2003 STEEP PROGRESS REPORT

RESEARCH PROJECT TITLE: Strategies for Profitable Conservation Tillage Farming in the Pacific Northwest

INVESTIGATORS: Doug Young (PI), Dept. Ag. & Resource Ec., WSU
Cooperators are Herb Hinman and Hong Wang, Dept. Ag. Ec., WSU; Dave Bezdicek, John Burns, James Cook, Bruce Frazier, Rob Gallagher, Robert Papendick, William Pan, William Schillinger, Joe Yenish, Dept. of Crop & Soil Sci., WSU; Dave Huggins, Frank Young, USDA-ARS, Pullman; Dennis Roe, USDA-NRCS.

INTERIM REPORT

PROJECT OBJECTIVES:
1. To evaluate the economic feasibility of oil seeds, food legumes, and spring grains in conservation tillage crop rotations.
2. To identify equitable farmland leases for conservation tillage farming systems.
3. To assess the potential for precision weed control to cut costs in conservation tillage.
4. To identify effective financial risk management strategies for adopting conservation tillage.
5. To disseminate the results on profitable strategies for conservation farming to growers, policy makers and others.

KEY WORDS: Conservation tillage, crop rotations, economics, risk

STATEMENT OF PROBLEM: The STEEP advisory committee has communicated several research priorities for fiscal year 2002 proposals which relate to concerns about the economic viability of conservation tillage systems. These include the feasibility of various alternative crops, strategies for improving farmland leases, and concerns about grass weed control costs. Surveys also show growers are worried about the financial risks of no-till drill acquisition. This project will provide economic analysis on all four of these issues. Long term collaboration between the PI and scientist cooperators ensures that economic results will be based on a foundation of quality biological and physical data. This collaboration will improve the value of the results to the region’s farmers. Responding to growers’ priority research requests on key barriers to adoption of conservation tillage in the Pacific Northwest (PNW) will reduce the long run economic and environmental losses from soil erosion in the region.

ZONE OF INTEREST: Dryland farming agro-climatic zones with 10-22 in/yr av. ppt.

ABSTRACT OF RESEARCH FINDINGS:
Promising economic results from a 1997-2001 experiment at Ritzville show continuous SWSW averaged the highest net return among spring crops at $8.52/ac, followed by SWSW/Spring Barley (SB) at -$1.28/ac, and Safflower (Sa)/Yellow Mustard (YW)/SWSW/SWSW at -$9.43/ac, respectively. Neighboring farms growing WW-SF over
the same 5-year period averaged $11.80/ac, not statistically different from the $8.52/ac for continuous SWSW. Annual no-till SWSW did exhibit more economic risk than WW/fallow.

A survey indicated that the number of acres farmed by a tenant increases the tenant’s perception of landlord supportiveness for no-till. Some, but not all, landlords perceive that no-till could contribute to the long run quality of their land.

The final version of a computerized site-specific herbicide decision model for winter wheat boosted projected profitability (which accounted for yield and revenue increases as well as cost changes) by 65% compared to the farmer, extension consultant, weed scientist and label rate recommendations.

Analysis of a survey of long term no-till farmers in eastern Washington and northern Idaho revealed that they cut their costs substantially by purchasing rather than renting no-till drills. The cost advantage of purchased drills increased with acres no-tilled. The survey data also showed that no-till farmers from low precipitation regions realized slightly greater economies from drill ownership than those from the higher precipitation regions.

We used the Simetar farm management risk simulation program to assess the financial riskiness of different no-till transition strategies. Regardless of farm type, speed of adoption had a larger effect on navigating the no-till transition successfully or unsuccessfully than did the drill acquisition method. For large farmers, rapid purchase of a no-till drill had a reasonable chance of success. Custom and rental drill acquisition during the early years of the transition is recommended for small farmers.

RESULTS AND INTERPRETATION:

Objective 1. To evaluate the economic feasibility of oil seeds, food legumes, and spring grains in conservation tillage crop rotations.

A 1997-2001 experiment at Ritzville conducted by Bill Schillinger included no-till canola, yellow mustard, safflower, spring barley, and soft white spring wheat. The results of this experiment have been examined over the past year for economic viability. Yields of oilseeds during drought years were very low. However, no-till continuous soft white spring wheat (SWSW) showed greater economic promise. Continuous SWSW averaged the highest net return among spring crops at $8.52/ac, followed by SWSW/Spring Barley (SB) at $1.28/ac, and Safflower/Yellow Mustard (YW)/SWSW/SWSW at $9.43/ac, respectively. All results are converted to dollars per rotational acre to provide a common unit of comparison for the different rotations. Based on a survey of 10 farms in the immediate vicinity of the experiment, net returns of WW-SF averaged $11.80/ac, not statistically different from the $8.52/ac net returns for continuous SWSW. Similar average profitability between a no-till spring grains system and WW-SF is a very welcome result given the $40 shortfall in annual profitability shown in previous research comparisons of no-till HRSW to WW-SF in semiarid eastern Washington. The result may be somewhat robust considering that the five-year study contained four years of below average precipitation and two major drought years.

