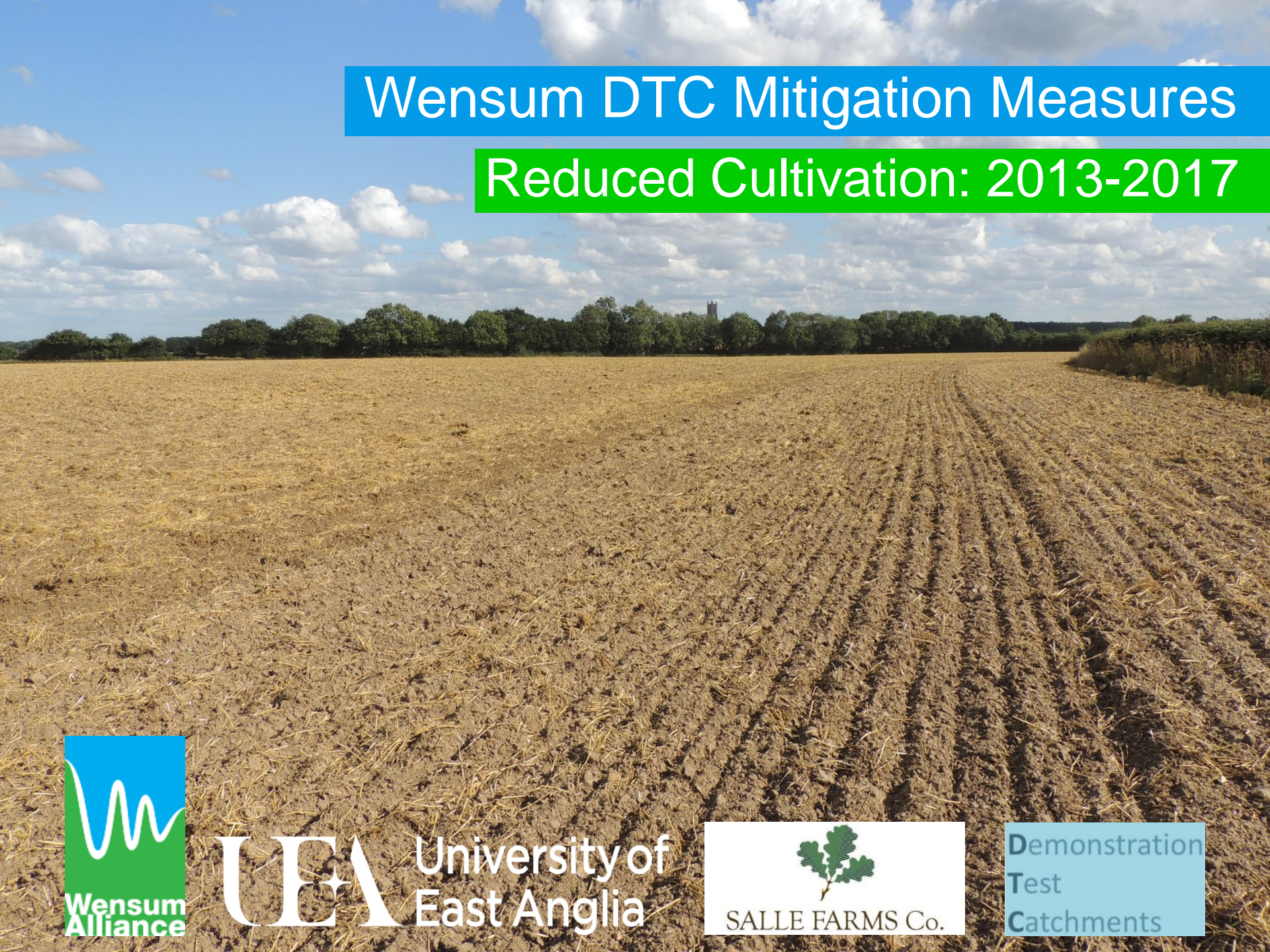
**33%
higher**

**£16
higher
£412
higher**

Acknowledgement: Data supplied by Salle Farms Co.

