Management Practices and Net Returns in a Wheat-Stocker Enterprise

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Wheat in the southern Great Plains is unique in that we harvest it for dual purposes. Cattle graze much of the wheat from November through the winter. When the wheat begins to joint, cattle are removed and the wheat is harvested for grain. Because of this dual use, there are additional management factors that are considered by the producer. Today, I would like to share some of what we have been learning about a few of these management factors. The overall objective is to evaluate practices which might increase the net return in a wheat-stocker cattle enterprise.

There are four general ways of increasing the net return in a wheat-stocker cattle enterprise:

- Improve animal performance.
- Increase stocking rate.
- Lengthen the grazing season.
- Increase the grain yield and/or test weight.

In today's discussion, I will concentrate on two of these aspects: increasing the stocking rate and lengthening the grazing season.

Increasing Stocking Rate

For the last two years, we have conducted trials at our Wheat Pasture Research Unit at Marshall, OK. where we have four varieties each being grazed at four different stocking rates. These trials are conducted in 18 to 24 acre pastures. Wheat is planted in early September at 90 lb/acre. Enough nitrogen is available at planting to produce 300 lb/acre of beef and 50 bu/acre grain. Cattle begin grazing around November 1 and are removed at the first hollow stem stage of growth. This will be defined later.

As the stocking rate increased, the beef produced per acre has increased (Fig. 1), but the grain yields have decreased. Applying economics to this data, we conclude that the reduction in grain yield has more than compensated for the beef gain differences (Fig. 1). However, we have only conducted this study over two years at one location and desire several years' data before we draw very many conclusions. The preliminary conclusion would be that producers may be trying too hard to take advantage of every bite of forage produced and decreasing their net return per acre by doing so.

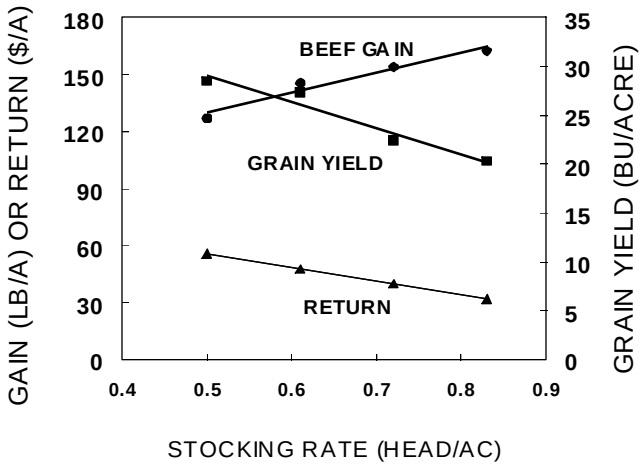

Figure 1. Stocking rate while grazing wheat pasture influences beef gains, grain yield and net return per acre.

Lengthening the Grazing Season - Start Grazing Earlier

The grazing season can be lengthened by either starting grazing earlier or removing the cattle from wheat pasture later. I will discuss several ways we might be able to influence either end of the grazing season. First we will look at ways we might be able to start grazing earlier.
To start grazing earlier, we have to obtain a minimum amount of forage by an earlier date.

1. Plant wheat earlier. Several years ago, there seemed to be a general understanding that wheat should not be planted before the soil temperature was below 85°F in mid-afternoon. Since then, we have learned that one reason for this understanding was because poor stands were obtained when soil temperatures were too high. With shallow planting, no

seed deeper than one inch, excellent stands can be obtained even if soil temperatures at mid-afternoon are above 100°F. As long as enough soil moisture and rainfall are available to prevent drought stress, planting date has a major impact on forage yield before first hollow stem (Fig. 2). These data are averages of years with little drought stress in the fall and others like 1993-94 at Lahoma where forage production was severely limited because of drought stress.

