

Canadian Farmers: Stewards for Healthy Soils

Farmers across Canada are increasingly aware of the importance of soil health.

Soil is a key partner in their farming success. It can also be a major solution to pressing environmental concerns such as climate change.

It all comes down to six basic principles. These are known as the **6Cs of Soil Health**.

This Fact Sheet is one of a series that describe these basic principles for building healthy soils & provide video interviews with Canadian farmers who are putting these principles into practice.

The 3rd C: Continuous Living Plants

Why keep living roots in the soil year-round?

First of all, let's consider what plants do for a living. Plants use the miracle of photosynthesis to turn the sun's radiant energy into chemical energy in the form of sugars (in general, these are known as photosynthate). Each plant uses the energy in these sugars to build its own living tissues and to reproduce via flower and seed.

But here is the key: plants don't save all this chemical energy for themselves; they share up to 40 per cent of their photosynthate with the organisms in the soil. They do this by secreting sugars and other substances made from these sugars into the soil through their roots. They use these secretions (called *exudates* by scientists) to feed and grow the microbial populations in the regions of soil surrounding their roots. This is a mutually beneficial process by which plants feed the soil organisms who, in turn, bring them the nutrients that they need, not only to grow and reproduce, but also to build the defences that ward off diseases and pests.

This symbiotic relationship between the soil microbes and plant roots is the basis for soil fertility and the fundamental formula for healthy soils and plants. It makes sense, then, for farmers to foster and support this relationship by keeping living roots in the soil as much as possible.



Soil Health Matters in Agriculture

featuring

Norm Lamothe

Cavan, Ontario

Norm Lamothe of Woodleigh Farms in Ontario uses compost and continuous roots to build his organic matter levels at 0.1 to 0.2 per cent per year (a high rate of carbon sequestration).



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Here are some ways in which farmers practice the 3rd C.

- **Integrating perennials whenever possible.** Perennial plants (those that live longer than two years) are the best option for creating healthy soils, as their roots feed the soil organisms all year round. For field crop farmers, who grow annual plants such as corn, soybeans and wheat, the most effective option for integrating perennials is to include perennial pasture in the rotation. Pastures plants such as grasses, forbs (flowering plants), and legumes (nitrogen fixers such as alfalfa) can be harvested and used or sold as forage. In many cases, field-crop farmers have relationships with local ranchers where the latter rent these areas for grazing their animals during the pasture seasons.
- **Cover crops.** These are plants that are grown after harvest to keep continuous living roots in the soil. Species like annual or perennial rye grass, buckwheat, alfalfa, various clovers, or mixes of several species are used. Each type of cover crop will have its own benefits (e.g., some fix nitrogen) and potential drawbacks (e.g., some re-emerge in the spring). Some farmers use multi-species mixes as covers, increasing diversity as well as root duration.
- **Intercropping.** This involves mixing two or more different crops in the same field. This can extend the time that roots are in the ground and/or cover more surface area.
- **Agroforestry.** This involves integrating woody plants into a field crop system. For example, trees can be planted in rows with crops grown in the alleys between them (called alley cropping).

Canadian Farmers: Bringing Soil Health to Life



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A cover crop of tillage radish in the fall. The radish will help break up compaction but most importantly will feed the soil organisms until the next crop is planted. The roots will release carbon-rich exudates while the plant lives, then, when it dies over the winter, the decaying organic matter will continue to feed the underground army of beneficial creatures. At the same time, the biomass above ground protects the soil from temperature and moisture extremes and prevents wind and water erosion of topsoil.

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