Tuesday, September 3rd, 2013

Students gathered approximately 8.30 in the classroom.

At 8.30 Endla Reintam, Estonian soils and nature

The presentation was about Estonian soils, relief and climate. The beginning of the presentation was a global approach about Estonian landscape and geology, which are from Vendian, Cambrian, Ordovician and Devonian sediments.

The best soils in Estonia are in the middle of Estonia. In Estonia there is a diversity of the soils like: Leptosols, Rendzinas, Cambisols, Luvisols, Stagnosols, Planosols, Podzolic soils, Podzols, Gleysols, Histosols etc. For example the Cambisols are the best soils for agricultural purpose and also have a very thick humus layer and are about 10% of the cultivated area. The soils can be differentiated by the number and the type of the horizons. Most of the soils have an A horizon on the upper surface which correspond to humus layer. For example, the exceptions are the Podzols which have an O-horizon on the top which correspond to organic horizon. Each type of the soils has a different property about pH, humus concentration, texture etc.

At 10.30 Alar Astover, Protection and sustainable use of soils

Alar Astover gave a theoretical presentation, how to sustain a soil and protect it. In the beginning of the presentation was mentioned, that sustainability of the soils can be defined in many different ways. Overall sustainability means an agriculture that indefinitely maintains productivity. In the presentation it was pointed out that the area of arable land per capita has decreased continuously worldwide. But still the crop production should be doubled by 2050. Various soil functions and qualities were pointed out and it was showed how their properties change in time.

At 12.00 Lunch

At 13.00 Endla Reintam, Soil degradation

In the second presentation, Mrs. Reintam pointed out several threats which affect soils. For example erosion, decline in organic matter, contamination, soil sealing, floods, landslides etc. 17 % of land area is affected on water erosion. Thus soil loss in Europe every year is quite significant. In addition there is also a damage done to the soil organisms because of the impacts of soil degradation like pollution with heavy metals, toxic substances like pesticides or soil compaction. Especially for soil organic matter decrease there are general factors like: cultivation, deep ploughing, overgrazing, erosion and forest fires.

At 14.30 Endla Reintam and Alar Astover, Practical work related to soil description and classification

The students gathered in front of the university. The group was divided into two smaller groups. One group went to the laboratory and second group went to a field to do a practical

work. The digging was conducted in Tartu, Tähtvere (N58.39583°, E26.68431°). To properly describe soil features, a 1 m deep hole was necessary to dig 8 (figure 1).

