GRAZING TRIAL EVALUATION OF WHEAT VARIETIES IN THE WHEAT GRAIN/STOCKER CATTLE ENTERPRISE[1]

Gerald Horn[2], Larry Redmon[3], Dan Bernardo[4], Gene Krenzer[5]
and John Andrae[6]

Story in Brief

Fall-weaned steer calves (196 head) and 16 wheat pastures were used during the 1993-94 wheat pasture year to determine the effect of wheat variety (Karl, 2163, 2180 and AGSECO 7853) and stocking density on cattle performance, grain yield, net returns to the wheat grain/stocker cattle enterprise during the 1993-94 wheat pasture year. Grain yield decreased linearly with increasing stocking density, and the rate of decrease was greater for 2180. Total gain/steer decreased linearly as stocking density increased. Steer gain/acre ranged from 129 to 250 lb, and increased in a near linear manner as stocking density increased. Net return from cattle ranged from $36 to $65/acre across all varieties and stocking densities, and increased with increasing stocking density with the exception of 2180 which peaked at a stocking density of .64 steers/acre or 1.56 acres/steer. Total net returns from cattle plus grain ranged from $33 to $67/acre. Total net return from Karl and AgSeCo 7853 tended to increase with increasing stocking density although net return from AgSeCo 7853 plateaued at a stocking density of .74 steers/acre or 1.35 acres/steer. Total net return from 2180 decreased in a curvilinear manner because of the decrease in both weight gain/steer and grain yield with increasing stocking density. The varieties differed in rate of decline, with increasing stocking density, for grain yield and cattle weight gain/head. Differences in net return from cattle and total net return were $29 and $35/acre, respectively, which is similar to that observed for the more moderate stocking densities of the 1992-93 wheat pasture year.

(Key Words: Wheat Varieties, Growing Cattle, Net Returns.)

---

[1]This material is based upon work supported by the Cooperative State Research Service, U.S. Department of Agriculture, under Agreements No. 89-34198-4288 and 93-34198-8410. Opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.
[2]Professor, Animal Science [3]Assistant Professor, Agronomy [4]Professor, Agricultural Economics [5] Professor, Agronomy [6]Graduate Assistant

Introduction

Wheat varieties have traditionally been selected based on data obtained from small, ungrazed field plots. Selection has been based primarily on grain yield, disease resistance, lodging, test weight and other grain-related production characteristics. Forage production from small, ungrazed plots has also been measured by mechanical clipping methods, and recent studies have shown that there is at least a twofold difference in forage production among high-grain yielding wheat varieties. Very few grazing trials have been conducted to evaluate different wheat varieties. Development of the Wheat Pasture Research Unit near Marshall has allowed us to initiate grazing studies with the explicit objective of evaluating different wheat varieties from both biological (i.e., production) and economic standpoints. Results from the second year's study, which was conducted during the 1993-94 wheat pasture year, are reported in this paper.

Materials and Methods

Four hard-red winter wheat varieties (Karl, 2163, 2180 and AGSECO 7853) were chosen during the summer of 1992 for inclusion in this study. All four are semidwarf varieties with early to very early maturity, have tolerance to soilborne mosaic virus and were rated better than average for leaf rust resistance at the time. The rationale for selection of the varieties and the specifics of the cultural practices employed in the clean-till plantings were reported by Horn et al. (1993 and 1994).

Wheat was seeded during September 6-9, and each variety was grazed for 133 days (November 2, 1993 to March 15, 1994) at four stocking densities as shown below.

Stocking density				
Steers/acre:	.42	.61	.72	.83
Acres/steer:	2.40	1.64	1.38	1.20
Initial lb of live wt				
steer/acre:	210	305	360	415

One-hundred-ninety-six (196) fall-weaned British X Continental or Beefmaster Crossbred steer calves were used in the study. The calves were "ranch" calves that originated near Elk Mountain, Wyoming and the Texas Panhandle, and were received on October 5 and 14, 1993. During the receiving program the calves had free-choice access to large roll bales of bermudagrass hay and were hand-fed 2 lb/head/day of a high-protein soybean meal based supplement that contained added vitamin E, selenium and Deccox®. The steers received an injection of Ivomec-F® and were implanted with Synovex-S® immediately prior to placement on wheat pasture on November 2.

