
Management of Barley Crop Residue Produced by Combines Equipped with Stripper Headers

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Introduction

Short growing seasons, characteristic of the Parkland, and in particular northeastern Saskatchewan, have increased producer interest in using technology to expand the number of harvest days. In a survey of producers by the University of Saskatchewan, about 27 harvesting days were available in a normal year and about 17 to 18 days in a short (above average precipitation) year. Producers in the Parkland, who use pickup combines but not grain driers, reported the fewest harvest days. The combination of straight combining or use of a stripper header, with grain drying could add from 4 to 8 additional days, a major improvement during the harvest season in the Parkland (Johnston 1997).

Both the raised straight cut header and the stripper header leave tall residue (> 20 cm) in the field. Although the stripper header increases the number of harvest days, producers are concerned with respect to management of crop residues after harvest. The stripper header leaves crop residue standing, which can affect seeding operations, crop germination and emergence. Producers cite hairpinning, plugging, excessive soil moisture at seeding, and low soil temperatures as reasons for not adopting stripper header technology.

Residue management has also become an important issue with the adoption of direct seeding. The adoption of conservation tillage in the Saskatchewan Parkland has occurred at a rate faster than the remainder of the prairies primarily for economic reasons. Reduced fuel consumption, machinery depreciation and labor requirements mean a lower cost of production and increased net returns with conservation tillage production systems. Reservations with respect to residue management, similar to those for the stripper header, are also of concern to producers.

Objectives

The objective of this study was to evaluate various means of managing tall crop residue in the spring prior to seeding broadleaf and cereal crops.

Methods and Materials

Field studies were conducted at the Melfort Agricultural Development and Diversification Board demonstration centre in 1995 and 1996. The soil is classified as a silty loam, Blaine Lake association.

Barley was grown in the plot area and harvested with a stripper header prior to the residue experiment. Barley grain and residue were at harvest. Spring soil moisture, residue height and snow cover were measured prior to initiation of the residue

The experimental design is a split plot with 4 replicates. Main and subplot effects were crops and residue management. Each subplot was 14.6 by 30.5 m. Canola (Excel), spring wheat (Katepwa), flax (Norlin) and peas (Express) were seeded at recommended rates and depths. Crops were be seeded with a Conserva-Pak seeder across the seed rows of barley grown in the previous year. Barley residue treatments were, no management, double bladed stubble cutter, harrow-cultivate, rotary harrow, swath and combine and burn. Crop yield and quality was measured with a Massey 550 combine equipped with a weigh scale in a 3.7 m by 30.5 m swath in the middle of all plots

Soil fertility was measured in all plots at 0-15, 15-30,30-60 cm increments in the spring and fall. Soil moisture was measured at 0-30,30-60 and 60-90 cm in all plots. Soil temperature was measured in the fall and spring prior to seeding the wheat treatments with direct seed, and swath and combine residue management.

Results and Discussion

The response of crop yield to residue management varied in 1995, 1996, and 1997. Although no clear advantage was observed with respect to residue management, significant differences were observed between residue management systems.

