

Cover Crop

Common Species and Properties of South Dakota

A cover crop is a crop generally grown at times of the year when cash crops are not actively growing. Covers are planted primarily to improve soil fertility, soil quality, control weeds, improve water infiltration, break up pest and disease cycles, and reduce soil erosion. Cover crops are also used to manage water, improve water quality, provide wildlife habitat, and extend the grazing season. Many farmers have discovered the economic benefits of incorporating cover crops into their farm operation. Cover crops can be adjusted to the objective of exactly what the producer needs.



Hoyle Farm, Edmunds County
Dennis Hoyle is using a cover crops cocktail to address soil compaction and improve organic matter to rejuvenate his hay land. In this photo, NRCS' Val De Vine shows how the radish root had grown down until it reached the "plow pan" layer. In September, Dennis intensively grazed this field to harvest the forage and build organic matter through the manure.



Schoenrock Farm, Hanson County
Justin Schoenrock drilled this rye after corn harvest in 2015 for the purpose of efficiently using the next spring's moisture all while managing saline spots, building OM, structure, infiltration, till, and cycling nutrients. On some of his fields he is also utilizing the rye for additional livestock forage. Weed control was very good and the soil temps were much lower than the neighboring fields that were black!



Namken Ranch, Hamlin County
Jared Namken explains that using cover crops has given him more options. "We've come a long way in the last few years." By incorporating the use of full season cover crops, Namken's rotational grazing system has helped save time and money while also giving his cattle high quality feed.



Cronin Farm, Potter County
Our cattle grazed a 12-way full season cover crop with biomass production at 8,200 lbs., and dry matter with 11% protein. We grazed this in January of 2017 with average temperature of 11° and with 34 inches of snow on the ground. Our goal was to leave 33% biomass which we were able to do. This field was set up with 5 paddocks grazed for 40 days contributing \$1.26 on the feed cost per day for 675 cows. If we would have had a normal winter this cover would have been our cattle's full feed.



Smith Farm, Davison County
This cover crop mix included barley, dwarf essex rape, soybeans, flax, oats, and radishes. It was a Prevent Plant field which was seeded on 7/25/2016. There was excellent growth. He grazed it overwinter and pulled cows late in March. Excellent grazing and left 1 ton of residue to help with the salinity issue.



Heber Farm, Spink County
J.P. and Holly Heber are using soil biological activity to prepare their soil for the next year's spring planting. They precision planted cover crops to stimulate biology and decomposition in the narrow strip where they'll be planting next year's crops. Meanwhile, they used a mix of cover crops between the rows that will leave a higher stubble for snow catch, but also protect against wind and water erosion.



Nehl Farm, Corson County
Robert Nehl planned and implemented a no-till and cover crop plan for his land in 2014. "The wheat I had in 2014 was the best I ever had where there was cover crops," he said. "It was the nicest wheat I saw all year long." Robert said the success of that first cover crop, an 8-species variety, was fueled by some nice rains. The cover crop mix he used was turnips, radishes, lentils, winter peas, sweetclover, oil sunflowers, sorghum sudan grass and forage oats.



Rausch Farm, Potter County
Rausch farms used cover crops to elevate platy soil structure in their silt loam dominated soils. Fibrous root cover crops such as oats address the adverse effects of platiness. Platiness isn't necessary compaction, but the soil may have similar symptoms (reduced root growth).



Stehly Farm, Davison County
This field had winter rye flown on 9/5/2016 for the purpose of efficiently using the next spring's moisture all while managing saline spots, building OM, structure, infiltration, till, and cycling nutrients. Added bonus of better managing next years weed growth as well. We're hoping to get 2 years of weed suppression too.



Williams Ranch, Pennington County
Monty Williams is using cover crops to revive the soil in his hay/crop fields. The cover crops are improving soil structure as well as increasing organic matter which will in turn lower future input costs. The cover crops are also providing additional grazing or haying opportunities with a high quality forage (including sorghum/sudan, oats, winter wheat, millet, radish, and turnip in various mixes) and rest to rotationally grazed pastures.



Arnoldy Farm, Lyman County
Mike Arnoldy planted flax, Indian head lentil, and rapeseed into wheat that was harvested with a stripper head.



Jorgensen Land & Cattle Partnership, Tripp County
In 2014, the Jorgensens installed 26 miles of new fence around their cropland acres. "We have seen a savings of \$1.50 head/day (or a 70% reduction) in feed cost alone when grazing instead of confining and feeding. Take that over roughly 1,000 head per year (so effectively around 3,000 head) for 60 days per animal, and we have gotten about \$250,000 in saved feed costs since the fence was put in 2014. And that's lowballing it" says Nick Jorgensen.



