# Effect of Time of Grazing Termination of Winter Wheat Pasture on Cattle Performance and Subsequent Grain Yield

B.G. Fieser, G.W. Horn, E.G. Krenzer, and S. A. Schaefer

## Story In Brief

The objective of this study was to determine the timing of grazing termination, relative to emergence of first hollow stem (FHS) on cattle performance and subsequent grain yield. Fifty-two predominantly black crossbred steers (average initial BW = 892 lb) were used during winter and spring of 2003 to determine cattle performance. One continuous, traditionally managed wheat field was used and divided into four pastures, resulting in 13 steers per pasture. First hollow stem was observed on March 13, and the period following this date was considered the graze-out phase. Exclosures to prevent grazing were erected periodically between February 12 and April 15. Average stocking rate from March 13 thru April 1 was 1.11 acres per steer, from April 1 thru April 17 average stocking rate was increased to .73 acres per steer. Despite relatively heavy starting weights, steer weights increased linearly during graze-out to an average weight at the end of the trial of 1010 lb, with an ADG of 3.53 lb/steer. Grain yield responded in a quadratic manner relative to the number of days past FHS before grazing termination. Average grain yield when grazing was terminated at FHS was 40.1 bushels (bu) per acre. Grazing one and four weeks past first hollow stem resulted in reducing grain yield by 1.4 and 14.2 bu per acre, respectively. This data indicates that cattle performance can be excellent during the graze-out phase of wheat grazing. However, dramatic detrimental effects of grazing past FHS are seen in subsequent grain yields.

Key Words: wheat, grazing termination, steer, ADG, grain yield

## Introduction

One of the continuous questions facing producers of dual-purpose winter wheat operations is when to terminate grazing. If cattle are removed sooner than necessary then the production of cattle gain is lost. However, if cattle are left on wheat pastures too long the resulting grain yield can be decreased. The common recommendation to producers is to remove cattle before wheat reaches the first hollow stem (FHS) stage of growth to avoid losses in grain yield. It has previously been shown that grazing past FHS results in net returns which are less than when grazing is terminated at FHS (Redmon et al., 1995; Krenzer and Horn, 1997). Factors such as weather, market conditions, and management constraints can dictate when producers are able to remove cattle from pastures. With this in mind, the objective of this study was to determine the effects of grazing past FHS (referred to as graze-out) on cattle performance and subsequent grain yields.

## Materials and Methods

***Study Site***. One continuous, clean-tilled wheat field (90 acres) was divided into four pastures (approximately 22 acres per pasture). Wheat was planted on Labor Day weekend (Sept 5 and 6). Cattle grazed these pastures as part of a separate study from Nov 13, 2002 through Mar 13, 2003. Length of FHS was monitored on a section of ungrazed wheat beginning Feb 19. Krenzer and

Horn (1997) offer a detailed explanation of how FHS was measured. When FHS reached 1.5 cm (Mar 13, 2003) the previous trial was concluded and the remainder of the grazing season was considered "graze-out". In each pasture a random location was selected to erect exclosures that would prevent cattle grazing. These exclosures were 16 ft x 16 ft and constructed with temporary wire panels. The first exclosure was set Feb 12, and other exclosures were added periodically through Apr 15. All wheat was planted at a seeding rate of 120 lb/acre with seven-inch row spacing to a single variety (2174), and 87 lb N/acre was applied as anhydrous ammonia immediately prior to planting. Pastures were hand-clipped at random locations within pastures to ground level inside 2 $ft^2$ quadrants for determination of standing forage crop. Clipping dates were Mar 13, Apr 1, and Apr 17. Steers were removed from pastures on Apr 17. This removal date resulted in a 35-d graze-out period. Grain was harvested on June 19 using a Gleaner Model A combine with an 8-ft header. Grain yields were calculated as the total weight (lb) of wheat grain harvested per unit of area ($ft^2$) and did not reflect differences in test weight.

