

Cover Crops (101)

February, 2013

Success with Cover Crops will require additional management

Benefits of Cover Crops

- Reduce compaction
- Fix Nitrogen (note: most N fixed at bud stage)
- Scavenge Nitrogen – keep it in the soil
- Increase soil biological activity
- Increase organic matter – mostly in top 2 inches. About 0.1%/year in the top 7 inches.
- Increase earthworms
- Improved water filtering
- Increased porosity
- Increased water holding capacity
- Increased water infiltration
- Increased nutrient cycling
- General increased capacity for production on ANY soil

Factors influencing the cover crop selection process

- Objectives
- Cover crop should complement the following crop:

Examples:

- cereal rye will immobilize N if not terminated in the early vegetative growth stages.
- cereal rye before soybeans - will build OM, provide weed control and moisture conservation
- Method and timing of planting
- Use the Midwest Cover Crop Selector Tool <http://www.mccc.msu.edu/selectorINTRO.html>

Producers should NOT expect to reduce nitrogen rates in the first few years. A 5 year cover crop plan may be necessary before you really see results then might be able to reduce N rate.

Below ground cover crop growth may be MORE important than above ground vegetation. DIG!

Cover Crop growth depends on a variety of factors

- Planting date
- Nitrogen available to scavenge
- Moisture availability
- Temperature (higher temperature = more growth)

Seeding and establishment considerations

- Manage spring herbicides for fall cover crop - Consider possible herbicide carryover – dry conditions or late herbicide application
- Utilize Crop Selector Tool to determine windows for seeding dates
- Helicopters are not suitable for aerial seeding of cover crops.
- Generally cover crops will need sunlight within 2-3 weeks of seeding date. Watch corn maturity.

- Cover crop should be seeded into soybeans at or just prior to leaf drop.
- Drilling will generally provide better results than aerial application but is limited by harvest date and acreage to be planted.
- Wind speed with aerial application should be less than 7 MPH.
- Effective aerial seeding will depend on plane elevation, spreader/diffuser and pilot experience
- Variable seed size does NOT mix well with aerial application – peas & annual rye grass

Aerial seeding of cover crops – consider advanced notice to neighbors.

- Producers should be prepared to control “escapes” on neighbors.
- Off-target aerial seed application should be anticipated.

Potential issues with Cover Crops

- Window for termination may be limited by environmental conditions – wet, dry, windy
- Starter fertilizer may be critical when planting corn with No-till and cover crops
- Establishment of spring strips in annual rye grass may be difficult
- Can deplete soil moisture (especially in a dry spring)
- Can result in planter issues – possible need for more aggressive row cleaners or additional down pressure to create seed slot
- Nitrogen can be tied up/not available for following crop (especially with mature cereal rye)
- Potential for increased insect problems – cutworm, armyworm, etc. Crop scouting is important.
- Cover crop can become a “weed” the following year
- Potential for increased disease – Example: Hairy Vetch may result in increased incidence of White Mold and higher nematode numbers.
- Some cover crop mixes may increase vole damage – planting populations and total residue production can be reduced to reduce potential vole damage
- Caution should be used to assure that residue levels required for compliance are maintained
- Use of cover crops can have negative implications for crop insurance and FSA ACRE program

Cover crops can impact plant diseases - Pathogens can either be enhanced or inhibited by cover cropping systems. The impact of the cover crop on the pathogen will depend upon the nature and life cycle requirements of the pathogen. For example, if the pathogen survives best on surface residue and the cover crop is left on the surface as a mulch, the level of disease may increase. On the other hand, increases in soil organic matter content can enhance biological control of soil-borne plant pathogens through direct antagonism and by competition for available energy, water, and nutrients. In experiments in Georgia, *Sclerotium rolfsii* was reduced in cover cropped, no-till systems.

Organisms that cause disease can be affected by decreases in temperature, increases in moisture, reductions in soil compaction and bulk density, and changes in nutrient dynamics. Whether or not the cover crop is taxonomically related to the subsequent crop will also influence whether or not disease cycles are interrupted or prolonged. Some cover crops have also been shown to reduce nematode populations, including velvetbean, sorghum-sudangrass, and sun hemp.

