Evaluating soil structural quality and compaction

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Background: My work

- **SQUARE Project:**
  - **Soil Quality Research Project (Teagasc)**

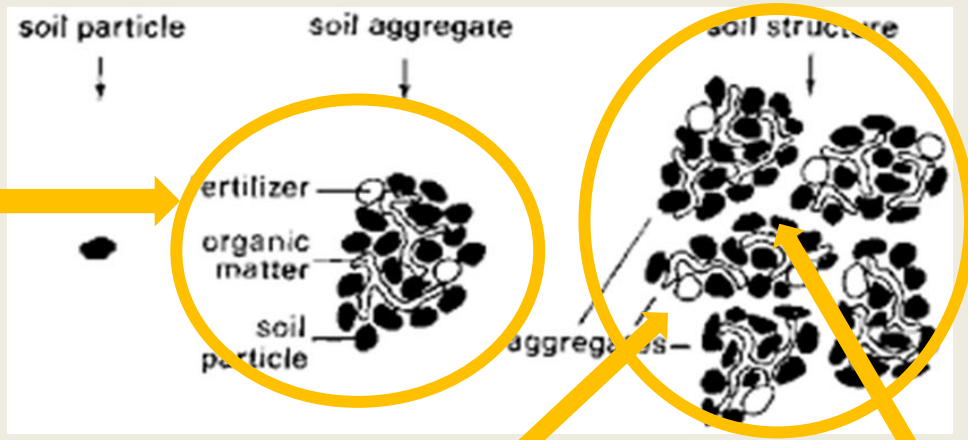
Evaluating GrassVESS; a technique to assess the land management impacts on the structural quality of Irish grassland soils

Overview of presentation

- **Soil structure** - importance
- **Soil structural quality** – Good v's bad
- **Impact of land management** - compaction
- **How to evaluate soil structure** – In field techniques
- **Example of a technique developed for Ireland-** GrassVESS

Importance of soil structure

- **Soil structure**
  - **Aggregates**



Source: Pastureforhorses.com

- **Determines:**

  Functional soil capacity

  (1) Primary production - crops or grass

  (2) Water purification - drainage

  (3) Carbon sequestration

  (4) Habitat for biota

  (5) Nutrient cycling

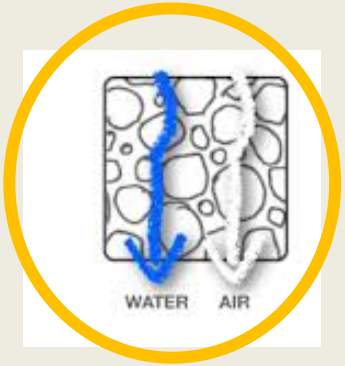
Soil structural quality

Good soil structural quality

- **Aggregates:**
  - **Small**
  - **Round**
  - **Friable**

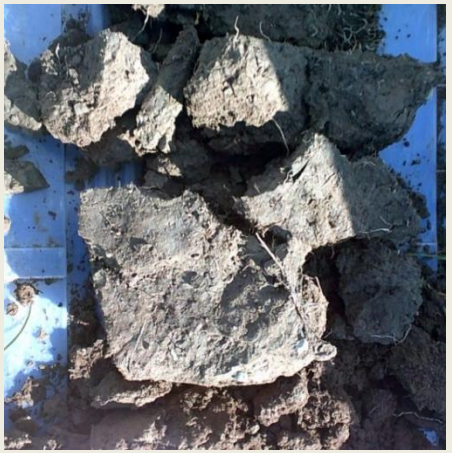
Benefit:

