Soil Carbon

Soil organic carbon, (SOC) is the carbon stored within soil. It is part of the soil organic matter (SOM) and is made up of decaying plant and animal material. The type of organic carbon present in the soil is important because it affects the soil's productivity. It varies across soil types and some of the fractions can be altered by management practices. The soil test reports the percentage of soil organic carbon present in the soil sample.

Australian scientists have identified four important types of soil organic carbon:

1. **crop residues** – shoot and root residues less than 2mm found in the soil and on the soil surface
2. **particulate organic carbon** – individual pieces of plant debris that are smaller than 2mm but larger than 0.053mm
3. **humus** – decomposed materials less than 0.053mm dominated by molecules stuck to soil minerals. This is an important component that plays a role in all key soil functions. Most of the plant available soil nitrogen comes from the humus fraction.
4. **biologically stable organic carbon** – this is often in the form of charcoal.

Soil carbon differs in size and is composed of different materials which have different chemical and physical properties and decomposition times.

Soil Carbon Functions

Biological Functions

Provides energy for biological processes.
Provides nutrients for soil life.
Contributes to resilience.

Physical Functions

Improves the soil's structural stability.
Influences water retention.

Chemical Functions

Contributes to cation exchange capacity.
Enhances pH buffering.

Direct Drill Maize with crop residue

The soil carbon cycle is dynamic and soil organic carbon levels are constantly changing. New inputs come from plant and animal material which soil biological processes break down to simpler mineral forms. Carbon levels build up in environments where water, nutrients and sunlight are plentiful. However warm moist environments also favour soil microbial activity and soil organic matter is broken down.

Physical factors such as clay content, soil depth and soil density affect the amount of soil carbon that can be held. Management practices that reduce plant residues accelerate carbon depletion. These include fallowing, stubble removal and over-grazing.

Reference Arable Update. 92 Quantifying and modelling soil carbon pools