Cover Crop Chart

GROWTH CYCLE	RELATIVE WATER USE	PLANT ARCHITECTURE
A = Annual	= Low	♈ = Upright
B = Biennial	= Medium	✱ = Upright-Spreading
P = Perennial	= High	≈ = Prostrate

----------Cool Season---------- ----------Warm Season----------

---Grass---								---Grass---
A Barley ♈	----------Broadleaf----------							A Pearl millet ♈
A Oat ♈	A Phacelia ♈						A Amaranth ♈	A Foxtail millet ♈
A/P Ryegrass ♈	A Flax ♈		----------Legumes----------				A Buckwheat ♈	A Proso millet ♈
A Wheat ♈	A Spinach ✱	B Turnip ✱	A Field pea ♈	A Berseem clover ♈	A/P Medic ✱	A Chickpea ✱	A Sunflower ♈	A Sudan grass ♈
A Cereal rye ♈	A Kale ✱	A Radish ✱	A Lentil ✱	B/P Red clover ♈	P Birdsfoot trefoil ≈	A Cowpea ✱	A Safflower ♈	A Teff ♈
A Triticale ♈	A/B Canola ✱	B Beet ✱	A Lupin ♈	P White clover ♈	P Sainfoin ♈	A Soybean ✱	A Squash ≈	A Grain sorghum ♈
A Annual fescue ♈	A/P Mustard ✱	A/B Carrot ✱	A/B Vetch ≈	A/B Sweetclover ♈	P Alfalfa ♈	A Mung bean ✱	P Chicory ✱	A Corn ♈

◈ *Additional Information*

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Cover Crop Chart

The Cover Crop Chart is produced and distributed by the staff of the Northern Great Plains Research Laboratory at Mandan, ND.

The Cover Crop Chart represents a compendium of information from multiple sources in the U.S. and Canada. Primary sources of information included the Midwest Cover Crops Council, USDA-SARE, USDA-NRCS PLANTS database, and relevant peer-reviewed journal articles. Designation of warm/cool season crops is based on prevalent growth habits rather than photosynthetic pathway. Ranges for seeding depth take into consideration moisture conditions at planting and variation in soil texture. Values for crude protein and C:N ratio assume homogenous samples of aboveground plant material unless stated otherwise. Information on specific crops is occasionally generalized, approximate, and/or incomplete and may not reflect performance in on-farm conditions. USDA-ARS makes no guarantee to the performance of specific crops based on information provided herein. Content and data for crops were assembled by Holly Johnson and Mark Liebig with input from Dave Archer, Heather Dose, Marvin Hatzenbuhler, John Hendrickson, Robert Kolberg, Steve Merrill, Kristine Nichols, Delmer Schlenker, Marty Schmer, Eric Scholljegerdes, Don Tanaka, Cal Thorson, and Dawn Wetch. Chart design by Mark Liebig, Holly Johnson, and Jill Gunderson. The Cover Crop Chart was generated with input from producers and technicians in the Area IV Soil Conservation Districts of North Dakota and NRCS staff at the Bismarck and Dickinson Field/Area Offices.

AREA 4 SCD

- **Useful cover crop resources:**
  - **Managing Cover Crops Profitably, 3rd Ed. Andy Clark (Ed.). Handbook Series Book 9, Sustainable Agriculture Network, Beltsville, MD.**
  - **http://www.mccc.msu.edu = Midwest Cover Crops Council**
  - **http://www.sarep.ucdavis.edu = SARE, University of California-Davis**
  - **http://www.plants.usda.gov = USDA-NRCS, PLANTS Database**

For further information please contact:
Cover Crop Chart
USDA-ARS Northern Great Plains Research Laboratory
P.O.Box 459 Mandan, ND 58554-0459
Voice: 701 667-3000 FAX: 701 667-3054.
www.mandan.ars.usda.gov

NGPRL

Barley (*Hordeum vulgare* L.)