***Cattle Management***. Fifty-two predominantly black crossbred steers were used in this trial. Steers were carried over in their previously grazed pastures (from a previous study), resulting in 13 steers per pasture. No supplemental feed or mineral was provided during graze-out. For this experiment steers were weighed on Mar 13 and 21, and Apr 1 and 17. To correspond to setting of exclosures, weights from Feb 11 and Mar 6 were also used. Stocking rate leading up to FHS averaged 1.74 acres per steer. The first 19 d of graze-out (Mar 13 – Apr 1) stocking rates were increased to 1.11 acres per steer. To better utilize the amount of available forage in the pastures stocking rates were further increased to .73 acres per steer by decreasing the area grazed.

***Statistical Analyses***. Average daily gains were determined using the REG procedure of SAS. Once it was established that steer weights were linear the slope of the line for steer weights was used as the ADG. Pasture was the experimental unit. Therefore, pasture means were used in the statistical analyses. The MIXED procedure of SAS was used to determine lines of best fit. The model for the statistical analysis included days from FHS as a continuous variable and pasture as a random effect. The linear, quadratic, and cubic effects of days from FHS were analyzed and removed until a P-value of less than .25 was achieved.

## Results and Discussion

***Forage Allowance***. Forage availability was plentiful during graze-out. At the start of graze-out average forage allowance was 448 lb forage DM per 100 lb steer body weight (BW). As stocking rates increased forage allowance was reduced. Forage allowance on Apr 1 was 213 lb DM per 100 lb BW and was further reduced by the increased stocking rate to 163 lb DM per 100 lb BW at the end of graze-out.

***Cattle Performance***. Pasture means and averages for cattle performance are shown in Table 1. Despite heavy weights at the initiation of graze-out, steers gained incredibly well, averaging over 3.5 lb per head per day. This resulted in final shrunk weights at the end of the 35-d graze-out phase in excess of 1000 lb. Gains per acre were also very good. This is due in part to the excellent cattle performance, as well as the heavy stocking rates, less than a steer per acre, used to keep up with the rapid forage growth during graze-out. Average gain per acre was 126 lb, with individual pasture observations ranging from 110 to 135 lb per acre. On average steers gained 119 lb per head during graze-out. Redmon et al. (1995) concluded that steers cannot

achieve high enough ADG to offset the loss in grain production due to grazing past FHS. However, weight gain of steers during graze-out was not directly measured and was assumed to be 2.42 lb per day. With gains as exceptional as those observed in our study, grazing past FHS may be an economical alternative to harvesting a grain crop.

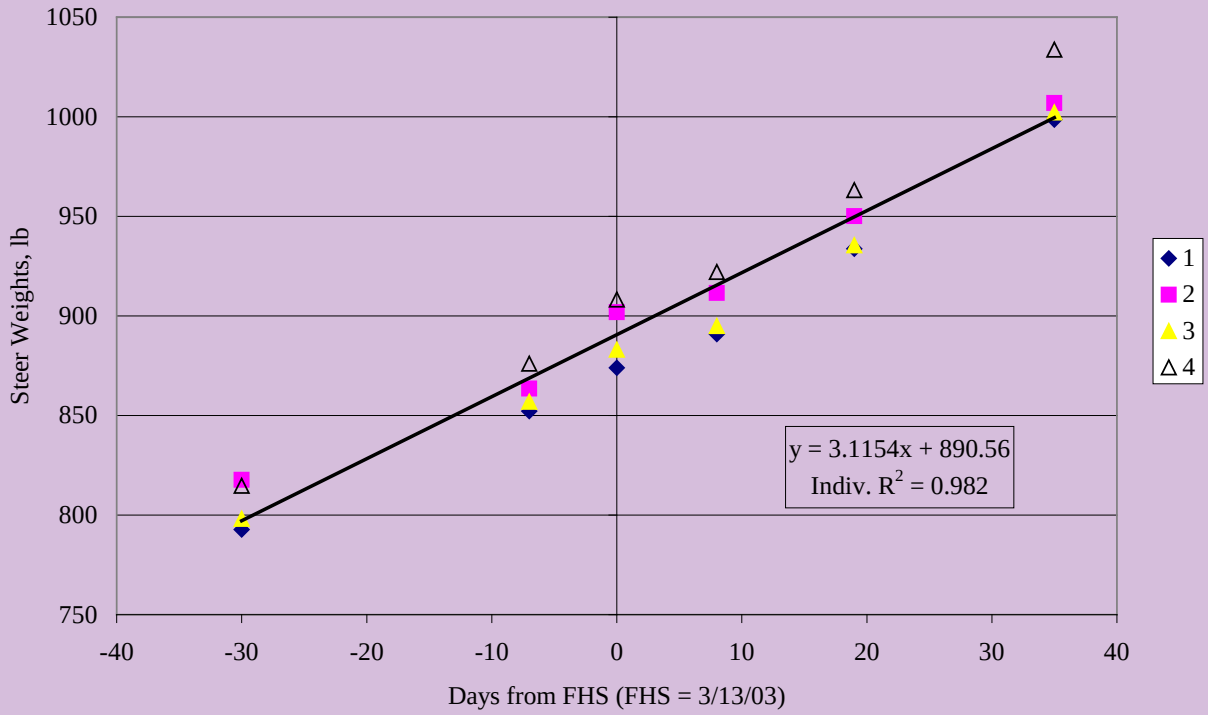
**Table 1. Steer performance during graze-out, 2003**

