



COVER CROP MANAGEMENT



Cover Crop Benefits

Retaining Nitrogen and Phosphorous

Excess nitrates and soluble phosphorous are taken up and used by cover crops. Organic residues from crop crops will hold particulate phosphorous in the soil. This keeps nutrients in the soil profile and out of surface and ground waters.

Weed Suppression

Cereal grains, particularly cereal winter rye, make an effective barrier to weeds by blocking sunlight. Other cover crops, like radishes, can excrete natural weed suppressing chemicals.

Erosion Control

Cover Crops reduce soil erosion in many ways:

- Reduce rain drop impact
- Increase water infiltration
- Trap and secure crop residues
- Improve soil aggregate stability

Soil Health

Cover crops have many benefits to soil health, such as:

- Increased organic matter
- Increased soil biodiversity
- Breakup compacted soil layers
- Increase infiltration
- Increase soil aeration
- Increase in earthworms



Cover Crop Grazing

Grazing cover crops improves soil health more rapidly than cover crops alone. This is because livestock adds manure to the system that creates a beneficial environment and adds more organic-matter to the soil. This is a cost-effective way to use cover crops in an operation. **Check with Iowa State University Publication Crop 3082 “Herbicide Use May Restrict Grazing Options for Cover Crops.” Or Iowa State University Extension Specialist before grazing cover crops.**

Use grazing in the spring to:

- Terminate cover crop
- Convert biomass to manure
- Increase profits

Begin grazing when cover crop is 6 inches or taller.

Planting Preparation

Before planting cover crops in the fall, be sure to:

- Have residue spread evenly before or just after broadcast seeding.
- Spray any weeds that may interfere with cover crop establishment

Be sure to follow manufacturer’s label rates and guidelines when applying herbicide. Work with Iowa State University Extension Specialist to determine best timing and rate. **Herbicide carryover from a previous crop can cause issues with cover crop establishment.**

Seed Selection

Table 1. Suitability of Cover Crop Species

Species	Erosion Fighter	N Scavenger	Weed Fighter	Good Grazing	Quick Growth	Soil Builder
Cereal Rye	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Triticale	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Winter Wheat	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Annual Ryegrass	Good	Good	Good	Very Good	Very Good	Very Good
Hairy Vetch	Good	Good	Fair	Poor	Fair	Good
Oats	Very Good	Very Good	Good	Very Good	Excellent	Very Good
Oilseed Radish	Fair	Very Good	Good	Good	Excellent	Good
Oriental Mustard	Fair	Very Good	Good	Poor	Very Good	Good
Rapeseed	Fair	Very Good	Good	Poor	Very Good	Good
Turnip	Fair	Very Good	Good	Good	Excellent	Good
Barley	Very Good	Very Good	Good	Very Good	Excellent	Very Good
Red Clover	Good	Good	Good	Very Good	Good	Very Good
Alfalfa (dormant)	Good	Good	Good	Very Good	Good	Good

Midwest Cover Crop Council -Cover Crop Decision Tool- Cover Crop Selector for Iowa Counties

Seeding

Cover Crop Establishment

Cover Crop success is dependent on several factors:

- Seeding date
- Weather
- Seedbed conditions
- Fertility
- Mulch/ previous residue amounts
- Planting depth
- Seed to soil contact
- Seeding rate
- Insects and disease

Table 2. Seeding Depth Guidance

Groups	Optimum	Maximum	Surface Application
Brassicas, clovers, small seeded legumes, small seeded grasses	1/4"	3/4"	yes
Vetches, sorghums	1/2"	1"	yes
Cereal Grains	3/4"	1 1/2"	yes
Beans, peas	1 1/2"	2"	no

General seed groupings by application recommendations

Group 1: Small grains (cereal rye, wheat, barley, oats, and triticale)
Seed sources are plentiful and relatively inexpensive. When moisture is present they germinate quickly and easily.
Group 2: Ryegrass (annual and perennial)
Benefits from rain just after being broadcast. If using for forage or grazing increase seeding rate.
Group 3: Small seeded brassicas
Should be established early to ensure a successful stand is established before it is terminated over winter.
Group 4: Sorghum - Sudan and millet
Require warm and moist soil conditions with soil temperatures above 65 degrees
Group 5: Small seeded legumes
Most successful when drilled in to seed bed.
Group 6: Large seeded legumes
Not recommended for aerial seed application. Successful stand is achieved when drilled in or incorporated.

