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GRAZING ANNUAL FORAGES ON CROPLAND IN WESTERN NORTH DAKOTA - PROJECT UPDATE

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INTRODUCTION

Manske and Nelson (1995) reported on the first two years of a four-year study designed to begin investigating the potential of grazing cattle on cropland seeded to annual forages. This update report will summarize the third year (**YR3**) of data from this study. The 1996 grazing season (**YR4)** will complete this study and a final report drafted that winter.

MATERIALS AND METHODS

The study site (47 14 N. lat., 102 50 W. long.) is located 20 m N and 2 m W of Dickinson, in southwestern North Dakota, U.S.A. The site is situated on the Manning ranch of the Dickinson Research Extension Center operated by North Dakota State University. Soils are primarily Typic Haploborolls. Long-term (1982 - 1994) weather data have been reported (Manske and Nelson, 1995).

Eight 8.3 acre pastures are being utilized in this study. Pastures are arranged into a north (4) and south (4) half, thus giving a set of four replicated pastures. Each set of pastures has access to a common waterer and salt box. Access to waterer is provided to each pasture by means of a grass alleyway.

The forages selected for grazing evaluation in YR3 and YR4 include: winter rye (*Secale cereale*; **WR**), an oat (*Avena sativa*)/pea (*Pisum sativum arvense*) intercrop (**OP**), barley (*Hordeum vulgare*; **BR**) and Siberian millet (*Setaria italica*; **SM**). The desired grazing management involves utilizing WR in May, OP in June, BR in July and SM in

August. Expected seeding and initial grazing dates are presented in table 1. Generally, the tillage and seeding program outlined by Manske and Nelson (1995) was followed with the following exceptions. The oat variety Hytest was used as a replacement for Otana in OP. Horesford barley was included in BR to replace an earlier pearl millet (*Pennisetum glaucum*) treatment. The WR (pastures 3 and 7; Manske and Nelson, 1995) grazed in YR3 was actually seeded in early August, 1993. Pastures were grazed for 13 days in early July, 1994, and then mowed and disked in August, 1994. The resultant regrowth was grazed in May, 1995. Winter rye was seeded with OP in YR3 and spring growth will be grazed in YR4.

The collection of vegetative and animal data have been previously described (Manske and Nelson, 1995). Data in this update are reported as means or as means and standard deviations. A more complete analysis of the data will be presented next year following the final year of data collection.

RESULTS

Seeding and initial grazing dates.

Table 1 compares the desired and actual seeding and initial grazing dates for annual forage pastures in YR3. Spring grazing of WR was earlier in YR3 than in 1994 (15 May vs 15 June and 1 July). The seeding date of OP was later than desired, however it was similar to the previous two years of data. Initial grazing date on OP was later than desired, but earlier than in other years. Evaluations in 1993 and 1994 did not include BR. Seeding and initial grazing dates for BR in YR3 were delayed about 3 weeks, while the respective dates for SM were very close to their targets.

Grazing data.

Grazing intervals and stocking rates are shown in table 2. Ten cow/calf pairs were grazed per replicate in YR3, thus giving a stocking rate of 1.2 animal units per acre. While none of the pastures achieved the desired 30 days of grazing, OP was close with 27. Pasture animal unit months (AUM) ranged from 4.9 to 8.9. Expressed in terms of AUM per acre, pastures ranged from .59 to 1.07. Out of a possible 107 grazing days (15 May - 30 August), cows grazed a total of 77 days. The combined, 4-pasture system produced 25.2 AUM or .76 AUM per acre.

Herbage production and disappearance.

Herbage yield at the initial grazing date and at the end of grazing are presented in table 3. The initial aboveground biomass of WR was less than in previous years, however the present use (difference between initial and final herbage yields divided by the initial yield) was greater (41 vs 6%). Initial and final herbage yields of OP and SM pastures were roughly similar to other years. Initial herbage yields in BR were numerically similar to OP but the percent use of BR was greater (86 vs 50 %). Days from seeding to the initiation of grazing averaged 57.3 ± 2.5 in YR3. The original intent of initiating grazing approximately 6 weeks after seeding is still desired, however observation and experience are suggesting closer to 8 weeks after seeding maybe a more practical value. Differences between these two values may relate to germination time during typical North Dakota spring weather. A target of 6 weeks will remain into YR4.