Bainbridge Farm, Davison County
Matt and Neal Bainbridge, along with their father, Louis, plant into last season's cover crops through their no-till drill. In this photo, they had burned down the cover crop prior to planting. The NRCS infiltration tests showed success. Through the use of cover crops, they are seeing results with better infiltration and soil structure.

What is the Primary Purpose of the Cover Crop

	Purpose	Erosion Reduction	Increase soil organic matter	Capture, recycle, redistribute nutrients in soil	Promote biological nitrogen fixation	Salinity tolerance	C:N Ratio	Attract Beneficial Insects	Mycorrhizal fungi association	Weed suppression	Provide supplemental hay	Provide supplemental grazing	Rooting Depth / Plant Water Use / 1	Minimize / reduce soil compaction	Seed size (Large or Fine)	Crop Type and Seeding Dates / 2 / 3	Full Seeding rate, lbs/acre / 4	Seeding depth, inches
Cool Season Broadleaf	Alfalfa	G	G	G	Y	P	L	Y	M	G	F	F	DH	G	F	CB	6.5	.25 - .75
	Alsike clover	G	F	G	Y	P	L	Y	M	G	F	F	SL	P	F	CB	3	.25 - .75
	Brassica hybrids	F	F	G	N	G	L	Y	N	G	F	F	MM	G	F	CB	7	.25 - .5
	Canola	F	F	G	N	G	L	Y	N	P-G**	F	F	MM	G	F	CB	5	.25 - .75
	Chickling vetch	G	F	G	Y	P	L	Y	M	F	F	F	SL	F	L	CB	50	.5 - 1.5
	Common vetch	G	F	F	Y	P	L	Y	M	P	F	F	SM	F	L	CB	25	.5 - 1.5
	Crimson clover	G	F	G	Y	P	L	Y	M	G	G	G	SM	F	F	CB	15	.25-.75
	Ethiopian cabbage	F	F	G	N	G	L	Y	N	F	F	F	MM	G	F	CB	5	.25 - .75
	Flax	F	F	F	N	F	H	Y	H	P	P	P	SM	P	F	CB	30	.25-.75
	Hairy vetch	G	F	G	Y	P	L	Y	M	P	F	F	SM	F	L	CB	15	.5 - 1.5
	Kale	F	F	G	N	G	L	Y	N	G	F	F	MM	G	F	CB	4	.25 - .5
	Lentils	P	P	F	Y	P	L	Y	M	P	F	F	SL	P	F	CB	30	1-1.5
	Mustard, oriental or brown	F	F	F	N	P	M	Y	N	G	F	F	MH	F	F	CB	6	.25 - .75
	Mustard, tame yellow	F	F	F	N	P	L	Y	N	G	F	F	MH	F	F	CB	12	.25 - .75
	Peas	P	P	P	Y	P	L	Y	M	F	G	F	SL	P	L	CB	70	1.5 - 3
	Radishes	P	P	G	N	P	L	Y	N	G	P	G	DH	G	F	CB	8	.25 - .5
	Rapeseed	F	F	G	N	G	L	Y	N	F	F	G	MM	G	F	CB	5	.25 - .75
	Red clover	G	F	G	Y	P	L	Y	M	G	F	F	SL	P	F	CB	5	.25 - .75
	Sugar beets	P	P	G	N	G	L	N	N	F	P	G	DH	G	F	CB	4	.25 - .5
	Sweet clover	G	F	F	Y	F	L	Y	M	F	P	F	MM	F	F	CB	4	.25 - 1
Cool Season Grass	Turnips	P	P	G	N	P	L	Y	N	G	P	G	DH	G	F	CB	4	.25-.5
	White clover	G	F	G	Y	P	L	Y	M	G	F	F	SL	P	F	CB	1.5	.25 - .75
	Winter camelina	F	F	G	N	P	L	Y	N	F	P	P	ML	G	F	CB	3	.25-.5
	Annual Oregon ryegrass	F	G	G	N	F	M	Y	L	F	G	G	MM	P	F	CG	15	.5-1.5
	Barley	G	G	F	N	G	M	Y	M	G	F	F	MM	F	L	CG	50	.75 - 2
	Oats	G	G	F	N	F	M	N	M	F	G	F	MM	F	L	CG	70	.5 - 1.5
	Spring wheat	G	G	G	N	F	M	Y	M	G	F	F	MH	F	L	CG	60	.5 - 1.5
Warm Season Broadleaf	Tall wheatgrass	G	G	G	N	G	H	N	M	G	G	G	DH	F	L	CG	13	.25 - 1
	Triticale	G	G	G	N	G	M	Y	M	G	F	F	MH	F	L	CG	60	.5-1.5
	Winter wheat or rye	G	G	G	N	G	M	Y	M	G	F	F	MH	F	L	CG	60	.75 - 2
	Buckwheat	G	F	G	N	P	L	Y	N	G	P	P	SL	P	F	WB	50	.5 - 1.5
	Cowpeas	P	P	F	Y	P	L	Y	M	G	F	F	SL	F	L	WB	30	1 - 1.5
	Dry beans	P	P	F	Y	P	L	Y	M	G	F	F	SL	F	L	WB	30	1 - 1.5
	Safflowers	F	F	G	N	F	M	Y	M	F	P	P	DM	F	L	WB	30	.5-1
Warm Season Grass	Soybeans	P	P	F	Y	P	L	Y	M	P-G**	F	F	SM	P	L	WB	35	1-1.5
	Sunflowers	F	F	G	N	F	M	Y	M	F	P	G	DM	F	L	WB	7	.5-1
	Sunn hemp	F	F	F	Y	P	L	Y	Y	G	P	P	DM	F	L	WB	15	1.5-2
	Corn	G	G	G	N	P	H	N	H	P-G**	F	F	DH	G	L	WG	12	1-1.5
	Forg. Sorghum/sudan hybrids	G	G	G	N	F	M	Y	H	G	G	F	MM	G	L	WG	15	.5 - 1.5
	Grain sorghum	G	G	G	N	F	M	Y	H	G	G	F	MM	G	L	WG	5	.5 - 1.5
	Millet	G	G	F	N	P	M	N	H	G	G	F	SL	F	F	WG	25	.25-.75
	Sudangrass	G	G	G	N	F	M	Y	H	G	G	G	MM	G	L	WG	20	.5 - 1.5
	Teff grass	F	G	F	N	P	M	N	N/A	F	G	F	SM	P	F	WG	5	.13 - .25