- Cool Season, grass
- Annual
- Upright plant architecture
- Low water use
- Good salinity tolerance
- Seeding depth: ¾ – 2 inches
- Crude protein: hay 10-15%, grain 11-15%
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated 'very good' at scavenging nitrogen from the soil

USDA-ARS, NGPRL

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Oat (*Avena sativa* L.)

- Cool Season, grass
- Annual
- Upright plant architecture
- Medium water use
- Fair salinity tolerance
- Seeding depth: 1 – 2 inches
- Crude protein: hay 9-15%, grain 13-18%
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated ‘very good’ at scavenging nitrogen from the soil

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Midwest Cover Crops Council

Ryegrass (*Lolium sp.*)

Midwest Cover Crops Council

- Cool Season, grass
- Annual or perennial
- Upright plant architecture
- Major types:
  - Annual (Oregon, Italian, Australian, Common)
  - Perennial (English)
- Medium water use
- Fair salinity tolerance
- Seeding depth: ¼ – ½ inch
- C:N ratio: 14 – 40
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated 'very good' at scavenging nitrogen from the soil

Back to Cover Crop Chart

Wheat (*Triticum aestivum* L.)

- Cool season, grass
- Annual
- Upright plant architecture
- Includes spring and winter wheat varieties
- Medium water use
- Good to fair salinity tolerance
- Seeding depth: ½ – 1 ½ inches
- Crude protein: straw 4-10%, grain 12-16%
- C:N ratio: leaf 15-29, stem 31-65, root 24-74 , straw 80-95 [*end of season*]
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated ‘very good’ at scavenging nitrogen from the soil

USDA, NRCS, PLANTS Database

USDA-ARS, NGPRL

Back to Cover Crop Chart

Cereal rye (*Secale cereale* L.)

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- Cool Season, grass
- Annual
- Upright plant architecture
- High water use
- Good salinity tolerance
- Seeding depth: ¼ – 2 inches
- Crude protein: straw 4%, grain 14%
- C:N ratio: 40 – 48
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)
- Rated ‘very good’ at scavenging nitrogen from the soil

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Triticale

(*Triticale hexaploide* Lart.;*Triticosecale rimpaui* Wittm.)

- Cool Season, grass
- Annual
- Upright plant architecture
- Fall and spring types available
- High water use
- Good salinity tolerance
- Seeding depth: 1 ½ – 2 inches
- Crude protein: hay 9-16%, grain 17%
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)

Back to Cover Crop Chart

Annual fescue
(*Fetuca* sp.; *Vulpia myuros* L.)

- Cool Season, grass
- Annual
- Upright plant architecture
- Common names: Rattail fescue, Foxtail fescue
- Seeding depth: ¼ – 1 inch
- Crude protein: hay 8-10%
- Benefits from arbuscular mycorrhizal associations

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Phacelia (*Phacelia tanacetifolia* Benth.)

- Cool Season, broadleaf
- Annual
- Upright plant architecture
- Low water use
- Low salinity tolerance
- Seeding depth: ⅛ – ¼ inch
- C:N ratio: 10 – 15
- Grown as a nitrogen catch crop
- Attracts beneficial insects
- Will form arbuscular mycorrhizal associations

USDA, NRCS, PLANTS Database

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Flax (*Linum usitatissimum*)

- Cool Season, broadleaf
- Annual
- Upright plant architecture
- Medium water use
- Fair salinity tolerance
- Seeding depth: ½ – 1 ½ inches
- Benefits from arbuscular mycorrhizal associations
- Flowers attract pollinators

USDA-ARS, NGPRL

Back to Cover Crop Chart

Spinach (*Spinacia oleracea* L.)

