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Machinery Sharing by Agribusiness Firms

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Sharing may reduce capital investments and potentially allow firms access to higher quality, larger capacity, and / or additional machines.

In an effort to improve farm profitability, reduce costs, and manage risk, U.S. agricultural producers are beginning to adopt unique lease and machinery ownership programs (Schwalbe, 2006). Unfortunately, because many actions taken to reduce machinery can result in a decrease in net returns, trade-offs exist. Consider the seemingly simple decision to purchase a new machine. Purchasing a lower quality machine may reduce initial costs, but additional repairs and potential down time negatively affect productivity and costs, therefore, net returns. If the decision is made to purchase a higher quality machine, initial costs are higher, but fewer repairs and increased productivity may offset the increase in costs. One option to improve equipment management is machinery sharing; the use of a single piece or set of machinery by

two or more firms. Obviously, not all equipments can be shared, but machines that are used sparingly or seasonally are candidates for sharing. Sharing may reduce capital investments and potentially allow firms access to higher quality, larger capacity, and / or additional machines. These benefits also come at additional costs. A case study of two wheat farms sharing combines is presented here to illustrate the potential benefits, costs, and other important issues to bear in mind when considering an equipment sharing opportunity. A simulation model was developed to illustrate the benefits and costs of sharing on net after tax cash flows (Wolfley 2008). The concepts presented are applicable to a wide range of machinery.

Contractual Issues

Important issues when looking

for potential partner(s) for sharing equipment are compatibility, expectations, and trust. Although the majority of agricultural producers are trustworthy, the “best” way to address these issues is through a legal contract. Contractual issues that need addressing before entering into a machinery sharing contract are listed in Table 1. Although not comprehensive, the listing is indicative of the issues involved. One potential way to reduce individual liability and financial risk is through forming a limited liability company. The limited liability company purchases or leases the machinery, and both producers pay the company a percentage of the costs for the right to use the machine. Insurance is either purchased by the company or the individuals. One advantage to the formation of a company is that the partnership can be expanded to include more equipment and/ or more partners under the same framework.

As an illustration of contractual issues, when sharing combines the possibility exists that the combines will not be available at the optimal time for both farms. If two producers live close to each other, sharing machinery is likely to lead to demand for the combines at the same time. As a result, one producer may face reduced yields because of delays in harvesting. If the producers are in different geographical regions, the harvesting windows for the two farms may not overlap. Custom harvesters have traveled the country for years in a similar manner using the same equipment and following the harvest windows of different geographic regions. When it comes

Table 1. Selected Issues to take into Account when Considering Machinery Sharing

Contractual Issues	Non-contractual Issues
Percentage of Paid shared costs- variable and fixed.	Trust Issues
Overlap of harvesting windows- machinery delivery dates	Costs of finding person to share
Percentage of shared depreciation	Contract negotiation costs - including lawyer fees
Penalty structure- who bears the risk of untimely delivery of the machinery	Compatibility
Amount of time to allow for harvesting	Other
Machinery set size	
Repair / maintenance schedule and payments	
Transportation costs and payments	
How natural disasters will be handled	
Other	

to harvest timing and distance between partners, again trade-offs must be considered. Transportation costs increase, the greater the distance. At the same time if the partners' operations are too close, the costs associated with an overlap of harvest windows can make the partnership impractical. A higher potential overlap in harvesting windows between the farms requires that a very well defined set of expectations be addressed in the contract.

Case Study Machinery Sharing

To illustrate variability in harvesting windows and transportation costs, representative farms at four locations are modeled: Dumas, Texas; Pampa, Texas; Akron, Colorado; and Big Sandy, Montana. All four farms are 10,000 acre wheat farms using a wheat-fallow rotation. It is also assumed the farms have the same machinery complement. The base scenario assumes that 75 percent of the land and non-shared machinery is owned debt free. Costs and returns normally included in a farm simulation model are included, but because of sharing two combines the model has several unique aspects. Two farms are simultaneously simulated, and are assumed to have formed a limited liability company (LLC) which encompasses only the shared machinery. Given this assumption, depreciation and other costs from sharing machinery can be shared on a percentage basis as negotiated in the contract. The two farms are analyzed over a five crop year horizon, the assumed useful life of the shared combines. Prices, yields, and harvesting windows

are all stochastic in the model, meaning that the risks associated with these factors are considered in the analysis. The model simulates the net present value of after tax cash flows (for brevity referred to as cash flows) for both farms over a number of iterations. Each iteration represents a different possible combination of price, yield, and harvest timing for each farm. Cash flows are defined as revenues (market receipts or crop insurance indemnities) plus government payments plus any penalty payments minus fixed and variable costs, and federal and self-employment taxes. Contract penalty payments for late delivery of the combines, if any, are negative for the farm which uses the combines first and positive for the second farm.

