

# PRELIMINARY RESULTS FROM THE BROAD-SCALE FIELD SURVEY

Landwise 2<sup>nd</sup> annual event  
20 February 2020

UK Centre for Ecology & Hydrology,  
University of Reading, British Geological Survey,  
Forest Research & Partners (Farm Advisors and  
Working Group)

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# Introduction

- Broad-scale field survey
  - overview
  - initial results
  - field observations



# Broad-scale field survey



- Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage

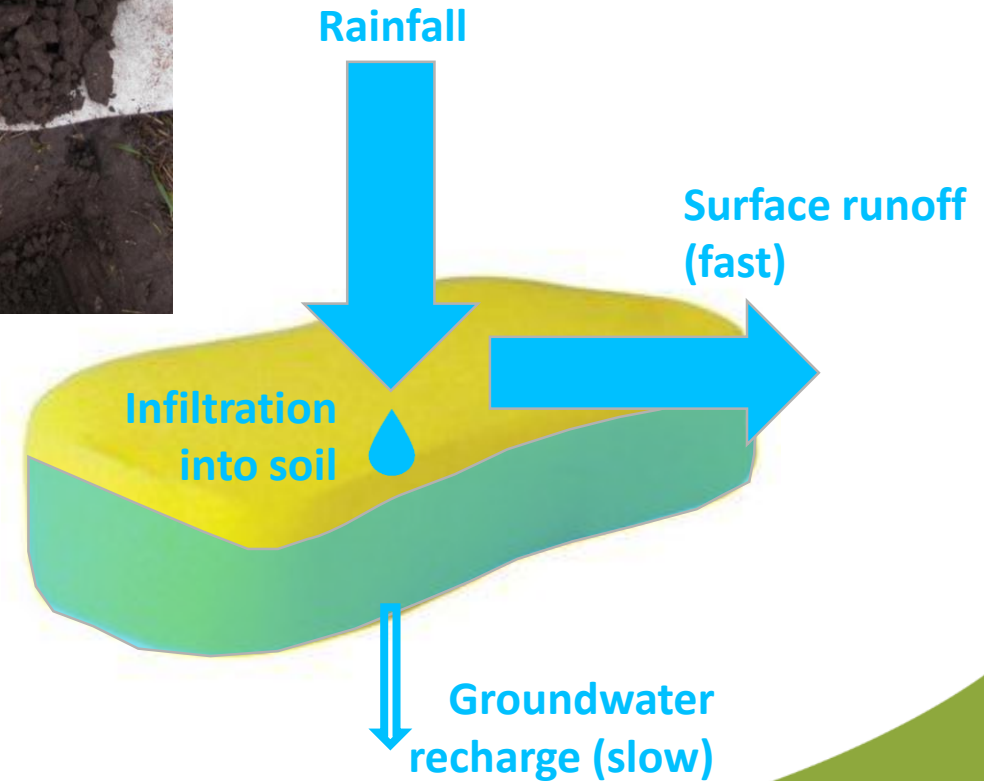
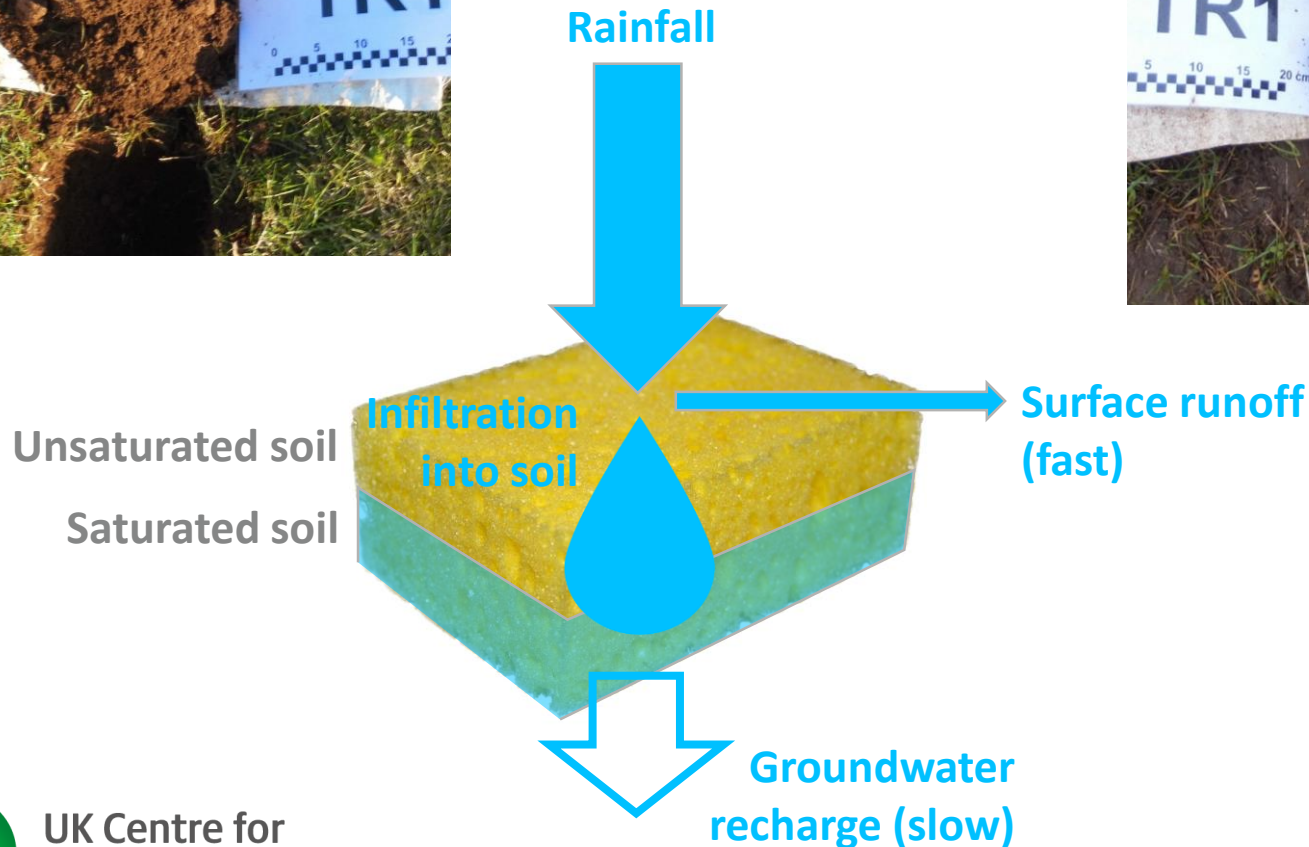
# Soil hydrology – simplified rainfall-runoff



