Integrated Crop/Livestock Systems in the Northern Plains: Forage and Grain Production for Swath Grazing.

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INTRODUCTION

Agriculture has evolved over the decades from simple cultivation to a number of differentiated forms. Separate crop and livestock operations have evolved because of agricultural specialization. Specialization has resulted in the uncoupling of crop and livestock where crop and animal diversity has given way to chemical pest control (Kirschenmann, 2002; Brummer, 1998). Diversity provides the key to ensure a productive and sustainable agriculture for the future. To overcome this narrowing of focus, multidisciplinary research teams need to work collaboratively on whole farm systems including both crops and livestock. Adding livestock to a cropping system complements both crops and livestock by adding value to the grain, efficient nutrient cycling, and providing uses for forages and crop residue (Powell et al., 1996).

Our broad research objective was to develop an integrated crop/livestock system that met the nutritional requirements of dry bred cows during the winter and provided adequate crop diversity in time and space for sustainable crop production. The specific cropping systems objective was to determine the influence of winter grazing dry gestating cows on no-till forage and grain production, water-use efficiency, and protein production.

MATERIALS AND METHODS

Research was conducted 6.0 km southwest of the Northern Great Plains Research Laboratory in Mandan, ND. Two pastures (6.0 ha) that had been in crested wheatgrass for 15-yr were used in a randomized complete block design with unbalanced treatment replications (Fig. 1). The three-year crop rotation consisted of oat/pea-triticale/sweet clover-drilled corn was designed to meet the nutritional requirements of wintering dry bred cows. All phases of the crop rotation and the swath grazing of the forage are illustrated in Fig. 2. The treatments for each crop were residue or stover left in place with no livestock (IP), residue or stover removed (R), and residue or stover grazed by livestock (L) (Fig. 3). All phases of the crop rotation were present each year and all crops were no-till seeded.

Figure 1. Aerial photo of integrated crop/livestock systems at Mandan, ND.

Figure 3. Integrated crop/livestock systems treatments with residue or stover left in place with no livestock (IP), residue or stover removed (R), and residue or stover grazed by livestock (L).

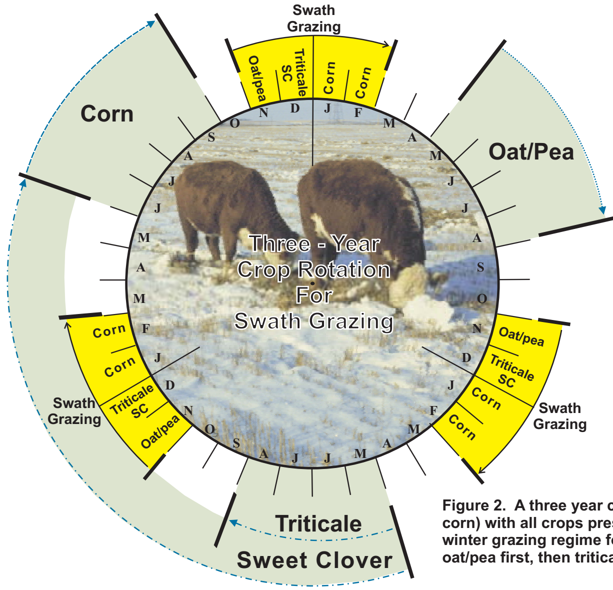

Figure 2. A three year crop rotation (oat/pea-triticale/sweet clover-drilled corn) with all crops present each year to provide a consistent within year winter grazing regime for dry gestating beef cows. Cows swath graze oat/pea first, then triticale/sweet clover, and drilled corn last.

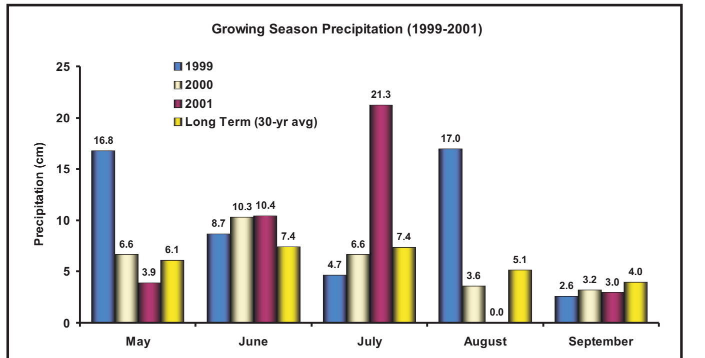

Figure 4. Monthly growing season precipitation for 1999, 2000, and 2001 at Mandan, ND.

