# IOWA STATE UNIVERSITY

**A Return of the Threshing Ring? Motivations, Benefits and Challenges of Machinery and Labor Sharing Arrangements**

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**May 2009**

**Working Paper # 09008**

## Department of Economics Working Papers Series

**Ames, Iowa 50011**

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## Abstract

Cooperative approaches provide an alternative for small- and medium-sized producers to obtain the efficiencies of larger farming operations and remain competitive in an increasingly concentrated agricultural industry. This article examines the motivation and effectiveness of equipment and labor sharing arrangements in the Midwestern US. Case study evidence shows that in addition to cost savings, access to skilled, seasonal labor is an important motivation for farm-level cooperation. Key factors identified for successful cooperative agreements include compatibility of operations and members' willingness to communicate and adapt. Sharing resources is found to improve farm profitability, efficiency and farmers' quality of life.



*Key Words:* machinery sharing, skilled farm labor, productivity, farm-level cooperation

JEL Classifications: Q12, Q13

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Introduction

A number of market forces are driving U.S. agriculture production towards a larger scale. Equipment and facility requirements for crop and livestock farms are increasingly capital intensive and frequently demand specialized knowledge and scale-dependent management practices (Kutzbach 2000). Implementing modern technologies requires substantial investments of resources and often entails a minimum production scale. Major changes in the food marketing system – mass retailing patterns, product standardization, volume requirements and traceability issues – induce food processors and retailers to pursue well-managed, large-volume suppliers with precise, formally documented production processes. These market pressures favor larger farm operations. As a result, many smaller scale farmers have been compelled to seek off-farm income to supplement their farming revenues, or to exit farming altogether (Gebremedhin and Christy 1996; Martinez 2006).

One important factor driving increased farm size is escalating input costs, including machinery costs. Estimated machinery costs per acre for Iowa corn and soybean production from 1994 to 2008 illustrate these trends (Duffy and Smith 2008). For corn production, machinery costs rose nearly fifty percent, from roughly $75 per acre in the mid-1990s to $110 per acre by 2008. At the same time, other input costs were also rising. Duffy and Smith estimate that labor costs per acre increased 50%, land costs nearly doubled and seed, chemical and fertilizer costs per acre were 130% percent higher in 2008 relative to fifteen years earlier. Until very recently, prices paid to farmers for their crops have remained largely unchanged. This "cost-price squeeze" has put pressure on producers to either enhance revenues or to control or

cut costs. "Low-cost producers are generally better able to survive periods of low prices and thrive when prices improve, while high-cost producers are often the first to exit farming when prices are low" McBride (2003).

In response to these pressures, many producers have increased their farm size. This strategy, however, is not always appropriate or feasible. Insufficient access to land and capital can limit expansion. And, as Roe (2005) notes, expanding production may increase risk: "the level of variability of farm income may not decrease, but increase due to larger investments in a similar, if not identical, commodity." Smaller scale producers who lack either the resources or the desire to expand have sought alternative strategies to remain profitable. Value-added enterprises, niche and direct marketing and agritourism activities are some of the ways in which smaller scale farmers have maintained profitability. Another potentially successful strategy is active cooperation with similar farm businesses. Historically, farm input and supply cooperatives helped farmers increase margins through collective input purchases and group marketing activities. Cooperation at the farm level is often more subtle. Many farmers occasionally share a piece of equipment or trade a few days labor. There are many stories of neighbors helping when a farmer is sick or injured. But some farmers are working together in a more routine way. Although anecdotal evidence suggests this type of sharing is not unusual, there is often little formality in these strategies. In many cases (but not all) they develop gradually over time with little fanfare.

Informal equipment sharing agreements are probably the most common form of resource sharing among farmers. There are some groups of producers, however, who have formalized their sharing into a cooperative business structure to collectively own and operate machinery. Although they are organized around machinery, these more formal arrangements go beyond

simply sharing equipment. They often involve shared labor, common production schedules, standardized production processes and, in some cases, marketing of their product in volume.

Relatively little is known about the effectiveness of sharing arrangements for improving farm profitability for producers or the requirements for success. This research is aimed at better understanding the general nature, benefits, and pitfalls of cooperative farming agreements in the Midwestern U.S.