The disappearance of major forage types within each pasture is depicted in figure 1. On a pound basis, very few weeds were removed. Only the SM pastures experienced a final weed yield that was less than the initial, indicating some net disappearance from this treatment. Otherwise, weeds accumulated from 6 to 39 percent as much weight as was removed from the total pasture. Not only was the percent use of BR greater than the other forage types, but the total disappearance of BR was also numerically greater.

Animal performance.

Performance of cows grazing annual forages in YR3 is presented in figure 2. Cow liveweights (LW) increased early in the season, and then seemed to maintain this weight throughout the rest of the summer. Body condition scores (BCS) seem to follow LW patterns, except in late May when cows were grazing WR and their LW increased and BCS decreased. Actual mean LW and BCS were as follows: 15 May, 1127 ± 29, 6.3 ± .07; 30 May, 1171 ± 28, 6.1 ± .11; 29 June, 1280 ± 6, 6.5 ± .14; 26 July, 1234 ± 25, 6.1 ± 0; 11 August, 1290 ± 1, 6.38 ± .04; 30 August, 1273 ± 14, 6.2 ± .21.

Calf performance while grazing with their dams on annual forages in YR3 is presented in figure 3. Average daily gain was numerically highest for calves on BR (3.39 ± .42), lowest on OP (2.09 ± .06) and intermediate on WR (2.22 ± .07) and SM (2.48 ± .34). In terms of production per head and per acre, WR (33.4 ± 1.1 and 40.2 ± 1.3) numerically produced the least and BR (57.7 ± 7.1 and 69.5 ± 8.5) the highest. Production on OP (54.5 ± 1.6

and 65.6 ± 2.0) and SM (47.1 ± 6.4 and 56.7 ± 7.7) was intermediate. Overall, calves gained an average of 2.5 ± .002 pounds per day for 77 grazing days. Calves accumulated 192.6 ± .14 pounds per head and 58.0 ± .04 pounds per acre in YR3.

DISCUSSION

Results from the first three years of this study indicate that there are numerous managerial and biological problems associated with the grazing of seeded annual forages for an entire season. Preliminary data suggest that grazing livestock on land typically devoted to traditional cropping can be a viable option. However using average costs per acre ($20.81, cash land rent; $12.53, custom seeding; $10.00, seed), as presented by Manske and Nelson (1995), the production of 58 pounds of calf per acre would require $74.7 per cwt average calf prices to breakeven. More research is needed to increase the average output per acre if the grazing of annual forages is to be adopted large scale in western North Dakota, especially during troughs in the cattle price cycle. Forage selection and appropriate seeding and grazing management are essential for this type of grazing system to succeed.

Table 1. Desired and actual seeding and grazing dates in year 3 (1995) of annual grazing study.

		Desired			Actual		
Forage	Field No.	Seeding Date	**Initial Grazing Date**	**Age of Stand (wk)**	Seeding Date	**Initial Grazing Date**	**Age of Stand (wk)**
Winter Rye	3	-	early May[a]	-	Aug, 1993	15 May	-
Oat/Pea	4	early Apr	01 Jun	6	03 May	29 Jun	8
Barley	2	early May	01 Jul	6	01 Jun	26 Jul	8
Siberian Millet	1	mid Jun	01 Aug	6	12 Jun	11 Aug	8.5

[a] Grazing of fall regrowth may be possible.

Table 2. Grazing intervals and stocking rates in year 3 (1995) of annual grazing study.					
Forage	**Grazing dates**	**Days**	**AU[a]**	**AUM**	**AUM/acre**
Winter Rye	15 May - 30 May	15	10	4.9	.59
Oat/Pea	29 June - 26 July	27	10	8.9	1.07
Barley	26 July - 11 August	16	10	5.2	.63
Siberian Millet	11 August - 30 August	19	10	6.2	.75
Overall for season[b]	15 May - 30 August	77[c]	10	25.2	.76

[a]AU = animal unit (one cow/calf pair). AUM = animal unit month.

