Morley SIP platform and farming systems research

Plant Science into Practice

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MORLEY FARMS LIMITED

THE MORLEY AGRICULTURAL FOUNDATION

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SIP

Sustainable Intensification Research Platform (SIP) - Morley

- SIP is a multi-partner programme comprising farmers, industry experts, academia, environmental organisations, policymakers and others.
- What is SI? *Managing farmland to increase farm output and competitiveness, whilst protecting the countryside and enhancing environment and social benefits*
- The platform is developing a community of practice, utilising research study farms and creating creating a data platform
  - see www.siplatform.org.uk for more information.

Work at Morley

- Cover crops, Cultivations and Amendments
- Comparison of arable crop production systems:
  - IFM system A: Deep (20cm) non-inversion cultivation with over-winter cover crops plus other modified management.
  - IFM system B: Low intensity (<10 cm) soil disturbance with over-winter cover crops plus other modified management.
  - Conventional (C): 'Farm standard' cultivation (typically plough-based) and practices, with no cover crops
  - Collaboration with the Wensum DTC project and cross linkages to the Loddington SIP site(mixed farming).

New Farming Systems (NFS)

(supported by The Morley Agricultural Foundation and the JC Mann Trust)

- NFS cover crop and cultivation experiment
  - 4 cultivation systems (plough, deep and shallow non-inversion and managed)
  - ± autumn cover crops ahead of spring sown crops in rotation with winter wheat
  - medium soil (Ashley series)

Long term yield and margins (all crops)

	Relative yield (to ploughed approach)	Cumulative gross margin minus machinery cost (£/ha)	Relative margin (to ploughed approach)
Plough	100	2085	100
Managed	94	2105	101
Deep	90	2123	102
Shallow	83	1966	94
Average	-	2069	

(margins as gross output minus input costs and direct machinery costs)

Winter wheat yield (t/ha) and margin in NFS

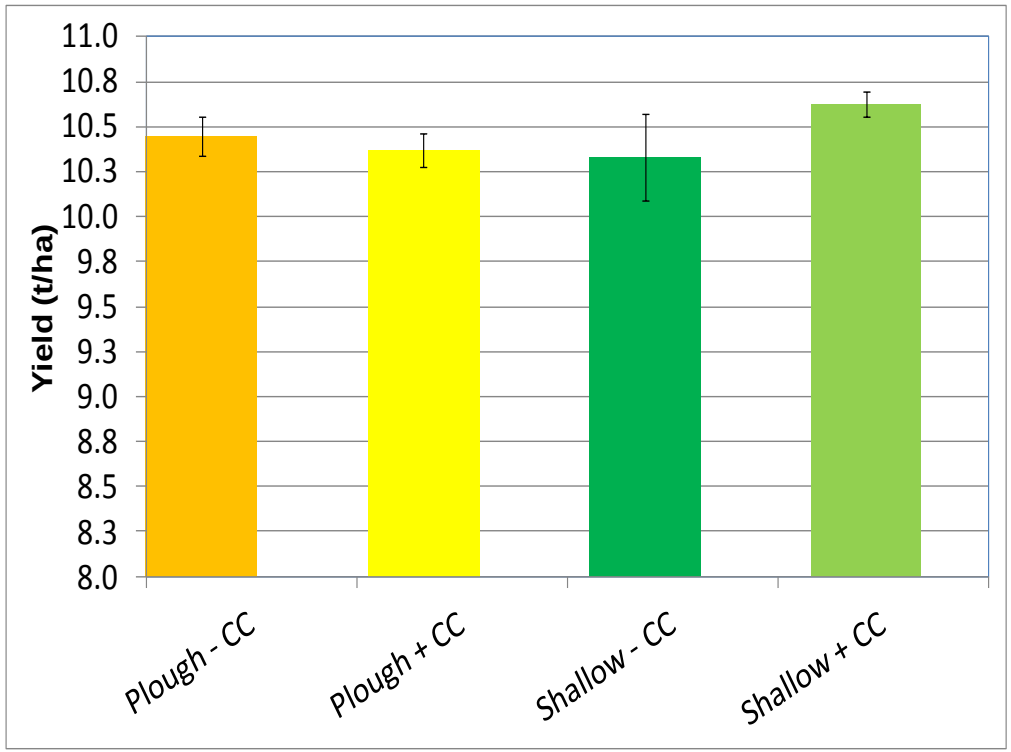
Cross season analysis for tillage practice is as presented in the table; 'year' was significant at P<0.001 and 'treatment x year' interaction at P<0.01.