Background

Sharing equipment among farming operations is not new. In the early 20th century U.S. farmers often worked together during harvest on threshing rings.[1] Machinery sharing rings and other cooperative arrangements are more common in European countries and Canada.[2] There is some evidence that a significant number of U.S. farmers are beginning to revisit the practice of sharing equipment and labor with other producers. For example, the original idea behind the agricultural leasing firm MachineryLink was to share machinery between farmers over a geographic distance in order to take advantage of differences in growing seasons across regions (Ginder, Artz, and Colson 2004).

Studies of machinery cooperatives in Canada and Europe have identified a variety of potential benefits attributable to sharing resources. Foremost, machinery costs for members of a farm machinery cooperative are estimated between 33% and 50% lower than for an independent farmer. But in addition to the machinery cost savings, there may be several related benefits, including access to specialized equipment and more efficient machinery, ability to draw on the experience, labor and ideas of other members, access to volume discounts on other inputs and a reduction of risk. At the same time, potential drawbacks identified by these studies include a loss of timeliness in field operations, decreased autonomy in decision making, more complex

management, potential problems with lenders and split lines of credit, and difficulties in unwinding the arrangement. (Murray and Fulton 2000; Toro and Hansson 2004; Gertler and Murphy 1987; Gertler 1981).

The academic research on resource sharing arrangements in the United States is sparse. A few University Extension guides address machinery sharing as one of a variety of options for controlling equipment costs on the farm (for example, see Edwards 2001; Weness 2001), but to our knowledge, no systematic study of the nature, extent or effectiveness of machinery sharing has been undertaken for the U.S.[3] Evidence of cooperative agreements between producers for sharing equipment, labor and expertise is therefore largely anecdotal. As a result, the benefits and potential pitfalls of these arrangements for U.S. farmers are not well understood.

This research seeks to better understand the potential role of resource sharing in helping small- and medium-sized farmers improve their farming operations. These cooperative arrangements appear to have great promise in providing better access to efficient machinery, technology, labor, and knowledge as well as cost savings and increased opportunities for marketing. At the same time, there are risks involved in sharing resources with other farmers. The objective of this research is to identify which types of farmers share machinery and labor and what motivates them to share. It aims to understand how sharing agreements are structured and to characterize the primary advantages and disadvantages of sharing machinery and labor in a Midwestern U.S. grain farming operation.

## Conceptual Framework

The decision about whether or not to participate in a resource sharing arrangement parallels farmers' decisions to adopt new technologies or practices. Theories of adoption maintain that farmers decide to adopt new innovations based on expected utility; that is, farmers

will choose the technology or practice that provides them the greatest expected utility. A variety of factors have been shown to influence farmers' expectations. These include: farmer characteristics, such as age, education, and attitudes towards risk; farm and household characteristics, such as farm size, type of production, land tenure and wealth; and institutional and policy factors, like government price supports and environmental regulations (Sunding and Zilberman 2001).

A farmer would choose to participate in a group sharing arrangement if he expects the benefits from sharing to outweigh those of farming alone. Potential benefits from sharing outlined above include cost savings, improved efficiency of operations, lower risk, access to volume discounts or price premiums and an increased pool of knowledge and experience. At the same time, sharing may present a variety of challenges that reduce the expected utility obtained from participating in a group.

Anecdotal evidence suggests that anticipated cost savings and improved farm profitability are the primary motivators for machinery and labor sharing. Three hypotheses regarding the affect of sharing on these objectives are presented below. Secondary objectives and farmer-specific characteristics are considered in the subsequent discussion of a series of case studies.

Hypothesis 1: *Sharing affects efficiency.* Relative to farming alone, farming in a group has the potential to be more efficient. Economies of scale exist in agricultural production (Hallam 1993). As farms become larger, they spread their fixed costs over more units of output, reducing average costs. This is illustrated by data on machinery costs per crop acre for Iowa farms. In 2006, machinery costs per acre for the largest farms in the sample were 25% lower than the costs for the smallest farms ($76 vs. $101 per acre) (Smith and Edwards 2007). Working in a group to

share machinery would tend to increase the number of acres serviced by the machinery and reduce average costs for a given amount of output. It can also make newer, larger equipment economical. "Larger farm machinery allows producers to cover more acres, lowering their labor costs per acre and optimizing their field operations" (Foreman 2006 p 12). Working in a group, members could coordinate tasks to reduce duplication and allow for specialization. All else equal, this would increase profits from sharing relative to farming individually.

