Soil Carbon and Organic Matter – Myths and Realities

The term soil carbon has been getting a lot of air time recently, but there are some myths and misconceptions that farmers need to think about.

Soil carbon is made up of organic and inorganic carbon. Generally when we talk about soil carbon we are referring to the organic component because this is what we can influence as land managers.

Organic carbon is the main element in soil organic matter. Soil organic matter provides plant nutrients such as nitrogen, phosphorus, potassium, sulphur and calcium. It also improves the structure and stability of the soil, soil nutrient and water holding capacity and a plant's capacity to withstand long dry periods.

Myth 1: All soil organic matter is transformed into soil carbon. This is incorrect. In the process of breaking down organic matter, micro-organisms release much of the carbon as carbon dioxide gas back into the atmosphere.

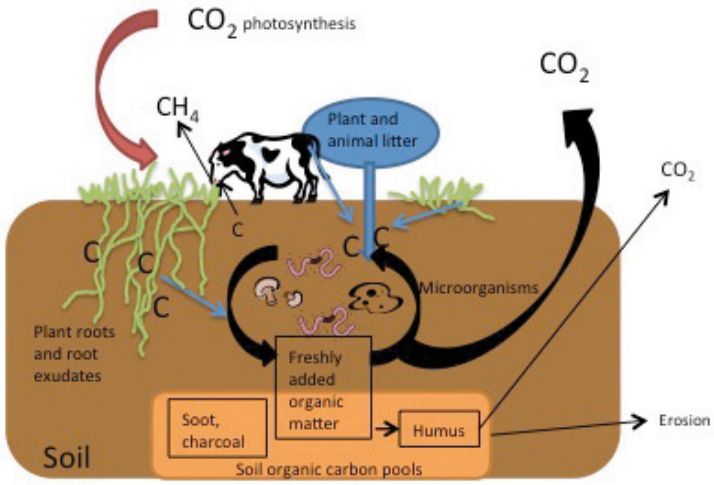
Soil carbon exists in three main pools; labile, slow labile and inert pool. Long term storage of carbon focusses on the inert pool while improvement in soil health relies more in the labile and slow labile pools.

Myth 2: Soil carbon levels can be increased to 10+%. This is true in part, but not for the fraction we are interested in to store soil carbon. Increases of this size generally include the labile pool in their measurement.

The labile pool consists of freshly added plant, animal and microbial residues. This pool can be increased very quickly through addition of organic matters such as animal and plant manures, but it is turned over quickly, usually in a matter of days to weeks. It commonly makes up less than 10% of the soil carbon pool.

The slow labile pool, or humus, is highly decomposed. It can be further broken down, but it generally takes years to decades unless it is physically disturbed, for example by cultivation. It is very important for soil structure and the retention of plant nutrients in the soil. It makes up about 60-80% of the soil carbon pool.

The Carbon Cycle



The third pool of carbon is inert and is usually soot or charcoal. It is chemically and physically stable and takes centuries to millennia to break down, unless, again, it is disturbed by cultivation or the input: output balance is altered. Biochars generally fall into this category.

Myth 3: All soils can store carbon equally. Again, this is not true. Soil does have the potential to store a lot of carbon, largely because soil disturbances since settlement have resulted in a significant loss of organic carbon.

A soil's potential to store carbon depends on soil type, climate and soil depth (volume). We can influence the levels of carbon stored in soil by increasing the organic matter inputs (perennial pastures, stubble retention) or decreasing the losses (grazing management, minimum till). However, soils vary in the level of carbon they can store and the level of carbon at which soil health is restored. Healthy sandy soils for instance commonly have lower amounts of slow labile soil carbon than healthy clay soils.

By adapting management practices we can reinstate some of that soil carbon lost through clearing and cultivation. For most perennial pastures in the Goulburn Broken Catchment a target of around 3-5% or in cropping soils around 2-4% is achievable.

Regardless of some of the myths and misconceptions, soil organic matter is fundamental to farm productivity, soil health and sustainability so implementing practices to increase it is a good thing.

FURTHER INFO

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