/1 Rooting Depth/Water Use
SL= Shallow rooted/Low water use
SM= Shallow rooted/Medium water use
SH= Shallow rooted/High water use
ML= Medium rooted/Low water use
MM= Medium rooted/Medium water use
MH= Medium rooted/High water use
DL= Deep rooted/Low water use
DM= Deep rooted/Medium water use
DH= Deep rooted/High water use

/2 Crop types
CG= cool season grass
CB= cool season broadleaf
WB= warm season broadleaf
WG= warm season grass

Shallow 6 - 18 inches
Medium 18 - 24 inches
Deep 24 + inches

Ratings
L= Low
M= Medium
H= High
Y= Yes
N= No or None
N/A= Not Available
*Variable depending on seed size and row spacing.
**Poor weed competitor, but herbicide-tolerant varieties are available.

/3 Seeding Dates
April 1 through May 15 – predominantly cool-season species
May 15 through August 1 – predominantly warm-season species
August 1 through October 1 – predominantly cool-season species
Seeding dates fluctuate annually. The dates listed above are averages that maybe changed
10 days in either direction depending on current climatic conditions

/4 Full Seeding rates
Multiply by the percent desired if mixtures are used.

/5 Buckwheat contamination
To reduce chances of buckwheat contamination in wheat do not rotate to wheat for grain for 2 years.

Source: USDA Natural Resources Conservation Service South Dakota, Field Office Technical Guide, Agronomy, Cover Crops, Table 1.

Cover Crops

Considerations when using cover crops:

- What is the primary purpose of the cover crop?
Refer to the USDA NRCS SD Cover Crops Table 1.
- What crop type will the following cash crop be?
The majority of the cover crop mix should be an alternate crop type.
- Do you include warm season species or not?
If planting later than about August 10, do not include warm seasons.
- Would you like any species to overwinter?
Cereal grains most consistently overwinter i.e. rye, winter wheat, triticale, etc.
- What is the primary purpose of the cover crop?
Graze, Building Organic Matter, or Compaction, etc.

- Review the "half life" of previously applied herbicides.
Herbicides break down by microbes, sunlight, OM level, pH, etc.
- For overwinter cover crops, refer to NRCS Cover Crop Termination Guidelines
Termination Zone Map, Considerations, and Definitions.
- Seeding Timing Options
Drill after small grain/silage/corn/soybeans; aerial interseeding, or full season.
- See the Seed Supplier List on the SD No Till Association website at www.sdnottill.com.



