

Evaluating soil structural quality and compaction

Eileen Jeuken
(CERIS at IT Sligo)



Supervisors:

Ms. Cait Coyle (CERIS at IT Sligo)

Dr. Owen Fenton (Teagasc)

Background: My work

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

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

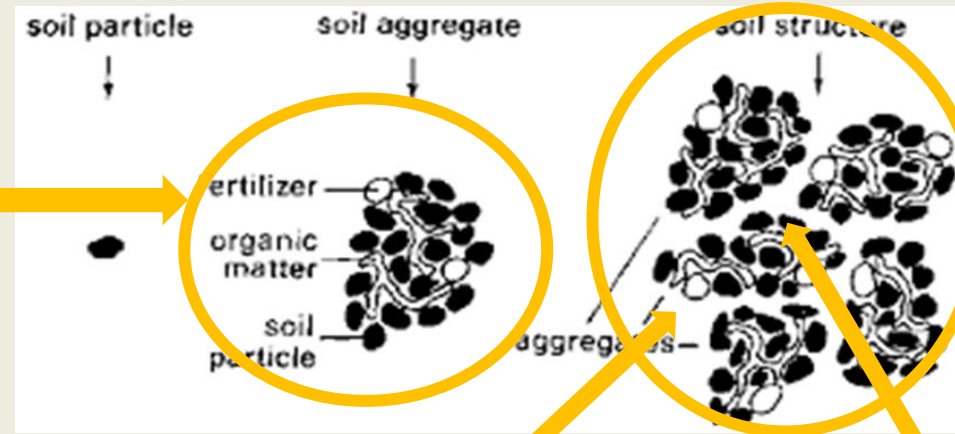
Overview of presentation



- **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**



- **Determines:**
Functional soil capacity

- (1) Primary production - crops or grass
- (2) Water purification - drainage
- (3) Carbon sequestration
- (4) Habitat for biota
- (5) Nutrient cycling

Water / air / nutrients

Source: Pastureforhorses.com

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**

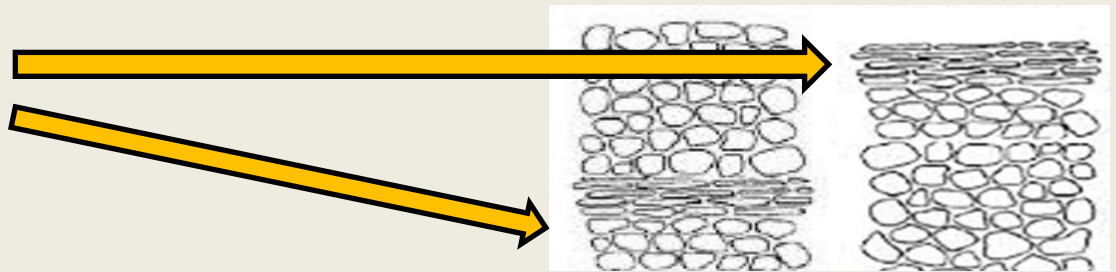


Impact of land management

- Land management can impact on soil structural quality and cause compaction

– Where

Topsoil
Sub-soil



– 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 YOU 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



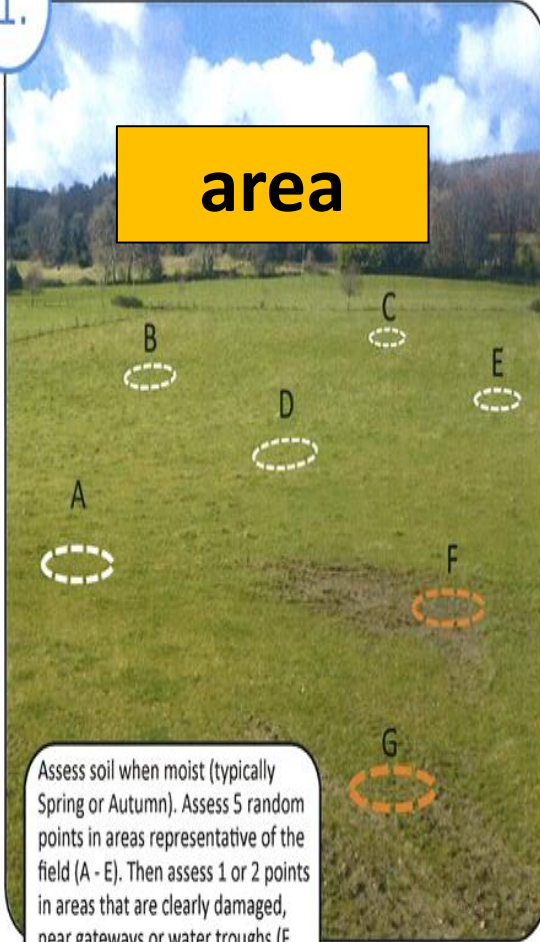
How to conduct



Step 1: Extract a block of soil

1.

area



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.