Wensum DTC Mitigation Measures

Reduced Cultivation: 2013-2017



UEA University of
East Anglia



Demonstration
Test
Catchments

Cultivation Trial

Block J
Conventional
plough

Far Hemskey

Middle
Hemskey

Block L
Direct drilling

Sheds Field

Potash

First
Hemskey

Swanhills

Gatehouse

2013–2017 Trial

- 143 ha
- 9 fields in 3 Blocks
- **Block J:** mouldboard plough (25 cm)
- **Block P:** non-inversion with disks/tines (10 cm)
- **Block L:** direct drill with no inversion
- **Beans (CC) > wheat > barley > rape** rotation

Dunkirk

Moor Hall
Field

Block P
Shallow non-
inversion

Agricultural Equipment

Cultivation

Block J: mouldboard plough



Block P: TopDown + Carrier (non-inversion)



Sowing

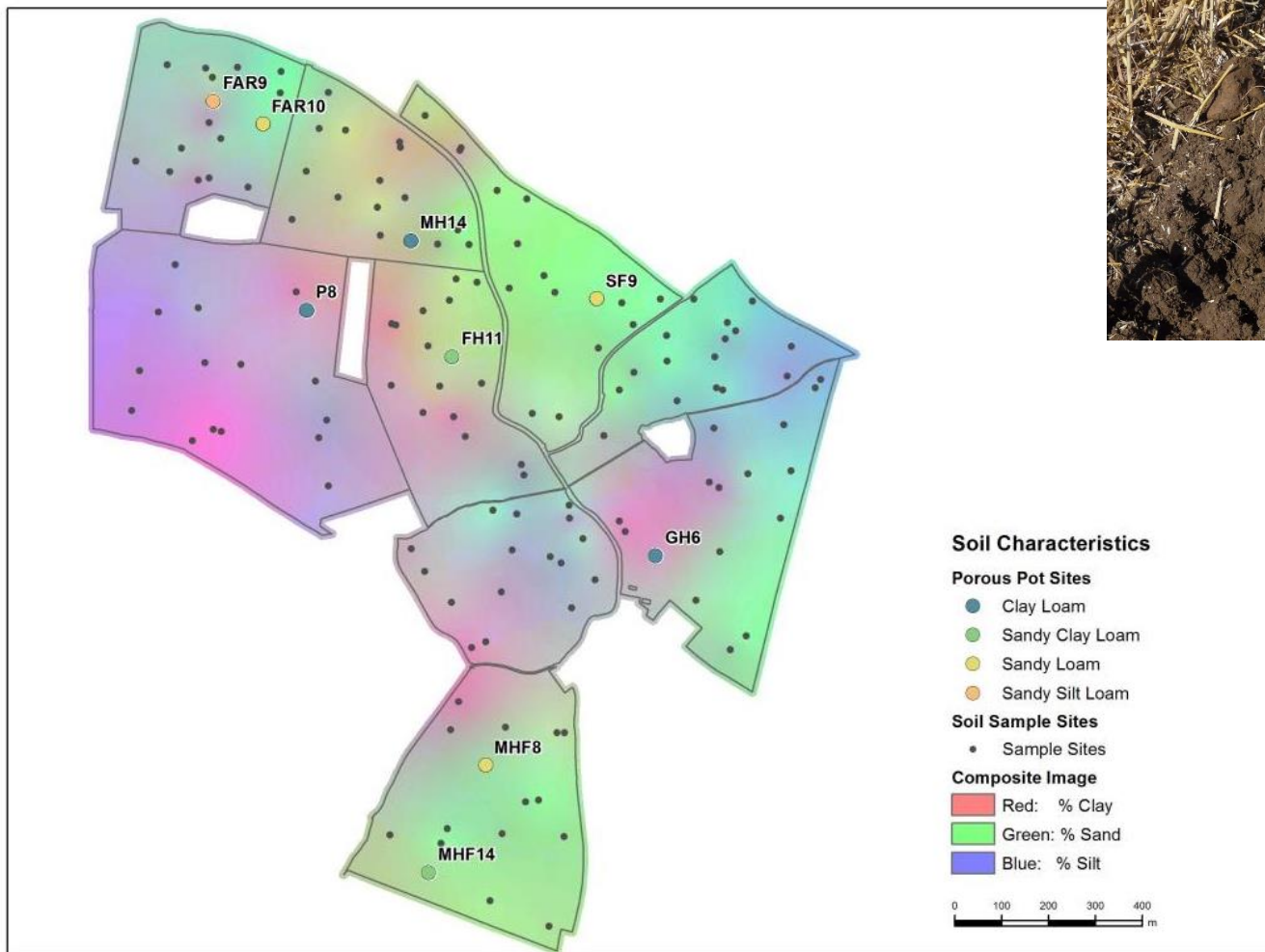
Blocks J + P: Rapid drill



Block L: Seed Hawk direct drill



Field Measurements

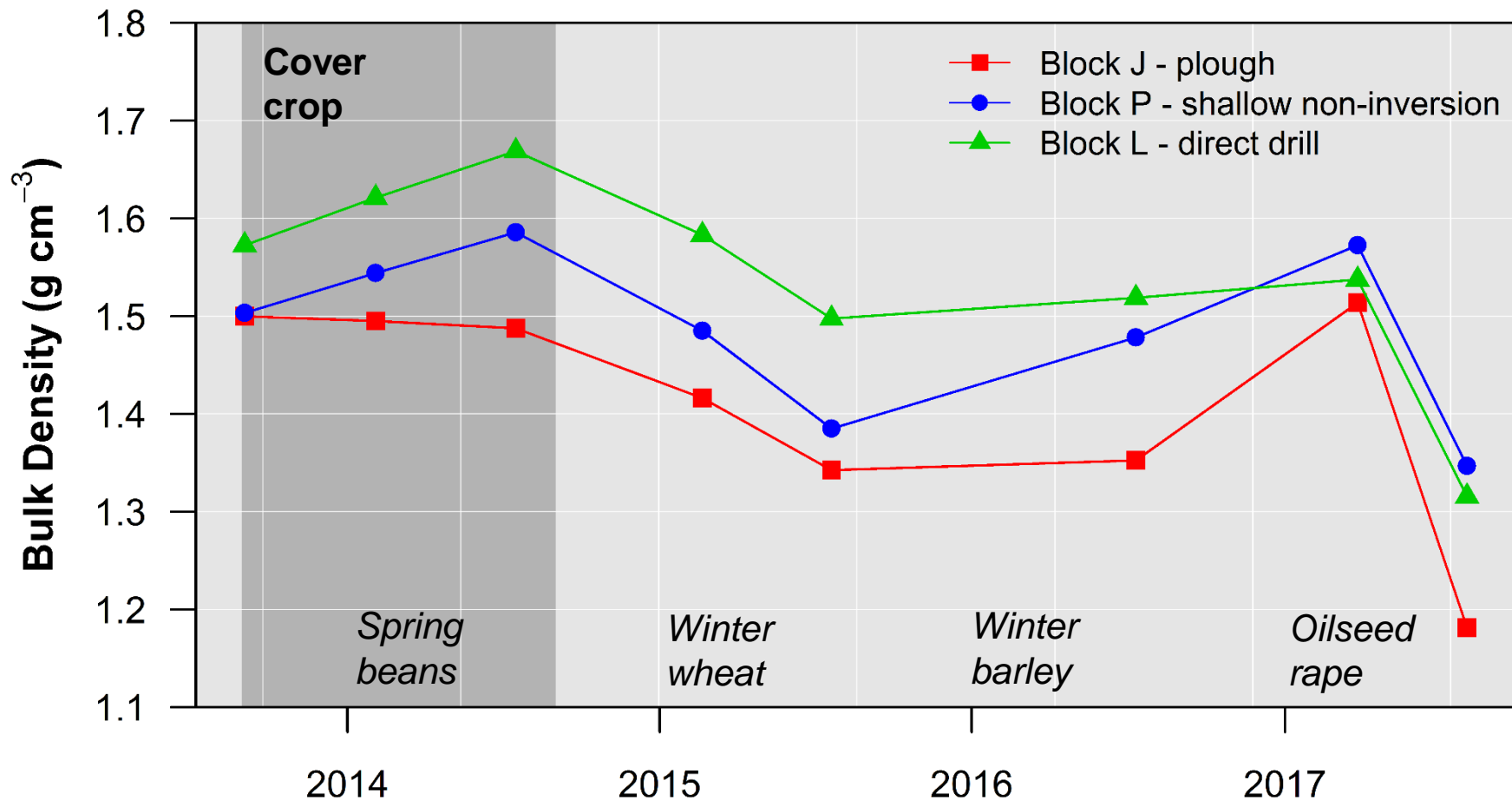


- Soil texture
- Soil structure
- Infiltration rate
- Bulk density
- SMN
- P, K, Mg indices
- OC content
- Soil biology