Hypothesis 2: *Sharing impacts prices.* In the literature it is typically assumed that input and output prices are given for any individual farmer. However, in practice, costs may be lower for larger farms, "because of their ability to negotiate volume discounts on inputs, better management, and other factors" (McBride 2003). Participating in a group of sufficient size could reduce input prices for its farmer-members. Sharing could also increase output prices. Groups might be able to attract specialty contracts that pay premiums for delivery of a larger amount of product. Much like larger marketing cooperatives which obtain higher retail prices through quality assurance, these smaller farmer groups may be able to successfully coordinate production practices such as planting and harvest times, in order to maximize quality specifications (Sexton and Iskow 1988, p 12).

Hypothesis 3: *Sharing affects the amount of managerial effort required.* It is unclear whether the managerial effort required by an individual farmer would be more or less in a group relative to farming alone. On the one hand, participating in a group can lower the amount of time required by any one member due to an increased pool of knowledge and specialization. On the other hand, group activities have costs. Group sharing could require more time and effort to handle scheduling and decision making. There might be monitoring costs to ensure that other members are careful with the shared equipment or are contributing an agreed upon number of

hours of work when labor is shared. In addition, collective decision making can be costly, particularly when the interests of group members are not well-aligned (Hansmann 1996).

It is important to note that both the benefits and the costs of sharing relative to farming alone will vary with the size and scope of the sharing and the parties involved. Sharing only a combine with a neighbor during harvest may lower machinery costs while requiring some amount of coordination between partners, but is unlikely to result in volume discounts on other inputs or increased output prices. In contrast, a group of many producers farming in a more integrated manner year-round might encounter both significantly greater benefits as well as significantly greater coordination costs.

Study Design and Data

The data for this research were collected through a series of case studies profiling producers who were currently or had previously participated in a resource sharing arrangement. Potential case study subjects were identified through a web-based survey of University Extension professionals in seven Midwestern states. The survey asked respondents to identify groups in their regions that fit the following description: "independent farms that are participating in cooperative arrangements to share resources for production, yet retaining decision making sovereignty over their assets and labor." Survey responses also provided some descriptive information about the nature and extent of cooperative arrangements currently being used to share resources among farms in the Midwestern U.S.

The web survey identified a wide range of cooperative arrangements. Some producers only share the cost of a single piece of equipment. Other groups share whole machinery sets (e.g., combine, tractor, planter, sprayer) as well as labor for operating the equipment. Some others share not only equipment and labor, but also purchase inputs and market output as a

group. The formality of the sharing arrangements varied as well from simple verbal agreements to written contracts and formal business structures. Ten case study analyses based on in-person interviews of producer groups who share or have shared resources among farms were completed between June 2004 and January 2005. Cases focused on examples of sharing in Midwestern grain operations, but were chosen to represent the spectrum of formality in arrangements and degree of cooperation. This diversity facilitates comparisons among groups and helps ensure the findings can be generalized. Tables 1 and 2 provide a summary of the ten cases included in the study. These cases demonstrate the range of possibilities for farm-level resource sharing arrangements.[4]

**[Place Table 1 Approximately Here]**

**[Place Table 2 Approximately Here]**

Groups varied from sharing a single piece of equipment (a combine) to sharing entire machinery sets, structures, and separate business entities. The degree of labor sharing varied from none, in the case of a long-distance equipment sharing arrangement, to a few weeks during harvest season to fully integrated labor operations year-round. Agreements between group members were of two basic types. Groups involving fewer than four members, regardless of the number of equipment pieces or amount of labor shared, predominantly had only a verbal agreement. Groups with a significant scale and scope of operations typically had a written contract, and most had formed a business entity (e.g., LLC). Nine of the groups were operating at the time of the interviews; one group had dissolved.

Research Propositions and Case Evidence

Table 3 compiles evidence from the ten cases studies related to the three hypotheses described above.

**[Place Table 3 Approximately Here]**

*Hypothesis 1: Sharing Affects Efficiency*

In nearly all cases, it was clear that sharing improved efficiency. Sharing machinery and working together reduced per acre equipment and labor costs in the majority of cases. In others, machine costs per acre remained comparable to farming individually, but allowed members access to newer, technologically advanced machinery. Producers reported an increased speed of operations, especially during harvest, due to higher capacity machines, fewer breakdowns, larger pools of labor and more efficient use of labor. As one producer put it, "Three go twice as fast as two." Some producers stated that, due to the cost and/or time savings of their cooperative agreement, they were able to significantly expand the acreage of their crop operation or expand the size of their livestock operation.

