

Daily report – IP „Soil & Water “ 13.9.2013 Tartu – Estonia

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8:30 – 10:00 (Synthesis form Erasmus IP “Soil & Water”)

In the last two weeks we had so many lectures from a lot of different topics and this lecture should combine all topics we discussed.

What we have learned:

Soil: methods; soil as a resource that needs protection; soil horizons; interaction between water and plant roots; importance of soil organisms; microorganisms in the soil.

Plants: wetland plants; allelopathical interactions between plants; rhizosphere; adaptations to the environment (climate); water potential; plant roots; mosses and lichens; dependence from pH; litter decomposition; plant stress; PSM (plant secondary metabolites); identification of plants

Drought and Flooding: hypoxia; toxicity of metals; adaptation of wetland plants to flooding; NADES as adaptation; influence of soil texture for water availability; post anoxic stress; stress under flooding; climate change simulation.

Soil Organisms: adaptation to the life in the soil; pore size in dependence from soil organisms; methods of catching; classification of soil organisms; importance for decomposition; differences between epigeic and endogeic; importance of protozoa; fungi and mycorrhizas.

Soil-Plant-Interactions: nutrient content and cycling; nutrient availability; erosion migration; succession; sustainable crop production; soil as a substrate for plants; invasive species.

Soil degradation and reclamation: acidification; sealing; compaction of soil; salinization; nutrient loss; water and wind erosion; non sustainable use => decline of organic matter; consequences of high biomass production => pesticides.

Environment soils and plants: global climate change; geology of Estonia => soil and plant cover; emissions; organic matter mineralization; complexity of interactions in nature; litter decomposition.

Excursions:

1. **Järvselja:** gas profiles (daily courses); particles in the air; eddy covariance; plant volatiles; wind speed; gas exchange on the leaf level; litter decomposition; boundary layer resistance; managements and history of forests, drainage; managed and unmanaged forests; the tallest tree in tilia forest
2. **Wetlands:**
Meenikunao bog: different sphagnum moss vegetation; carnivorous species; lake with pH 4; higher plants in bogs (mushrooms and berries); plants on nutrient poor soils
Piusa sandstone cave: bats; artificial cave; colors of sand; glass color depends on sand quality; new biotopes after mining
River valley landscape: sandstone outcrops; hydroelectric power plants => destruction of rapids; landslides; erosion in the sandstones
3. **Northern Estonia:**
Oil shell mining: working conditions in the past (underground); example of mining area; collapsing in the ground; development of stalagmites (and lichens) in the mine; efficiency of energy production; emissions and environmental impact
Reclamation site and deposits: Devonian fossils; artificial hills and underground fires; primary succession increasing biodiversity => organic matter accumulation; active recultivation; revitalization recreational use; new biotopes

11:00 – 13:00 (Visiting the Botanical Garden of the University of Tartu)

In the Botanical Garden of the University of Tartu students were split into two groups. First, group one went to the greenhouse of Botanical gardens with Dr.Muhle and second group went outside in Botanical gardens for half hour. Then it changed and first group went outside with Prof. Dr. Kazda and the second group went inside with Dr.Muhle for half of hour. They showed around the parts of Botanical gardens and spoke about them.

In greenhouse we saw arocaria's species from southern Brazil, succulents from Africa etc. There were *Echeveria*'s species, *Agave Americana*, *Opuntia sp.*, *Aloe sp.*, *Welwitschia mirabilis* etc. In section of tropical forest we saw *Ananas comosus*, *Ficus benjamina*, *Cubanola domingensis* (shrub or small tree from Dominican republic), *Pilea involucrata* (*Urticaceae*) etc.



Succulent plants



Cubanola domingensis

Outside we saw very well selected plants according to their flowering time and the colour of their blossoms. We briefly saw *Asteraceae*, *Brassicaceae*, *Crassulaceae*, *Fabaceae* and *Apinaceae* families.



Botanical gardens outside

Basic information about University of Tartu Botanical gardens and their departments

The Botanical gardens in Tartu were founded in 1803. The department of **Plant Taxonomy** was founded on the current site, in front of the greenhouses in the year 1870.

Botanical gardens in Tartu are one of the oldest Botanical Gardens in the world. They are situated on the ruins of the ancient city wall and fortifications near the river and ponds. They have over 6500 plant species from all the world's climatic zones. The Garden's greenhouse is the biggest in the Baltic. The Botanical Gardens were designed under the supervision of world-famous botanists, Prof Ledebour and Prof Bunge. The Botanical Gardens currently belong to the University of Tartu and they are used as a study base for students.

There is also the area for growing **monocots**. The most rich-in-species groupings comprise the family *Liliaceae* (genera *Tulipa*, *Allium*, *Fritillaria*, *Ornithogalum*); the *Iris* family, the Orchid family, families *Gramineae*, *Cyperaceae*, *Araceae*. There are more than 300 species of monocotyledonous plants growing in the area. The plants are situated to the right of the main entrance, according to their plant geographical distribution. The species from Europe and Asia Minor have been planted alongside the pathway, the plants of Eastern Asia are growing at the tropical greenhouse, the plants from Africa and South-America are in the warmest habitat – the bottom of the hollow. Spring-time flowering starts already in March by

bulbous irises, crocuses, snowdrops. They are followed by tulips, tuberous irises. Some of the bulbous plants flowering in early spring have been planted to decorate the shores of the great pond, together with day lilies.

Beside monocots, there is area for **dicots**. A total of 800 natural species grow in this area. The herbaceous perennials constitute the majority of them (more than 60%), but there are also annual plants and those surviving the winter. The most rich-in-species is the *Asteraceae* family with 180 species. The decorations of the department are a pool and some granite statues.