WW/summer fallow was also the least risky rotation over 1997-2001 with a S.D. of $14.96/ac, compared to $36.06/ac for Saff./Y.M./SWSW/SWSW, $40.39 for continuous SWSW, and $41.25 for SWSW/Spring Barley (Table 4). Farmers generally prefer cropping
systems that have the potential of sustaining profitability while reducing annual economic risk. During 1997-2001 WW/fallow had this advantage.

In related work, oil seeds, food legumes, and spring grains in conservation tillage crop rotations were found to be a major factor in decreasing summer fallow and increasing cropping diversity in both western Canada and the U.S. Substantial soil quality benefits were associated with this trend in both countries. Further work in Canada has uncovered the importance of Round Up Ready canola in that country in providing a profitable diversification crop under no-till.

**Objective 2. To identify equitable farmland leases for conservation tillage farming systems.**

A literature review of landlord influence on no-till adoption has been completed. This review shows that equitable crop shares would require tenants to receive increased crop shares relative to the 1/3:2/3 crop shares which have been traditional for WW/SF. A questionnaire for landlords and a questionnaire for tenants were developed and distributed to assess the role of landlords in retarding or promoting adoption of no-till. Twenty-seven complete surveys have been obtained from tenants and 11 from landlords. Statistical analysis is underway. Preliminary results indicate that the number of acres farmed by a tenant is positively correlated with the tenant perceiving that landlords will be supportive of no-till. Some, but not all, landlords perceive that no-till could contribute to the long run quality of their land and this positively influences their view of the practice. Further results from this objective will appear in next year’s report.

**Objective 3. To assess the potential for precision weed control to cut costs in conservation tillage.** In related work with Frank Young, preliminary results show an economically promising cropping system for control of jointed goat grass. The results of this study suggest that the four-year rotation, no-burn, conventional seeding and fertilizing and the three-year rotation, burn, conventional seeding and fertilizing both provide the highest net returns with very low subsequent JGG infestation. The third most profitable treatment 3NC(SB/fallow/SWWW, No-Burn, Conventional) suffered much higher JGG infestation.

Final results were published in an international precision agriculture journal on a computerized site-specific herbicide decision model for winter wheat. The model showed potential to increase profit while reducing postemergence grass herbicides, but not broadleaf herbicides, in the eastern Palouse study region. The model increased broadleaf herbicide rates compared to competing recommendations, but reduced the more expensive grass herbicides. The projected costs of weed control using the model were slightly higher than for the farmer and extension recommendations, but much lower than the weed scientist and label rate recommendations. On average, the model recommendations boosted projected profitability (which accounted for yield and revenue increases as well as cost changes) by 65% compared to the farmer, extension consultant, weed scientist and label rate recommendations. The estimated $2.43/ac cost for using the weed decision model could be absorbed by the model’s projected profitability advantage $16/ac over farmer applications. However, the costs of weed monitoring and adjusting herbicide application to irregular subfields might be higher in real world conditions.

**Objective 4. To identify effective financial risk management strategies for adopting conservation tillage.** Analysis of a survey of 266 east-central Washington farmers showed that 20% had tried no-till. Most had used this practice with continuous spring cropping. The
survey revealed that an NRCS-Extension soil conservation educational program had boosted the adoption of no-till. A sample of 11 successful long term PNW no-till growers used a variety of no-till transition strategies. Some rented larger tractors needed only for drilling and some retrofitted no-till drills in farm shops. Others shared no-till drills and tractors with neighbors, timed purchases of drills and tractors during high cash flow years, and shopped for low cost financing. Some farmers did custom no-till to help pay for drills. Most retained their conventional equipment as a safety hedge. Interviews were conducted with 10 no-till farmers from eastern Washington who considered themselves in the transition from conventional farming. Although the speed of conversion to no-till varied greatly, none of the farmers “backtracked” in no-till acreage over five years. Most transition farmers custom hired or rented a drill in years 1-3, but over half had purchased a drill by years 4 and 5. All but one of the drill purchasers reported having paid cash for their no-till drills.

Recommendations from using a farm management risk program revealed that gradual adoption of no-till, graduating up to 30% of acreage in six years, was least risky if no-till began with a 10% yield penalty. Large farmers with the cash or financing should purchase a no-till drill early on. Custom and rental drill acquisition in early years of the transition is recommended for small farmers, especially for gradual no-till acreage expansion. Low equity farmers should be careful about adopting no-till if they fear an initial yield penalty. Small size low equity farmers may wish to wait until they can pay cash for a lower cost no-till drill.

