reduced, and grain yield increased, when wheat was grown in rotation with barley every other year. Remnant downy brome weed seeds remained dormant for 6 years and longer to heavily infest recrop winter wheat. There were few quantifiable changes in soil quality due to crop rotation, but soil organic carbon increased in the surface 0-to 5-cm depth with no-till during the 10 years to approach that found in undisturbed native soil. Annual no-till crop rotations experienced lower average profitability and greater income variability compared to WW-SF. Yellow mustard and safflower were not economically viable. Continuous annual cropping using no-till provides excellent protection against wind erosion and shows potential to increase soil quality, but the practice involves high economic risk compared to winter wheat – summer fallow. The ability of spring-planted crops to compete economically with winter wheat - summer fallow is highly dependent on the quantity of precipitation stored in the soil over the winter and the quantity of rainfall in May and June. Figure 1 shows the grain yield performance of continuous annual no-till soft white spring wheat compared to winter wheat – summer fallow (i.e., one crop every two years) at the Jirava site over the past ten years.

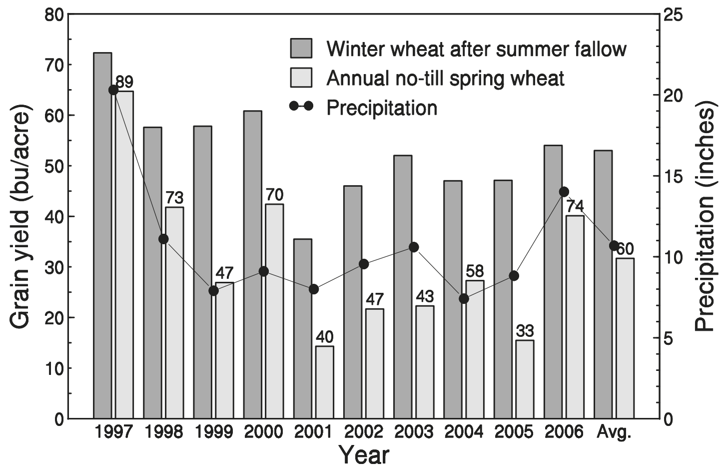

Fig. 1. Grain yield of soft white winter wheat after summer fallow (one crop every two years) vs. continuous annual no-till soft white spring wheat near Ritzville, WA from 1997 to 2006. The numbers above the bars are the percent grain yield of annual spring wheat compared to winter wheat-summer fallow for each year. Note that annual spring wheat is competitive with WW-SF in wet years but has low grain yields and lacks the stability of WW-SF during dry years.

Rodweeding Frequency and Timing Effects on Seed-Zone Water Retention in Summer Fallow

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A 3-year field study was initiated in 2006 at the WSU Dryland Research Station at Lind to evaluate the frequency of rodweeding operations on seed-zone moisture retention and several other agronomic and environmental factors. In mid April, primary spring tillage was conducted to a depth of 5 inches. Aqua nitrogen fertilizer was injected into the soil with the undercutter sweep implement during the one-pass primary tillage. Subsequent rodweeding operations were conducted at the 4-inch depth with a Calkins center-drive rodweeder. Treatments are:

1. No rodweeding (i.e., check). Weeds are controlled with a glyphosate herbicide with a sprayer as needed to maintain weed-free plots.
2. Rodweed only when required to control weeds (this will range from 1 to 3 rodweedings, depending on the year, but only one rodweeding was required in 2006).
3. Rodweed immediately after primary spring tillage, but thereafter only as required to control weeds (as per treatment no. 2, above).
4. Rodweed immediately after primary spring tillage and then at one-month intervals until late July-early August. This was a total of five rodweedings.

Results for 2006 show that, following a wet 2005-2006 winter season, rodweeding was not required to maintain adequate seed-zone moisture for late planting. The primary tillage alone (in this case mid April with a Haybuster undercutter sweep) was the only operation required to retain seed-zone moisture. Surface residue and surface clod mass are reduced with increased rodweedings (Fig. 1). The undercutter only treatment (i.e., no rodweedings) had relatively low surface clod mass (Fig. 1) because individual clods were difficult to identify as they had “fused” together during spring rain events. The undercutter only treatment maintained a highly crusted surface that provided excellent control for wind erosion throughout the fallow cycle. There was a much higher quantity of subsurface clods in the reduced rodweeding treatments compared to the 5x treatment but, as previously documented by Schillinger and Papendick (SSSAJ 1997), subsurface clods do not appear to reduce seed-zone water content in tilled summer fallow. Excellent stands of winter wheat were achieved in all treatments in 2006.