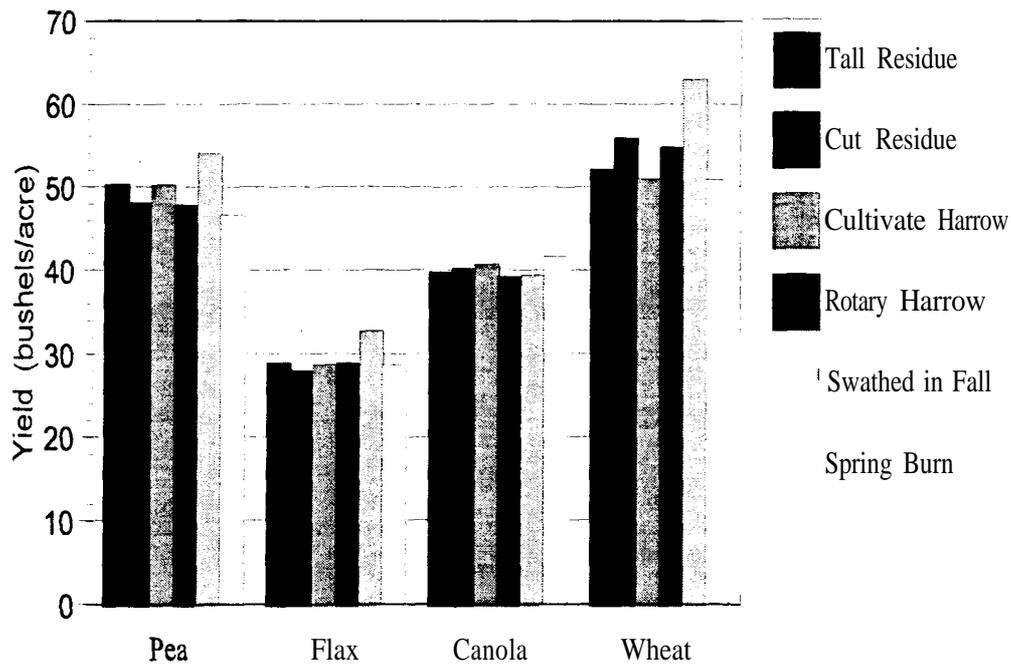


Figure 1 Crop yield in residue treatments in 1995. Error bars represent the least significant difference ($P=0.05$) between pairs of means of residue treatments within crops.

In 1995, yields of wheat, peas and flax, in plots where barley residue was swathed the previous fall, were higher than where tall residue was managed in the spring (Figure 1). Development of wheat heads was earlier in tall residue plots compared to swathed plots.

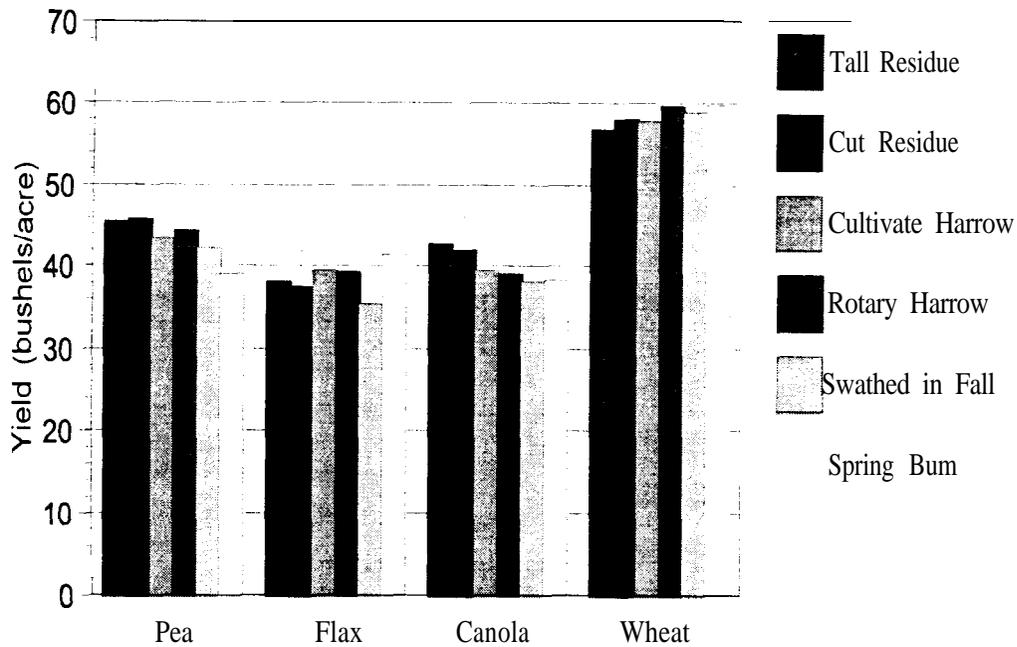


Figure 2. Crop yield in residue treatments in 1996. Error bars represent the least significant difference ($P=0.05$) between pairs of means of residue treatments within crops.