We completed use of the Simetar farm management risk simulation program developed at Texas A&M University to assess the financial riskiness of different no-till transition strategies. These strategies involve combinations of rate of adoption of no-till over total farm acreage and different sequences of custom-rent-buy for no-till drill acquisition. The program was applied to eastern Palouse wheat-barley-pea farms of different sizes and equity structures. With no-till beginning with a 10% yield penalty, gradual adoption of no-till, reaching only 30% of acreage after six years, was least risky. For large farms, with 80% of their land owned, the probability of investment failure (defined as failing to meet expenses two years in a row) was only 9-11% for all drill acquisition options. In contrast, large farms with only 20% of their land owned incurred a risk of investment failure of 41-44% over all options with gradual adoption. Immediate adoption of no-till (100% of acres in year 1) elevated risk of investment failure to 18-33% for high equity large farms and 57-79% for low equity large farms. Interestingly, immediate purchase of a no-till drill was less risky than custom or rental options for the large farms which immediately converted to no-till. The reason is that economies of scale made purchase cheaper than custom or rental. In contrast, high equity small farms could cut risk of investment failure from 35% to 20% by custom hiring no-till drill services versus purchasing a drill at the outset when no-till was gradually adopted. When these small farms adopted no-till immediately, the probability of investment failure was about the same for purchase, rental, and custom options. Overall, risks of investment failure were higher for small than large farms under our assumptions of equivalent yields for the two groups.

Analysis of a survey of nine successful long term no-till farmers in eastern Washington and northern Idaho revealed that they cut their costs substantially by purchasing rather than renting no-till drills. Figure 1 displays the present cost of actual purchased and hypothetical rented drills by annual acres no-tilled for the sample of nine farms. The cost of a purchased drill includes down payments, principal payments, interest,
property tax and repairs, net of tax savings versus a flat rental charge per acre for rented drills. In this sample, a cost advantage for purchased drills was observed for each farm. This shown in Figure 1 by the triangles representing no-till farmers lying below, in terms of annual drill cost, the higher rental cost line. The relative cost advantage of purchased drills increased with acres no-tilled. This pattern indicates increasing economies of size for no-till drill purchase, not a surprising result. The survey data also showed that no-till farmers from low precipitation regions realized somewhat greater economies from drill ownership than those from the higher precipitation regions.

![Figure 1. Relationship between annual cost of purchased and rented drills in the sample no-till farms.](image)

Note: Squares equal rented drills and triangles equal purchased drills. Letters A through I represent the sampled farms.

**Objective 5.** To disseminate the results on profitable strategies for conservation farming to growers, policy makers and others.

We have responded to requests for information from growers, newspapers and magazines. Examples include the *Capital Press* and *Pullman-Moscow Daily News*. One of our research reports was selected by the U.S. Certified Crop Advisors for their continuing education program. Four reports were written for WSU’s 2003 *Field Day Proceedings*. These were disseminated to growers, industry, and scientists in the form of written abstracts and web postings of the complete reports. Results of research on differing crop rotations and tillage systems throughout western North America, on factors influencing adoption of no-till, and on precision weed control in conservation tillage were published in three professional journals. A major presentation on managing the risk of the no-till transition was made to over 700 participants at the 2003 Direct Seed Meetings in Pasco, WA. Results on the economic viability of no-till oilseed and soft white spring wheat rotations were published in a
WSU extension bulletin and this work has been accepted for publication in a professional journal. A report on profitable fertilization of hard red spring wheat was presented at a professional meeting, posted on the web, and is now forthcoming in a professional journal. A paper on conservation spring cropping systems was also coauthored for the 2003 Soil and Water Conservation Society meetings in Spokane, WA. As a member of the Washington State NRCS Advisory Committee, the P.I. has presented input on a range of conservation policy issues including the EQIP and CRP programs. The P.I. also presented research results on conservation economics in Alberta, Canada during a professional leave with Agriculture and Agri-Food Canada during late 2003.

INTERACTION (COOPERATION) WITH OTHER SCIENTISTS CONDUCTING RELATED ACTIVITY: Adams County farmers Ron Jirava and Curtis Hennings and Benton County farmer Doug Rowell provided land for conservation farming experiments. These farmers also provided valuable information on machinery use, production costs, crop performance, and farm programs in their areas. John Burns, WSU-Extension and Dennis Roe, NRCS, were particularly helpful in the selection of farmers who could provide information on the no-till transition. Several project cooperators also have provided data on no-till yield levels, yield variability, and input requirements. Drs. Bill Schillinger and Frank Young have been especially helpful in providing data from their long run no-till and min-till cropping systems at Lind and Ralston in Adams County. Drs. Dave Huggins and William Pan provided essential data and collaboration on N fertilization of hard red spring wheat. Drs. Frank Young and Tae-Jin Kwon also provided valuable data and collaboration for the site-specific weed management model. Dr. James Richardson, Texas A&I University, provided software for modeling the economic risk of no-till transition strategies. Drs. Elwin Smith and B.M. Upadhyay of Agriculture and Agri-Food Canada collaborated on research on conservation economics.

PUBLICATIONS AND PRESENTATIONS:

STEPP


STEEP related


