



Cover Crop Guide



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It's All About Your Health—Soil Health

Pick up any farm newspaper in the last five years and it would be hard not to find an article regarding soil health issues. Modern cropping systems over the last 50 years, all minds agree, have taken their toll on productivity. With the advent of modern fertility and herbicide practices we have arguably taken the easy route in managing these very important crop inputs. Economics dictate that we cannot go back in time to a corn, soybean, wheat and clover rotation. However, incorporating a well thought out cover crop management program will help the soil function as a living ecosystem and have it derive all the benefits that we are presenting in Merit Seeds Cover Crop Guide. We hope that the information in this guide will help you make some of those important management decisions.

Cover Crop Benefits

- Protect the soil surface from erosion & improve water infiltration
- Elevate water holding capacity of the soil
- Suppress weeds
- Guard the soil surface from extreme temperatures, rain, and wind
- Improve soil structure & reduce compaction
- Increase yield potential
- Raise soil organic matter levels and improve soil physical properties
- Mineralize, reposition, and scavenge nutrients in the soil and utilize them for the next crop
- Enhance soil biological activity and health
- Produce forage, reducing feed costs
- Potentially reduce nutrient costs



Cover Crop Benefits

Soil Surface Protection

There are many reasons to adopt cover crops into your farming operation. Cover crops protect the soil surface from water and wind erosion, allowing you to keep your soil on your farm. Cover crops form a canopy to shield the soil surface from extreme temperatures and heavy, pounding rains. Cover crops also give us the ability to keep water on the farm by allowing water enough time to soak into the soil, preventing run off.

Soil Structure

Over time, a living cover crop, along with earthworms, will change the soil structure on your farm. Cash crop roots will penetrate the soil with greater ease, more oxygen will enter the system, more chemical reactions will take place, and a larger microbial population will grow. Reaching a 25% air to 25% water ratio will optimize plant nutrient availability. As cover crops grow and die, resilience is brought back to the soil, particles stick together (flocculate), and compaction is reduced.

Decreasing Undesirables

Cover crops suppress weeds in two ways – by direct competition and by shading the soil. In some cropping systems, using a cover crop as a companion to the primary crop (growing between rows or underneath the canopy) will help outcompete weeds. Cover crops, like cereal rye, release allelopathic compounds that deter weed germination. Other cereal grains like oats, barley, millet, sunflowers, buckwheat and sorghum sudan are very good in weed suppression as well.

Organic Matter

Organic matter percentage of soil volume expands as the cycle continues. More nutrients are securely stored in more humus as it develops over time. Measuring organic matter increases is a multiyear process, but not a lifetime process, as we used to believe. The short term soil structure improvements give us physical evidence of organic matter increase. Since most cover crops are forages, and are suitable for livestock feed, the farm feed bill is reduced too, while still giving the soil benefits. We provide the plants, nature does all the work. The soil benefits every time a cover crop is present, and these benefits can happen much quicker than we used to think.



Northside of road after 2.8" of rain. Cover crop system used on this farm.



Southside of road after 2.8" of rain. No cover crops being used.



Plant Seed—Not Grain

With Merit Seed there are never any compromises when it comes to seed quality. Merit Seed cover crop seed offers the following advantages:

- Seed fields are monitored from planting, throughout the growing season, and at harvest to make sure there are no issues with potential weed problems or varietal purity.
- Seed is professionally conditioned, cleaned, and packaged by professional seedsmen.
- Every lot of seed is tested at harvest and after conditioning by laboratories approved by and standards set up by the Association of Official Seed Analysts.
- Any mixing is done in our facility, by our people, with our equipment, which is designed to gently handle seed.

Do not take the chance of introducing new and potentially invasive (and glyphosate resistant) weeds to your farm by buying “cheap” seed.

A Word About “Dormant” Seed

Certain species of seeds that are utilized for cover crops have shown a portion of dormant seed present. We believe that everyone planting cover crops should be aware of this phenomenon. “Dormant” seed contains properties that inhibit germination right away. These properties must be reduced by degrading or leaching out over time and thus allowing the seed to germinate. This is nature’s way of making sure the species continues. For example, if some disease or pest came through and eliminated every radish on earth, next year there would still be approximately 4% of radishes that would emerge as that is a normal level of dormancy for that species. Dormancy also occurs in annual ryegrass and crimson clover. We have had examples of a field planted in the fall of 2011 to annual ryegrass and radish, and in the fall of 2012, they had a better stand than the fall of 2011, and they never planted the cover crop in 2012. The stand was established from dormant seed leftover from the 2011 planting. We are working to determine normal dormancies for some of these species, but it is very inconsistent because it depends on seed production growing conditions and the age of the seed. The point is to be aware that this can happen and it is normally not a production detriment.



