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Grazing Winter Wheat in Nebraska

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Grazing cattle on winter wheat, often prior to grain harvest, is common throughout the southern Great Plains. Relatively high and volatile wheat prices have increased the need for management to analyze grain production and wheat grazing decisions. Benefits can be realized by grazing prior to the primary environmental risk period for drought, heat stress, and hail, all of which frequently reduce grain yield while having limited impact on forage production. Cattle also are grazed on winter wheat fields in western Nebraska and the surrounding region. Typically in Nebraska, fall forage would be used to graze cows and reduce winter supplement costs and to lower stocker operation feed costs in the spring. In many cases, wheat is grazed as a forage and also harvested at maturity for grain.

Figure 1. Cows graze winter wheat stubble near Bridgeport.

The effectiveness and profitability of grazing wheat forage depends on numerous factors. Producers can harvest wheat for grain only or they can harvest both the grain and forage (either through ownership of the cattle or leasing the pasture), or they can harvest just the forage through "graze-out" of the crop. The bottom line for producers is to maximize returns per acre. Owning the cattle, as opposed to leasing out the wheat pasture, involves significant risk and intensive management at critical times. Producers should use the information in *Table I* and in the Economic Analysis on pages 5 and 6 to identify their costs and set a value for the forage, grain, and cattle. The calculations in the economics section will value wheat both as grain and forage to provide a basis for management decisions at critical times during the wheat growing season.

Table I. Dryland wheat cost estimates — 45 bu/ac yield

	Cost/Acre	*Your Estimate*
Field operations, materials, services, and associated interest	$116.75	
Overhead, management, crop insurance, and real estate taxes and interest	$ 42.20	
TOTAL	$158.95	

Source: *Nebraska Crop Budgets 2010*, EC872, pages 53-54.

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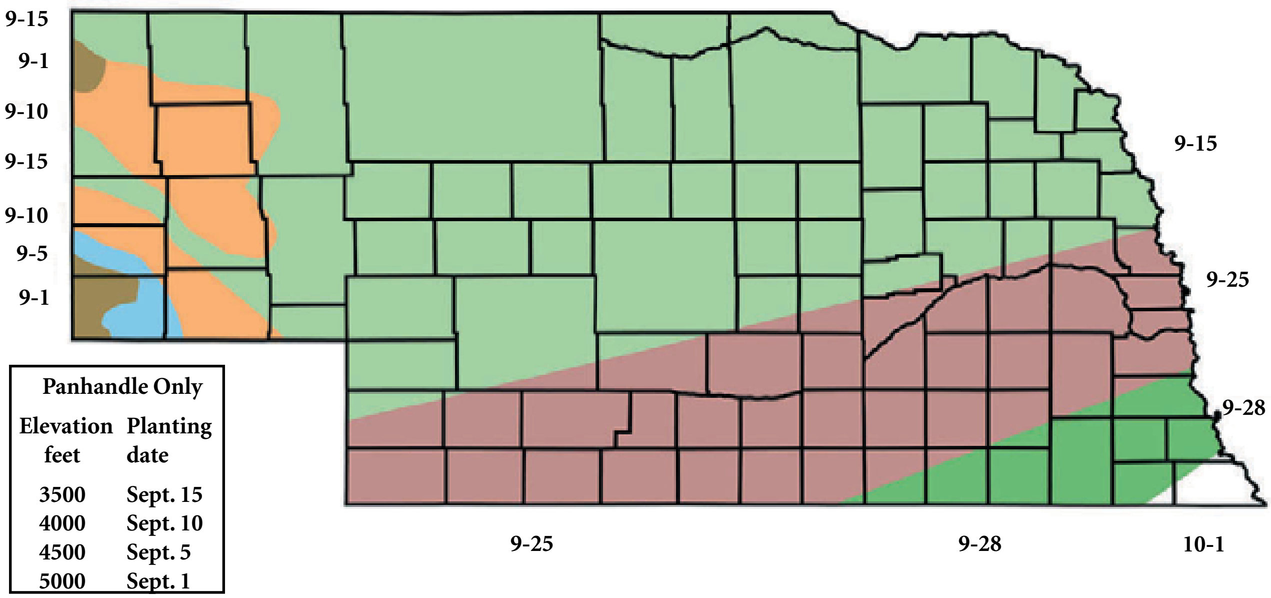

Figure 2. Recommended winter wheat planting dates across Nebraska.