Somewhat surprisingly, labor, more so than machinery costs, motivated sharing in a number of cases. Many producers rely on family members or retired neighbors to help during busy times, but finding reliable, skilled and seasonal labor is a major challenge for many grain farmers. Working with other nearby producers offers one solution to this challenge. Several groups reported that sharing eliminated their need to hire outside labor and improved efficiency of operations, particularly during harvest.

The main exception to this finding was the case of Bennett, Taylor and Nelson. Rather than improving efficiency through group efforts, in this case sharing seemed to reduce it. This failed cooperative effort was stymied by the group's inability to agree on farming practices and scheduling (specifically-how, when, and by whom field work would be done) as well as the purchase of an undersized combine for their combined number of acres.

*Hypothesis 2: Sharing Affects Prices*

The cases provided very little evidence of marketing opportunities being exploited. Only Panhandle Farms and LMC jointly marketed any of their production. Only one of groups had attempted to coordinate production practices in order to attract price premiums. LMC expanded its operations into a variety of subsidiaries, including a seed cleaning business and an export venture for a variety of specialty crops. Through these expansions, the machinery cooperative has integrated forward into value added activities that increase profitability without expanding acreage. Parker and Anderson did suggest that a major benefit of their partnership was having someone to share ideas with; "Two heads are better than one." They felt the opportunity to routinely discuss marketing strategies improved their bottom-line, even though they continue to market their crop separately.

Even joint input buying was problematic in many cases because members maintained loyalties to different seed and chemical dealers. When groups did report coordinated buying of inputs, they generally claimed savings. For example, the Spauldings reported that coordinated purchases resulted in a discount of $3 per acre on chemicals and several free bags of seed each year. Anderson and Parker estimated a fifteen to twenty percent savings on seed and chemicals from joint purchases. Panhandle Farms received price discounts for large volume purchases of seed, chemicals and fuel.

Several groups reported advantages with regard to renting land. Panhandle Farms felt their ability to plant and harvest in a timely fashion provided an edge in obtaining crop share leases, which are desirable since they require less capital and carry less financial risk than cash rent leases. The Spaulding family also noted an advantage from their group efforts with regard to landlords. They jointly own equipment for tile work which allows them to make improvements to their rented farms more cheaply than the going rate.

Although not explicitly tied to price, another perceived advantage of group size appears to be special treatment from machinery dealers, input suppliers and local elevators. When the members of Progressive Farmers encountered problems with a new combine, the manufacturer sent two engineers directly to their farms to fix it. The Spauldings reported that the local elevator occasionally extended its hours to accommodate additional delivery from the group. Anderson and Parker also felt their larger volume purchases resulted in improved service from their dealers.

Despite the lack of coordination observed in input buying and marketing among these groups, it is conceivable that, if opportunities arose, these groups would be well positioned to take advantage of them. Their history of successfully coordinating group machinery use gives them experience managing group dynamics other producers frequently lack. As in the case of LMC, and to a lesser extent Panhandle Farms and Zimmerman and Erickson, such improved coordination may evolve over time as the group gains experience working together.

*Hypothesis 3: Sharing Affects Managerial Effort*

It is very apparent from the case studies that sharing equipment and labor impacts the amount and type of managerial effort involved in farming. There are a variety of costs associated with sharing equipment. Members must coordinate schedules, production practices and in some cases, even seed varieties. They must make joint decisions about what type of equipment to share, when to trade, how to operate as a group, how to handle repairs and regular maintenance and a variety of other issues. The more integrated the operations of a group, the more likely additional record-keeping is required. These costs seem to be higher in the beginning stages of the sharing arrangement. Once groups have operated for some time, they report that many decisions become routine.

At the same time, operating as a group allows for some specialization. To the extent that group members can take advantage of their complementarities, sharing can reduce the amount of managerial effort required. In several cases, producers reported assuming responsibility for tasks they enjoyed or for which they had special training or knowledge. For example, in the case of Zimmerman and Erickson, Zimmerman takes care of most machinery maintenance and repairs since he is a mechanic by training. Erickson, who has a commercial driver's license, handles much of the hauling and scheduling with their local cooperative.

