



Soil degradation: the impact of rainfall on soil condition

The status of soil can be represented by many properties. However, how well they represent soil status depends on the level of rainfall in the area. Researchers in Spain found that in wet regions soil status is strongly linked to biological factors, such as vegetation cover and biodiversity. In drier regions, status has a stronger link to the physical properties of the soil.

There are clear changes in water availability across Southern Spain, from 240 mm of rain per year in dry Mediterranean regions such as Gergal, to 1100 mm of rain per year in the humid areas such as Gaucin. Changes in precipitation affect vegetation which has impacts on soil organic matter cycle and the texture of soil. This can influence the runoff rate and formation of surface crusts, which affect erosion and cause deterioration.

The study investigated the status of the soil in eight different areas in southern Spain. Several soil properties were measured in a total of 469 topsoil samples. Many of these properties could be divided into two broad categories. Biotic or biological factors, such as vegetation cover, biodiversity, soil organic matter, and abiotic factors, such as soil texture (e.g. sand or clay) structural stability and salt content. The researchers also measured soil moisture content and calculated the likelihood of erosion.

In general, an increase in mean annual precipitation was linked to changes in the soil properties with indicators of soil degradation increasing with lower levels of rainfall. The status of the soil was better in wet areas and worse in drier areas.

In wet environments, with 950-1100 mm of annual rain, biotic factors, such as the amount of vegetation and organic matter, play the greatest role in maintaining good soil status and preventing erosion. In sub-humid environments, with 650-950 mm of annual rain, biotic factors were also important but so too was the soil texture. For example, high sand content and low clay content increased the likelihood of erosion.

In dry Mediterranean soils, with 450-550 mm per year, there was less vegetation and more unprotected soil so condition was mediated by soil moisture and also by soil texture with again the sand content increasing the likelihood of erosion. Finally, in the semi-arid and arid regions, where rainfall is between 250-350 mm per year, vegetation is of a specific type that needs little water, such as strawflower and cottonweed. This vegetation produces low levels of organic matter in the soil and the soil condition is more closely linked to abiotic properties. High levels of sand content increase the likelihood of erosion but so do high levels of clay since, due to lack of vegetation, there will be a crusting of the clay surface which increases erosion.

The research suggests that, depending on the level of precipitation, different indicators for soil condition are needed. The researchers established a precipitation threshold of 500 mm per year, below which vegetation is no longer associated with great soil moisture contents and soil status depends more on its physical and chemical properties.

Source: Ruiz-Sinoga, J.D. & Romero Diaz, A. (2010). Soil degradation factors along a Mediterranean pluviometric gradient in Southern Spain. *Geomorphology*. 118:359-368.

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Additional information

Soil degradation, which includes erosion and loss of organic matter, is accelerating in Europe and the EU has proposed a Soil Directive which requires Member States to identify and combat soil degradation. Since the level of soil degradation and the means to measure it can vary according to local situation, Member States will have flexibility in how to implement the Directive. For further information: http://ec.europa.eu/environment/soil/three_en.htm