Wheat Pasture in Kansas

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Introduction

Many producers in the southern Great Plains use wheat as a dual crop. Wheat is a cash grain crop as well as forage. Wheat pasture is a valuable source of high-quality forage, typically available in late fall, winter, and early spring, when other forage sources are low in quality and quantity. The crude protein content of wheat pasture commonly ranges from 20–30 percent. The stocking rate during fall and winter ranges from 250–500 animal pounds per acre, depending on growing conditions. During the spring, stocking rates usually can be increased to 500–1,000 animal pounds per acre to utilize the lush growth. Average daily stocker gains are commonly 1.5–2.0 pounds.

In Kansas, the cash grain value of wheat is approximately $1.2 billion on 10–12 million acres. Three to six million acres of wheat, primarily in the southern half of the state, could be grazed without detrimental effects on grain yields. Wheat pasture allows grain/cattle producers to utilize their acreage more effectively. Many producers have decided that it is more profitable to graze out their wheat than to harvest it for grain. These decisions must be made on a field-to-field and producer-to-producer basis.

Cultural Practices

Planting Date. Early planted wheat has the potential to produce excellent fall growth if soil moisture allows rapid germination and emergence. Dry soil nullifies the advantages of early planting. Wheat planted late in the season limits fall grazing potential. Producers generally plant wheat 2–3 weeks earlier than usual if it is to be grazed. Grazing can begin 4-6 weeks after planting when there is 6–12 inches of growth. Producers usually try to plant in late August or early September, to promote enough growth to allow fall grazing.

There are disadvantages in planting wheat for pasture too early. The incidence of diseases such as wheat streak mosaic may increase, which would reduce forage production. Early planted wheat serves as a host, spreading the disease to fields planted later. Early planting also encourages heavy Hessian fly infestations. Dry soil conditions frequently prevail in late August and early September and may necessitate "dusting-in" the seed. Variable germination and emergence may cause erratic stands and delay initiation of grazing.

Planting rate. Producers interested in early fall grazing increase planting rates by 50–100 percent, depending on planting date and soil moisture. The earlier the planting date, the less the need to increase seeding rates. Higher rates, however, will promote greater upright growth. If planting is delayed, it is important to increase seeding rates as much as 100 percent.

In irrigated fields and in eastern Kansas where rainfall is higher, seeding rates commonly are 90–120 pounds/acre. In dryland areas of western Kansas, seeding rates should be no more than 50 percent above those of wheat planted for grain. In central Kansas, seeding rates for wheat pasture often will be 75–120 pounds/acre. Because high seeding rates can cause moisture stress, it is necessary to monitor soil moisture carefully to determine when the top growth should be removed.

Varieties. There are probably greater year-to-year differences than varietal differences in total forage produced. A Kansas grazing study found a difference of 2,000 pounds forage dry matter/acre between years with the same variety, but only 800 pounds forage dry matter/acre difference among varieties. In a five-year Texas grazing study, seasonal forage yields ranged from 2,700–8,800 pounds dry matter/acre, but the difference among 13 varieties ranged from 600–2,500 pounds/acre.

Some plant characteristics make certain varieties more useful for grazing. Producers should select varieties that tiller profusely, have rapid, upright fall growth, and good regrowth potential after grazing. In much of Kansas, it is important that grazing varieties be resistant to soilborne mosaic virus and Hessian fly. In much of eastern and central Kansas, varieties should be tolerant to aluminum toxicity caused by acid soils. These problems can reduce forage yields dramatically and require careful management to avoid losses.

In other regions of the Great Plains, producers mix species such as rye and annual ryegrass to promote growth throughout the year. Because rye has excellent fall growth, it maybe mixed with wheat to improve early fall growth for graze-out. Wheat ordinarily will produce more spring forage than rye. Species mixtures are not a good practice for a field that will be combined, because of the potential for dockage at the elevator. Farmers should destroy the rye after grazing to eliminate seed production.