Cover crops can also impact insect populations either negatively or positively - Cover crops attract beneficial and pest insects into cropping systems. Both can disperse to cash crops when the cover crop matures or dies. Prior to the arrival of important insect pests, beneficial insects attracted into an area by a cover crop may reach sufficient population densities to maintain pest populations in adjacent crops below economic threshold levels. Research in Georgia reported high densities of bigeyed bugs, lady bugs, and other beneficial insects in vetches and clovers. It has also been reported that assassin bugs

have destroyed Colorado Potato Beetle feeding on eggplant planted into strip-tilled crimson clover.
<http://www.ces.ncsu.edu/depts/hort/hil/hil-37.html>

Points on Termination:

Early kill is most effective, resulting in high nutrient content and quick decomposition.

Early kill – 3 or more weeks before planting

- Smaller plants
- Greater insect and pest suppression
- Better moisture conservation
- Easier time management

Late kill – less than 3 weeks before planting

- Maximum biomass
- Maximum root growth
- Increased herbicide activity
- Larger size plants may be more difficult to control

Producers should have multiple plans for cover crop termination – not just one!

- If field conditions are too wet does producer have access to an ATV sprayer or is aerial application of herbicide possible?
- Timely termination is critical. Producers must be flexible and be able to adapt to whatever environmental conditions exist when it's time to terminate the cover crop.
- Need to be patient with early kill – longer kill reaction time due to cooler weather

Comments on specific cover crop species

- Cereal Rye - Maximum height in spring before kill is 15 inches.
- Crimson clover – appears to be winter hardy, maximum Nitrogen fixation is at bloom, around May 1st
- Austrian Winter Peas – maximum nitrogen at bloom, Virus can be a problem.
- Radish – don't plant alone (odor problems enhanced)
- Annual Rye Grass – aggressive and may dominate other species in a cover crop mix

Issues and concerns associated with Annual Rye Grass (ARG)–

- Many seed sources do not use pure varieties. Many Annual Ryegrass products are actually blends of more than one variety which can result in a mix of germinations periods and plant maturities. This makes termination difficult. Do not plant annual ryegrass on fields that are routinely rotated with wheat if the varieties and relative maturities of the varieties in the seed product cannot be determined.
- The following are criteria for successful termination of ARG when using glyphosate – Do it right the first time!!
 - Kill pre-joint or as first joint is forming (joint at ~7-10 inches height) – but actively growing!!
 - If grazed, allow regrowth to reach 6 inches before herbicide treatment
 - A 3-4 day period of daily high temperatures above 55 degrees
 - Daily low temperatures above 40 degrees
 - Watch for fluctuating temperatures!

- Spray herbicide at a full rate (4" top growth might have 42" root depth – need to kill roots not just vegetation)
- Antagonism with glyphosate can occur when tank mixed with certain herbicides.
- Wait for plant to dry before herbicide application
- Use Ammonium Sulfate
- Use 10 gals of water or less
- Spray on sunny day
- Spray BEFORE 2 PM (needs at least 4 hours of sunlight to get a good kill)

NOTE: plants "damaged" but not killed may NOT effectively translocate herbicide when re-sprayed

- Current demand for ARG has reduced or eliminated the normal 1 year conditioning period.
 - Non-conditioned ARG may have 10% or more latent (dormant) seed which could germinate a year or more after planting
 - Watch for rye grass in all fields seeded to AGR fall 2012

Decomposing radishes will produce an offensive "natural gas like" or "rotten egg like" odor.

- Watch field location to avoid issues with neighbors and communities.
- Large taproots release more odor (roots with diameter greater than 2 inches)
- Radishes perform best in a mix rather than single species seeding.
- A cover crop mix will reduce the radish seeding rate – reducing potential odor and lowering cost.

Watch variety selection when purchasing radish for cover crop.

- In one instance a producer was sold red garden radish seed.

If using radish in a mix, general consensus indicates seeding date needs to be prior to September 20th in Central IL and prior to September 10th in Northern IL.

- General recommendation is the earlier the better to insure adequate taproot development.
- Ideal taproot size seems to be between ¾ to 2 inches.

Sample plan to get started with Cover crops

1. Cereal rye into corn stalks – seed with vertical tillage tool or no-till drill
2. Plant soybeans into cereal rye – consider early maturing soybean for greater window to plant fall cover crop
3. Plant low C:N ratio mix – Oat/Radish mix – plant after soybean harvest
4. No-till corn into field – use starter Nitrogen and fertilizer at planting