Most annual ryegrass we sell is the previous year’s crop, so dormant seed is not an issue.



Annual Ryegrass Management

From Oregon Ryegrass Growers Seed Commission

Control of the annual ryegrass cover crop is best done when the plant is small, 6-9" in height, and preferably before the first node has developed. Typically, this has corresponded to late March to mid-April depending on weather and farm location. Annual ryegrass can be more difficult to control after the first node has developed, although control through heading is not difficult with good management. Warm temperatures and actively growing plants are a must for effective control. Thorough spray coverage using medium spray droplet sizes and moderate spray pressures is critical to achieving control. The use of air induction spray systems or nozzles that produce coarse droplets should be avoided. Reduce spray application volume to 8-12 gallons per acre. While one burn-down herbicide application may provide control of the annual ryegrass, growers should plan for two applications. Even when annual ryegrass is small it requires full rates of herbicides to achieve control. Low rates will often stress the plant making it more difficult to control at a later date. In the spring, annual ryegrass has been established 7-8 months and has an extensive root system. It should be treated as if it were an established forage like tall fescue or smooth brome grass, not like a two week - old giant foxtail seedling. Growers should be aware that some ryegrass seed may remain in the soil for several years after using it as a cover crop. Control as needed depending on crop rotation or let it grow as another cover crop depending on weather and farm location.

Achieving good control of annual ryegrass with glyphosate herbicides before planting corn or soybeans depends on timing, application rate, and weather conditions. Apply glyphosate at 1.25- 1.50 lb a.e./a with ammonium sulfate and surfactant in late March to mid-April. Follow label directions carefully with respect to pH and mixing order. It is important when adding ammonium sulfate, buffering agents, or water conditioners that they be added to the full spray tank of water and agitated for 3-5 minutes before adding the glyphosate. This is to ensure that the calcium, magnesium, iron and other dissolved minerals in the water do not interfere with the glyphosate activity. Additional NIS surfactant, if called for, is normally added last. Weather conditions affect how well glyphosate controls annual ryegrass and may require a second application.

- Spray with a daytime minimum temperature of 55° F (above 60° F optimum).
- Wait until all the annual ryegrass is actively growing for best results (5-7 days).
- If night temperatures drop below 38° F, wait three days before spraying.
- Soil temperatures should be above 45° F.
- Spray at least 4 hours prior to sunset to allow for maximum translocation of the glyphosate within the plant.

Early termination of the cover crop makes control easier and reduces the amount of residue into which you'll plant corn or soybeans. Early control also facilitates soil dry-down, allows for significant decomposition of the ryegrass residue and release of nutrients for uptake by the corn or soybean crop.

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Nitrogen Producers—Summer Seeded

Peas

- High nitrogen producer
- Excellent choice for forage production
- Very drought tolerant
- Can be mixed with radish
- Will winterkill



Sunn Hemp

- Excellent nitrogen producer - Alabama reported average of 126 lbs. per acre of nitrogen in 12 weeks
- Can reach six feet tall in 60 days producing 100 lbs. of nitrogen, translocating phosphorus & potassium to the topsoil
- Deep tap root; performs very well on low fertility, well-drained sandy soils
- Great biomass producer when grown in high temperatures
- Excellent weed and root knot nematode suppression, increases organic matter quickly



Phacelia

- Excellent soil conditioner
- Fibrous roots can penetrate to 29" deep
- Grows up to four feet tall
- Will survive temperatures as low as 20° F
- Excellent source of nectar and pollen - can increase beneficial insect populations



Balansa Clover

- Excellent nitrogen producer
- Fast growing, heavy biomass producer
- Works well in acidic soils
- Can tolerate short periods in waterlogged soils



Nitrogen Producers—Fall Seeded

Hairy Vetch

- Can produce significant amounts of nitrogen
- Tolerates lower fertility
- Relatively easy to kill
- Hard seed – can become a weed
- Needs 5-6 weeks of good growth before winter for best results



Crimson Clover

- Excellent nitrogen producer when planted early
- May overwinter in northern climates
- Works well in mixes with annual ryegrass and radish
- Produces an excellent environment for earthworms
- Easy to kill in the spring