A related key finding of these case studies is that personality matters. Time and again during the case study interviews, producers emphasized the importance of flexibility, "give and take" and willingness to be part of team. In several cases, group members did not mind small individual losses or decisions by the group that ran counter to their own preferences because they felt in the long run everything evened out. They believed they were better within the group than outside it. Trust and good communication were also repeatedly cited as important factors for success. The evidence from the Bennett, Nelson, and Taylor group certainly supports this. While several factors contributed to the failure of this group, a major cause was a lack of trust among partners and, at times, the unwillingness of members to consider the wellbeing of the group ahead of individual interests.

## Conclusion

Cooperation at the farm level is an emerging trend that may accelerate as machinery costs continue to rise and the level of technical knowledge and skill required for production increases. The case evidence presented here suggests several common factors that motivate and help determine the success of farm-level sharing arrangements. Among the cases analyzed, cooperation tended to be motivated by an attempt to control machinery costs or to fill a need for

skilled, seasonal labor. Once established, many groups found other benefits of group interaction to be as important, if not more important, than any associated cost savings. For example, the ability to specialize, the increased pool of knowledge and ideas, and the camaraderie enjoyed when working together, were frequently cited as significant benefits of group participation. Many of the key success factors identified involve personality traits: an ability to communicate effectively, a willingness to be flexible, and a capacity to consider group interests above individual interests, at least occasionally.

This research makes clear that a variety of different sharing approaches can be effective for improving farm efficiency, farm profitability and quality of life of the producers involved. Successful arrangements ranged from a fairly uncomplicated agreement between neighbors to jointly own and use a combine to a highly complex organization of both production and value-added businesses now approaching its third generation of owners. Groups devised a variety of methods for managing potentially challenging aspects of group sharing, such as how to schedule use of equipment, compensate for unequal contributions of time and machinery use, and make groups decisions

At the same time, these groups face one enduring problem that appears to be more difficult to manage than any of the other issues they confront. In several cases, groups struggled with how to recruit and integrate new members into the arrangement as well as how to fairly treat members who wanted to retire from farming or leave the group for other reasons. Exit of members is especially complicated because it usually involves an abrupt withdrawal of capital and labor resources from the group. Even when the transition can be extended over a two or three year period there is likely to be a significant negative impact on the remainder of group. If the withdrawing member(s) have provided significant contributions of labor and capital to the

group, both the capital position of the group and the internal dynamics of the group are affected. To replace such a member requires that a different member who has similar personal characteristics, similar capital to invest, and a desire to participate in the group be located. Failing that, it may require dissolution of the group and reconstitution of the remaining members into a smaller scale group with fewer members. It is therefore important to clearly establish the procedures for dissolution at the outset.

While there does appear to be potential for resource sharing strategies to enhance farm profitability, these arrangements, particularly the most complex ones, are clearly not for everyone. It is unlikely that wide-spread adoption of these organizational models will occur given their complicated nature. The more costly it is to implement a new practice in terms of time, money, and acquisition of new skills, the more slowly adoption will proceed (Hall and Khan 2003 p 234). An implication of this is that further research into resource sharing is warranted. None of the case study groups had access to information regarding how to design a cooperative arrangement, what the potential costs and benefits may be, what the optimal scale for their operation was, or how to best manage uncertainty and problems that may arise. Additional research and related outreach materials would prove valuable in raising producers' awareness of resource sharing as a possible business strategy and improving their understanding of the benefits, risks and mechanics of sharing equipment and labor with other producers.

[1] One agricultural historian describes the use of threshing rings in Midwestern communities: "The machinery for threshing required a considerable capital investment, much greater than most farmers could afford. Even small farmers could reasonably invest in a binder or header, but a farmer who purchased a threshing rig needed significant acreage to make up for the cost of investment and operation. Most farm people either cooperatively owned or

custom hired threshing equipment. ….Even when farmers hired a machine for cash, they tended to pair this cash transaction with exchanges of labor within the neighborhood" (Neth, p. 160).

[2] The website for the Machinery Ring Association of England and Wales lists ten member machinery rings. Likewise, the Scottish Machinery Ring Association claims ten member rings. Some of these are quite large. Tayforth Machinery Ring in central Scotland reports 800 members (http://www.tayforth.co.uk). A report on the socio-economic impacts of rural business rings in Scotland estimates that 23% of Scottish farmers belong to machinery ring (SAOS, 2008). Toro and Hansson report 5000 members in 20 associations in Sweden noting this is only about one-fifth the level of activity in Germany (2004). Fulton and Harris (2000a) report more than 1000 member farms in forty-seven CUMA's ("Coopérative d'Utilisation de Matériel Agricole—loosely translated as "co-operative for the use of farm implements") in Quebec.