The assumed contract in this case allows the first producer 25 days from the time his / her wheat crop is ready to harvest to complete harvest plus transportation time to deliver the combines without penalty. At the end of 25 days, if the first producer has not completed harvesting, he / she must decide whether to finish harvesting and pay a late delivery penalty or stop harvesting and deliver the combines on time. For both farms, delays in harvesting beyond 25 days from when the crop is ready to harvest, whether it is caused by weather or untimely machinery delivery, results in a 0.5 percent yield loss per acre for each day. Given the different farm locations, the wheat crop is ready for harvest at the four locations at different times for any given year. The further apart the farms are the less likely the overlap in the harvesting windows.

All variable and fixed costs unrelated to sharing machinery are paid by each individual farm. Costs associated with the combines, however, vary based on the scenario. For the non sharing scenario, each producer purchases two combines and pays all costs associated with the use and ownership of the combines and at the end of the five years receives the salvage value. When sharing, two combines are purchase and shared between the two farms. Obviously, when the machinery is shared, the total purchasing, financing, and depreciation costs for the two farmers are lower. An individual combine, however, depreciates more when sharing because of the increased use of the combine. Operating (interest, repairs, labor, fuel and lube) and transportation costs are higher in the shared case because of the additional acres the combines must harvest. Each producer pays the costs directly associated with harvesting their acreage, such as fuel and repairs. All other costs can be split from zero to 100 percent between the two producers.

Results

To illustrate one contractual issue, the percentage of shared costs paid by each farm and harvest window effects, differences in cash flows between shared and non-shared simulations for various combinations involving the Pampa farm are reported in Table 2. Pampa gains by sharing in all cases except where it pays 100% of the shared costs. This statement also is true for Akron and Big Sandy farms. Dumas only gains when Pampa pays 75 or 100% of the shared costs. Besides the results present in Table 2, several other cases were examined to obtain

Equal sharing of the costs is generally not the “best” contractual arrangement because of potential harvest delays and penalty payments.

Table 2. Differences in Expected NPV of After Tax Cash Flows for Various Combinations of the Pampa Farm Assuming Different Percentages of Shared Costs Paid (in Hundred Thousand Dollars)

Percentage of Shared costs Paid by Pampa	Pampa & Dumas		Pampa & Akron		Pampa & Big Sandy	
	Pampa	Dumas	Pampa	Akron	Pampa	Big Sandy
100%	-1.266	2.948	-1.284	4.047	-1.406	4.558
75%	0.338	1.483	0.341	2.714	0.259	3.120
50%	1.917	-0.007	1.941	1.377	1.897	1.665
25%	3.463	-1.522	3.506	0.036	3.497	0.190
0%	4.972	-3.060	5.033	-1.310	5.058	-1.306

the following synopsis of different contractual issues.

Percentage of shared costs paid - A potential reasonable assumption to reduce transaction costs and facilitate machinery sharing is for two identical size farms to equally share costs associated with machinery sharing. Equal sharing of the costs is generally not the “best” contractual arrangement because of potential harvest delays and penalty payments.

Penalty structure – Different penalty structures were examined that shift the weather risk of delaying harvest between the farms. Different penalty payments are similar to shifting costs. As expected, each farm prefers to shift the risk to the other farm. But even with the different structures, machinery sharing can increase cash flows.

Percentage of depreciation claimed – Trade-offs exist between the percentage of shared costs paid and depreciation claimed. Both producers may be better off if a producer in a higher tax bracket pays a higher percentage of shared costs but also claims a larger percentage of the depreciation if

the other producer is in a lower tax bracket.

Harvesting windows - When harvesting windows highly overlap, both farms are individually better off sharing machinery only when farm 1 pays more than half but not all of the shared costs. Farm 1 must pay a larger percentage of the costs because Farm 2 is incurring uncompensated yield losses as s/he waits for the harvesting equipment. Two viable options available to producers to minimize harvesting time conflicts are entering contracts with producers geographically separate and / or increasing machinery size.

Machinery set size - To examine machinery size effects, the model was reformulated such that when machinery is not shared, smaller combines are used (costs and harvesting delays are modified). A larger harvesting machinery set is assumed when sharing machinery. Results suggest using machinery sharing to obtain the use of larger machinery, even at the expense of delaying harvest, is a viable option producers may want to consider.

This study helps explain why

machinery sharing is observed and increasing in importance but not widely practiced in today’s farming operations. Gains from machinery sharing may be small in comparison to annual farm revenue. Another reason that machinery sharing may not be widely practiced is because of additional transactions costs associated with finding another farmer to share machinery, resolving trust issues, and determining actual contractual parameters. Such market and non-market psychological transaction costs are not modeled. The use of machinery sharing, however, is a potentially viable option to increase after tax cash flows and reduce the variability of cash flows producers way want to consider.

References

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