



Carbon balance of five different ecosystems

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The work addresses the issue of different carbon management in different ecosystem types in the Czech Republic [U+FFFFD] spruce and beech forests (29 and 105 years old, respectively), wetland, agroecosystem and grassland. Net ecosystem production is analyzed in the connection of inner (ecosystems characteristics - phenology and a production strategy) and outer (climatic conditions) factors.

Daily and yearly net ecosystem production (NEP) was determined from measured and gap-filled half-hour eddy-covariance data. To get gross ecosystem production (GEP), respiration was added to NEP. Comparing five ecosystem types in the Czech Republic in 2009, we recorded the highest carbon sequestration potential in an evergreen Norway spruce forest (100%) and an agroecosystem (65%), followed by European beech forest (25%) and a wetland ecosystem (20%). Because of a massive ecosystem respiration, the final carbon gain of the mountain grassland was negative.

Norway spruce forest is relatively young ecosystem with high production potential. In 2009, production season started in first week of April, which was two or three weeks later than in previous years. It was caused by prolonged period of low temperatures. By the sudden temperature rise in the beginning of April, the production rose quickly, whereas in previous years the start of production was gradual. NEP in production season was balanced and was terminated in the beginning of October by series of overcast and rainy days, causing sudden ecosystem change from sink to source.

Annual sums of GEP and ecosystem respiration were similar in grassland and so carbon was not accumulated there. Grassland was mowed in the end of July and cut biomass was taken away. After mowing, production decreased to zero and respiration was also lower, but GEP dropped down significantly. Since that time (23 days), grassland was source of CO₂.

In wetland, year 2009 was warmer and more rainy comparing to long-term average. There were three periods of floods not significantly influenced net ecosystem exchange, only after flood there were higher respiration due to decomposition of damaged aboveground biomass.

Production of agroecosystem was dependent on grown crops and amount and distribution of precipitation. In 2009, precipitation was higher than long-term average.

Start of production in beech forest relates to development of foliage. Ecosystem respiration was high thanks to warm spring. From second half of April, photosynthesis was so high that forest became a sink of CO₂. GEP of beech forest reached highest values of all ecosystems in summer months, but due to high respiration resulting NEP was small comparing to spruce forest. Production season ended in the beginning of October.

Climate was shown to be an important factor of carbon uptake by ecosystems: by varying the growing season length (a 22 day longer season in 2005 than in 2007 meant increased carbon sink by 13%) or by the effect of short-term synoptic situations (e.g. summer hot and dry days reduced net carbon storage by 58% relative to hot days with sufficient humidity conditions).

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