During the wheat pasture grazing period the calves had free-choice access to a high-calcium (15 to 17% calcium) commercial mineral mixture[2], but received no other supplemental feed other than limited amounts (about 10 lb/head/day) of alfalfa hay during periods of snow cover of wheat. Weather during the 1993-94 wheat pasture year was very mild and it was an excellent year for cattle gains. Planting conditions were ideal and adequate rainfall in the fall resulted in excellent forage from all wheat varieties. Senescent forage did not decompose and was available for consumption through February. The grazing season was dry until rain and a heavy snow (12-14 inches) fell on March 8, 1994. Alfalfa hay was fed, as described above, on March 8 and 9. Calves were not removed from wheat pasture except to periodically weigh them. Little trampling of wheat was observed until after the snow. Weights of individual steers were measured after overnight shrinks of 14 to 16 hours without feed and water.

After a short grazeout period on wheat pasture, steers were placed on feed at a commercial feedyard[3] on April 12, 1994. Steers from each pasture (i.e., each variety by stocking density combination) were placed in each of two feedlot pens, and were fed to a common target end point. The steers were reimplanted with Synovex-S® during initial processing at the feedlot, and were adapted to a steam-flaked grain (corn and milo) finishing diet (NEm and NEg of 101 and 68 Mcal/cwt DM, respectively; 13.8% crude protein). Because of the excellent weight gains on wheat pasture, the steers were heavy when placed on feed. Mean initial on-feed weights at the feedyard were 817 and 909 lb for the two pens.

An economic analysis was conducted to evaluate the profitability of wheat and stocker production on the four varieties across stocking densities. First, regression analysis was applied to the grain yield and cattle performance data to estimate response functions relating grain yield and cattle gain to stocking density. Both linear and quadratic functions were evaluated with dummy variables to incorporate varietal effects. Quadratic functions did not improve goodness of fit. These relationships were then used to estimate net return from the production of wheat and stocker cattle on each of the four varieties over the range of stocking densities evaluated (.42 to .83 head/acre). Grain yield was measured on June 8 by cutting two swaths the entire length of each pasture with a Gleaner A combine equipped with an 8-foot header.

All net return estimates represent a return above operating costs and do not include a land charge or fixed costs of machinery ownership. No attempt was made to partition wheat production costs between the wheat and cattle

---

[2] Wheat Pasture Pro Mineral, Farmland Industries, Inc.

[3] Cimarron Feeders, Texhoma, OK

enterprises; therefore, all costs of establishing the wheat pasture (cultural cost, fertilizer, etc.) were allocated to the wheat enterprise. Five-year (1989-93) average prices for grain and stocker/feeder cattle were used in the analysis.

Total operating costs for the wheat enterprise were estimated from a survey (Walker et al., 1988) of producers in central Oklahoma and averaged $66.60/acre. Harvest and hauling costs were dependent upon grain yield. A wheat price of $2.95/bushel was employed, which represents the average Oklahoma cash price during the June, 1989 to July, 1993 period.

All livestock prices used in the analysis represent average prices received at Oklahoma for steer calves in November and feeder steers in March. Steer calves were purchased in November at an average weight of 500 lb for $102.78/cwt. The sale weight was estimated as the sum of the calf weight (500 lb) and seasonal gain (estimated from the cattle gain equation). To adjust sale price to the end-weight, the following procedure was used. Livestock prices are reported in 100-lb ranges (e.g., 500 to 600 lb steers); therefore, the reported price was assumed to reflect the midpoint of each range (e.g., 550 lb). Sale prices for cattle between these midpoints were determined by interpolating between the two midpoints which bound the sale weight. Prices used to estimate sale weights were: 500 to 600 lb, $99.54/cwt; 600 to 700 lb, $89.75/cwt; and 700 to 800 lb, $83.85/cwt.

Total operating costs for the stocker enterprise varied slightly across varieties and stocking densities. Stocker production costs averaged $536.60/steer, including the $513.90 calf cost and a $22.70/head interest expense. The remaining operating costs ($48.12/head) included expenses for feed, minerals, veterinary services, marketing, hauling and labor. Hauling and marketing charges varied based upon sale weight, and a death loss of 2% was assumed.

Results and Discussion

Because of potentially large year-to-year or environmental effects which affect results, grazing trials need to be conducted over several years. Weather during the 1993-94 wheat pasture year was very mild and it was an excellent year for cattle gains.

