WINTER WHEAT – SUMMER FALLOW VS. CONTINUOUS ANNUAL NO-TILL HARD RED SPRING WHEAT IN THE HORSE HEAVEN HILLS

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Winter wheat - summer fallow is the predominant cropping system in the 300,000-acre Horse Heaven Hills region in south-central Washington. A 6-year study was conducted from 1997 to 2002 to compare the conventional soft white winter wheat - summer fallow rotation to continuous annual no-till hard red spring wheat (HRSW). Long-term annual precipitation at the experiment site is six inches, which we believe is the lowest for any non-irrigated wheat region of the world. Annual precipitation during the study ranged from 4.1 to 9.8 inches and averaged 5.9 inches. Six-year mean grain yield was 17.9 bu/a for winter wheat after fallow and 8.1 bu/a for annual HRSW (Fig. 1). Net economic returns for annual HRSW were always negative and lagged behind winter wheat - summer fallow by an average $40 per acre per year. In the driest years, only one inch of soil water was stored and recharge occurred only to 12-to 18-inch soil depth. Although annual no-till cropping has clear environmental advantages, growers in the Horse Heaven Hills have advised that, even if annually cropped wheat should become more competitive after many years of no-till, they cannot afford to go through the transition period. This study is now completed. Two journal articles are planned.

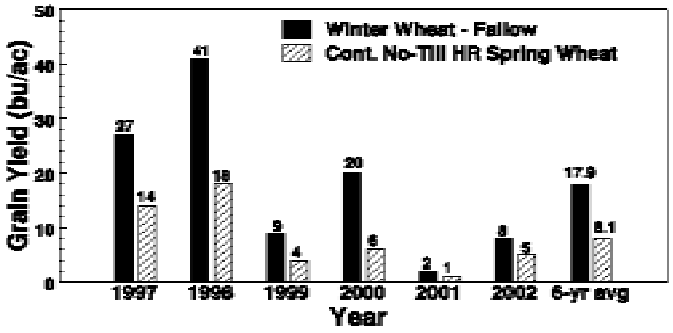

Figure 1. Grain yield of winter wheat after summer fallow compared to continuous annual hard red spring wheat during six years at the Doug Rowell farm, Horse Heaven Hills, Washington.

ALTERNATIVE TO BURNING

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A long-term irrigated cropping systems study was initiated in 1999 at Lind, WA, to evaluate a 3-yr rotation of winter wheat - spring barley - winter canola sown: i) directly into standing stubble, ii) after mechanical removal of stubble, and iii) after burning the stubble. The traditional practice of continuous annual winter wheat sown after burning and moldboard plowing is

Table 1. Grain yields of winter wheat, spring barley, and canola in 2001 and 2002 as affected by various stubble and soil management practices.

	Winter Wheat (bu/a)		Spring Barley (ton/a)		Winter Canola (lb/a)	
	2001	2002	2001	2002	2001[A]	2002
Stubble burned	85	106	2.88	2.21	2574	2502
Stubble mechanically removed	67	110	3.03	2.33	2486	2226
Standing Stubble	69	107	2.88	2.26	2282	2188
Burn and Plow	75	97				
LSD (0.05)	NS	NS	NS	NS	NS	NS

NS = no significant differences at the 5% probability level.
A: spring canola instead of winter canola in 2001.

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also included as a check. There are 40 plots (3 crops x 3 stubble management practices + check x 4 replications). Measurements include: grain yield, diseases, soil quality assessment, soil water dynamics and weeds. Excellent stands and yields of spring barley direct seeded into 10,000 lb/acre winter wheat stubble have been consistently achieved. Winter canola stands, weed pressure, and grain yield have been somewhat hampered by direct seeding into barley stubble compared to burning. Disease pressure has been low except for Pythium root rot of winter canola in all residue treatments. Differences in soil enzyme activity and microbial analyses between burn/plow and the direct seed treatments become more apparent each year. Farmers and urban dwellers are closely following this study because direct seeding into heavy residue with a diverse 3-yr crop rotation eliminates smoke emissions and air quality concerns created by stubble burning.

POLYMER SEED COATINGS FOR LATE FALL DORMANT PLANTING OF CEREALS

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Fall or dormant seeding is a management practice where spring crops are sown in the fall instead of March or April. The list of benefits of dormant seeding include faster spring growth to compete with Russian thistle and other broadleaf weeds, reduced heat and water stress, and higher yields. Dormant seeding is not without risks. Warm temperatures after late-fall seeding may result in emergence of spring wheat seedlings that may easily winter kill. In this study at Lind, we are evaluating hard red spring wheat (Scarlet), soft white spring wheat (Alpowa), spring barley (Baronesse), and soft white winter wheat (Eltan) planted in late November with and without polymer seed coating. The polymer "Extender^{TM}" has been developed to prevent seed from imbibing water until soil temperatures begin to warm in late winter - early spring. The trial was planted in the last week of November in both 2001 and 2002 and again in mid March in 2002 and 2003 (planned). The four cereal entries are planted with and without the polymer coating into undisturbed spring wheat stubble with a Cross-slot drill equipped with a cone seed feeder. Planting rate for all entries is 70 lbs/acre and fertilizer rate is 40 lbs N, 10 lbs P, and 10 lbs S per acre. Experimental design is a randomized complete block with four replications.

For the 2002 crop year, plant stand establishment for all cereal entries was significantly reduced when planted in late November compared to mid March regardless of whether or not seed was coated with the polymer (Fig. 1a). Scarlet was the only entry that had better emergence from November planting without the polymer compared to with the polymer. The polymer had no effect on stand establishment on any of the four cereal entries from the mid-March planting (Fig. 1b). Within cereal entries, Eltan planted in late November without the polymer had significantly greater grain yield than late November planting with the polymer as well as mid March planting (both with and without the polymer) (Fig. 1b). For the other entries, there were no within-cereal grain yield differences as affected by planting date or polymer coating for Scarlet, Alpowa, or Baronesse (Fig. 1b). This project is ongoing.