Fertility. Adequate amounts of all essential plant nutrients are necessary for maximum forage production. Wheat used for grazing will remove more soil nutrients than the wheat grain crop. Nitrogen (N) is usually the most limiting nutrient associated with wheat forage production. A soil test for available nitrogen is helpful in evaluating the amount of supplemental nitrogen needed.

Wheat forage containing 25 percent crude protein will have 80 pounds of nitrogen in each ton of dry matter. Realistic forage yields and the growing season are factors to consider when applying fertilizers. A general recommendation is to increase nitrogen rates by 30–50 pounds/acre for wheat as forage or for more specific recommendations, this formula can be used: (animals/acre) x expected pounds of weight gain x 0.4 = amount of nitrogen/acre to add. Many producers who utilize wheat as grain make only one nitrogen application at or prior to planting. Others use split applications, applying a portion of the nitrogen in the spring. This increases application costs, but particularly with sandy soils susceptible to leaching and heavy soils subject to standing water (denitrification), it allows more efficient use of the nitrogen. Split applications are best suited for grazing situations because producers can adjust N-rates to forage removal and environmental conditions. If conditions are favorable for heavy fall and/or spring grazing, additional N maybe necessary, especially for a grain crop.

Wheat responds well to phosphorus (P) application on soils testing low in available phosphorus. Phosphorus deficiency reduces wheat tillering and makes the plants more susceptible to winterkill. Phosphorus fertilization should be based on a soil test. Banded phosphorus applications, preplant or at planting, are more efficient than broadcasting, especially on acid soils low in available phosphorus. Incorporating phosphorus fertilizer into the soil increases the efficiency of broadcast applications. Dual applications of nitrogen and phosphorus in a band with a tillage implement save time by combining fertilization with tillage prior to planting.

Potassium (K) deficiency also can limit forage production. A soil test is the best guide for sound K applications. Low potassium levels are common in southeastern Kansas soils and in sandy soils. Potassium may be applied either as a starter or can be broadcast and incorporated ahead of planting. To avoid possible germination problems, no more than 20 pounds/acre of potassium (or combination of N and K) should be in direct contact with the seed.

Soils low in organic matter may benefit from sulfur. Sulfur deficiency symptoms resemble those of nitrogen deficiency, with yellowing leaves and slow growth. Studies at Kansas State University have shown grain yield increases and a forage greening effect with the addition of sulfur on sandy, low-organic-matter soils.

In south central Kansas, low soil pH can dramatically reduce forage and grain yields. Low soil pH can be corrected by liming. Tolerant varieties do not replace a liming program and should be used in combination to reduce the pH effect. See the "Wheat Production Handbook," C-529, for more details regarding production practices.

Nutritive Value of Wheat Pasture

Wheat forage provides succulent and highly nutritious forage for cattle and sheep. It is palatable; high in protein, energy, and minerals, and low in fiber. Because of its high moisture content, it is sometimes difficult to meet the daily dry matter needs of cattle. Making some dry, high-quality forage or grain available often improves animal performance.

The crude protein (CP) content is particularly high, usually between 20 and 30 percent, and sometimes above 30 percent. The CP component is highly soluble and available to animals. Properly managed wheat can be an effective protein supplement for livestock simultaneously grazing or eating other lower quality feedstuffs.

Stage of maturity influences chemical composition of wheat. In vitro dry matter digestibility decreases from 80 percent or more during the vegetative stages of fall and early spring to less than 60 percent by the soft dough stage. The major decline occurs by the heading stage. Crude protein also declines rapidly, dropping from 25–30 percent for vegetative wheat forage to 12–15 percent by heading and 9–10 percent by the soft dough stage.

Conversely, cell wall components increase with advancing maturity. Total cell wall (neutral detergent fiber) increases from less than 40 percent to the mid-50 percent range, and acid detergent fiber, primarily cellulose and lignin, increases from 20–25 percent to more than 30 percent.

Mineral content [potassium, calcium (Ca), phosphorus, and magnesium (Mg)] also declines considerably with maturity. The Ca:P ratio is often as low as 1:1.1 compared with a desired 2:1 ratio, and Mg levels can be low or inadequate for animal needs. A free-choice "wheat pasture mineral" containing 6–8 percent calcium and magnesium is often recommended for livestock on wheat.