Aim: to assess the physical, chemical and biological condition of the soils

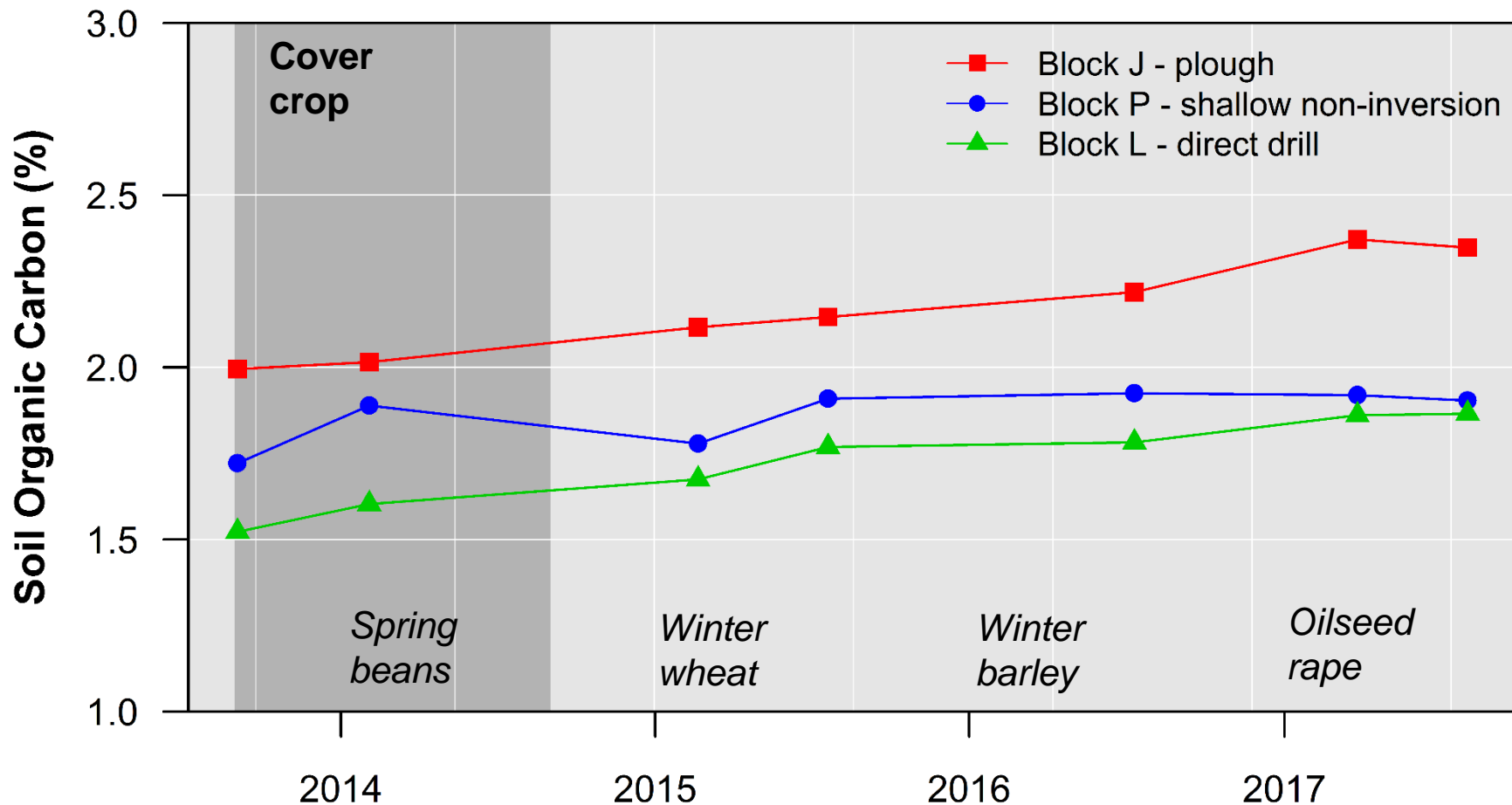
Soil Structure: bulk density