Planting Date

Many factors should be considered when selecting a planting date for winter wheat. If fall or early spring grazing is of primary interest, an early planting date is important to ensure maximum forage production *(Table II)*. Soil temperatures at the depth of planting (1.5 to 2 inches) should not exceed 77°F for optimum seed germination. Early planting of winter wheat often results in increased plant stress from soil water depletion, increased incidence of plant disease (crown and root rot, wheat streak mosaic), and increased insect damage (Russian wheat aphid, Hessian fly), all of which contribute to reduced late spring forage production *(Table II)* and reduced grain yields at harvest *(Table III)*.

If grain yield or spring grazing is of primary importance, then wheat planting should be delayed until at least the earliest recommended planting date for the region. Planting date for maximum grain yield potential in the Nebraska Panhandle depends on elevation. Fields located at 4,000 feet of elevation should be planted on September 10. The planting date is moved up one day for every 100 feet above the 4,000-foot baseline, or alternately delayed by one day for every 100 feet below the baseline. See *Figure 2* for recommended seeding dates throughout Nebraska.

Table II. Forage yields for wheat planted at four dates in the fall and harvested for forage in the late fall, at jointing and boot stages of plant development, and at maturity at Sidney.

	Planting date				
Harvest date	*Very early (Aug. 23-28)*	*Recommended early (Sept. 3-9)*	*Recommended late (Sept. 10-19)*	*Very late (Sept. 21-30)*	*Harvest date mean*
	pounds dry matter/acre				
1993					
Fall	—	—	—	—	—
Joint stage	1340	1590	1310	860	1280
Boot stage	4300	4600	5350	5700	4990
Full-season	2980	3530	3130	4210	3460
Planting date mean	2880	3240	3260	3590	3240
1994					
Fall	2860	1340	360	230	1200
Joint stage	1450	1190	870	460	990
Boot stage	2880	3460	3310	2860	3130
Full-season	4880	5940	6510	5980	5820
Planting date mean	3020	2980	2760	2380	2790
1995					
Fall	2480	1560	460	0	1130
Joint stage	4320	4110	2930	1290	3160
Boot stage	7770	8400	7260	4640	7020
Full-season	13,210	12,680	14,200	11,960	13,040
Planting date mean	6950	6700	6210	4470	6080

Table III. Grain yields for wheat planted at four dates in the fall and harvested for forage in the late fall, at jointing, or not at all (full-season) at Sidney.

Harvest date	*Planting date* Very early (Aug. 23-28)	Recommended early (Sept. 3-9)	Recommended late (Sept. 10-19)	Very late (Sept. 21-30)	Harvest date mean
	bushels/acre				
1993					
Fall	8.7	10.2	9.0	14.0	10.5
Joint stage	6.8	8.2	10.9	15.5	10.4
Full-season	8.7	10.2	9.0	14.0	10.5
Planting date mean	8.1	9.5	9.7	14.5	10.5
1994					
Fall	30.4	42.7	46.6	38.2	39.4
Joint stage	23.2	35.1	39.7	35.0	35.0
Full-season	33.2	43.3	48.2	45.4	42.6
Planting date mean	28.9	40.3	44.9	39.6	38.4
1995					
Fall	56.5	60.6	72.8	68.5	64.6
Joint stage	36.2	43.5	53.6	56.5	47.5
Full-season	60.0	60.9	73.7	67.7	65.5
Planting date mean	50.9	54.9	66.7	64.3	59.2

The trade-off between early planting for increased fall and early spring forage and reduced grain yield should be evaluated by the producer on the basis of the value of grazing relative to grain yield. Given the high quality of fall wheat forage, early planting for increased fall grazing would allow a producer to take advantage of market conditions that favor beef production by providing supplemental feed that alleviates protein and energy deficiencies in deferred summer pastures.

Seeding Rates

Wheat grown for grain production in the Nebraska Panhandle and surrounding region is generally seeded at rates of 45 to 60 pounds per acre for dryland production and 60 to 120 pounds per acre for irrigated production. Dryland budgets were used in *Table I* to estimate establishment costs. Irrigated budgets are available from the same production cost publication (*Nebraska Crop Budgets 2010,* EC872). Some studies indicate that seeding rates for grazing wheat should be increased by about 50 percent over the typical rate for grain production to maintain good leaf area for grazing and to maintain plant health. The earlier the planting date, the less need to increase seeding rates. Higher seeding rates, however, will promote greater upright growth.

