

Small grain cereals can be a valuable forage supplement to summer annuals and native grass pastures, and a good primary forage when backgrounding beef cattle. Depending on grain and cattle prices, producers sometimes realize a higher net income by harvesting small grain cereals as forage rather than as grain.

For fall and spring pasture, producers can use winter wheat, rye, barley and triticale. These crops, along with spring oats, can also produce an early summer supply of hay or silage. Animal health concerns, such as nitrate poisoning, are less likely to occur with hay and silage from small grains than with summer annual forages.

## Production Factors

Maximizing the forage potential of any of these cereal crops depends on several basic production factors.

### Planting date

It is important to follow the recommended planting dates for each crop (Table 1). In general, the earlier the planting, the better—within acceptable ranges. If fall-seeded crops are planted late, total forage production will be reduced. If spring-seeded cereal crops are planted late, hay or silage production potential will be limited.

**Table 1.** Suggested Planting Dates for Small Grain Cereals for Pasture.

Crop	Planting Date*
Wheat	Zone 1: 8/25–9/10
	Zone 2: 9/1–10/5
	Zone 3: 9/1–10/10
	Zone 4: 9/5–10/10
Barley	Zone 1: 8/25–9/10
	Zone 2: 9/1–9/20
	Zone 3: 9/10–10/15
	Zone 4: 9/10–10/5
Rye	Zone 1: 8/20–9/10
	Zone 2: 8/25–9/20
	Zone 3: 9/1–9/25
	Zone 4: 9/1–10/1
Triticale	Zone 1: 8/20–9/10
	Zone 2: 8/20–9/20
	Zone 3: 9/1–9/25
	Zone 4: 9/1–10/1
Spring Oats	Zone 1: 3/5–3/30
	Zone 2: 3/1–3/25
	Zone 3: 3/1–3/20
	Zone 4: 2/20–3/15

\* With the later dates in these ranges, fall forage yields will be reduced.

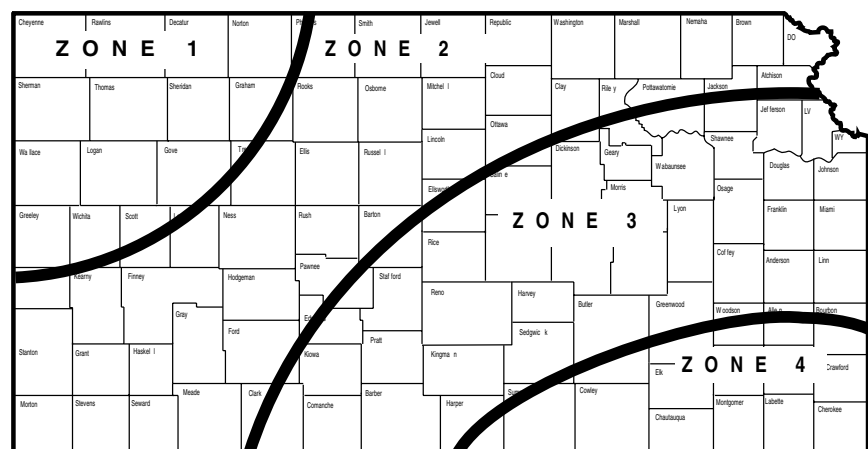
For best pasture production, planting of small grain cereals should begin about 2 to 4 weeks before the Hessian fly-free date. When planting wheat for forage, use Hessian fly-resistant varieties if feasible. Rye, barley and triticale generally aren't affected by Hessian fly. If planting is delayed until October and winter or early spring pasture is needed, rye is the most likely to provide ample forage.

### Seeding rates

For fall grazing, seeding rates of small grain cereals should be 25 to 50 percent higher than normal (Table 2). A heavier seeding rate will provide forage earlier in the fall. Spring oats also should be planted at 25–50 percent higher seeding rates when grown for hay or silage rather than for grain. Thicker plantings will reduce stem size and make curing or ensiling easier.

