

Residue Management for Direct Seeded Wheat (Latah)

Goal

To determine whether reducing stubble height of the previous crop to less than the drill row width improved plant stand and yield of direct seeded wheat.

Seeding into heavy residue can be extremely challenging with direct seeding, especially if the straw has lodged and the ground is very moist. “Hairpinning” or tucking of residue from the previous crop may occur with disk-type drills, resulting in poor seed-to-soil contact and reduced germination. Hoe drills tend to act like a hay rake, leaving clumps of straw across the field. Reduced plant stand may cause a loss in yield.

The grower wanted to test a theory he had heard that if the stubble height of the previous crop is less than the drill row spacing, then these problems should not occur.

Methods

Immediately following harvest in the test field, the grower used his combine to cut the test strips. He harvested the field at a normal 20-in height, and then lowered the combine header to cut test strips that left the stubble 6 inches high. The grower seeded the strips using a Great Plains chisel drill with double disk openers that was set with paired 4-inch rows on 7-in center spacing.

In the 2001 season, he tested Madsen winter wheat that he seeded into 45 bu Wawawai spring wheat stubble; in 2002, he seeded Zak spring wheat into 86 bu Madsen winter wheat stubble; and in 2003, he seeded Wawawai spring wheat into 79 bu Madsen stubble. The 2 treatments were tall stubble (20 inches) and short stubble (6 inches). There were 3 replications of the treatments in 2001, 5 replications in 2002, and 6 replications in 2003. He did no other residue management prior to seeding, and he planted the whole field at the same time, treating the plots similarly in every other management practice.

Each season we collected data on stand counts and weed populations in the plots about a month after emergence. Stand counts were the average number of plants in a 3-ft length of 2 drill rows (paired), and we took 6 random samples per plot. Weed counts were the total number of weeds in a random 100-ft strip, counted as the number of weeds intersecting with knots on two 50-ft residue ropes. We harvested each plot separately using the grower’s combine, and took a single test weight sample of the grain from each plot.

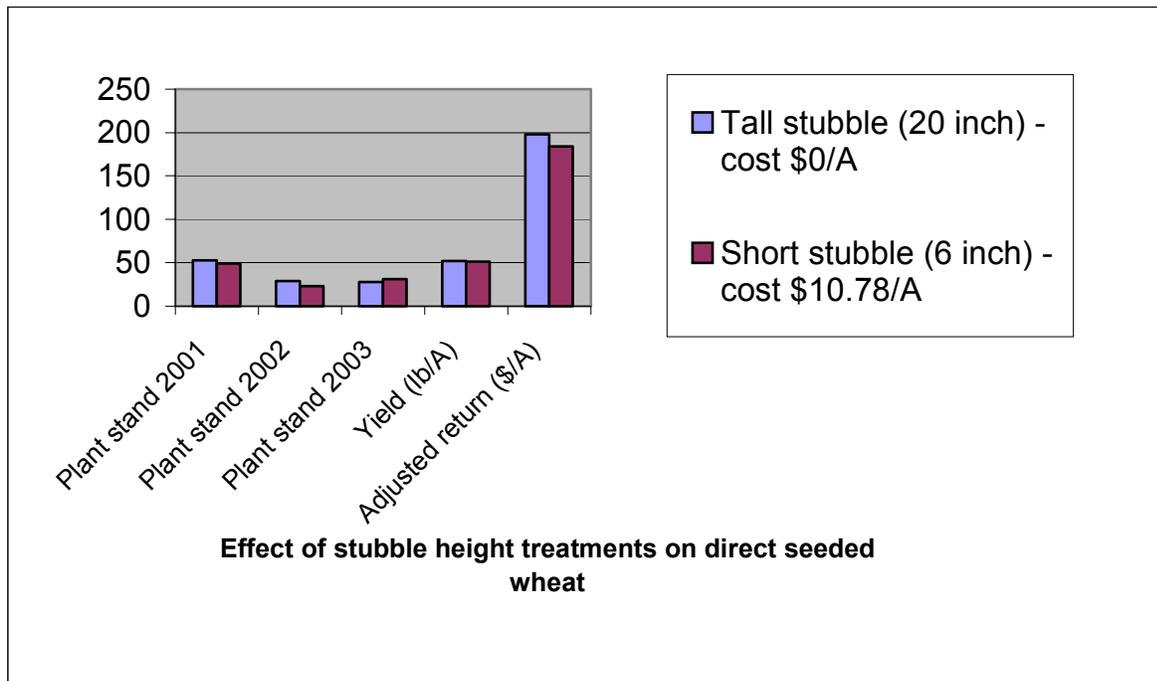
Results and Discussion

The summary of the combined 3-year data is shown in Figure 1, and features the variables of primary interest. The complete results of the analysis are in Table 1 in the Appendix section.

In 2001, contrary to expectation, the stand counts were higher in the tall stubble (53 plants/yd) than in the short stubble (49 plants/yd), as shown in Figure 1. An early snow precluded our taking these counts in the fall, and as all spring wheat volunteer did not winterkill, it is possible that increased survival of spring wheat in the tall stubble affected the results. In 2002, plant stands were also higher in the tall stubble (29 vs. 23 plants/yd). It is possible that the combine did not spread the chaff and straw adequately, so more tucking occurred in the short stubble plots. The cooperator had a factory John Deere straw chopper on the combine, plus a Kary chaff spreader. This was hydraulic with variable speeds, and spread the chaff wider

than the width of the header. However, on hillsides the distribution of the chaff was inadequate due to the slope, as the combine remained level. With a tractor-drawn mower this situation should not arise. In 2003, however, the trend was reversed with an average of 28 plants/yard in the tall stubble vs. 31 plants/yard in the short stubble. As the farmer seeded the field when the cultivated ground around the plots was ready, and because the stubble ground dried out slower, the plots tended to be too wet at seeding in the spring (2002 and 2003). Some of the seed tended to bounce out of the drill row, and this may have contributed to the stand establishment differences.

Figure 1. Effect of 2 stubble height treatments (20 inches and 6 inches) on subsequent direct seeded spring and winter wheat at Latah, WA, from 2001 to 2003.



Despite differences in stand establishment, in each year of the project there were no visible differences between the treatments by harvest, and there were no appreciable yield differences in any season (Figure 1). We calculated an adjusted return (\$/A) to compare the economics of the treatments. Adjusted return was the gross economic return on a treatment less the cost of the residue management treatment *only* (no seeding, herbicide, fertilizer, harvest costs). We used *total costs* that included ownership, depreciation, fuel, maintenance, and wear and tear on the equipment. We used the costs for a mower, assuming the farmer would not use his combine for mowing a whole field. The costs for the treatments were: mowing - \$10.78/A, standing stubble - \$0/A. The grain price (\$3.80/bu) was the target price for 2001 to 2003.

Over the 3 years there was a consistent trend (Figure 1) of the short stubble treatment providing a lower adjusted return (\$183.93/A) than did the tall stubble treatment (\$197.91/A). From this it was evident that the extra cost of mowing (\$10.78/A) was not warranted. If there were stand differences due to seeding conditions, the crop consistently compensated in yield.

Observations

The farmer noted during the winter of 2001-2002, the tall stubble plots held drifting snow in place better than the short stubble plots. This is consistent with direct seeding principles, and in a low-moisture year or region it would be beneficial. However, every year that we conducted the trials, we took 4-ft soil tests in each plot in the spring and both treatments were consistently at field capacity (13 inches).

In 2003, the direct seeded plots yielded 10 to 15 bu/A less than the rest of the field. The farmer attributed this to the timing of seeding, which was good for the tilled ground, but too wet and cold for direct seeding.