[b]Animals moved to crested wheatgrass (*Agropyron cristatum*) for 30 days (30 May - 29 June) after grazing winter rye for AI insemination and to wait for the oat in the oat/pea intercrop pastures to reach approximately the 5th leaf stage.

[c]107 days desired

Table 3. Aboveground biomass (lb/acre) for forage pastures in year 3 (1995) of annual grazing study.

Forage	Days after seeding	Aboveground biomass[a]		Difference[b]

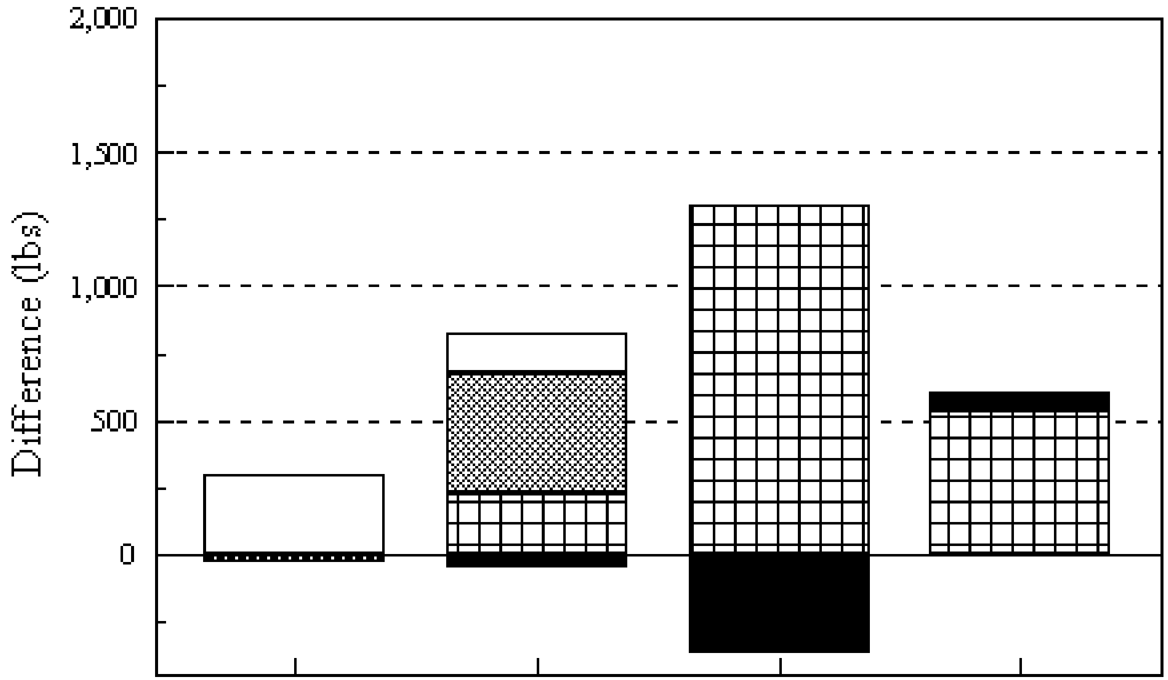
	seeding	Initial	Final	
Winter Rye	-	718 (158)	455 (111)	263
Rye		718 (158)	425 (121)	293
Weeds		- -	30 (9)	-30
Oat/Pea	57	1864 (268)	1087 (119)	777
Oat		580 (117)	348 (129)	233
Pea		518 (118)	72 (38)	446
Rye		548 (154)	403 (58)	145
Weeds		216 (115)	265 (10)	-49
Barley	55	1684 (391)	748 (82)	936
Barley		1518 (420)	215 (85)	1303
Weeds		166 (29)	532 (166)	-366
Siberian Millet	60	1999 (149)	1388 (176)	611
Millet		1902	1369 (182)	533

		(220)		
Weeds		97 (71)	19 (6)	78

[a]Values presented are means, with standard deviations in parentheses.

[b]Negative differences indicate growth exceeded disappearance.

Figure 1. Herbage differences between initial and final clips within a pasture.
Values in graph are in pounds of major herbage components in each pasture.
Values in table are individual percentages of overall herbage difference.
Negative values indicate a negative difference or that final herbage yield was greater than initial.