### Fertilization

Adequate fertilizer amounts are required for maximum forage production with small grain cereals. All small grains respond to nitrogen. In general, when a small grain cereal is grown for pasture, nitrogen rates should be increased by about 30 to 50 pounds



**Table 2. Suggested Seeding Rates for Small Grain Cereals for Pasture.**

Crop	Seeding Rate (lb/a)
Wheat	West, dryland: 30–60
	West, irrigated: 60–90
	Central: 60–90
	East: 75–100
Barley	West, dryland: 30–60
	West, irrigated: 72–96
	Central: 60–96
	East: 72–96
Rye	West, dryland: 30–60
	West, irrigated: 75–100
	Central: 60–75
	East: 75–100
Triticale	West, dryland: 30–60
	West, irrigated: 75–100
	Central: 60–75
	East: 75–100
Spring Oats	West, dryland: 32–48
	West, irrigated: 64–96
	Central: 48–64
	East: 64–96

per acre. The extra nitrogen required can be calculated using the following formula:

$$\text{Additional lbs nitrogen/acre} = (\text{No. of animals/acre}) \times (\text{Lbs. of weight gain/animal}) \times 0.4$$

Split applications can help reduce lodging and the possibility of nitrate poisoning. In a total graze-out program, all the fertilizer can be applied preplant — except on sandier soils — or regular topdress applications can be made through the fall and early spring. If the crop is to be grazed until early spring then grown for grain, a split application is often best, with at least half the fertilizer applied preplant and the remainder topdressed after the cattle have been removed.

With small grain cereals grown specifically for silage or hay, use the same nitrogen rates recommended for grain production.

As with other crops, it is important to take a soil test and follow fertilizer recommendations when producing small grain cereals for forage. When sending in soil samples for fertilizer recommendations, be sure to indicate whether the crop will be used for grazing. Extra nitrogen in the spring topdress application will be recommended if the wheat will be grazed.

The optimal soil pH level for small grain cereal production is between 6.0 to 7.5. This is true for both forage and grain production.

## Pasture Production

In Kansas, small grain cereals can be pastured until the jointing stage in late winter or early spring and still produce a grain crop. They also can be used in a total graze-out program, which can be a more profitable option in some years than harvesting the crop for grain.

There is considerable variation in pasture production from year to year and among different varieties of small grain cereals. Generally, rye has the highest total season-long production, followed by triticale, wheat and barley. However, rye becomes stemmy and unpalatable earlier in the spring than other cereals. Since rye is less palatable and higher in fiber than wheat or barley, cattle gains during grazing are normally greater on wheat, triticale and barley pasture.

Small grain cereals usually produce good pasture in late fall and early winter (Figure 1). Production declines during the winter and generally resumes in late February, depending on temperature and moisture conditions. If the crop is left to graze out, forage production and quality begin to decline rapidly after jointing.

Barley produces palatable growth rapidly in the fall under favorable conditions. It is considered superior to other cereals for fall and early winter pasture, but wheat, triticale and rye provide better late-winter and spring grazing. Wheat usually produces most of its forage in late fall and early winter, and again in the spring. Triticale falls in between rye and wheat in its period of peak production.

