The Soil Carbon Project

The Farm Results so far

The numbers

- 55 farms
- 201 Fields (a few more to finish off for year 1)
- Replicated trial looking at management (another 150 sample sites)
- 77 Arable fields, 103 Grassland (64 TG / 39 PP), 21 Horticultural
- Also partnership with TOMS project to test soil samples from research plots.
- 1st Farm sampled 15th February 2018, last 2018 sample 6th December 2018 – will be revisited same time period 2019.

The Numbers: Each field

- Soil organic matter 3 x depths 0-10cm, 10-30cm, and 30-50cm
- Bulk density 3 x depths
- Nutrients: pH, phosphate, potash, magnesium
- 3 x aggregate stability samples
- Equals – 10 bags of soil per field
- Year 1 (so far)

4,000 bags of soil!

The Results: Soil Organic Matter

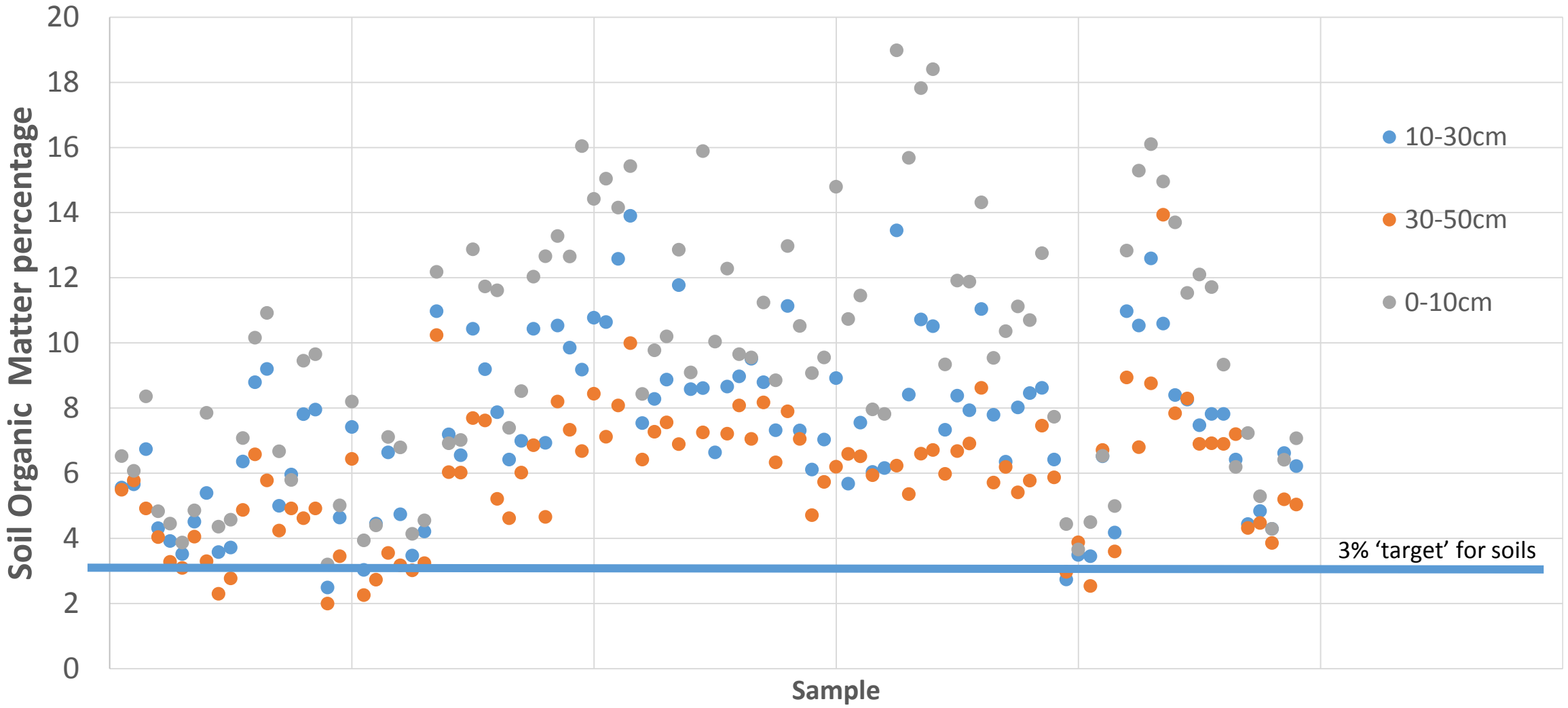
- Tested using Loss on Ignition Method (LOI)
- Main constituent of soil organic matter – soil organic carbon

