Reducing Direct Harvest Losses in Conservation Tillage Dry Bean Production

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Dry bean production in Wyoming is relatively expensive compared to other crops due to high labor, equipment, and fuel costs. A typical dry bean grower may use five to nine field operations over each acre of dry beans. Planting dry bean directly into previous crop stubble reduces input costs and has the added benefit of reducing soil erosion and protecting the crop from wind damage early in the growing season. Another way to reduce input costs is to direct-harvest the dry bean crop instead of undercutting and windrowing.

In this project, we are investigating practices that could reduce harvest loss associated with direct harvest of dry beans grown in conservation tillage systems. Adoption of this practice could result in reduced soil erosion due to wind and substantial savings in the cost of dry bean production through reduced fuel and labor requirements. Direct-harvest of the dry bean crop will eliminate at least one—and in some cases two—field harvest operations while also reducing the risk of weather damage to seed during the critical time the crop is in the windrow.

Objectives
Our objective is to determine the impact of previous crop residue on dry bean growth habit and harvest loss.

Materials and Methods
A large-scale study was conducted on the Anderson farm in southeast Wyoming near Albin in 2014. During the 2013 wheat harvest, wheat was cut at three different heights. Each wheat stubble height was replicated three times in a randomized complete block design. Stubble heights measured in spring 2014 were 7.5 inches (low residue), 10 (medium residue), and 14 (high residue).

The study included three plots for each treatment, and each plot measured 35 feet wide (width of the combine header) by the length of the field (approximately 1,000 feet), for a total trial area of nearly 10 acres. Pinto beans were drilled into the standing wheat stubble treatments on May 22, 2014, in 10-inch row spacing. Crop stand was measured by counting the number of beans in 20 feet of row (30 counts per strip). Total plant height and height from soil to the first and second bean pod were measured (30 bean plants per strip).

The strips were then harvested with a flex header with air reel (owned and operated by the Andersons). The entire strip was harvested and placed into a weigh wagon. Strip lengths were measured using a global positioning system to determine bean yield per acre. Harvest loss was then determined by counting the number of beans on the ground within a 2.7 ft² quadrat (10 per plot). Data was analyzed by analysis of variance (ANOVA). Treatment means were separated where appropriate using Fisher’s protected LSD (least significant difference).

Results and Discussion
Pinto bean populations averaged approximately 73,000 plants per acre and did not differ be-

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between wheat residue treatments. Bean height increased as wheat stubble height increased, from 14 inches in the low residue treatment to 15.5 inches in the high residue treatment. Although not statistically significant, there was a trend for increased pod height as wheat residue amount increased (Table 1). Pinto bean yield was reduced as wheat stubble height increased. Yield ranged from 3,490 lbs/ac in the low residue treatment to 2,960 in the high residue treatment. Although some yield reduction was expected from the increased stubble amount, the 15% reduction in bean yield was greater than expected. Additionally, the lowest harvest loss was observed in the low residue treatment. These combined results suggest that leaving increased winter wheat stubble height should not be a recommended practice.

Although results are not promising, the study is being repeated in 2015. The 2014 growing season was nearly ideal for reducing harvest losses, and, therefore, the results may be overly optimistic for the low residue treatment. Results from 2015 should provide greater insight into whether this may be a viable practice to reduce harvest losses. The results from 2014, although contrary to what we expected, may actually provide some good news for growers considering dry bean production in winter wheat stubble. Our results suggest that lower wheat stubble heights produced greater bean yields and did not negatively impact harvest losses. Therefore, the additional wheat straw could be baled and sold when straw prices are high.

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PARP: I:3,4,7,8,9, II:6, IV:4, IX:2,4, X:1,2

<table>
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<tr>
<th>Treatment</th>
<th>Stubble height (inches)</th>
<th>Bean height (inches)</th>
<th>Pod height (inches)</th>
<th>Bean yield (lbs/A)</th>
<th>Harvest loss (%)</th>
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<tr>
<td>Low residue</td>
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<td>July 16</td>
<td>Sept. 17</td>
<td>Sept. 18</td>
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<tr>
<td></td>
<td>7.5</td>
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<td>0.4</td>
<td>NS</td>
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