



## Biological soil properties – Exercise B01

### ROOTS OBSERVATION <sup>1</sup>

*Reference poster n. 8a*

#### RELEVANCE

The observation of root penetration and development can reveal important indications on soil structure and consistency. Soils with a high penetration resistance such as a compacted layer or a hardpan, restrict vertical root growth and development, causing roots to grow sideways. This limits plant uptake of water and nutrients, reduces fertilizer efficiency, increases leaching, and decreases yield. Decay and dieback of roots can also occur as a result of pests and diseases, especially in soils prone to waterlogging strongly mottled and poorly aerated.

#### MATERIALS



Shovel



Spatula



Magnifying glass

#### PROCEDURE

1) 1) Open a pit of about 40 x 40 x 40 cm (70 x 70 x 70 x 70 cm; in case of tree crops) using the trowel or a shovel if possible and keep the excavated block



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2) Clean the surface of the block with the spatula to observe the roots.



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3) To complement the observation, use the spatula to clean the exposed soil profile of the excavated pit and observe the root systems with a magnifying glass (if needed).



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ADVANTAGES OF THE METHOD	Easy to assess with few tools needed
LIMITATIONS OF THE METHOD	Different roots systems in different soil conditions should be observed for comparison
QUESTIONS TO BE ADDRESSED	Does the soil allow crops to fully develop healthy root systems? How deep the roots penetrate in the soil? How thick are the roots? How healthy are they? Do the roots grow easily through the soil or are they deviated?

EVALUATION EXAMPLES		
POOR	MODERATE	GOOD
Few living roots or with considerable symptoms of growth problems (twisted, shallow or horizontal growth, root thickening). Poor nodulation in legumes. This situation can occur even within the surface horizon. Low biomass.	Good quantity of roots, vertically-oriented, with plenty of branching and absorbing hairs.	Abundant roots, vertically-oriented, with many branches and absorbing hairs. Roots can grow without physical or chemical limitations and are deep-penetrating. Abundant nodulation in legumes. Significant amount of biomass.

<sup>1</sup> [https://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_050956.pdf](https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050956.pdf)