Larger soil pores,  
good structure,  
limited compaction



Smaller soil pores,  
poor structure,  
higher compaction

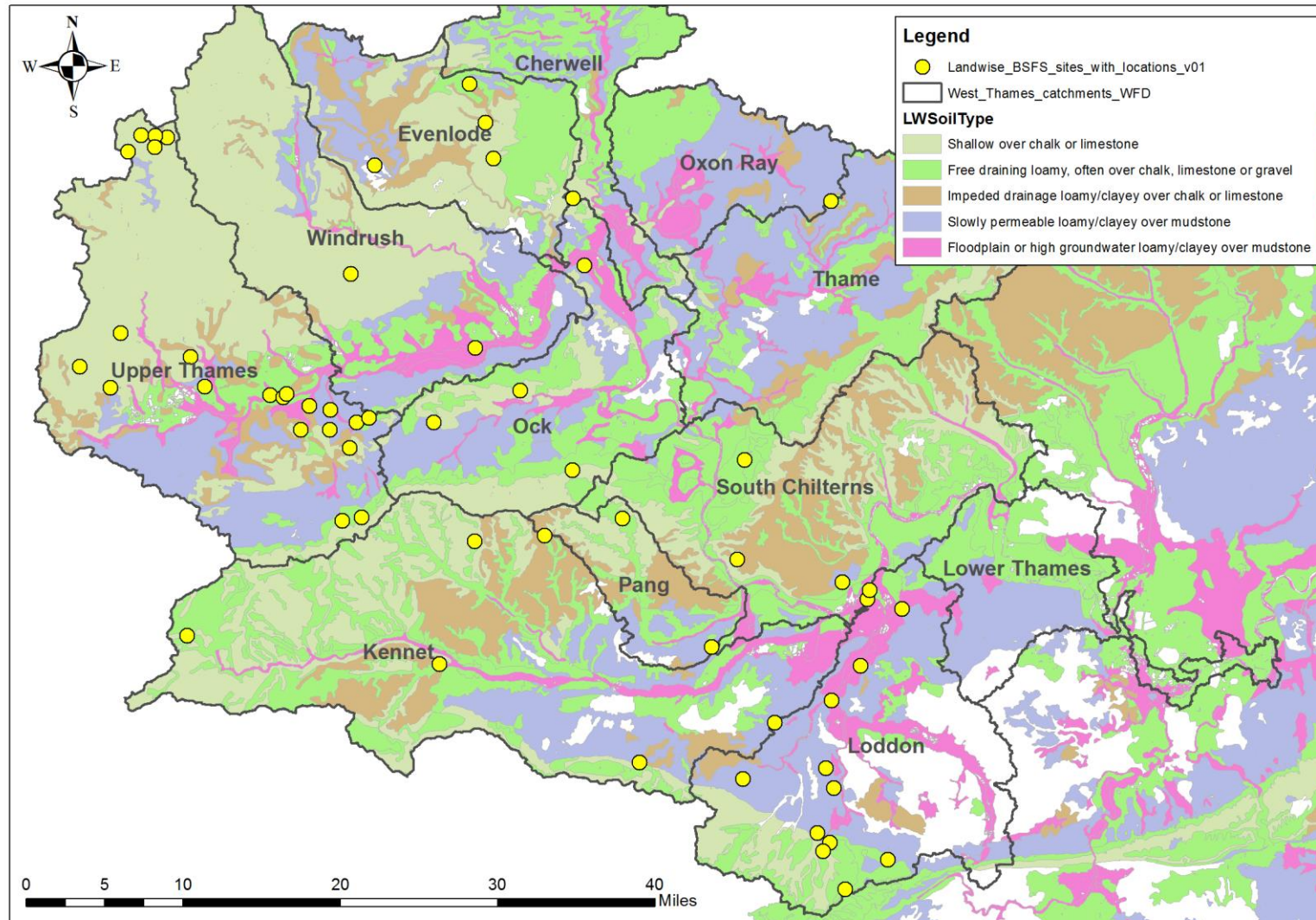


# Broad-scale field survey

- Survey aim: Quantify land use/management impact on near-surface soil properties which affect water infiltration/storage
- Soil bulk density (porosity), organic matter, texture, structure, volumetric water content, aggregate stability
- Vegetation type, height and cover
- **Co-produced with Farm Advisors and Landwise Working Group**



# Broad-scale field survey – W. Thames catchment



# Broad-scale field survey – sampling progress

- 144 fields sampled (aim 160)
- 115 fields lab & QC finished
- Sampling taking longer than anticipated...
  - robust protocol, but time consuming...
  - weather / flooding...
  - arranging access...
- Intermittent lab issues with laser sizer

Geology	LANDWISE Soil Type	Land use and management			
		Arable		Grassland (permanent, est. 5+ yr.)	Woodland (broadleaf, mature)
		Rotation with grass*	Rotation without grass		
Carbonate (Chalk, Limestone)	Shallow over chalk or limestone	6	9	8	8
	Free draining loamy <sup>1</sup>	6	8	8	8
	Impeded drainage loamy/clayey	2	9	7	8
Mudstone	Slowly permeable loamy/clayey	8	7	8	8
	Floodplain or high groundwater loamy/clayey	4	7	8	7

