

# Sustainable Agriculture and Forestry in the Czech Republic

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## Introduction

In the Czech Republic (Fig. 1), agriculture and forestry represent 4.4 % and 5.5 % of the global domestic product (10,900 USD per capita/year), respectively. However, the agriculture and forest land extend on 54 % and 34 % of the country area (78,866 km<sup>2</sup>). Therefore, both sectors have a serious impact on the environment, water resources, and the landscape. Agriculture activities include the arable land (70 %), permanent grassland (24 %), gardens, vine-yards and hope-yards (5 %), and devastated land by open-cast coal mining (1 %). About 50% of the agricultural land is exposed to a significant erosion risk.

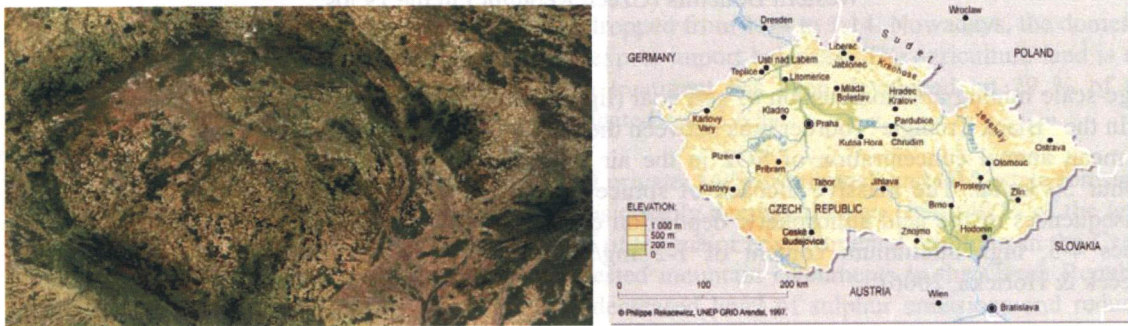


Fig. 1: Czech Republic (48 – 51 N, 12 – 19 E; humid temperate zone; elevation: 115 – 1,602 m).

Commercial forests cover 76 % of the forested area. The coniferous tree species dominate: plantations of Norway spruce (*Picea abies*) cover 53 %, and Scotch pine (*Pinus sylvestris*) 17 % of the forest land. About 30 % of all managed forests are located in headwater areas important for the recharge of national water resources.

## Development

Since the end of the 13th century, on the territory of the Czech Republic, the percentage of forest land (34 %) did not change significantly. In the middle ages, forests were protected for wildlife reserves and military barriers.

In the 17th century, the significant timber exploitation, clear-cut technology, and first serious signs of devastation occurred (Křeček & Hořická, 2001). Particularly, in the second half of the 19th century, forest stands were converted to commercial spruce plantations more sensitive to environmental stress.

Agriculture activities stayed environmentally friendly almost till the middle of the 20th century. Unfortunately, in the frame of the “Soviet Block” (1945-1989), serious wrong decisions lead to environmental damages. In the 1950s, the collectivization enlarged the size of agriculture fields (Fig. 2). Most of meadows and pastures were converted to the arable land and growing crops often did not correspond to the side conditions. Thus, the soil erosion accelerated to the mean annual loss of 5,000 kg/ha. Moreover, the sides were loaded by extremely high content of chemical fertilizers (200-250 kg/ha

annually). The negative site effects (mainly the loss of soil, sedimentation, and contamination of waters) exceeded 20 % of the agricultural production (Ministry of Agriculture, 2004).



Fig. 2: The enlargement of agriculture fields from hectares to hundreds of hectares, Western Bohemia (Czech Republic) in the 1950s.

Large-scale mining and combustion of soft coal (lignite) rapidly increased emission of sulphur into the air. In the “Black Triangle” (border area between the Czech Republic, former East Germany and Poland), the mean annual concentration of SO<sub>2</sub> in the air exceeded 60 µg/m<sup>3</sup>, and the annual deposition of sulphur 50 kg/ha. The massive dieback of spruce plantations occurred namely in mountain regions. Consequences of the acid atmospheric deposition caused extreme acidification of water resources (pH values 4-5, high aluminium content of 1-2 mg/l), reduce in water biota, and extinction of fish (Křeček & Hořická, 2006).

### Recovery

After the political change (“Velvet Revolution” in 1989), the new political system in the Czech Republic is more open to ideas of “smart resource management”. In the 1990s, the restitution process and several land rehabilitation programmes started. The agriculture land has been transformed in family farms (16 %), new cooperatives (79 %) and public area (5 %). The average size of the farm decreased from 842 ha (1989) to 41 ha (1997). According to the deregulation of economy, the price of fertilizers increased by 75 %, and the annual application of chemical fertilizers decreased by 61 % (from 230 to 90 kg/ha), Fig. 3. The application of nitrogen was reduced from 100 to 58 kg/ha Ministry of Agriculture (2004). However, the total agriculture production decreased only by 28 % (from 5.5 to 3.9 billion US\$) not affecting the state economy.



