THE UNIVERSITY FOREST ENTERPRISE IN KOSTELEC NAD ČERNÝMI LESY – A BASIS FOR PRACTICAL EDUCATION AND RESEARCH AT THE FACULTY OF FORESTRY AND WOOD SCIENCES IN PRAGUE

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Abstract
The paper presents the University Forest Enterprise, established in 1935, as an important part of the Czech University of Life Sciences Prague. The contribution also describes the natural conditions of the enterprise (altitude, climate, geological and soil condition) and the species composition of the forests. Attention is also paid to the organizational structure of the enterprise and to the main activities, being carried out there. These are focused on education and research. However, the number of these activities is stagnating or declining in recent years. Therefore it is necessary to seek a new financing model and start work on the modernization of the facilities and equipment.

Key words: University Forest Enterprise, Kostelec nad Černými lesy, Czech University of Life Sciences Prague, forestry practical, education, research.

History of the University Forest Enterprise in Kostelec nad Černými lesy

The University Forest Enterprise (UFE) was founded in 1935 as a facility of the College of Agricultural and Forestry Engineering of the Czech Technical University in Prague. The state forest administration of Kostelec nad Černými lesy, originated from Liechtenstein's estate in 1933, became the base of this school enterprise. The forests of Kostelec n. Č.l. was chosen for their variegated natural conditions and healthy forests (Šrámek, 1985).

At present, the University Forest Enterprise is run as a self-supporting enterprise and forms one of the two similar facilities of the University of Life Sciences Prague. The present state of its forest area originates from the changes after 1990 as consequence of the restitution processes. The University Forest Enterprise covers an area of 5,700 ha of forests, detailed land data are shown in Table 1.

Location
The region of the University Forest Enterprise, situated 25-50 km from Prague in SE direction, forms a part of the Středočeská pahorkatina geomorphology system (in an area 6,328 km2 situated in the middle and northern parts of South Bohemia along both banks of the Vltava River. The area is located at an altitude of 250 to 729 meters), bordering on the lowland of Polabí in the north, which is part of Česká křídová tabule. The forests are situated in the natural forest region Středočeská

pahorkatina (Central Bohemia Upland), only an inconsiderable area in the north is part of the natural forest region Polabí (Lowland). The altitude of this area varies between 300 and 527 m.

Table 1: Land data review of the UFE (area in ha, state in 2015)

	Agricultural land	**Forest land**	**Ponds**	**Build-on area**	**Total**
State forest (CULS Prague)	38	5681	77	40	5835
Of which classified as Natural Reserve		674		2,5	677
Rented private and municipal forests	3	852			854
Total	41	6533	77	40	6690

Climate conditions
The locality is characterised as warm climate region (B), slightly warm, slightly humid upland climate district, with a mild winter (B3), with average temperatures 8.5-9°C, mean annual precipitation 650 mm. The vegetation season lasts 150-160 days. However, in recent years very dry periods negatively affected the vitality of the forests. Annual precipitation reached only 563 mm (2014), 451 mm (2015) and 509 mm (2016).

Natural conditions
The geology of this region is very manifold. Perm and Carbon are prevailing – conglomerates, arkoses, sandstone, bony coal, shale, breccia. The Central-Bohemia pluton forming bedrock of the south-western part of the University Forest Enterprise is also present in many places represented. It is mainly biotite-porphyric granodiorite. Large grains of orthoclase are typical for this rock. Pleistocene's clays, mostly loess, are less important, nevertheless they are good bedrock from the soil forming viewpoint.

The soil – result of weathering of the rock mentioned above – are very varied in physical aspects – from the large boulder detritus to clay-sand and clay soils, mostly acid, lower nutrient supply, Chemically favourable soils are situated in the valley at the base of slopes , often with gley soils. The mesotrophic cambisol representing about 33.6 % of the forest soil is the most frequent type in the UFE, followed by oligotrophic cambisol (brown forest soil – 28.3 %), and pseudogley (15.2 %); whereas alluvial soils (3.0 %), eutrophic cambisol (2.6 %) and podzol (1.1 %) are less important. Other soil types represent less than 1 %.

The present tree species composition is very different from the natural one. In the last two centuries forest management affected the tree species composition in favour of the most-productive tree species (Norway spruce and Scots pine, see Table 2).

The natural conditions can be described by classifying the forests into forest vegetation zones (Table 3). Most sites belong to the second, third and fourth

vegetation zones which were dominantly formed by oak and beech. In addition, silver fir had earlier a significant presence in the local forests, especially on the water-affected sites.

