OKLAHOMA COOPERATIVE EXTENSION SERVICE AGEC-212

Should I Buy (or Retain) Stockers to Graze Wheat Pasture?

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Winter wheat, valued at $617 million in 2007, ranks second in value of commodities produced in Oklahoma. That is the value of grain only. It does not include the value for pasture used in producing cattle and calves, which is estimated at $2 billion and is Oklahoma's largest agricultural commodity measured in terms of gross sales.

Wheat producers may be interested in grain yields only, forage yields only (if wheat is grazed out), or both grain and forage yields (dual-purpose wheat) if livestock are taken off pasture before first hollow stem. How can a farmer/rancher calculate potential returns to wheat grain and pasture? The profit potential in forage depends on the following factors:

1. the costs of producing forage,
2. the returns to livestock utilizing forage (or rents received through lease agreements), and
3. forage yields.

Production costs of establishing dual-purpose wheat are frequently higher than producing grain only. Heavier seeding rates for dual-purpose wheat are recommended. Furthermore, additional nitrogen may be needed to maintain grain yields if grazing is allowed.

Returns to livestock depend on the purchase price of cattle, costs of supplemental feed and other inputs into the livestock production process, the timing of forage production (amount produced before dormancy in winter), the efficiency of the livestock in converting forage to weight gain, and the sale price of cattle. Forage yields depend primarily on planting date, weather, variety seeded, and fertilization.

In this OSU Extension Fact Sheet, factors that should be considered in deciding whether to buy or retain cattle to graze wheat pasture are discussed. The impact on potential profit of variability in forage yield and returns to livestock are demonstrated. Means of managing risks associated with variability in forage production and utilization are outlined.

Wheat Production Costs

Farm records should provide the data needed to establish historical costs of producing wheat and forage as illustrated in a wheat enterprise budget. The budget incorporates information about the specific resources, management practices, and technology used in the production process. Table 1 shows an example wheat budget summary for grain only listing inputs, costs, and returns per acre (excluding government payments for participation in commodity programs) generated using OSU Enterprise Budget Software.[1] The assumed yield of 32 bushels per acre is equal to the state's average wheat yield for 1998 to 2007. The wheat price is projected at $7.50 for the 2008 marketing year. Seeding rate and nitrogen fertilization practices are those used to produce grain only. Pasture inputs and returns are omitted.

With current high prices, the grain budget shows positive returns to overhead, risk, and management. Even with good records to indicate likely costs and yields and an expert forecast of market prices, profit potential from a particular plan is uncertain. Recent prices, of course, are much higher than historical averages. Table 2 shows the sensitivity of grain returns (excluding government payments) to yields and prices given the costs listed in Table 1. High yields and high prices lead to positive projected profits given production costs. Lower yields and lower prices (or higher total costs of production) result in negative returns highlighting the importance of managing production costs.

Livestock Returns

If wheat pasture is not grazed or is underutilized, then it may result in forgone income (an opportunity cost) to the wheat producer. The amount of income forgone depends on the returns to livestock utilizing forage or the potential income from leasing grazing rights. To estimate the net returns to livestock, a producer should develop an enterprise budget for the livestock enterprise, that is, estimate the costs of livestock production (e.g. feed, veterinarian costs, stocker purchase costs, fertilizer, and additional wheat seed required for forage production) and income from sale of livestock. Wheat producers who do not have the time or capital, or who do not wish to take on the additional risk associated with livestock may lease grazing rights to others.[2]

A stocker steer enterprise budget (Table 3) is used in developing an estimate for forage returns. In the stocker budget, steers are projected to gain 2 pounds per day over a

[1] Information about OSU enterprise budget software is available at www.agecon.okstate.edu/budgets, through your local Extension office, or the OSU Agricultural Economics Department, 515 Agricultural Hall, Stillwater, OK 74078, 405-744-9836.

[2] See OSU Extension Current Report CR-216, Oklahoma Pasture Rental Rates, for typical rates and terms.

