

Soil structure management

Structure in soils is not static and it can be both created and destroyed. Some soils are naturally well structured and are inherently more robust and resilient when exposed to poor practices. The structure of all soils, however, will be degraded by poor practices.

Water is generally the factor that most limits crop yields. A key benchmark of crop performance is its water use efficiency. Having soil with good structure is critical if crop water use efficiency is to be maximised and the highest yields achieved from the rain or irrigation applied to the crop.

Soils with good structure will:

1. Maximise water infiltration and subsequent soil water storage, thereby minimising the amount of water lost to the crop in run-off or deep drainage below the root zone;
2. Minimise the incidence of waterlogging;
3. Maximise the volume of soil and the nutrients that plants have access to.

Good soil structure is characterised by:

- ▶ No impediment to water entry to the soil;
- ▶ High water-holding capacity;
- ▶ Freely drained, with a range of pore sizes to ensure adequate aeration at high water content;
- ▶ Soil of a strength that is sufficient to give good structural support to the plant, but not so high that it impedes root penetration and growth.

Signs of poor soil structure include surface crusting and hard-setting; J-rooting of tap-rooted crops or matted roots of cereals above cultivation pans; or smeared and compacted soil layers caused by tillage or traffic.

Poor soil structure leads to reduced yields because of:

- ▶ Poor emergence and establishment;
- ▶ Low water-holding capacity and periods of crop stress through water shortage;
- ▶ Waterlogging.

There are four principles underlying all management actions to maintain or improve soil structure:

1. Retain stubbles;
2. Minimise tillage;
3. Control traffic;
4. Avoid prolonged bare fallows.

These practices work because they:

1. minimise disruptive forces that break apart aggregates (raindrop impact, cultivation);
2. retain or build soil organic carbon levels to increase soil aggregate stability;
3. minimise compaction that reduces pore space and hence water entry and soil water storage;
4. keep soil strength below root penetration limits to ensure a maximum root volume.

The key to maintaining good soil structure over the long term is to monitor your soils. Keep records of paddock activities, observations of soils and crops, soil test results and grain yields in order to track your progress and assess the benefits and costs of your management actions.

This factsheet was written by Sam North and Abigail Jenkins from NSW DPI as part of the Extension of best practice principles for identifying and managing soil limitations in southern and central NSW (GRDC Project code FLR1909-001SAX).

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