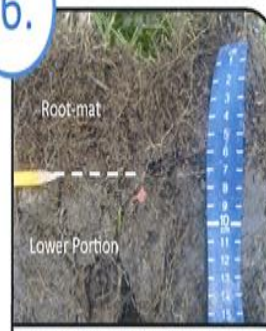
How

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.



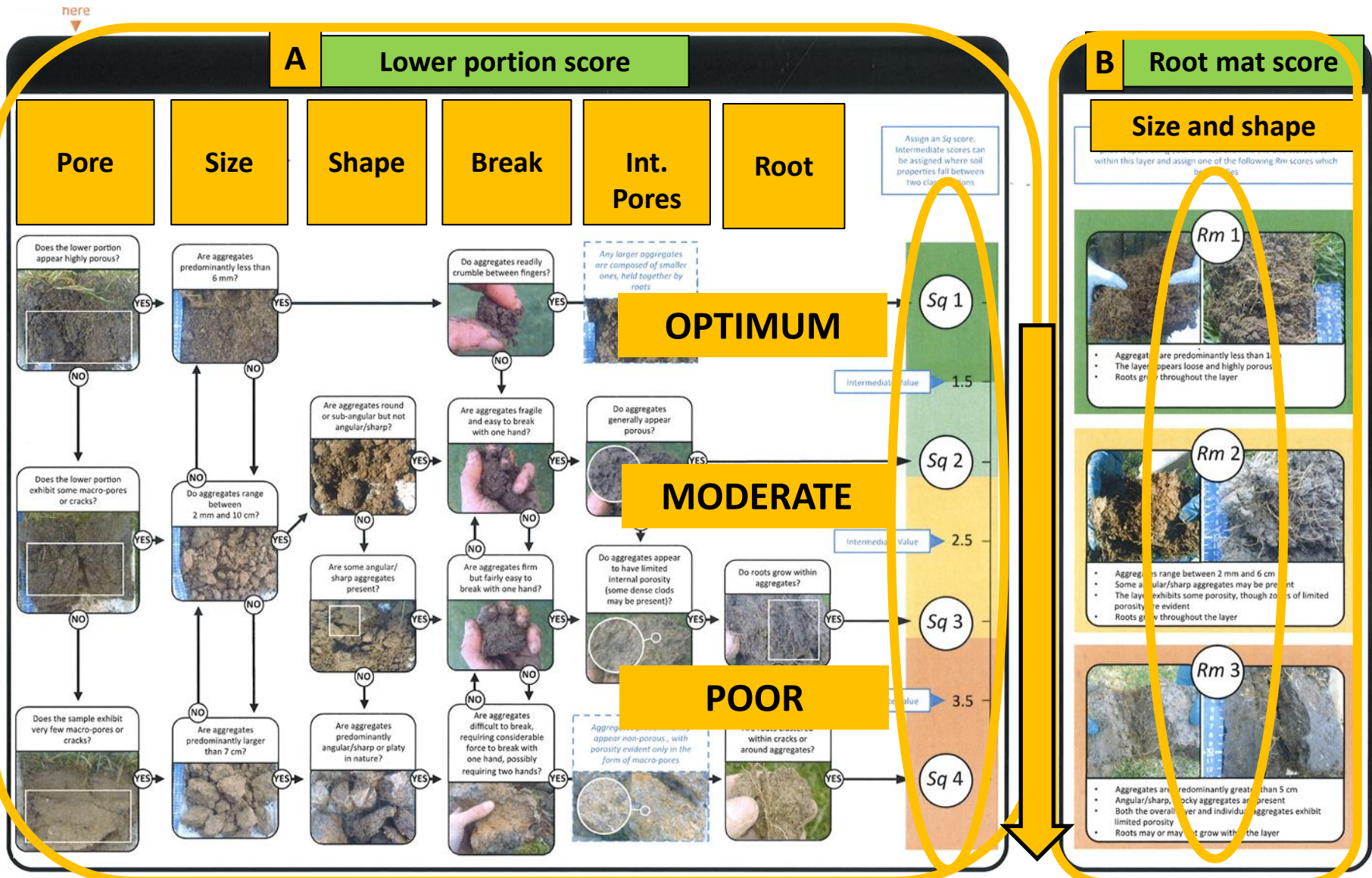
Identify layers of different structure. Measure and record the depth of the root-mat and the overall sample. If no root-mat layer is present, treat the upper 5 cm as such.