0-15 cm depth



Soil Chemistry: organic carbon

0-15 cm depth



Block J = +18%

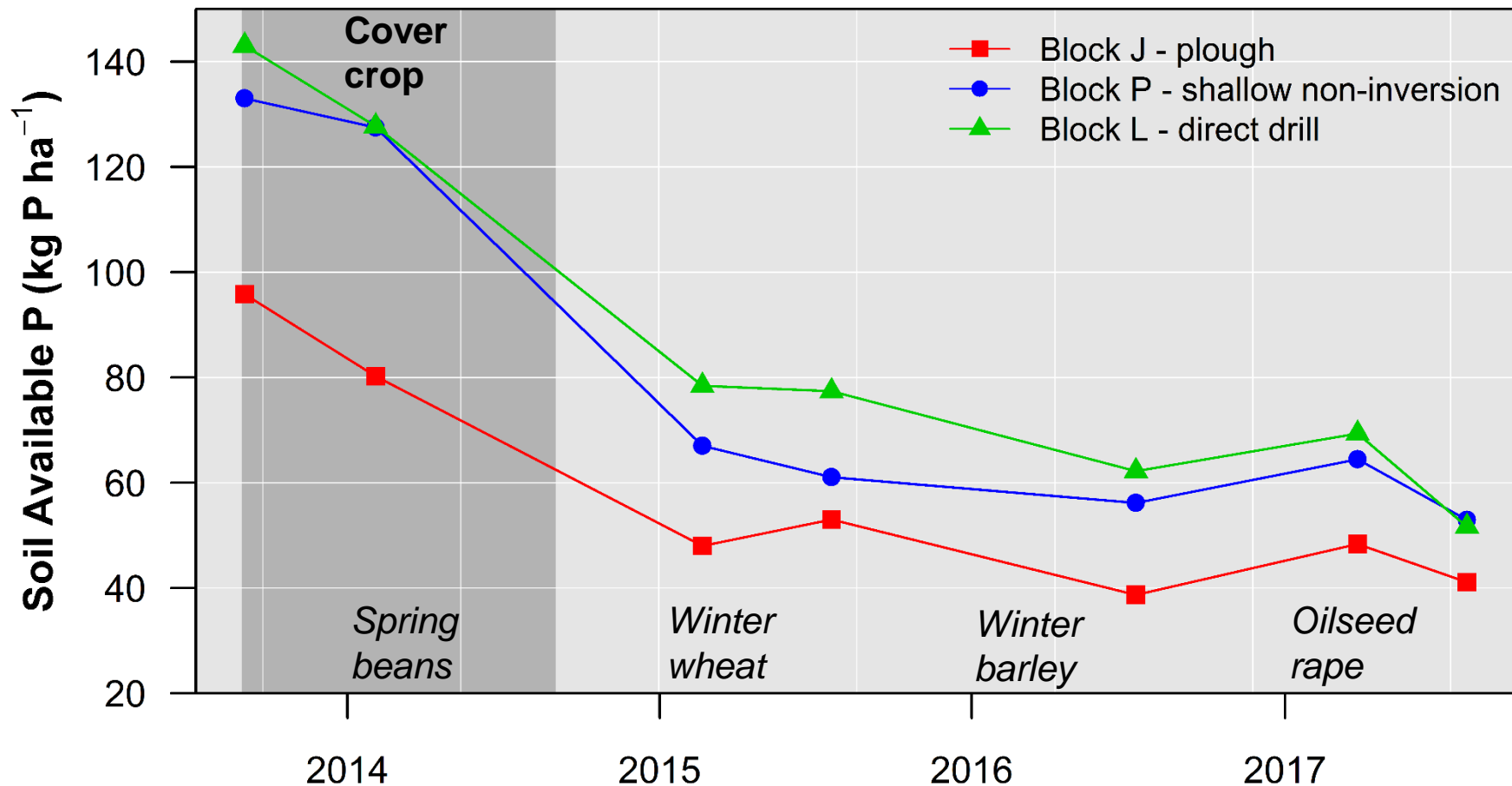
Block P = +11%

Block L = +23%