All samples: all depths	7.61%
All samples: 0-10cm	9.08%
All samples: 10-30cm	7.63%
All samples: 30-50cm	6.11%

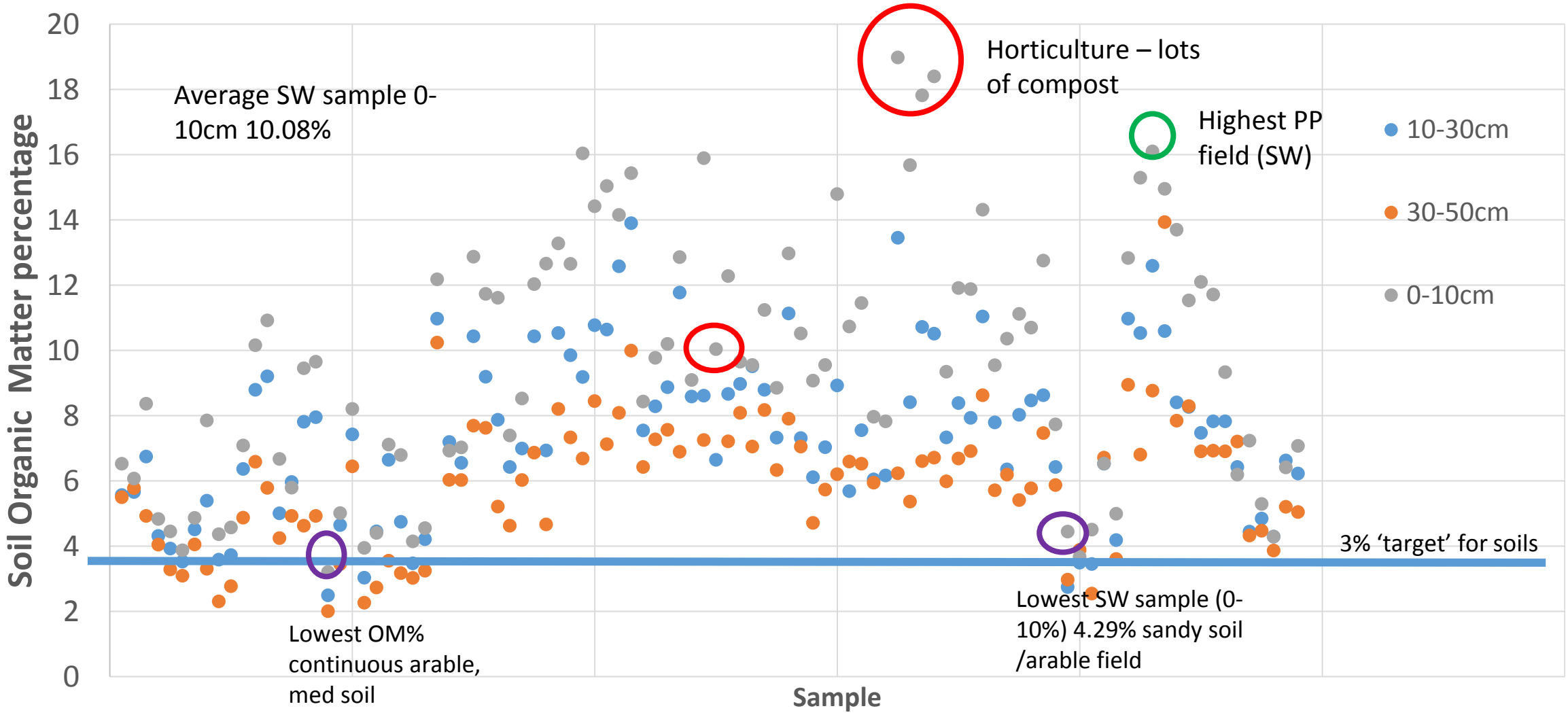
The Results: Soil Organic Matter

	Permanent Pasture Average	Grassland Average	Arable Average	Horticulture Average
SOM 0-10	12.12%	8.84%	6.27%	9.55%
SOM 10-30	9.24%	7.31%	5.76%	8.27%
SOM 30-50	7.05%	6.18%	4.81%	6.53%

