

Agronomy of Annual Crops for Forage and Pasture



[Cool Season Spring Crop Options](#) | [Warm Season Crop Options](#) | [Fall and Winter Crop Options](#) | [Seeding Rates](#) | [Fertilizing Annual Crops for Forage](#) | [Typical Stocking Rates](#) | [Possible Herd Health Problems Associated With Grazing Annuals](#)

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Annual crops can be grown to provide emergency or supplementary forage in all areas of the province. Some producers are also considering annual forage because they do not want to commit land to a long-term perennial crop. Spring or winter cereal crops are well suited to both these roles. They are easy to seed and establish quickly to provide pasture later in the growing season when the demand is typically the highest and pasture often is becoming short.

Oats, barley and triticale have traditionally been the most widely used cereals for green feed and pasture, however many other crops are also being used to lesser extents. Spring cereals are a good choice if the crop may not be needed exclusively for grazing. Spring cereals produce much of their forage production 8 - 10 weeks after seeding. (Figure 1) This growth is difficult to stockpile for late season growth without considerable wastage from trampling and maturity. If conditions warrant, these crops can easily be harvested for green feed or grain or swath grazed.

The disadvantage of using spring cereals is they do not re-grow well after being grazed. Therefore, maintaining pasture for late season use is difficult. Where late summer grazing capacity is needed winter cereals such as fall rye, winter wheat and winter triticale may be more suitable. The cost of seed for these crops may be higher, however their advantage is better quality forage in the late summer and fall period.

When seeded in the spring, winter cereals have a unique advantage over spring cereals in that they produce little seed, and as a result stay leafy. Compared to barley or oats, only 5 - 10% of winter cereal plants typically head in the year of seeding. Winter cereals can also provide early season pasture the next spring. Fall rye is the most winter hardy winter cereal. Typically fall rye will produce well for one or two years, however some producers have reported grazing fall rye more than two years.

Cool Season Spring Crop Options

Cool season crops include spring cereals, canola, peas and annual ryegrass. Spring cereals, peas and canola produce the majority of their growth early in the summer with production declining by late summer. Trampling losses of all these crops will be high if grazed after heading and if cattle are not restricted to limited areas. Varieties that produce high grain yields often produce high forage yield. For some crops, forage varieties are available.

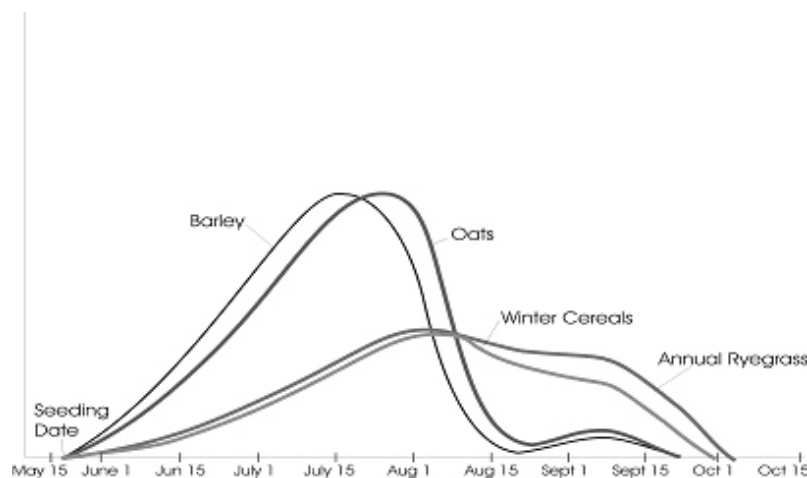


Figure 1: Typical growth curves for common annual forage crops grown in Saskatchewan

Oats

- Oats is a high yielding annual forage, particularly in the black and grey-wood soil zone.
- Graze when oats reaches 10 inches. Cut for greenfeed at the soft dough stage.
- Not as good overall quality as barley for silage.

- Staggering the spring seeding date will spread out pasture production.
- Useful as a greenfeed or swath grazing crop.
- Readily available rust resistant varieties with medium maturity include AC Assiniboia and AC Medallion. Forage oat varieties include CDC Bell, CDC Baler, Foothills.