RESULTS

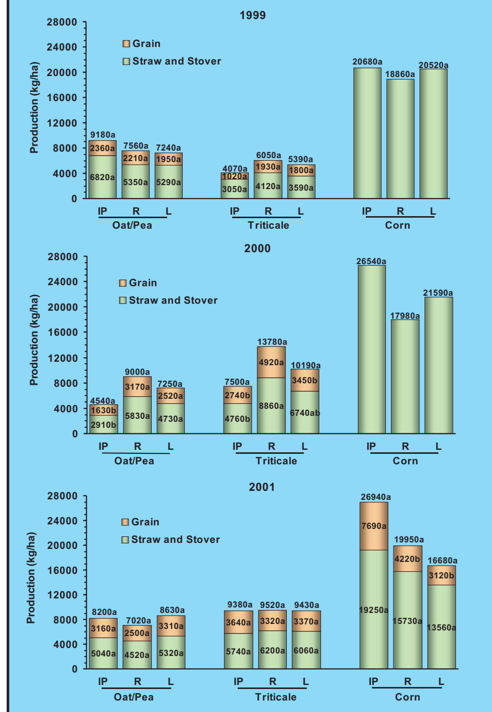

Figure 5. Total dry matter grain, and straw/stover production for straw or stover left in place with no livestock (IP), straw or stover removed (R), and straw or stover swath grazed by livestock (L) in 1999, 2000, and 2001. Means followed by different letters within total dry matter, grain, or straw/stover for each crop were significantly different at the 0.10 probability level.

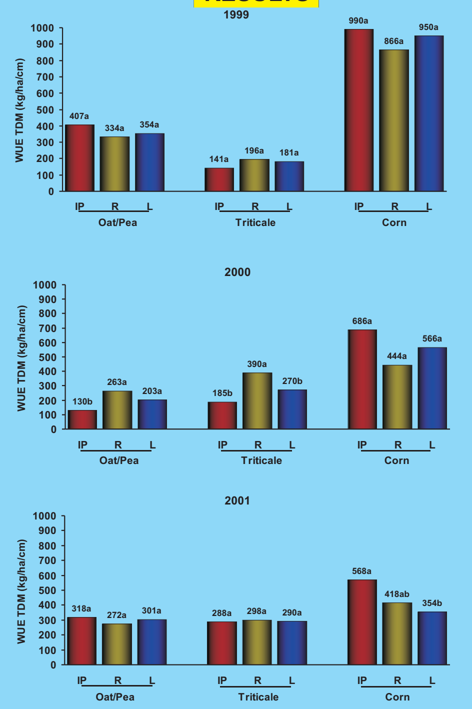

Figure 6. Water-use efficiency (WUE) for total dry matter (TDM) or forage production as influenced by straw or stover left in place with no livestock (IP), straw or stover removed (R), and straw or stover swath grazed by livestock (L) in 1999, 2000, and 2001. Means followed by different letters were significantly different at the 0.10 probability level.

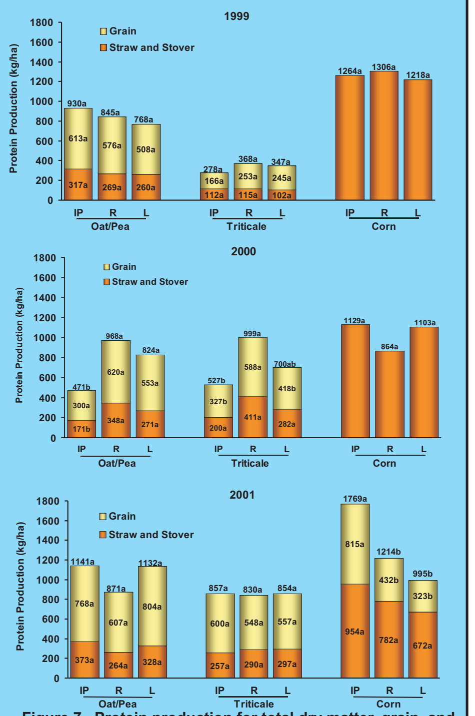

Figure 7. Protein production for total dry matter, grain, and straw/stover when straw or stover is left in place with no livestock (IP), straw or stover removed (R), and straw or stover swath grazed by livestock (L) in 1999, 2000, and 2001. Means followed by different letters within total dry matter, grain, or straw/stover for each crop were significantly different at the 0.10 probability level.

SUMMARY

1. Trends suggest corn grain and stover production may be enhanced with increased crop residue.
2. Good crop stands of oat/pea and triticale/sweet clover may require moving part of the previous crop residue. Appropriate adjustments and modification of seeding equipment could solve the problem.
3. Cool and warm season annual and biennial crops are needed in the system to take advantage of erratic precipitation frequency and distribution and to improve water-use efficiency of forage production in the northern Great Plains.
4. True system benefits from legumes may require long-term data. A system may need to be in place for 9 to 12 years to see the true implications of legumes.

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