- **Non-compacted soils Improves Soil functioning**



Poor soil structural quality

- **Aggregates:**
  - **Large**
  - **Angular**
  - **Compact**

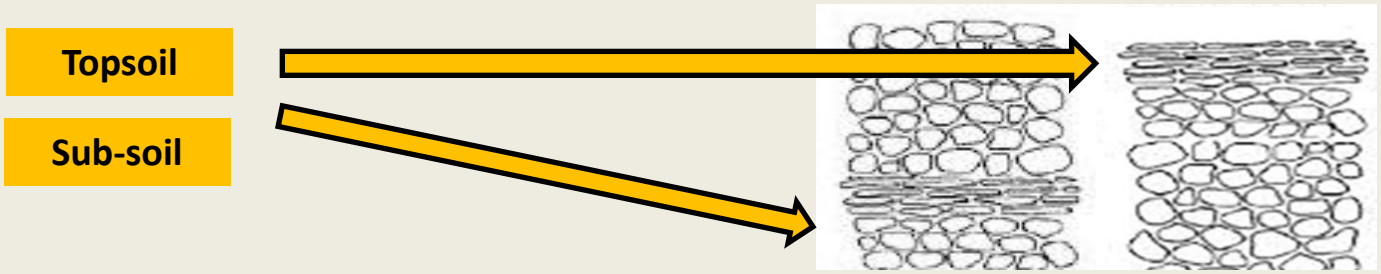


Problem:

- **Compacted soil Impairs soil functioning**

Impact of land management

- **Land management can impact on soil structural quality and cause <u>compaction</u>**
  - **Where**



  - **How**

Especially during WET CONDITIONS!

  - **Avoid**
    - **Reduce weight (double width tyres / tracks)**
    - **Timing operations**

How to evaluate soil structure

- **Soil structure can be evaluated directly in the field using Visual soil evaluation (VSE) techniques**
  - **Procedures that visually and tactilely evaluate soil structure**
  - **Focus on the impact of land management on soil structural quality**
  - **Available for both topsoil and subsoil**

  – **Advantages:**
    - **Can be used by <u>YOU</u>** i.e. Researchers, advisors, farmers
    - **Quick and easy**
    - **Basic equipment**
    - **Instant results**

Example of a VSE technique: GrassVESS

- **Developed in Ireland (**Booth et al., 2016)
- **Specifically for grassland soils**
- **Assesses the top 25cm**

What you need

GARDEN SPADE

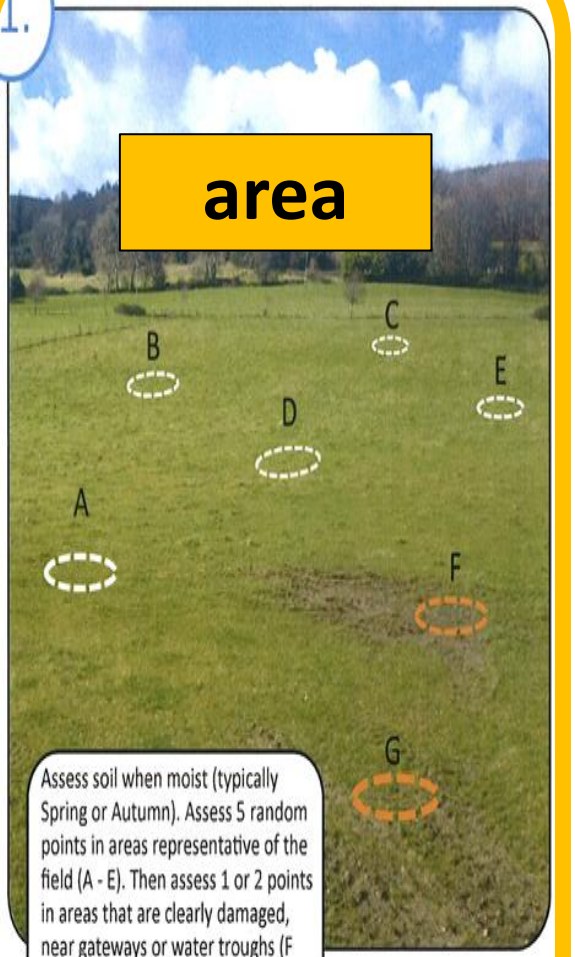
TRAY, TROWEL , TAPE

CHART

How to conduct

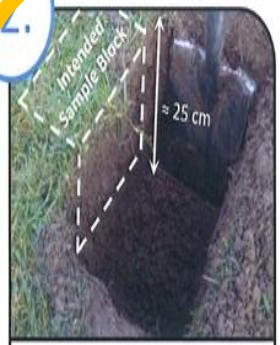
Step 1: Extract a block of soil

1.



