



Virginia Cover Crop Fact Sheet Series

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Beneficial Uses of Cover Crops

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Introduction

The general purpose of a cover crop is to improve the soil, the broader environment, or other crops in rotation, not for direct harvest. Cover crops, depending on which are selected, are capable of providing many diverse assets. This publication provides a short description of these main benefits.

Soil quality

Soil quality is defined as "the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation" (Karlen et al., 1997). By providing additional residue (carbon) and plant biodiversity, cover crops can slowly improve the overall quality of the soil and surrounding ecosystem.

Soil erosion

In the absence of the cash crop, a cover crop stabilizes soil in the root zone, reducing the chance for erosion. Leaves and stems of the cover crop decrease soil erosion by reducing the impact from rain droplets, which can dislodge soil particles. The presence of the leaves and stems also slows water movement over the soil surface, reducing sediment loss from the field.

Soil compaction

Cover crop root systems can be used to combat both shallow and deep compaction. Cover crops with taproot systems reach deep in the soil and can break up deep compacted layers that have formed in the soil. Likewise, extensive root systems in grass cover crops reduce surface compaction. The ability of cover crops to break up soil compaction makes it easier for cash crop roots to get to essential water and nutrients that may have previously been unavailable and below the compacted soil layer.

Soil organic matter

Cover crop residues increase soil organic matter, providing numerous benefits to the soil and successive crops. Increasing organic matter, subsequently, improves soil structure, soil water holding capacity and infiltration, and increases cation exchange capacity. It provides a habitat for beneficial insects and microorganisms, and increases soil aggregate stability. Decaying plant materials contribute nutrients

back to the soil; however, different cover crop species contribute to nutrient cycling at different rates based on the rate of decomposition.

Water infiltration and runoff

Cover crops slow the movement of water across the soil surface, providing more opportunity for water to infiltrate instead of running off the surface. Cover crop residues increase soil organic matter which in turn increases development of stable soil aggregates. These larger soil aggregates encourage greater soil water infiltration and water holding.

Nutrient cycling

By scavenging nutrients left over from cash crop production, cover crops help minimize undesirable losses. Legume cover crops fix N from the atmosphere that can then be available for cash crop utilization, reducing the need for additional N supply. Cover crop decomposition and N supply capacity depends on the C:N ratio. At C:N ratio >20:1, N is immobilized by the decomposing cover crop; at <20:1 N is mineralized, or released from the cover crop.

Weed suppression

Cover crops can act as a smother crop to outcompete weeds for essential resources of water, nutrients, and sunlight. In addition some cover crops, like cereal rye, produce allelochemicals when residues are left on the soil surface. These plant chemicals produce an effect known as allelopathy which is an inhibition of the growth of other plants. Additionally, the killed cover crop can act as a surface mulch, reducing weed pressure.

Insect control

Cover crops provide habitat and food for beneficial (predator and parasitoid) insects such as assassin bugs and lady beetles. If cover crop residue remains on the surface when row crops are planted, beneficial insects will remain in their habitat and feed on or kill other insects that can be detrimental to row crops. Although cover crops can provide an environment for beneficial insects, success with insect control is dependent on proper management and matching the cover crop, subsequent row crop, and possible pest threats.

Summary

Advantages of cover crops should be weighed against the extra time and expense they require, however in general the benefits outweigh the costs in most Virginia cropping systems. This analysis should definitely consider both short and long term effects as it often takes years to realize the full benefit of cover crops in a crop rotation.

No single cover crop will accomplish all the listed goals. Cover crops can generally be grouped into three broad categories, those grown to catch or trap nutrients that remain after cash crop harvest, those grown to fix N and supply a significant portion of that N to the following cash crop, and those grown to cover and protect soil while adding to soil organic matter. Managers decisions about which cover crops to plant should be based on field- and farm-specific goals.

References

Karlen, D.L., M.J. Mausback, J.W. Doran, R.G. Cline, R.F. Harris, and G.E. Schuman. 1997. Soil quality: a concept, definition, and framework for evaluation (a guest editorial). *Soil Sci. Soc. Am. J.* 61:4-10