The Results: Soil Organic Matter



The Results: Soil Organic Matter



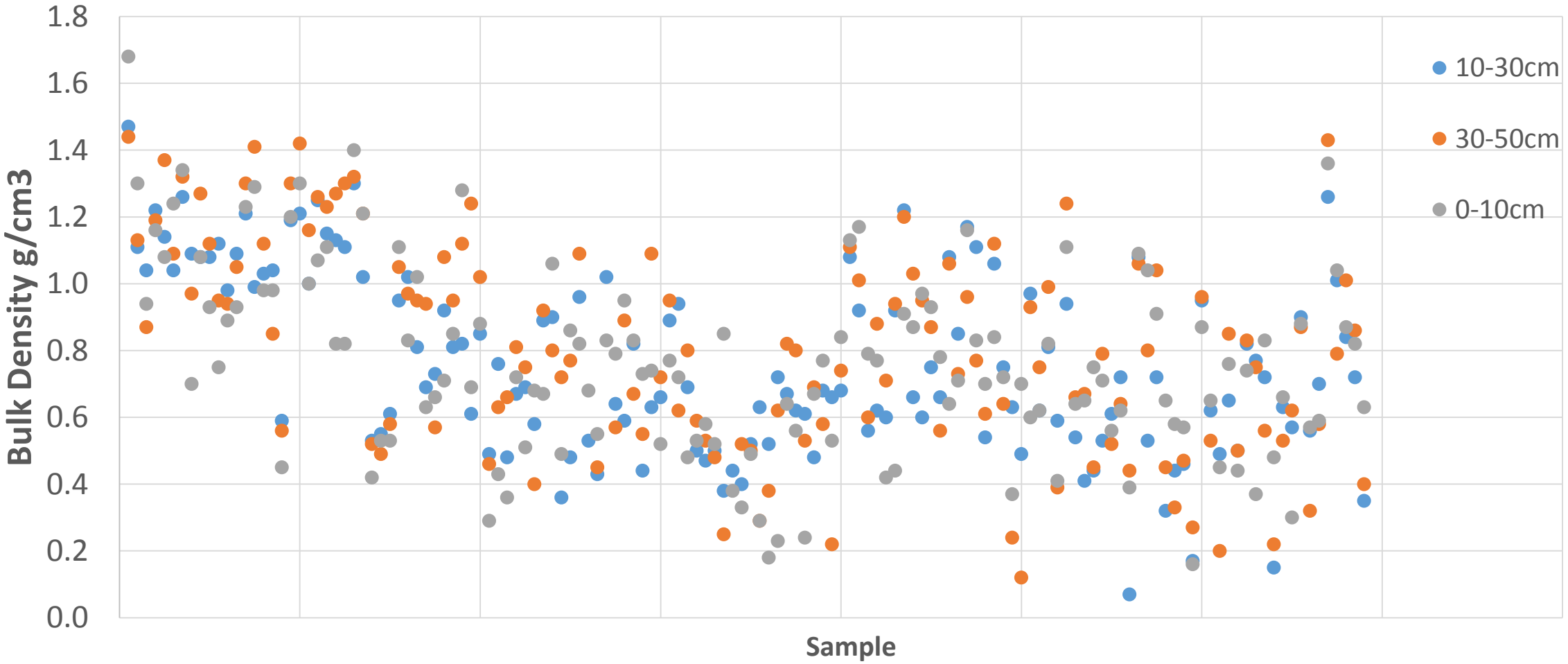
The Results: Bulk Density

- Soil's ability to function for structural support and aeration
- Calculation – dry weight of soil / volume (including stone volume)
- Allows comparisons between soil types
- Needed for soil carbon calculations

