INTRODUCTION

Enterprise diversity is the key to ensure a productive and sustainable agriculture for the future (Kirschmann, 2002). Integrating crop and livestock systems adds enterprise diversity by adding value to grain, efficient nutrient cycling, and providing uses for forages and crop residues (Powell et al., 1996). Livestock have been known to enhance soil water storage on perennial grassland due to trampling of vegetation (Naeth and Chanasyk, 1995). Information on the impact of livestock on soil water storage in cropping systems is not well documented.

Our broadscale objective was to develop an integrated crop/livestock system that met nutritional requirements of dry bred cows during the winter and provide adequate diversity in time and space for sustainable crop production (Tanaka et al., 2005; Karn et al., 2005). Specifically, objectives of this research were to determine if over-wintering dry bred cows on cropping systems designed for forage and grain swath grazing influences soil water storage, profile soil water, and precipitation storage efficiency during the non-crop period.

RESULTS

1. Drilled corn stored water to a greater depth in the soil profile than either oat/pea or triticale/sweet clover (Fig. 4). When residue or stover was removed (R) for corn residue, differences in soil water content did not occur as deep in the soil profile as when residue or stover was left in place with no livestock (IP) or when grazed by livestock (L) (Fig. 4). Soil water storage during the fall period was negative for 0-30 and 30-60 cm depths when residues were oat/pea and triticale/ sweet clover. Cover crops may have a fit since minimal soil water storage occurs during the fall period (Fig. 5).

2. Precipitation storage efficiency (PSE), during the total non-crop period for corn residue was about two-fold greater than oat/pea or triticale/sweet clover residues (Table 2).

3. Soil water storage during the fall period PPRE was about two-fold greater than oat/pea or triticale/sweet clover residues (Table 2).

4. Precipitation storage efficiency (PSE), during the total non-crop period for corn residue was about two-fold greater than oat/pea or triticale/sweet clover residues (Table 2).

5. Precipitation storage efficiency (PSE), during the total non-crop period for corn residue was about two-fold greater than oat/pea or triticale/sweet clover residues (Table 2).

REFERENCES


The authors wish to thank Robert Kolberg, Marvin Heiberg, Brandon Johnson, Jordan Stenbeck, Jori Hartel, and Richard Huppier for help in conducting the research.

MATERIALS AND METHODS

Research was initiated in 1999, 6.9 km southwest of the Northern Great Plains Research Laboratory in Mandan, ND. The three-year no-till cropping system, with all phases present each year, consisted of oat/pea–triticale/sweet clover–drilled corn. The research project was designed to meet nutritional requirements for wintering dry bred cows in each of the treatments (Fig. 1). Soil water content, to a depth of 2.1 m, in 30 cm increments was measured using a neutron moisture meter from fall 2000 to June 2006 to determine soil water storage (SW), and precipitation storage efficiency (PSE). Soil water content was determined for the noncrop storage periods of fall, winter, and total (Fig. 3). Crop residue or stover treatments 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. 2).

SUMMARY

1. Drilled corn stored water to a greater depth in the soil profile than either oat/pea or triticale/sweet clover (Fig. 4).

2. When residue or stover was removed (R) for triticale/sweet clover and drilled corn, differences in soil water content did not occur as deep in the soil profile as when residue or stover was left in place with no livestock (IP) or when grazed by livestock (L).

3. Soil water storage during the fall period was negative for 0-30 and 30-60 cm depths when residues were oat/pea and triticale/ sweet clover. Cover crops may have a fit since minimal soil water storage occurs during the fall period (Fig. 5).

4. Precipitation storage efficiency (PSE), during the total non-crop period for corn residue was about two-fold greater than oat/pea or triticale/sweet clover residues (Table 2).

Table 1:cropping system 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).

Table 2: Soil water storage (SWS) and precipitation storage efficiency (PSE) to a depth of 2.1 m as influenced by storage and management treatments. Residue treatments were oat/pea or triticale/sweet clover, or drilled corn. Stover treatments were residue or stover removed (R) or residue or stover grazed by livestock (L).