Although many trials comparing types and varieties of wheat have noted differences in quality, the growth stage, climatic differences, and rate and timing of nitrogen fertilizer applications regularly overshadow such differences.

In summary, wheat pasture is high in moisture content, crude protein, and digestible nutrients prior to heading. It is palatable and digestible, and has a fast rate of passage because of its low content of cell wall constituents (fiber and lignin).

Grazing Management

Depending on climatic conditions, wheat pasture may be grazed in the fall, in the spring, or both. During mild winters with adequate rainfall, some growth occurs. In Kansas, most grazing occurs during late fall and early winter and again in spring, with animals removed early enough to allow good grain production. Some producers completely graze out the wheat, precluding grain harvest.

To maximize forage for grazing, early seeding, increased seeding rate, and more nitrogen fertilizer are recommended. Depending on rainfall and stored soil moisture, wheat pasture is generally available for 120–150 days. Grazing cannot begin until the plants have adequate root development to prevent their being uprooted by grazing animals. Ordinarily, wheat is available for grazing between October 15 and November 15. An accumulation of one-third to one ton of dry matter/acre (6–12 inches tall) will result in excellent season-long pasture production, provided moisture, temperature, and management are reasonable. More typically, however, an accumulation of one-fourth to one-half ton of dry matter/acre (4–8 inches tall) should be available before grazing begins.

Wheat tends to produce more tillers and leaves than are necessary for maximum grain yield. However, research literature and producers' experiences disagree on the beneficial and detrimental effect of grazing on grain yields when animals are removed before stem elongation (jointing). Some researchers say yield loss is related to the amount of leaf area lost due to spring grazing. There is, however, definite agreement on the sharp, steady decline in grain yield if grazing continues after jointing.

Grazing wheat generally affects maturity, the number of culms (tillers) produced, lodging, and available soil moisture. Grazed wheat usually matures 1–4 days later than ungrazed, with more severe grazing resulting in longer delays. Delayed maturity may expose the crop to increased stress from high temperatures and/or disease pathogens during grain filling.

The number of culms per acre is reduced in direct proportion to grazing severity. This reduction in tiller number will reduce yields in favorable years, but can be beneficial if moisture or other stresses follow in late spring.

Grazing wheat tends to reduce lodging. With the advent of semidwarf wheats and optimum fertilizer applications, however, grazing is less advantageous than with older, taller varieties. Risk of lodging is usually lower in western and central Kansas than in eastern Kansas.

Grazing removes 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.

In summary, studies in Kansas and throughout the Great Plains indicate that grazing appears to have little effect on grain yields when fertility is adequate, grazing is not too heavy, cattle are removed before jointing, top growth removal reduces water use, and lodging is reduced.

Grazing may reduce grain yields when nutrients are limited, grazing is severe, water stress is limited or nonexistent, lodging is not a problem, or wet soil conditions cause compaction and trampling of the wheat plants.

Livestock Management

Both stocker cattle and mature animals can effectively utilize wheat pasture. Because of its high nutritive value, stockers and fall-calving cows can utilize the forage more profitably.

Both continuous and rotational grazing systems are acceptable for stocker cattle. Average daily gain of stockers on good wheat pasture is essentially the same with either system. This is true as long as adequate forage is available because the quality of vegetative wheat forage is generally high.

The primary advantage of rotational grazing is better utilization of available forage. It reduces spot grazing and often results in 10–15 percent increased animal gain/acre. Better utilization often is perceived as increased forage production. The more often wheat is grazed, the longer the period for forage production.

Many farmers do not use rotational grazing because of added fencing and water costs and because it requires more planning. It may require more labor to move animals from field to field, particularly if fields are some distance apart.

Optimum stocking rates vary considerably from year to year, depending on many climatic and management factors that influence wheat forage yields. Recommended fall and winter stocking rates often range from 250–500 pounds of animal/acre (l–2 acres/stocker, depending on weight). Spring stocking rates usually are 1.5-2.0 times greater than for fall (0.75-1.3 acres/stocker, depending on weight), although rates as high as 1,400 pounds of animal/acre (2.5 stockers/acre) have been noted in some research trials during late spring graze out.