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



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

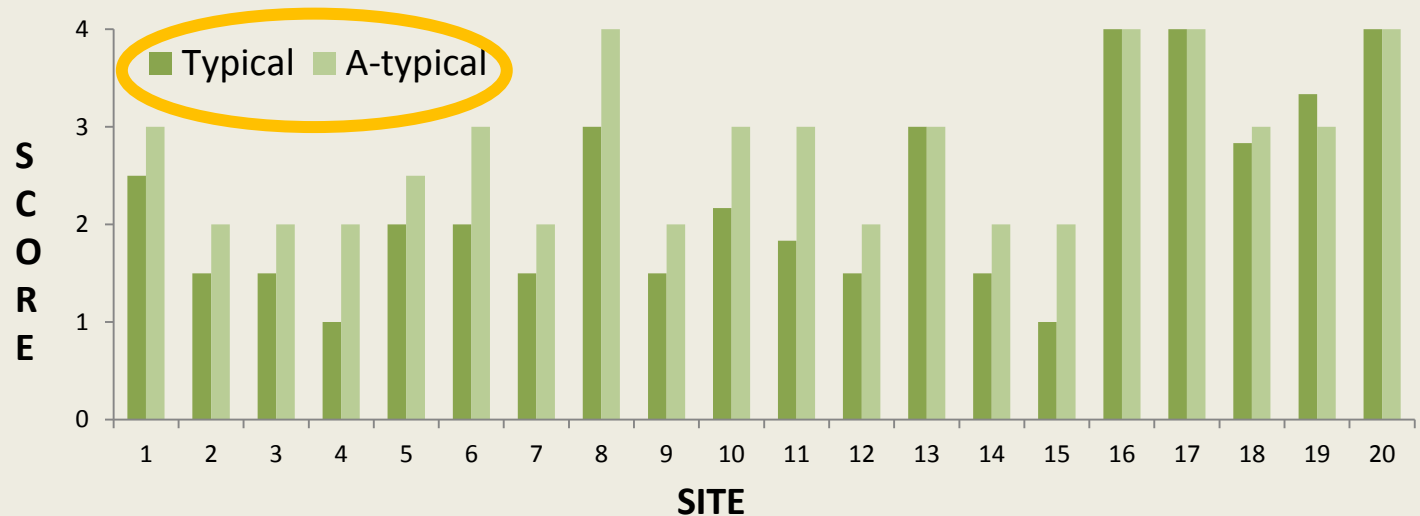


Figure 1: GrassVESS Soil structure score

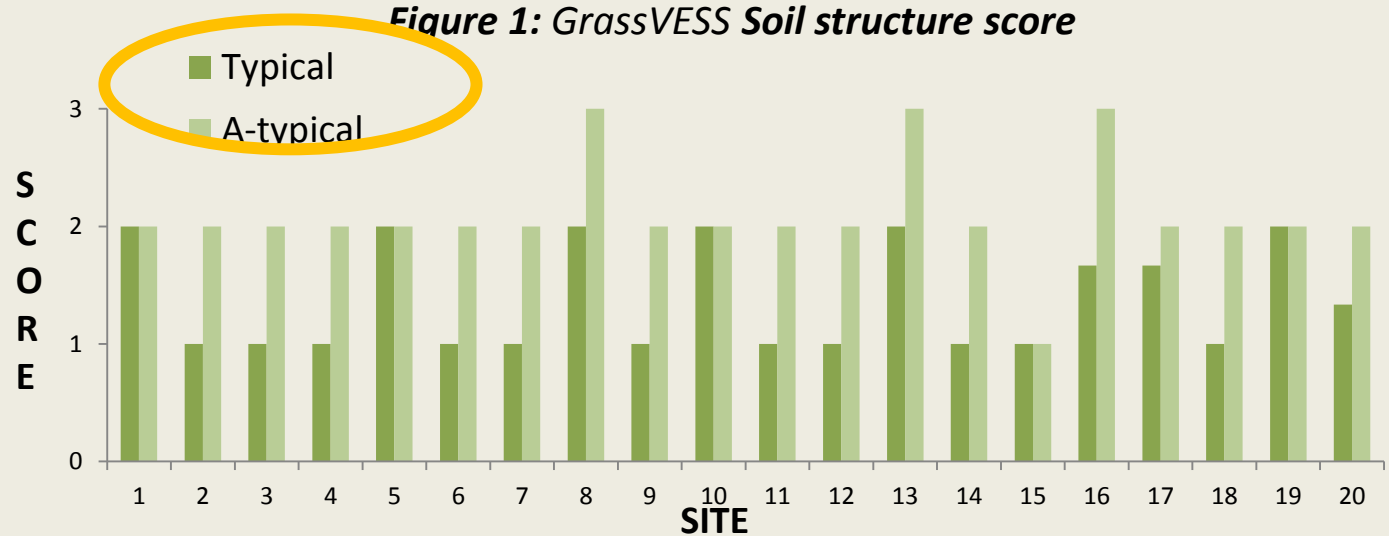


Figure 2: GrassVESS root mat score

Typical areas indicate better soil structural quality compared to a-typical areas

Ability to detect the land management impacts on soil structure

Today's 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