Soil Nutrients: phosphorus

0-15 cm depth

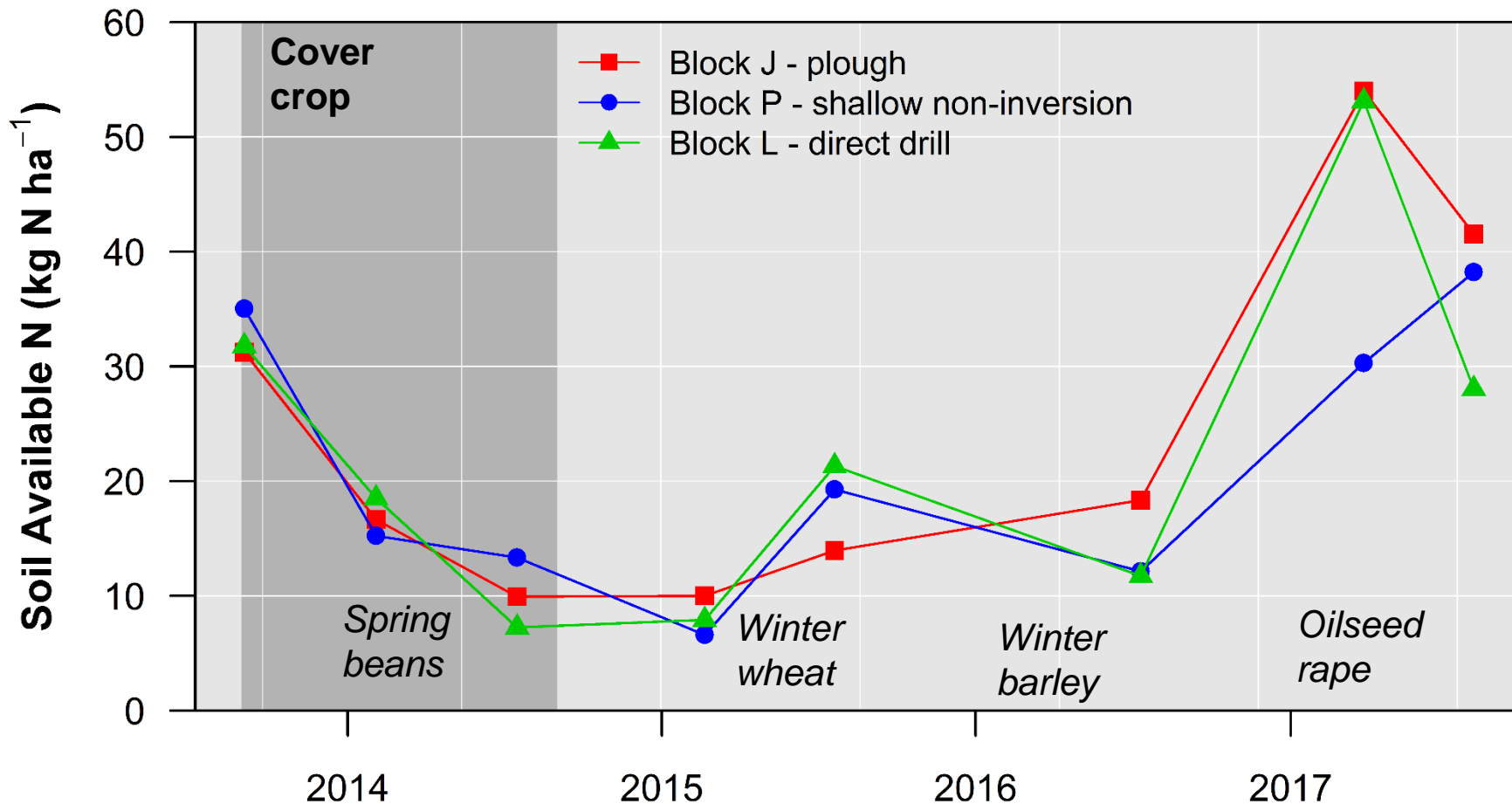


Same trend observed for potassium (K) and magnesium (Mg)