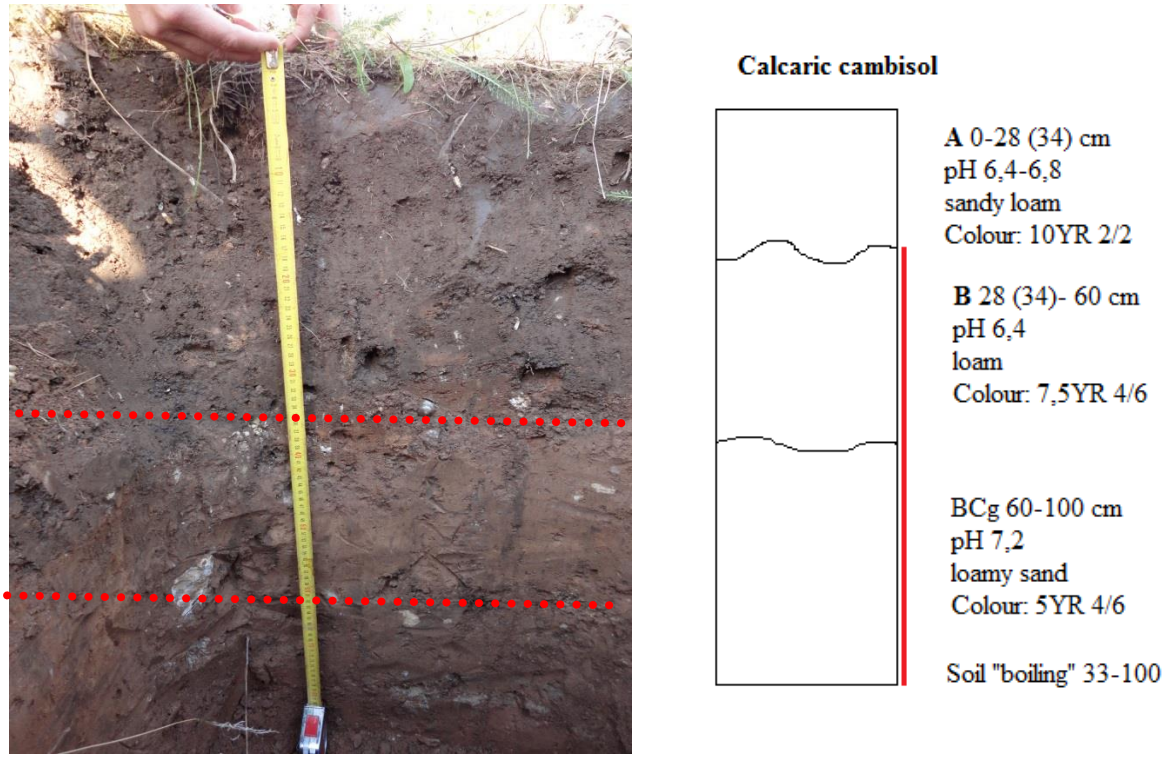

Figure 1: Horizons of a Calcaric Cambisol soil (the scheme on the right is slightly displaced)

Then we made a couple of rough property tests. More detailed tests were made in laboratory. The Characteristics are shown in the following list.

1- Color

The specific color of each horizon was compared to a special reference book (Munsell Color Charts) with color-codes. The humus horizon was darker than the others (Figure 1) because it contains more organic residues.

2- “Boiling”-reaction

At 33 cm depth, we observed the starting of the reaction of the soil with 10% HCl solution (bubbles appeared). That means we had more calcium-carbonate matter (Figure 2).

Figure 2: “Boiling”-test by tipping HCl solution down the several horizons

3- pH

We visualized the acidity of the soil of different horizons with an universal indicator. Results are summarized in Figure 1. The deeper the sample the more alkaline it was (Figure 1). (The layers above were more yellow to green thus more acidic.

Figure 3: Showing the color change range of universal indicator. As soil itself was alkaline, the acid was added to the dish to get red reaction.

4- material content

We formed a ring with hands out of the soil samples and checked the rifts and cracks of it. It represents proportion of the sand, silt and clay particles.

5- porosity

We had a look at the structure of some soil samples. The amount of pores and the size related to the entire volume correspond to the porosity.

6- water content

The water content was measured with a Percometer device developed by the Estonian engineer Tiit Plakk. It measures the dielectric constants and specific conductivity of the soil. This two parameters are related to the water amount in the soil and hence to concentration of salts including beneficial nutrients.

The other group did similar work the next day (Wednesday, September 4th, 2013) but in consideration of another kind of soil type. This soil type is called Luvisol and was characterized by a special E-horizon in comparison to the Calcaric Cambisol. In the following two figures one can see the scheme and a picture of the Luvisol soil profile. In the German soil systematic it is called Parabraunerde.

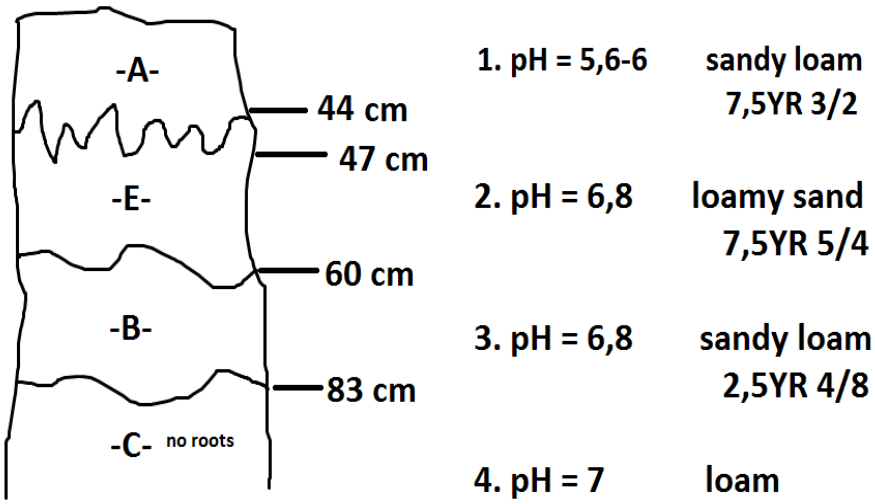

Figure 4: Scheme of the Luvisol observed on the field near the Estonian University of Life Sciences (at address Kreutzwaldi 64).

In the figure above are shown the features und properties. The change from sandy loam to loamy sand and the other way around is distinctive. The pH approaches to the neutral point till the fourth horizon (C-horizon). In contrast to the calcareous Cambisol there was no chemical bicarbonate reaction with the HCl solution.

Figure 5: Picture of the investigated Luvisol

The A-horizon was well structured and uncompacted. The E-horizon had a clayey washed out appearance. B-horizon is similar to the first and the C-horizon consists of the parent material.