\* incl. grass only rotation (e.g. dairy), not just grass as break crop

<sup>1</sup> sometimes also over gravel superficial deposits overlying mudstone

# Broad-scale field survey – methodology

## Arable sampling - example

### 15 sample locations per field:

5 infield

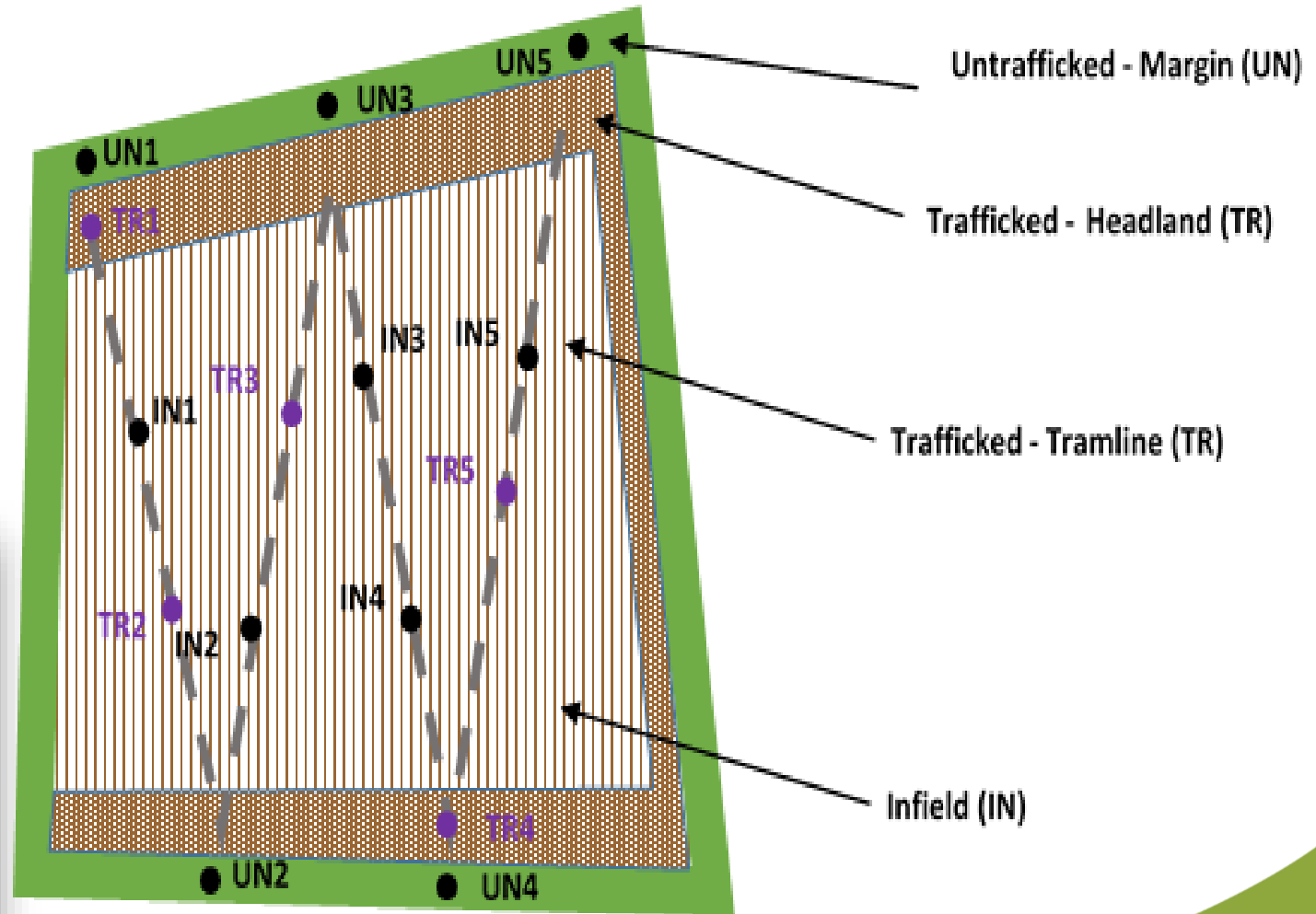
5 trafficked (*cropped headland or tramlines*)

5 untrafficked margin

*(uncultivated/uncropped rough margin, avoid within 1 m of tree/hedge stems and animal burrows)*

