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Predicting Forage Production, Stocking Rate, and Beef Production in Eastern South Dakota: A Case Study

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Introduction

In the summer of 1999, the Hand and Hyde County Bootstraps group met to form a working group to better understand "Management Intensive" Grazing (MIG) systems. From this working group of ranchers and state and federal agency personnel, evolved a goal to establish six demonstration sites in South Dakota (Figure 1). In 2000, the first demonstration site was established by Jim Faulstich near Highmore, SD in Hyde County. This site is a 320 acre pasture dominated by native mixed-grass prairie vegetation with some introduced species such as smooth bromegrass, Kentucky bluegrass, and crested wheatgrass. The pasture was fenced into 21 paddocks and water was developed using aboveground pipeline. Cattle weights, forage biomass, forage utilization, and climate data were measured. This report summarizes the first six years of the study and provides some predictive tools for forage production, stocking rate, and beef production based on climate data.

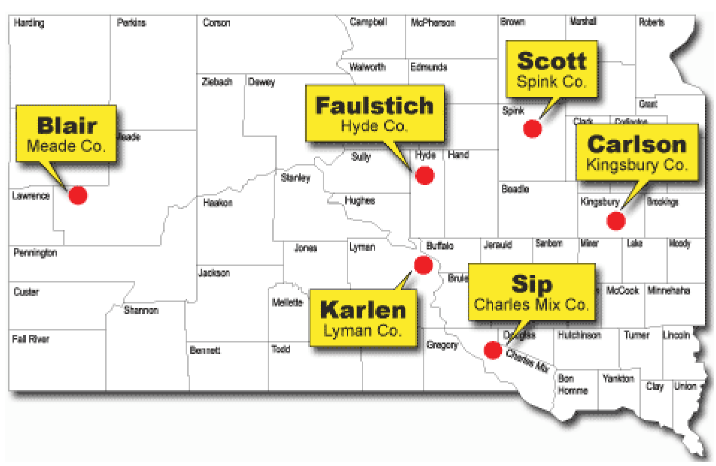

Figure 1. South Dakota Grassland Coalition managed intensive grazing demonstration sites.

[1] This project was funded by the SD Grassland Coalition.
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Data Collection

Animal Performance. The pasture was stocked with Red Angus x South Devon cross bred heifers during the summers of 2000 to 2005. Animal performance data during the first six years of the demonstration study are listed in Table 1. In 2002 and 2004, the stocking rate was reduced to compensate for dry conditions. The average number of grazing days supported by the MIG pasture was 124 days. Gain per animal and average daily gain (ADG) was quite consistent except in 2005 for unknown reasons. Gain per acre averaged 38.5 lb/acre over the six years and varied due to yearly stocking rate and ADG differences.

Table 1. Animal performance statistics for the Faulstich MIG demonstration site from 2000 to 2005 near Highmore, South Dakota.

	Year					
Item	2000	2001	2002	2003	2004	2005
Area grazed, acres	313.7	313.7	313.7	313.7	288.5	313.7
Stocking rate, AUM/acre	1.17	1.18	0.79	0.96	0.53	1.15
Grazing season, days	119	118	111	132	127	135
Number of heifers	100	109	76	71	38	86
Initial weight, lb	848	784	822	886	874	890
Final weight, lb	1007	943	949	1035	1024	980
Gain per animal, lb	159	159	127	149	150	90
Average daily gain, lb	1.34	1.34	1.15	1.34	1.35	0.67
Gain per acre, lb/acre	50.7	55.2	30.8	33.7	19.8	24.7

Forage Biomass. Forage biomass estimated before cattle grazed each paddock averaged 2200 lb/acre, but varied considerably each year (Table 2). Forage biomass after cattle grazed each paddock was 1200 lb/acre resulting in an average utilization of 42%. The average number of days spent grazing each paddock was 4 days. Due to dry conditions, forage growth was less in 2002 and 2004 which resulted in longer grazing periods per paddock. Grazing periods per paddock were shorter in 2001 due to good forage growing conditions.

Table 2. Average forage biomass before and after grazing, utilization, and average grazing days per paddock for the Faulstich MIG demonstration site from 2000 to 2005 near Highmore, South Dakota.

	Year					
Item	2000	2001	2002	2003	2004	2005
Average forage biomass before grazing, lb/acre	2500	3900	1200	1700	1500	2500
Average forage biomass after grazing, lb/acre	1400	1800	800	900	900	1600
Average utilization, %	44	54	33	47	40	36
Average time in paddock, days	2.8	2.2	5.0	3.2	6.6	4.5

Weather. Precipitation data for 2000 through 2005 and the historic 30 year average are shown in Table 3. Considerable variation existed in the monthly total precipitation each year. Drought conditions exhibited in the 2002 and 2004 forage biomass (Table 2) is in large part due to the amount of April precipitation (Table 3). Spring and summer total precipitation masks the effects of the importance of April precipitation. For example, in 2004, average forage biomass before grazing was 1500 lb/acre even though spring precipitation (April-June) was above the 30 year average (Table 3).

Table 3. April through August, spring, summer, and season total precipitation from 2000 to 2005 and the 30 year average for the Faulstich MIG demonstration site near Highmore, South Dakota.