In 1996, yields of canola, peas, flax and wheat, varied between residue management systems (Figure 2). Yields of canola for swath and combined treatments were similar to spring bum, rotary harrow and harrow cultivate, but lower than for the double bladed stubble cutter and tall residue. Pea yields were lowest in the spring bum and highest in tall residue. Flax yields were lowest in swath combine and highest in spring bum. Wheat yields were similar in all residue management systems.

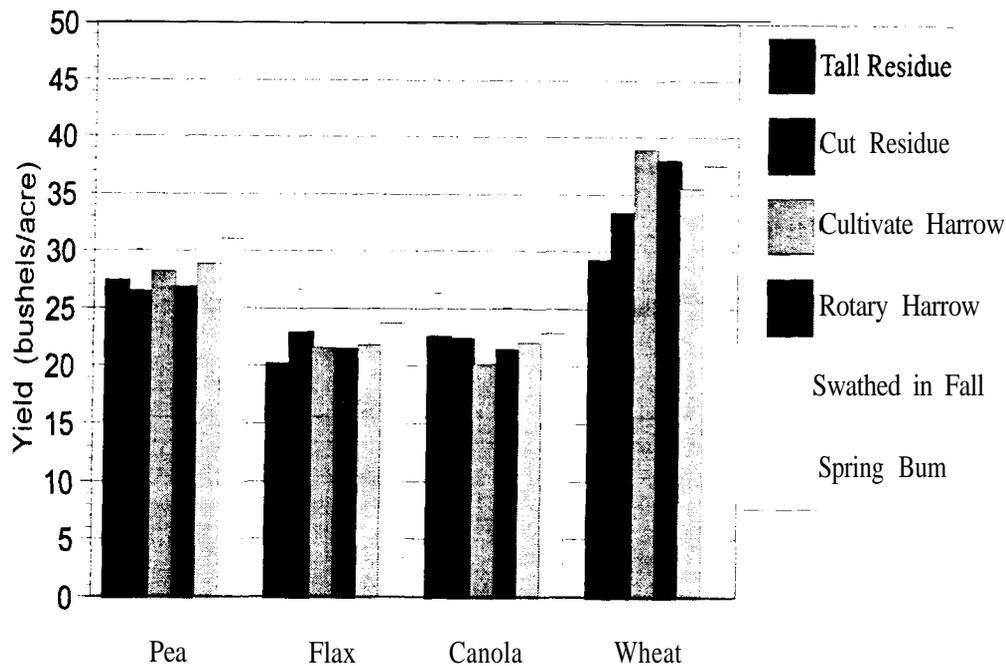


Figure 3. Crop yield in residue treatments in 1997. Error bars represent the least significant difference ($P=0.05$) between pairs of means of residue treatments within crops.

In 1997, yields of canola, peas, flax and wheat, were lower than in previous years, and varied between residue management systems (Figure 3). Yields of canola for swath and combined treatments were similar to spring bum, rotary harrow, cut and tall residue, but higher than harrow-cultivate. Pea yields were lowest in the cut straw and highest in spring bum. Flax yields were lowest in tall straw and highest in spring bum. Wheat yields were lowest in tall residue and highest in harrow-cultivate.

These data contrast with research in drier parts of Saskatchewan. Grain yield and water use efficiency of spring wheat seeded into tall stubble increased by about 12% compared to wheat seeded into cultivated stubble in the Brown soil zone (Cutforth and McConkey 1997).

Conclusions

Producers can take advantage of the longer harvest window afforded by the use of stripper headers or raised straight cut headers, but will have to manage residue differently. Crop yield varies significantly from year to year due to variability in precipitation, and soil moisture and temperature as affected by residue management. Tall residue may have to be cut or cultivated in the fall to adjust soil moisture by reducing the amount of precipitation stored as snow in the winter.

References

Cutforth, H.W and B. McConkey 1997. Stubble height effects on microclimate, yield and water use efficiency of spring wheat grown in a semiarid climate on the Canadian Prairies. *Can. J. Plant Sci.* 77:359-366

Johnston, A. 1997. Crop rotations and harvest management, a survey of direct seeding farmers. *Prairie Steward*. Saskatchewan Soil Conservation Association. p 3.