



The Landowner's Guide to **RENOSTERVELD SOILS**

Renosterveld is typically found on shale-derived soils which have a high clay content. Shale-derived soils are those that are formed from shale rock parent material, which is formed by the deposition of clay and silt that has become compressed. Ancient inland lakes and seas also form part of the shale parent material.

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

Shale-derived soil is known as a crusting soil. When raindrops strike the soil surface, clay moves over the surface and a very thin seal or crust forms. This seal is made up of a mixture of fine sand, silt and clay particles and is often only a millimetre or two thick.

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 shows 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 of soil. This layer has fewer nutrients than the topsoil as well as 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/small particles, water is able to move clay more easily than sand. As water moves through the soil it takes clay with it and removes it from the topsoil and deposits 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 do enable some mixing to take place. If it were not for the porcupines, the topsoil would probably be a lot sandier!

How does farming change soils?

What happens to the shale-derived soils when bushes are removed by ploughing, frequent burning or intense grazing pressure?

The soil under bossies 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 does not decompose as quickly as in the open. When the vegetation cover is removed, the soil heats up and the organic matter decomposes rapidly and is lost from the soil. Organic matter gives the soil a strong structure, and binds the soil particles together. Without organic matter, the soil forms a crust easily and water runs off the surface. The roots of bushes bring up nutrients from deep within the subsoil. 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!

Will overgrazing change the shale-derived soils?

Yes, the soil will crust more because there is less bush cover, less organic matter and less nutrients in the soil. This will reduce infiltration of rainwater into the soil.

How will crusting affect the productivity of the veld?

Because crusting reduces infiltration, there is less water in a crusting soil. Productivity of the vegetation depends largely on the supply of water in the soil. If crusting reduces the supply of water then it will also reduce productivity of the veld.



How exactly does a crust form?

A crust forms when clay disperses, which means that the clay stays suspended in the water for a long time and does not settle out of the water easily. If clay disperses, it blocks the pores at the soil surface. If clay settles out quickly it does not block the pores as effectively.

The force of raindrops on the bare soil causes clay to disperse.

This is why a cover of vegetation is so important – it prevents the force of the raindrops from dispersing the clay.

In addition, when nutrients and organic matter are lost from the soil, the clay is more likely to disperse rather than settle out. This is because a high nutrient and organic matter content make the clay settle out. This is why managing the soil to keep its nutrients and organic matter is so important – it stops the clay dispersing and therefore prevents crusting.

How do bushes affect shale-derived soils?

Greater bush cover in renosterveld means:

- less crusting,
- greater soil water content
- greater fertility

Greater areas of bare soil in renosterveld means:

- increased crusting and rainwater runoff
- greater loss of organic matter
- greater loss of nutrients
- a drier soil
- greater death of renosterveld seedlings

How does wheat farming affect soil crusting and fertility of shale-derived soils?

The following information was derived from research conducted in the Nieuwoudville area and is therefore

only applicable to this context: Fertilizer applied by farmers to shale-derived soils under wheat appears to be sufficient to maintain the soil's phosphorus and potassium fertility. The relatively high nutrient content of the wheat lands affects the soil chemistry in such a way that the soil does not crust as severely as bare soils in renosterveld.

How should soils be managed during renosterveld restoration?

Experiments still need to be undertaken to discover the best way 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 could apply an organic mulch to the surface. The organic matter will bind the soil and attract soil invertebrates such as termites, which will also break the crust down. Various manufactured substances can also be applied to the soil to reduce crusting. For example, anionic polyacrylamide has been shown to greatly increase infiltration on crusting soils. Anionic polyacrylamide is a water-

soluble synthetic polymer which is available in dry powder form, liquid emulsion, and gelatinous blocks. It is typically applied at about 80 kg per hectare.

For more information on the results of extensive research done on the renosterveld soils in Nieuwoudville, please contact **Ingrid Nanni** at the National Botanical Institute nanni@nbi.ac.za ph: 021-7998652.

Bibliography

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