



# Training soil science

*ESSET*

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# 1 Introduction

Welcome in the fascinating world of soil.

Soil is an important part of our environment. We live on soil and we use it in many ways, although you will not always be aware of that. Soil is used for agricultural purposes to grow crops and animal feed. Soil is the underground for constructions like buildings, roads and bridges. Soil is hiding place for cables and pipes that transport electricity, gas, water and communication. Drinking water is extracted from soil to a large extent. Natural plants and trees have their roots in the soil to obtain water and nutrients from it. Soil is a playground for children and for many other outdoor activities. What would earth be without soil? There wouldn't be any living thing on earth if there was no soil.



You may wonder: what is soil, what is its origin? How come that different soils have different colours, how come that plants are able to grow on soil, why is it necessary to keep the soil clean and healthy? What is a healthy soil?

It may be clear that if soil is polluted or abused it's normal function will be disrupted. The huge amount of soil dwelling organisms are not able to survive or to reproduce. Ground water can be contaminated, which is a problem for agriculture and our drinking water supply. However, it is not that easy to decide

whether a soil is polluted or not. For soil used for agricultural purposes and a soil that is an underground for a building, the constraints of soil quality are quite different. Soil is a living thing where chemical, biological and physical processes interact with the environment. It is an amazing part of the earth.

In your study ESSET, the scope of soil science is soil quality related to soil pollution. Some of you will become environmental engineers/consultants who's main work is investigate soil pollution and solve soil pollution problems. This training gives you an introduction in soil science. In the project soil quality (also period 1 year 2) we'll pay attention to how to investigate a possibly polluted soil. In year 3, measures that can be taken to decrease risks of soil pollution *e.g.* soil remediation techniques, will be discussed.

## 2 Learning goals

The training offers basic knowledge needed to keep the soil healthy, to do investigations into contaminated soil and to understand soil remediation techniques. The learning objectives of this training are:

1. When asked for, you explain topics of soil science that are important in relationship with soil contamination: soil formation, soil constituents, soil physics, soil chemistry, behaviour of nutrients and pollutants in soil, soil ecosystems, and geohydrology.
2. In given situations, you apply this basic knowledge to explain the importance of soil protection for the purpose of sustainability
3. With given information you calculate soil bulk density, soil water content, soil organic matter content, the pore volume and the travel velocity of a compound in soil
4. When data about sand, silt and clay content are given you classify the soil using the texture triangular
5. You are able to determine several basic soil characteristics practically in the laboratory and discuss their relative dependence (if any)

## 3 Contents of the training

The following topics are discussed:

- Soil constituents: gas, water, organic matter, different types of minerals; soil texture;
- soil formation (weathering, breakdown organic matter, profile formation, aggregation)
- storage and release of nutrients and pollutants (soil pH, adsorption, exchange, retardation)

- soil living organisms, microbes and nutrient recycling
- geohydrology, water storage, water binding, water holding capacity, water permeability
- erosion and desertification
- practical determination of soil characteristics

## 4 How the training is organised

There are 6 lectures (2 hours) in which theory is explained that you afterwards will study in your book (see chapter 5). Attendance to the lectures is **not compulsory**. Soon after the lecture, a homework assignment will be made available on BB. This assignment will be discussed in the next lecture. The homework assignments are **not compulsory**, however, the average score for the assignments are used to determine the final grade of the training. The training will be concluded with a written exam (week 8) that consists of multiple choice and open questions. There is one labwork session scheduled in week 3, here attendance IS compulsory.

The study load of this training is 56 hours (2 ECTS).

## 5 Study materials

We use the following book for the training:

Ashman, M.R., Puri, G., Essential Soil Science, Blackwell Publishing, Malden USA, 2002

Sometimes extra information is discussed which cannot be found in the book, here you have to rely on the spowerpoints and your own notes! A practical manual will be available on blackboard.