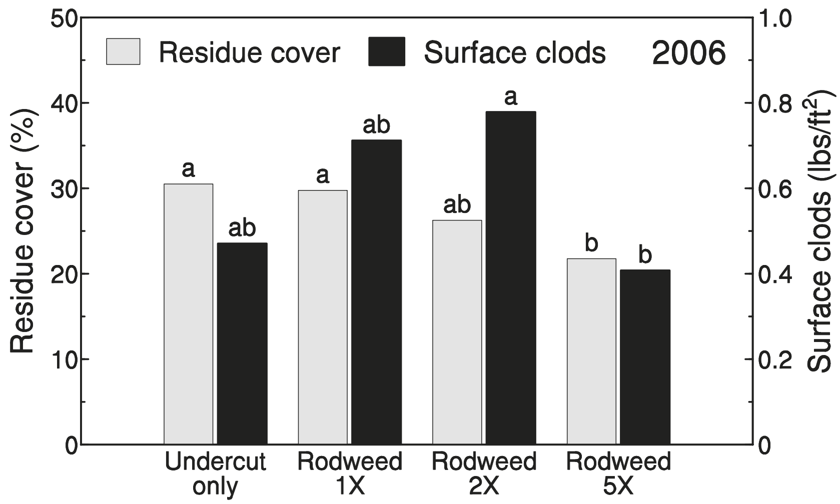

Fig. 1. Percent residue cover and surface clod mass in summer fallow just prior to planting winter wheat in late August 2006 at Lind with three rodweeding frequency and timing treatments plus the undercutter only check. Within residue cover and surface clod mass means followed by the same letter are not significantly different at $P < 0.05$.

Grain Yield and Available Moisture Relations for Winter Wheat after Fallow and Recrop Spring Wheat

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In last year's (2006) CSS Field Day Abstracts, we reported on the similarity of wheat grain yield and available moisture relations reported by G.E. Leggett from 1953-1957 and by W.F. Schillinger et al. from 1993-2005. Those data sets combined grain yield of winter wheat after summer fallow, recrop winter wheat, and recrop spring wheat.

Today, we report available moisture and grain yield relations for winter wheat after fallow compared to recrop spring wheat from 1993-2005. For winter wheat after fallow, we partitioned available moisture into: (i) soil moisture available in fallow at time of planting in late August-early September, (ii) soil moisture stored in the soil over the winter, (iii) April rainfall, (iv) May rainfall, and (v) June rainfall. For recrop spring wheat we, of course, used only factors (ii) through (v) above in the analysis. Multiple regression statistical methods were used to calculate the relative contribution of available moisture to grain yield. All growing-season (April, May, June) rain was

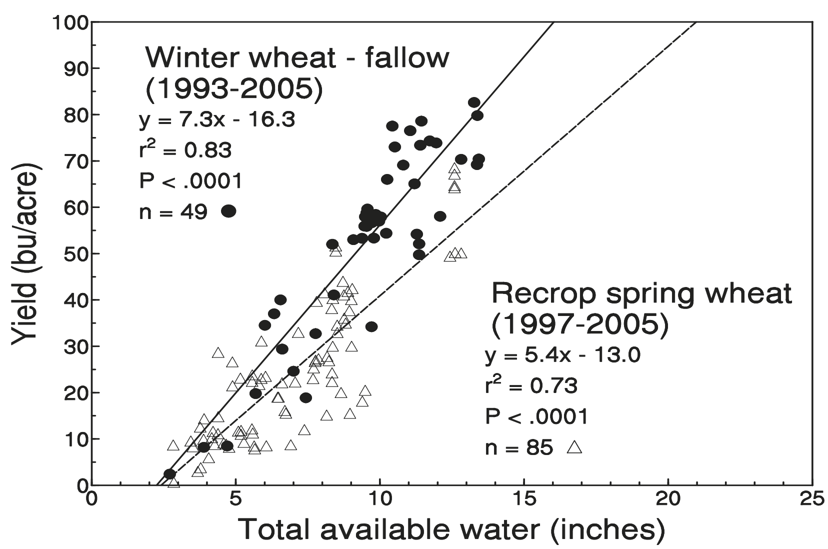

Fig. 1. The relationship between available soil moisture and grain yield for winter wheat after fallow (solid line, filled circles) and for recrop spring wheat (dotted line, open triangles) in Eastern Washington.