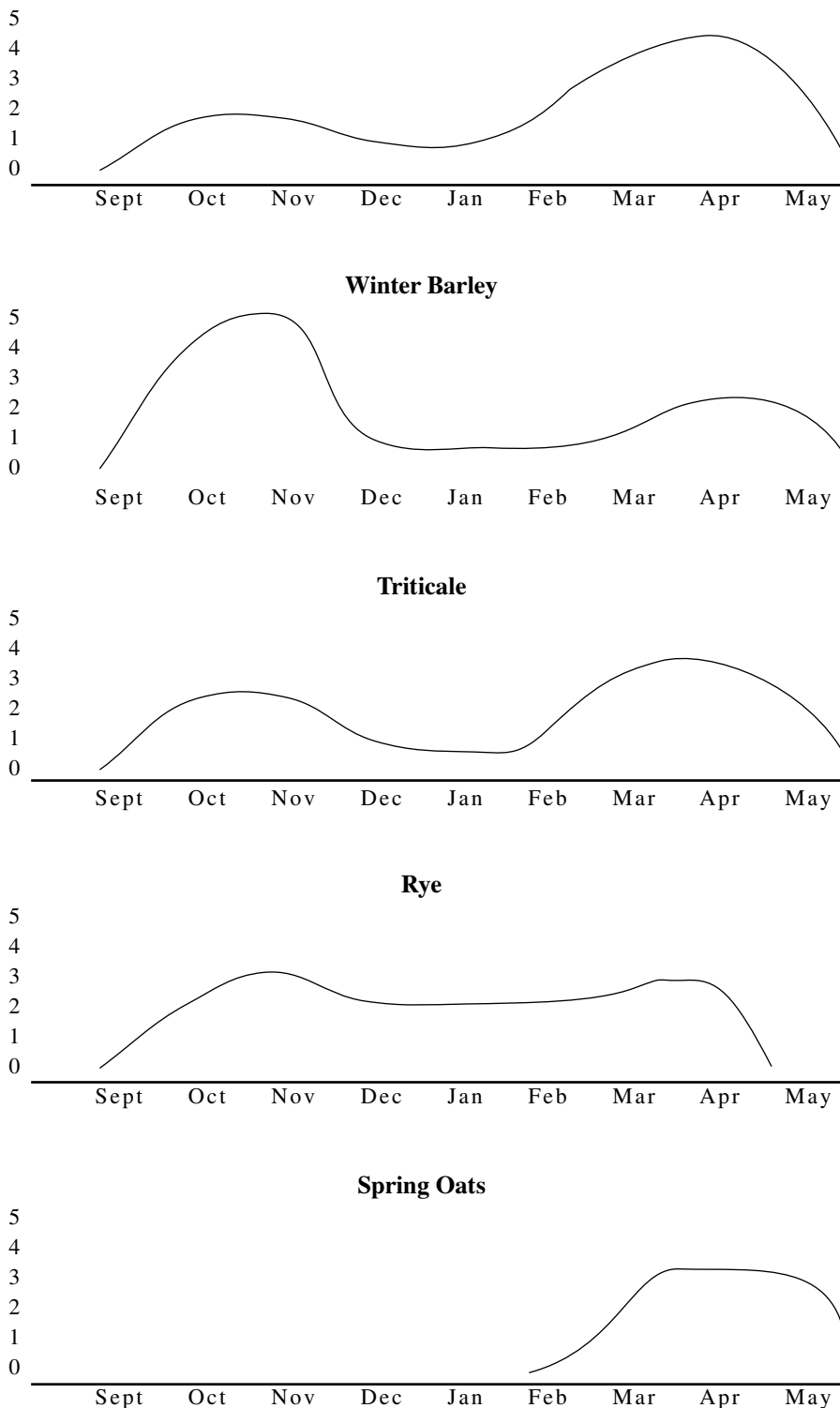
Stocking rates must be adjusted to match the crop's production potential. For example, if the pasture is heavily stocked during the fall, provisions for additional feed must be made to maintain good cattle gains during winter months when pasture production declines. Plan stocking rates to match the seasonal production potential of each crop.

Under good growing conditions, a well-fertilized small grain pasture can carry about 500 pounds of cattle per acre. Under poor growing conditions, stocking rates should be reduced considerably. Cattle gains of 1.5 to 2.5 or more pounds per day are possible during periods of good pasture production.

In terms of overall forage quality of pasture, barley is highest, followed by wheat, triticale and rye. During the fall and early spring periods of peak production, the crude protein content of small grain pasture is normally about 20 to 25 percent. Growing cattle require about 12 percent crude protein, thus no protein supplements are necessary.

Small grain pastures can cause bloat. Daily supplementation with poloxalene (Bloat Guard) is

**Figure 1.** *Relative Pasture Production of Small Grain Cereals.*



highly effective in reducing bloat. Feeding high-quality grass hay, silage, and/or an ionophore such as Rumensin or Bovatec can also provide some protection against bloat. Rumensin and Bovatec have also been shown to increase stocker cattle weight gains on wheat pasture. Mineral supplements containing magnesium are necessary when grazing cattle on small grain pasture to minimize the occurrence of grass tetany.