Assess soil when moist (typically Spring or Autumn). Assess 5 random points in areas representative of the field (A - E). Then assess 1 or 2 points in areas that are clearly damaged, near gateways or water troughs (F and G). This will give a comparison between undamaged and damaged areas. At each point, an intact sample block of soil must be extracted.

2.



Dig a hole, wider and deeper than an intended sample block. Do not stand on or lean the spade against the sample block.

3.

Mark out and carefully loosen the sample block with straight spade insertions.

4.

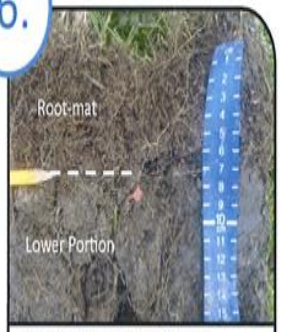
Carefully lever out the sample block on the spade and place on a plastic sheet or tray.

How

5.

Using a knife or trowel, open the sample block like a book. It is useful to use the sward to gently pull the sample apart.

6.

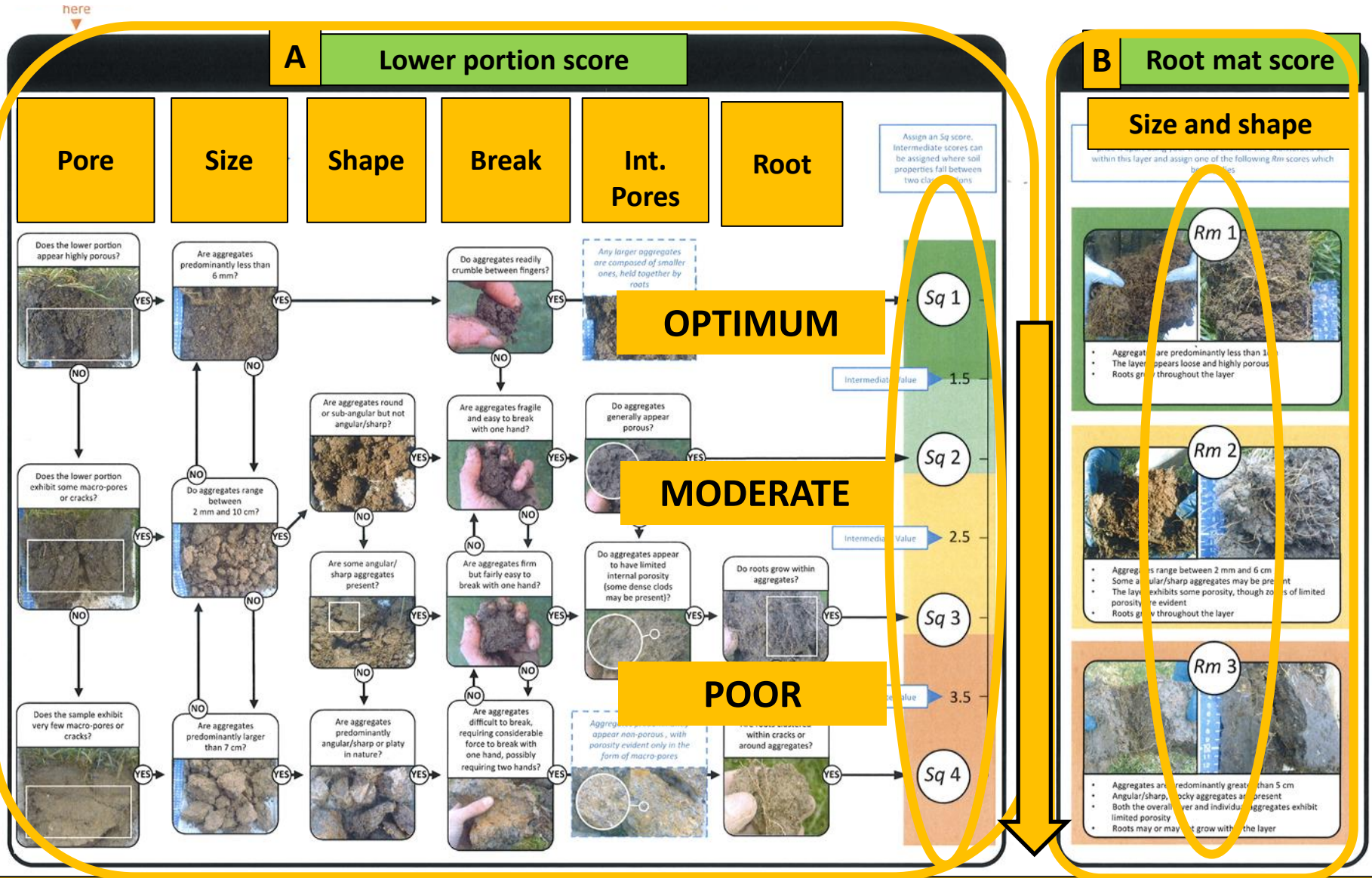


Identify layers of different structure. Measure and record the depth of the root-mat and the overall sample. If no root-mat layer is present, treat the upper 5 cm as such.

7.

Conduct the assessment described overleaf. First examine the lower portion and then the root-mat layer. Record results on the GrassVESS score sheet.

Step 2: Evaluate the extracted block of soil



Increasing **score** = decreasing **soil structural quality**

Case study: Evaluating GrassVESS in Ireland on typical and a-typical areas at 20 sites during the summer 2016

Typical areas indicate <u>better</u> soil structural quality compared to **a-typical areas**