Table 1. Dryland Wheat Enterprise Budget- Grain only.

PRODUCTION	Units	Price	Quantity	$/Acre	Your Value
Wheat	Bu.	$7.50	32	$240.00	
Small Grain Pasture	Acre	$ -	0	$ -	
Other Income	Acre	$ -	0	$ -	
Total Receipts				**$240.00**	
OPERATING INPUTS	**Units**	**Price**	**Quantity**	**$/Acre**	**Your Value**
Wheat seed	Bu./acre	$14.80	1.00	$14.80	
Fertilizer[1]	Acre	$50.45	1	$50.45	
Custom Harvest	Acre	$22.97	1	$22.97	
Pesticide	Acre	$4.18	1	$4.18	
Crop Insurance	Acre	$7.00	1	$7.00	
Annual Operating Capitol	Dollars	8.50%	77.05	$6.55	
Machinery Labor	Hrs.	$8.25	0.67	$5.53	
Machinery Fuel, Lube, Repairs	Acre	$27.62	1	$20.67	
Total Operating Costs				**$139.10**	
Returns Above Total Operating Costs				**$100.90**	
FIXED COSTS	**Units**	**Rate**		**$/Acre**	**Your Value**
Machinery/Irrigation	$/value				
Interest at	Dollars	8.00%		$7.28	
Taxes at	Dollars	1.00%		$1.41	
Insurance	Dollars	0.60%		$0.55	
Depreciation	Dollars			$9.99	
Land	$/acre	-			
Interest at	Dollars	0.00%		$ -	
Taxes	Dollars	0.00%		$ -	
Total Fixed Costs				**$19.23**	
Total Costs (Operating + Fixed)				**$158.33**	
Returns Above All Specified Costs				**81.67**	

[1] Fertilizer - NH3 56 lbs. @ $.35/lb., DAP 55 lbs. @$.46/lb., UAN (28% N) 30 lbs. @ $.20/lb.

Table 2. Income (excluding government payments) Above All Costs at Differing Yields and Prices.[1]

Yield (bu./acre)	Price per bushel				
	$5.50	$6.50	$7.50	$8.50	$9.50
12	($90)	($78)	($67)	($55)	($44)
22	($35)	($14)	$8	$30	$52
32	$18	$50	$82	$114	$146
42	$71	$113	$155	$197	$240
52	$124	$176	$229	$281	$334

[1] If custom harvest is used, the custom harvest charge used is based on the new yield.

120-day holding period (November 15 to March 15), and are subject to sale weight shrinkage of 3 percent, and a 2 percent death loss. A return to land, overhead, risk, and management of $21.73 per head is projected when 400-pound steer calves are purchased at $140 per hundredweight and sold 120 days later at 621 pounds for $110 per hundred weight.[3]

Stocker returns per head are quite sensitive to steer calf and steer prices. A $10 per hundredweight difference in either the price received or price paid for calves results in an approximate $40 to $60 per head variation in returns. Table 4 indicates the sensitivity of stocker returns per head to stocker calf and steer prices.

Likewise, stocker returns per head are sensitive to the rate of daily gain and to the length of ownership. Table 5 shows returns under alternative scenarios.

To calculate returns to grain and forage, stocker returns

[3] Calf price projections are based on five-year (2003 to 2007) seasonal patterns.

Table 3. Partial Stocker Enterprise Budget -150 Steers (assuming owner-operator has wheat acres for grain production). November purchase-400 lbs., March sale-621 lbs.