Fall grazing management is critical to the success of small grain pastures. Begin grazing when the plants are well-rooted and tillered, usually about 6 to 8 weeks after planting. If the foliage is too tall when the animals are introduced, or if the crop is overgrazed, the plants will be more susceptible to winterkill. Make sure some green leaves remain below the grazing level. The minimum stubble height should be about 3 to 4 inches. Rye has a more upright growth pattern than most wheat varieties, so it should not be grazed as low. Barley and triticale are more susceptible to winterkill than rye or wheat. Varietal differences exist within plant species.

If wheat is to be grown for grain, cattle should be removed in the spring before jointing, and fertilizer should be applied to the field. In a graze-out program, stocking rates should be increased through the spring to keep up with forage production. For more information, see K-State Research and Extension publication C-713, *Wheat Pasture in Kansas*.

For pasture production, choose soils with good surface drainage. Soils with high clay content and fields that are prone to be boggy are not suitable for small grain pasture production. Well-drained, slightly rolling land

generally produces the most usable forage because of the greater number of grazing days. On sandy soils, rye and barley perform best. On heavier soils, wheat and triticale perform best.

Best fall grazing is often obtained on bottomland soils with good moisture. In the spring, the best grazing is often obtained on upland soils that warm early.

Spring oats can be pastured, but the total length of grazing is limited. Spring oats for grazing should be planted as early as possible in the spring. The quality of oat pasture is very high.

### Silage Production

Producing small grain silage allows greater use of existing ensiling facilities. Harvesting small grain cereals as silage rather than grain also permits double-cropping and reduces the risk of drought, hail and other adverse weather conditions during the late stages of growth.

Small grain cereals can produce average to high-quality silages (Table 3). Mid- to late-dough stage barley silage generally has the highest quality among the cereals. At the late-milk to late-dough stages, barley has the greatest grain-to-forage ratio, followed by wheat, triticale and oats. Wheat, barley, triticale and spring oat silage yields are similar — about 5 to 7 tons of 35 percent DM forage per acre in the late-boot stage and 8 to 10 tons in the late-dough stage — depending on growing conditions. Wheat and triticale yields are generally more consistent than barley or oat yields.

**Table 3.** *Silage Quality of Small Grain Cereals Harvested at Dough Stage.\**

Crop	% TDN (dry basis)	% Crude Protein (dry basis)
Barley	64–68	9–11
Wheat	58–64	9–11
Oats	56–62	8–10
Triticale	54–58	8–10
Rye**	52–56	7–9

\* K-State Research and Extension publication L-884, *Nutritional Composition of Feedstuffs for Beef Cattle*, and Morrison, F.B. *Feeds and Feeding* (22nd ed.)

\*\* Estimated

Total production of digestible energy and crude protein per acre in wheat, barley and oat silages is highest when they are harvested at the mid- to late-dough stages. Although the percentage of crude protein decreases as cereals mature from the boot to late-dough stages (Figure 2), the tonnage of silage dry matter (DM) nearly doubles during this period, so that the total protein production per acre is higher.

Late-milk to late-dough stage wheat, barley and oat silages are usually about 2 to 4 percentage points higher in crude protein than corn and forage sorghum silages. The feed value of small grain silage for growing/backgrounding cattle can be compared with that of whole-plant corn silage as follows:

- Barley 90 to 100 percent of corn.
- Wheat 70 to 90 percent of corn.
- Oats 60 to 80 percent of corn.
- Triticale 50 to 70 percent of corn.
- Rye 50 to 65 percent of corn.

When fed to finishing cattle in high-grain rations, wheat, barley and corn silages support similar feedlot performance. Growing beef cattle should gain 1.5 to 2.25 pounds per day when fed rations containing 85 to 90 percent good-quality wheat or barley silages. Feeding cereal silages can produce up to 50 percent more beef per acre than feeding the grain alone.

Silage palatability generally is not affected by the presence of awns, although awns in hay can be a concern.

