

## Using Alternative Forages on Traditional Small Grain Crop Land in Rotational Grazing Systems for the Northern Great Plains\*

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### Research Summary

Crop selection in the Northern Great Plains is limited due to environmental conditions. Similar constraints limit the length of time that high quality perennial forage is available. Integrating crop and livestock enterprises using forages could be mutually beneficial. The results of this study will determine the economic feasibility of producing summer forage for grazing or haying in the Northern Great Plains. Definitive results are not available to date. However, positive results could increase the amount of quality forage available to livestock, while expanding the number of crops available for use in developing sustainable crop rotations.

### Introduction

The ultimate objective of this project is to evaluate whether an integrated crop-livestock system can be developed that would produce human food (e.g. small grains, meat) in an economically efficient and environmentally friendly manner. An appropriate system would be one that effectively integrates the biological and natural resources available, while conserving as many nutrients as possible so as to reduce the need for purchased inputs (e.g. N fertilizer). Enabling enterprise diversification, particularly in small- and medium-scale operations, would help reduce environmental and economic risks. The risk management achieved could potentially enhance the economic viability of surrounding communities.

### Objectives

- i. Determine production of and yearling heifer performance from forages produced on traditional small grain crop land in the Northern Great Plains during late summer.

- ii. Determine if economic returns to crop land from growing forages and grazing cattle are competitive with returns from small grain production in the Northern Great Plains.

## Materials and Methods

*Objective 1.* Twenty-six, 2.5-ac paddocks were established (1997-1998) to support research efforts involving summer grazing of annual forages by beef cattle in the Northern Great Plains. Forage treatments were seeded into replicated paddocks (n=2) in 2000. Treatments included Siberian millet (M; *Setaria italica*), sweetclover (C; *Melilotus alba*), alfalfa (A; *Medicago sativa*), barley (*Hordeum vulgare*), field pea (*Pisum arvense*) and combinations of M/C and M/A. Forage production resulting from these seedings was grazed using yearling beef heifers. Subsequent forage production from previously seeded biennial (sweetclover) or perennial (alfalfa) legumes will be available for grazing in year 2 of the study (2001). Initial forage treatments will also be seeded again in year 2 of the study.

Paddocks were seeded to respective forages using no-till seeding techniques. Grazing of paddocks with yearling beef heifers initiated on August 2 and continued for at least 16 days (actually length depended upon forage availability). Forage samples and animal weights were collected at the beginning and end of the grazing period, and at 14-day intervals during the grazing period. Forage samples will be used to determine dry matter available for grazing, rate of dry matter disappearance and chemical composition (nitrates, crude protein, acid detergent fiber and neutral detergent fiber). Rate of dry matter disappearance and residual dry matter remaining at the end of grazing will be used to estimate length of potential grazing period. Animal weights will be used to calculate average daily performance and total live weight production during the grazing period.

At the completion of the study, animal and forage data will be analyzed as a completely random design. Forage treatment will be considered as a fixed effect, while year and pasture replicate will be considered random. Sources of variation will include year, treatment, a year by treatment interaction and pasture nested within year and treatment combinations. Significant treatment effects will be described using a pre-determined set of orthogonal and nonorthogonal contrasts.

*Objective 2.* To evaluate the economic return of various crop and harvesting combinations tested in this study, regional budgets published by the North Dakota State University Extension Service for small grains, forages and livestock will be used. These budgets will be compared against the actual direct expenses incurred in this trial. This will insure that the relationship among direct costs used in the published budgets matches the actual direct expenses incurred in the trial. For analysis purposes the regional budgets will be used since some direct costs may be skewed due to the small size of research plots. Costs will not include overhead expenses. Returns will be reported as returns to overhead costs. Using measured animal performance and reported regional prices for livestock, small grain and forage crops grown for sale, estimates of returns to overhead will be made for each treatment.

In addition a model farm will be created using the Finpack financial analyzer. This model farm will be representative of farms/ranches in the Northern Great Plains. This farm will include small grain crops, forage crops and livestock typical of farms/ranches in the region. The model farm as created will be the economic control. The model will then be tested using whole farm analysis to determine effects on the returns to owners labor, management, equity and risk of adding each treatment individually to the base farm.

Final results from this experiment will be presented at various field days and producer (both crop and livestock) meetings. Follow-up surveys of meeting participants will assess attitudes toward annual forage production and integration of crop-livestock systems. Intended changes in cropping systems to include annual forages and/or livestock will also be addressed.

## Results

Production data has been collected during the first of a two-year project. Average dry matter production at the initiation of grazing was 5829 <sup>2011</sup> 1196 lb/ac. Across all paddocks, approximately 67% of this production was seeded plants and 33% was weedy plants. Heifers grazed for an average of 29 <sup>2011</sup> 4 d, gaining 78.6 <sup>2011</sup> 23.6 lb/head and 94.3 <sup>2011</sup> 28.3 lb/ac. This experiment is on going with final data to be collected in September 2001.

## Literature cited

None.

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<sup>1</sup>This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, and the Nebraska Agricultural Experiment Station, University of Nebraska, under Cooperative Agreement number 99-COOP-1-7686. Any 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.

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