Fertility

Nitrogen and phosphorous needs for optimal forage production are similar to those for maximum grain yield and should be based on soil tests (see *Fertilizing Winter Wheat,* EC143, for recommendations). The earlier in the season that grazing is needed, the earlier the fertilizer should be applied. Applying preplant nitrogen or starter fertilizer with nitrogen and phosphorous will promote early fall growth.

Grazing Periods

Grazing can begin four to six weeks after planting or when there is 4-6 inches of growth. In western Nebraska, eastern Wyoming, and northeastern Colorado, wheat is usually grazed after establishment in the fall and through the winter and early spring. Many integrated crop/livestock producers will not graze winter wheat until after the soil is frozen to avoid having the wheat plants pulled from the ground. Generally, the soil is frozen from January through March. It also may be necessary to move cattle off of wheat in the spring to avoid hoof impact damage if the soil becomes muddy. The cattle can be placed on the wheat again after the soil dries out. Rotational grazing systems also may help maintain wheat plant vigor and maximize grazing potential, but these systems must be carefully managed to avoid crop damage.

Fall grazing of wheat has been effectively used as a protein supplement for adjacent range. In the fall, immature wheat in an early growth stage is frequently higher than 30 percent crude protein, but only produces an average of 1,200 pounds of forage per acre. Grazing can remove excessive top growth, which conserves soil moisture by reducing the amount of water transpired by the leaves. This can be particularly advantageous in seasons with adequate or surplus fall precipitation but limited spring moisture. Removal of leaf tissue through grazing in the spring also may help control Russian wheat aphids by limiting their habitat in the field and thereby reducing damage. Light fall stocking rates (0.2 to 0.4 AUM/acre) will not cause significant damage to wheat yields and is the recommended fall grazing strategy.

Impact on Grain Production

Fall-seeded winter cereals go through a cold period (vernalization), which stimulates head development the following spring. Vernalized winter wheat plants produce heads in the spring and by early- to mid-April the initiated heads begin to emerge from the crown within the tiller (this is commonly referred to as the jointing stage of development). If the wheat heads are grazed off, or severe defoliation occurs, seed yields will be severely affected. This means that producers should not graze wheat once jointing has begun unless they plan to graze the crop out and forfeit grain production *(Table III)*.

Studies conducted near Sidney confirm that grazing through the jointing stage of development has a direct negative impact on grain yields *(Table III)*. In two out of three years, grain yield was reduced an average of 25 percent compared to the ungrazed check when plants were harvested for forage at the joint stage. No grain was harvested from plots where forage was removed at the boot stage, indicating a rapid increase in injury to grain yield from jointing to the boot stage. In western Nebraska, there is normally a four-week period between the joint and the boot stage of winter wheat. The rapid decline in wheat grain yield (from 25 percent to 100 percent loss) from grazing during this four-week period demonstrates the high grain yield cost associated with continued livestock use. This loss begins as soon as the wheat has begun to joint.

Grazing Benefits and Opportunities

Studies indicate that stocker-backgrounded steers and heifers in average flesh may gain 1.75 to 2.75 pounds per head per day while grazing wheat when forage is in good supply. Lightweight cattle in thin condition will experience compensatory higher gains while heavier, fleshier cattle will have lower gains.

Some local cow-calf producers use their winter wheat forage pastures as a protein supplement, sometimes using wheat pastures for a short period to rapidly increase body condition of bred cows to potentially increase fertility.

Economics

Individual producers should consider cost/benefit analysis each year because of the variables involved. Costs associated with wheat establishment and all cultural practices up until grazing turnout in the fall or spring are considered "sunk costs." Turnout is a critical time to look at projected costs and potential returns. The end of March is the other critical time for management to decide on yield reductions and projected cattle returns. The equations in the Economic Analysis section on pages 5 and 6 provide information to aid in these critical decisions. These decisions depend on potential returns, the amount of risk one can take, and market projections.

Grazing Risks

Although grazing winter wheat and other cereal crops has many benefits, there also are some potential problems. One is grass tetany, especially in mature high milking cows. Grass tetany is characterized by a low blood magnesium level in livestock. Grass tetany frequently occurs when rapid spring plant growth follows cool cloudy days (45-60°F), but also can occur in the fall. Prevention while grazing wheat is best managed by supplementation with 6 to 8 percent magnesium in a palatable, free-choice mineral.