	Seasonal yield data (t/ha)			
Tillage	**Year 1 (2007/08)**	**Year 3 (2009/10)**	**Year 5 (2011/12)**	**Year 8 (2014/15)**
Plough	12.75	8.26	10.41	10.70
Deep	12.55	8.17	10.54	11.27
Shallow	12.30	7.42	10.48	10.45
Mean	12.53	7.95	10.47	10.81
LSD	0.30 (NS) (*P*=0.16)	0.77 (NS) (*P*=0.11)	0.21 (NS) (*P*=0.56)	0.68 (NS) (P= 0.10)

	Mean yield and margin data			
Tillage	**Mean yield (t/ha)**	**Yield (% of plough)**	**Margin (£/ha)**	**Margin (% of plough)**
Plough	10.53	100	921	100
Deep	10.63	101	978	106
Shallow	10.17	96	930	101
LSD	0.16 (P<0.001)	-	-	-

New Farming Systems research
Yield response data in winter wheat

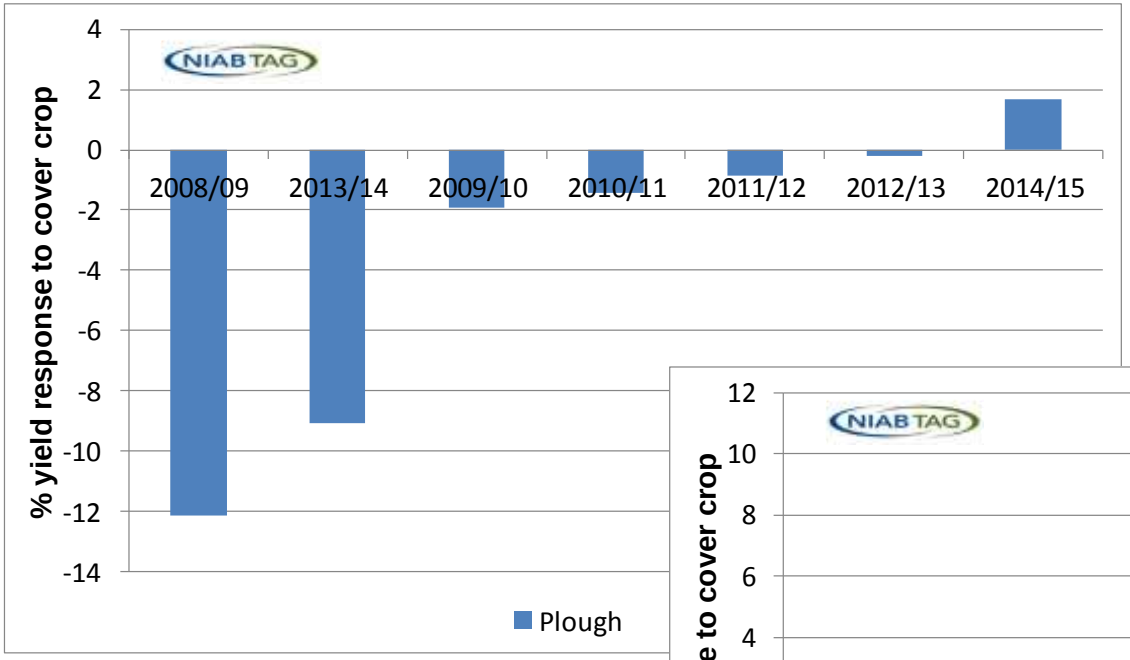
Winter wheat yields, 2012

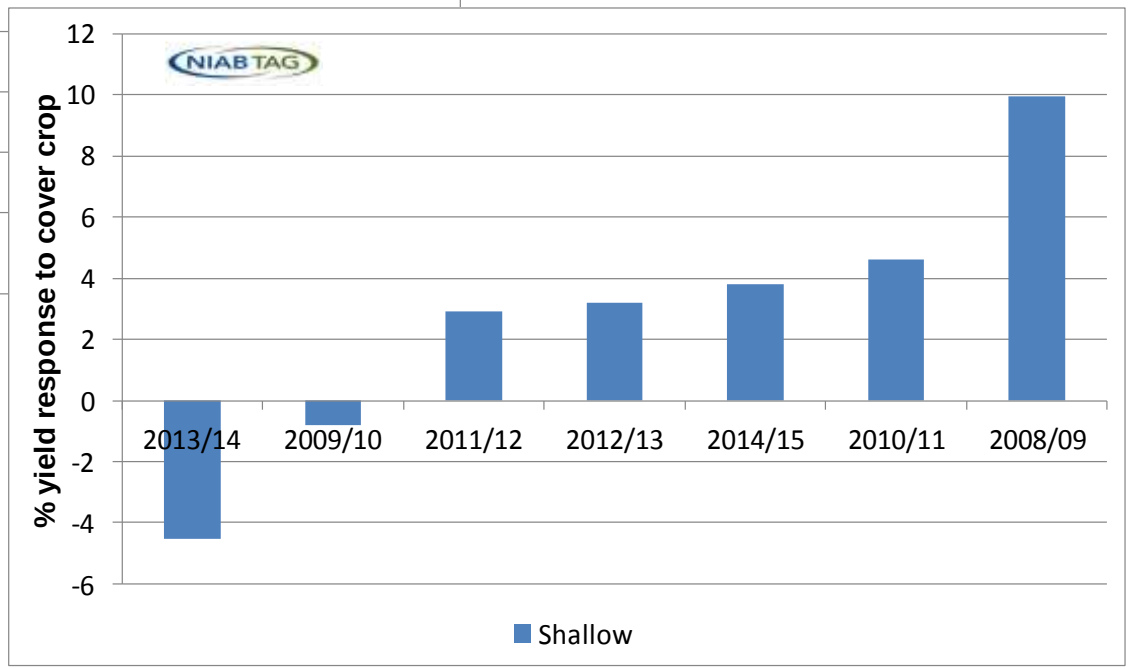


- Generally higher ear numbers where cover crops were used
- Increases in margin over input costs in cover crop comparisons
  - 2012: £52/ha - £98/ha (depending on comparison)
  - 2015: £38/ha - £47/ha (depending on comparison)

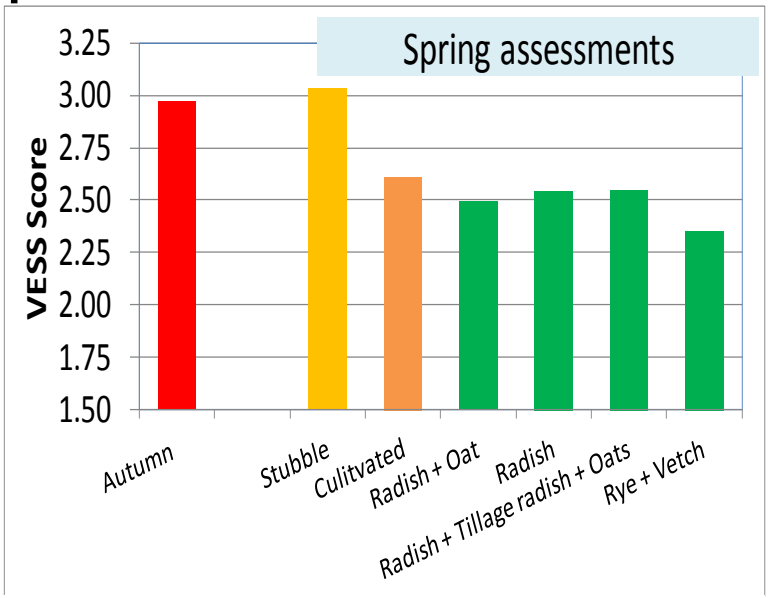
Yield response (%) to the use of a brassica cover crop in the NFS long term study at Morley.

