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Soil evolution dynamics and cultural response: Transformation of habitation patterns in the southern Netherlands (1000 BC-500 AD)

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Long-term archaeological data gathering in the southern Netherlands may deliver an interesting scale model that is suitable for the Pleistocene sand areas of the Northwest European Plain. On a micro-scale level it has become clear that Bronze Age and Iron Age farmers intensively used the landscape, resulting in relatively dense distribution patterns of settlements all over the sand plateaus. However, this agricultural use of the landscape – related to the 'celtic field' system - led to a process of soil degeneration during which initially brown moder podzols gradually transformed into degenerated humus podzols that could no longer be used as farmland. According to established 'models', this process of 'secondary podzolisation' particularly affected those sections of the landscape that were dominated by dry sandy soils with a low loam content (between c. 10 and 20%). In the later Iron Age the changing soil conditions resulted in a dramatic shift in the habitation pattern that clearly manifests itself in the Roman period; on the local scale the habitation moved from the degenerated soils to nearby zones with better soil conditions (higher loam content), which became more densely inhabited now than in the Bronze Age/Early Iron Age. The zones where the Roman period settlements concentrated became also the zones where we can find the early medieval habitation and where in the late medieval period the plaggen soils started to develop.
Measured loam values of soil samples (n=181) in Veldhoven, southern Netherlands, are in agreement with the described model that the plaggen cover is located on soils containing high loam% and that humus podzolsoils of former heath areas have low loam content. Local spatial as well as vertical variations in loam content of sand layers is shown to occur, warning against single parameter research. Other potential causes for the deviation of the model are: a) the impact of fluctuating groundwater levels, b) impact of older formations with different hydrological properties in the shallow subsurface, depending on the grain size and transmissivity of the sediments, c) organic matter content, d) land management and e) climate change. Future research is focussing on comparing regions with multiple analytical techniques (GSA, TGA, and microfabrics), taking general soil profile analysis into account. Another objective is supra-regional systematic sampling and soil investigation in prehistoric 'celtic field' complexes on degenerated soils in submodern heath lands.