Nitrate poisoning may occur if the winter cereals have been fertilized with high levels of nitrogen fertilizer. Stress from drought, hail, or frost may increase nitrates to levels toxic to livestock. Livestock can withstand higher levels of nitrates when they are grazing than when they are feeding on plant material harvested as green-feed or hay. Rumen microbes can adjust to higher levels of nitrates over time, which enables livestock to graze winter cereals in fall with a lower risk of nitrate poisoning. Forage testing for nitrates is the only accurate way to be sure that toxic levels are not present in any feed stuffs.

Another problem that may occur with grazing wheat forage is bloat. High crude protein and soluble carbohydrates in wheat pasture are believed to contribute to bloat. Cool, moist conditions favor bloating. To aid in bloat prevention, some producers offer low quality roughages free choice with ionophore, Rumensin®, or Bovatec® supplements. Finally, blood urea nitrogen levels also may increase in cattle grazing winter wheat forage, suggesting that this may have an adverse effect on cow fertility. Research on how pasturing wheat affects cow fertility is not available. It is known that wheat pasture is very high in protein, energy, vitamins, and minerals, which all have positive effects on cow fertility.

Variety and Management Recommendations for the Nebraska Panhandle

In a study conducted near Sidney during the mid-1990s, six wheat cultivars were used: four were standard height cultivars and two were semi-dwarf cultivars. While some differences among the cultivars were observed for various traits in specific years, there were no consistent or overall trends for superior forage performance by any cultivar over the three-year study. It appears that while semi-dwarf varieties are shorter, they have similar quantities of forage and frequently have higher grain yields. No single cultivar had both exceptional forage and grain yield characteristics. Longhorn is a semi-awnless (beardless) cultivar developed for grazing, but it has a relatively low grain production potential. Scout 66 has been used by local cattle producers because it has strong seedling vigor and good fall growth, but its grain yield potential is low relative to newer wheat cultivars. Buckskin is a tall wheat cultivar grown extensively in areas of western Nebraska and the surrounding region that have shallow soils and limited rainfall.

Arapahoe is a semi-dwarf wheat that was planted on more acres than any other wheat in the state during the mid- to late 1990s. It has good to excellent winter hardiness and appears to be a good dual-purpose wheat. Alliance was a newer semi-dwarf wheat that was grazed in the region. Producer experience suggests that Alliance can be grazed "hard," but that it may have to be sprayed for weeds after grazing. Other cultivars grazed in the Nebraska Panhandle include the semi-dwarf cultivars Millenium, Jagalene, 2137, and Pronghorn, and the tall wheat cultivar Goodstreak.

In general, any wheat variety well adapted to the region can be used for grazing and when both forage and grain are expected from the crop, the best grain producing variety will be the best overall. Some pesticides used in wheat production have grazing restrictions. Check all chemical labels before applying if grazing is planned.

Summary

Grazing cattle on winter wheat as a fall forage protein source offers opportunities most years in the Nebraska Panhandle. Closely observing wheat growth and stocking rate is needed to be successful. Winter and spring grazing at light stocking rates is the less risky method of grazing wheat pastures and can possibly generate more returns per acre than fall grazing. Government program payments were not considered here, but may make some strategies more viable. Grazing wheat also may reduce economic risk, especially in an environment such as in western Nebraska where hail and drought frequently reduce grain yield. Using wheat in a grain and livestock production system to help manage economic

Economic Analysis of Grazing Dryland

It is important to develop a wheat establishment cost estimate before evaluating the value of the forage and grain. Typically, wheat production in the Nebraska Panhandle is a dryland farming practice. Therefore, the economic budget for a dryland wheat/fallow system is briefly itemized in *Table I.* Producers are encouraged to enter their own cost estimates to establish what these "sunk" costs are. "Sunk" costs include interest on real estate.

Typically, grazing wheat in the Nebraska Panhandle would be for the purpose of 1) reducing the cost of purchased feeds for cows or 2) providing light winter grazing for feeder cattle.

To compare the value of the protein in grazed wheat with that in alfalfa hay, follow these steps.

Step 1. Calculate the value of protein in alfalfa.

If alfalfa analysis shows 90% dry matter and 18% crude protein (dry matter basis),

then 2000 lb (ton) x Percent dry matter (DM)
= Pounds of alfalfa DM x Percent crude protein
= Pounds of crude protein per ton of hay.

$$\frac{\text{Cost per ton of alfalfa hay}}{\text{Pounds of crude protein}} = \text{Cost per pound of alfalfa protein}$$

Step 2. Calculate the value of protein in wheat forage.