- Cool Season, broadleaf
- Annual
- Upright and spreading plant architecture
- Low to medium water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: ≈20%
- C:N ratio: 6 – 8
- Sensitive to acid soils
- Belongs to the family Chenopodiaceae, which does not form arbuscular mycorrhizal associations

USDA, NRCS, PLANTS Database

Back to Cover Crop Chart

Kale (*Brassica napus* L. var. *pabularia*)

- Cool Season, broadleaf
- Annual
- Upright and spreading plant architecture
- Major types: Siberian, Russian
- Kales belong to same genus and species as canola
- Medium water use
- Fair salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: ≈30%
- C:N ratio: 10 – 30
- Does not form arbuscular mycorrhizal associations

Seed Ambassadors

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Canola (*Brassica napus*)

- Cool Season, broadleaf
- Major types:
  - Annual (spring-type)
  - Biennial (winter-type)
- Upright and spreading plant architecture
- Also referred to as rapeseed
- Medium water use
- Good salinity tolerance
- Seeding depth: ¼ – 1 inch
- Crude protein: hay 16%, grain 21%, silage 12%, pasture 17%
- C:N ratio: leaf 12-16, stem 21-37, root 24-43
- Does not form arbuscular mycorrhizal associations
- Rated 'very good' at scavenging nitrogen from the soil
- Flowers attract pollinators

USDA-ARS, NGPRL

Canola Council of Canada

Back to Cover Crop Chart

Mustard (*Brassica sp.* L.)

- Cool Season, broadleaf
- Annual or perennial
- Upright and spreading plant architecture
- Major types: brown, yellow, Indian, Oriental, etc.
- Low water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: hay 10%, grain 24-35%
- C:N ratio: 10 – 30
- Mustard is related to crambe which has a low water use requirement
- Does not form arbuscular mycorrhizal associations
- Rated ‘good’ at scavenging nitrogen from the soil
- Plants from the *Brassica* group have potential to release compounds or metabolic by-products that work as bio-toxins against bacteria, fungi, insects, nematodes, and weeds
- Flowers may attract honeybees, lygus bugs, and hoverflies

Midwest Cover Crops Council

Crambe: USDA-ARS, NGPRL

Back to Cover Crop Chart

Turnip (*Brassica rapa* L. var. *rapa*)

- Cool Season, broadleaf
- Biennial
- Upright and spreading plant architecture
- Root crop
- High water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: tops 16%, root 12-14%
- Closely related to rutabagas
- Does not form arbuscular mycorrhizal associations
- Rated ‘good’ at scavenging nitrogen from the soil
- Flowers attract pollinators

Bonnie Plants

AMPAC Seed Company

Mas du Diable, January 2009

Back to Cover Crop Chart

Radish (*Raphanus sativus*)

- Cool Season, broadleaf
- Annual
- Upright and spreading plant architecture
- Root crop
- Major types:
  - Oilseed (var. *oleiformis*)
  - Forage (var. *niger*)
- High water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: 26-30%
- C:N ratio: oilseed 19 – 20
- Does not form arbuscular mycorrhizal associations
- Rated ‘very good’ at scavenging nitrogen from the soil
- Flowers attract pollinators

University of Maryland Extension, Fact Sheet 824

Back to Cover Crop Chart

Beet (*Beta vulgaris*)

- Cool Season, broadleaf
- Biennial
- Upright and spreading plant architecture
- Root crop
- High water use
- Variable salinity tolerance, depending on beet type.
- Seeding depth: ½ - ¾ inch
- Crude protein: tops 12-15%, root 7-10%
- C:N ratio: tops 11 – 14
- Does not form arbuscular mycorrhizal associations
- Rated ‘good’ at scavenging nitrogen from the soil
- Self pollinator (wind)

Augustus Oils Limited

katynally.wordpress.com

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Carrot (*Daucus carota* var. *sativus* L.)

- Cool Season, broadleaf
- Major types:
  - Biennial (cultivated)
  - Annual (wild)
- Upright and spreading plant architecture
- Root crop
- High water use
- Seeding depth: ⅛ - ¼ inch
- Crude protein: 10%
- Forms arbuscular mycorrhizal associations
- Plants may bolt and flower starting in second year of growth. Flowers may attract honeybees.

Forestry Images

Back to Cover Crop Chart

Field pea (*Pisum satuvum arvense* L.)

