2021 Cost-Benefit Analysis of Direct Seeding and Conventional Tillage Systems for the Foster Creek Watershed

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Summary

Direct seeding has a number of very important benefits for this region, which is prone to both wind and water erosion. This erosion displaces the topsoil necessary for producing healthy crops and also pollutes our air and waterways. The producers in this study are enthusiastic about the benefits of direct seeding (DS) to their farms. DS techniques reduce the number of field operations. In addition, their soil has become increasingly easy to work and healthier in terms of organic matter content. Healthier soil is more resilient when growing conditions are less than optimal, a common condition in this low rainfall region.

Producers in this study expressed concern over machinery costs, which are the main barrier to transitioning to direct seeding. No-till drills are very expensive and often require larger, higher horsepower tractors. These two implements can easily cost several hundred thousand dollars, depending on the age of the equipment. In addition, repair costs are much higher for these expensive pieces of machinery. However, this new technology has the potential for increasing profitability with just a fraction of the field operations and much higher precision in terms of steering and spraying agrichemicals. Producers in this study also expressed concern over increased pesticide costs in DS systems, as herbicides are used in place of tillage operations.

While benefits of direct seeding are long term, ensuring healthy soils for the future, costs of transitioning are a cash-flow problem for producers. This study has allowed these producers to experience the benefits of direct seeding and compare results to their conventional systems. Once the direct seed system is in place, producers are often able to improve their profitability or, at minimum, have comparable returns from the DS system. In time, most producers are able to achieve comparable returns with their DS system, but individual results vary.

Cost Comparison

Since DS systems replace tillage with herbicide sprays, pesticide costs are much higher in these systems. In this study, pesticide costs were more than three times higher, averaging $28 per acre for DS compare to $9 per acre for conventional tillage (CT) systems (Fig. 1). However, for the DS system, average machinery variable costs (VC), which include fuel, lubricants, repair, and machinery labor, are just 56% of the costs for CT system, averaging $29 per acre, compared to an average of $52 per acre for the CT system (Fig. 1). Machinery fixed costs (FC), which include depreciation, interest on capital invested in machinery, housing, taxes, and licenses, are comparable for the CT and DS systems, averaging $10 per acre across producers for CT and $11 per acre for the DS systems. Although the DS machinery is more expensive, there are just a few pieces of machinery and they are used for much fewer hours. The typical

CT machinery complement includes a plow or chisel, harrows, a rodweeder, and a cultivator or cultiweeder. The machinery complement for the DS system includes a sprayer, a drill, and possibly a harrow to manage stubble or a coulter to break up the soil during transition.

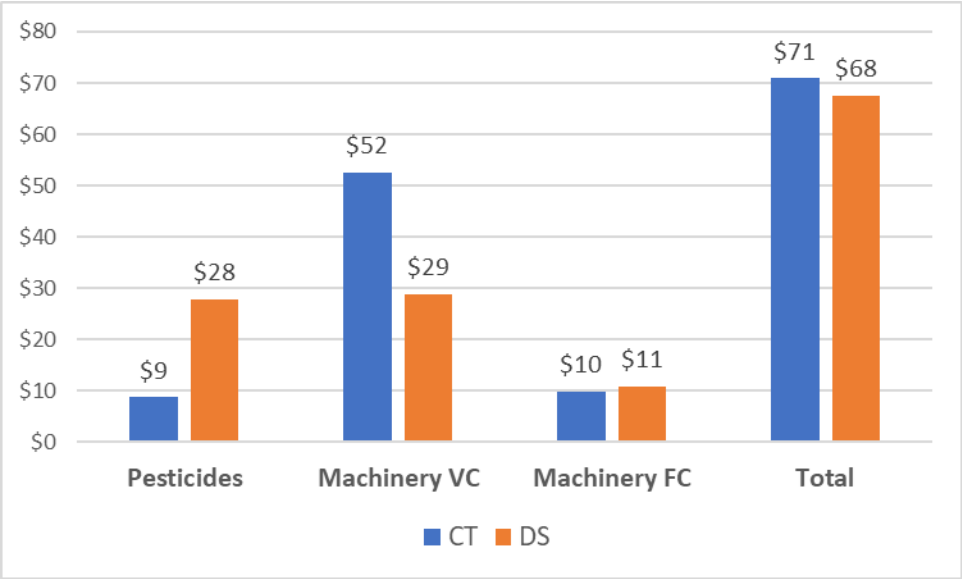

Figure 1. Cost Comparison by Category for Conventional Tillage (CT) compared to Direct Seed (DS).