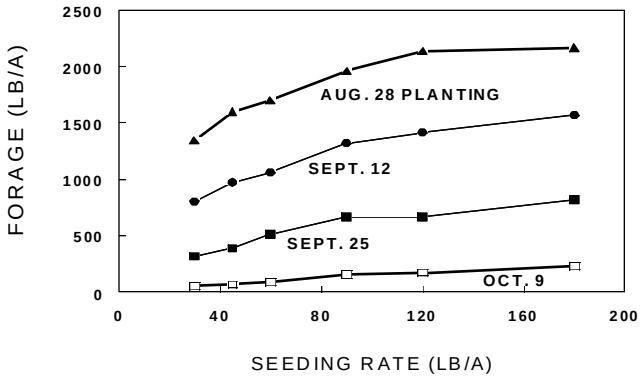

Figure 2. Forage produced by the first hollow stem stage of growth increases as seeding rate increases and wheat is planted earlier.

It is important to note that the forage yield increases do not come free. For reasons unknown at this time, the earlier planting dates also strongly influence test weight (Fig. 3) and grain yield (Fig. 4). We intend on applying economics to these data in the near future, but have not gotten them ready yet.

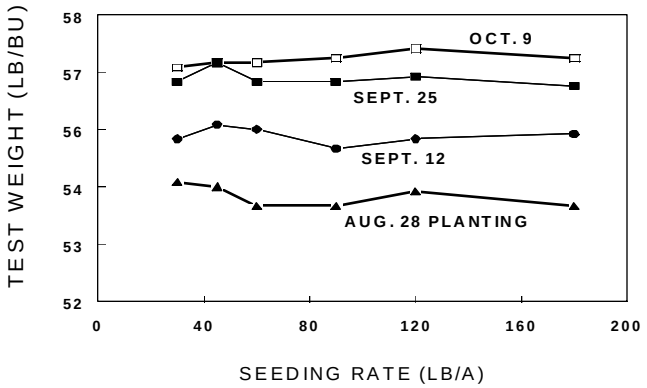

Figure 3. Planting date and seeding rate influences on test weight of wheat from which forage was removed by clipping until the first hollow stem stage.

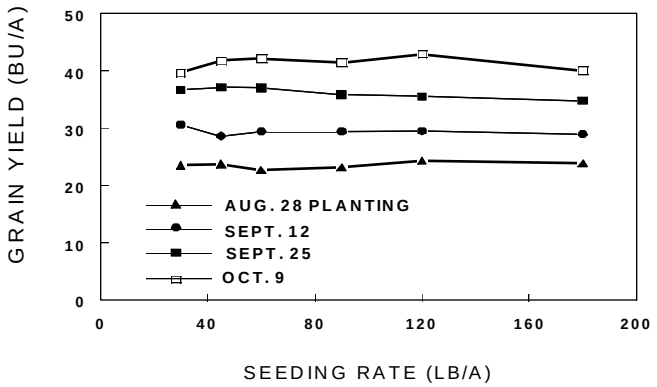

Figure 4. Planting date and seeding rate influences on wheat grain yield of plots clipped to remove forage until the first hollow stem growth stage.

2. Increase the seeding rate. Our best guess is that most producers in central Oklahoma involved in the wheat-stocker system are planting approximately 90 lb/acre. We have seen that increasing the seeding rate as high as 180 lb/a has increased the forage produced prior to first hollow stem (Fig. 2). Depending on the price you assign to wheat seed, the return may or may not exceed the increased cost. We have not finished the economics for this data set. The strong point here is that increasing the seeding rate does allow us to produce more forage earlier.

3. Improve stand establishment. From Fig. 2, we see how important the number of plants is for increasing forage production. In the fall of 1992 and 1993, we conducted a survey of producer fields to determine how well they were doing in stand establishment. To conduct the survey, we contacted agricultural agents to set a date when many producers were planting in their county. We traveled down a highway where wheat was being grown and stopped every drill we saw planting. Over 100 fields were included in the survey. The average field had 57% of the live seed planted resulting in a plant (Fig. 5).

