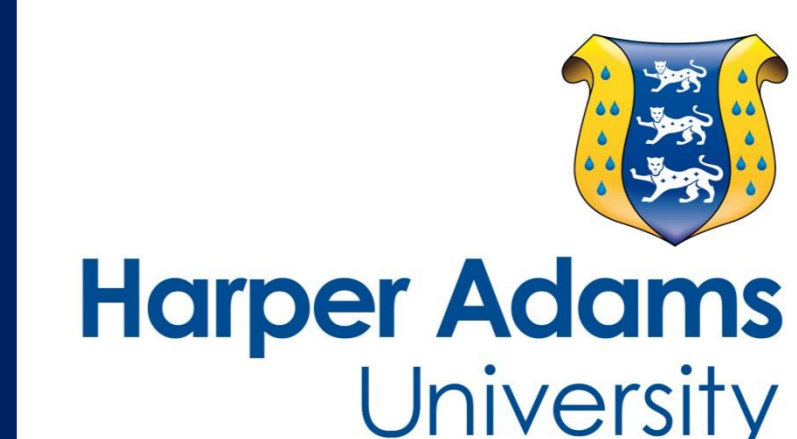


An investigation into the effect of traffic and tillage on soil properties and crop yields

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1 Background

- Current agricultural production systems increasingly use heavier machines covering 80-90% of field area
- In the UK, 40% of farmers plough, 40% shallow till and 20% zero-till
- Extensive compaction from traffic and tillage leads to degraded structures, water pollution and yield losses
- Remedial actions costs time, money and energy
- Compaction can be mitigated using Low Ground Pressure (LGP) and Controlled Traffic Farming (CTF)

2 Objectives

- Establish the first fully replicated field trial to investigate the interaction between traffic (CTF, LGP, Random Traffic Farming (RTF)) and tillage (deep, shallow, zero) on soil, crop and energy responses
- Determine the most appropriate trafficking system to maintain wheel-ways
- Optimise soil and water resources, crop growth and yields and system performance and economics in commercial agricultural practice

