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PROFITABILITY OF RESEARCH CENTER DIRECT-SEED CROPPING SYSTEMS

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Introduction

There has been considerable interest expressed in annual cropping in many regions of traditional winter wheat-fallow production as farmers are forced to find new ways to improve the profitability of dryland cereal grain production. Winter wheat-fallow has been commonly used in the Inland Northwest as a way to improve weed control, smooth work-flow, stabilize year-to-year income, and conform to farm program requirements (Young and van Kooten 1989). Recently, however, changes have occurred in cropping practices because of revised agriculture policy, declining crop prices, additional crop insurance options, and new production technology. Changes also reflect efforts to improve or maintain the profitability of farm operations while addressing environmental concerns and the long-term sustainability of dryland wheat production in the Pacific Northwest.

There has been growing concern among producers as to the economic sustainability of dryland wheat production under the traditional winter wheat-summer fallow rotation in this region of limited precipitation. Increasing competition for export markets, changing input costs, and the specter of increased concern over off-farm environmental impacts associated with current production systems is leading producers to search for alternatives that might help mitigate some of these problems.

During the last century there have been changes in input costs, improved wheat varieties, availability of chemicals to control weeds, diseases, and insects, and changes in precipitation patterns that suggest elimination of summer fallow in the rotation may increase the economic sustainability of the farming operation and also reduce the off-site affects of agricultural production.

Chemical fallow has been suggested as a way to meet environmental targets while retaining some of the benefits of conventional summer fallow. Alternatively, direct-seeded annual cropping may be an alternative to summer fallow with potential to increase profitability over a fallow system while also meeting environmental targets. Annual or flexible cropping systems are being adopted as more efficient means to match crops to weather or market conditions, and provide soil, air and water quality benefits (Rasmussen et al. 1998). A flexible cropping system would include the options of spring or fall-seeded crops with the use of fallow if environmental conditions did not warrant seeding.

The objective of this paper is to examine and compare the production costs and profitability of direct-seeded winter wheat-chemical fallow, direct-seeded annual winter wheat, and direct-seeded annual spring wheat based on the level of inputs used and crop yields observed at the Pendleton Agricultural Research Center, Pendleton, Oregon.

Data and Methods

The data used in this analysis were generated on the Pendleton Agricultural Research Center direct-seed plots. The production systems examined are all direct-seed systems that include direct-seed-summer fallow or what is commonly known as chem fallow (NTWWSF), direct-seed annually cropped winter wheat (NTWW), and direct-seed annual cropped spring wheat (NTSW). The wheat was all soft white and the crop yields per harvested crop acre for each system in each of the last 3 years, 1998 through 2000, are shown in Table 1. Much of the year to year variation in yields is due to crop year precipitation and in particular, May and June precipitation. The smaller 1999 crop yields in Table 1 reflect 1999 May-June precipitation of 1.25 inches which is 35 percent below the mean of 1998 and 2000.

Table 1. Wheat yields under selected production systems at the Pendleton Oregon Agricultural Research Center, 1998-2000.

Year	NTWWSF[1] 80 lb N/acre	NTWW[2] 100 lb N/acre	NTSW[3] 80 lb N/acre
		(bu/acre)	
1998	92	81	62
1999	70	62	42
2000	100	71	55
mean	88	71	53

1 NTWWSF (No-till winter wheat-chemical fallow)

2 NTWW (Annual cropped no-till winter wheat)

3 NTSW (Annual cropped no-till spring wheat)

As shown in Table 1, the mean harvested crop yield was greatest for the winter wheat-chemical fallow system but crop yields are only part of the story. In order to examine the relative profitability of the three systems, the production costs associated with each system must be examined. The production costs are developed for each system based on the direct production costs as used on the research center and the machinery costs that would be representative of a 3,000-crop-acre farm.

Enterprise budgets are used to examine the profitability of each cropping system. An enterprise budget is an organization of revenues, expenses, and profit for a single enterprise. In this analysis, budgets are developed for the direct-seed winter wheat-summer fallow, direct-seed annual winter wheat, and direct-seed annual spring wheat. Enterprise budgets can be created for many different levels of production, or in this case, the actual production practices

used in producing the plot yields. The base unit of production is 1 acre and all the budgets were created in a manner that allows comparisons to be made across systems.

There are three components to an enterprise budget: crop revenue, variable costs, and fixed costs. Crop revenue is equal to the crop yield multiplied by the crop price. In this analysis, a wheat price of $3/bu is assumed.

Variable or direct costs are the next components of the enterprise budget and include all inputs that vary with the level of production. An example would be the applied fertilizer. If the decision was made to grow nothing in the field, then no fertilizer would be applied and no cost would accrue. Another example would be tractor fuel. If the tractor is not used to produce the crop, no fuel would be used and again, no cost would accrue.

The third cost category is fixed or ownership costs. These costs accrue even if nothing is produced. Examples might be tractor depreciation or property taxes.

