Agribusiness Management Series

The Effect of Grazing Past First Hollow Stem On Wheat and Stocker Profits

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Background

In some years as much as two-thirds of Oklahoma's winter wheat may be planted as a dual-purpose, grazing and grain crop (True et al.; Hossain et al.). A critical decision point in dual-purpose wheat profitability occurs near a physiological growth stage called first hollow stem (FHS). FHS occurs when stems of ungrazed plants begin to elongate and the stem above the roots and below the developing head becomes hollow. The wheat plant is said to be at FHS when the hollow stem portion of the plant is 5/8 inch long. The occurrence of FHS depends on climatic factors including temperature and precipitation and on wheat variety. (See Edwards and Horn for more details.)

For a given planting date and with a reasonable stocking density, grazing prior to FHS has limited effects on wheat yield, but extended grazing beyond FHS can greatly reduce wheat yields. Grazing, however, increases calf weights. So, if the value of weight gain exceeds the value of reduced wheat yields, extended grazing would be economically viable. The questions are (1) what are relative values of increased weights versus reduced wheat yields and (2) Under what circumstances is grazing wheat intended for grain harvest past FHS advisable?

Wheat Yields and Extended Grazing

Two field experiments have been conducted to determine the effect of grazing past FHS on Oklahoma wheat yields. A chart that shows the results of these experiments is included in Figure 1. Redmon et al. conducted experiments in 1990, 1992, 1993, and 1994. In 1992 and 1994, the wheat yield decline from grazing past FHS was dramatic. They found that on average grazing past FHS reduced wheat yields by 1.25 bushels (or 5 percent of yield) per day. They concluded that grazing should be terminated at or before FHS. The Fieser et al. study was conducted in 2003 and 2005. In 2003 they found only a small yield decline from grazing a week past FHS. They concluded that there may be a "safety zone" during which cattle can be grazed past FHS without damaging grain yield. The results of these field trials, as with almost all field crop experiments, were sensitive to weather prior to FHS and weather after FHS. In addition to the weather, wheat recovery after grazing is sensitive to the amount of green leaf area left after grazing.

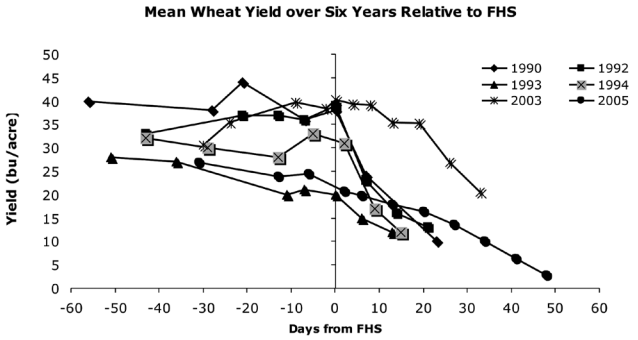

Figure 1. Mean wheat yields relative to first hollow stem (FHS) Wheat yields relative to first hollow stem (FHS) and date of grazing termination for six production seasons at the Wheat Pasture Research Unit, Marshall, OK. Wheat yields in years 1990-1994 are from Redmon et al. and wheat yields in 2003 and 2005 are from Fieser et al.

Addressing the contradictory findings from these two studies, Taylor et al. revisited the grazing termination date issue. They combined data from the two studies, used a more precise statistical modeling approach, and assumed that conditions reflected in each of the six years was equally likely to occur. Whereas Fieser et al. assumed that 2003 conditions would occur half the time, and Redmon et al. assumed that 1992 conditions would occur a quarter of the time, Taylor et al. assumed that each of the six years for which data were available was equally likely. They assumed that the very favorable conditions of 2003 could be expected to occur only once in six years. Similarly, by assumption, the very unfavorable conditions of 1992 could be expected to occur only once in six years. As could be expected, the Taylor et al. results fall roughly half way between those of Fieser et al. and Redmon et al. Taylor et al. found an expected 3 percent reduction in grain yield for grazing one day past FHS, an 8 percent reduction at three days past FHS and an 18 percent reduction at

Table 1. Estimated percent reduction in wheat grain yield from extended grazing.

Days Past FHS	*Feiser et al. data*	*Redmon et al. data*	*Combined data*
0			
1	1%	5%	3%
2	2%	10%	5%
3	3%	15%	8%
4	3%	20%	11%
5	4%	24%	13%
6	5%	29%	15%
7	6%	33%	18%
8	7%	37%	20%
9	8%	41%	22%
10	9%	45%	25%
11	11%	48%	27%
12	12%	52%	29%
13	13%	55%	31%
14	14%	58%	33%

Source: Adapted from Taylor et al.

seven days past FHS. Table 1 shows the expected percent reduction in wheat yield from extended grazing from each of the three studies.

