

## **ECONOMICS OF NO-TILL ANNUAL CROPPING SYSTEMS, RITZVILLE, WA, 2001-2004**

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During 1997-2004, William Schillinger conducted a no-till annual cropping experiment in Adams County, near Ritzville, WA. The experiment site averages about 11 inches precipitation/yr. Annual precipitation at the experiment site averaged 12.04 inches in 1997-2000 compared to only 8.88 inches in 2001-2004. The objective of the study was to determine the long-run economic and agronomic feasibility of diverse, cereal-based, no-till cropping systems for low-precipitation areas in the inland Pacific Northwest. Economic reports on the first five years of the experiment have been presented earlier. The 2001-2004 phase included six rotations involving soft white spring wheat (SWSW), hard white spring wheat (HWSW), spring barley (SB), yellow mustard (YM), and soft white winter wheat (SWWW). The six rotations were as follows: four-year SWWW/SWWW/SWSW/SWSW, four-year SWWW/SB/YM/SWSW, two-year SWSW/SB, two-year HWSW/SB, continuous SWSW, and continuous HWSW. SWSW/SB and continuous SWSW were the only two rotations maintained throughout the entire eight-year project. Conventional tillage winter wheat-summer fallow (SWWW/SF), the dominant system in the experiment area, was not included in the experiment. However, an economic comparison of SWWW/SF system to the experiment's no-till annual cropping rotations was accomplished by surveying ten neighboring farmers regarding their recent yields of WW after tillage fallow.

Table 1 shows the yields from the experiment for each crop in each rotation from 2001-2004. Four-year average yields and standard deviations for each crop per rotation are reported. The four-year average yield for yellow mustard includes a zero value for a 2002 crop failure. YM and SWWW display the highest yield variability (CV). Comparative yield results for SWWW-fallow on neighboring farms are reported in a separate paper in this section.

Tables 2 and 3 describe the annual and four-year average profitability per rotational acre of each rotation and the average surveyed SWWW/SF rotation in terms of returns over variable costs and returns over total costs, respectively. The latter measure pays farmers the full market return for their land and machinery investments, as well as for their labor and other variable inputs. The "normal profit" for returns over total costs would be zero, because all resources, including the farmer's labor and management, are earning their exact market values. Returns above (below) zero indicate the grower is earning above (below) market values on utilized resources. Crops were valued at the average market price of the preceding five years. Government payments were not included. A rotational acre contains  $1/n$  of an acre for each crop in an  $n$ -year rotation; for example, 0.5 acre of WW and 0.5 acre of SF for SWWW/SF. Standard deviations (S.D.) are provided as an indication of the profit risk for each rotation. None of the no-till annual rotations were able to generate sufficient market returns to cover total costs during the relatively dry 2001-2004 period at this site. Five of the six rotations earned statistically equivalent negative returns over total costs. The HWSW/SB, SWSW/SB, and SWSW rotations all had average annual losses of about \$58 per rotational acre. The HWSW/SB rotation was the most risky with a S.D. of \$18.59/acre. Average 2001-2004 returns of the surveyed SWWW/SF rotation exceeded all of the experiment's no-till annual rotations. Returns over variable costs and over total costs for the SWWW/SF rotation averaged \$40.09 and -\$9.99 per rotational acre,

respectively. The S.D. of returns over total cost of SWWW/SF was \$9.58, lower than any of the annual rotations.

Comparing the low precipitation 2001-2004 results to previously reported higher precipitation 1997-2000 results for the two common rotations at the same site showed costs remained relatively constant over the 1997-2004. However, net returns over total costs for continuous SWSW fell from \$17.92/acre for 1997-2000 to -\$58.79 in 2001-2004. The corresponding comparison for continuous SWSW/SB is \$8.12/acre versus -\$58.13. The sharp drop in net returns can be largely attributed to diminished yields during the dry 2001-2004 period. When returns over total costs are averaged over the full eight-year experiment, the continuous SWSW and the SWSW/SB rotations generated annual net returns over total costs per rotational acre of -\$20.42/acre and -\$25.01/acre, respectively. SWWW/SF averaged net returns over total costs of \$2.35/acre/yr over 1997-2004.

The traditional SWWW/SF rotation in this low precipitation region averaged \$23-\$27/acre higher annual net returns than the two no-till SWSW rotations over 1997-2004. At \$2.35 per rotational acre, SWWW/SF growers netted just slightly over “normal market returns.” Adding government payments would add to returns for both SWWW/SF and the annual systems. Conservation incentive payments of roughly \$25/acre would erase the shortfall of the annual cropping systems compared to SWWW/SF. A payment of \$25/acre is less than the annual \$45/acre Conservation Reserve Program (CRP) payment that taxpayers have made to retire many wind erosion-prone SWWW/SF acres in Adams County to annual grasses; however, CRP might generate additional wildlife or other benefits not considered here. On the other hand, movement to a more sustainable system of no-till annual cropping might generate more enduring benefits than a 10-year CRP retirement program. Further research on societal valuations would be needed to resolve these comparisons.