- Cool Season, broadleaf
- Annual
- Legume (N fixation)
- Upright plant architecture (vine)
- Low water use
- Poor salinity tolerance
- Seeding depth: 1 – 3 inches
- Crude protein: hay 14%, grain 24%, silage 15%
- C:N ratio: leaf 13-25, stem 27-83, root 17-27
- Forms arbuscular mycorrhizal associations
- Flowers attract bees

Back to Cover Crop Chart

Midwest Cover Crops Council

USDA-ARS, NGPRL

Lentil (*Lens culinaris* Medik.)

- Cool Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright and spreading plant architecture
- Low water use
- Poor salinity tolerance
- Seeding depth: 1 – 1 ½ inches
- Crude protein: hay 14%, grain 28%, silage 15%
- C:N ratio: leaf 11-21, stem 25-49, root 22-30
- Forms arbuscular mycorrhizal associations
- Self pollinated but flowers may attract pollinators

USDA-ARS, NGPRL

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Lupin (*Lupinus sp*. L.)

- Cool Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright plant architecture
- Examples include blue, narrow-leaved, European yellow, white, Spanish, etc.
- Low water use
- Prefers acid soils
- Seeding depth: 1 – 2 inches
- Crude protein: silage 15%
- C:N ratio: leaf 12-30, stem 25-49
- Does not form arbuscular mycorrhizal associations
- Flowers attract bees

USDA, NRCS, PLANTS Database

Sustainable Agriculture Research & Education, University of California, Davis

Back to Cover Crop Chart

Vetch (*Vicia sp.*)

- Cool Season, broadleaf
- Annual or biennial
- Legume (N-fixation)
- Prostrate plant architecture (vine)
- Examples include common, hairy, purple, smooth, etc.
- Low to medium water use
- Poor salinity tolerance
- Seeding depth: 1 ½ – 2 ½ inches
- Crude protein: 13-20%
- C:N ratio: 10 – 19
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

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Midwest Cover Crops Council

Berseem clover
(*Trifolium alexandrinum* L.)

- Cool Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright plant architecture
- Common name: Egyptian clover
- Low water use
- Fair salinity tolerance
- Seeding depth: ¼ – 1 inch
- Crude protein: 27-29%
- C:N ratio: 18 – 23
- Forms arbuscular mycorrhizal associations
- Flowers attract bees

Wild Flowers of Israel, *Trifolium alexandrinum*

Sustainable Agriculture Research & Education, University of California, Davis

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Red clover (*Trifolium pratense* L.)

- Cool Season, broadleaf
- Biennial; short-lived perennial
- Legume (N-fixation)
- Upright plant architecture
- Common names: medium red clover, mammoth clover
- Medium water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: hay 15%
- C:N ratio: 15 – 23
- Forms arbuscular mycorrhizal associations
- Flowers attract bees

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White clover (*Trifolium repens* L.)

- Cool Season, broadleaf
- Perennial
- Legume (N-fixation)
- Upright plant architecture
- Common names: Ladino, Dutch white, New Zealand white
- Medium water use
- Poor salinity tolerance
- Seeding depth: ¼ inch
- Crude protein: 24-30%
- C:N ratio: 13 – 23
- Forms arbuscular mycorrhizal associations
- Flowers attract bees

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Sweetclover (*Melilotus sp.* L)

- Cool Season, broadleaf
- Annual or biennial
- Legume (N-fixation)
- Two varieties
  - yellow *Melilotus officinalis* L.
  - white *Melilotus alba* L.
- Upright plant architecture
- Moderate water use
- Fair salinity tolerance
- Seeding depth: ½ inch
- Crude protein: hay 11-18%
- C:N ratio: 12 – 23
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

WHITE VARIETY
Midwest Cover Crops Council

YELLOW VARIETY
Midwest Cover Crops Council

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Medic (*Medicago* spp.)

