

# HOW THE 2001 DROUGHT AFFECTED THE ECONOMIC RISK OF CONTINUOUS NO-TILL HARD RED SPRING WHEAT IN ADAMS AND BENTON COUNTIES EXPERIMENTS

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This report provides results updated through 2001 on the experiments at Ralston in Adams County and the Horse Heaven Hills in Benton County. This report will focus on the economic effects of the 2001 drought at these sites.

**Ralston.** These experimental trials were initiated in August 1995 on a farm near Ralston in an 11.5 inch annual rainfall zone. The main trials at the site evaluated four tillage/crop rotation systems: a) conventional/minimum tillage SWWW/fallow; b) no-till soft white spring wheat (SWSW)/chemical fallow; c) continuous no-till HRSW; and d) no-till HRSW/no-till spring barley (SB). Above average precipitation in 1996-98 favored both spring and winter grain yields, but yields for both spring and winter grains were reduced by dry conditions in 1999-2001 (Table 1). The 2001 drought, with October-September precipitation of only 7.22 inches, reduced all yields, but continuous no-till spring grains were especially hard hit. In 2001 continuous HRSW, HRSW after SB, and SB after HRSW suffered yield losses 67, 79, and 84 percent, respectively, compared to their 1996-2000 averages. In contrast, the comparable 2001 yield reductions for SWWW after fallow and SWSW after fallow were “only” 46 and 56 percent.

Table 2 shows that the 2001 drought decreased average yields for all Ralston crops, but that yield risk as measured by the statistical coefficient of variation (C.V.) for the experiment duration was nearly doubled, or was doubled, for several crops. For example, the drought year increased the C.V. for continuous HRSW from 23 to 38 percent, and for HRSW after SB from 17 to 41 percent.

Because the higher production costs for spring cropping systems are still incurred in a drought year while yields and revenue are drastically reduced, it is not surprising that net returns plummet. Table 3 shows that losses for continuous HRSW more than quintupled in 2001 to -\$145.03/acre. Losses with HRSW/SB were equally low in 2001. While SWWW/fallow averaged \$16.29 over total costs during 1996-2000 at Ralston, it lost \$39.76 per rotational acre in 2001. These results show that spring cropping was more vulnerable to downside risk in a drought year. The average \$38/acre disadvantage of continuous HRSW versus SWWW/fallow during 1996-2000 ballooned to a \$99/acre disadvantage in 2001. Furthermore, the net returns in Table 3 include decoupled AMTA and supplemental government payments estimated at \$29/acre. The results do not include crop insurance claims which would have assisted growers who purchased coverage for 2001 (but would have added to production costs without payoff in higher yielding years).

**Table 1. Annual Crop Yields by Rotation, Ralston.**

Crop/Rotation	1996	1997	1998	1999	2000	2001
SWWW (bu/ac) swww/fallow	78	64	73	58	73	37
SWSW (bu/ac) ssw/chem fallow	51	61	62	38	50	23
HRSW (bu/ac) cont. hrsw	40	55	39	32	34	13
HRSW (bu/ac) hrsw/sb	43	56	42	37	39	9
SB (met. tons/ac) hrsw/sb	0.89	1.52	1.49	0.90	1.02	0.19

NOTE: Yields reflect typical moisture and chaff levels.

**Table 2. Average and Coefficient of Variation (Percent) of Crop Yields by Rotation and Period, Ralston.**

Crop/Rotation	Avg.	Avg.	C.V.	C.V.
	96-00	96-01	96-00	96-01
SWWW (bu/ac) swww/fallow	69	64	12	23
SWSW (bu/ac) ssw/chem fallow	52	48	19	31
HRSW (bu/ac) cont. hrsw	40	35	23	38
HRSW (bu/ac) hrsw/sb	43	38	17	41
SB(metric tons/ac) hrsw/sb	1.16	1.00	27	49

NOTES: Yields reflect typical moisture and chaff levels.