Because cereals advance from boot to dough stages rapidly, producing a high-quality cereal silage is often more difficult than producing high-quality corn or sorghum silages. The mid- to late-dough stages of wheat, for example, normally last only a few days. The crop becomes too mature to ensile successfully at later growth stages. If large acreages are to be harvested, it is a good idea to start cutting at the late-milk stage so that all the crop can be in the silo before the end of the late-dough stage. If silage harvest is delayed, the cutter bar can be raised and the upper half of the plant direct-cut as “head chop” silage. This will reduce harvesting time, increase the density of the ensiled material and increase the energy and protein value of the silage. Barley usually matures a week earlier than wheat; and wheat matures 1 to 3 weeks before spring oats, depending on the late-spring and early summer weather conditions.

Small grains should be ensiled at 62 to 68 percent moisture in most bunker, trench, or upright silos. Moisture levels above 70 to 75 percent can cause seepage and result in a clostridial (butyric acid) silage; lower moisture levels result in excessive air entrapment due to the hollow stems. Cereals must be chopped finer than corn or sorghum, using a recutter screen if necessary to aid packing and minimize air entrapment. The silo should be filled as rapidly as possible and the surface sealed with a weighted plastic sheet.

## Hay Production

Small grain cereals can be used as a hay crop, either as an emergency feed or as part of a planned early summer forage program. Yields often average about 2 to 4 tons (air dry) per acre. The moisture content at baling should be about 15 to 20 percent for small, rectangular bales.

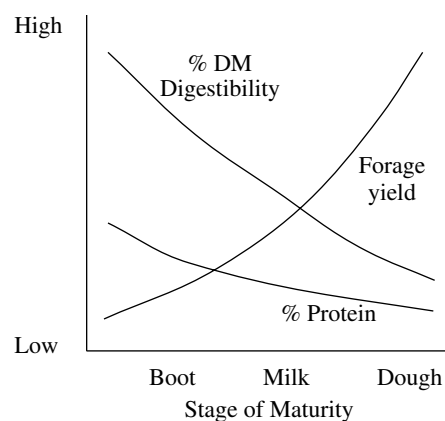
The quality of hay made from wheat, barley, oats and rye at the late- boot stage is similar (Table 4). Of the small grain cereals, triticale hay is the most variable in quality. Hay quality is more dependent on stage of maturity at harvest than is silage quality. Small grain hays will have the highest quality when harvested at the late-boot stage. A popular time to harvest small grain cereals for hay is at the early milk stage, however. This is the best compromise between highest DM yield and maximum hay quality (Figure 2). If protein content is an overriding factor, the crop should be harvested at the late-boot stage. DM yields are about 20–40 percent lower at this stage compared with the dough stage.

Although the feeding value of small grain hays is less than that of small grain silages, hay can be an excellent forage for young calves, replacement heifers, beef cows and dry dairy cows.

Rough awns in small grain hay can cause cattle considerable soreness and irritation to the eyes, mouth, lips, gums, and lower surface of the tongue. A crop with rough awns should be ensiled rather than baled to minimize this occurrence. Also, harvesting at the late-boot stage rather than the dough stage reduces palatability problems caused by rough awns. Producers may want to consider planting awnless varieties of hard red winter and soft red winter wheat.

When harvesting small grains for hay in the late-boot stage, a crimper or crusher attachment will help speed the drying. But when harvesting in the milk or dough stages, these attachments increase kernel

**Figure 2.** How Stage of Maturity Affects Forage Quality of Wheat.



**Table 4.** Hay Quality of Small Grain Cereals Harvested at Dough Stage.\*

Crop	% TDN (dry basis)	% Crude Protein (dry basis)
Barley**	62–66	9–11
Wheat	56–62	8–10
Oats	54–58	10–12
Triticale**	52–54	8–10
Rye**	48–52	7–9

\* K-State Research Extension publication L-884, *Nutritional Composition of Feedstuffs for Beef Cattle*, and Morrison, F.B. *Feeds and Feeding* (22nd ed.)

\*\* Estimated

shattering losses. If the crop is harvested in the dough stage, plants will not contain an excessively high moisture content, so crimping or crushing is seldom beneficial.