Dwarf Essex Rapeseed

(*Brassica campestris/Brassica napus*)
Cool Season, broadleaf

- Good for grazing
- Good cold tolerance for late season grazing
- Large Tap root
- pH tolerance 5.5–8.3
- Occasionally overwinter with mild winter conditions
- Flood tolerance Low, especially during establishment
- High Drought tolerance
- The minimum soil temperature for planting is 45°F
- Fits well into rotations with non-brassica crops



Common Vetch

(*Vicia sp.*)

Cool Season, broadleaf

- Annual or biennial
- Good for grazing
- Prostrate plant architecture (vine)
- Common Vetch is different than Hairy Vetch or Chickling Vetch
- Poor salinity tolerance
- Seeding depth: 1 ½ – 2 ½ inches
- Crude protein: 13-20%
- Low C:N ratio
- Forms arbuscular mycorrhizal associations
- Attracts pollinators



Cereal Rye

(*Secale cereale*)

Cool Season, grass

- Winter annual
- Very good rating to increase Organic Matter
- High water use
- Good salinity tolerance
- Seeding depth: ¼ – 2 inches
- Crude protein: straw 4%, grain 14%
- Medium C:N ratio
- Forms arbuscular mycorrhizal associations
- Assists in weed control for subsequent crops
- Rated 'very good' at scavenging nitrogen from the soil



Flax

(*Linum usitatissimum*)

Cool Season, broadleaf

- Annual
- High C:N ratio
- Medium water use
- Fair salinity tolerance
- Seeding depth: ½ – 1 ½ inch
- Benefits from arbuscular mycorrhizal associations
- Flowers attract pollinators



Cowpea

(*Vigna unguiculata*)

Warm Season, broadleaf

- Annual
- Legume (N-fixation)
- Resembles or looks like soybean
- Good for grazing
- Low water use/shallow rooted
- Fair salinity tolerance
- Seeding depth: ¾ – 1 inch
- Crude protein: grain and leaves 19-30% – stems 13-17%
- Low C:N ratio
- Forms arbuscular mycorrhizal associations
- Attracts pollinators



Oats

(*Avena sativa*)

Cool Season, grass

- Annual
- Good at increasing Organic Matter
- Fair salinity tolerance
- Seeding depth: .5 – 1.5 inches
- Crude protein: hay 9-15%, grain 13-18%
- Forms arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated 'very good' at scavenging nitrogen from the soil



Radish

(*Raphanus sativus*)

Cool Season, broadleaf

- Annual
- Good for grazing
- High water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: 26-30%
- C:N ratio: low 19 – 20
- Does not form arbuscular mycorrhizal associations
- Rated 'very good' at scavenging nitrogen from the soil
- Flowers attract pollinators



Field Pea

(*Pisum sativum arvense*)

Cool Season, broadleaf

- Annual
- Legume (N fixation)
- Good for grazing
- Low water use
- Poor salinity tolerance
- Seeding depth: 1 – 3 inches
- Crude protein: hay 14%, grain 24%, silage 15%
- Low C:N ratio
- Forms arbuscular mycorrhizal associations
- Flowers attract pollinators



Pearl Millet

(*Pennisetum glaucum*)

Warm Season, grass

- Annual
- Excellent for increasing Organic Matter
- Good for grazing
- Poor salinity tolerance
- Seeding depth: ½ – 1 inch
- Crude protein: hay 13%
- Forms arbuscular mycorrhizal associations
- Potential for accumulating toxic levels of nitrate, especially on the lower 6" of the stalks



Turnip

(*Brassica rapa L. var. rapa*)

Cool Season, broadleaf

- Good Cold Tolerance
- Good for grazing
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: tops 16%, root 12-14%
- Low C:N ratio
- Does not form arbuscular mycorrhizal associations
- Rated 'good' at scavenging nitrogen from the soil
- Flowers attract pollinators



Annual Ryegrass

(*Lolium multiflorum*)

Cool Season, grass

- Good at increasing Organic Matter
- Seeding rate is much less than cereal rye
- Deep rooted - Good at scavenging nutrients from the soil profile
- Desirable for grazing but often less biomass than other grasses
- Has been used in aerial seeding into a standing crop
- Can overwinter with spring control difficult
- Cross-pollinate freely, and many different types have developed
- It does not withstand hot, dry weather or severe winter



Sorghum-Sudangrass

(*Sorghum bicolor*)

Warm Season, grass

- Annual
- Good for silage, grazing or hayed
- Excellent for increasing Organic Matter
- High tonnage potential
- Fair salinity tolerance
- Seeding depth: 1 inch
- Crude protein: hay 7-11%, silage 6-17%
- Medium C:N ratio
- Forms arbuscular mycorrhizal associations
- Rated 'Excellent' at nutrient scavenging
- Stress conditions that limit growth (e.g., drought, frost) can contribute to prussic acid accumulation in leaves