- Cool Season, broadleaf
- Annual or perennial
- Legume (N-fixation)
- Upright and spreading plant architecture
- Over 35 known species of medics exist. Examples include barrel, black, burr, etc.
- Low water use
- Poor to fair salinity tolerance
- Seeding depth: ¼ inch
- Crude protein: black medic 19-21%
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

BLACK MEDIC
Midwest Cover Crops Council

BURR MEDIC
Sustainable Agriculture Research & Education,
University of California, Davis

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Birdsfoot trefoil (*Lotus corniculatus*)

- Cool Season, broadleaf, legume
- Perennial
- Legume (N-fixation)
- Prostrate plant architecture
- Low to medium water use
- Fair salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: hay 16%
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

USDA, NRCS, PLANTS Database

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University of California, Davis

Sainfoin (*Onobrychis viciifolia* Scop.)

- Cool Season, broadleaf
- Perennial
- Legume (N-fixation)
- Upright plant architecture
- Medium to high water use
- Fair salinity tolerance
- Seeding depth: ¼ – ¾ inch
- Crude protein: hay 13-20%
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

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Alfalfa (*Medicago sativa* L.)

- Cool Season, broadleaf
- Perennial
- Legume (N-fixation)
- Upright plant architecture
- High water use
- Poor salinity tolerance
- Seeding depth: ¼ – ½ inch
- Crude protein: hay or silage 14-22%
- C:N ratio: 11 – 13
- Non-dormant cultivars can perform like an annual
- Forms arbuscular mycorrhizal associations
- Good at scavenging nitrogen from the soil
- Attracts pollinators

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Chickpea (*Cicer arietinum* L.)

- Warm Season, broadleaf
- Annual
- Legume (N-fixation)
- Two types
  - Desi
  - Kabuli
- Upright and spreading plant architecture
- Common name: garbanzo bean
- Low water use
- Poor salinity tolerance
- Seeding depth: 1 ½ – 2 inches
- Crude protein: straw 6%, grain 22%
- C:N ratio: leaf 10-15, stem 26-56, root 16-27
- Forms arbuscular mycorrhizal associations
- Flowers attract bees

www.mathildasanthropologyblog.wordpress.com

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Cowpea (*Vigna unguiculata* L.)

- Warm Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright and spreading plant architecture (vine)
- Alternate names: Southern pea, Black-eye pea
- Low water use
- Poor salinity tolerance
- Seeding depth: ¾ – 1 inch
- Crude protein: 19-24%
- C:N ratio: 18 – 22
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

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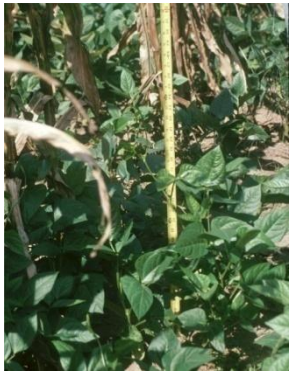
USDA-ARS, NGPRL, dry bean



Midwest Cover Crops Council

Soybean (*Glycine max* (L.) Merr.)

- Warm Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright and spreading plant architecture
- Medium water use
- Poor salinity tolerance
- Seeding depth: 1 – 2 inches
- Crude protein: hay 17%, grain 42%
- C:N ratio: leaf 14, stem 39, root 34
- Forms arbuscular mycorrhizal associations
- Self pollinated but flowers may attract pollinators

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USDA-ARS, NGPRL

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Mung bean (*Vigna radiata* L.)

- Warm Season, broadleaf
- Annual
- Legume (N-fixation)
- Upright and spreading plant architecture
- Low to medium water use
- Poor salinity tolerance
- Seeding depth: 1 ½ – 3 inches
- Crude protein: 16-23%
- C:N ratio: 10 – 15
- Forms arbuscular mycorrhizal associations
- Self pollinated

