

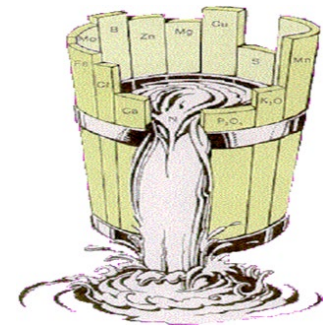
# Assessing Soil Structure



Double Spade



**Mark Plunkett, Teagasc,  
Johnstown Castle, Wexford**



# Soil Structure Assessment





# Steps to soil assessment

## Double Spade



Carefully dig a soil pit (trench), roughly 45 cm deep, 50 cm long and 30 cm wide. While digging, do not stand on, lean the spade against or damage the wall of the soil pit that is to be assessed.

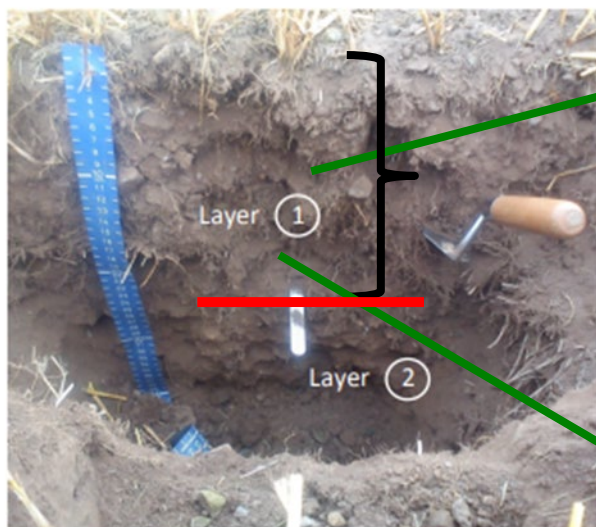


## Preparing for a soil assessment – Double Spade Method

1. Tools required – Spade / Measuring tape / Trowel
2. Identify areas of the field for examination
3. Take a spade and dig a soil pit to a depth of 45 to 50cm as shown in the diagram
4. Examine the top 25cm (plough layer)
5. Examine the next 25cm which may contain a plough pan or a compacted layer.
6. Examine the following in each of the two layers:-
  - a. Aggregate size
  - b. Aggregate shape
  - c. Aggregate strength
  - d. Aggregate porosity
  - e. Abundance of rooting
  - f. Soil colour & smell
7. Examine the soil in the different layers using the images below. This will help classify the soil as good / medium or poor quality.
8. It will also help identify if there is compacted layers present restricting root / water movements.
9. Repeat this 5 times randomly to be representative of the field.

# Visual & Physical Characteristics

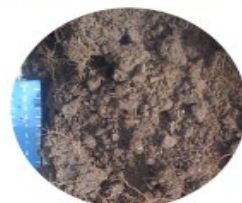
## Double Spade



Plough Layer (1)

### Aggregate size

For each layer, gently break up the soil and assess the size of aggregates. Generally, the larger the aggregates, the poorer the soil structural quality.



**Good Quality**  
Predominantly small



**Moderate Quality**  
A mixture of sizes



**Poor Quality**  
Predominantly large

### Aggregate shape

Assess the shape of the aggregates. The sharper (more angular) the aggregates, the poorer the structural quality.



**Good Quality**  
Predominantly round



**Moderate Quality**  
Rounded but with edges



**Poor Quality**  
Predominantly sharp/angular

### Aggregate strength / Rupture resistance

Try and break the aggregates, first between your finger and thumb, then with one hand. Assess how easy it is to break.



**Good Quality**  
Easy to crumble between  
finger and thumb



**Moderate Quality**  
Firm but fairly easy to  
break with one hand

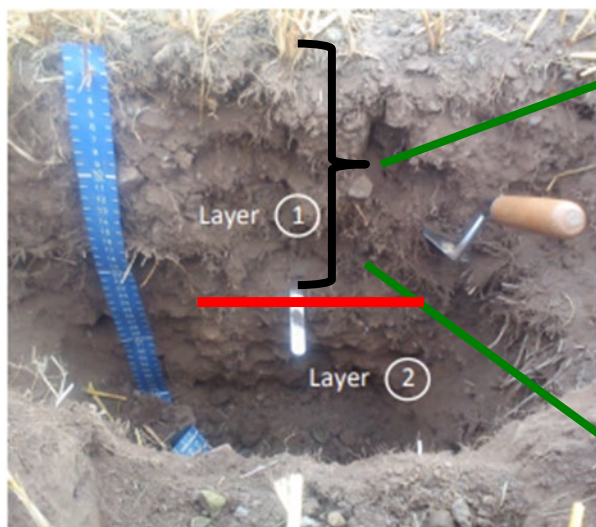


**Poor Quality**  
Difficult to break with  
one hand



# Visual & Physical Characteristics

## Double Spade



Plough Layer (1)

### Aggregate Porosity

Break aggregates open and examine the porosity within. If aggregates are too small to examine inside (i.e. aggregates 1 to 2 cm in width) it is a sign that the entire soil layer has good porosity.