The other site is the **Park**, which is located on the top and slopes of the former bastion and covers the biggest area in the Garden. The arboretum contains species of woody plants from different temperate regions of the world. The area of East-Asian woody plants begins immediately behind the greenhouses. Abundant ground vegetation comprises rhododendrons, maples and yews. The woody plants of North America are on the northern bank of the former bastion, in the back and the northernmost part of the garden.

The **perennials** grow in the department of plant taxonomy, in the rock garden and the arboretum.

The plants from the Caucasus have been planted on the western slope. The East-Asian plants grow from here down to the bottom of the valley. The perennials of South-European origin grow on the warmer western slope.

The **annuals** collection varies from year to year, but the average number of taxa is 100 every year. There are two fixed places for exhibiting annuals, first besides the Palm House and second one in the rock garden on a sunny slope where annuals are planted to form a picture.

The department of **alpine plants** is located in the middle of the garden, on the slopes and the valley of the former St. George's Bastion of the town wall. The plants are selected according to their natural habitats – the upper part of the forest zone of mountainous regions and the alpine zone. Currently 900 taxa of alpine plants grow in the Rock Garden.

The other part of this department is the **talus garden** which reaches the shady slope and is also the site of the turf garden. The ascent, moulded from peat loaves is suitable for plants growing in acid soils.

The **Rose Garden** is located near the river-side edge. The more than 200-cultivar collection of roses provides an overview of the most important modern variety groupings of cultivated roses, their decorative character and suitability to be grown on an open field.

The Department of **Estonian Plants** is located in the western side of the Botanical Garden, beside the Department of Plant Taxonomy.

The **Palm House**, built in 1982 has the height of 22 meters and the floor area of 500 m². There are 58 species of palm trees originating from America, Africa, Asia and Europe. On the hot sunny side of the balcony we can find succulent plants. In the middle of the house an epiphyte tree is exposed – a trunk with bromeliads and cacti displaying a typical rainforest habitat. Under the bananas there is a pool with fish and tortoises.

The **subtropical house** displays plants of subtropics from all over the world. First two beds consist of plants from Australia – the most common representative is eucalyptus and with acacia build up 95% of native dendroflora. The ground-covering plant here is *Viola hederacea*. The big fir-like tree is *Araucaria cunninghami* from the Mediterranean region. The representative of Africa is *Harpephyllum caffrum*. The tree with the syringa-like blossoms is *Melia azedarach* from East-Asia. American plants are represented with *Juanulloa mexicana* from genus *Solanacea*.

In the **tropical house** the main goal is to expose the representatives from tropical America. Some of them are grown from seeds and seedlings brought directly from expeditions. The tropical climate zone has no seasons and the changes in the amount of rainfall and temperature are minimal. There also are tropical epiphytes – bromelias and orchids, lianas and trees.

The collection of **succulents** introduces plants that have become adapted to life in dry climate, bright sunlight and strong winds. The homes of such plants, with minor exceptions, are Africa and Central and South America. The collection on 100 m² consists of 600 taxa.

The African cactuses are the following – *Aloe*, *Aeonium*, *Crassula*, *Euphorbiaceae*. The representatives of the New World are *Cactacea*, *Agavaceae*.

Resources

http://www.ut.ee/botaed/index.php?module=2&op=&xid=&dok_id=188

http://www.tripadvisor.co.uk/Attraction_Review-g274959-d2665505-Reviews-Tartu_University_Botanical_Garden-Tartu_Tartu_County.html

Photos from Jana Baxová

14:00 – 15:00 (Mobility within Erasmus programmes)

In this part Dr. P. von Wrangell told students the most actual problems what have consider when someone wants do go and study for sometime in a foreign country. The mayor things to consider are:

1. Paperwork maybe takes more than half a year time when someone wants to go as a foreign student;
2. Funding problems;
3. One of the biggest problems is to bring Credit points back to home university;
4. Most want to go as foreign students in England and Ireland, because of the English language, but this is hard because there are so many people how want to study there and for many universities it is hard to get a partner university in the UK.

For the students Dr. P. von Wrangell gave evaluation papers where the students that took part in the Soil & Water course had to give rating for this program and had the opportunity write what from they option was well made and what could have been made better in the next year. The Evaluation was anonymous, but every one had to write the name of their native university on it.

15:00 – 16:30 (Why should you go to ... as an Erasmus-student?)

Groups of students from all participating countries (Czech Republic, Estonia, France, Germany) presented a short contribution to introduce their mother country and university in

order to motivate the other students for coming there as an Erasmus students. The first presentation of Estonian students was focused mainly on study opportunities and social events organized by students in Tartu. Presentation was completed by two short videos showing activities during two main student events in spring and autumn. All the German students shared presentation advertising the main attractions of Ulm city and their mother University. The presentation was humorously made as a guided trip by „Deutsche Bahn“ company to Ulm. Students from the Czech Republic briefly introduced their country of residence by basic geographical informations (population, capital city, neighboring countries, geomorphology) and continued by description of The South Bohemia University. They described the main social and scientific activities connected with their Institute and continued by a short video showing the main attractions in Czech Republic (i.e. famous places and historical sites, main inventions originated from Czech. Rep., cuisine, products etc.). Then were the other students tested for their new knowledge by a short quiz. Winners were awarded. Last presentation of French students was made as an invitation to Marseille and surroundings. French students showed a lot of their own pictures from the city, main attractions and historical sites together with main natural interests of Marseille county. The presentation was humorously supplemented by short video-dialogues between French and local Estonian students made previous day in the Tartu city centre. The contributors were asked for they knowledge of French culture. Students from all participating countries were often asked by other students for supplementary informations.