Forage Type	Winter Rye	Oat/Pea	Forage Barley	Siberian Millet
Grass	???	233	1,303	533
Weed	(30)	(49)	(366)	78
Pea	???c	446		
Winter Rye	293	145		

Figure 2. Cow performance while grazing various forage pastures in year 3 (1995) of annual grazing study. Means and standard deviations are presented in text.

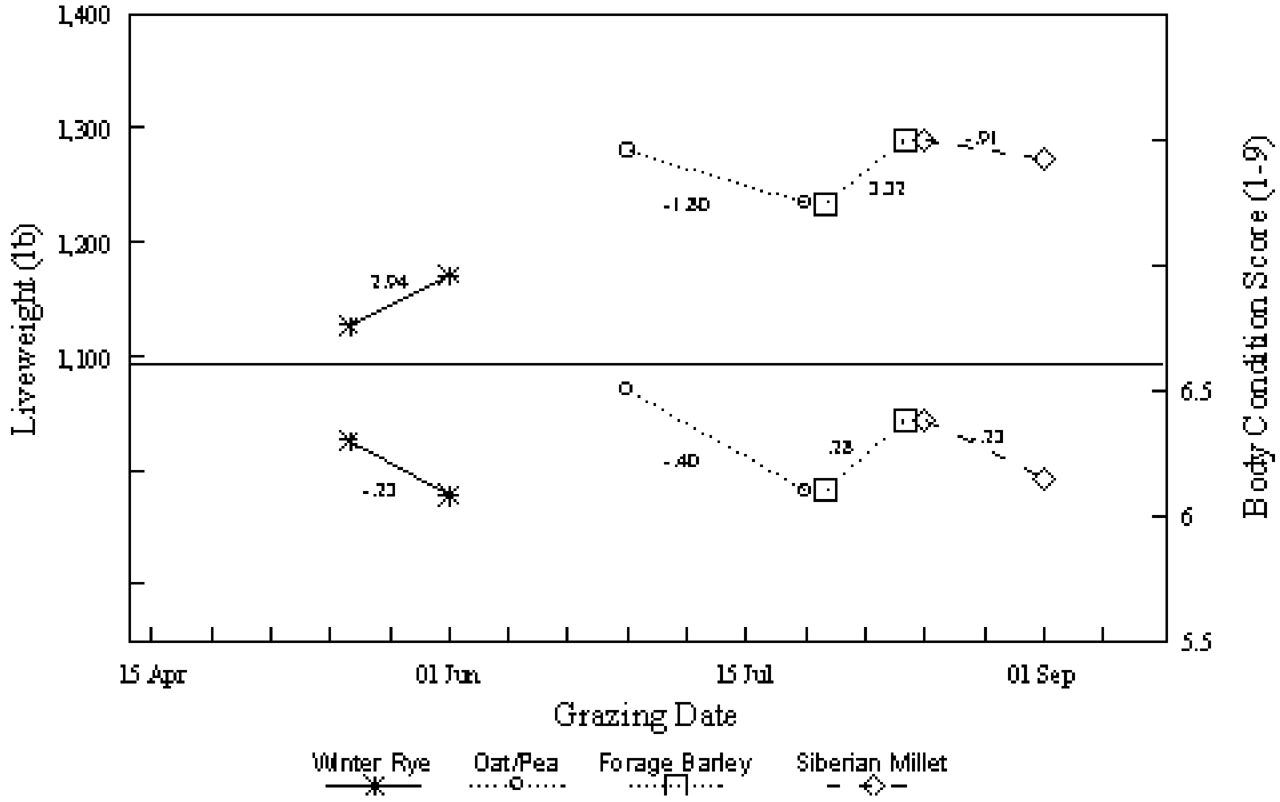
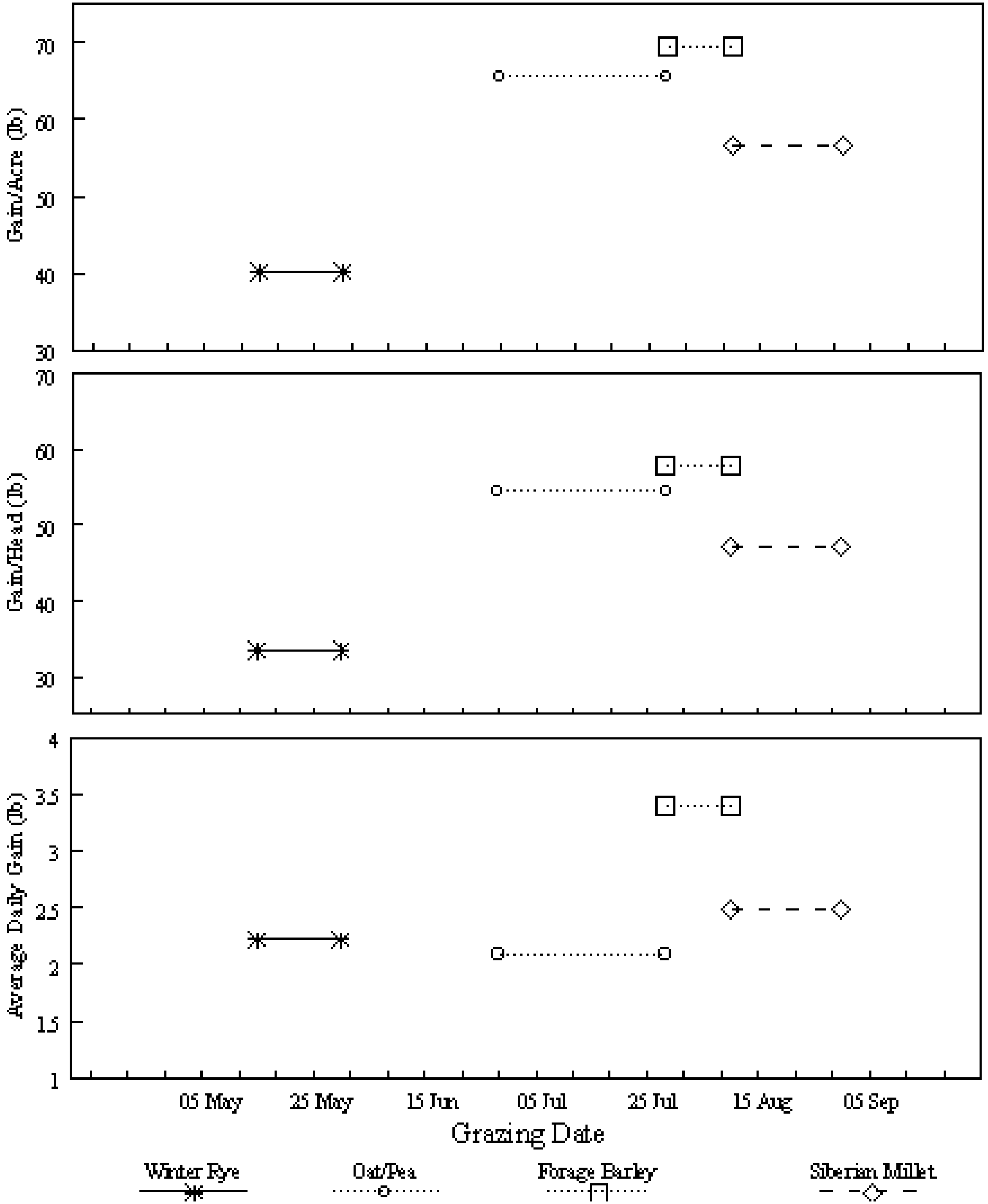


Figure 3. Calf performance from various forage pastures in year 3 (1995) of annual grazing study. Means and standard deviations are presented in text.


Gain/Acre (lb)
70
60
50
40
30
Gain/Head (lb)
70
60
50
40
30
Average Daily Gain (lb)
4
3.5
3
2.5
2
1.5
1
05 May
25 May
15 Jun
05 Jul
25 Jul
15 Aug
05 Sep
Grazing Date
Winter Rye
Oat/Pea
Forage Barley
Siberian Millet

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