The enterprise budgets are "economic budgets" meaning that in addition to cash expenses and depreciation, opportunity costs are also included. Typically, these costs would include costs for operator labor, capital used for variable costs, and capital invested in machinery. The resulting profit is an economic profit that provides a return to all the resources used in the enterprise. An economic profit allows the comparison of enterprises that use differing input levels, particularly for inputs such as labor, where a farmer may not actually hire labor for a cash wage.

In this analysis, the budgeted costs include all production costs excluding a land charge, management charge, and overhead expense. The equipment complement was developed and costed-out as would be appropriate for a farm of 3,000 acres. The reason for the exclusion of a land charge is that land can be difficult to value, and if the land is owned, excluding this cost will not affect the relative profitability of the systems being compared. Crop-share lease terms can affect the relative profitability of the production systems, but due to the great variation in lease terms, will not be addressed here. While an opportunity cost of management would be appropriate to include, it is a difficult cost to estimate and is excluded from this analysis. Overhead is also omitted from the enterprise budget for many of the same reasons as land. By definition, the overhead cost will not vary by crop but it may vary greatly by farm operation.

One of the difficulties associated with comparing the three cropping systems is that the summer fallow system uses 2 years to produce a crop, as opposed to a single year for annual winter or spring wheat. This affects the calculations of profitability of each enterprise in two ways. First, in the fallow system, a crop is harvested off each crop-acre only once every 2 years, resulting in 50 percent fewer harvested acres each year. Secondly, for a given farm size, fewer harvested acres under a fallow production system may increase the fixed cost per acre due to fewer available acres over which to spread the

fixed costs such as machinery and taxes. To address this problem, the profit per harvested crop-acre in the summer fallow rotation must be spread over 2 years. This is referred to as the annualized return per acre and may be directly compared to the profit per acre of an annual crop.

Results

Total specified production costs were highest for the chemical fallow system at $144/acre followed by the annual winter wheat at $124/acre and annual spring wheat at $96/acre (Fig. 1).

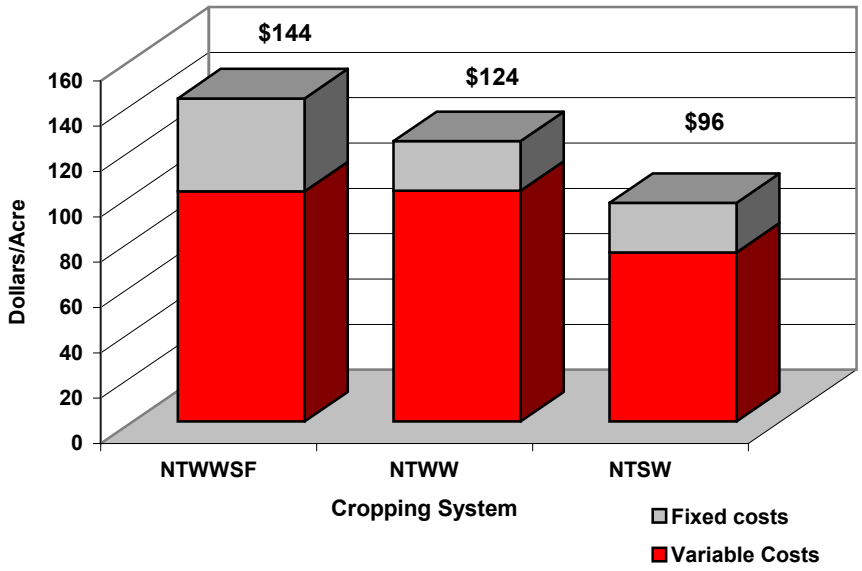

Figure 1. Variable and fixed production costs per harvested acre.
NTWWSF = Direct-seed winter wheat chemical fallow
NTWW = Direct-seed annual winter wheat
NTSW = Direct-seed annual spring wheat

The primary cost difference between the winter wheat systems is the level of fixed costs per acre (Fig. 1). This difference is due primarily to the fact that only half as many acres are under crop in a given year and machinery costs are spread over fewer acres, if we assume total cropland acres remain the same. The fixed costs for annual spring wheat are nearly the same as the annual winter wheat.

Variable production costs differ between systems primarily in fertilizer and herbicide costs. A lower nitrogen rate was used in the winter wheat-chemical fallow than in the other two systems and the annual spring wheat required fewer and less expensive herbicide applications. The variable input costs by system are shown in Figure 2.

