Northwest Columbia Plateau PM$_{10}$ Project

Objective 7: Evaluating the Profitability and Social Benefits of Alternative Farming Systems for Air Quality Control

Title: Economics of wind erosion control

Personnel: Principal Investigator: Doug Young, WSU
Cooperators: William Schillinger, WSU; Harry Schafer, WAWG; Brenton Sharratt, Frank Young, Ann Kennedy, Tim Paulitz, USDA-ARS, Pullman; Dennis Roe, USDA-NRCS.

Abstract of Research Findings
This annual report presents new findings on preliminary results from the (WAWG/NRCS) Undercutter Project in low rainfall counties of the Pacific Northwest (PNW). It also introduces work beginning on a related $184,000 tri-state STEEP grant on barriers and facilitators to adoption of direct seeding and conservation tillage in the PNW. Forty-seven growers in 10 PNW counties contracted to purchase undercutter tillage implements on a 50% cost share basis. In both 2008 and 2009 there were no statistically significant differences in yields or in number of rodweedings with undercutter fallow versus conventional fallow. All 47 farmers had completed a complete fallow-rotation cycle by 2009, but results were available on only 25 farmers at the time of reporting. The uniformity in yields and in number of rodweedings is attributed in part to the dry conditions in both 2008 and 2009. Moisture was insufficient to stimulate much weed growth regardless of fallow system. Moisture was also a universally constraining factor on winter wheat yields. On the positive side, during 2009 growers ranked their satisfaction with the undercutter on a 1 to 5 scale at 4.5, up from 4.1 in 2008. Similarly, 52% of sampled farmers in 2009 subjectively perceived their long run profit to improve with undercutter fallow versus conventional fallow, up from 36% of the 2008 sample.

D. Young and colleagues at UI and OSU will survey 1000 farmers by mail in Whitman and Columbia Counties, WA; Latah and Lewis Counties, ID; and Umatilla and Wasco Counties, OR. The first listed counties in each state are noted for low adoption of conservation farming practices and the second listed counties for high adoption. The mail questionnaires and selective personal interviews will attempt to identify key physical-biological, institutional, and socio-economic barriers and facilitators to adoption of conservation practices.

Objectives
1. To continue economic analysis of wind erosion control cropping systems in dryland grain farming regions of the Pacific Northwest.
2. To complete economic analysis of the WAWG/NRCS undercutter project.
3. To disseminate research results to growers and others through talks and published materials.
Methods and Materials
Standard enterprise budgets are used to assess the profitability and riskiness of conservation farming systems in eastern Washington which have been compared in field experiments by cooperating scientists. Total costs, including cash and noncash costs, are calculated for each practice and crop. These costs include a fair market return for the farmer’s land, machinery, and labor. Under such total cost budgeting, a “fair or normal profit” would be zero. Costs are based on the actual sequence of operations conducted on the research plots or farmers’ fields, but assume typical farm-scale machinery for the region. Fertilizer, herbicide, seed and other input rates are averages used on the experiment or farm for each practice or treatment. Grain yields are those measured for each practice. All cost and revenue figures are presented on a rotational acre basis. For example, a rotational acre of a wheat/fallow rotation will contain 0.5 acre of winter wheat and 0.5 acre of fallow. Input and crop prices are averages over the experiment era and/or are varied over reasonable ranges for the intermediate term. Premiums and discounts for protein are included to adjust prices of hard red and white wheat. Government payments will be included in the net revenue results only when they would be expected to differ by treatment or to clarify net returns interpretation.

Preliminary results from the WAWG/NRCS undercutter project are based on annual spring and fall interviews of all participating farmers by the project manager, H. Schafer. D. Young developed the economic component of the survey questionnaire. Young also accompanies Schafer on some farmer interviews. This project has been extended one year until February 2011. At that time, data for farmers who have completed a complete fallow-winter wheat cycle will be available for the full study group of 47 farmers for 2009 and 2010. For 2008, data for only 11 farmers in this category were available due to slow acquisition of undercutters from manufacturers. Results on cost, profitability, and economic risk comparisons for both undercutter and conventional fallow systems will be completed after the fall 2010 farmer interviews.