### 3 VESS:

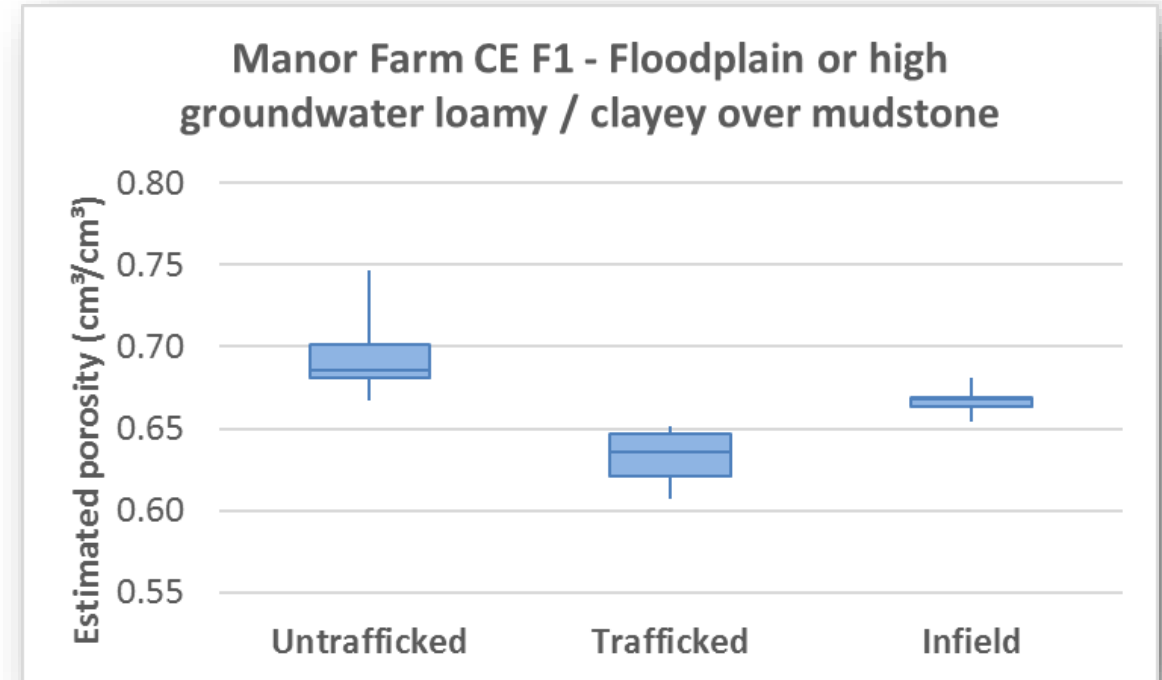
one sampling location from each of infield, trafficked and untrafficked