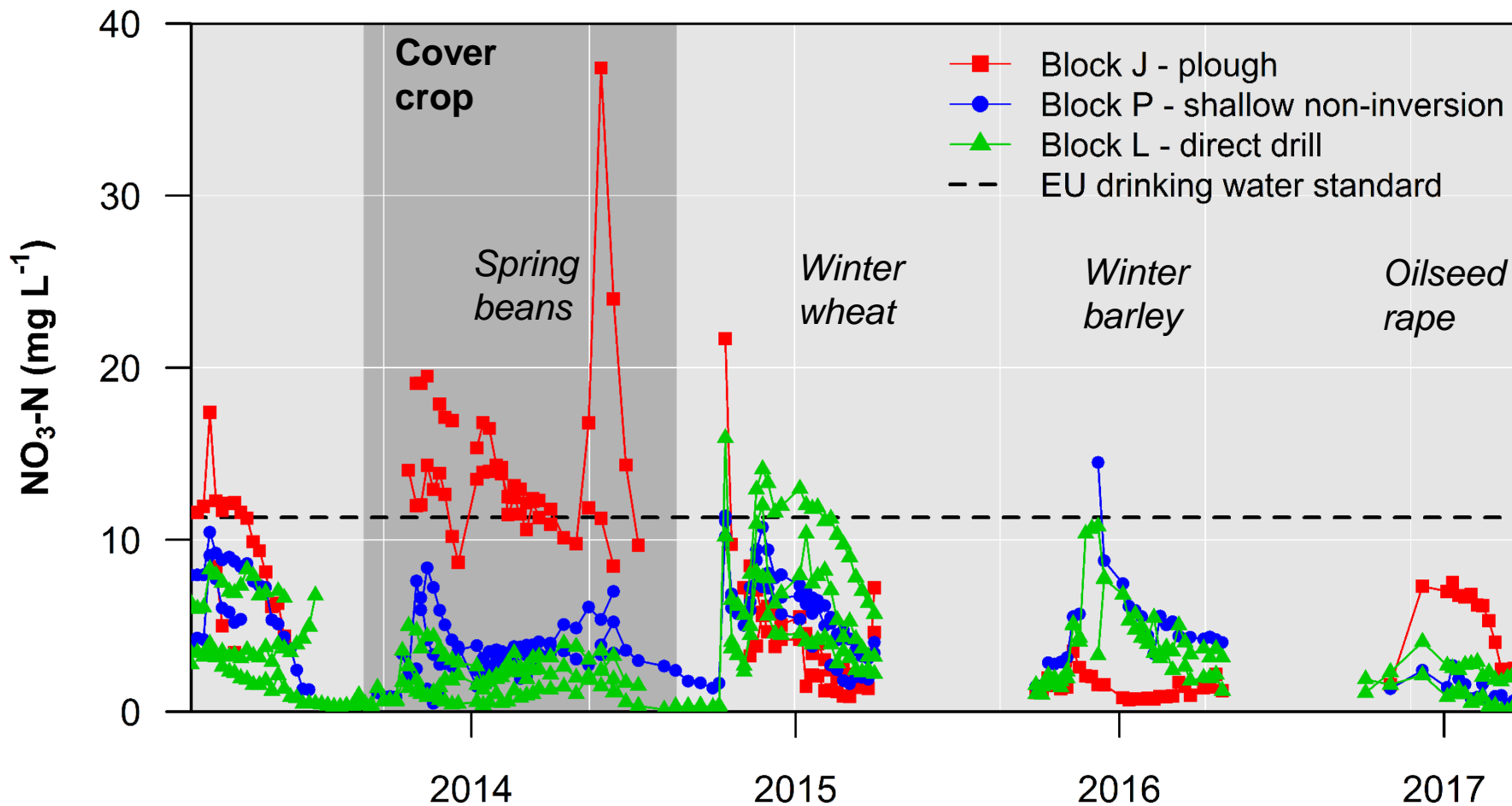
Soil Nutrients: nitrogen

0-15 cm depth



Soil Leaching: nitrogen

Field drains



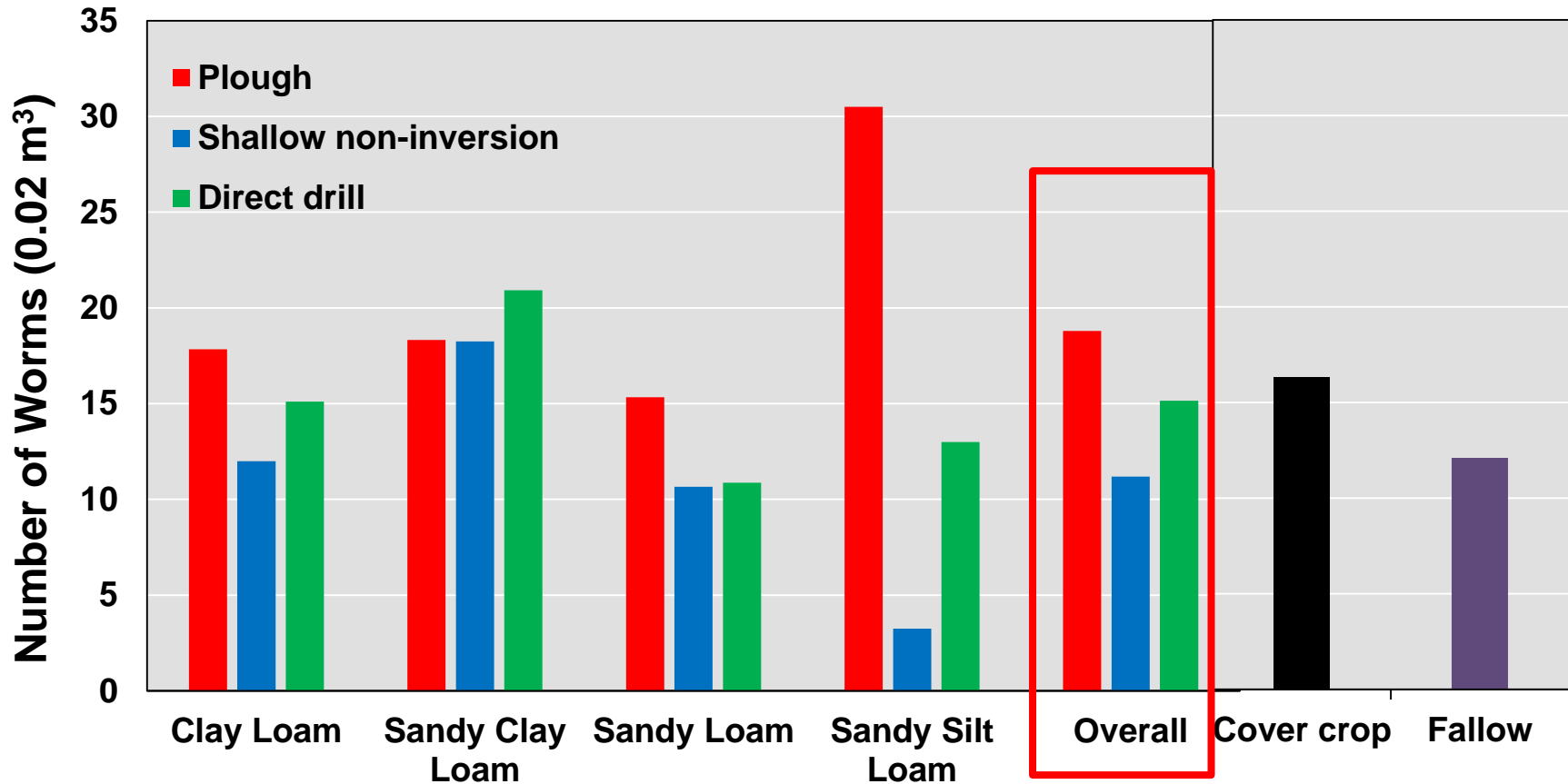
Block J = 3.4 mg/L

Block P = 4.8 mg/L

Block L = 4.5 mg/L



Soil Biology: worm counts



April 2016 | September 2016 | March 2017

Financial Returns: 2013–2017

		2013/14	2014/15	2015/16	2016/17
		Spring beans + CC	Winter wheat	Winter barley	Oilseed rape
Block J	Total cost (£/ha)	589	784	561	-
<i>Plough</i>	Output (£/ha)	1,334	1,694	1,086	-
	Margin (£/ha)	745	910	525	-
Block P	Total cost (£/ha)	748	782	581	-
<i>Shallow non-inv.</i>	Output (£/ha)	1,506	1,695	1,099	-
	Margin (£/ha)	758	913	518	-
Block L	Total cost (£/ha)	704	788	598	-
<i>Direct drill</i>	Output (£/ha)	1,435	1,620	1,086	-
	Margin (£/ha)	731	832	488	-

Block L: Lowest fuel/labour costs | highest pesticide/fertiliser inputs | Lower yields
Margins 4-9% below Block P





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Assessing the farm-scale impacts of cover crops and non-inversion tillage regimes on nutrient losses from an arable catchment



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ABSTRACT

The efficacy of cover crops and non-inversion tillage regimes at minimising farm-scale nutrient losses were assessed across a large, commercial arable farm in Norfolk, UK. The trial area, covering 143 ha, was split into three blocks: winter fallow