



The Landowner's Guide to SOIL IN RENOSTERVELD AREAS

Renosterveld is typically found on shale-derived soils that have a high clay content. Shale-based soils form over shale rock parent material developing from the deposition and compression of clay and silt in ancient inland lakes and seas.

Why does water run off shale-derived soils so easily?

Shale-derived soils are often referred to as 'crusting soils'. When raindrops strike the soil surface, clay particles become mobile, blocking the pores in the soil surface and creating a very thin seal or crust. This crust, often only a millimetre or two thick, prevents water infiltrating these soils.

Why is there often a pale layer of soil just below the topsoil in shale-derived soil?

This pale layer is known as the E-horizon. It indicates that this part of the soil is often waterlogged. The water has,

over time, removed most of the iron from this layer and left behind a 'bleached' layer that has fewer nutrients than the topsoil or the deeper subsoil.

Why is there more clay deeper down than close to the surface in shale-derived soils?

Because clay is made up of extremely fine particles, water is able to move clay more easily than sand. As water moves through the soil it takes clay with it, removing it from the topsoil and depositing it lower down in the subsoil. The subsoil and topsoil of shale-derived soils are able to develop separately over time because they do not mix. Porcupines are responsible for some mixing – without them the topsoil would probably be a lot sandier.

How does farming change soils?

What happens to the shale-derived soils when natural veld is removed due to ploughing, frequent burning or intense grazing?

The soil under bushes and grass clumps on shale-derived soils is rich in nutrients and organic matter. The vegetation protects the soil from the heat of the sun and the organic matter decomposes slowly. When the vegetation cover is removed, the soil heats up, the organic matter decomposes rapidly and is lost from the soil. Organic matter gives soil a strong structure and binds soil particles together. Without organic matter, the soil forms a crust more easily, preventing the penetration of water. The roots of shrubs draw nutrients from deep within the subsoil and when the plants lose their leaves, these nutrients are incorporated

into the topsoil. If the bushes are removed the supply of nutrients to the topsoil is essentially cut off.

What is the effect of overgrazing?

The soil tends to crust more, as there is less vegetation cover and less organic matter and nutrients in the soil. This reduces infiltration of rainwater into the soil and leads to long term loss of grazing potential.

How does crusting affect the productivity of the veld?

Because crusting reduces infiltration, there is less moisture in a crusting soil. Productivity of the veld depends largely on the level of water in the soil, which is significantly reduced when a crust forms.

How exactly does a crust form?

A crust forms when clay remains suspended in the water for a long time and does not settle out of it. When clay disperses like this, it blocks the pores at the soil surface. The force of raindrops on a bare soil causes clay to disperse, making vegetation cover important as it reduces the force of the raindrops. Clay is also more likely to disperse rather than settle when the soil is low in nutrients and organic matter. Healthy soil helps prevent clay from dispersing and crusts forming.

How does wheat farming affect soil crusting and fertility?

The following information is derived from research conducted in the Nieuwoudville area and may not be applicable everywhere. Fertilizer applied to shale-derived soils under wheat appears to sufficiently maintain the soil's phosphorus and potassium fertility. The relatively high nutrient content of wheat lands affects the soil chemistry in such a way that the soil does not crust as severely as bare soils in overgrazed renosterveld.

How does natural vegetation affect shale-derived soils?

More vegetation cover results in:

- less crusting
- greater soil water content
- higher fertility

Less plant cover and more bare soil results in:

- increased crusting and rainwater runoff
- greater loss of organic matter and nutrients
- drier soil
- reduced survival of plant seedlings



How can soils be managed to facilitate restoration?

Experimentation is still required to establish the optimum means of preparing soils for renosterveld restoration. The extreme crusting of shale-derived soils and the loss of rainwater to runoff may prevent successful establishment of seedlings. To reduce soil crusting, farmers can apply an organic mulch to the surface. This will bind the soil and attract organisms such as termites, which will help break the crust down. Various manufactured substances can also be applied to the soil to reduce crusting. For example, anionic poly-

acrylamide has been shown to greatly increase infiltration on crusting soils. It is a water-soluble synthetic polymer available as dry powder, liquid emulsion or gelatinous blocks. Typically, about 80kg is applied per hectare.

For more information about the research done on the renosterveld soils in Nieuwoudville, please contact Ingrid Nanni at the SA National Biodiversity Institute (SANBI) 021 799 8652 or nanni@sanbi.org.

Reference

Mills, A. June 2003. The Crusting Vaalgrond and Cracking Rooigrond: Effects of farming on soils of Nieuwoudville - A report for farmers on the findings of the Conservation Farming Project. Kirstenbosch Research Centre, National Botanical Institute, Cape Town.



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