Coefficient of Variation (CV) = (Standard Deviation/Average)100

**Table 3. Net returns over total costs (\$/rot. ac) for Phase I Ralston rotations for 1996-2000 average yields and for 2001 drought year yields.**

Rotation	1996-2000	2001
SWWW/ fallow	16.29	-39.76
SWSW/ chem fallow	-11.99	-62.16
Cont. HRSW		
actual protein	-25.55	-145.03
HRSW/SB		
actual protein	-13.73	-139.14

NOTE: Net returns include estimated AMTA and supplemental government payments for 2001.

**Horse Heaven Hills.** This experiment was initiated in 1997 on a farm in the Horse Heaven Hills of Benton County, a 6.5-inch annual rainfall region. The experiment compares conventional tillage winter wheat-fallow (WW-fallow), the historically dominant rotation in this arid region, to continuous no-till hard red spring wheat (HRSW). Table 4 shows that continuous no-till HRSW averaged only 10 bu/ac over 1997-2000. Protein was well below 14% in the first two years and just above 14% in last two drier years. WW after fallow, on the other hand, averaged 24 bu/ac in 1997-2000 including an area record 41 bu/ac in 1998. In contrast, only 2.4 bu/acre WW after fallow and 0.6 bu/acre continuous HRSW were harvested in the 2001 drought year. The year 2001 was actually the third year of drought at the site with annual precipitation between four and five inches (Table 4). Seasonal distribution of rainfall was also poor for spring

crops in 2001. The exceptionally low yields in 2001 reduced experiment average yields marginally and markedly increased the measure of yield risk. The C.V. for 1997-2001 versus 1997-2000 grew from 57 to 78 percent for SWWW and from 63 to 85 percent for HRSW. These results show the drier Horse Heaven Hills site (av 6.5 inches/yr/ppt) had higher yield risk than the Ralston site (av 11.5 inches/yr/ppt). The Horse Heaven site had a HRSW yield C.V. through 2001 of 85 percent compared to only 38 percent at Ralston. For winter wheat after fallow the comparison is 78 percent versus only 23 percent. Interestingly the yield risk for winter wheat after fallow and continuous HRSW at the Horse Heaven Hills experiment is about the same, 78 versus 85 percent (Table 4). At Ralston, on the other hand, winter wheat after fallow has only three fifths the yield risk of HRSW, 23 versus 38 percent.

The coefficient of variation, or standard deviation, provides only one measure of risk, one based on variability around the average. Many farmers and business people define risk alternatively as “probability of loss” or probability of income below zero. The standard deviation of net returns over 1997-2001 at the Horse Heaven Hills experiment is \$13.72/acre and \$15.74/acre for continuous HRSW and conventional winter wheat/fallow, respectively. This would suggest that the economic risk is slightly higher for wheat-fallow. However, the “probability of loss” (considering government payments of about \$10/acre) is 100% (five years out of five) with continuous HRSW and only 40% or two years out of five with wheat-fallow. Even this understates the advantage for wheat-fallow since the magnitude of the losses are much higher with continuous HRSW (Table 5).

Table 5 compares gross returns, total costs, and net returns over total costs for the WW-fallow and HRSW systems in the Horse Heaven Hills Experiment for 1997-2001. Gross returns on an annual per acre basis averaged slightly less for HRSW, but production costs for HRSW were double those for WW-fallow. Costs for the WW-fallow system, which were modeled after the host farmer’s practices, are the lowest we have observed anywhere in the U.S. Fallow tillage costs on this farm are reduced to the minimum using efficient machinery acquired and maintained at minimal cost. During dry years, no fertilizer is applied. Chemical weed control is limited to inexpensive herbicides like 2,4-D. Farm-grown grain is kept and treated for seed. While the HRSW production costs are low compared to higher rainfall regions, the more regular use of fertilizer and herbicides, plus every year no-till seeding and harvesting drives the HRSW total cost to nearly double that of WW-fallow. In summary, HRSW averaged a loss of \$44/ac/yr while the WW-fallow lost only \$3 over 1997-2001. Decoupled government payments might add another \$10/acre returns per year for both cropping systems. Total costs in Table 5 include an allowance for the farmer’s labor, land, and machinery investment. Interestingly, winter wheat-fallow budgets for some higher moisture regions have showed negative net returns during recent years.