| Item | Initial Wt., lb 3/13/03 | Final Wt., lb 4/17/03 | ADG, lb/steer[a] | Gain/Acre, lb | Total Gain, lb/steer |
|---|---|---|---|---|---|
| Pasture 1 | 874 | 999 | 3.65 | 135 | 125 |
| Pasture 2 | 902 | 1007 | 3.24 | 111 | 105 |
| Pasture 3 | 883 | 1002 | 3.51 | 128 | 119 |
| Pasture 4 | 908 | 1034 | 3.68 | 133 | 125 |
| Averages | 892 | 1010 | 3.53 | 126 | 119 |

[a]ADG determined by regression of four shrunk wts (3/13, 3/21, 4/1, and 4/17).

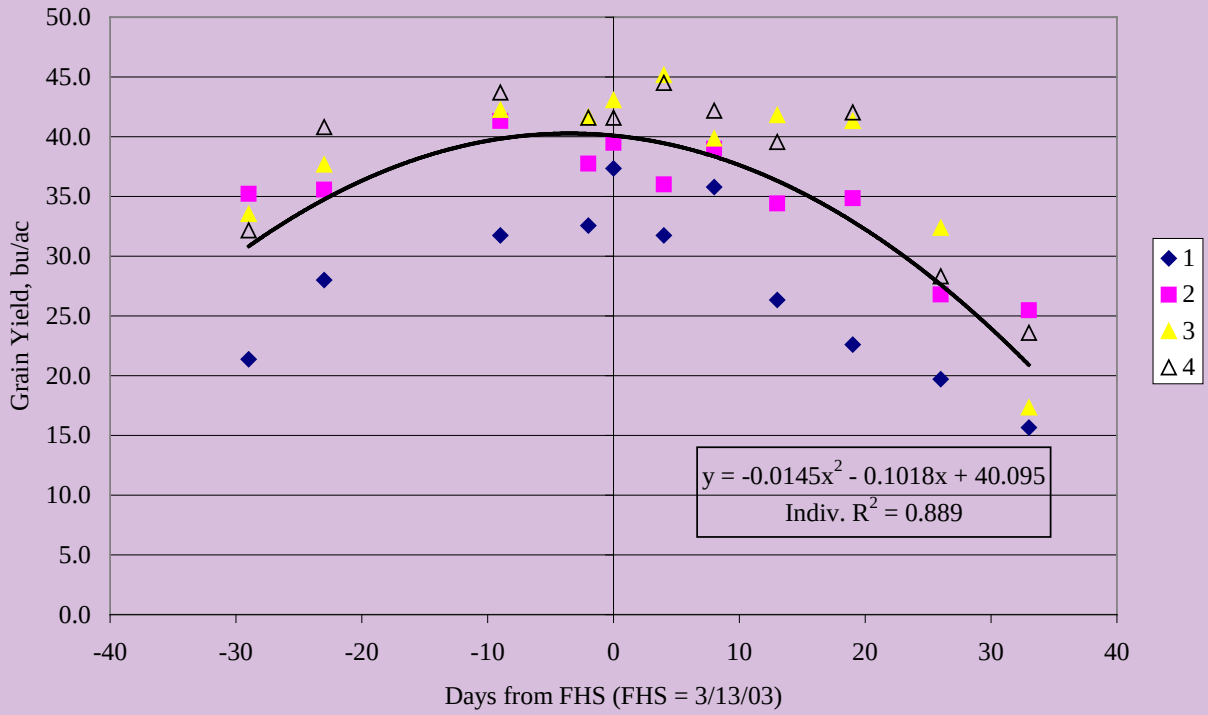
Figure 1 shows steer weights over the course of time that exclosures were set, corresponding with the dates that grain yields were recorded. Steer weights increased linearly ($P<.01$) from early Feb through mid-April. Over this range of dates ADG is 3.11 lb per steer. This is less than was observed using only the weights taken during graze-out (3.53 lb ADG) and may indicate that steer ADG was increased during graze-out, relative to the grazing season ending at FHS. Additionally, the weights taken prior to FHS (March 13) were influenced by the previous trial, and could skew the data relative to steer gains during the graze-out phase alone.