PRODUCTION:	**Wt.**	**Unit**	**Price/Cwt**	**Quantity**	**$/Head**	**Your Value**
Stockers[1]	621	Lbs.	$110.00	.980 Hd.	$669.22	
Other Income		Head	$ _	.980 Hd.	$ -	
Total Receipts					**$669.22**	
OPERATING INPUTS	**Wt.**	**Unit**	**Price**	**Quantity**	**$/Head**	**Your Value**
Stockers	400	Lbs.	$130.00	1 Hd.	$520.00	
Add'l Fert./Seed for Forage[2]		Head	$67.93	1	$ 45.87	
Hay		Head	$7.20	1	$7.20	
Salt		Head	$0.13	1	$0.13	
Minerals		Head	$0.13	1	$0.13	
Vet Services/Medicine		Head	$3.88	1	$3.88	
Vet Supplies		Head	$0.71	1	$0.71	
Marketing		Head	$5.54	1	$5.54	
Mach/Equip Fuel, Lube Repairs		Head	$16.98	1	$16.98	
Machinery/Equipment Labor		Hrs.	$9.50	1.11	$10.55	
Other Labor		Hrs.	$9.50	1.5	$14.25	
Annual Operating Capitol		Dollars	8.50%	191.87	$16.31	
Total Operating Costs					**$641.55**	
Returns Above Total Operating Costs					**$27.67**	
FIXED COSTS		**Unit**	**Rate**		**$/Head**	**Your Value**
Machinery/Equipment						
Interest at		Dollars	8.00%		$1.86	
Taxes at		Dollars	1.00%		$0.41	
Insurance		Dollars	0.60%		$0.14	
Depreciation		Dollars			$3.53	
Land						
Interest at		Dollars	0.00%		$ -	
Taxes at		Dollars	0.00%		$ -	
Total Fixed Costs					**$5.94**	
Total Costs (Operating + Fixed)					**$647.49**	
Returns Above all Specified Costs					**$21.73**	

[1] Stocker sale weight adjusted for 3% shrink.

[2] NH3 - 56 lbs. @ $.35 and 1 bushel seed @ $14.80/bu., adjusted on a stocking rate of .75 head per acre.

Table 4. Sensitivity of Stocker Returns per Head to Steer Calf Prices and Steer Prices.[1]

Purchase Steer Calves	Sell Steers $105/cwt	$110/cwt	$115/cwt
$125/cwt	$12	$42	$73
$130/cwt	($9)	$22	$52
$135/cwt	($29)	$1	$32

[1] Steer calves weigh 400 lbs.; steers sold weigh 621 lbs; all other costs equal.

per head must be converted to stocker returns per acre. Then, wheat and stocker returns per acre can be summed. Stocker returns per acre are the product of stocker returns per head and the stocking rate (or head per acre). The stocking rate is, in turn, a function of forage yield (pounds of dry matter produced per acre), livestock efficiency in grazing forage (pounds of dry matter consumed per pound of gain), and pounds of gain per animal. Remember that profitable stocker production is the result of matching economic conditions to alternative production systems combined with sound animal husbandry and business management.[4]

Forage Yields

Several factors impact the forage yield of small grains. Some of these, such as soil type, rainfall, and temperature are largely beyond the control of the farmer. Other factors,

Table 5. Sensitivity of Stocker Returns per Head to Rate of Gain and Length of Ownership.[1]

Rate Of Gain	Length of Ownership (days) 90	120	150	180
1.75	($58)	($10)	$41	$91
2.00	($35)	$22	$80	$138
2.25	($11)	$53	$119	$185

[1] Steers are sold for $110/cwt at end of holding period.

[4] For a general discussion of the factors that affect the economics of stocker production, refer to the publication, *Economics of Stocker Production*, Veterinary Clinics of North America, 22(2): 271-296, July 2006, available at www.vetfood.theclinics.com.

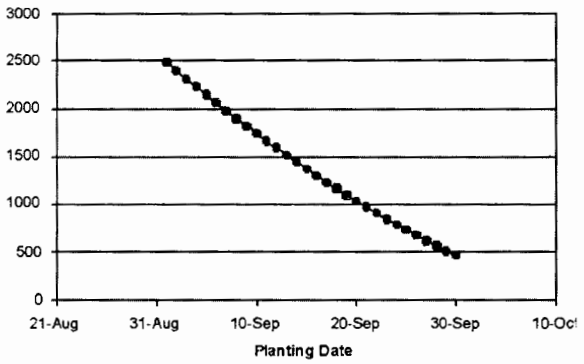

Figure 1. Wheat fall forage yield as affected by planting date at Lahoma, OK from 1991 to 1999.