If fall grazed, wheat forage has 1165 lb dry matter/ac, 31% crude protein (dry matter basis), and 38 bu/ac yield;

or

If joint harvested, wheat forage has 1810 lb dry matter/ac, 30% crude protein (dry matter basis), and 33 bu/ac yield;

or

If boot harvested, wheat forage has 5050 lb dry matter/ac, 17% crude protein (dry matter basis), and 0 yield;

or

If full season harvested at maturity, wheat forage has 7440 lb dry matter/ac, 9% crude protein (dry matter basis), and 0 yield.

(Source: "Wheat Grain and Forage Yields Are Affected by Planting and Harvest Dates in the Central Great Plains"; D. Lyon, D. Baltensperger and M. Siles; *Crop Science* Vol. 41 No. 2.)

Step 3. Compare the two sources of protein.

Pounds of wheat forage dry matter x percent of forage crude protein = pounds of wheat forage protein

(Pounds of wheat forage protein x value of a pound of protein from alfalfa hay) + (Grain yield (bu) x value of wheat) - sunk cost of wheat = Per acre value of forage and grain.

Examples:

1) If alfalfa hay (90% dry matter and 18% protein) is selling for or costs the producer $75 per ton and the wheat price is $6.00/bu calculating net returns per acre for fall grazing follows:

risk requires a producer to be flexible in cattle management and marketing.

Acknowledgments

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Wheat in the Nebraska Panhandle

Step 1: 2000# x .90 = 1800 x .18 = 324# protein per ton alfalfa

$75 ÷ 324 = 23 cents per pound (protein cost)

Step 2: (from page 5) 1165# (wheat forage) x .31(protein) = 361.15# protein x .23 = 83.06

plus 38 bu x $6.00 = $228.00 = $311.06 gross income

minus sunk cost ($158.95) = $152.11 net income

2) If alfalfa hay (90% dry matter and 18% protein) is selling for or costs the producer $100 per ton and the wheat price is $7.50/bu, calculating net returns per acre for grazing up to Joint follows:

Step 1: 2000# x .90 = 1800 x .18 = 324# protein per ton alfalfa

$100 ÷ 324 = 31 cents per pound (protein cost)

Step 2: (from page 5) 1810# (wheat forage) x .30 (protein) = 543# protein x .31 = $168.33

plus 33 bu x $7.50 = $247.50 = $415 gross income

minus sunk cost ($158.95) = $256.88 net income

A negative number indicates that hay would be a cheaper protein source than grazing, while a positive number indicates grazing would be a cheaper protein source than hay. Producers should have their own prices for alfalfa and wheat to calculate net income or loss.

Based on Lyon, Baltensperger, and Siles' work, fall grazed wheat had a total digestible nutrient (TDN) value of 80 percent. The 1996 National Research Council (NRC) *Nutrient Requirements for Beef Cattle* estimates late season grazed wheat is 58 percent TDN. Utilizing the 1996 NRC Ration Model for 600-pound cattle and assuming the following nutrient content resulted in the following estimated pounds of dry matter wheat forage to produce 1 pound of gain:

4.5 lb fall wheat 31% CP, 80% TDN = 1 lb of gain 500-700 lb cattle

4.7 lb joint wheat 30% CP, 79% TDN = 1 lb of gain 500-700 lb cattle

9.9 lb boot wheat 17% CP, 62% TDN = 1 lb of gain 500-700 lb cattle

14.5 lb full season wheat 9% CP, 58%TDN = 1 lb of gain 500-700 lb cattle

The following equation can be used to calculate returns per acre above sunk cost from grazing 500-700 pound weight feeders:

Net per acre value of forage and grain for growing cattle = [(lb forage ÷ yield lb forage for 1 lb gain) x value of gain on feeders ($/lb)] + (current or projected price of wheat x wheat yield $/bu) - $158.95 (estimated sunk costs from *Table I*).

The total cost of growing feeders is not included in this calculation, but needs to be accounted for to determine net returns to the total operation. Cost estimates for growing feeders are available in *Nebraska Livestock Budgets 2001,* EC01-818. Two other University of Nebraska–Lincoln Extension publications that will be useful are *Water Development Costs for Livestock,* EC821, and *Livestock Fencing Costs,* EC810.