Barley

- Barley is suitable for grazing, swath grazing or greenfeed or silage in all soil zones of the province. It is the preferred cereal for swath grazing and silage.
- Barley produces the best combination of yield and quality for silage of any of the cereals.
- Smooth awned varieties are recommended however not necessary.
- Graze when barley reaches 10 inches. Cut in the early dough stage for greenfeed.
- Not as much potential for regrowth as oats.
- Readily available smooth awned varieties include Excel, Robust, CDC Sisler, Brier, AC Lacombe and AC Rosser. Forage varieties include; AC Ranger, Westford, and Hawkeye

Triticale

- Triticale can produce similar forage yields to oats on black soils. It is more tolerant of dry conditions than oats.
- Graze when triticale reaches 10 inches. Cut in the early dough stage for greenfeed.
- Lodging is not usually a problem.
- Palatability is lower than oats or barley. Rough awns similar to barley.
- Triticale is later maturing than oats or barley.
- Triticale will not tiller or re-growth as well as oats after cutting.

Wheat

- Wheat is suited to all soil zones of the province
- Some wheat varieties can produce as much greenfeed as oats or barley.
- Quality for silage or greenfeed is generally lower than barley.
- Regrowth after cutting or grazing is not as good as oats.

Peas

- Peas are adapted to the Dark Brown , Black and Grey soil zones
- The higher seed costs than cereal crops is offset by lower nitrogen requirement.
- Small seeded varieties reduce the amount of seed required.
- Peas are generally not used for grazing unless included with a cereal.
- Generally cereal/pea mixtures yield less dry matter but more protein per acre than cereals alone.
- Trials indicate peas have a better chance of increasing the forage protein content if the mixture is seeded on stubble land where the amount of available nitrogen is low.
- Varieties that would be suitable include: CDC Handel, CDC Mozart, CDC Minuet, DS Admiral, DS Stalwarth, Eclipse, SW Salute, and CDC Sonata: These varieties have relatively long vines, relatively small seed size, and powdery mildew resistance. All of these varieties have yellow cotyledons and white flowers and are semi-leafless, except for CDC Sonata, which has the normal leaf type. Trapper and 40-10 have smaller seed size than all of the above varieties.

Canola

- Canola is best adapted to the black and grey soil zones.
- All varieties of canola and mustard except industrial use oils can be fed to livestock.
- Cut at the early to mid - podded stage of development, protein content averages 14 – 15% and TDN 58 – 60% (dry matter basis).
- Quality and palatability decline as the plant matures. Canola cut near maturity tends to be coarse and stemmy. Crude protein averages 8 – 10 % and TDN 48 – 50%.
- It may take a few days for cattle to become accustomed to the taste of canola, but find it quite palatable.
- Canola cut for hay should be crimped to hasten the drying process. It may take 7 to 10 days to dry to 16% moisture content for baling and 2 to 4 days to wilt to acceptable moisture levels for ensiling.
- High levels of sulphur in canola can cause feeding problems. It is recommended to feed no more than 50-60% of the total ration as canola or mustard hay or silage. It is advised to test for nitrates prior to feeding.
- Ensure adequate levels of trace minerals that include both copper and selenium, are fed on a daily basis.

Annual Ryegrasses

- Annual rye grasses are adapted to the Grey and Black soil zones.

- They are shallow rooted, and intolerant of drought.
- Annual ryegrasses do not establish as rapidly as cereal crops as a result production is generally later in the summer and fall.
- Growth continues slightly later into fall than winter cereals.
- Very productive under conditions of high moisture and high soil fertility.
- Italian types produce very little seed in the year of seeding. They will stay leafy so they are well suited to grazing or stockpiled fall and early winter pasture.
- The Westerwolds type produces seed in the year of seeding as a result it is taller and better suited to cutting. However it will not produce as much greenfeed as a cereal crop. Westerwolds types can be used for summer grazing if the stocking rate is heavy enough to remove seed heads early. This type may volunteer from seed in subsequent crops.

[Table of Contents](#)

Warm Season Crop Options

Warm season crops include corn, millets, sorghum and sorghum sudangrass. These crops generally need more heat than cereal crops to mature. They need warm soils to germinate. In order to achieve optimum forage production from these crops they should be left grow through July and August. They are generally slow to develop through the seedling stage as a result they are not good competitors with weeds. Green foxtail is difficult to control in millet stands. They can tolerate dry conditions during the summer but yield better with good soil moisture especially rains in July and August. In years with cool summers, the warm season crops will not yield well.