**Good Quality**  
Many pores and cracks



**Moderate Quality**  
Limited pores or cracks



**Poor Quality**  
No pores or cracks

### Rooting

Assess root growth within the layer and within aggregates. Fibrous roots should be able to grow unrestricted through the soil layers and aggregates, while tap-roots should not be distorted.



**Good Quality**  
Many growing throughout



**Moderate Quality**  
Fewer but within aggregates



**Poor Quality**  
Distorted, restricted or no roots

### Soil colour and smell

Soil colour and smell can indicate the drainage status of the soil. Soil should smell earthy but poor drainage can cause foul or putrid smells and is a sign of poor structural quality.



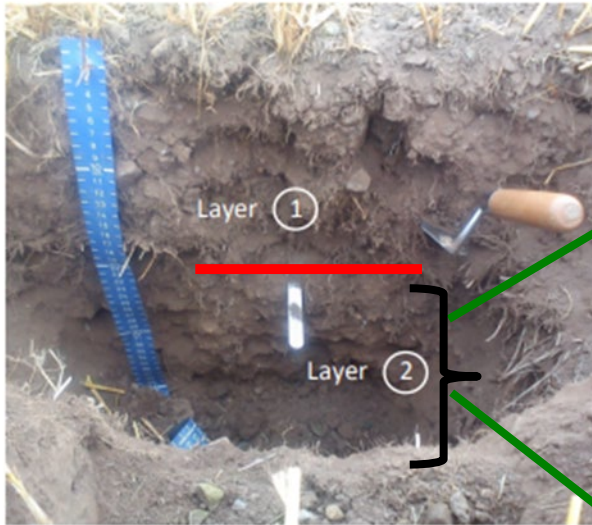
**Good Quality**  
No orange or blue/grey zones



**Poor Quality**  
Orange or blue/grey zones

# Visual & Physical Characteristics

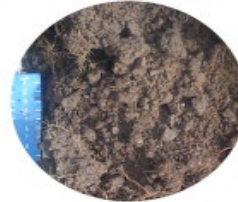
## Double Spade



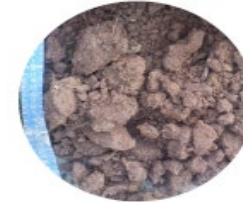
Subsoil (2)

### Aggregate size

For each layer, gently break up the soil and assess the size of aggregates. Generally, the larger the aggregates, the poorer the soil structural quality.



**Good Quality**  
Predominantly small



**Moderate Quality**  
A mixture of sizes



**Poor Quality**  
Predominantly large

### Aggregate shape

Assess the shape of the aggregates. The sharper (more angular) the aggregates, the poorer the structural quality.



**Good Quality**  
Predominantly round



**Moderate Quality**  
Rounded but with edges



**Poor Quality**  
Predominantly sharp/angular

### Aggregate strength / Rupture resistance

Try and break the aggregates, first between your finger and thumb, then with one hand. Assess how easy it is to break.



**Good Quality**  
Easy to crumble between



**Moderate Quality**  
Firm but fairly easy to

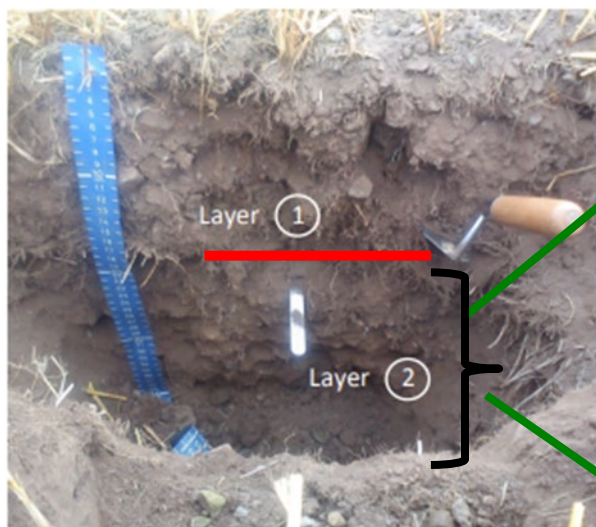


**Poor Quality**  
Difficult to break with



# Visual & Physical Characteristics

## Double Spade



Subsoil (2)

### Aggregate Porosity

Break aggregates open and examine the porosity within. If aggregates are too small to examine inside (i.e. aggregates 1 to 2 cm in width) it is a sign that the entire soil layer has good porosity.