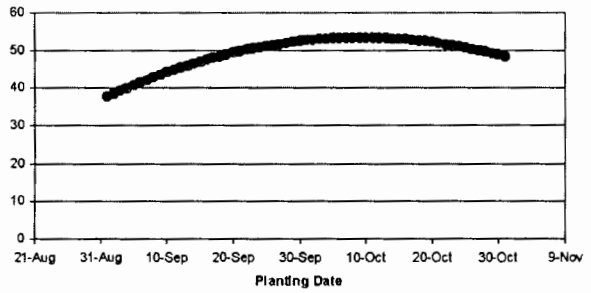

Figure 2. Wheat grain yield as affected by planting date at Lahoma, OK from 1991 to 1999.

such as variety selection, seeding rate, fertility, and planting date are controllable by the farmer. Among the controllable factors, planting date has the largest influence on the amount of forage produced by small grains. As long as sufficient moisture is available to fuel crop growth, earlier planting will result in more forage production than later planting (Figure 1). The tradeoff, however, is that early planting (before October 1) generally reduces wheat grain yield (Figure 2).

The extent to which wheat grain yield is affected by early planting varies by year and location, but research conducted at OSU indicates that reductions in wheat grain yield are generally greatest for wheat sown prior to September 15; therefore, around September 15 is a good time for sowing dual-purpose wheat in Oklahoma. Growers wishing to place greater emphasis on a cattle enterprise might benefit from greater forage resulting from earlier sowing. Likewise, those placing greater emphasis on grain yield will likely benefit from a more traditional, early- to mid-October sowing date.

Seeding rate and row spacing impact forage production of wheat. High seeding rates (more than 2 bu/ac) will result in more rapid accumulation of forage than seeding rates required for grain-only production (usually around 60 to 90 lbs/ac). This is largely due to more rapid canopy closure and faster accumulation of biomass. It is important however, not to overlook seed quality when deciding on increased seeding rates. Seedling health and vigor are even more important in a dual-purpose wheat production system than in a grain only system. This is because of the need for rapid canopy expansion and biomass accumulation.

Many wheat producers place great emphasis on variety selection, and OSU variety performance tests continue to demonstrate that variety selection does impact wheat forage production. Simply put, some varieties do not produce much forage or have extremely prostrate growth habits that are not conducive to grazing. Likewise, there are generally two or three fall wheat forage varieties that produce well above average. These are the exceptions rather than the rule, as most modern wheat cultivars grown in the southern Great Plains are fairly comparable in their forage production potential. To help in this decision-making process, OSU compiles forage production data on the most popular varieties each year. These data are published at Production Technology reports and are available at: www.wheat.okstate.edu.

Fall forage production by wheat varieties is only part of the equation when is comes to the total amount of forage available for cattle grazing. To optimize the dual-purpose wheat enterprise, cattle should be removed from wheat pasture by first hollow stem. The date which first hollow stem occurs varies according by year, location, planting date, and variety. Varieties sown on the same date in the same location can vary by as much as three weeks in reaching first hollow stem. This equates to a three week difference in grazing time during early spring. This is generally at a time during which average daily gains for stocker cattle are at their highest. To compare the first hollow stem rating among varieties, obtain a current wheat variety comparison chart from your local county Extension office.

A good fall fertility program will have great impact on the amount of wheat forage that is available for grazing. Wheat requires approximately 30 lb/ac of nitrogen to produce 1,000 lb/ac of wheat forage and 2 lb/ac of nitrogen to produce one bushel of grain. Nitrogen required for forage production must be available for crop growth early in the fall and should ideally be applied prior to sowing wheat.