Response curves for total weight gain/steer, weight gain/acre, net return ($/acre) from cattle, and total net return ($/acre) from both wheat and cattle versus stocking density are presented in Figures 1, 2, 3 and 4, respectively. We are interested in the following: 1) ranking of the varieties and whether the ranking changes with increasing stocking density, 2) identification of stocking density where the various responses peak or plateau, and 3) magnitude of the differences in the various responses. Response of the cattle, as measured by weight gain/steer, is shown in Figure 1. On native range this response is generally characterized by an initial plateau region followed by a linear decrease as stocking density is further increased. We did not observe a plateau region in this study, but rather weight gains decreased linearly, with the exception of 2163, with increasing stocking density similarly to year 1. The response of weight gain/steer versus stocking density for 2163 was a flat line. For 2163 we did not achieve as heavy a grazing pressure, as measured by steer grazing days per ton of forage, as with the other varieties. Therefore, for this report where the economic analysis is related to stocking density, data for 2163 have been deleted. Of the remaining three varieties, the rate of decrease in total gain/steer with increasing stocking density was greatest for 2180. Across all varieties and stocking densities, weight gain/steer ranged from 277 to 350 lb. Weight gains at the lowest stocking density were greater for steers grazing 2180; whereas, they were greater for Karl at the heaviest stocking density. Steer gain/acre ranged from 129 to 250 lb (Figure 2), and increased in a near linear manner as stocking density increased. This is in contrast to year 1, which was very wet, in which weight gain/acre peaked at a stocking density of about .6 head/acre or 1.7 acres/head and then decreased as stocking density increased further.

Grain yield decreased linearly with increasing stocking density as did net return/acre from wheat grain. Grain yield across all varieties and stocking densities ranged from 30 to 19 bu/acre, and the rate of decrease with increasing stocking density was greater for 2180 as compared with Karl and AgSeCo 7853. Net return from cattle ranged from $36 to $65/acre (Figure 3), and increased with increasing stocking density with the exception of that for 2180 which peaked at a stocking density of .64 head/acre (1.56 acres/head). Large differences in both absolute values and the pattern of change of total net returns from cattle plus grain (Figure 4) were observed. Across all varieties and stocking densities total net returns ranged from $33 to $67/acre. Total net return from Karl and AgSeCo 7853 tended to increase with increasing stocking density although net return from AgSeCo 7853 plateaued at a stocking density of .74 steers/acre (1.35 acres/steer). Total net return from 2180 decreased in a curvilinear manner because of the decrease in both weight gain/steer and grain yield with increasing stocking density.

As shown in the table below, feedlot performance of the steers was excellent even though placement weights were high. Mean dressing percentage of the steers was about 65%. Twenty-eight percent of the carcasses of the heaviest pen (i. e., pen 2) weighed over 900 lb, and sometimes would be subject to carcass weight discounts by packers. In general, this should be kept in mind when deciding when to ship cattle from stocker programs.

On-feed wt, lb	825 (Pen 1)	918 (pen2)
Days on feed	120	112
Final wt, lb	1253	1337
Daily feed DM (deads in), lb	19.5	20.6
Daily gain (deads in), lb	3.43	3.66
Feed: Gain (deads in)	5.68	5.62
Cost of gain (deads in), $/lb	.51	.50
Mean carcasses wt, lb	813	863
Dressing percentage	64.9	64.5
Percent carcasses choice	32.3	50.9
Percent carcasses select	62.6	41.5
Percent carcasses 900 lb or greater	8.0	28.3

Literature Cited

Horn et al. 1993. Wheatland Stocker Conf. p G1-G10.
Horn et al. 1994. Wheatland Stocker Conf. p D1-D13.
Walker et. al. 1988. Okla. Agr. Exp. Sta. Res. Rep. P-903.

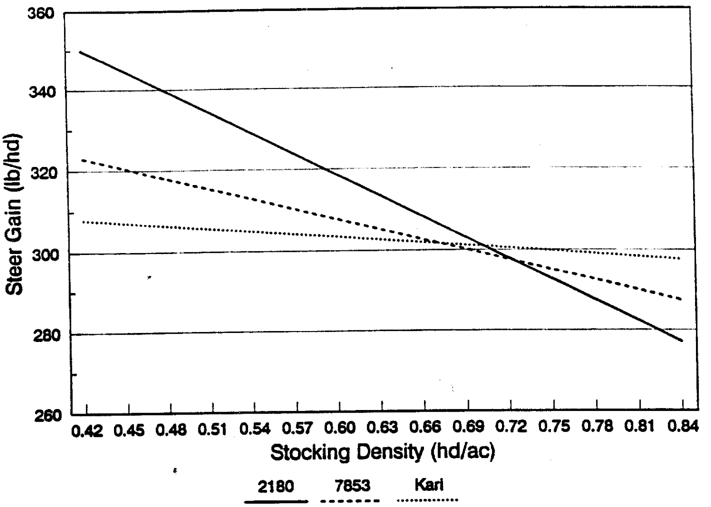

Figure 1. Response of total gain/head during 133-day grazing period to stocking density.