- Generally positive responses with cover crops and shallow tillage systems. Benefits less clear where plough based systems were used.





Soil structure assessments at Loddington
Comparison of cover cropping approaches

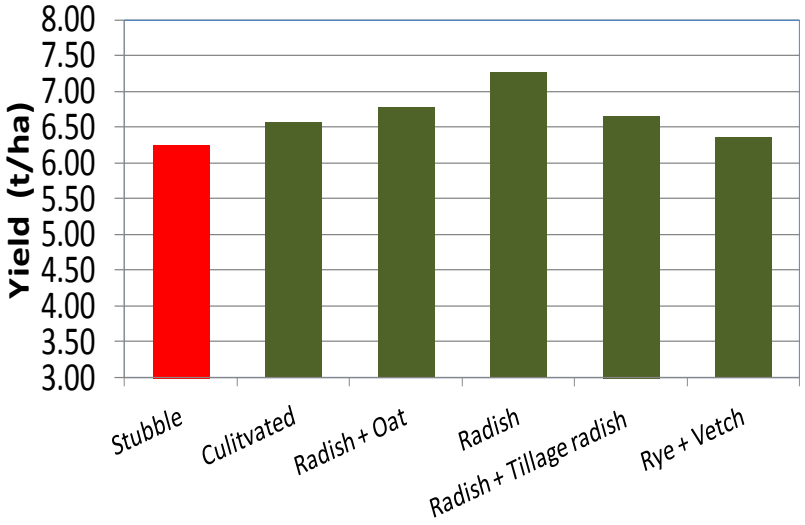


Cover crop costs from c. £20-60/ha.

Mean yield response from cover crop over 'stubble' 0.5 t/ha (c. £60/ha).

Peak yield response 1.0 t/ha.

Costs should also account for wide rotational yield responses.



http://www.sruc.ac.uk/info/120062/crop_and_soils_systems/412/visual_evaluation_of_soil_structure

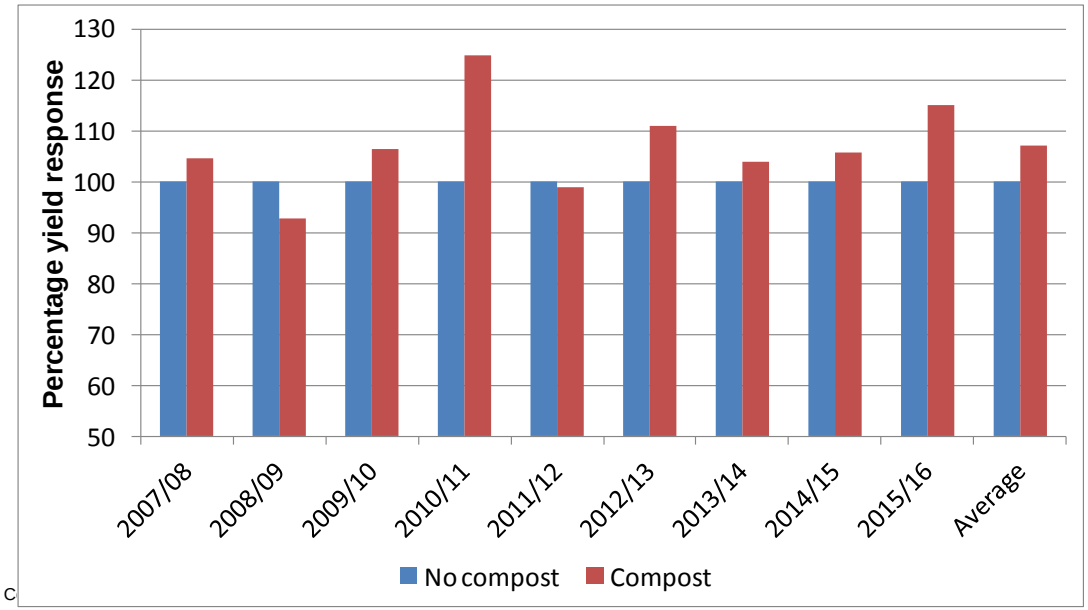
Determining the value of soil amendments.

