**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. 20 cm wide, 22-25 cm long.
- Optional: light-coloured plastic sheet, sack or tray ~50 x 80 cm, 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:

<table>
<thead>
<tr>
<th>Step</th>
<th>Option</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extract soil block</td>
<td>Loose soil</td>
<td>Remove a block of soil ~15 cm thick directly to the full depth of the spade and place spade plus soil onto the sheet, tray or the ground.</td>
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<tr>
<td>Firm soil</td>
<td></td>
<td>Dig out 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.</td>
</tr>
<tr>
<td>2. Examine soil block</td>
<td>Uniform structure</td>
<td>Remove any compacted soil or debris from around the block.</td>
</tr>
<tr>
<td>Two or more horizontal layers of differing structure</td>
<td></td>
<td>Estimate the depth of each layer and prepare to assign scores to each separately.</td>
</tr>
</tbody>
</table>

### Soil scoring:

- **5. Assign score**
  - Match the soil to the pictures category by category to determine which fits best.

- **6. Confirm score from:**
  - **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 ~ 1.5 – 2.0 cm of diameter fragments to reveal their type

### 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.

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<table>
<thead>
<tr>
<th>Structure quality</th>
<th>Size and appearance of aggregates</th>
<th>Visible porosity and Roots</th>
<th>Appearance after break-up: various soils</th>
<th>Appearance after break-up: same soil different tillage</th>
<th>Distinguishing feature</th>
<th>Appearance and description of natural or reduced fragment of ~ 1.5 cm diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sq1 Friable</td>
<td>Mostly &lt; 6 mm after crumbling</td>
<td>Highly porous</td>
<td>Roots throughout the soil</td>
<td>Fine aggregates</td>
<td>The action of breaking the block is enough to reveal them. Large aggregates are composed of smaller ones, held by roots.</td>
<td></td>
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<tr>
<td>Sq2 Intact</td>
<td>A mixture of porous, rounded aggregates from 2mm - 7 cm. No clods present</td>
<td>Most aggregates are porous</td>
<td>Roots throughout the soil</td>
<td>High aggregate porosity</td>
<td>Aggregates when obtained are rounded, very fragile, crumble very easily and are highly porous.</td>
<td></td>
</tr>
<tr>
<td>Sq3 Firm</td>
<td>A mixture of porous aggregates from 2mm -10 cm; less than 30% are &lt;1 cm. Some angular, non-porous aggregates (clods) may be present</td>
<td>Macropores and cracks present.</td>
<td>Porosity and roots both within aggregates.</td>
<td>Low aggregate porosity</td>
<td>Aggregate fragments are fairly easy to obtain. They have few visible pores and are rounded. Roots usually grow through the aggregates.</td>
<td></td>
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<tr>
<td>Sq4 Compact</td>
<td>Mostly large &gt; 10 cm and sub-angular non-porous; horizontal/plyat also possible; less than 30% are &lt;7 cm</td>
<td>Few macropores and cracks</td>
<td>All roots are clustered in macropores and around aggregates</td>
<td>Distinct macropores</td>
<td>Aggregate fragments are easy to obtain when soil is wet, in cube shapes which are very sharp-edged and show cracks internally.</td>
<td></td>
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<tr>
<td>Sq5 Very compact</td>
<td>Mostly large &gt; 10 cm, very few &lt; 7 cm, angular and non-porous</td>
<td>Very low porosity. Macropores may be present. May contain anaerobic zones. Few roots, if any, and restricted to cracks</td>
<td>Grey-blue colour</td>
<td>Aggregate fragments are easy to obtain when soil is wet, although considerable force may be needed. No pores or cracks are visible usually.</td>
<td></td>
<td></td>
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</tbody>
</table>