	Year						
Month	2000	2001	2002	2003	2004	2005	Average
April	2.59	4.68	0.85	2.02	0.08	1.18	2.32
May	4.02	2.66	1.06	2.35	4.57	2.20	3.37
June	0.84	2.04	0.95	3.75	4.98	5.14	3.19
July	2.23	0.30	1.92	1.72	2.28	1.10	3.25
August	0.53	0.30	4.92	1.22	2.36	0.58	2.97
Spring (April-June)	7.45	9.38	2.86	8.12	9.63	8.52	8.88
Summer (July-August)	2.76	0.60	6.84	2.94	4.64	1.68	6.22
Season total	10.21	9.98	9.70	11.04	14.27	10.20	15.10

Predictive Tools

Regression equations using monthly total precipitation to predict average forage biomass before grazing, stocking rate and beef gain per acre were evaluated. April precipitation had the greatest ability to adequately predict forage biomass (Fig. 2). These results are extremely valuable since typical pasture turnout dates are late-April to early May in eastern South Dakota.

Producers in this region can measure April precipitation and determine the average forage biomass before grazing.

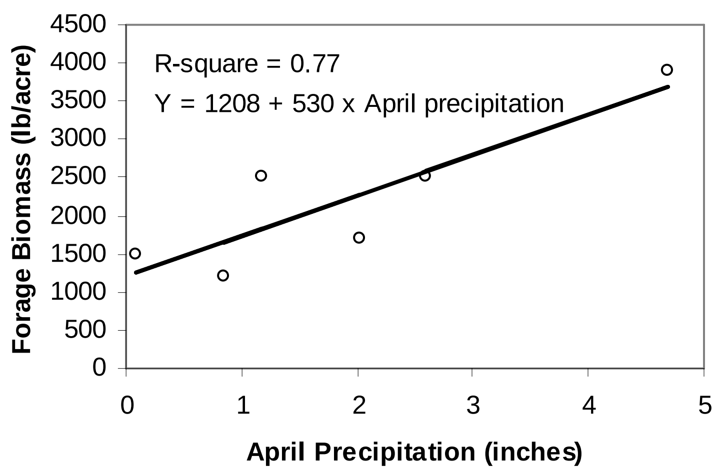

Figure 2. Relationship between average forage biomass before grazing and April monthly total precipitation for the Faulstich MIG demonstration site near Highmore, South Dakota.

Summer stocking rates can be estimated in two ways. The relationship between the actual stocking rate and predicted stocking rate using April precipitation is presented in Fig. 3. Also, stocking rate can be calculated from the predicted forage biomass estimate. For example, the dotted line in Fig. 3 is a calculated estimate of stocking rate based on the forage prediction equation (Fig. 2) and multiplying by 35% harvest efficiency and dividing 750 lb (monthly dry matter intake of forage per 1000 lb animal unit). Notice the calculated estimate over predicts the stocking rate when April precipitation is greater than 4.5 inches compared to the actual stocking rate (Fig. 3).

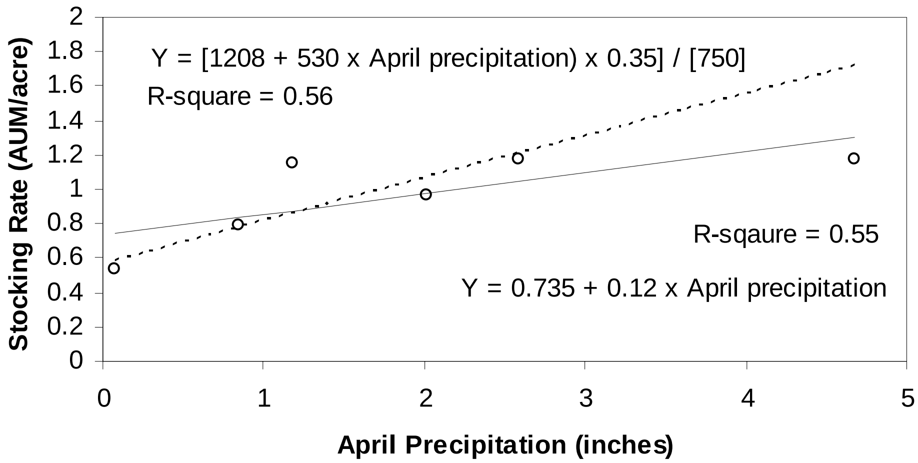

Figure 3. Relationship between actual stocking rate (open circles) and predicted stocking rate using April precipitation (solid line) and calculated stocking rate based on predicted forage production (dotted line) for the Faulstich MIG demonstration site near Highmore, South Dakota.

Finally, beef production per acre was adequately estimated using April precipitation (Fig. 4). Determining the net profit or loss of stocker enterprises can be estimated before the grazing season has started.

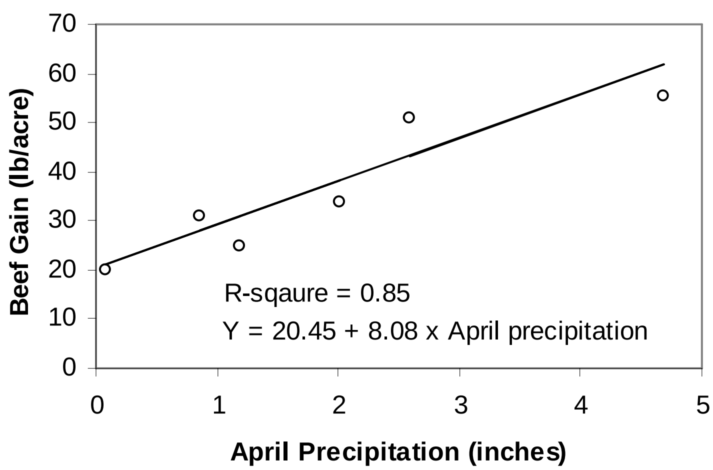

Figure 4. Relationship between beef gain per acre and April monthly total precipitation for the Faulstich MIG demonstration site near Highmore, South Dakota.