No-till Drilling

(Post-Harvest) Use the right type of drill. Make sure it can handle heavy residue and the type of cover crop planted. Check depth controls of drill regularly for optimum depth. Check soil conditions before planting; wet soils can cause improper seed placement.

Benefits:

- Creates uniform stands
- Higher rate of success

Considerations:

- Less growing degree days
- Slower option

Narrow Row Planting:

(Post-Harvest) Split-row or narrow row planters, like those used for sugar beets and sorghum, can be fitted with a seed plate to plant cover crops. Be sure to calibrate planter for specific seed.

Benefits:

- Fast emergence
- Consistent stand
- Uses multiple species
- Good seed to soil contact

Consideration:

- Less growing degree days
- Causes disturbance to soil
- Uses existing equipment

Harrow Seeding:

(Post-Harvest) Air delivery seeders mounted on a rotary harrow, coulter harrow, or vertical tillage tools can be used to plant cover crops.

Implements should not be set to run deeper than 1" and should not invert soil or bury residue. Coulters will be set to run straight.

Benefits:

- Many acres planted in short time
- Good seed to soil contact

Considerations:

- Causes disturbance to soil
- Less growing degree days

Broadcast Seeding:

(Post-Harvest) Broadcast seeding is an easy way to plant cover crops. Seed may be mixed with fertilizer, or pelletized lime using an airflow applicator. **When seed is blended with fertilizer, spread immediately to prevent damage to seed.** Winds speeds of 15 mph or less are need to broadcast lighter seed.

Benefits:

- Inexpensive option
- Uniform application
- Little soil disturbance

Consideration:

- Only fair seed to soil contact
- Success dependent on soil conditions
- Less growing degree days

Above considerations are based on average grain corn and soybean crop harvest dates. If harvesting seed corn, silage, or a small grain there will be more growing degree days available.

Planes:

Aerial seeding with a plane has become a popular and simple way to establish cover crops.

Benefits:

- More growing degree days
- Many acres planted in a short time
- Good options for seed mixes

Considerations:

- Only fair seed to soil contact
- Success is dependent on soil conditions

Helicopter:

This can be an effective way to aerial seed cover crops before harvest, if available.

Benefits:

- Good option for seed mixes
- More growing degree days
- Better for small fields

Consideration:

- Only fair seed to soil contact
- Success dependent on soil conditions

High Clearance Vehicle:

Using a high-clearance sprayer can be a great tool for farmers to establish cover crops into standing row crops.

Benefits:

- Good seed coverage
- More growing degree days
- Good option for seed mixes

Considerations:

- Can damage standing crop
- Time consuming
- Limited by wet soil conditions

Aerial seed into soybeans when leaves start to yellow and into corn after 1/2 milk line is reached

Termination

Most cover crops will not be harvested therefore, they will need to be terminated before the next crop is established. Check with the Risk management Agency (RMA) to ensure that cover crop's management is compatible with crop insurance and/or USDA program criteria. (see "NRCS Cover Crop Termination Guidelines")

Herbicide: If terminating cover crops with herbicide, be sure to follow all federal, state, and local guidelines and the manufacture's label. **Herbicides should not be applied until day time temperature is above 55 and night time temperatures are above 45.** If application is made during colder weather, it should be applied between 9:00 am and 3:00 pm. For additional information, contact local consultants or ISU Extension Specialist. **Always apply herbicide according to the labeled directions.**

Mechanical: If using mowing, crimping, haying or tillage to terminate cover crops, make sure the practice is effective for the cover crop planted.

Frost: There are many cover crop species that will terminate with cold temperature. See Table. 5. for cover crops that are not winter hardy. For more information see Midwest Cover Crop Council- Cover Crop Decision Tool. Cover crop selector and choose your County.

Operation and Maintenance

Determine if cover crop is meeting its purpose and adjust management to fit operation needs. This could mean changing cover crop species, planting method, or termination method.

