



# **The Soil Carbon Project**

The Farm Results so far





European Regional **Development Fund** 

## 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.
- 1<sup>st</sup> Farm sampled 15<sup>th</sup> February 2018, last 2018 sample 6<sup>th</sup> 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!



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

All samples / all depths All samples: 0-10cm All samples: 10-30cm All samples: 30-50%

9.16%\* 7.70%
9.67% (n=98)
7.45% (n=98)
5.93% (n=95)

IHE SUIL LA

|           | Permanent<br>Pasture average | Grassland<br>Average | Arable<br>Average |
|-----------|------------------------------|----------------------|-------------------|
| SOM 0-10  | 11.66%                       | 9.87%                | 7.29%             |
| SOM 10-30 | 8.41%                        | 7.99%                | 5.67%             |
| SOM 30-50 | 6.49%                        | 6.73%                | 4.36%             |

Horticulture – combination of peatland soils and waiting on more fields, not representative yet.







## 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<br>(g/cm <sup>3</sup> ) | BD that restricts root growth (g/cm <sup>3</sup> ) |
|--------------|---|--|
| Sandy        | <1.60   | >1.80  |
| Silty        | <1.40   | >1.65  |
| Clayey       | <1.10   | >1.47  |

Source: Soil Quality Survey

#### **The Results: Bulk Density**



Sample

#### The Results: Bulk Density



## The Results: Yield of soil carbon



Soil bulk density

Soil sampling depth (0.1 or 0.2)





Tonnes Carbon / ha



Soil organic carbon %ge (SOM x 1.72)





## The Results: Soil Carbon Yield

|                   | Carbon yield 0-10cm | Carbon yield 10-<br>30cm | Carbon Yield 30-<br>50cm | Total across all depths |
|-------------------|---------------------|--------------------------|--------------------------|-------------------------|
| Project Average   | 39 t/ha             | 64 t/ha                  | 54 t/ha                  | 156 t/ha                |
| Arable            | 35 t/ha             | 59 t/ha                  | 53 t/ha                  | 146 t/ha                |
| Grass             | 39 t/ha             | 58 t/ha                  | 57 t/ha                  | 153 t/ha                |
| Permanent Pasture | 43 t/ha             | 69 t/ha                  | 57 t/ha                  | 167 t/ha                |
| Horticultural     | 38 t/ha             | 75 t/ha                  | 35 t/ha                  | 148 t/ha                |



## The Results: Soil Carbon yield

|                   | Highest field (t/ha) | Lowest Field (t/ha) |
|-------------------|----------------------|---------------------|
| Arable            | 245 t/ha             | 77 t/ha             |
| Grassland         | 324 t/ha             | 48 t/ha             |
| Permanent pasture | 311 t/ha             | 74 t/ha             |
| Horticulture      | 200 t/ha             | 112 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 1.95
- Infiltration 3m 27s
- Worms / pit 4.8
- Temperature 16.59°C
- Aggregate Stability (5m) 0.45
- Aggregate Stability (2hrs) 0.95



## The Results: Proxy tests

|                    | Project Average | Grassland<br>Average | Permanent<br>Pasture Average | Arable Average | Horticultural<br>Average |
|--------------------|-----------------|----------------------|------------------------------|----------------|--------------------------|
| VESS Top           | 1.89            | 2.26                 | 2.19                         | 1.81           | 1.58                     |
| VESS Bottom        | 1.95            | 1.93                 | 1.73                         | 1.89           | 1.59                     |
| Infiltration       | 3m 27s          | 4m 27s               | 2m 58s                       | 4m 0s          | 1m 28s                   |
| Worms/pit          | 4.8             | 4.1                  | 4.7                          | 10.8           | 2.8                      |
| Temperature        | 16.59 °C        | 17.29 °C             | 17.21 °C                     | 15.98 °C       | 15.36 °C                 |
| Ag Stability (5m)  | 0.45            | 0.27                 | 0.18                         | 0.72           | 0.89                     |
| Ag Stability (2hr) | 0.95            | 0.57                 | 0.47                         | 1.52           | 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.....









#### Pants...

Were potentially impacted by this summer's lack of moisture

## A quick word on the impact of management



BASE UK field – split field trial started in2010Half ploughed / half direct drilled

SOM results this year

| A REAL PROPERTY AND A REAL |         |        |       |  |  |  |  |
|--|---------|--------|-------|--|--|--|--|
| an a   | SOM%    | Plough | DD    |  |  |  |  |
|  | 0-10    | 5.79   | 6.67  |  |  |  |  |
|  | 10-30   | 5.96   | 5.00  |  |  |  |  |
|  | 30-50   | 4.92   | 4.24  |  |  |  |  |
|  | Average | 5.56%  | 5.30% |  |  |  |  |

#### Management impact



## What are we finding? (at present)

|                      | SOM % | BD g/cm3 | Soil<br>carbon<br>yield | VESS Top | VESS<br>bottom | Infiltration | Worms | Aggregate<br>Stability |
|----------------------|-------|----------|-------------------------|----------|----------------|--------------|-------|------------------------|
| Grassland            | **    | *        | **                      | *        | *              | *            | **    | ***                    |
| Permanent<br>Pasture | ***   | *        | ***                     | *        | **             | **           | **    | **                     |
| Arable               | *     | **       | *                       | **       | **             | *            | ***   | *                      |
| Horticulture         | NS    | ***      | *                       | ***      | ***            | **           | *     | *                      |

## What next? – more testing!

- Year 2 : SOM tests continuing to protocol
- Carbon footprint analysis
- Testing of additional proxy measures
- Testing of all farms on same day / week? (would we be up for it?!)
- What other proxy measures are you interested in?