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Soil and Water: a larger-scale perspective

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More than one third of soils studied in southwest England are highly degraded

An extensive field investigation discovered that 38% of soils in southwest England show signs of enhanced surface water runoff due to soil degradation. The study also revealed which types of fields and soils are linked to the most or least degradation.

Damage to soil causes water runoff across the landscape instead of being infiltrated properly by the soil. Poor land management is known to cause these problems. Runoff has the potential to increase flooding, contaminate surface water with fertilisers and microbes, clog watercourses and also decrease the amount of water seeping down into the aquifer.

Between 2002 and 2011, an assessment of the health of soils was carried out using visual and manual examination of 3 243 samples, over 31 catchments. The researchers checked the amount of soil damage in relation to runoff. Samples were taken during the winter and spring months to ensure the soils were at an optimum moisture level for study. In each sample the researchers looked at the surface condition of the soil, degree of soil erosion and enhanced runoff where present, the structure of the soil profile, and the moisture levels, among other characteristics.

Overall, 38% of sites showed high or severe degradation with signs of erosion and runoff, 50% displayed moderate damage, and only 10% had low levels of damage. Cultivated sites posed a large problem, with 55% having high or severe damage, while less than 10% of permanent grass sites had high or severe damage.

Fields with maize or potatoes, or other late-harvest crops, were the most damaged, with 75% of those sites showing degradation. In fact, one in five of those sites had serious rill and gully erosion. They found that winter cereal crops, like wheat and barley, also caused problems, with 60% of sites from those fields displaying high or severe degradation.

The study was also able to pinpoint which types of soils are more sensitive to farming practices. Soils that showed the most signs of damage were cultivated brown sands, brown earths and loamy stagnogley soils: soil types that cover more than 50% of southwest England. Due to their good agricultural qualities some of these soils are overexploited in crop production and as a result become highly degraded, resulting in greater surface runoff, surface water pollution, localised flooding and reduced winter rains seeping through the soil to refill the aquifer (recharge rates). Conversely, chalk- and limestone-based soils showed the least amount of degradation, with less than 20% of sites with those soils suffering from damage.

Southwest England's high rainfall, sloping fields and choice of crops probably put it at a higher risk for soil degradation caused by farming practices than the rest of the country, the researchers concluded. Numerous techniques to avoid compaction of the soil or to reduce soil compaction are available, therefore decreasing runoff, but are often under-utilised or are not carried out adequately. Topsoil lifting and subsoiling (which breaks up soil at a greater depth than ploughing) — both serving to loosen soil layers without turning it over — are options, as is avoiding traffic, e.g. for spreading manure or slurry, when the fields are too wet. However the use of increasingly large and heavy machinery is causing a higher risk for increasing soil compaction.

Better soil health would allow plants to take up more fertiliser, grow better root systems and access more water; it could also help in preventing localised flood events. The researchers say it is important for land users to be able to properly identify the characteristics of soil damage in order to make educated decisions about soil management.