

2020 Cost-Benefit Analysis for Participants in Foster Creek Conservation District's Direct Seed Grant-Funded Programs

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2020 Cost-Benefit Analysis of Direct Seeding and Conventional Tillage Systems for the Foster Creek Watershed

Summary

Direct seeding has a number of very important benefits for this region, which is prone to both wind and water erosion that displace topsoil necessary for producing healthy crops, which in turn pollutes the air and waterways. The producers in this study are enthusiastic about the benefits of direct seeding (DS) to their farms, which reduces the time necessary to perform field operations and 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, for example, during moisture stress, a common condition in this low rainfall region.

In August, 2019, a severe thunderstorm that brought hail to some areas was a true test of the ability of direct seeding to reduce water erosion. Direct seeded fields were much more resilient to this storm, with little to no erosion relative to conventionally tilled (CT) fields. In the area with hail, everyone lost their crops, as 4 inches of precipitation fell as hail, with stones the size of gumballs. While everyone had to reseed their crop, CT fields lost their topsoil down to the hardpan. Producers had to replace the fertilizer and the seed after they repaired the damage to their fields. The loss in fertility due to the topsoil removal will take years to regain. There is no question that the on-site and off-site damage from this severe storm far exceeds the cost of converting to direct seeding.

In terms of costs, machinery costs are the main barrier to transitioning to direct seeding, as the no-till drills are very expensive and typically require larger, higher horsepower tractors. These two implements can easily cost several hundred thousand dollars, depending on the age of the equipment. 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, as herbicides replaced 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 over 2.8 times higher, averaging \$34 per acre for DS compare to \$12 per acre for conventional tillage (CT) systems (Fig. 1). However, average machinery variable costs (VC),

which include fuel, lubricants, repair, and machinery labor, are about two-thirds as expensive for the DS system, averaging \$24 per acre for all the producers, compared to an average of \$35 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 \$19 per acre across producers for CT and \$18 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, harrows, a rodweeder, a cultivator, and a chisel. In the DS system, all you need is a sprayer, a drill, and possibly a coulters to break up the soil during transition.

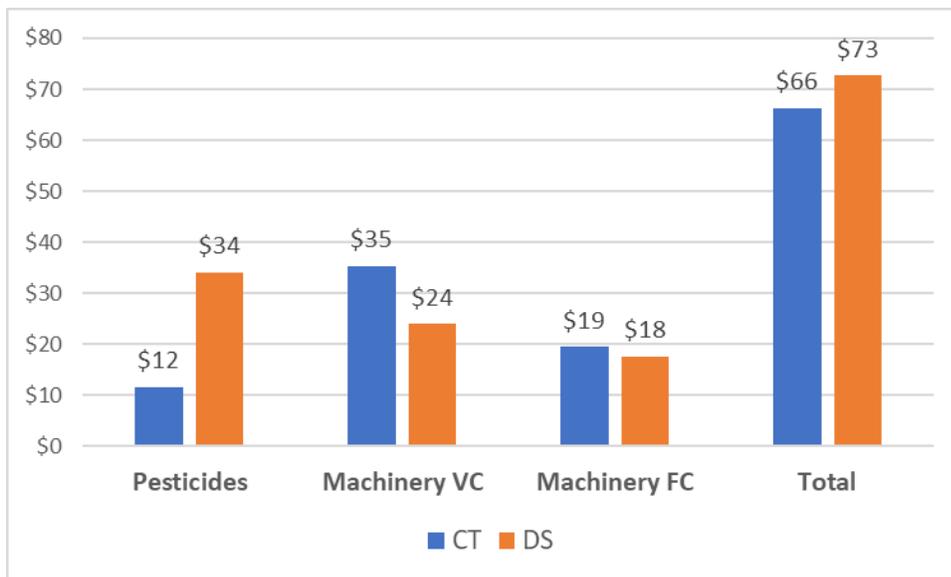


Figure 1. Cost Comparison by Category for Conventional Tillage (CT) compared to Direct Seed (DS).

Profitability Comparison

On average, returns over variable costs, which include fuel, lubricants, repairs, and machinery labor, were quite similar for the DS and CT systems, averaging \$136 per acre for CT and \$140 per for DS (Fig. 2). Higher fuel, lubricants, repairs, and machinery labor costs under CT were offset by lower pesticide costs.