Due to the price of nitrogen fertilizer, it generally gets the most attention by wheat farmers, but phosphorus (P) fertility is just as important to wheat forage production. Phosphorus is even more important when the soil pH falls below 5.5. The most effective and efficient way to deliver P to the plant is through an in-furrow application with the seed. This can be accomplished using either dry or liquid forms of P, as the efficacy of each of these forms is similar. The most important factor is not the P source, but rather that P is applied and that it is banded with the seed, as this allows the young seedling to readily access P fertilizer and encourages early growth and tillering by the wheat plant.

Conversion Efficiency

Forage utilization, or the conversion efficiency for grazing compared to clipping, is assumed to be less than 100 percent. Wheat producers stock conservatively — they do not stock at rates that are supported only by optimum growing conditions and/or may face credit constraints for purchasing cattle. Forage intake may be reduced by weather (for instance, snow cover). Forage growth is not continuous and could be limiting in some months while the stocking rate is fixed during the

grazing period. Finally, some loss from trampling may occur. Research data are not currently available to compute economically optimal stocking rates for winter wheat pasture.

Research data support the rule-of-thumb that a pound of gain requires approximately 10 pounds of dry matter intake for stocker steers. Dry matter intake requirements for other livestock may be higher or lower. Rates of gain vary with the weight, age, and genetic potential of livestock. They can be influenced substantially by weather, management practices, and husbandry skills of the producer as well as by the quantity and quality of the wheat forage.

Stocking Rate

The formula for calculating head per acre is listed in Table 6. If 240 pounds of gain per head are planned and livestock consume 10 pounds of dry matter per pound of gain, then 2,400 pounds of dry matter are required per head during the grazing period. The number of head per acre that can be maintained on pasture depends on the forage production.

Table 6. Stocking Rate Calculation

Minimum Forage Production	Head/Acre	Acre/Head
3,600 lbs. DM	1.5	0.67
2,400 lbs. DM	1.0	1.0
1,800 lbs. DM	0.75	1.33
1,200 lbs. DM	0.50	2.0

The minimum forage production figure can be compared to clipping data to determine the approximate number of head the pasture will support, given the assumed rates of gain and conversion efficiency. Again, remember to look at early forage production to ensure that stocking rates are justified, or plan to purchase feed or pasture to supplement weak early forage stands. A stocker on target to gain 240 pounds before March 15 will require 900 pounds of DM between November 15 and January 1.

Returns to Grain and Pasture

Table 7 is a worksheet for calculating the returns per acre to both grain and forage production. Information from the wheat and stocker budgets is combined with forage production data and assumptions about grazing efficiency and dry matter (DM) consumed per pound of gain. Grain costs and returns per acre and stocker returns per head are transferred directly from the appropriate enterprise budget, with adjustments needed for dual-purpose wheat compared to wheat for grain only. Additional costs for dual-purpose wheat (fertilizer and seed) are included in the stocker budget. Grain yields are assumed to be 90 percent of grain only enterprises.

Positive returns to the stocker operation enhance the returns to the wheat enterprise. However, stocker production adds other risks, both production and financial, and removing cattle from wheat pasture prior to first hollow stem is critical to maintaining grain yields. If returns to the livestock enterprise are negative, they reduce any income associated with wheat production. In Table 8, the sensitivity of total returns to both grain and cattle prices are demonstrated. Remember that these are based on a strict set of assumptions and conditions represented by the individual enterprise budgets.

Similar calculations could be made to evaluate the returns to grain and forage using other livestock budgets, such as cow-calf or sheep operations. Note that assumptions about grazing efficiency, pounds of dry matter per pound of gain and pounds of gain per head differ for different sizes and types of livestock.