Soil texture	Ideal BD for plant growth (g/cm^3)	BD that restricts root growth (g/cm^3)
Sandy	<1.60	>1.80
Silty	<1.40	>1.65
Clayey	<1.10	>1.47

Source: Soil Quality Survey

The Results: Bulk Density



The Results: Yield of soil carbon

Soil sampling depth (0.1 or 0.2)

Soil bulk density

Soil organic carbon %ge (SOM x 1.72)

Tonnes Carbon / ha

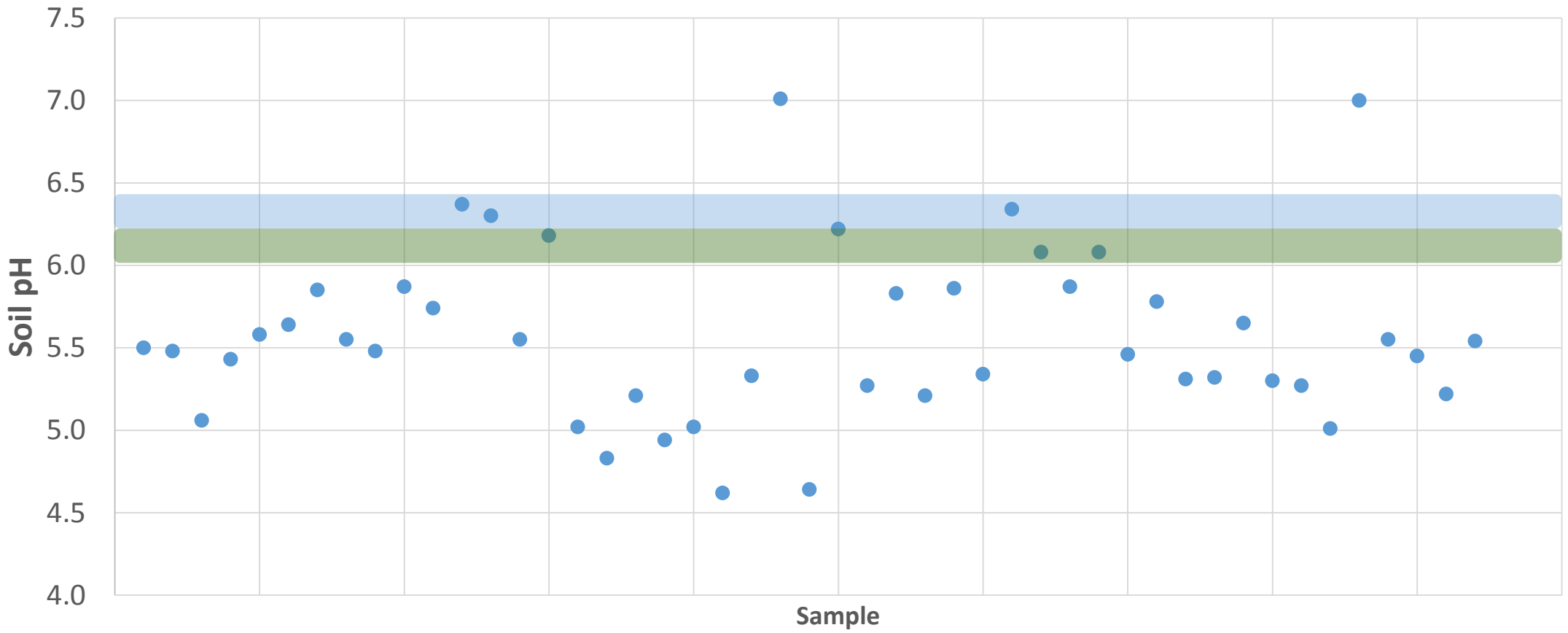
The Results: Soil Carbon Yield

	Carbon yield 0-10cm	Carbon yield 10-30cm	Carbon Yield 30-50cm	Total across all depths
Project Average	36 t/ha	58 t/ha	49 t/ha	142 t/ha
Arable	31 t/ha	52 t/ha	48 t/ha	129 t/ha
Grass	39 t/ha	57 t/ha	53 t/ha	147 t/ha
Permanent Pasture	43 t/ha	67 t/ha	54 t/ha	162 t/ha
Horticultural	29 t/ha	58 t/ha	40 t/ha	125 t/ha