Profitability Comparison

On average, returns over variable costs, which include fuel, lubricants, repairs, and machinery labor, were about 25% higher for the CT systems in 2020, averaging $74 per acre for CT and $59 per for DS (Fig. 2). While the CT systems had higher fuel, lubricants, repairs, and machinery labor costs, higher pesticide costs for the DS system as well as custom machinery expenses for most producers made the DS system less profitable.

Producers saw little or no yield differences between the two systems. The main limiting factor for crop yields in this region is low moisture. One producer felt that the bare patches on his ridges were possibly larger in the DS system, but it was also poorer ground. Once the stand was up, they felt there was no yield difference in the two systems. Over time, increased water holding capacity in the DS systems soils should enhance yields.

Profitability varies by producer in this study for many reasons. Some producers hire a custom operator for both planting and harvesting, which increases their DS variable costs and decreases their DS fixed costs. Depending on their soils and climate, they might experience a yield decline during the transition to DS. In time, most producers expect their DS yields to increase and exceed CT yields.

Two producers rent all their equipment from a machinery corporation they have formed. This rental rate replaces all machinery variable and fixed costs but doesn't actually represent an

economic or fair market value for their usage as was done for the other producers in this study. Using a machinery corporation in this manner separates machinery costs from the typical variable and fixed cost categories used for the other operations into a machinery category, which is another approach used in agricultural accounting. Excluding their results from this year's results would make the conventional tillage systems on average even more profitable than the DS systems.

Producers' machinery complements are highly individualized across farming operations. Depending on what they already own and what they choose to purchase for DS operations, the difference in machinery costs are quite variable. For example, some producers use high horsepower tractors for CT field operations while others use low horsepower tractors. Some producers may to purchase new tractors with higher operating and ownership costs when they switch to heavy DS drills.

When both variable and fixed costs are included, the CT systems in this study are about 35% more profitable, at $62 per acre averaged across all producers, compared to the DS system, which averages $46 per acre across all producers (Fig. 3). These costs include machinery variable costs, including fuel lubricants, repairs and machinery labor, as well as machinery fixed costs (also referred to as ownership costs) including depreciation, interest on capital tied up in machinery, machinery housing, licenses, and taxes. Land costs are not included in this analysis. In time, with increases in soil organic matter and less erosion, yield increases would be expected for the DS systems, which would narrow the profitability gap.