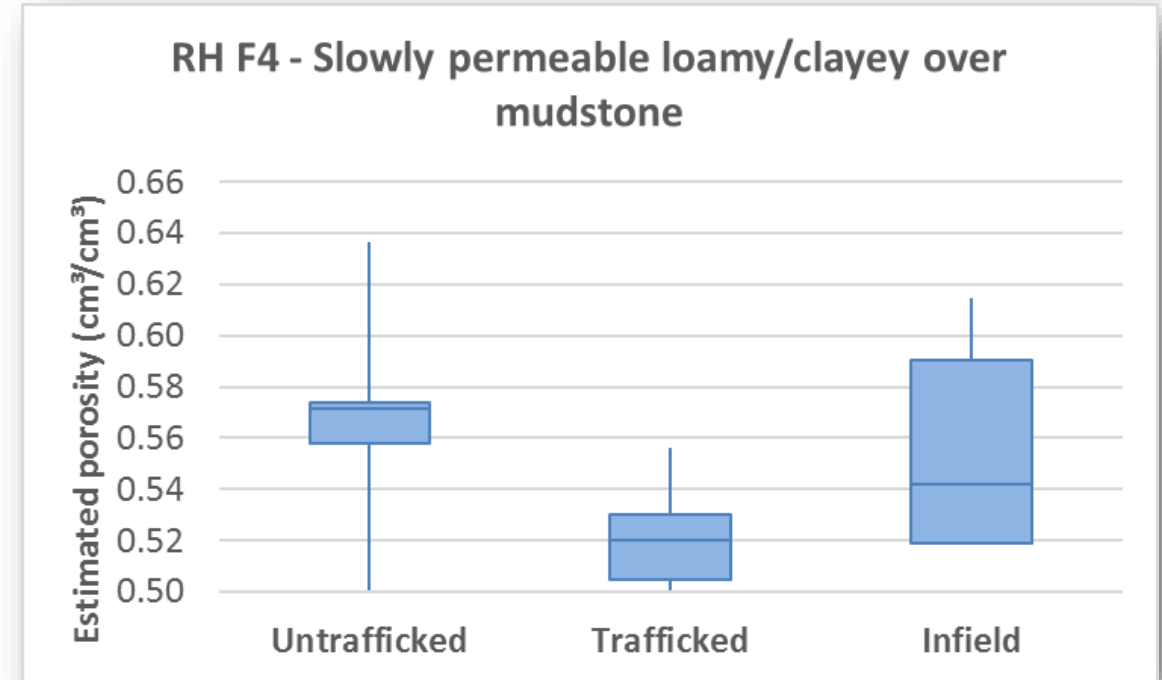


# Broad-scale field survey – preliminary results



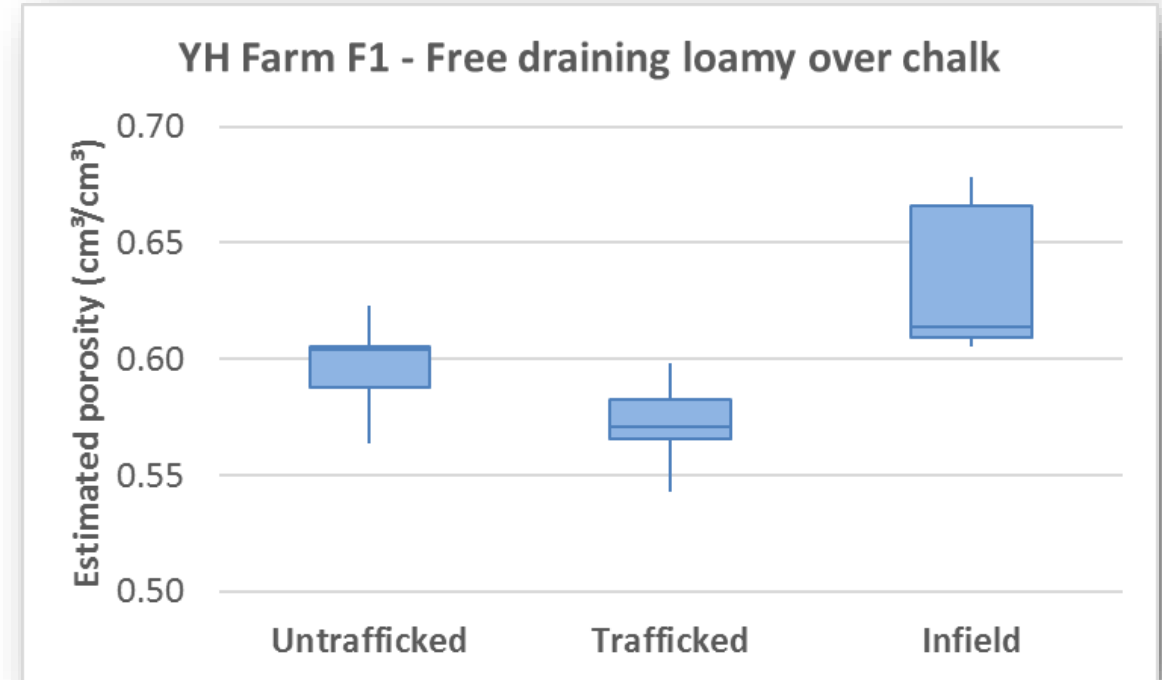
- Conventional arable without grass in rotation, min till
  - infield areas have higher porosity than trafficked but less than untrafficked margin

