

Rehabilitating soil structure

What is soil structure?

Soil structure is one of the key focus areas of knowledge sharing and capacity building through the community-based Farming for Sustainable Soils (FSS) Project.

Soil structure refers to the arrangement of soil particles or aggregates. The spaces between soil particles - including pores, micropores and channels - are necessary for essential aspects of soil health. Adequate aeration, good drainage, worm burrows and old root channels allow the beneficial movement of air, water and roots through the soil.



For soils scientist Christian Bannan, FSS Project Manager Phil Dyson, FSS Community Facilitators and landholders alike, improving soil structure through increasing organic matter is the key challenge for soil health in north central Victoria:

“The one thing I want to improve for the future is the soil structure. I think that’s the biggest limiting factor for our farm and many farms throughout the area.”
(Mel Watts, FSS Community Facilitator)

“The key priority for us is soil structure. We’re still dealing with 150 years of farming practices that have left us with soil structure issues.

A lot of that is to do with the subsoil, the clay layers. Three quarters of our soils are naturally dispersing sodosols.” (Phil Dyson, FSS Project Manager)

As Phil explains, soil carbon is intimately linked to soil health: “Without levels of soil carbon we just can’t get the soil structure. All of our FSS Groups have been trying to overcome those kinds of barriers.”

Some issues with soil structure

Through the FSS Project, farmers and Community Facilitators work together with a range of soils experts to understand and improve soil structure in their local areas throughout the catchment. Some of the soil structure challenges faced by FSS Project participants include compaction layers, dispersion and erosion.

Soil compaction layers, which are sometimes called hard pans, are layers of dense, hard soil close to the surface that have lost adequate macropores and soil structure. Compacted layers (often caused by heavy equipment and stock moving across the soil surface, and conventional cultivation practices) can limit root growth and water infiltration. Craig Cossar, FSS Community Facilitator, explains that this is experienced by a lot of farmers in the Wycheproof and Glenloth East areas. The FSS Project supports farmers to understand the extent of the problem and explore a range of solutions.



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“Our biggest problem we have identified is the hard pan with the red duplex soils [...] A lot of the guys have problems with getting the roots to penetrate through the soils. [Through the FSS Project] we’ve done some deep ripping trials - and we’ve investigated into tillage radish now too - to break up some of that hard pan.” (Craig Cossar, FSS Community Facilitator)



Dispersion is also a concern for many farmers in the catchment. Dispersive soils can be highly erodible and present a range of challenges for sustainable and productive land management. As an indicator of sodic soils, dispersion occurs when excessive sodium is present. When water is added, dispersion of fine clay particles occurs in response to sodium. These fine particles clog up small pores in the soil and degrade soil structure as well as restricting root growth and water and air movement.



Dispersion can result in a surface crust or hard-setting layer on the soil, inhibiting seedling emergence and water penetration - as well as reduced water movement down the profile, gully and tunnel erosion, and plants becoming unable to access moisture and nutrients within the soil.

Through the FSS Project, farmers have trialled the use of gypsum (calcium sulphate) as an ameliorant for dispersive soils.



Communities involved in the FSS Project now see addressing soil structure concerns as a priority:

“I’m all about working on our soil structure [...] Lessening compaction and making nutrients available to the plants, encouraging bugs [...] If the soil structure isn’t there, there’s not much point putting things on to it. We need to look at soil structure, get that back and then look at putting things back on to it that can help condition the soil even more.” (Mel Watts, FSS Community Facilitator)

“We need to be getting the sodic layer down towards 50-100 centimetres, not just 20 centimetres below the surface. It’s about increasing the water [retention] and the rooting zone.” (Ash Moon, participating farmer)