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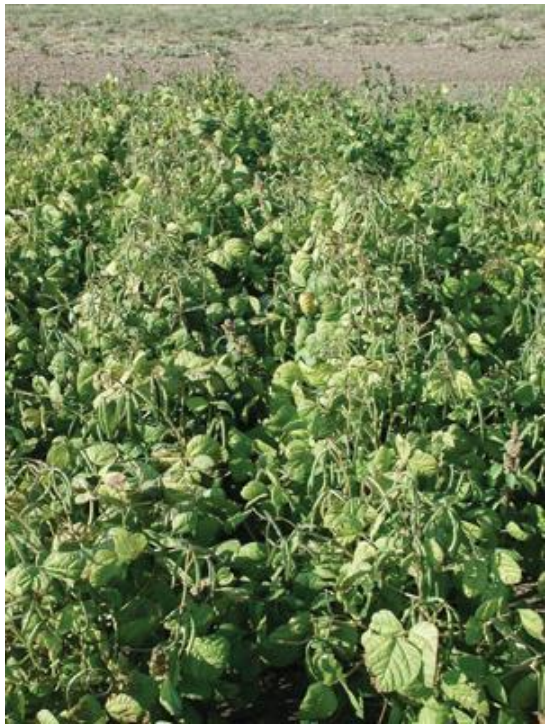

Top Crop Manager

Amaranth (*Amaranthus sp.*)

- Warm Season, broadleaf
- Annual
- Upright plant architecture
- Over 50 species
- Low water use
- Tolerant of heat and drought
- Seeding depth: ½ – 2 inches
- Crude protein: ≈14%
- In-vitro dry matter digestibility: ≈ 71%
- Does not form arbuscular mycorrhizal associations
- Self pollinated (wind) but flowers may attract pollinators

USDA-ARS, Germplasm Resources Information Network
**additional images at ForestryImages.com*

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Buckwheat

(*Fagopyrum esculentum* Moench; *Fagopyrum sagittatum* Gilib)

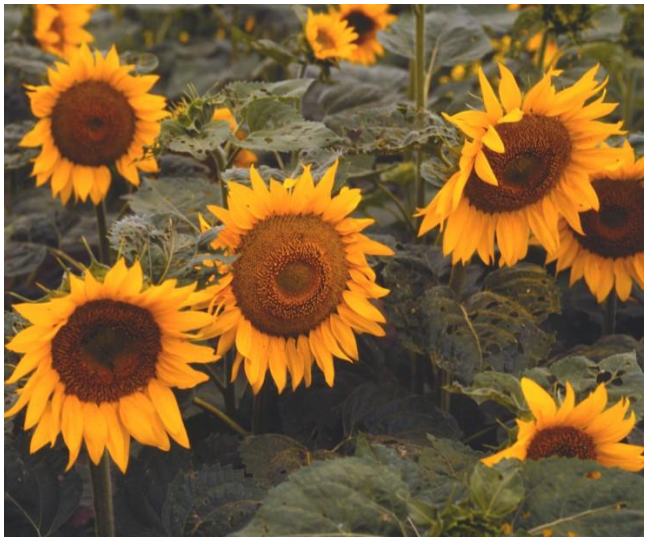
- Cool Season, broadleaf
- Warm season growth characteristics
- Annual
- Upright plant architecture
- Medium water use
- Poor salinity tolerance
- Enhances soil P availability
- Seeding depth: ½ inch
- Crude protein: straw 5%, grain 13%
- C:N ratio: leaf 8-10, stem 12-32, root 28-47
- Does not form arbuscular mycorrhizal associations
- Attracts pollinators

USDA-ARS, NGPRL

Back to Cover Crop Chart

Sunflower (*Helianthus annuus* L.)

- Warm season growth characteristics, broadleaf
- Annual
- Upright plant architecture
- High water use
- Fair salinity tolerance
- Deep rooted
- Effective at 'mining' mobile nutrients deep in the soil profile
- Seeding depth: 1 – 3 ½ inches
- Crude protein: silage 11-12%, grain 20-28%
- C:N ratio: leaf 11-14, stem 41-46, root 50-68, flower 14-19 [*end of season*]
- Will form arbuscular mycorrhizal associations
- Flowers attract pollinators



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GAP Photos

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Safflower (*Carthamus tinctorius* L.)