Economics of Extended Grazing

Table 2 shows the impact, based on the Taylor et al. estimates, of extended grazing on wheat grain returns, feeder cattle returns, and total returns. ADG is set at 3 lb/day (Fieser et al. reported an ADG of 3.5 pounds in 2003 and 3.3 pounds in 2005. Redmon et al. estimated an ADG of 2.43 pounds.). Wheat grain yield is set at 35 bu/ac, stocking rate is 0.64 hd/ac (1.6 ac/hd), wheat price is $7.80/bu, calf price is $124/cwt and wheat pasture rental rate is $0.50 per pound of gain.The Redmon et al. data show the worst case scenario. Even a single day of extended grazing reduces profit. The combined data show a similar, although less pessimistic, result.

Although not shown in Table 2, there is an additional adverse effect due to calf prices. Both seasonal trends and price slide reduce expected returns from extended grazing. Seasonally, prices for heavier weight cattle (700+ pounds) tend to decline from February through March. The effect is typically $8 to $10 per cwt for 700+ pound feeder calves.

For most expected weather and price conditions, extending grazing beyond FHS for wheat intended for grain harvest is not likely to generate more net income than terminating grazing at FHS. If an additional day of grazing adds 3 lbs to calves and calf price is $124/cwt with a $6 slide, stocking rate is 0.64 head per acre and wheat pasture rental rate is $0.50 per pound of gain, added calf returns are only about $0.61 per acre. That translates into a breakeven yield loss of 0.08 bu/acre at $7.80/bu for wheat. Any wheat grain yield loss greater than 0.08 bu/acre/day will reduce profit given these prices, ADG, and stocking rate.

Table 3 provides a worksheet to determine if extended grazing is advisable for your situation. A computerized decision aid is also available to assist producers with economic evaluation of extended grazing. A free copy of the program is available at: http://agecon.okstate.edu/faculty/publications/3443.xlsm

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Table 2. Effect of extended grazing on cattle return, wheat grain return and total returns.

Grazing Termination Date	*Change in cattle returns ($/hd)*	*Change in cattle returns ($/ac)*	*Change in wheat yield (bu/ac)*	*Change in wheat return ($/ac)*	*Change in total return ($/ac)*
1 day after FHS					
Fieser et al.	$0.95	$0.61	-0.35	-$2.73	-$2.12
Redmon et al.	$0.95	$0.61	-1.75	-$13.65	-$13.04
Combined data	$0.95	$0.61	-1.05	-$8.19	-$7.58
7 days after FHS					
Fieser et al.	$6.46	$4.13	-2.10	-$16.38	-$12.25
Redmon et al.	$6.46	$4.13	-11.55	-$90.09	-$75.96
Combined data	$6.46	$4.13	-6.30	-$49.14	-$45.01

Note: Assumes a 35 bu/ac wheat grain yield, a stocking rate of 0.64 hd/ac, average daily gain = 3.0 lb, wheat price = $7.80/bu, calf price of $124/cwt, a $6 slide and wheat pasture lease rate of $0.50 per lb of gain. Adapted from Taylor et al.

Table 3. Extended grazing worksheet to determine the expected change in net return from grazing past First Hollow Stem (FHS).

Weight at FHS (lb)	×	Sale price ($/lb)	=	Calf revenue ($/hd)	
_____	×	_____	=	_____	(a)
Weight after extended grazing (lb)	×	Sale price ($/lb)	=	Calf revenue ($/hd)	
_____	×	_____	=	_____	(b)
Change in calf revenue		($/hd)		_____ (a-b)	(c)
Rental rate ($/lb of gain)	×	Pounds gained during extended grazing (lb)	=	Rent paid extended grazing ($/hd)	
_____	×	_____	=	_____	(d)
Net change in calf revenue		($/hd)		_____ (c-d)	(e)
Stock rate		(hd/ac)		_____	(f)
Net change in calf revenue		($/ac)		_____ (e × f)	(g)
Reduced wheat yield (bu/ac)	×	Wheat price ($/bu)		Change in wheat revenue ($/ac)	
_____	×	_____	=	_____	(h)
Change in net return		($/ac)		_____	(g-h)

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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