Providing stockers with dry feed in addition to the wheat pasture allows increased stocking rates and may improve general animal health. Grass hay, silage, or limited grain may be fed, or adjacent sorghum stubble or cornstalks may be grazed along with wheat pasture. Providing some dry feed may offset possible animal digestive problems—including bloat—that result from the succulent, laxative wheat forage.

To avoid overgrazing and damage from trampling, it is best to provide an area (preferably grass) near the wheat pasture for water, salt-mineral, supplemental feeding, and animal loafing. If this is not feasible, provide them at different field corners or borders to improve grazing distribution. Remove animals from the pasture during extremely wet weather, particularly on fine-textured soils. During periods of extreme cold—about 15°F or less—remove animals to prevent injury to plants.

Average daily gains of stockers on wheat pasture regularly range between 1.5–2.0 pounds. Gains under 1.0 pound/day indicate that the pasture probably is overstocked and/or other key management practices are lacking.

Grazing Problems

Two potential problems when grazing wheat pasture are bloat and grass tetany. High crude protein and low fiber contents in wheat pasture are associated with bloat. Cool, moist conditions also favor bloating.

To aid in preventing bloat, do not put hungry cattle on lush pasture. When grazing begins, carefully monitor to identify animals more susceptible to bloat, so they can be removed before chance of loss. Observing the cattle often to detect bloat can prevent loss. Bloat potential is greatest during the 3- to 4-week periods of lush growth in the fall and early spring. Feeding Bloat-Guard (poloxalene) as a dry or liquid energy supplement, molasses block, or mineral supplement is the most effective procedure to prevent bloat. Feeding high-quality grass hay, silage and/or grain with Rumensin or Bovatec also will minimize the bloat potential.

Tetany is characterized by a low blood magnesium level in livestock. It occurs more often in older cows nursing young calves, but may affect stockers as well. Tetany frequently occurs during rapid spring growth following cool temperatures (45º–60ºF), but may occur in fall. The easiest prevention is to provide 6–8 percent magnesium in a palatable, free-choice mineral supplement.

Wheat Pasture in a Forage System

In addition to its high quality a major advantage of wheat pasture is its time of availability. Producers need good-quality roughage in late fall, winter, and early spring to complement perennial warm- or cool-season grass pastures. Wheat pasture alone, or in conjunction with crop residues, can reduce cowherd feed costs when perennial grasses are dormant.

Another excellent way to utilize wheat pasture is to graze out some acreage before turning stockers or cows into native range. Frequently, producers start utilizing native range too early in the spring because they have no more stored hay reserves. Grazing out some wheat pasture can delay the beginning of grazing native range, thereby improving grassland stands and vigor. Rotational grazing during rapid spring growth will keep the wheat plant vegetative longer for graze-out purposes.

As the season progresses, stocking rates must be increased to utilize all the forage being produced; pasture must be stocked heavy enough that the wheat won't get "ahead" of the cattle. Increased stocking rates are especially important at and after jointing stage. Plant growth rates are high and forage nutritive value is declining rapidly. If sufficient cattle are not available to provide a stocking rate high enough to fully utilize wheat forage, consider fencing off a portion of the pasture to be harvested as hay or silage.

What is Wheat Pasture Worth?

Determining a realistic dollar value for wheat pasture is important to wheat and livestock producers desiring an equitable means of establishing rental rates. It is also important to those who simply want to evaluate the "opportunity cost" of forage in a wheat grazing enterprise. In addition to budgeting the profit potential of grazing wheat, producers often use a couple of simple methods to estimate the economic value of this forage. Several methods of charging for or valuing wheat pasture in Kansas are:

- $/cwt/month based on initial body weight
- $/cwt/month based on average weight
- $/pound of gain
- $/head/day
- $/acre

With the exception of $/acre, these methods express the pasture cost on an animal-unit basis rather than per acre. While any of the methods is accepable, it is important to recognize financial risks associated with each for both the cattle owner and the wheat pasture owner.