Austrian Winter Peas

- Produces 60-120 lbs. of nitrogen/acre
- Generally winterkills
- Easy to kill with herbicides
- Works very well with radishes



Frostmaster Peas

- Good winterhardiness and strong plant growth
- Produces more biomass than Austrian winter peas
- Very sweet and much more desirable for forage than Austrian winter peas
- Good nitrogen fixer





Nutrient Scavengers—Summer Seeded

Buckwheat

- Rapid summer growth
- Very fine, fibrous root system
- Excellent for mineralizing phosphorous from the soil
- Terminated with the first frost

Sorghum Sudangrass

- Great biomass builder
- Rapid growth helps suppress weeds
- Tolerates heat and dry conditions
- Large, fibrous root system



Nutrient Scavengers—Fall Seeded

Oats

- Rapid fall growth with fibrous root system
- Great forage, especially when mixed with turnips
- Winterkills 20-22° F
- Winterkilled oat plants help protect other overwintering cover crops

Turnips

- Great forage for cattle as well as a nutrient scavenger
- Survives down to 20-22° F
- Matches well with oats
- Good carbohydrate source for cattle



Cover Crop Wheat

- Good fall growth with fibrous root system
- Most shallow rooted of the cereal grain cover crops
- Inexpensive
- Easy to terminate in the spring
- Can be used as a spring forage



Nutrient Scavengers—Fall Seeded

Cereal Rye

- Fall seeded cereal grain that is very winter hardy
- Most common cover crop
- Immense fibrous root system and large amounts of spring biomass
- Huge scavenger and relocater of nutrients
- Makes a great mulch to suppress weeds
- Strong allelopathy for weed suppression
- Can be used as a “living” cover crop or as a forage
- Latest planted cover crop – even into November



Radish

- Daikon type radish
- Great nutrient scavenger
- Mixes well with small grains and grasses
- Earthworm “magnets”
- Deep taproots and fine root hairs
- Repositions nutrients from soil profile



Winter Barley

- Early planted fall cover crop
- Dual purpose forage
- Scavenger of nutrients with fibrous root system
- Builds biomass
- Winter hardy variety



Dwarf Essex Rape

- Fall seeded brassica
- Great nutrient scavenger
- Cold tolerant
- Alleviates compaction
- Helps improve soil water holding capacity





Nitrogen Producers—Frost Seeded

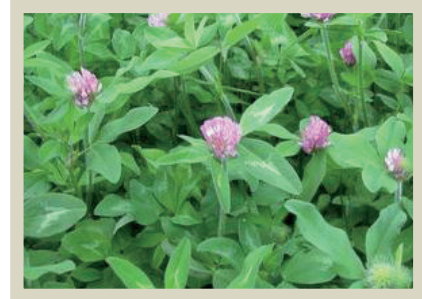
Medium Red Clover

- Best frost seeded into wheat
- Produces 60-100 lbs. of nitrogen/acre
- Deep tap root breaks up hard pan and scavenges nutrients
- Produces tons of quality forage



Mammoth Red Clover

- Best frost seeded into wheat
- Produces 65-110 lbs. of nitrogen/acre
- Deep tap root breaks up hard pan and scavenges nutrients
- Excellent biomass producer



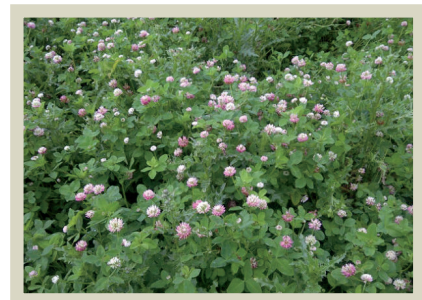
Yellow Blossom Sweet Clover

- Best frost seeded into wheat
- Produces 60-100 lbs. of nitrogen/acre
- Deep tap root breaks up hard pan and scavenges nutrients
- Produces tons of biomass



Alsike Clover

- Best frost seeded into wheat
- Produces 40-60 lbs. of nitrogen/acre
- Shallow rooted
- Works best in wet soils



Garden Cover Crop

Merit Seed Garden Cover Crop Mix

- The purpose of this blend is to ensure that your garden will be productive and healthy next growing season
 - Additional plant structure will help suppress weeds
 - This mix will build productive soil and incorporate nitrogen back into the soil
 - Application is simple and requires little to no care taking
-
- **37.62% Buckwheat**
 - **28.42% Austrian Winter Pea**
 - **23.98% Hairy Vetch**
 - **8.89% Daikon Radish**



“A great choice for produce farmers looking for erosion control and added nutrients into existing soil.”

