



What Cover Crops Are and How They Protect and Improve Your Land

Information for Landowners

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June 2024

Introduction

Cover cropping is an ancient agricultural practice used to protect soil in between crop rotations when soils would otherwise be left bare. When used effectively, cover crops can address many management concerns and lead to increased yields, build soil organic matter, improve rainfall infiltration, control weeds, reduce soil compaction, prevent erosion, increase essential nutrients, support livestock, and increase biodiversity.

Cover crops can be annual or perennial plants, grown as a single species or in a multi-species mix, and adapted to fit nearly any production system. The cover crop species grown can vary and include cereals such as rye, fast growing turnips, and nitrogen-fixing plants like clovers.

Soil health principles and cover crops

Healthy soils should be able to function as a living ecosystem that sustains plants, animals, and humans. In general, between four and six soil health principles have been regularly used to guide all land use which is to (1) maximize living roots, (2) minimize soil disturbances, (3) maximize biodiversity, (4) maximize soil cover, (5) integrate livestock with soil health, and (6) know the context in which you are working.

Cover crops are not a fix-all for the array of challenges farmers and landowners face from market volatility, climate variability, and social stigma associated with new practices. However, after a few years of cover crop use, farm lands have been shown to increase resilience by storing substantially more water than bare fields during torrential rains, suppressing weeds which have built herbicide resistance, lessening erosion, better withstand drought, and improving soil aggregation

and nutrient availability which can lessen farm inputs such as fertilizers.

Soil food web and cover crops

The soil food web is a complex, dynamic interaction between plants, organic matter, fungi, bacteria, protozoa, nematodes, invertebrates, birds, and other animals. Two key categories of soil organisms are soil fungi and soil bacteria; each play major roles in exchanging nutrients with plant roots and helping break down plant residue and build organic matter. Cover crop roots serve as a two-way superhighway whereby nutrients acquired through photosynthesis are released through the roots and then consumed by soil microbes which are then ultimately taken back up by plant roots.

Another soil food web benefit comes from fungal hyphae which often spread throughout a larger soil volume than the crop roots, effectively giving the crop roots access to a greater supply of soil nutrients and water. This is especially helpful in a dry year when crop root growth may be very limited.

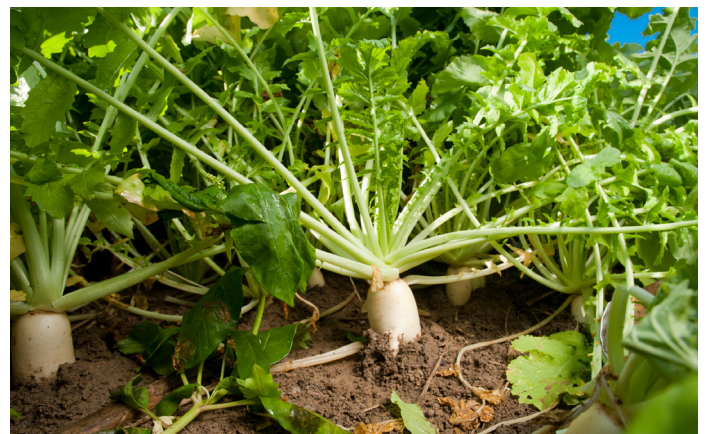


Figure 1. Cover crops combating on-farm soil compaction. *Photo Credit: SARE*

This symbiotic relationship between plant roots and the soil food web highlights the utility of cover crops to maximize living roots. Imagine going to the grocery store in November and being told there's no more food available till April. That is a rough equivalent to what soil microbes are facing when fields are left barren from fall to spring with no living roots to help support the soil food web.

Soil organic matter and cover crops

Soil organic matter is decomposed organic material such as leaves, roots, and microorganisms that exist in soil and provides water and nutrient storage. An analogy can be made between soils with high organic matter as a porous sponge and low soil organic matter more like an impermeable brick. Importantly, soil organic matter is often used as a measurement of a soil's fertility and resilience. Cover crops can increase soil organic matter by adding biomass (especially below the soil surface via root growth), creating habitat for microorganisms, and protecting the soil from erosion.

Erosion's connection to soil health and cover crops

On average, half of the soil organic matter has been lost from cultivated fields in the U.S. Fortunately, soil organic matter can be rebuilt over time when cover crops are implemented and soil disturbances (chemical and physical) are reduced or eliminated. Cover crops mitigate soil erosion in several ways. Cover crop leaves and residue intercept rainfall drops and prevent soil detachment, cover crop roots and earthworm tunnels improve rainfall infiltration resulting in less water running over the soil surface reducing soil erosion. Cover crops also anchor the soil and residue in place reducing wind erosion.

Erosion may not seem immediately connected to soil health, but it is. The most biologically active and nutrient-dense part of the soil profile is typically

the top inch. That is also the portion of soil that will be lost during erosion. Saving that nutrient-dense, biologically active upper layer of the soil by seeking out tenants who use cover crops, could result in increased land value in addition to improved farm profitability.

Summary

Cover crops are a unique management strategy for increasing soil organic matter levels, a benefit that can improve the efficiency and resilience of farms over time as detailed in the [USDA-SARE Cover Crop Economics national report in 2019](#). Cover crop management decisions are important in maximizing their benefits, and in most cases, farmers need to use a multi-year approach to evaluate the return on investment from cover crops as they would when buying equipment.

Cover crops will pay off more quickly when used intentionally to address two or more on-farm challenges such as combating herbicide-resistant weeds, soil compaction, and poor soil moisture. Cover crop cost-share programs, like [Farmers for Soil Health](#), are available to farmers and provide access to financial support, technical assistance, and a sustainability marketplace. Following three to five years of annual use, cover crops should contribute to soil health improvements that positively impact yields and improve the overall land value.

Additional resources

1. [Farmers for Soil Health website](#)
2. [Soil health and cover crops](#)
3. [USDA-SARE Cover Crop Economics report](#)
4. [Center for Regenerative Agriculture cover crops](#)



Center for Regenerative Agriculture
University of Missouri

FarmersforSoilHealth.com

Farmers for Soil Health is a collaborative initiative led by the Soy Checkoff, Pork Checkoff, and National Corn Growers Association in partnership with state commodity groups and conservation organizations.