For example, if the wheat pasture charge is based on average daily gain, the cost of gain for the cattle owner will not be affected with poor gains, but the wheat owner may feel compensation for the wheat is not high enough. If the pasture charge is based on initial body weight, however, the cost of gain for the cattle producer will be high with poor gains while the compensation to the wheat owner will not be affected. Some producers use a combination of several methods to reduce the financial risk to both parties. An example of this would be a fixed rate plus an additional charge based on cattle gains.

The rate should reflect the local supply and demand for wheat pasture. If the owner provides any feed or management such as fencing and cattle handling facilities, water, mineral, supplemental feed during snow cover, animal care, and guaranteed head count, the rate should compensate for each. The charges for these items can be separate from the standard pasture cost. It is important that the stocking rate and all other terms be negotiated and agreed to before the cattle are placed on the wheat.

Livestock producers who own wheat pasture should make optimum use of this high-quality forage. It should not, however, be viewed as free. If local demand for rental wheat pasture exists, the "opportunity cost" based on one of the methods above can be used to determine the economic value of wheat forage to the farming enterprise. This also makes it clear whether the cattle or the wheat are "making the money." If the feasibility of renting the wheat pasture as a cash crop does not exist, its opportunity cost would be zero. However, the additional out-of-pocket expenses incurred because of grazing, such as higher seeding and nitrogen fertilization rates, still must be included when developing budgets.

Should I Graze Stockers on Wheat Pasture?

Livestock producers use wheat pasture because it is generally a high-quality forage and costs of gain on wheat pasture are often lower than those of a conventional backgrounding program. Wheat producers use wheat as pasture because it maybe the most profitable use of the wheat. There are three basic wheat grain and forage strategies wheat producers need to consider: harvest the wheat for grain only, harvest as forage and grain, harvest as forage only (graze out).

Determining whether it is profitable to graze wheat requires both livestock and wheat producers to do partial budgeting. The livestock producer is interested in returns per head, whereas the wheat producer is interested in how grazing affects per-acre returns. Therefore, the budget of a livestock producer will differ from that of a wheat producer.

Livestock Owner's Perspective

A livestock producer's budget will include the income and costs per head associated with owning cattle and grazing them on wheat pasture. Returns to livestock depend on the purchase price of cattle, costs of wheat pasture, supplemental feed and other production inputs, the timing of forage production, the efficiency of the livestock in converting forage to weight gain, death loss, and sale price of the cattle.

Forage yields depend on planting date, weather, variety selection, and fertilization. Because many of the factors affecting forage yields are decided by the wheat producer, it is important for the livestock producer and the wheat producer to communicate prior to planting the wheat.

The livestock producer must consider all factors affecting profitability when budgeting for wheat pasture profitability. Even though all costs will affect profitability, only variable costs need to be considered in making management decisions. Fixed costs such as depreciation, interest, and taxes on equipment and facilities will affect profitability and will be incurred with or without cattle purchase. Because these costs are fixed in the production year, they can be left out of budget projections and should not affect production decisions. In addition to estimating profitability, it is beneficial to estimate the cost of gain on wheat pasture and compare it with the cost of gain in a drylot feeding program. Table 1 is an example of the type of budget a livestock producer who is considering renting wheat pasture should develop.

Table 1. Cost return budget for winter wheat grazing (steers)[1].