How to Plant Garden Cover Crop

- Till or fork the soil to loosen it to a depth of at least 3 or 4 inches and to remove any existing vegetation
- Smooth out the soil with a hard metal rake to make an even seed bed
- Scatter the seed by hand or with a seed spreader at the rate indicated on the seed package
- Rake the soil again to cover the seed. Small seeds should stay close to the surface, so just give those a very light rake; larger seeds need to go deeper, so rake the soil more vigorously for those
- Keep the seedbed moist with a sprinkler until germination occurs. Or, you can wait for rain to come and do the watering for you
- Best time to plant is from August - October



Radish Size—Is Bigger Better?

Do not be dismayed if you go out into your field of cover crop radish in the month of November and don't see some of these prize size radishes that are as big as your forearm. What they don't tell you when you see radishes that size is that they were probably planted after wheat, had decent moisture for establishment, were planted at low populations and have had adequate fertility to reach this size. Moreover, we believe that the seed trade, us included, has done a disservice promoting these giant radishes because that creates false expectations. The reality is that cover crop radishes do a great deal of good for your soil after approximately 6-7 weeks of growth. Keep in mind that, as brassicas, the cover crop radishes will grow at much lower temperatures than other species. The benefits of 6-7 weeks of radish growth are as follows:

- Excellent tool for reducing soil compaction - University of Maryland researchers found that radish roots can penetrate plow pans and other layers of compacted soil
- Even though the upper part of the taproot may only be 6-12", the lower part can extend 20" or more (this is the part you always break off when pulling them out to admire)
- The radish creates a root channel after winter killing for subsequent crop's roots and water infiltration & holding capacity
- Radishes can scavenge nitrate and make it available to the subsequent crop
- The forage of radishes are known to attract and feed earthworm populations
- Very compatible with seed oats
- Can be aerial applied

Keep in mind that it takes several nights of temperatures into the low 20's to winterkill radishes. This means you can get decent growth into November. Even though they are not as big as your arm, they are still doing a whole lot of good for your soils.



The Living Soil: Earthworms

by Clive A. Edwards - The Ohio State University

Of all the members of the soil food web, earthworms need the least introduction. Most people become familiar with these soft, slimy, invertebrates at a young age. Earthworms are hermaphrodites, meaning that they exhibit both male and female characteristics.

They are major decomposers of dead and decomposing organic matter, and derive their nutrition from the bacteria and fungi that grow upon these materials. They fragment organic matter and make major contributions to recycling the nutrients it contains.

Earthworms occur in most temperate soils and many tropical soils. They are divided into 23 families, more than 700 genera, and more than 7,000 species. They range from an inch to two yards in length and are found seasonally at all depths in the soil. In terms of biomass and overall activity, earthworms dominate the world of soil invertebrates, including arthropods.

What Do Earthworms Do?

Earthworms dramatically alter soil structure, water movement, nutrient dynamics, and plant growth. They are not essential to all healthy soil systems, but their presence is usually an indicator of a healthy system. Earthworms perform several beneficial functions.

Stimulate microbial activity. Although earthworms derive their nutrition from microorganisms, many more microorganisms are present in their feces or casts than in the organic matter that they consume. As organic matter passes through their intestines, it is fragmented and inoculated with microorganisms. Increased microbial activity facilitates the cycling of nutrients from organic matter and their conversion into forms readily taken up by plants.

Mix and aggregate soil. As they consume organic matter and mineral particles, earthworms excrete wastes in the form of casts, a type of soil aggregate. Charles Darwin calculated that earthworms can move large amounts of soil from the lower strata to the surface and also carry organic matter down into deeper soil layers. A large proportion of soil passes through the guts of earthworms, and they can turn over the top six inches (15 cm) of soil in ten to twenty years.

Increase infiltration. Earthworms enhance porosity as they move through the soil. Some species make permanent burrows deep into the soil. These burrows can persist long after the inhabitant has died, and can be a major conduit for soil drainage, particularly under heavy rainfall. At the same time, the burrows minimize surface water erosion. The horizontal burrowing of other species in the top several inches of soil increases overall porosity and drainage.

Improve water-holding capacity. By fragmenting organic matter, and increasing soil porosity and aggregation, earthworms can significantly increase the water-holding capacity of soils.