# Broad-scale field survey – preliminary results



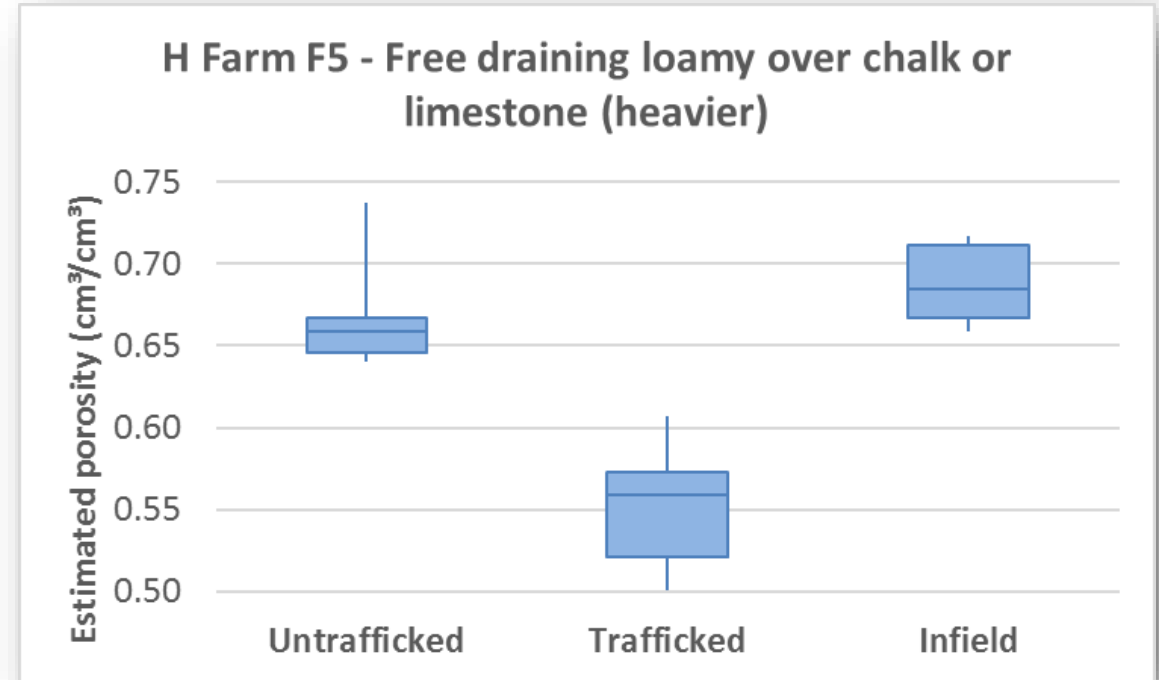
- Organic arable with grass ley in rotation, ploughed, disc & harrow, paddock grazed
  - some infield areas have similar porosity to untrafficked margin

# Broad-scale field survey – preliminary results



- Organic arable with diverse ley grassland in rotation, zero tillage, limited/sensitive trafficking
  - infield areas have higher porosity than both trafficked and untrafficked margin

# Broad-scale field survey – preliminary results



- Conventional arable without grass in rotation, cover crops, min till, direct drill, controlled traffic
  - infield areas have higher porosity than both trafficked and untrafficked margin

# Broad-scale field survey – field observations



- Tramlines
  - compaction, runoff pathways
  - deeper soil unsaturated

# Broad-scale field survey – field observations



- Heavy clay soil
  - water moving quickly downslope through soil macropore

# Broad-scale field survey – field observations



- Heavy clay soil
  - near-surface saturated – water rapidly ponds and runs off
  - deeper soil unsaturated



# Broad-scale field survey – field observations



- Silty loam soil
  - evidence of surface runoff down tramlines

# Broad-scale field survey – field observations



- Floodplain woodland
  - slowing flood flows – moving across meander
  - natural woody debris dams, slowing surface runoff to main channel

# Broad-scale field survey – summary



- Interesting results so far...
- Importance of **near-surface soil properties** and **preferential flow pathways**
- Discernible **differences** in soil bulk density / inferred porosity and organic matter **attributable to land use and management**
- **Woodland porosity and organic matter higher on same soil type**
- Trafficked porosity ~ 5-25% less than untrafficked
- **Several fields with infield porosity greater than or equal to untrafficked...**
  - tentatively appears linked to organic farming / building up organic matter / tillage / controlled traffic (**TBC!**)
  - **'MAGIC' SOIL!**
- Mixed effects **statistical analysis to draw out significance of different land management practices...**
  - crop types, rotation, organic, conventional/min/no tillage, cover crops, controlled traffic, drainage, flooding history etc.



- Thank you!
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