	Example	Your Farm
VARIABLE COSTS PER HEAD:		
1. Wheat Pasture ($2.25 /cwt/mo x 4.5 cwt x 4 mo)	$40.50	
2. Silage (900 lb @ $16/ton)	7.20	
3. Hay (___lb @____/ton)		
4. Grain (2.4 cwt @ $4.45 /cwt)	10.68	
5. Protein (____ lb @ ____ /ton)		
6. Vitamins-salt (30 lb @ $.15/lb)	4.50	
7. Feed Processing (_____bu @ ____bu)		
8. Labor (0.5 hr @ $8.00/hr)	4.00	
9. Veterinary, Drugs, and Supplies	10.00	
10. Marketing Costs	3.50	
11. Freight, Yardage	12.00	
12. Utilities, Fuel, and Oil		
13. Repairs	1.00	
14. Miscellaneous	2.50	
15. Interest on Purchased Livestock		
+ ½ Variable Costs @ 10% (120 days)	16.67	
A. TOTAL VARIABLE COSTS	$112.55	
FIXED COSTS PER HEAD:		
16. Depreciation on Equipment and Facilities	$ 6.88	
17. Interest on Equipment and Facilities @ 10%	3.28	
18. Insurance on Equipment and Facilities @ .25%	0.16	
B. TOTAL FIXED COSTS	$10.32	
C. TOTAL COSTS PER HEAD (A + B)	$122.87	
RETURNS PER HEAD:		
19. Market Animal: 690 lb @ $84.50/cwt	$583.05	
20. Less Cost of Animal: 450 lb @ $100.50/cwt	452.25	
21. Less Death Loss: 2% of line 19.	11.66	
D. GROSS RETURN PER HEAD	$119.14	
E. RETURNS OVER VARIABLE COSTS (D - A)	$ 6.59	
F. RETURNS OVER TOTAL COSTS (D - C)	–$ 3.73	
G. AVERAGE SELLING PRICE NEEDED:		
22. To Cover Variable Cost and Feeder	$83.55	
23. To Cover Total Cost and Feeder	$85.04	
H. TOTAL FEED COST (lines 1 thru 7)	$62.88	
24. Cwt produced (gain)	2.40	
25. Feed cost per cwt gain	$26.20	

[1]Source: KSU Farm Management Guide MF-1009, 1992 Revision

The factors that have the biggest effect on livestock profitability are purchase price, average daily gain, and sale price. Producers must decide how much risk they can bear and the best way to manage the risk associated with each factor. Table 2 shows the sensitivity of breakeven price to purchase price and average daily gain (ADG). Table 3 shows the sensitivity of returns to the same factors. The selling price in Table 3 is adjusted by a sliding scale based on selling weight. For more information on the effects of selling weight on selling price see "Factors Affecting Auction Prices of Feeder Cattle," Kansas State University Extension bulletin C-697.

Table 2. Sensitivity of breakeven price to purchase price and average daily gain.

ADG	Cattle Purchase Price (per cwt) $85	$90	$95	$100	$105	Selling Weight[1]
	Selling price per cwt needed to cover total costs					
1.50	$81.48	$85.26	$89.05	$92.83	$96.62	630
1.75	77.78	81.39	85.00	88.61	92.22	660
2.00	74.40	77.85	81.31	84.76	88.21	690
2.25	71.30	74.61	77.92	81.23	84.54	720
2.50	68.44	71.62	74.80	77.98	81.16	750

[1]Based on initial weight of 450 pounds and 120 days on pasture.

Table 3. Sensitivity of returns per head to average daily gain and purchase mice.[2]

ADG	Cattle Purchase Price (per cwt) $85	$90	$95	$100	$105	Selling Weight[1]
	Returns per head over total cost					
1.50	–$50.28	–$42.62	–$34.96	–$27.29	–$19.63	630
1.75	– 33.18	– 24.02	– 14.86	– 5.69	– 3.47	660
2.00	– 16.53	– 5.87	4.79	15.46	26.12	690
2.25	–0.33	11.83	23.99	36.16	48.32	720
2.50	15.42	29.08	42.74	56.41	70.07	750

[1]Based on initial weight of 450 pounds and 120 days on pasture.

[2]Based on a $13/cwt buy-sell margin for 450 pound-690 pound steers and a $1.25/cwt price slide for every 50-pound change from 690 pounds.