Occasionally, nitrates accumulate in small grain cereals. This tends to occur as a result of drought, hailstorms or late frosts. Nitrate accumulation in small grains is more of a concern with hay than with silage. Oat hay is more likely to have a high nitrate level than other small grain cereal hays.

Additionally, small grain hays tend to be more slippery than alfalfa or native grass hays, and the bales will be more difficult to stack.

## Crop Selection

### Wheat

Wheat has good potential for pasture, silage or hay production. It is not used as an all-purpose forage crop to the extent that it could be. Wheat is usually higher in quality than oats, rye and triticale, and can produce more forage DM per acre than barley. Very short semi-dwarf varieties have less forage yield potential than taller varieties.

When grown for forage instead of grain, wheat should be planted earlier and at a higher seeding rate. Hessian fly and wheat streak mosaic can be greater concerns in early planted wheat.

Plant height may become a more important consideration than grain yield potential when growing wheat for graze out, silage or hay. However, if wheat is to be grazed and then used for grain production, grain yield potential should be an important factor in variety selection. Another consideration in variety selection is the length and roughness of awns.

Forage potential is greatly reduced when wheat is grown on soils with a pH of 5.5 or less.

## Winter Barley

Barley is generally more susceptible to winterkill than wheat, especially when it has been overgrazed. It should not be grazed as short or as late into the fall as wheat. Barley does best on fertile, well-drained soils, but is also well adapted to sandy soils.

Some varieties have barbed awns which can affect palatability in hay, while other varieties have smooth awns.

Barley yellow dwarf, leaf rust and smut can be serious problems for winter barley. Early planting tends to favor the occurrence of barley yellow dwarf.

## Triticale

The use of triticale as a forage crop is gaining popularity throughout the Midwest. Triticale generally has a higher forage yield, but lower quality than wheat. Triticale is a cross between rye and wheat. Although pure triticale will not contaminate adjacent wheat fields with rye, triticale seed is sometimes contaminated with rye seed.

For forage purposes, triticale is better suited as pasture than as hay or silage. Like rye, it has larger stems than wheat, barley or oats, which makes it more difficult to field wilt for hay or to pack for silage. There is little or no cash market for the grain.

## Rye

Rye is the most cold tolerant and least exacting in its soil and moisture requirements of the small grain cereals. Some commonly used rye varieties are Bonel, Elbon, and Maton.

Wheat producers often shun growing rye because of the chance of contamination of adjacent wheat fields. However, if rye is not allowed to head and produce seed, contamination can be eliminated. After pasturing, destroy the crop with tillage or herbicides, or cut it for hay or silage at the late-boot stage.

Quick fall and spring growth make rye the most productive of the small grains for pasture. It is a more consistent producer of spring pasture than wheat, although it quickly becomes stemmy and unpalatable in late spring.

## Spring Oats

Spring oats must be planted early when grown for forage. If not planted by April 10, other crops should be considered.

Select a high-yielding, grain-type variety that is resistant to barley yellow dwarf, crown rust and stem rust. Oats are also susceptible to wheat streak mosaic. "Forage-type" oats are later maturing varieties than grain-type oats and are likely to fill only small, shriveled grain in Kansas.

Oats are best used as hay or silage.

## Summary

Small grain cereals provide excellent forage, either as an emergency feed or as part of a planned, year-round forage program (Table 5).

Their pasture, silage or hay potential should not be overlooked by Kansas livestock producers.

**Table 5.** Best Uses of Small Grain Cereals for Forage.

Rye	Crop			
	Triticale	Winter Barley	Winter Wheat	Spring Oats
Pasture (Fall, winter, early spring)	Pasture (Fall and spring)	Pasture (Fall)	Pasture (Fall and spring)	
	Silage/Hay (Boot)	Silage/Hay (Boot to dough)	Silage (Boot to dough) Hay (Boot to milk)	Silage (Milk to dough) Hay (Boot to early heading)

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**Kansas State University Agricultural Experiment Station and Cooperative Extension Service**

MF-1072

August 1993

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