**Figure 1. Effect of grazing termination date on steer weights.**




***Grain Yield***. Grain yield response to grazing termination date is shown in Figure 2. Grain yield responded quadratically ($P<0.01$) to grazing termination date. Peak predicted grain yield occurred at 3.5 d prior to FHS. Pasture 1 consistently had the lowest grain yields. The test weights for pasture 1 averaged only 53.2 lb per bushel (bu), while the other three pastures ranged from 54.4 to 55.8 lb per bu. This reduced test weight is likely the reason for the reduced grain yields observed in pasture 1. The reduction in grain yield by terminating grazing prior to FHS is not understood. In a total of 6 yr of data reported by Redmon et al. (1995) and Krenzer and Horn (1997) there was little to no effect of terminating grazing prior to FHS. A linear reduction in grain yield has been observed with grazing past FHS (Redmon et al., 1995; Krenzer and Horn 1997). In these multi-year studies, grain yield was reduced by 1.24 (Redmon et al., 1995) and 1.25 bu per acre (Krenzer and Horn, 1997). Table 2 shows the predicted effect on grain yield from grazing past FHS in from our data, as well as the corresponding increase in steer weight. Our data indicates that grazing 4 wk past FHS will result in a reduction in grain yield of 14.2 bu per acre. However, to partially offset this potentially lost revenue, steer weights would have increased 87 lb per head over those 4 wk.

**Figure 2. Effect of grazing termination date on grain yield.**




| Table 2. Comparison of the effect of grazing termination date on steer weights and grain yield | | |
|---|---|---|
| Days past FHS | Predicted Steer Weight, lb | Predicted Grain Yield, bu/acre |
| 0 | 890 | 40 |
| 3 | + 9.3 | - .4 |
| 7 | + 21.8 | - 1.4 |
| 10 | + 31.1 | - 2.5 |
| 14 | + 43.5 | - 4.3 |
| 21 | + 65.3 | - 8.5 |
| 28 | + 87.1 | - 14.2 |

## Literature Cited


Krenzer, E.G. and G.W. Horn. 1997. Extension Publication PT 97-5.

Redmon, L.A., et al. 1995. Agron. J. 88:94-97.

Fieser, B.G. – Research Assistant

Horn, G.W. – Professor

Krenzer, E.G. –Professor, Dept. of Plant and Soil Science, OSU

Schaefer, S.A. – Herdsman