**Good Quality**  
Many pores and cracks



**Moderate Quality**  
Limited pores or cracks



**Poor Quality**  
No pores or cracks

### Rooting

Assess root growth within the layer and within aggregates. Fibrous roots should be able to grow unrestricted through the soil layers and aggregates, while tap-roots should not be distorted.



**Good Quality**  
Many growing throughout



**Moderate Quality**  
Fewer but within aggregates



**Poor Quality**  
Distorted, restricted or no roots

### Soil colour and smell

Soil colour and smell can indicate the drainage status of the soil. Soil should smell earthy but poor drainage can cause foul or putrid smells and is a sign of poor structural quality.



**Good Quality**  
No orange or blue/grey zones



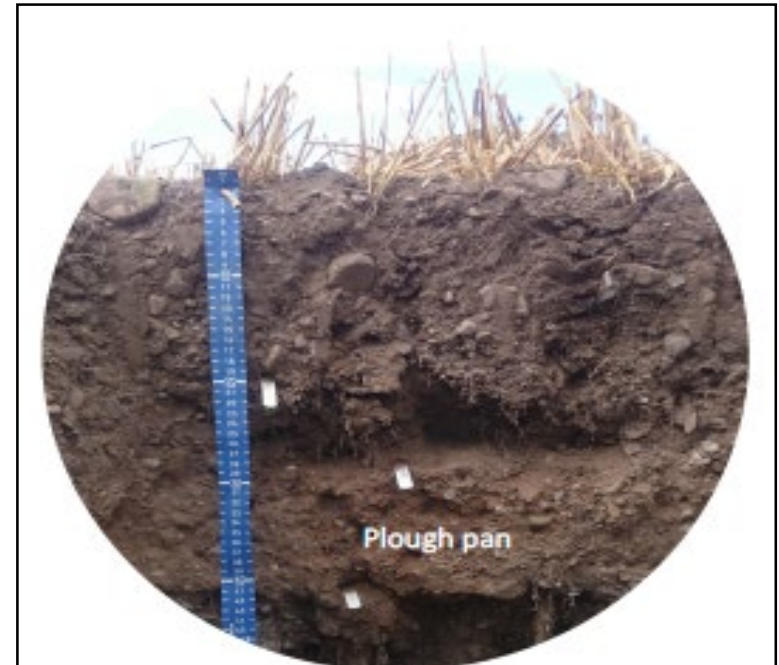
**Poor Quality**  
Orange or blue/grey zones

# Enhancing Soil Structure

Shallow Compaction



Plough Pan





# Enhancing Soil Structure

## Organic Manures



## Cover Cropping



# Soil Quality Information

Teagasc  
ANIMALS CROPS ENVIRONMENT FOOD RURAL ECONOMY

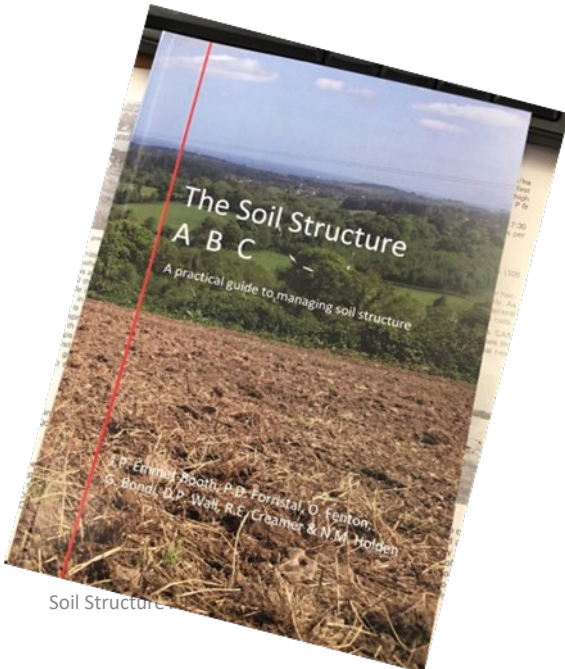
Crops > Soil & Soil Fertility

## Soil & Soil Fertility

The health of our soil is a key component to the efficient utilisation of soil nutrients in the production of food in an environmental and sustainable manner.

## Soil Quality Videos

- Soil Compaction - Do's & Do...
- Soil Cultivation Systems
- Soil Compaction - Double sp...
- Soil Compaction - Preventio...



<https://www.teagasc.ie/crops/soil--soil-fertility/>