



## **Increase of geodiversity by historical land use in the Maashorst area (SE-Netherlands)**

J.M. van Mourik and A.C. Seijmonsbergen

Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam

The Maashorst area (SW Netherlands) is part of an extensive region in Northwestern Europe underlain by predominantly Late Glacial aeolian coversand deposits. The natural geodiversity was determined by the characteristic elements of coversand geomorphology (ridges and planes) and the western Peel fault (horst and graben). The geodiversity should increase by the impact of (pre)historical land management on soils and landforms.

Regional deforestation, mainly related to forest grazing and shifting cultivation, started in the Neolithic. The main impact on the landscape was degradation of umbric to carbic podzols and of deciduous forest to heaths on well drained land surfaces. On valley bottoms and in geomorphological depressions, soil wetting was responsible for the transformation of umbric gleysols to histic gleysols or even histosols. The introduction of sedentary agriculture started in the Bronze Age around 1000 BC without more impact on landscape properties than continuing soil acidification and forest degradation. In fact, no drastic environmental changes have been registered till the end of the 10th century.

Commercial clear cutting of forest during the 11th – 13th century resulted in the first major extension of driftsand landscapes. During this time, land use was dominated by shallow stable agriculture. Farmers, using the heath for the production of organic manure, had to introduce management measures to protect the heath land and to stabilize the environmental disaster, sand drifting caused by clear cutting.

The introduction of the deep stable agriculture in the middle of the 18th century resulted in degradation of heath. Farmers started with digging sods of the humic topsoil. These form of plaggen manure included a mineral fraction and caused the accumulation of plaggenic deposits on arable land. The practices of the deep stable agriculture ended around 1900 AD by the introduction of chemical fertilizers and urban compost. The heath lands lost their production function and were reclaimed to arable land or reforested with Scotch pine.

The geological inheritance of historical land use increased the regional geodiversity with inland dunes (polycyclic arenosols), peat bogs (histosols) and plaggenic deposits (plaggenic anthrosols). The reconstructed evolution of cultural soils and landforms is based on information of scattered palaeosols, interpolated and extrapolated to a sequence of (palaeo)soil maps. Palaeopedological information is not included in regular soil maps because soil classifications are based on the diagnostic properties of actual soils and normally neglect relicts of preliminary steps in soil development. This is convenient for agricultural applications, but such soil maps are less useful for the presentation of long term soil development or as abiotic base for designs for restoration ecology. The results of this study include interpretive maps produced in a geographical information system of the soil patterns around 1500 AD and 2000 BC, based on the present soil map and the reconstruction of palaeoecological development during the Late Holocene. The time sequence of these historical interpretive soil maps reflects the impact of human land use on soils and landforms.