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 see their DS yields increase or even exceed CT yields.

Profitability really varies due to producers' machinery complements. Depending on what they already own and what they choose to purchase for DS operations, the difference in machinery costs are highly

variable. Some producers use high horsepower tractors for CT field operations while others use low horsepower tractors, so when they switch to DS operations they have to purchase new tractors with higher operating and ownership costs.

When both variable and fixed costs are included, the CT systems are more profitable, \$126 per acre averaged across all producers, compared to the DS system, which averages \$101 per acre across all producers (Fig. 2). 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.

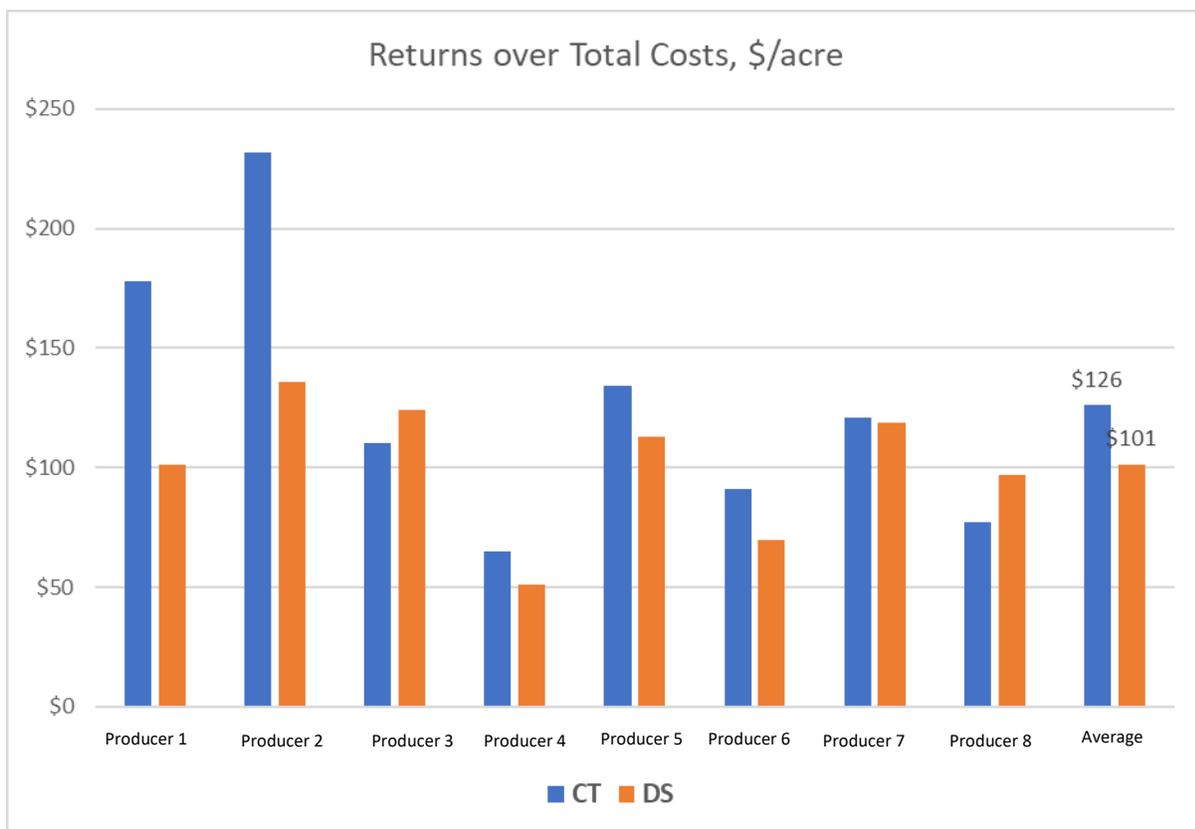


Figure 2. Average Returns to Land & Management for Conventional Tillage (CT) compared to Direct Seed (DS) by Producer, \$/acre.

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 will typically increase. 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.

In the following eight sections, detailed economic analyses for eight different producers compare conventional and direct seed operations in terms of costs and benefits and overall profitability. Each producer has a unique experience with this process. Their comments and opinions have been included in their reports.