

## **Cover crops contribute to soil health**

by Ralph C. Martin

For years I have told my students that the gospel according to Martin is to “keep your soil covered.” Under natural conditions soil is covered and the association between plants and soil shifts according to the season, weather and disturbance by animals or humans. Soil and plants, not to mention soil microbes, water and air, collaborate in a system of productivity, recycling and resilience. Soil is more than a substrate. It is an actor in a relational system and functions most effectively with ongoing living plant cover.

Farmers tend to focus on one desired crop by excluding all other plant species which are then labelled as weeds. There is no doubt that weeds can reduce or even eliminate crop yields. However, there is an emerging recognition that some crops may be grown together in intercrops (e.g. timothy and clover or oats and peas) with over-yielding potential. Furthermore, an intercrop of two or more crop species may decrease populations of species which disrupt yields. Cover crops are grown before and/or after the main cash or feed crop of each year, and in some cases, with the main crop, as a living mulch.

Cover crops protect the soil during rainfall events especially when the intensity is severe. Severe rainfall often occurs in the shoulder seasons when main crops are not growing. Water hitting plants first will be more likely to infiltrate into the soil in contrast to dislodging particles of bare soil, without cover. Erosion is reduced or prevented altogether and water has a better chance of percolating into the soil where it is needed, rather than running off the surface. There is also evidence that cover crops in the spring will reduce soil moisture at a time when it tends to be high, through evapotranspiration from the leaves, which eventually draw water up from a saturated soil.

Nutrients such as phosphorus and potassium can be lost from the soil to varying degrees when plants are not growing. Nitrogen is especially mobile and can escape in water or in air to become a pollutant. Cover crops become catch crops which take up nutrients thus catching them and preventing their loss from the system. Cover crops also maintain relationships with soil microbes by exuding carbon and nutrients from their roots to maintain healthy soil microbe populations which in turn drive the decomposition of organic material when it is added to the soil.

The main benefit of cover crops and forage crops is that, like crop residues, manures and other soil amendments, they improve soil organic matter. Soil organic matter is the foundation of healthy soil and is positively correlated with all other indicators of soil health such as soil aggregate stability, active soil microbial populations, soil water holding capacity, lower compaction and reduced erosion.

With higher levels of soil organic matter there is insurance for drought as more water is held in the soil and there is also insurance for excess water, by providing improved drainage.

Microscopy research shows that root channels of one plant are preserved as channels for successive plants to access water and nutrients. In fact, roots of three different crops, from three different years, in various stages of decomposition, were found in the same root channels. Cover crops help to maintain these intricate root channel systems between seasons.

Natural systems include numerous perennial plants. Permaculture and forest garden systems are designed to mimic how soil and plants evolved. As perennials are increasingly included in a farm system, soil is increasingly covered. Today agriculture provides sustenance for over 7 billion people, much of it with annual plants and livestock. To sustain food security, is to respect the soil-plant system and its integrity. Cover crops play a crucial role to keep soil covered and healthy.

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