

Visual Evaluation of Soil Structure

Soil structure affects root penetration, water availability to plants and soil aeration. This simple, quick test assesses soil structure based on the appearance and feel of a block of soil dug out with a spade.

The scale of the test ranges from Sq1, good structure, to Sq5, poor structure.

Equipment:

Garden spade approx. 8 inches wide, 7-9 inches long.
Optional: light-coloured plastic sheet, sack or tray ~20 x 30 in., small knife, digital camera.

When to sample:

Any time of year, but preferably when the soil is moist.
If the soil is too dry or too wet it is difficult to obtain a representative sample.

Roots are best seen in an established crop or for some months after harvest.

Where to sample:

Select an area of uniform crop or soil colour or an area where you suspect there may be a problem. Within this area, plan a grid to look at the soil at 10, preferably more, spots. On small experimental plots, it may be necessary to restrict the number to 3 or 5 per plot.



Method of assessment:

Step	Option	Procedure
Block extraction and examination		
1. Extract soil block	Loose soil	Remove a block of soil ~6" thick to the full depth of the spade and place spade plus soil onto the sheet, tray or the ground
	Firm soil	Dig a hole slightly wider and deeper than the spade leaving one side of the hole undisturbed. On the undisturbed side, cut down each side of the block with the spade and remove the block as above.
2. Examine soil block	Uniform structure	Remove any compacted soil or debris from around the block
	Two or more horizontal layers of differing structure	Estimate the depth of each layer and prepare to assign scores to each separately.
Block break-up		
3. Break up block (take a photograph - optional)		Measure block length and look for layers. Gently manipulate the block using both hands to reveal any cohesive layers or clumps of aggregates. If possible separate the soil into natural aggregates and man-made clods. Clods are large, hard, cohesive and rounded aggregates.
4. Break up of major aggregates to confirm score		Break larger pieces apart and fragment them into aggregates of 1/2" to 3/4". Look at the shape, porosity, roots and how easily the soil breaks apart. Clods can be broken into non-porous aggregates with angular corners and are indicative of poor structure and higher score.
Soil scoring		
5. Assign score		Match the soil to the pictures category by category to determine which fits best.
6. Confirm score from:		Factors increasing score:
	Block extraction	Difficulty in extracting the soil block
	Aggregate shape and size	Larger, more angular, less porous, presence of large worm holes
	Roots	Clustering, thickening and deflections
	Anaerobism	Pockets or layers of grey soil, smelling of sulphur and presence of ferrous ions
	Aggregate fragmentation	Break up larger aggregates to about 1/2" to 3/4" diameter fragments to reveal their type
7. Calculate block scores for two or more layers of differing structure		Multiply the score of each layer by its thickness and divide the product by the overall depth, e.g. for a 10" block with 4" depth of loose soil (Sq1) over a more compacted layer (Sq3) at 4-10" depth, the block score is $(1 \times 4)/10 + (3 \times 6)/10 = \text{Sq } 2.2$.

Scoring: Scores may fit between Sq categories if they have the properties of both.

Scores of 1-3 are usually acceptable whereas scores of 4 or 5 require a change of management.