3 Methods

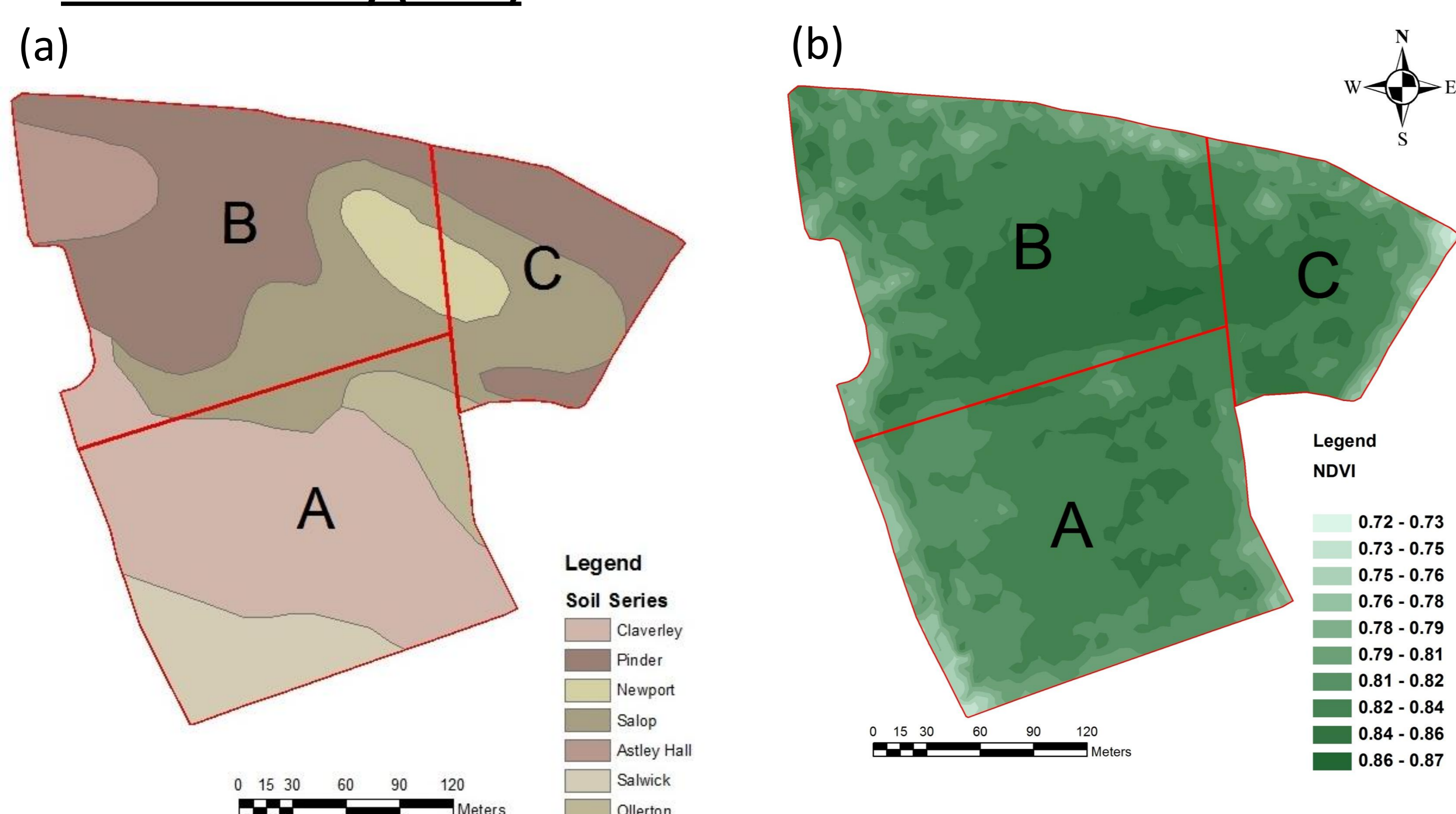
- Multidisciplinary long-term project established at Harper Adams University (UK) from October 2011
- Evaluation of spatial heterogeneity
- Fully randomised and replicated (n=4) 3x3 factorial plot (n=36, 4 x 80m) experiment measuring:
 - Soil water holding capacity, water infiltration, bulk density, penetrometer resistance
 - Crop emergence, growth and yield
 - Energy requirements including fuel usage and draught force requirement



Vaderstad TopDown cultivator for deep and shallow plots. Vaderstad Rapid for drilling all plots.

4 Results

Field Uniformity (2012)



- Soil texture classification (a) indicates important soil structural properties including water holding capacity, susceptibility to degradation and erosion, root development and plant growth.
- Normalised Difference Vegetation Index (NDVI) (b) evaluates crop canopy growth variation.
- Measurements of soil electrical conductivity and yield (2012) obtained

Crop Establishment (2013)

- A quadrat survey was performed at GS23 to determine crop emergence and crop height :
 - Treatment had no significant difference on crop count ($p > 0.05$) and crop height ($p > 0.05$)

Tillage	Count (plants/m ²)			Height (cm)		
	RTF	CTF	LGP	RTF	CTF	LGP
Deep	64	64	59	7.40	6.35	6.33
Shallow	53	56	73	7.53	6.65	6.62
Zero	59	70	66	7.50	7.82	8.22

- Tillage had a significant effect on crop height ($p < 0.05$):

Tillage	Deep	Shallow	Zero
Crop Height (cm)	6.69	6.93	7.85

5 Conclusions

- Site A uniformly yielded 4.2 t/ha in October 2012
- A reduction in tillage did not lead to a drop in yield
- Plot trials continually monitored
- Methods of reducing compaction from LGP systems to be further investigated

Contact Information

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