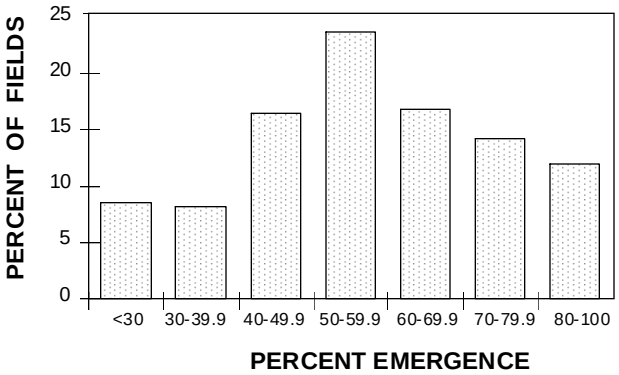

Figure 5. Stand establishment results showing the percent of fields surveyed contained in each percent emergence category. Percent emergence is % of live seed producing plants.

This means that in the average field, two seeds were planted to produce one plant. To me this means the average producer needs to plant twice as many seeds per acre as indicated on the graph in Fig. 2 to obtain the same forage yield. In these research plots, we have never attained less than 80% emergence.

The most frequent reason we were able to identify for poor stands was seed placed so deep the coleoptile could not grow long enough to reach the soil surface. The first true leaf emerged through the coleoptile tip and was trapped below the soil surface. When we removed soil from above the row, the resultant yellow accordion-leaved plant sprung from beneath. Such conditions could be lessened by planting shallower and at a more consistent or uniform depth. One way to reduce this problem is to have a firm seedbed prepared and use very shallow tillage just prior to planting. Another way of reducing the stand establishment difficulties is using varieties with longer coleoptiles. However, under hot soil conditions coleoptile length is reduced with all varieties as seen in the following table.

Variety	Soil Temperatures of Early September	October
Karl	1.6	2.3
2180	1.5	2.0
Chisholm	1.5	2.4
AgriPro Longhorn	2.4	3.5
Scout 66	2.4	3.5

Table 1. Coleoptile length (inches) of selected wheat varieties grown in soil temperatures representing early September and early October planting conditions.

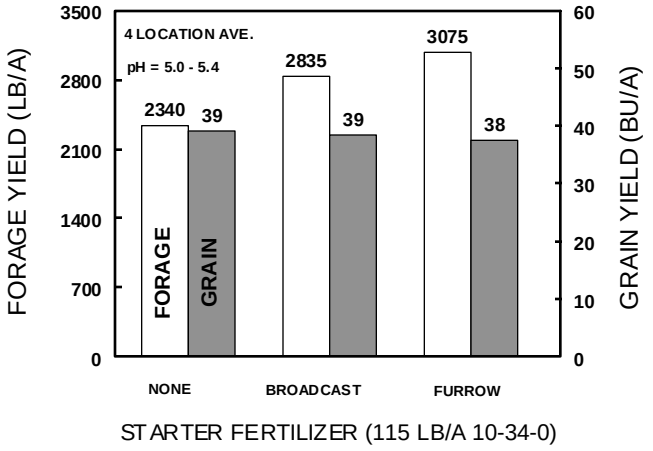

Figure 6. Forage and grain yield differences in a starter fertilizer trial.

4. Use starter fertilizer. For this discussion, a starter fertilizer is one containing both nitrogen and phosphorus and is applied directly in the seed furrow with the seed. Early forage yields have been increased by using a starter fertilizer (Fig. 6). Apparently, the fertilizer in close proximity to the developing root system helps the plant get started faster. No grain yield response has been obtained (Fig. 6).

5. Variety selection. Different wheat varieties produce different quantities of forage prior to first hollow stem. In Fig. 7, we show differences in forage yields of those varieties which were above average in grain yield for that particular year. This shows how big the differences are among varieties that are good grain producers.

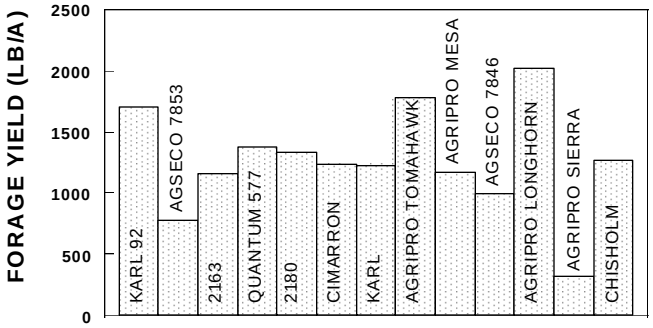

Figure 7. Forage yield prior to the first hollow stem stage of growth of hard red winter wheat varieties which yielded above average in 1992-93 grain yield trials.