Wheat Producer's Perspective

Wheat producers want to maximize returns per acre, so they have more options than the cattle producer. Returns to the wheat grain enterprise increase if the livestock enterprise generates positive returns. If livestock returns are negative, however, they will reduce returns to the grain enterprise. This is true whether the wheat producer owns the livestock or is leasing the wheat pasture to someone. The following are producer's options for the wheat enterprise:

- Harvest as grain only
- Harvest as grain and forage
  - a. Own cattle and graze wheat
  - b. Lease wheat pasture to someone
- Harvest as forage only (graze out wheat)

The production of grain only is common, but the next two options require more intense management. Harvesting the wheat as grain and forage requires judicious management to maximize cattle gains while minimizing potential yield reductions. Harvesting the wheat as forage only requires managing the wheat to maximize cattle gains per acre. The decision to graze out the wheat or remove the cattle and harvest grain generally does not need to be made at planting time. If the wheat is to be harvested for grain, removing cattle by jointing stage is important to minimize yield reductions. Thus, producers considering a graze-out program can delay their decision, and monitor wheat and cattle prices during the winter.

The examples that follow are based on harvesting the wheat as grain and forage. There will be years when the decision to graze out wheat may be necessary before the wheat reaches the jointing stage. In those cases, the budget format in the example can still be used.

The production of wheat for grain only is used as the baseline for profitability comparisons. The wheat producer should develop a budget to analyze whether returns per acre can be increased by harvesting the wheat as grain and forage or as forage only (graze out) compared with harvesting as grain only. A partial budget can be used to compare the returns of grazing wheat with harvesting for grain only.

A partial budget only includes the costs and income that change from the baseline. This makes it easy to see if grazing the wheat increases or decreases the income per acre compared with harvesting for grain only. It does not, however, indicate if all costs associated with wheat production are covered.

Table 4 is an example of a budget that a wheat producer who owns cattle would use to compare the returns of harvesting wheat as grain and forage with harvesting grain only. The first step in analyzing whether grazing will increase returns per acre is the per head cattle budget. All costs directly related to the cattle must be included in the

Table 4. Grazing wheat and harvesting grain versus harvesting grain only (wheat producer owns cattle).

	Example	Your Farm
A. CATTLE RETURNS PER HEAD (TABLE 1)		
1. Returns over variable costs	$ 6.59	
2. Returns over total costs	– 3.73	
B. STOCKING RATE (HEAD/ACRE)	1.25	
C. CATTLE RETURNS PER ACRE		
3. Returns over variable costs (line 1 x B)	$ 8.23	
4. Returns over total costs (line 2 x B)	– 4.67	
INCREASED (DECREASED) WHEAT PRODUCTION COSTS PER ACRE		
5. Seed cost ($4.00/acre x 50% increase)	$ 2.00	
6. Fertilizer (.12/lb x 40 lb. increase)	4.80	
7. Irrigation cost		
8. Harvest cost		
9. Yield reduction (10% x 35 bu x $3.00)	10.50	
D. TOTAL INCREASED (DECREASED) COST PER ACRE	$17.30	
E. INCREASED RETURNS PER ACRE[1]		
10. Returns over variable cost per acre (line 3 – D)	–$ 9.07	
11. Returns over total cost per acre (line 4 – D)	– 21.97	
F. INCREASED RETURNS PER ACRE (with no charge for wheat pasture)[1]		
12. Wheat pasture charge per head (Table 1)	$40.50	
13. Total wheat pasture cost per acre (line 12 x B)	50.63	
14. Returns over variable cost per acre (lines 10 + 13)	41.56	
15. Returns over total cost per acre (lines 11 + 13)	28.66	

[1]Positive number indicates per acre returns are increased by grazing wheat; negative number indicates harvesting wheat as grain only is more profitable.

partial budget because they "change" compared with the baseline of harvesting wheat for grain only. These costs will depend on whether the wheat producer is the cattle owner or is leasing the wheat pasture to someone. The costs included in the cattle budget will be basically the same as those of the cattle producer in Table 1.

The wheat producer is interested in income per acre, so the net returns must be adjusted to a per acre basis. This adjustment will be based on the stocking rate (see section on Livestock Management). Table 4 shows the increase (decrease) in returns per acre from grazing wheat for a wheat producer who also owns cattle.