- Two rotational approaches
  - 'spring' cropping and continuous wheat
- Two amendment management regimes
  - standard practice
  - addition of 35 t/ha of green waste compost

Determining the value of soil amendments to soils and rotation systems.

Yield response in continuous wheat (%)

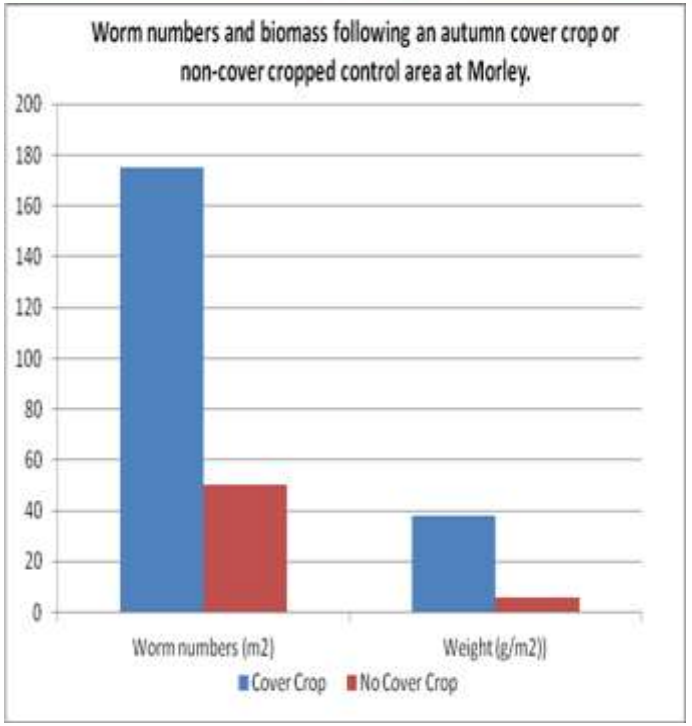
- Compost applied in years 1 to 4 only. No compost applied years 5-9.
- Positive yield responses in 7 years out of 9; mean response c. 7%.
- *Note: data for 2015/16 season is draft data subject to validation.*



- Compost applied annually over a 4 year period (ended 2011).
- Improved soil quality / water infiltration rates and yields.
- Infiltration rate increase a c. 20% increase in water infiltration over a 15 minute period.

Farm scale cover crops at Morley 2016/17

- Range of cover crop types
  - legumes, brassicas grasses.
  - Overwinter assessments and tracking the rotational legacy.
- Recent field strip highlights:
  - Field strip work has demonstrated increases in earthworm biomass
  - Beet work: shown 11% population increase and GAI from 1.2 to 1.9
  - Beet site still to be taken to harvest.



Questions:

- How many of you are using cover crops or amendments?
- Why are you using them/not using them?
- Problems and benefits?
- What other soil improvement strategies are you using?

Acknowledgements

Colleagues at NIAB TAG
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GWCT