Millets

- Millets can be grown in all soil zones of the province. But often do not out yield cereals for greenfeed or pasture.
- The most common types of millets grown in Saskatchewan are Proso millet, Foxtail millet and Pearl or Cattail millet.
- Proso millets tend to tiller more than the other two. They are earlier maturing and often lower yielding.
- Foxtail millet varieties vary from early to late maturing. Later maturing varieties like Golden German often yield better than early maturing varieties.
- All millets are slow to dry down for greenfeed and as a result should be crimped or sprayed with glyphosate to speed drying. These measures are not necessary if the crop is to be used for swath grazing.
- Because of the late maturity of some types of millet they may be well suited to swath grazing.

Sorghum and Sorghum-Sudangrass

- Sorghum and sorghum sudangrass have yielded well in Saskatchewan however the concern with these crops is they can accumulate prussic acid which is poisonous to livestock. This has generally limited their use as a forage crop.

Corn

- Corn is adapted to areas of the province receiving 2100 or more heat units per year.
- Corn is a useful as a silage crop or it can be left standing for late fall or early winter pasture.
- Corn will generally produce more forage than cereal crops, however without good weed control, corn will not reach its full yield potential.
- Early maturing varieties are recommended for much of the province. Herbicide tolerant varieties are available.
- Moisture and heat is required for optimum yields.
- The high cost of seed and fertilizer have limited the use of dryland corn for forage production in much of Saskatchewan. Higher input costs result in greater risks to the producer in growing this crop over cereals for forage.
- Late summer frost can substantially reduce yields.

[Table of Contents](#)

Fall and Winter Crop Options

Spring planted winter wheat, fall rye, and winter triticale are the most productive winter cereal crops for grazing.

Fall Cereals

- Fall cereals are best used for pasture production. They are adapted to all soil zones of the province.
- Grazing should begin once the rows have filled in.
- Fall rye is generally more winterhardy than winter wheat or winter triticale.
- Fall rye can be pastured prior to stem elongation in the spring and still produce a grain crop if moisture conditions

are adequate.

- Spring seeded winter wheat, fall rye and winter triticale tend to yield similarly for pasture. Winter triticale or winter wheat is more palatable to livestock than fall rye.
- Under good moisture conditions, fall rye produces lower forage yields than oats or barley. In contrast rye will produce more in drought prone areas.
- The early maturity of winter cereals allow them to be cut for hay or silage sooner in the second year than spring cereal crops.
- Fall rye makes acceptable silage if cut in the early dough stage. If cut late, the hay is usually of low quality and is hard to handle and difficult to cure.
- Winter wheat and winter triticale can also be used for silage. Silage quality of winter triticale or wheat will be slightly higher than fall rye.

[Table of Contents](#)

Seeding Rates

Seeding rates that producers use for seeding annual forages vary throughout the province. Typically seeding rates are higher in the black and grey soil zones than the brown and dark brown. The general rule when using annual crops for forage production is to use slightly higher seeding rates than used for crop production purposes.

Harvest stage for greenfeed purposes will depend on the crop type and the goals of the producer. Table 1 provides the typically, seeding rates, recommended harvest stage and days to harvest for a number of greenfeed crops. At these stages the combination of green feed yield and quality is maximized. If higher quality and animal preference is desired the crop should be harvested at an earlier stage.

Table 1: Typical Seeding Rates for Forage or Pasture and Harvest Stage of Annual Crops for Greenfeed or Silage.

Crop	Seeding rate		Latest Harvest Stage Silage/Greenfeed	Days to Harvest stage
	Kg/ha	Bu/ac		
Oats	60 - 90	2 - 3	Late milk	65-75
Barley	70 - 100	1.5 - 2	Soft dough	65-75
Spring or Fall Rye	70 - 90	1.5 - 2	Early dough	
Spring or Winter Triticale	70 - 100	1.5 - 2	Soft dough	70-80
Spring or Winter Wheat	55 - 100	1 - 2	Early dough	65-75
Annual Ryegrass	9-13	-	Not applicable	-
Foxtail Millet	18	-	Early heading	60-100
Corn	30,000 seed/ac	-	70% plant moisture	
Peas (small seeded)	100	2	First pods wrinkle	
Peas (large seeded)	140	3	First pods wrinkle	
<u>Pea/ Cereal Mixture</u>	Varies depending on desired crop composition		When cereal crop is at proper stage	
Cereal Peas	Ex. 1/2 - 3/4 of normal rate 1/2			

[Table of Contents](#)

Fertilizing Annual Crops for Forage

Generally annual crops used for forage should be fertilized to the same level as the crop would be if used for grain production. A soil test will provide recommendations specific for the land being seeded. In the absence of a soil test the general fertilizer recommendations for the various soil zones can be used. Remember, forage yield is dependant on a number of factors, two of the main ones being soil moisture levels and soil fertility. A well balanced fertility program will ensure optimal forage production for your area. Table 2 provides general fertilizer recommendations for Saskatchewan soil zones.