Table 2: Present species composition of the UFE forests

Species	%%
Norway spruce	49.78 %
Scots pine	18.15 %
European larch	4.35 %
Silver fir	1.64 %
European beech	11.65 %
Oaks	8.86 %
European hornbeam	1.12 %
Black alder	1.04 %
Other species	3.41 %

Table 3: The forest vegetation zones and their characteristics in the UFE forests

No.	**Name**	**Altitude m a. sea level**	**Average temperature**	**Annual precipitation**	**Growing season (days)**	**Presence in UFE (%)**
0	Pine					0.7
1	Oak	< 350 m	> 8 °C	< 600 mm	> 165	0.3
2	Beech-Oak	350-400	7.5-8 °C	600-650 mm	160-165	21
3	Oak-Beech	400-550	6.5-7.5 °C	650-700 mm	150-160	53.8
4	Beech	550-600	6.0-6.5 °C	700-800 mm	140-150	24.2
5	Fir-Beech	600-700	5.5-6.0 °C	800-900 mm	130-140	-
6	Spruce-Beech	700-900	4.5-5.5 °C	900-1050 mm	115-130	-
7	Beech-Spruce	900-1050	4.0-4.5 °C	1050-1200 mm	100-115	-
8	Spruce	1050-1350	2.5-4.0 °C	1200-1500	60-100	-
9	Mountain Pine	> 1350	< 2.5 °C	> 1500 mm	< 60	-

Structure of the enterprise

A director, who is directly subordinated to the Vice Chancelor of the Czech University of Life Sciences, heads the University Forest Enterprise. The faculty can indirectly influence the forest management at the UFE. Specifically in the forest stands which were selected as demonstrative and research objects for specific kind of forest management and scientific experiments. The enterprise comprises specialized centres, such as a Forest Management Centre, a Wood Processing Centre, a Nursery Activity Centre, an Aquaculture and Game keeping Centre, and the Castle (services – accommodation, conferences, social events etc.). The enterprise employs 154 workers and 41 THP (technical and managerial staff in 2017).

Activities and missions of the enterprise

Education and research
The main original purpose of the University Forest Enterprise was to demonstrate methods and practical exercise for students of the forestry faculty. Now the mission is wider, i.e. to support all education and research activities which are offered by the university.

The University Forest Enterprise prepares objects for demonstration and practical illustrations for forestry, environmental and fish management courses. It includes also student practicals –common practicals of students in the Forestry Bachelor study programme (about 70 students every year) and individual practicals (about 5-10 students every year).

Field exercises, organized as whole or half-day blocks due to a greater distance from the university campus, are very important activities. Approximately 1.300 students from the whole university are involved every year. For example, exercises in silviculture are completely organised directly in the forests.
Students' final these are also prepared in the territory of the University Forest Enterprise (about 15 per year). Students can evaluate different methods of forest management including economic efficiency.

Excursions to the university forests and fish management sites are also very popular. The annual number of participants can be estimated at 500 of which 250 are visitors from abroad. As mentioned before, the University Forest Enterprise owns a castle in Kostelec n. Č.l. The castle provides facilities for conferences, seminars and social events including the needed accommodation capacity (see Figure 1, 2).

The UFE is also used for research; be it directly in the context of research projects (permanent research and experimental plots established in university forests) or for PhD theses.
The costs of these educational and research activities are around 300,000 Euro per year. They are covered by faculty budgets and partly by the yield of forest management. However, the current financial model is not optimal, especially for the faculty, as the UFE weighs heavily on the faculty budget. This is one of the reasons, along with the growing orientation of the university to basic research, why the use of SFE has not increased in recent years, but rather stagnated.

Complementary activities
Forest management in the university forests, wood processing (ca 25,000 m3/year), plant production (ca 400,000 plants per year, 10 % is sold to customers from outside the UFE and game and fish management are complementary activities of the enterprise.

Figure 1 and 2: Participants of the 2017 SILVA-Network annual meeting in Prague in front of the castle owned by the University Forest Enterprise.

The university forests are managed using a clearcutting silvicultural system in combination with a shelterwood system. The importance of both is evident from the proportions of regeneration when 35 ha forest are regenerated artificially and about 15 hectares naturally. On specific sites conversion to the selection (selective cutting) system is also applied.

The total annual amount of timber harvesting is between 40-50,000 m3. The annual company's income is around 6 mill. Euro, the annual net profit is approximately 400,000 Euro.

Conclusion

The University Forest Enterprise has been an important part of the Czech University of Life Sciences for more than 80 years. It provides a basis for the practical education of university students and creates conditions for research activities of academic staff as well. For its further development, we need to find a new model of financing educational activities, including employee involvement (positive motivation like more independency, better payments etc.). Furthermore, it is necessary to modernize the facilities and equipment so as to be attractive for students and teachers and to correspond to the current state of knowledge and

technical development. At the same time, study structures or the university need to be adapted to the greater use the enterprise's potential for practical lessons.

Reference

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