After the per head returns are converted to a per acre basis, the next step is to account for the effect grazing has on wheat production costs and yield. The only costs of wheat production that will be affected by grazing are seed cost (higher seeding rate), fertilizer cost (increased nitrogen requirement) and possibly irrigation costs (see section on Cultural Practices). Harvest cost may be slightly lower if yields decrease and will be eliminated with graze-out wheat. If grain yields decrease with grazing wheat, this yield reduction is an "opportunity cost" of grazing and must be included in the budget. All other wheat production costs will be basically the same whether the wheat is harvested as grain only, grain and forage, or grazed out.

The increased cost of wheat production due to grazing (Table 4, line D) is subtracted from the per acre cattle returns. The resulting value (Table 4, line E) shows how much the returns per acre increase or decrease by grazing the wheat. It is important to remember that the increased return per acre is not a cash-flow return because the wheat pasture charge and yield reduction were included, even though they are not out-of-pocket cash expenses.

Section F of Table 4 allows the wheat producer to calculate the increased returns per acre from grazing the wheat when no charge

Table 5. Grazing wheat and harvesting grain versus harvesting grain only (wheat producer leases out wheat).

		Example	Your Farm
A.	INCOME AND COSTS PER HEAD:		
1.	Wheat pasture income per head (Table 1)	$40.50	
2.	Costs per head (fence, care, feed, etc.)	0.00	
3.	Net returns per head (line 1 - 2)	40.50	
B.	STOCKING RATE (HEAD/ACRE)	1.25	
C.	INCOME AND COSTS PER ACRE:		
4.	Wheat pasture net income per acre (line 3 x B)	$50.63	
5.	Increased wheat production costs per acre (Table 4)	17.30	
6.	Increased returns per acre (line 4 – 5)[1]	33.33	

[1]Positive number indicates per acre returns are increased by grazing wheat; negative number indicates harvesting wheat as grain only is more profitable.

Table 6. Sensitivity of returns per acre to wheat price and yield loss associated with grain.

Grain Yield Loss	Wheat Selling Price $2.00	$2.50	$3.00	$3.50	$4.00
	Increased return per acre				
0%	$43.83	$43.83	$43.83	$43.83	$43.83
10%	36.83	35.08	33.33	31.58	29.83
20%	29.83	26.33	22.83	19.33	15.83
30%	22.83	17.57	12.32	7.07	1.82
40%	15.82	8.82	1.82	– 5.18	– 12.18

Assumptions: Wheat yield without grazing = 35 bushels/acre
Increased wheat production cost = $6.80/acre ($4.80 fert, $2.00 seed)
Wheat pasture income = $50.63/acre ($40.50/head x 1.25 head/acre)

is assigned to the wheat pasture. This value is found by adding the wheat pasture charge back to the returns (Table 4, line E) No other costs or income should change.

Table 5 is an example of a budget that can be used by a wheat producer who leases wheat pasture to someone. Basically, it will be profitable to graze the wheat if the grazing income is greater than the increased wheat production costs and yield reduction. Leasing wheat pasture to someone is attractive because there is less financial risk than with owning the cattle. The wheat producer can eliminate some of the financial risk that exists by charging for the wheat pasture with one of the methods that does not rely heavily on gain. The increased production costs are fairly easy to project, but the "cost" of potential yield losses can vary significantly. Table 6 shows the sensitivity of increased returns per acre to percent yield loss and the price of wheat for the producer who leases out the pasture. In the example, returns ranged from an increase of $43.83/acre to a decrease of $12.18/acre. Negative returns were not obtained in this example until yield was reduced by 40 percent and the price of wheat was over $3.00. In order to prevent yield losses of this magnitude, it is important to put the cattle on the wheat and remove them at the right times (see section on Grazing Management).

Summary

Producing wheat as a forage crop as well as a grain crop can be a way for many wheat producers in Kansas to enhance the income from their wheat enterprise. Livestock producers like to use wheat as a forage crop because it is a high-quality forage and costs of gain on wheat pasture generally compare favorably with other backgrounding or growing programs. Wheat grazing can be profitable for both wheat and livestock producers, but it also can reduce income or generate losses. It is important that both parties put together budgets to help determine if wheat grazing will be profitable for them. In addition to budgeting, it is helpful for the producers to identify their production and financial risks. Once they have identified the factors that most affect profitability, they can more easily manage the associated risk.

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