

# THE ROLE OF COVER CROPS IN SOIL HEALTH

The term 'cover crops' is inextricably linked to other terminology such as soil build-up, soil health, sustainable agriculture as well as conservation farming. Cover crops are the axis of or the most important aspect of any of these ideological approaches.

However, many farmers are still struggling to get to grips with the establishment of cover crops on traditional crop farms. It demands a different way of thinking and specific practices are required to get the process of soil build-up going, such as altering red fallow soils into cover crop grazing.

This problem can be overcome by understanding how nature works and what the basic rules of soil health entail.

Rules for soil health  
Soil health depends on carbon – the more efficient the carbon cycle in the soil, the better the results and benefits for the producer.

The greatest improvement in soil health occurs when the following rules are followed and maintained:

- Permanent organic cover.
- Constant actively growing roots.
- Crop diversification.
- Minimal soil disturbance.
- Implementing a livestock factor.

## 1. Permanent organic cover

This aspect gives rise to a drop-in ground temperature, a decrease in the evaporation of soil moisture, less wind erosion, decelerated water run-off, and an increase in the soil's water uptake. High ground temperatures cause soil microbes to die off, which is why nature sends her own ground cover (weeds and undesirable species) as soon as the soil becomes exposed.

However, this cover is usually toxic, unpalatable or covered in thorns, thus preventing animals from grazing it. The ground is covered in this way to create conditions under which more desirable species can establish themselves.

## 2. Constant actively growing roots

Plants are the conduits of free carbon found in the air. The carbon is bound in the leaves by way of photosynthesis and then converted into sugar. The sugar, in turn, is discharged by the roots in exchange for minerals and other nutrients. These sugars consist of a large portion of carbon (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) and serves as a source of nutrients for soil microbes. Plants and microbes therefore live in symbiosis with one another.

## 3. Crop diversification

Different plants attract different microbes with the help of the sugars that they excrete, for example legumes as opposed to grassy types. In order to stimulate soil microbe activity as much as possible, it is important that the roots are established at different depths in the soil. This is achieved by planting crops with different root types for an effective distribution across different soil depths.

In this regard one can consider crops with tap roots and others with adventitious roots, and even plants with finely branched roots or thicker lateral roots. The different roots in the soil will attract and increase different types of soil microbes. This creates an environment characterised by a better balance of different types of soil life. The result is a situation in which desirable microbes will inhibit undesirable microbes. This can also assist in addressing problems such as nematodes.

## 4. Minimal soil disturbance

Air ducts are formed in the soil when roots or parts of roots die off after grazing or at the end of a growing season. These ducts or canals cause aeration and lead to a substantial increase in the soil's water infiltration ability.

It is a known fact that soil contains aerobic and anaerobic microbes. As soon as a plough takes to the soil, for example, the different microbes will be subjected to unfavourable oxygen levels and die. The air ducts and soil structures are broken by the ploughing action and soil compaction will once again occur.

The greatest drawback of this process, however, is the dying off of the soil microbes. Because soil microbes comprise mainly of carbon, oxygen then binds to the dead microbe's carbon, forming volatile CO<sub>2</sub> which disappears into the air. This process of evaporation represents the greatest form of loss of soil carbon in South African agriculture.

## 5. Implementing a livestock factor

There is a balance between surface plant mass and the amount of plant roots below the soil surface. As soon as animals start feeding on the surface leaves and stems, the factory that must produce the sugars will diminish and some of the finer and weaker roots below the surface will die, as too little energy will be available to them. Once new leaves are formed, new roots will also grow, and the process will repeat itself. The roots that die off in this way also consist of carbon and become part of the soil carbon build-up process.

Animals that graze cover crop pastures will therefore accelerate the entire soil carbon process below the surface but will also use their digestive tracts to help break down plant residues above the surface. Plant residues are therefore broken down to a medium that is easily degradable for the soil microbes.

## Sensible composition of mixtures

Cover crop mixtures must be composed sensibly with the emphasis on soil health, but also for use as high-quality grazing. Producers can utilise this aspect of cover crops to generate an income from their animals, while at the same time improving and building up the soil.

Agricol has developed its **AgriLife Grazer cover crop mixtures** to meet the following criteria:

- **AgriLife Grazer 12** is a summer mixture consisting of a base of different annual forage sorghums, Pearl millet (Babala), cowpeas as well as certain legumes. This mixture can be planted from October to February.
- **AgriLife Grazer 2** is a winter mixture consisting of different growth lengths of oats, stouling rye, radishes as well as vetch. The planting time for this mixture is from February to the end of May.
- **AgriLife Grazer 21+** is an advanced multi-species soil build-up mixture with 21 and more different annual crops that include both summer and winter crops. The best time to plant **AgriLife Grazer 21+** is in January. It can offer grazing or cover until the end of October. This mixture is ideal for use on fallow land.

Soil health improves much faster when planting a combination of the three main groups of plant species: grassy types, tuberous plants and legumes. The combination also offers high quality grazing for livestock.

Mixtures can easily become ineffective if composed non-judiciously by disregarding the various crop characteristics. This includes planting density, plant height, growth habit, growth rate, competition, light requirements, synergism, allelopathy, duplication, et cetera.

Non-judicious composition and disregard of crop characteristics can yield undesirable results, making it seem as though the mixture is ineffective. It is also important that the product remains affordable.

## Soil moisture challenges

The greatest challenge in the cultivation of cover crop mixtures, is the availability of ideal soil moisture and the fact that soil moisture must be conserved for the next grain crop. The rate at which a cover crop uses water, can be decreased by controlling its height through grazing.

However, this must be done in a way that will not over-expose the soil surface and increase evaporation. Soil will double its water retention ability with every 0,5% increase in carbon – this means that soil which has been managed based on the rules of soil health, will conserve more water than fields that lie fallow.

Soil build-up is a long and patient process for which there is no quick fix. Implementing cover crops is a step in the right direction and offers a solution for underperforming fields.

Contact your nearest Agricol-agent or visit the website at [www.agricol.co.za](http://www.agricol.co.za) for a recommendation in your area.



Read more on Agricol's AgriLife range on our website.

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