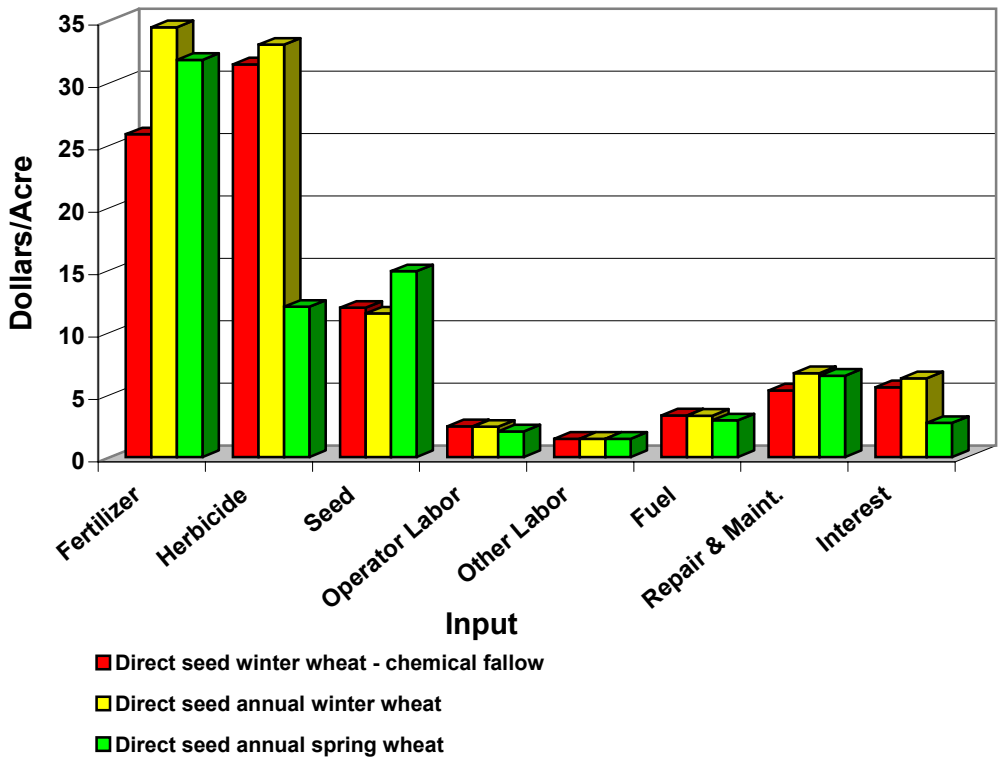

Figure 2. Variable production inputs by system.

Multiplying the mean crop yields for the 1998-2000 crop years by a $3/bu wheat price produces a mean gross revenue per acre for each system. Subtracting the total specified production cost for each system from the mean gross revenue results in the mean return over total specified cost per acre. We cannot use this number as is because we are comparing a system producing a crop semiannually with systems producing annual crops. Because we are measuring profit per acre per year, and the winter wheat-chemical fallow system produces a crop every other year, the return over the specified costs must be divided by two in order to annualize the return. The annualized return gives a different profitability ranking than the raw profit data and is shown in Figure 3.

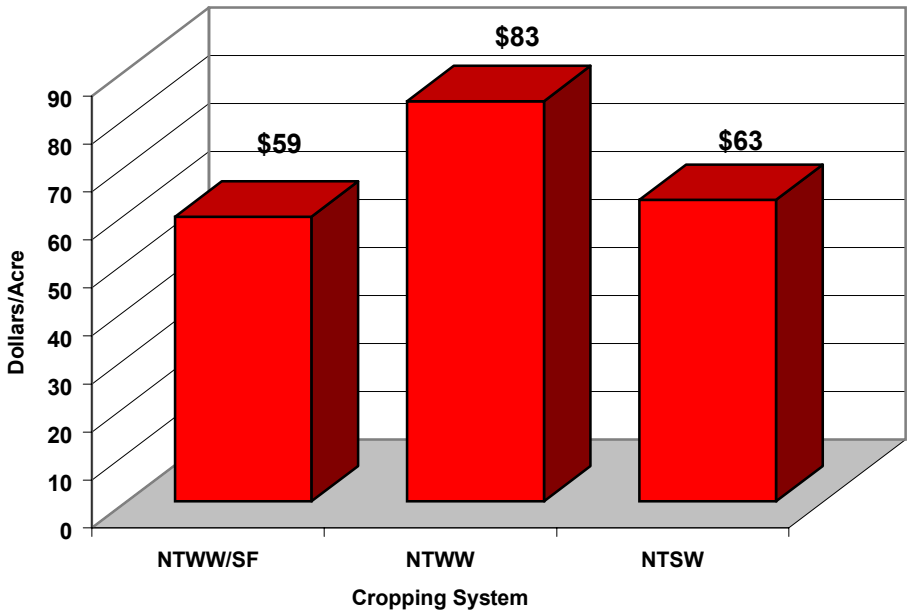

Figure 3. Annualized return over specified costs for three cropping systems.NTWWSF = Direct-seed winter wheat-chemical fallow
NTWW = Direct-seed annual winter wheat
NTSW = Direct-seed annual spring wheat

The annually cropped winter wheat produces the greatest return over winter wheat-chemical fallow primarily due to the ability to harvest twice as many crops per acre even though each individual crop has a lower yield under the annual system. The annual winter wheat is more profitable than the annual spring wheat primarily due to the higher crop yields produced by the winter wheat crop.

Conclusions

In all years examined, the winter wheat-chemical fallow produced higher crop yields than the annual systems but the ability to produce a crop every year resulted in greater profitability for the annual systems. It appears that the additional water saved during the fallow year does not result in wheat yields sufficiently high to offset the loss of a second harvested crop. While this analysis has produced some interesting results, it should be noted that only 3 years of crop yield data were available for this analysis in only one location. Additional research is needed to determine the effect of these systems on yields and production costs in other locations over a longer time period.

References

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