Table 3. C: N Ratios

Material	C: N Ratio
Rye Straw	82:1
Wheat Straw	80:1
Oat Straw	70:1
Corn Stover	57:1
Rye Cover Crop (anthesis)	37:1
Pea Straw	29:1
Rye Cover Crop (vegetative)	26:1
Mature Alfalfa	25:1
Ideal Microbial Diet	24:1
Rotted Barnyard Manure	20:1
Legume Hay	17:1
Beef manure	17:1
Young Alfalfa	13:1
Hairy vetch Cover Crop	11:1
Soil Microbes	8:1

Relative Decomposition Rate
 slower
 faster

C: N ratios are helpful for determining when to terminate cover crops. If biomass and an increase in soil organic matter is the goal, high C: N ratios are desirable. This is achieved by delaying termination of cover crop. Remember, winter hardy grains like cereal rye can cause problem for corn crops by tying up nitrogen. Make sure that winter hardy grains are terminated early enough so they won't interfere with corn crop.

References

Midwest Cover Crop Council – Cover Crop Decision Tool- Cover Crop Selector for Iowa Counties

www.mccc.msu.edu/SelectorTool/2011CCSelectorTool.pdf

Sustainable Agriculture Research and Education (SARE) "Managing Cover Crops Profitably" www.sare.org/publications/.

PURE LIVE SEED (PLS)

How to calculate the bulk seed you need.

Example: You want to drill in 55lbs PLS of cereal rye

$(95\% + 3\%) \times 90\% = 88.2\%$ PLS

$(55\text{lbs} / 88.2\% \text{ PLS}) \times 100 = 62 \text{ Lbs./acre bulk seed}$

$$((\% \text{ Germination} + \text{Dormant}) \times \% \text{ Purity}) / 100 = \text{PLS}$$

EXAMPLE SEED TAG	
Cereal Rye	
Purity: 90.0%	Germ: 95.0%
Inert: 0.06%	Dorm: 3.0%
Weed: 0.0%	

Table 4. Winter Hardy Cover Crops PLS Lbs./ acre (Minimum Seeding Rate)

Species Common Name	Drilled	Broadcast with incorporation	Broadcast on Surface
Winter Cereal Rye	55	61	66
Triticale	55	61	66
Winter Wheat	55	61	66

Table 5. Non-Winter Hardy Cover Crops PLS Lbs./ acre (Minimum Seeding Rate)

Species Common Name	Drilled	Broadcast with incorporation	Broadcast on Surface
Alfalfa (dormant)	16	18	19
*Annual Ryegrass	12	13	14
*Hairy Vetch	12	13	14
Oats	60	66	72
Oilseed Radish	5	6	6
Oriental Mustard	3	3	4
*Rapeseed	3	3	4
Red Clover	10	11	12
Turnip	3	3	4
Winter Barley	60	66	72

Rates in Table 1 & 2 are for pure stands. For a cover crop mix, use the desired percentage of the pure stand to determine each species' seeding rate in the mix.

Example:

You want a mix that is 75% Rye and 25% Radish that will be broadcast surface seeded.

$0.75 \times 66\text{lbs (Rye)} = 50 \text{ lbs.}$ $0.25 \times 6\text{lbs (Radish)} = 2 \text{ lbs.}$

*Annual ryegrass, rapeseed, and hairy vetch may over winter and require termination in the spring.

***If using a non-winter hardy plant in your cover crop mix, use the non-winter hardy planting date. ***

Table 6. Seeding Dates for Drilled or Incorporated Cover Crops

Zones	Winter Hardy Cover Crops	Non-Winter Hardy Cover Crops
1	October 21 st	September 9 th
2	October 28 th	September 16 th
3	November 5 th	September 23 rd

Table 7. Seeding Dates for Surface Broadcast (No Incorporation) Cover Crops

Zones	Winter Hardy Cover Crops	Non-Winter Hardy Cover Crops
1	October 14 th	September 2 nd
2	October 21 st	September 9 th
3	October 28 th	September 16 th

Iowa Cover Crop Planting Zones