Forestry Images

- Warm Season, broadleaf
- Annual
- Upright plant architecture
- High water use
- Good salinity tolerance
- Deep rooted
- Effective at 'mining' mobile nutrients deep in the soil profile
- Seeding depth: 1 – 1 ½ inches
- Crude protein: hay 10-13%, grain 18%
- C:N ratio: leaf 21, stem 56, root 73
- Will form arbuscular mycorrhizal associations
- Flowers attract pollinators

USDA-ARS, NGPRL

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Squash (*Cucurbita* sp.)

- Warm Season, broadleaf
- Annual
- Prostrate plant architecture (vine)
- Examples include butternut, winter, crookneck, and zucchini (summer squash)
- Genus encompasses summer/winter squash, pumpkin, and some gourds
- Seeding depth: ½ – 1 inch
- Forms arbuscular mycorrhizal associations
- Attracts pollinators

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Chicory (*Cichorium intybus* L.)

- Warm Season, broadleaf
- Perennial
- Upright and spreading plant architecture (vine)
- Seeding depth: ⅛ – ½ inch
- Protein levels: 10-32% depending on plant maturity
- Will form arbuscular mycorrhizal associations
- Attracts pollinators

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Pearl millet (*Pennisetum glaucum* L.)

- Warm Season, grass
- Annual
- Upright plant architecture
- Low water use
- Poor salinity tolerance
- Seeding depth: ½ – 1 inch
- Crude protein: hay 13%
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)

Midwest Cover Crops Council

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Foxtail millet (*Setaria italica* L.)

- Warm Season, grass
- Annual
- Upright plant architecture
- Low water use
- Poor salinity tolerance
- Seeding depth: 1 inch
- Crude protein: hay 15%
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)

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Proso millet (*Panicum milaceum* L.)

- Warm Season, grass
- Annual
- Upright plant architecture
- Medium water use
- Poor salinity tolerance
- Seeding depth: 1 inch
- Crude protein: hay 10%
- C:N ratio: leaf 12-16, stem 12-35, root 17-26
- Will form arbuscular mycorrhizal associations
- Self pollinator (wind)

USDA-ARS, NGPRL

Back to Cover Crop Chart

Sudan grass
(*Sorghum bicolor* L. Moench)

- Warm Season, grass
- Annual
- Upright plant architecture
- Common names: Sudan grass, Sorghum
  - *Note: These were formerly separate species that have been combined*
- Medium water use
- Fair salinity tolerance
- Seeding depth: 1 inch
- Crude protein: hay 7-11%, silage 6-17%
- C:N ratio: 48 - 63
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)
- Stress conditions that limit growth (e.g., drought, frost) can contribute to prussic acid accumulation in leaves

Forestry Images

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Teff
(*Eragrostis tef* (Zuccagni) Trotter)

- Warm Season, grass
- Annual
- Upright plant architecture
- Medium water use
- Poor salinity tolerance
- Seeding depth: ½ inch
- Crude protein: 10-18%
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)

Horsehints.org

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Grain sorghum
(*Sorghum bicolor* L. Moench)

- Warm Season, grass
- Annual
- Upright plant architecture
- Common names: Sorghum, Sudan grass,
  - *Note: These were formerly separate species that have been combined*
- Medium water use
- Fair salinity tolerance
- Seeding depth: 1 – 2 inches
- Crude protein: hay 7%, stover 5%, grain 10%
- C:N ratio: leaf 11-17, stem 10-27, root 22-30
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)
- Stress conditions that limit growth (e.g., drought, frost) can contribute to prussic acid accumulation in leaves

NDSU

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Corn (*Zea mays* L.)

- Warm Season, grass
- Annual
- Upright plant architecture
- High water use
- Poor salinity tolerance
- Seeding depth: 1 – 2 inches
- Crude protein: grain 9-10%, stover 5%, silage 8-11%
- C:N ratio: stalk 11-65, leaf 13-20, root 20-49
- Benefits from arbuscular mycorrhizal associations
- Self pollinator (wind)

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