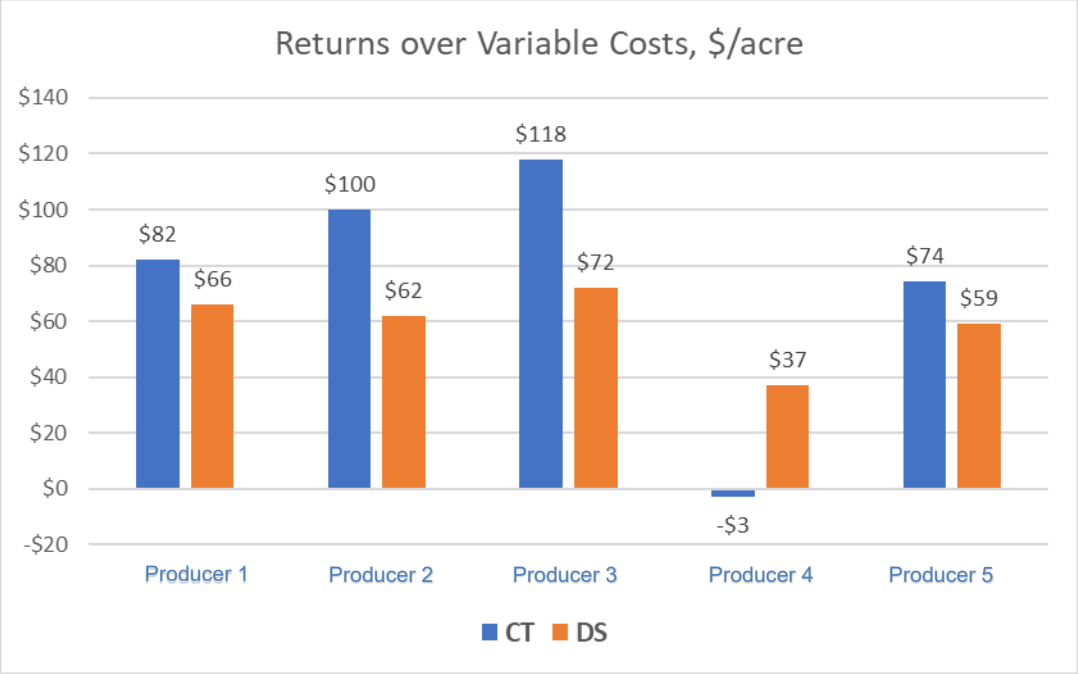

Figure 2. Average Returns over Variable Costs for Conventional Tillage (CT) compared to Direct Seed (DS) by Producer, $/acre.

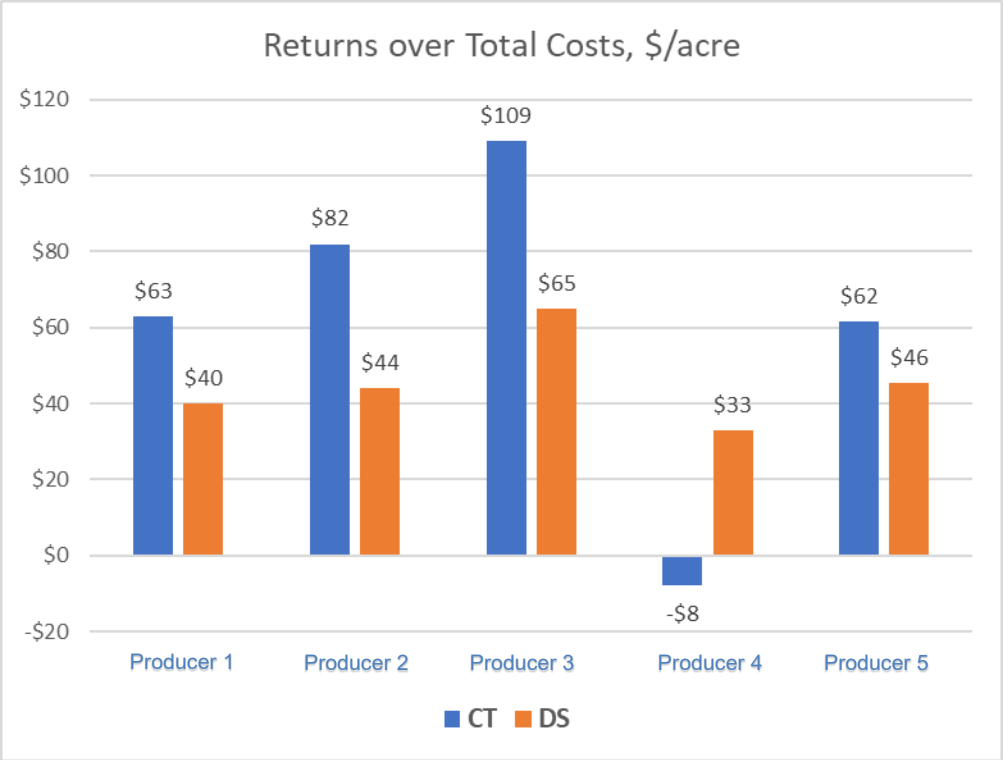

Figure 3. Average Returns to Land & Management for Conventional Tillage (CT) compared to Direct Seed (DS) by Producer, $/acre.

Transitioning to DS represents a cash-flow problem for producers, who cannot easily exchange a CT machinery complement for a DS system that is typically more than 50% more expensive. Once they have invested in a newer, more efficient and technically much more sophisticated machinery complement, their operating costs will fall, in terms of labor, repairs, and fuel. Yields should increase over time as well. Thus, the DS systems offer long term benefits that exceed costs for individual producers as well as for society as a whole in terms of environmental benefits. It may not be feasible from a cash-flow standpoint for producers to change from a CT to a DS system, but it should be more profitable once they are able to transition to a DS system.