Table 2: General Fertilizer Recommendations for Saskatchewan (kg/ha)

Soil Zone	Nitrogen		Phosphorus	Potash	Sulphur
	Stubble	Summerfallow			
Dark Brown	25-60	0-15	20-35	-	-
Black	45-85	15-55	20-35	-	-
Dark Grey	50-90	20-60	20-35	0-35	0-20
Grey	50-95	20-60	20-35	0-35	10-20

Typical Stocking Rates for Annuals

Stocking rate will depend on soil fertility and precipitation. Past experience will provide a good basis for setting a stocking rate. If grazing annual crops for the first time some typical stocking rates for broad geographical areas of the province are provided in Table 3.

Table 3: Typical stocking rates for annual pastures and the number of animals and acres per animal needed for each soil zone in Saskatchewan

Soil Zone	AUM /ac	# of 1300 lb cows/ac	Ac/1300 lb cow	# of 700 lb steers/ac	Ac/700 lb. steer
Brown	1.5	1.1	0.8	2.1	0.50.
Dark Brown	2.0	1.5	0.6	2.8	0.35
Black	2.5	1.9	0.5	3.6	0.25
Grey	2.0	1.5	0.6	2.8	0.35

Stocking rates for swath grazing will range from 60-100 days/acre. Some producers have reported 250 days/acre on standing corn. Swath grazing stocking rates will depend on crop yield and on how well the animals utilize the swathed forage.

[Table of Contents](#)

Possible Herd Health Problems Associated With Grazing Annuals

Producers considering grazing annual crops should be aware of a number of possible health concerns that may affect the herd. Generally most of the commonly used annual crops make safe, nutritious and productive pasture and greenfeed. However environmental factors such as frost and drought, as well as some plant diseases can adversely affect the quality of these crops for livestock feed. A number of these possible herd health concerns are described below.

Nitrate Poisoning

Nitrates in feed are converted to nitrites during digestion. This reduces the oxygen-carrying capacity of the blood and the animal can die by asphyxiation. Several factors increase the levels of nitrates in feed including high levels of soil nitrogen,

type of crop and frost or drought that reduce or stop growth will cause plant nitrate levels to increase particularly on well-fertilized fields. If the plant recovers it will use the accumulated nitrates for growth. High nitrate feed can be fed by blending to safe levels with low nitrate feed.

Atypical Interstitial Pneumonia (AIP)

This disease is also known as pulmonary emphysema or fog fever. It is sometimes associated with moving cattle from poor to a new lush pasture in the late summer and fall. If AIP is suspected, remove animals from the pasture. Avoid exerting the animals.

Grass Tetany

Most prevalent on lactating cows put on lush spring pasture. Prevention of this condition is possible through the proper supplementation of magnesium oxide and limestone and along with an adequate energy level in the diet. Consult a nutritionist for specific recommendations.

Grain Overload

Grain overload can occur when mature cereal crops are grazed. Caution is advised when turning animals into cereal crops either swathed or standing that are at a mature stage of development.

Milk Fever/Winter Tetany

Annual cereal crops (especially barley and oats) grown in some areas of Saskatchewan can accumulate excessive levels of potassium. When fed as a large percentage of the ration (hay or silage) it has been found that some cows develop milk fever/tetany symptoms two to three weeks prior to calving. A feed analysis will determine nutrient and mineral levels which can be used to develop acceptable feed rations.

This information was compiled from various sources by Allan Foster Rangeland and Forage Agrologist, Saskatchewan Agriculture, Food and Rural Revitalization. Tisdale, Saskatchewan.

Page Accessed: 1486 times

Navigation Path >> [Home](#) | [cropssecondpick=forage/pasture](#) | [forage management/production](#) |

[Top of Page](#)



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