The pattern of economic returns over the three-year (1999-2001) drought at the Horse Heaven Hills site is illuminating. The drought conditions reduced yields and net returns of continuous HRSW hard from 1999 onward (Tables 4 and 5). However, the resilient winter wheat-fallow system held its own somewhat in 1999 and 2000 by cutting costs and possibly relying on moisture reserves. But, by 2001, the persisting drought finally “caught up” with the wheat-fallow

system and yields and profit plummeted.. It also seems clear that seasonal distribution of precipitation as well as annual total is important.

**Table 4. Crop Yields and Precipitation, Horse Heaven Hills Experiment, 1997-2001.**

Year	Ppt. (In.) (Aug. - July)	Wheat Yield (Bu/Ac)	
		WW ff. Fallow	Cont. HRSW
1997	9.4	27	14
1998	7.9	41	18
1999	4.3	8	4
2000	4.8	20	6
2001	4.4	2.4	0.6
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Av. 97-00	6.6	24	10
Av. 97-01	6.2	20	9
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CV 97-00	37%	57%	63%
CV 97-01	38%	78%	85%

Note: Coefficient of Variation (CV) = (Standard Deviation/Average)100

**Table 5. Annual Costs and Market Returns, Horse Heaven Hills Experiment.**

Year	Rotation	Gross Returns (\$/Ac)	Total Costs (\$/Ac)	Net Returns (\$/Ac)
1997				
	WW-Fal	45.58	39.51	6.07
	HRSW	40.00	83.61	-43.61
1998				
	WW-Fal	70.86	54.82	16.04
	HRSW	63.90	88.53	-24.63
1999				
	WW-Fal	14.62	29.81	-15.19
	HRSW	16.18	69.94	-53.76
2000				
	WW-Fal	34.06	33.90	0.16
	HRSW	24.66	62.88	-38.22
2001				
	WW-Fal	4.09	26.79	-22.70
	HRSW	2.80	62.59	-59.79
Averages				
	WW-Fal	33.84	36.97	-3.12
	HRSW	29.51	73.51	-44.00

Notes: Returns exclude government payments and crop insurance claims. To convert to comparable per acre basis, costs and returns for winter wheat-fallow include one-half acre of wheat and one-half acre of fallow.

**Summary Continuous Spring Cropping.** Six- and five-year experimental results at Ralston and the Horse Heaven Hills have clearly shown that the continuous no-till spring grain systems tested are not economically competitive with the conventional/minimum tillage winter wheat fallow systems. Furthermore, the spring cropping systems expose the grower to significantly more economic risk in dry years. Of course, more yield enhancing research and public support for these soil and air quality conserving spring cropping systems, possibly using different wheat classes like soft white spring wheat, might make them more competitive with the relatively profitable, but erosive, winter wheat-fallow system. Researchers should also investigate other soil conserving systems, such as reduced tillage fallow-soft white winter wheat. Minimum tillage SWWW-fallow systems tested at Lind and at Ralston employed substantially less tillage during the fallow operation than was typical on most area farms. These “minimum tillage” SWWW-fallow systems, which are expected to cut dust emissions by 54 percent relative to conventional systems, might provide a cost effective intermediate cropping system for the region.

Results from farmer surveys and Cooperative Extension farmer panels have indicated that farmers may be able to trim the cost of production for HRSW below the estimates presented here. If possible, this would improve their competitiveness with winter wheat-fallow.

Other research has shown significant public valuation for higher levels of air quality which are provided by soil conserving cropping systems. Public cost sharing for soil conserving annual spring cropping would assist innovative growers adopt these systems profitably. However, Congress has not been inclined recently to substitute “green payments” in a major way for decoupled subsidies.