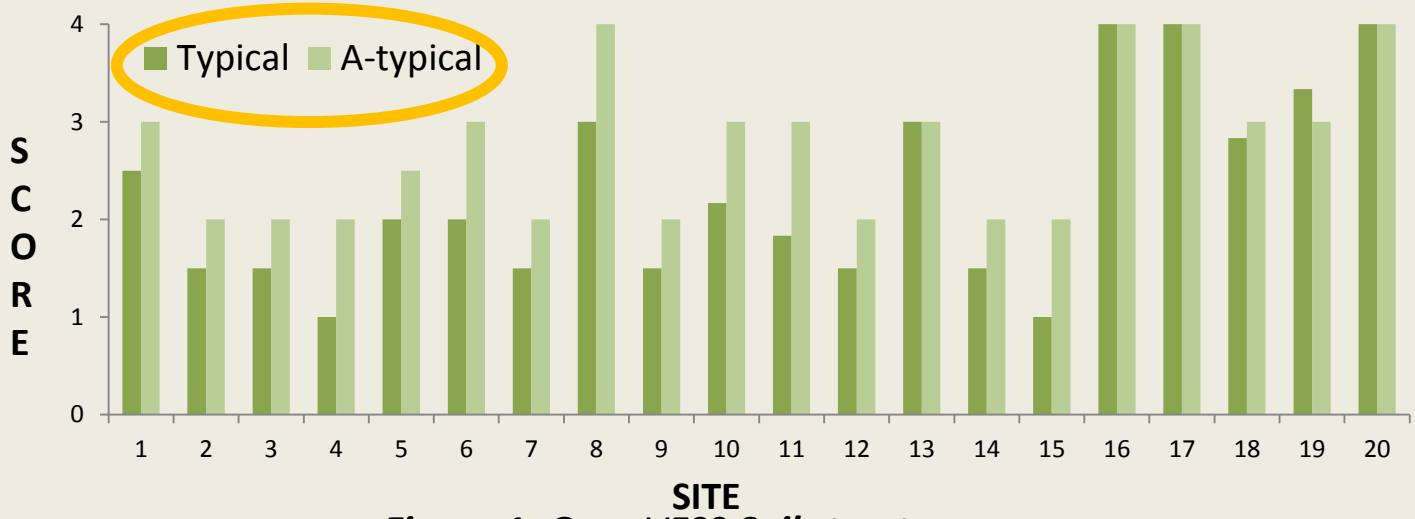


Figure 1: *GrassVESS* ***Soil structure score***

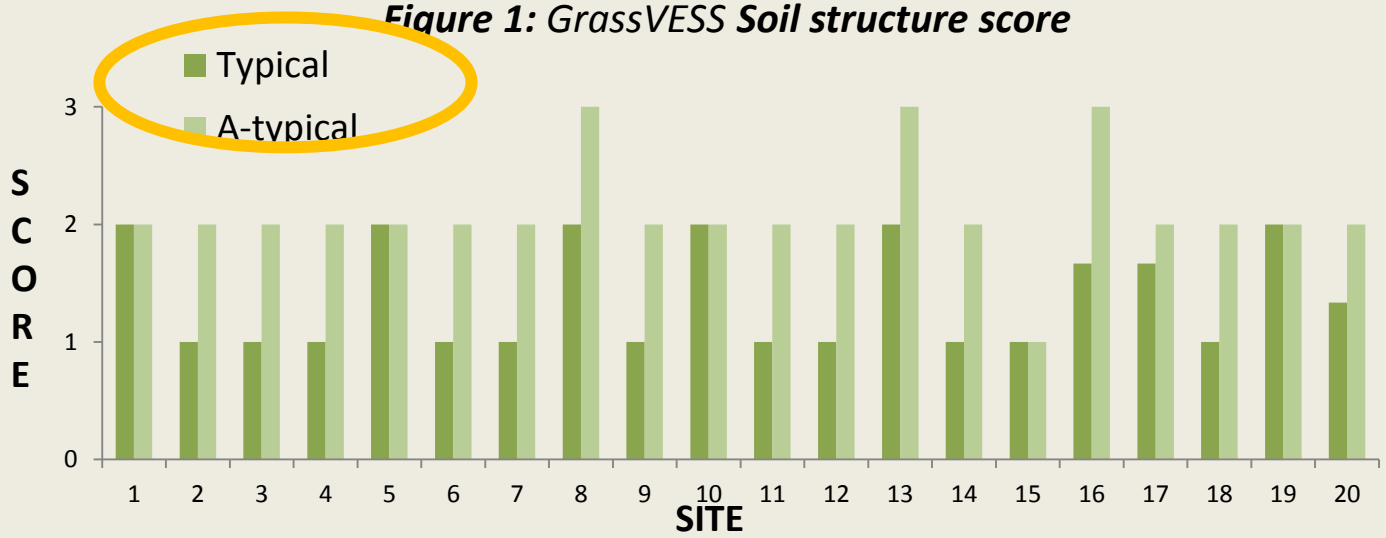


Figure 2: *GrassVESS* ***root mat score***

Ability to detect the land management impacts on soil structure

Todays message

- **Soil structure is important.**
  - Maintaining good soil structural quality is critical to ensure soil functioning, including primary production.
- **Land management practices can impact on soil structural quality.**
  - Machinery and livestock can damage soil structure and cause compaction. Ways to avoid this.
- **Easy to use techniques available to evaluate soil structure directly in the field.**
  - GrassVESS an example of a technique for Irish soils