[3] Lawless, Cropp and Harris (1996) address potential advantages and disadvantages of various legal business structures for multi-family dairy operations in Wisconsin, but do not analyze other aspects of these arrangements.

[4] Further evidence of the extent of sharing activity is provided from the web survey we conducted. University Extension staff responding to the survey identified fifty-two groups in five states (IA, IL, WI, NE and IN) sharing equipment and/or labor.

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**Table 1.** Basic Characteristics of Individual Case Studies

| Group | Current # of Members (Farms) | Start Year | Total Acres (Acres per Farm) | Major Equipment Shared | Agreement Type |
|---|---|---|---|---|---|
| Johnson and Olson | 2 (2) | 2003 | 1600 (800/800) | Combine | Verbal |
| Stevens and Smiths | 4 (3) | 2002 | 3250 (1500/1300 /450) | Combine | Verbal |
| Duncans and Fergusons | 3 (2) | 1996 | 3250 (4500 /1000) | Combine | Written (LLP) |
| Erickson and Zimmerman | 2 (2) | 1984 | 1530 (800/730) | Whole Set [a] | Verbal |
| Parker and Anderson | 2 (2) | 1997 | 4600 | Whole Set [a] | Verbal |
| Bennett, Nelson and Taylor | 3 (3) | 1996 | 3600 (1200/1200 /1200) | Whole Set [a] | Verbal |
| The Spauldings | 4 (4) | Pre-1986 | 4010 (1350/1100/ 1200/360) | Whole Set [a] | Verbal |
| Progressive Farmers | 3 (3) | 1999 | 2125 (775/750/600) | Whole Set [a] | Written (LLC) |
| Panhandle Farms | 6 (1) | 1986 | 8400 | Whole Set [a] | Written (LLC) |
| LMC | 5 (5) | 1970 | 8000 | Whole Set [a] | Written (Ltd.) |

[a] Whole machinery set required for grain farm operation including tractors, planters, combines, sprayers, etc.
Note: Names of the individuals and organizations have been changed to protect their privacy.

**Table 2**. Description of Individual Case Studies

| Group | Description |
|---|---|
| Johnson and Olson | Neighboring farms with shortage of skilled labor and out-dated combines • Jointly purchased a combine financed 50/50 through the dealer • Harvest together • Do not track fuel costs or combine usage |
| Stevens and Smiths | Two non-adjacent nearby farms with different cropping systems (ridge till / no till) • Jointly purchased combine • Share air reel and headers • Stevens handles maintenance, repairs, and insurance • Harvest together • Added a beginning farmer who contributes labor only |
| Duncans and Fergusons | Two farms in different states formed an LLP to jointly own a combine • Operating agreement specifies scheduling, repairs, maintenance, and storage terms • Use a rental rate to cover combine-related expenses and adjust for differences in usage |
| Erickson and Zimmerman | Two neighboring farms whose cooperation evolved from a custom combining agreement • Jointly own a combine and planter 50/50 • Each contributes additional equipment • Pool labor and farm their land as a single unit • Some specialization of tasks (e.g., repairs and hauling) |
| Parker and Anderson | Two non-adjacent nearby farms began trading labor for equipment use • Larger farmer owns most equipment, few pieces jointly owned • Purchase inputs together • Equally share maintenance and repair expenses • Use custom rates to value labor contributions • Expanded acreage as a result of partnership |
| Bennett, Nelson and | Three nearby farming friends sold individually owned combines and planters and leased new equipment |