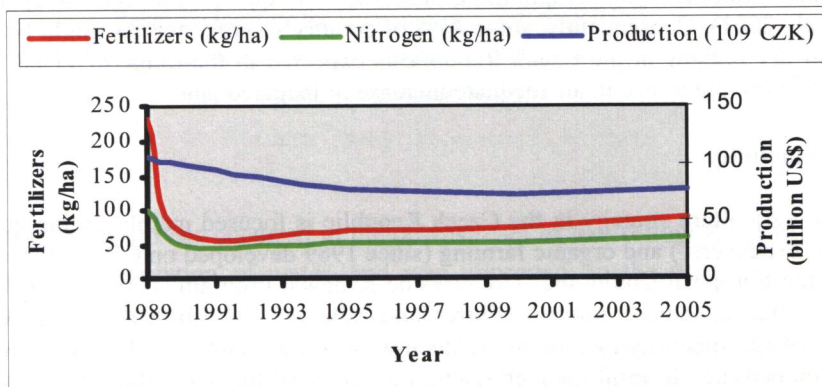


Figure 3: Chemical fertilizers and production, 1989-2005.

The ratio between the livestock and crop production dropped from 1.44 to 1.14. Nowadays, the domestic needs of agricultural products are saturated, and the export-import balanced. The agriculture land is not affected by salinity or alkalinity. The amelioration treatment has been developed on 29 % of the agricultural land: drained fields cover 25.4 %, and irrigated area 3.6 %.

Within the forestry, the ownership changed to 24 % of private, 16 % communal, and 60 % state forests. Although atmospheric emissions of sulphur have considerably decreased since 1990 (40 % of the level observed in the 1980s), air pollution still remains one of the major environmental problems in the Czech Republic. The recent improvement in quality of forested mountain catchments in the Czech Republic seems to be a consequence of two main factors – decreased level of sulphur emissions and reduced density of the canopy by clear-cut of spruce stands (Fig. 4).

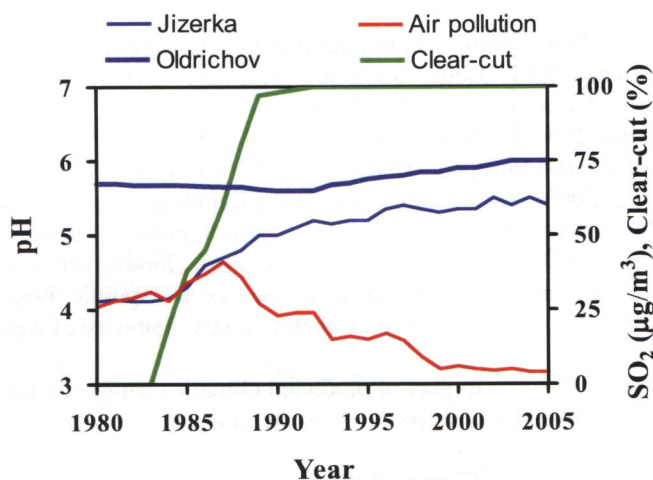


Fig. 4: Forest clear-cut and stream water chemistry at the Jizerka catchment (Křeček & Hořická, 2006).

### Climate change

On the territory of the Czech Republic, by the 2080's, annual average temperatures are supposed to rise by 2-3.5 oC. Precipitation in winter might increase by 10-35 %, but the snow-pack decrease by 30%.

Contrary, less precipitation is expected in the summer: 35-50 % less rainfall. The forecast includes also increasing wind velocities and evaporation, and more frequent (and intensive) rainstorm events (Houghton et al., 2001). Consequently, some 45% of country's spruce forests might be endangered. The enlargement of dry regions in the Czech Republic is expected in the range of 11-68 % (Toman et al., 2005). This situation might lead to an adequate increase of irrigated land.

### **Towards sustainability**

Nowadays, the agriculture strategy in the Czech Republic is focused mainly on the quality of products ("Safety-net of Producers") and organic farming (since 1989 developed on 6.2 % of the agriculture land). Supported by the European Union, the "Countryside Renewal Program" (European Commission, 2006) is oriented on restoring socio-economy, culture, landscape and environment of small villages (<2,000). The principles of sustainability include the protection of water quality and landscape retention capacity. Farmers are compensated to limit their production on 40 % of the agriculture land (areas vulnerable to the pollution of water resources). However, the agricultural policy still needs better coordination with the water management. Considering the future, it is supposed to reduce the area of grains, and to increase oil-crop products and fruits, and still to reduce the annual amount of chemical fertilizers. Particularly, the agriculture nitrogen should decrease from the recent annual value of 52 kg/ha to meet the OECD standard of 17 kg/ha (Ministry of Agriculture, 2003, 2004).

The basic strategy of the state forestry is the maintenance of forests for future generations. In the last years, the exploitation of timber (15.6 million m<sup>3</sup>) does not exceed the increment (17.2 million m<sup>3</sup>), Ministry of Agriculture (2006). The priority of the Czech forestry (like in the other European countries) is now to adapt forest stands to new environmental conditions. The plan is to increase the percentage of broadleaved trees from recent 23 % to original 65 %. Widely discussed are subsidies to forest owners for "environmental services" of forest stands (stability of headwater areas, torrent control etc.).

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