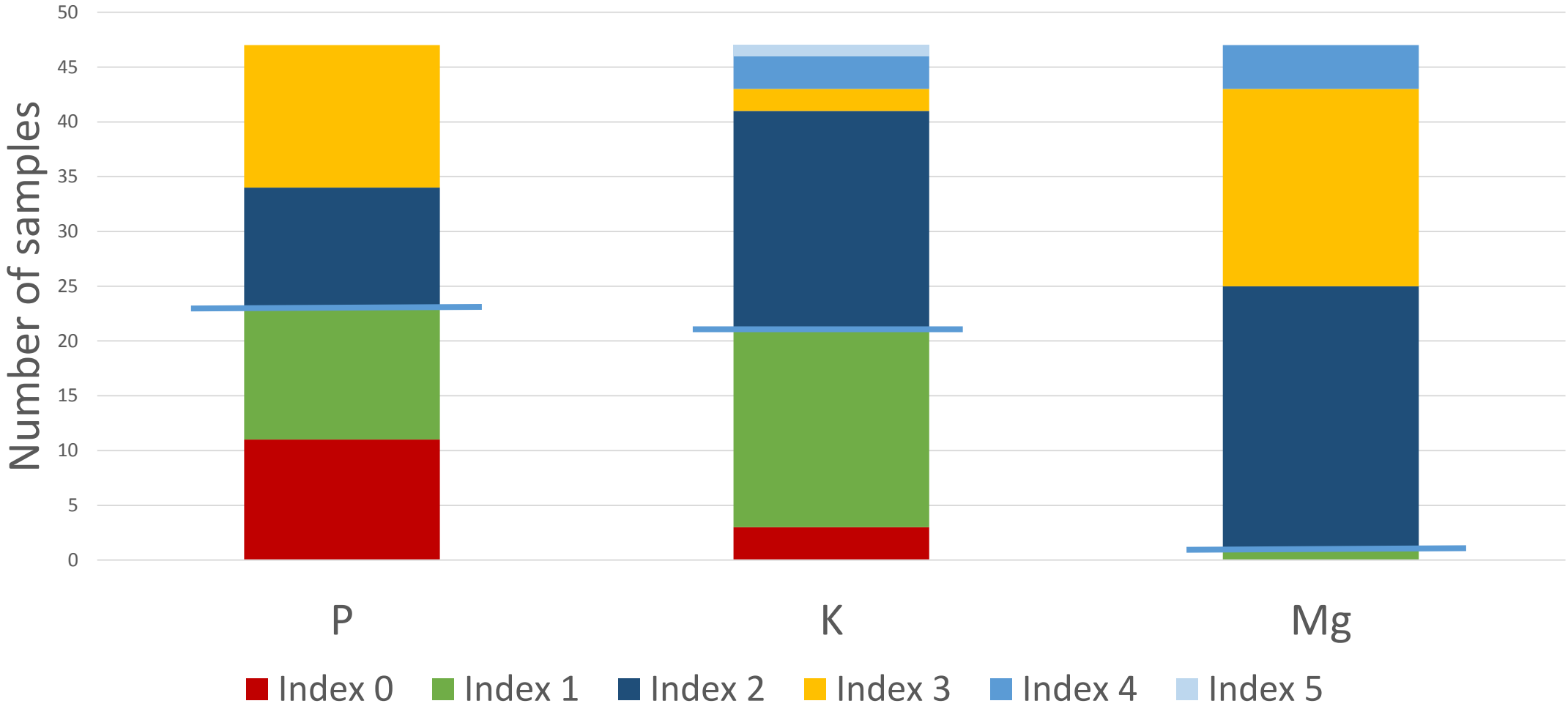
The Results: Soil Carbon yield

	Highest field (t/ha)	Lowest Field (t/ha)
Arable	245 t/ha	12 t/ha
Grassland	324 t/ha	41 t/ha
Permanent pasture	311 t/ha	74 t/ha
Horticulture	201 t/ha	57 t/ha

