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Aggregate stability in mine soils developed under different land uses during two decades

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Three soils developed since 21 years on a homogeneous mine spoil bank - one under a pure plantation of Quercus robur L., another under a mixed plantation of Q. robur L. and the N-fixer Alnus cordata Loisel, and a cropland-were compared and contrasted in terms of stability of the organo-mineral aggregates from their thin A horizon.

Aggregate stability was chosen as it is a soil characteristics that is linked to many soil properties and drives many processes occurring in the soil (e.g. infiltration, erosion, porosity and pore size distribution, etc.). As the number of samples to examine was fairly large and difference in aggregate stability were estimated to span over a large range, it was decided to use a method based on small sample and relatively quick to apply. The difficulty encoutered brought to the selection of the method developed by Imeson and Vis (1984). It was modified because the cropland aggregates only were weak enough to allow the method to find the number of drops breaking 50% of the aggregates before having counted 50 hitting drops. The forest samples required a modification of the test in order to be able to evaluate at least part of the frequency distribution of aggregate breakdown with increasing number of hitting drops. The observed frequency distribution were compared using the Kolmogorov and Smirnoff test: the larger the maximum difference between compared distributions, the larger the difference in aggregate stability.

The results show that the rate of pedogenesis as measured by the aggregate stability, is very low in the arable soil, where the Ap horizon shows values very close to the C horizon (which is the soil as it was when the banks where made). The resistance of aggregates is significantly higher in the two forested soils. In conclusion, these results highlight the importance of afforesting mine spoil banks once the mine activity is ceased so to improve terrain stability and organic matter sequestration.