We do need to keep in mind that frequently the limiting factor on how early we can graze the wheat pasture is not based on whether we have enough forage or not. Sometimes it is when the cattle are ready for wheat pasture, and other years is when can we get the nodal root system, those roots developing at the crown in contrast to the original roots emerging from the seed, developed. Producers frequently call these the secondary roots. Normally when the first tillers become visible, we should be able to find nodal roots expanding. If the soil is dry, they will not expand until it is moistened. These roots are important because they anchor the plant in the soil. The seminal root system provides some anchoring, but frequently the internode between the seed and the crown is not strong enough to withstand the force of cattle pulling on the wheat plant as they graze. Therefore, wheat plants are easily pulled up by grazing cattle until the nodal root system develops enough to anchor the plant. Grazing should not be initiated until this has occurred.

Lengthening the Grazing Season - Terminate Grazing Later

1. Grazing after first hollow stem. One of the most frequently asked questions in the late 1980's was "How much does it hurt the grain yield if we graze the cattle a few days or weeks later into the spring?" We have been evaluating this

with a trial at Marshall since the 1989-90 wheat year. To accomplish this, we place an exclosure in a wheat field being grazed whenever we want to terminate grazing. An exclosure is erected by placing four 16 foot long welded wire cattle panels in a square. We are monitoring cattle weights throughout the grazing period so we can calculate cattle weight gains from the pasture. Grain yields are measured inside each exclosure. Combining the economics from grain yields and beef gains, we calculate net return to the system for each grazing termination date.

Stage of wheat development appears to be critical in determining when grain yield begins to decline with continued grazing (Fig. 8).

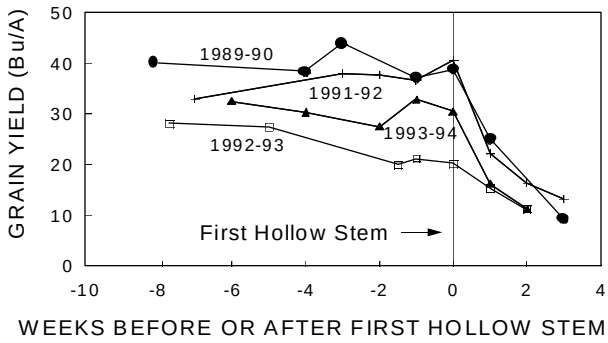

Figure 8. The effects of removing cattle from wheat pasture at different times on grain yield.

Development cannot be predicted by calendar date; therefore, we present the data in terms of time before or after first hollow stem. First hollow stem is defined as the growth stage where hollow stem can first be identified above the crown in larger wheat shoots and occurs before the growing point (head) reaches the soil surface. First hollow stem is the earliest portion of the jointing stage of growth. See "Wheat For Pasture" (FS - 2586) for pictures or the January 1993 "Fine Tuning Wheat Production" (TC 1320) video to see how to determine when first hollow stem occurs. At Marshall, Oklahoma, first hollow stem stage for Karl wheat occurred as early as February 28, 1992 and as late as March 16, 1993. Temperatures during January and February strongly influence the date first hollow stem occurs.

Removing stocker cattle from wheat pasture one to six weeks prior to first hollow stem had no effect on grain yield (Fig. 8). In Fig. 9, we summarize the grain yield response to show the four-year average. This would also be our best estimate of what will happen next year.

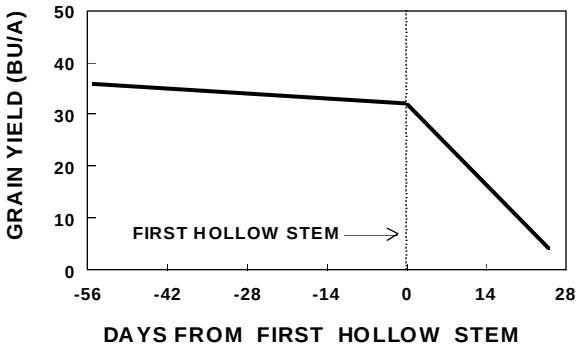

Figure 9. Average effect of removing cattle from wheat pasture at different times on grain yield.

