



Effects of a small clear-cut on microclimatic conditions of a spruce forest ecosystem: results of experimental and modeling studies

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Regeneration of forests and increase of their productivity are most important features of the sustainable forest management in different European countries. In Central Europe in order to increase the ecological stability of forest stands and to make them more robust against storms, snow and ice damages as well as insect attacks the pure spruce forests are often converted into mixed (e.g. spruce - broadleaf) forest stands. For tree felling various silviculture methods including selective cutting and clear-cuttings are used. Developing an optimal strategy for any forest conversion obviously demands for complex experimental and modelling studies, which could quantify the impacts e.g. of various harvesting strategies on microclimate, on thermal and moisture regimes of soils, or on success of forest regeneration.

Within the frameworks of the study effects of clear-cut on microclimate were investigated using field and modelling studies. A small clear-cutting area in Otterbach located in central part of Germany about 60 km northwest of Goettingen in the Solling highland at 51°46'N and 09°27'E, and about 300m above sea level was selected for the study. A three-dimensional model of soil - vegetation - atmosphere transfer (Mixfor-3D) has been developed and applied to estimate a possible impact of different tree cutting strategies on microclimatic conditions. The model was tested using experimental data obtained in Otterbach area during several field campaigns in 2005-07.

Experimental and modeling results show that clear-cut results in a huge increase of solar radiation, as well as in significant changes of spatial and temporal patterns of precipitation, wind, air humidity, soil and air temperatures. Such changes result obviously in different spatial patterns of soil and plant evaporations, CO₂ uptake and release rates.

This study was supported by the German Research Foundation, Grant No. Gr 738/16-1.