Provide channels for root growth. The channels made by deep-burrowing earthworms are lined with readily available nutrients and make it easier for roots to penetrate deep into the soil.

Bury and shred plant residue. Plant and crop residue are gradually buried by cast material deposited on the surface and as earthworms pull surface residue into their burrows.



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Cover Crop Key Attributes

	Crop	Variety	Species	Forage	Planting Season	Termination
Cool Season	Annual Ryegrass	VNS	Grass	yes	Fall	Overwinter
	Aust. Winter Pea	VNS	Legume	yes	Spring/Fall	Can Overwinter
	Balansa Clover	VNS	Legume	yes	Spring/Summer	5 F
	Barley	VNS	Grass	yes	Fall	Overwinter
	Buckwheat	VNS	Broadleaf	yes	Summer	32 F
	Cereal Rye	VNS	Grass	yes	Fall	Overwinter
	Crimson Clover	Dixie	Legume	yes	Summer/Fall	Overwinter
	Fall Triticale	VNS	Grass	yes	Fall	Overwinter
	Field Peas	VNS	Legume	yes	Spring/Fall	Can Overwinter
	Forage Turnip	Appin	Brassica	yes	Spring/Fall	15 F
	Hairy Vetch	VNS	Legume	yes	Fall	Overwinter
	Mammoth Red Clover	VNS	Legume	yes	Spring/Fall	Overwinter
	Med. Red Clover	VNS	Legume	yes	Spring/Fall	Overwinter
	Mustard, White	VNS	Brassica	no	Fall	Overwinter
	Oats	VNS	Grass	yes	Spring/Fall	20-22 F
	Pearl Millet	VNS	Grass	yes	Summer	32 F
	Phacelia	VNS	Broadleaf	yes	Spring-Fall	20 F
	Radish	VNS	Brassica	yes	Fall	20-22 F
Rape	VNS	Brassica	yes	Fall	Overwinter	
Spring Triticale	VNS	Grass	yes	Spring	20 F	
Sweet Clover	VNS	Legume	no	Spring/Fall	Overwinter	
Winter Wheat	VNS	Grass	yes	Fall	Overwinter	
Warm Season	Peas	VNS	Legume	yes	Summer	32 F
	Sorghum Sudan	VNS	Grass	yes	Summer	32 F
	Sunn Hemp	VNS	Legume	yes	Summer	28 F
	Teffgrass	VNS	Grass	yes	Summer	32 F

All seeds listed above are available through Merit Seed



Cover Crop Key Attributes

Days to Germination	Drill lbs/ac*	Drill Depth	Attributes	Scavenger or Producer
7	10	1/4"	Deep Root Mass	Scavenger
7-10	30	1/2-1"	Good N Producer	Producer
7	6	1/4"	Quality Forage	Producer
7	48	3/4-1"	Quick Biomass	Scavenger
7-10	25	1/2-1"	Phosphorus	Scavenger
7	56	3/4-1"	Weed Supression	Scavenger
7-10	8	1/8-1/4"	Fiborous Roots	Producer
10	56	3/4-1"	Great Forage	Scavenger
7-10	30	1/2-1"	Root System	Producer
5-7	3	1/4"	Quality Forage	Scavenger
7	6	1/8-1/4"	Great N Source	Producer
7-10	8	1/8-1/4"	Improve Soil Tilth	Producer
7-10	10	1/8-1/4"	Deep Taproot	Producer
6-7	1	1/8-1/4"	Deep Taproot	Scavenger
10	32	1/2-3/4"	Root Exudates	Scavenger
10	10	1/4-3/8"	Tolerates Poor Soil	Scavenger
7-10	1	1/4"	Soil Structure	Scavenger
2-6	3	1/4"	Attracts Worms	Scavenger
5-7	2	1/4"	Late Seeding	Scavenger
10	56	3/4-1"	Legume Nurse Crop	Scavenger
7-10	8	1/8-1/4"	Soil Improver	Producer
7-10	60	3/4-1"	Shallow Roots	Scavenger
7-10	60	1/2-1"	Drought Tolerant	Producer
7	25	1/4-1/2"	Biomass Builder	Scavenger
5-7	20-40	1/4-1"	Fast Growing	Producer
3-5	10	1/8"	Drought Tolerant	Scavenger

*Seeding rates vary depending on if it is a pure stand or a mixture. Aerial application 20% above drill rates; forage 100% above drill rates



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