Net return from cattle (Fig. 10) continued to increase with length of grazing season due to continued weight gain per animal. However, net return from wheat grain and total net return from the system decreased as cattle continued to graze beyond first hollow stem. Beef gains after first hollow stem do not compensate for reduced grain yield and rapid decreases in net return occurred when cattle continued to graze just a few days after first hollow stem. To obtain maximum return per acre, producers need to watch closely for the first hollow stem. A few less days of grazing reduced net return far less than grazing a few days too long.

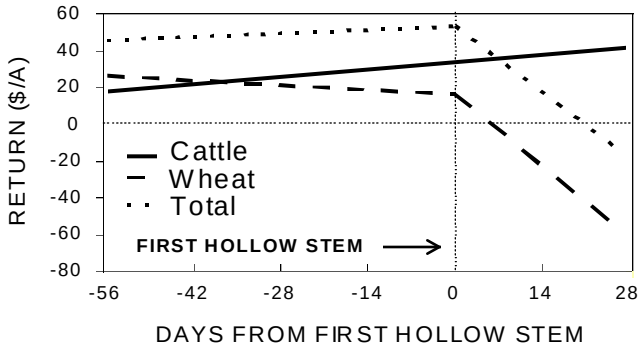

Figure 10. Changing the time of grazing termination effects on return to cattle, wheat, and the combination of cattle and wheat.

Historically, we have been taught that removing cattle from wheat pasture prior to the time they could graze off heads as the wheat stem elongates was critical. Now we learn that stem elongation is delayed by grazing, and wheat that is not being grazed needs to be monitored to determine when first hollow stem occurs. Even though two inches of hollow stem were present two weeks after first hollow stem in ungrazed wheat, no hollow stem could be detected where cattle grazed continually. By this time grain yield and net return had decreased sharply. Therefore, ungrazed wheat of the same variety, planting date, etc., needs to be checked to determine when first hollow stem occurs.

2. Variety selection. Wheat varieties do not all reach the first hollow stem stage at the same time. Producers who

would like to extend the grazing season slightly later into the spring could select a variety which reaches first hollow stem at the latest possible time relative to other varieties. We have monitored first hollow stem stage for the variety trial at Marshall the last two years. TAM 202, AgriPro Tomahawk, and 2180 have been the varieties reaching first hollow stem the earliest in both years and AgriPro Ponderosa, Chisholm, Cimarron, Ike and 2163 have been the latest. The difference between these groups was 9 days in 1994 and 18 days in 1995. We had a cold period during this time period each year, but the cold period was much longer in 1995.

Data from Texas indicates there may be a difference in how wheat varieties respond to grazing termination dates. When evaluating grain yield of grazed wheat compared to wheat grown for grain only, the yield of tall wheat varieties was reduced 12 and 25% when they were grazed until Feb. 3 and March 19, respectively, while semidwarf varieties were reduced 36 and 53%. We have included Scout 66 in the trials at Marshall in 1994-95 along with 2180, AGSECO 7853 and AgriPro Longhorn. We will be collecting data on first hollow stem stage as well as grazing termination information as discussed earlier to determine if tall varieties suffer less yield loss when grazed beyond the first hollow stem stage.

Summary:

1. Producers seem to want a wheat variety for the wheat-stocker cattle enterprise which has the following characteristics:

Long coleoptile, Late first hollow stem, Produces much forage early High total forage, High test weight, High grain yield

2. Planting date information might be summarized as follows:

Very early	> forage	< test weight	< grain yield
Later	< forage	> test weight	> grain yield
Net return	???		

3. Seeding rate between 90 and 150 lb/acre appears ideal depending on your ability to obtain an excellent stand and the cost of seed.

4. Modify practices where possible to obtain an excellent stand or increase seeding rate to compensate.

5. Use a starter fertilizer.

6. Terminate grazing on or before first hollow stem stage of growth in ungrazed wheat.

7. Identify your primary purpose for growing wheat in each field and apply the best production practices for that purpose.

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