| | |
|---|---|
| Taylor | for group use • Undersized equipment for their joint acreage • Had difficulty pooling their labor during planting/harvest efficiently • Due to several disagreements, the partnership dissolved after 2 years |
| The Spauldings | Began as a partnership between two brothers, but has expanded to include the next generation • Beginning sons have 2 year grace period from capital contributions • Farm land as a group • Purchase inputs jointly • Use a balance sheet system to track individual investments and determine "fair" payments • Labor contributions are not tracked, but may be in the future. |
| Progressive Farmers | Four farmers formed an LLC to share operating and machinery costs • Jointly own/lease a full set of equipment • Share expenses are on a per acre basis • Farm as one unit • Track labor contributions (all labor tasks valued at same wage rate) • Use a field rotation scheme to ensure fairness in the timing of field work • One original member left the group in 2003 |
| Panhandle Farms | Five partners with no individual farming experience formed an LLC to co-own equipment and land • 85% of land leased, 15% jointly purchased • Market crops jointly • Take a "draw" on income derived from LLC profits |
| LMC | Cooperative of seven families in the 2nd generation • Jointly own a full set of equipment • Farm as a group • Pool all grain and jointly market crops • All land is individually owned • Significant investments in value-added enterprises (e.g., seed cleaning and export businesses) |

**Table 3.** Case Evidence for Hypotheses

*Hypothesis 1: Sharing Affects Efficiency*

| | |
|---|---|
| Johnson and Olson | New, higher capacity machine eliminated productivity losses from breakdowns • Increased speed of harvest • Eliminated hired labor expense • Reduced combine costs per acre |
| Stevens and Smiths | Staggered hours to keep combine running longer per day during harvest • Reduced combine costs per acre • Eliminated hired labor expense • Reduced startup costs for beginning farmer |
| Duncans and Fergusons | Reduced combine costs per acre |
| Erickson and Zimmerman | Partnership allows for specialization of tasks and more efficient use of labor • Working Zimmerman's high ground and Erickson's low ground as one operation improves productivity • Reduced machinery costs per acre by eliminating duplicate pieces of machinery and sharing expenses |
| Parker and Anderson | Reduced need for hired help • Facilitated significant expansion in acreage |
| Bennett, Nelson and Taylor | Disagreement about work hours, farming practice reduced efficiency; undersized combine for # of acres forced group to hire custom operator, increasing costs |
| The Spauldings | Reduced equipment costs per acre • Reduced startup costs for younger members |
| Progressive Farmers | Access to higher quality equipment • Reduced per acre machine costs, especially for spraying • Over-equipped after exit of one member |
| Panhandle Farms | Specialization of tasks allows for greater efficiency |

| | |
|---|---|
| LMC | Eliminated duplicate pieces of machinery • Facilitated expansion into related ventures (seed cleaning, export business) • Reduced start-up costs for new members |

*Hypothesis 2: Sharing Affects Prices*

| | |
|---|---|
| Johnson and Olson | N/A |
| Stevens and Smiths | N/A |
| Duncans and Fergusons | N/A |
| Erickson and Zimmerman | N/A |
| Parker and Anderson | Save 15-20 percent on seed and chemicals buying together |
| Bennett, Nelson and Taylor | Saved 25¢/gal on fuel |
| The Spauldings | Reduced seed and chemical costs from bulk purchases • More competitive in attracting and negotiating land leases |
| Progressive Farmers | Do not buy in bulk due to loyalties to different seed and chemical dealers |
| Panhandle Farms | Volume discounts on fuel, seed, chemicals • More competitive in attracting and negotiating land leases |
| LMC | N/A |

*Hypothesis 3: Sharing Affects Managerial Effort*

| | |
|---|---|
| Johnson and Olson | Minimal increase in scheduling harvest operations • Some change in routine |
| Stevens and Smiths | More people involved reduces stress • Allows for occasional 'time off' |
| Duncans and Fergusons | Upfront negotiation costs and coordination costs, but monitoring costs reduced by operating agreement |
| Erickson and Zimmerman | Joint decision making required but has become more routine over time |
| Parker and Anderson | Increased pool of knowledge and ideas • Reduced risk |
| Bennett, Nelson and Taylor | Difficulty reaching consensus about scheduling and how to handle repairs on individually owned equipment contributed to the group • Interests of individual members not well aligned with interests of the group |
| The Spauldings | Additional time tracking expenses, contributions of equipment and labor • Requires coordination in practices to raise specialty crops |
| Progressive Farmers | Group decision making can be time consuming • Additional record keeping required, but results in better information • Member exit or addition difficult |
| Panhandle Farms | Specialization eliminates duplicate efforts • Increased record keeping • Succession problematic |
| LMC | Specialization eliminates duplicate efforts • Cooperative bylaws reduce coordination, negotiation costs • More time devoted to group decision making but has become more routine over time |