with mouldboard ploughing (Block J); shallow non-inversion tillage with a winter oilseed radish (*Raphanus sativus*) cover crop (Block P); and direct drilling with a winter oilseed radish cover crop (Block L). Soil, water and vegetation chemistry across the trial area were monitored over the 2012/13 (pre-trial), 2013/14 (cover crops and non-inversion tillage) and 2014/15 (non-inversion tillage only) farm years. Results revealed oilseed radish reduced nitrate (NO₃-N) leaching losses in soil water by 75–97% relative to the fallow block, but had no impact upon phosphorus (P) losses. Corresponding reductions in riverine NO₃-N concentrations were not observed, despite the trial area covering 20% of the catchment. Mean soil NO₃-N concentrations were reduced by ~77% at 60–90 cm depth beneath the cover crop, highlighting the ability of deep rooting oilseed radish to scavenge nutrients from deep within the soil profile. Alone, direct drilling and shallow non-inversion tillage were ineffective at reducing soil water NO₃-N and P concentrations relative to conventional ploughing. Applying starter fertiliser to the cover crop increased radish biomass and nitrogen (N) uptake, but resulted in net N accumulation within the soil. There was negligible difference between the gross margins of direct drilling (€200/ha) and shallow non-inversion tillage (€200/ha) with oilseed radish cover crop (€200/ha).