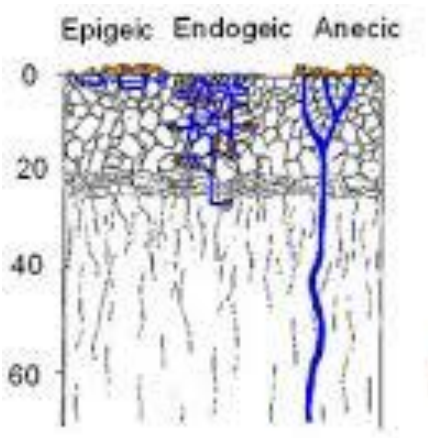
The Results: Soil pH



The Results: Nutrients



Proxy tests



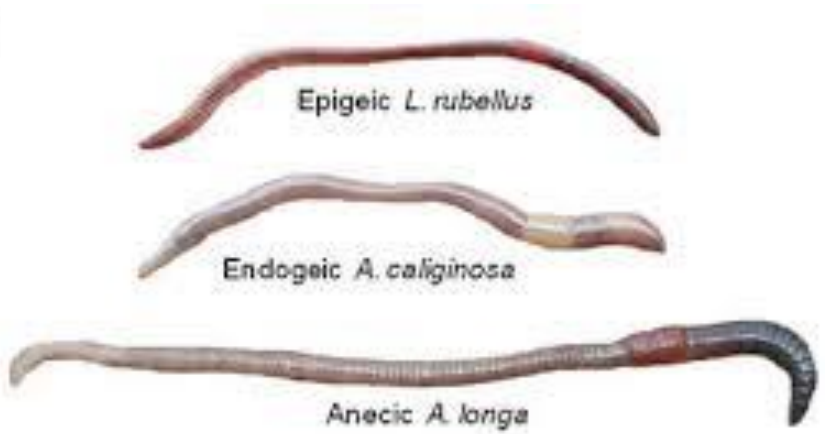


Figure 1. Assessment of appearance of air-dry peds in artificial effluent (SAR 5; EC 1 dS/m).

The Results: Proxy Averages

• VESS Top	1.89
• VESS Bottom	1.94
• Infiltration	3m 30s
• Worms / pit	5.2
• Temperature	16.44°C
• Aggregate Stability (5m)	0.45
• Aggregate Stability (2hrs)	0.95

The Results: Proxy tests

	Project Average	Grassland Average	Permanent Pasture Average	Arable Average	Horticultural Average
VESS Top	1.89	2.26	2.19	1.84	1.58
VESS Bottom	1.94	1.93	1.73	1.84	1.59
Infiltration	3m 30s	4m 12s	2m 58s	4m 9s	1m 28s
Worms/pit	5.2	4.7	4.9	5.8	2.4
Temperature	16.44 °C	17.29 °C	17.21 °C	15.31 °C	15.36 °C
Ag Stability (5m)	0.45	0.27	0.18	0.71	0.89
Ag Stability (2hr)	0.95	0.57	0.47	1.51	1.47

The Results : Proxy Tests

- Most number of worms 31
- Quickest infiltration 0.2 seconds

- But we also had the influence of the weather…..

World Worm Week (23rd – 31st March)

- Jackie Stroud from Rothamsted Research is investigating earthworm types and numbers and relating to management practices.

- Soil Carbon Project Farmers took part due to concerns that sampling in different seasons/weather conditions affects the project results.

	Total Number of Worms	Adult Surface Worms	Adult Topsoil Worms	Adult Deep Burrowing Worms	VESS Top	VESS Bottom
Project Totals	2548	522	931	142	N/A	N/A
Project Averages	10.11	2.07	3.69	0.56	2.57	1.09

What are we finding? (at present)

	SOM %	BD g/cm3	Soil carbon yield	VESS Top	VESS bottom	Infiltration	Worms	Aggregate Stability
Grassland	**	*	**	*	*	*	**	***
Permanent Pasture	***	*	***	*	**	**	**	**
Arable	*	**	*	**	**	*	***	*
Horticulture	**	***	*	***	***	***	*	*