Risk Management

Once the budgeting and planning process has been completed, a producer's attitude toward risk must be considered in deciding whether to implement a plan. Risk management strategies to use in dealing with uncertainty include:

1. Reduce uncertainty. With wheat pasture, leasing out the pasture for a fixed rental rate per acre may be an option.
2. Shift some of the risk. Risks can either be shifted to or shared with another firm, for instance through insurance, contracting, hedging, or share leases. Sharing risk comes at a cost through premiums paid or profit potential given up. Risks can also be shifted by planting several good varieties and staggering planting dates. In that way, a producer prevents the risk of failure.
3. Rely on reserves to carry one through low income or loss periods. Reserves might include feed, hay, or cash in a farm account.

Decision aid software is available to evaluate various options and associated returns with wheat and stocker enterprises. The Wheat and Wheat-Stocker Production Planner spreadsheet enables the user to describe farm-specific situations and to compare the economic consequences of alternative wheat and wheat-stocker production systems. Information about Wheat and Wheat-Stocker Production Planner software is available at www.agecon.okstate.edu/faculty/ffmr.asp or the OSU Agricultural Economics Department, 417 Agricultural Hall, Stillwater, OK 74078, 405-744-6156.

Summary

Farm income can be earned from grain and forage utilization as well as governmental commodity programs. High yields, high prices or relatively low costs of production are needed to generate positive returns to wheat without government payments or forage utilization. Positive returns to livestock enterprises which utilize wheat pasture enhance the profitability of wheat production.

Producers should look at yield data over time from both experiment station plots and from their farm records in evaluating forage potential for different wheat varieties. Once the basic enterprise budgets are developed, they can be updated periodically to reflect new and different circumstances. By monitoring the farm operation and adjusting plans in response to changing production and price conditions, a producer can maximize profits earned for the farm.

Table 7. Worksheet for Calculating Per Acre Returns to Dual Purpose Grain and Forage Production.

Grain Returns to Land, Overhead, Risk and Management
(Without Government Payments)

	Example	Your Value
Total Receipts (90% of grain only budget)	$216.00	
- Total Operating Costs (custom harvest adjusted)	-138.08	
- Total Fixed Costs	-19.23	
Wheat Returns per Acre	$58.69	_____ (A)

Stocker Returns to Land, Overhead, Risk, and Management

Total Receipts	$669.22	
- Total Operating Costs (w/additional fertilizer/seed)	- 641.55	
- Total Fixed Costs	- 5.94	
Stocker Returns per Head	$21.73	_____ (B)

Stocking Rate (Head per Acre);

$$\text{Head/Acre} = \frac{\text{Lbs DM Produced per Acre}}{\text{(Lbs DM per Lb of Gain) x (Lbs of Gain per Head)}}$$

$$= \frac{1{,}800}{10 \times 240}$$ _____

= .75 _____ (C)

Stocker Returns per Acre = Stocker Returns per Head (B) * Head/Acre (C)

= $21.73 x .75 _____

= $16.30 _____ (D)

Total Returns ($/A) to Land, Overhead Risk, and Management

Wheat Returns (A)	$58.69	
+ Stocker Returns (D)	$16.30	
Total Returns	$74.99	

Table 8. Sensitivity of Total Returns Per Acre to Grain and Cattle Prices.[1]

Grain Price	Stocker Sale Price = $105/cwt Stocker Purchase Price			Stocker Sale Price = $110/cwt Stocker Purchase Price			Stocker Sale Price = $115/cwt Stocker Purchase Price		
($/bu)	$125/cwt	$130/cwt	$135/cwt	$125/cwt	$130/cwt	$135/cwt	$125/cwt	$130/cwt	$135/cwt
$5.50	$10	($6)	($21)	$33	$17	$2	$56	$40	$25
$6.50	$39	$23	$8	$61	$46	$31	$85	$69	$54
$7.50	$68	$52	$37	$90	$75	$59	$113	$98	$83
$8.50	$96	$81	$66	$119	$104	$88	$142	$126	$111
$9.50	$125	$110	$95	$148	$133	$117	$171	$155	$140

[1] Based on budgets used in this publication and a stocking rate of .75 head per acre.

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Adopted from an earlier version by Damona Doye and Eugene Krenzer, former Extension Wheat Specialist.

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