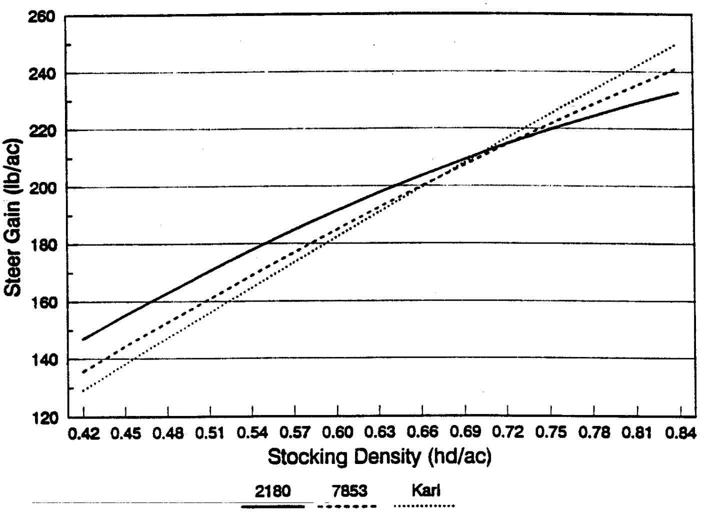

Figure 2. Response of total beef gain/acre during 133-day grazing period to stocking density.

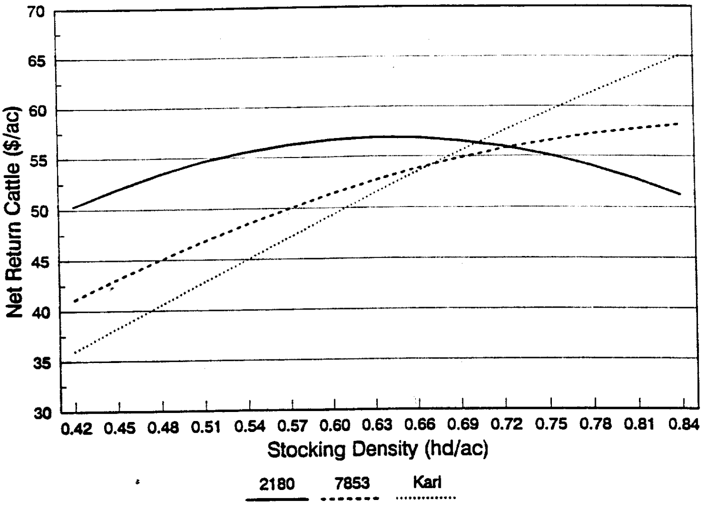

Figure 3. Net return from cattle ($/acre) above operating costs versus stocking density.

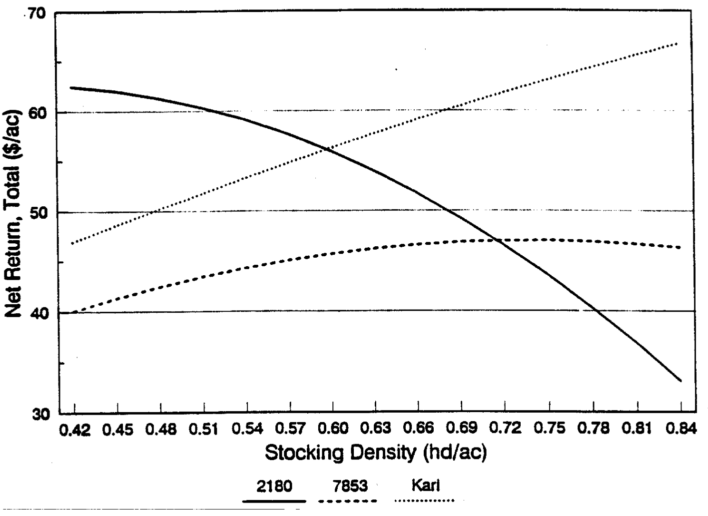

Figure 4. Net return from cattle plus grain ($/acre) above operating costs versus stocking density.