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Are integrated approaches for land degradation assessment necessary?

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Assessments of soil erosion, salinization, compaction, hydrological functioning or soil quality have been carried out over the whole of Europe at varying scales ranging from plot to regional scales. Often these assessments are carried out focusing on one type of process or property only, e.g. soil erosion. However integrated assessments are necessary as one process may accelerate or influence other soil degradation processes in a non-linear or unpredictable way. Furthermore land use management and policies strongly affect the processes occurring, which may be difficult to predict.

In this study an example is discussed of complex interactions between several land degradation processes leading to accelerated erosion of top soils in a small sub-catchment in SW Luxembourg on marls. For this region it was suggested that increased degradation rates, resulting in serious on site erosion and off-site damage, were related to climate change or increased winter rainfall, implying a relative simple cause. However, due to land use conversions from meadow to other agricultural crops such as maize, a significant decrease in infiltration occurred and hence increasing runoff and surface erosion rates were noticed. These were further exacerbated by significant plowing related compaction of the subsoil, as well as by enlarged fields enabling larger runoff paths and reduced buffering of local water. Furthermore local changes in roads and build up areas reduced the surface area where runoff and sediment buffering could occur, and also redirected water and mud to unwanted areas.

This simple example shows that a combination of increased erosivity combined with a chain of processes inducing soil property and landscape changes, led to increased land degradation, which would probably not have occurred at the current extent, when one of these two main factors not would have changed. The combination of the occurrence of different processes has amplified the final results. Although this fine scale example may seem anecdotic, this would however suggest that if we want to assess land degradation risks for an area, it would be difficult to do so if we are combining different soil degradation processes and their risks, assessed at different locations or using standardized inventories. It will therefore be a challenge to overcome this problem even with modeling approaches, and this can be considered as a major challenge to improve the proper assessment of land degradation risks in Europe.