



Clear cutting (10-13th century) and deep stable economy (18-19th century) as responsible interventions for sand drifting and plaggic deposition in cultural landscapes on aeolian sands (SE-Netherlands).

Jan van Mourik (1), Hein Vera (2), Jakob Wallinga (3,4)

(1) University of Amsterdam, Biodiversity and Ecosystem Dynamics (IBED), Amsterdam, Netherlands (j.m.vanmourik@uva.nl), (2) ICT Division, Municipality Dongen, Netherlands, (3) Netherlands Centre for Luminescence dating, Delft University of Technology, Delft, The Netherlands., (4) Wageningen University and Research Centre, Wageningen, Netherlands

The landscape in extensive areas in SE-Netherlands is underlain by coversand, deposited during the Late Glacial of the Weichselian. In the Preboreal, aeolian processes reduced soil formation. From the Preboreal to the Atlantic a deciduous climax forest developed. The geomorphology was a coversand landscape, composed of ridges (umbric podzols), coversand plains (gleyic podzols), coversand depressions (histic podzols) and small valleys (gleysols). The area was used by hunting people during the Late Paleolithic and Mesolithic. During the Bronze and Iron Ages the area was populated by people, living from forest grazing, shifting cultivation and trade. The natural deciduous forest gradually degraded into Calluna heath. The deforestation accelerated the soil acidification and affected the hydrology, which is reflected in drying out of ridges and wetting of depressions, promoting the development of histic podzols and even histosols.

Aeolian erosion was during this period restricted to local, small scale sand drifting, related to natural hazards as forest fires and hurricanes and shifting cultivation.

Sustainable crop productivity on chemically poor sandy substrates required application of organic fertilizers, composed of a mixture of organic litter and animal manure with a very low mineral compound, produced in shallow stables. At least since 1000 AD, heath management was regulated by a series of rules that aimed to protect the valuable heath lands against degradation.

During the 11th, 12th and 13th centuries there was an increasing demand for wood and clear cutting transformed the majority of the forests in driftsand landscapes. The most important market was formed by the very wealthy Flemish cities. The exposed soil surface was subjected to wind erosion and sand drifting which endangered the Calluna heath, arable land and even farmhouses. As a consequence, umbric podzols, the natural climax soil under deciduous forests on coversand, degraded into larger scale driftsand landscapes, characterized by deflation plains (gleyic arenosols) and complexes of inland dunes (haplic arenosols).

Clear cutting was responsible for the mediaeval first large scale expansion of drift sand landscapes.

In such driftsand landscapes, the majority of the podzolic soils in coversand has been truncated by aeolian erosion. Only on scattered sheltered sites in the landscape, palaeopodzols were buried under mono or polycyclic driftsand deposits. They are now the valuable soil archives for palaeoecological research.

During the 18th century, the population growth and regional economic activity stimulated the agricultural productivity. Farmers introduced the innovative 'deep stable' technique to increase the production of fertilizers. Farmers started sod digging, including the top of the Ah horizon of the humus forms. This consequently promoted heath degradation and sand drifting, resulting in the extension of driftsand landscapes.

Deep stable economy and sod digging was responsible for the 18th century second large scale expansion of drift sand landscapes.

During the 19th century, farmers tried to find alternative fertilizers and authorities initiated reforestation projects. The invention of chemical fertilizers at the end of the 19th century marked the end of the period of heath management and plaggic agriculture. The heath was no longer used for the harvesting of plaggic matter and new land management practices were introduced. Heath was reclaimed to new arable land or reforested with Scotch pine. Geomorphological features as inland dunes and plaggic covers survived in the landscape and are now included in the geological inheritance.