

# Cropping farm soil quality - mini visual soil assessment (miniVSA) method

There are many functional benefits of maintaining or building soil quality. These include improvements in root development, drainage, water holding capacity and reduced runoff risk. Soil quality is positively correlated with yield.

## Equipment

Spade, tarpaulin, 2 x clear containers (1-2 L), 2 L water, score sheet, camera (photos are an important tool to compare differences over time).

## When to sample

Be consistent with the time of the year that you carry out the assessment. The best time is early spring when there is enough moisture for earthworms to be active. If the soil is very wet, wait for it to drain for a few days.

## Where to sample

Select the paddock/s that you want to monitor. Identify two areas in the paddock (avoiding wheel tracks) and an undisturbed area near the paddock (e.g. a grass verge) to carry out the VSA.

## Who to sample

Anyone can carry out a MiniVSA to see how soils respond to different stages of the rotation and management decisions BUT results are relative and can only be used for on-farm comparisons (e.g. to compare the same paddock over time or different paddocks on the farm at different stages of the rotation). This test works best when carried out by the same person who can 'get their eye in' for the farm.

## Observations

- Where in the paddock you have dug the hole.
- How easy was it to dig, were there any hard layers (pans) or visible surface crusting? Use a pocket knife to feel for tightness down the profile.
- If there are roots, how far do they go down? If there is a compacted layer you might see roots grow out at a right angle or just clean stop. Do they have a rhizosheath (a layer of soil and microbes stuck to the root) or are the roots bare?
- Are there any mottles in the top soil (an indication of compaction and/or water logging)?

## 1. Dig a hole using the farmer spade method (Figure 1) in an undisturbed area of the paddock e.g. a grass verge

Place the soil on a tarp. Record the soil's texture if you know it. Fine texture (silt and clay) have a greater capacity to hold organic matter than coarse/light (sand) texture soils. Record any general observations (refer to lower left panel).

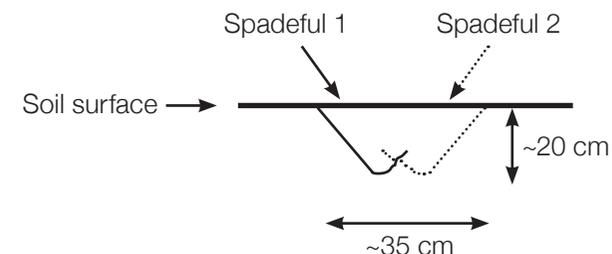


Figure 1. The farmer spade method.

## 2. Score structure and porosity

Scoring an undisturbed area near the paddock of interest provides a point of comparison as it represents what the soil can look like. Part clods by hand and look for signs of nutty aggregates as opposed to smooth compacted faces. Use clods from the top 5-7 cm when scoring. Put aside a clod from the top 5-7 cm for the turbidity test.

Score based on the description of soil structure and porosity outlined in Table 1 below. Score to half values if appropriate (e.g. 1.5). Refer to Figures 2 and 3 for examples of a high and low score.

Table 1. Soil structure and porosity score guide.

Condition	Description	Score
Good condition	Good distribution of nutty aggregates with no significant clodding.	2
Moderate condition	Soil contains some nutty aggregates but also a significant proportion of coarse firm clods and/or fine non-aggregated soil.	1
Poor condition	Very few nutty aggregates. Soil dominated by coarse compacted, very firm clods and/or fine non-aggregated soil.	0



Figure 2. A high score (2) may look like the sample above.



Figure 3. A low score (0) may look like the sample above.

## 3. Repeat steps 1 and 2 in the paddock

## 4. Score turbidity

Partially fill the clear containers with water and gently submerge a clod from the top 5-7 cm from the undisturbed verge in one container and from the hole dug in the paddock in the other container. If there is something growing, use this to lower the clod into the container. Let the soil sit for a minute and observe. If the behavior of the paddock soil is very similar to the undisturbed soil this is a good sign (the undisturbed soil is in the containers to the right in Figure 4)\*. The cloudier the water becomes with suspended soil (i.e. becomes turbid), the lower the score. Take a photo and save for future reference. Score based on the descriptions in the turbidity table (Table 2).

**Table 2. Turbidity score guide.**

Condition	Description	Score
Good condition	Low turbidity. Water remains clear or has a similar turbidity to the undisturbed soil.*	2
Moderate condition	Medium turbidity. Water becomes cloudy but it does not happen immediately (within 1 minute).	1
Poor condition	High turbidity. Water immediately becomes cloudy with suspended matter compared to the undisturbed soil.	0

\* Minimal pore spaces due to extreme compaction may also result in low turbidity. Refer to observation notes and score 2 if you suspect low turbidity is a result of compaction (if it is, give a score of 0).

**High score**



**Low score**



**Figure 4.** Samples showing the difference between a high and low turbidity score.

## 5. Score earthworms

Sort through the soil sample taken using the farmer spade method (Figure 1) and count the number of earthworms. Look around the roots since earthworms often reside amongst the roots just below the shoot. Score based on Table 3. To convert to earthworms per m<sup>2</sup>, multiply the number of earthworms found in the soil sampled using the 'farmer spade method' (Figure 1) by 16.

**Table 4. Earthworm score guide.**

Total earthworm count	Score
>8	2
4-8	1
2-4	0.5
<2	0

## 6. Total your scores

On the score sheet add up 1, 2 and 3 for each site in the paddock (aim to do two sites in the paddock) and for the undisturbed soil. Where two sites were scored in the paddock add the totals from site One and Two and divide by 2.

**How are you tracking?**

5-6	
3-4	
1-2	

Compare contrasting paddocks on the farm, e.g. paddocks with different tillage histories, paddocks that have been winter grazed compared to those that have not, paddocks in a depletive stage of the rotation compared to those in a more restorative stage (i.e. where there has been less soil disturbance and more below ground returns of organic matter from roots).

# Cropping farm soil quality - visual soil assessment score sheet

Date: \_\_\_\_\_ Assessor: \_\_\_\_\_

Paddock name: \_\_\_\_\_

Current crop: \_\_\_\_\_ Establishment method: \_\_\_\_\_

X crop: \_\_\_\_\_ Establishment method: \_\_\_\_\_

Soil type: \_\_\_\_\_

Soil texture: \_\_\_\_\_

Soil moisture and seasonal conditions: \_\_\_\_\_

	Site one	Site two	Undisturbed site
General comments <i>Draw a map of where in the paddock you dig the holes</i>			
1. Structure and porosity score			
2. Turbidity score			
3. Earthworm score			
Total score per site (add 1, 2 and 3)			
Average score for paddock (Site one plus Site two total score divided by 2)			
Earthworms/m <sup>2</sup>	Multiply the number of earthworms found in the soil sampled using the 'farmer spade method' by 16.		
	Site one:	Site two:	