Results and Discussion
As noted below, one journal article (in press), one proceedings paper, and two abstracts were published from Air Quality supported research in 2009. Some of these publications are based on earlier research that has been previously reported. In this report, we will focus on new findings on preliminary results from the WAWG/NRCS Undercutter Project in low rainfall counties of Washington and Oregon. The report also introduces work beginning on a related $184,000 tri-state STEEP research grant on barriers and facilitators to adoption of direct seeding and conservation tillage in the PNW.

Preliminary results from WAWG/NRCS Undercutter Project: The WAWG/NRCS Undercutter Project is targeted to the winter-wheat/summer fallow region of Washington and Oregon in counties with less than 12 inches average annual precipitation. The undercutter method of summer fallow employs a wide-blade V-sweep for primary tillage plus fertilizer injection, followed by as few as one non-inversion rodweeding operations. Tillage is reduced from up to eight operations with the traditional method to as few as two operations using the undercutter method. The undercutter method increases surface residue and roughness which better protects against wind erosion compared to traditional tillage.
Forty-seven growers located in 10 counties in Washington and Oregon agreed to purchase undercutter tillage implements on a 50% cost share basis. Individual cost-share payments averaged $15,320, including $980 for the fertilizer application equipment. Total payments to growers equaled $720,042.

Tables 1 and 2 show no statistically significant differences in yields and number of rodweedings with either undercutter fallow or conventional fallow among sample farmers in 2008 and 2009. Only 11 farmers had completed a complete fallow-rotation cycle in 2008 due to slow delivery of the undercutters from manufacturers. All 47 farmers had done so in 2009, but interview results were available on only 25 at the time of reporting. Detecting differences in yields and number of rodweedings between the two fallow systems was hampered by very dry conditions in both 2008 and 2009. These conditions restricted weed growth and the need for rodweedings regardless of fallow system. Low moisture universally restricted winter wheat yields in these two years. Variation in yields, as shown by the coefficient of variation (C.V.), was relatively high in both years. This is due in part to the large geographic dispersion of the participating farmers with long run average annual precipitation varying from 6 to 12 inches per year.

On the positive side, sampled farmers ranked their average satisfaction with the undercutter at 4.5 on a scale of 1 to 5 in 2009, up from 4.1 in 2008. In 2009, 52% of sampled farmers subjectively perceived their long run profit to increase with the undercutter versus the conventional system, up from 36% of sampled farmers in 2008.

Table 1. Average Yield Results, Complete SF-WW Cycle, by System and Year

<table>
<thead>
<tr>
<th>System</th>
<th>Average Yield (bu/ac)</th>
<th>C.V. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
<td>2009</td>
</tr>
<tr>
<td>Undercutter</td>
<td>43</td>
<td>31</td>
</tr>
<tr>
<td>Conventional</td>
<td>43</td>
<td>29</td>
</tr>
</tbody>
</table>

Notes: 2008, sample size = 11; 2009, sample size = 25. No statistically significant differences over systems in either year. Fertilizer was injected with the undercutter. The glyphosate application rate nearly always identical over systems at 16 oz/ac.

Table 2. Average Number of Rodweedings, by System and Year

<table>
<thead>
<tr>
<th>System</th>
<th>Average Number of Rodweedings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2008</td>
</tr>
<tr>
<td>Undercutter</td>
<td>1.3</td>
</tr>
<tr>
<td>Conventional</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Notes: 2008 sample size = 47; 2009 sample size = 25. No statistically significant differences over systems in either year. 2008 and 2009 were dry years, averaging 70% of normal precipitation.

Interviews with a few key stakeholders regarding the design of the related tri-state STEEP grant on barriers and facilitators to adoption of direct seeding and conservation tillage have uncovered some potential hypotheses which will be examined in the mail questionnaire and in selected qualitative interviews. Hypotheses related to physical-biological conditions is that low adoption counties confront more difficult straw, disease, and weed management conditions under direct seeding. Anecdotal evidence suggests that socio-economic facilitators include knowledgeable and passionate educators promoting direct seeding such as Dr. Roland.
Schirman in Columbia County, WA. An institutional hypothesis is that NRCS staff and district committees are more effective in making growers aware of conservation cost share programs in high-adoption counties. Another hypothesis is that high disturbance custom fertilization services provided by some companies, coupled with low cost fertilizer, constitutes a barrier to residue-conserving direct seeding in some counties.

Publications and Presentations

Refereed Journal Articles

Experiment Station Research and Extension Report