**Table 1: Crop Yields by Rotation, Ritzville Experiment, Adams County, WA, 2001-2004**

Rotation	Units	2001	2002	2003	2004	4-yr Avg.	S.D.	C.V. (%)
<b>1. Four Year A</b>								
Soft White Winter Wheat	bu/acre	7	21	30	18	19	9.5	49.9
Soft White Winter Wheat	bu/acre	9	21	29	14	18	8.7	47.6
Soft White Spring Wheat	bu/acre	8	23	19	23	18	7.1	38.8
Soft White Spring Wheat	bu/acre	10	23	25	27	21	7.7	36.1
<b>2. Four Year B</b>								
Soft White Winter Wheat	bu/acre	5	16	28	16	16	9.4	57.8
Spring Barley	ton/acre	0.16	0.65	0.69	0.73	0.56	0.3	47.9
Yellow Mustard	lb/acre	350	0	146	348	211	170.1	80.6
Soft White Spring Wheat	bu/acre	12	21	31	29	23	8.7	37.2
<b>3. Two Year A</b>								
Soft White Spring Wheat	bu/acre	12	25	27	34	25	9.2	37.5
Spring Barley	ton/acre	0.35	0.75	0.83	1.05	0.75	0.3	39.2
<b>4. Two Year B</b>								
Hard White Spring Wheat	bu/acre	10	22	27	29	22	8.5	38.7
Spring Barley	ton/acre	0.27	0.78	0.83	1.04	0.73	0.3	44.8
<b>5. Continuous A</b>								
Soft White Spring Wheat	bu/acre	14	24	24	27	22	5.7	25.5
<b>6. Continuous B</b>								
Hard White Spring Wheat	bu/acre	6	21	18	15	15	6.5	43.2
Precipitation	inches/year	8.00	9.55	10.59	7.41	8.89	1.45	16.3

**Table 2: Comparison of Net Returns Over Variable Costs by Rotation and Year Between Varying Yield Levels of SWWW and Six No-Till Crop Rotations for Ritzville, Adams County, WA, 2001-2004.**

Rotation	2001	2002	2003	2004	2001-2004 Average	S.D.
Experiment:	-----\$/Per Rotational Acre/Yr.-----					
SWWW/SWWW/SWSW/SWSW	-38.12	-7.86	16.49	-8.72	-9.55abc*	22.34
SWWW/SB/YM/SWSW	-33.31	-32.57	2.91	-10.10	-18.27c	17.76
SWSW/SB	-29.81	-0.43	13.22	27.73	2.68a	24.52
HWSW/SB	-34.59	1.96	20.89	27.48	3.94a	27.87
Continuous SWSW	-18.53	-2.26	11.75	13.94	1.23ab	15.00
Continuous HWSW	-42.89	5.67	1.88	-17.30	-13.16bc	22.22
Survey:	-----					
SWWW/Summer Fallow Average	27.28	40.38	50.38	42.34	40.09	9.58

\*Average returns within the experiment followed by the same letter are not significantly different. LSD.05 is \$16.68/acre.

**Table 3: Comparison of Net Returns Over Total Costs by Rotation and Year Between Varying Yield Levels of SWWW and Six No-Till Crop Rotations for Ritzville, Adams County, WA, 2001-2004.**

Rotation	2001	2002	2003	2004	2001-2004 Average	S.D.
Experiment:	-----\$/Rotational Acre/Yr.-----					
SWWW/SWWW/SWSW/SWSW	-83.75	-68.27	-51.17	-68.23	-67.85ab*	13.31
SWWW/SB/YM/SWSW	-81.42	-90.07	-58.34	-73.72	-75.89b	13.47
SWSW/SB	-79.71	-60.46	-50.72	-41.64	-58.13a	16.31
HWSW/SB	-83.27	-59.24	-45.94	-42.13	-57.64a	18.59
Continuous SWSW	-71.93	-61.41	-51.21	-50.61	-58.79a	10.06
Continuous HWSW	-88.92	-56.89	-58.44	-72.09	-69.09ab	14.88
Survey:	-----					
SWWW/Summer Fallow Average	-22.81	-9.70	0.29	-7.75	-9.99	9.58

\*Average returns within the experiment followed by the same letter are not significantly different. LSD.05 is \$12.54/acre.