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Alternative approaches for sharing machinery, labor, and other resources among small- and medium-sized agricultural producers

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ABSTRACT

As the U.S. agriculture industry continues to become increasingly concentrated, the viability of small- and medium-sized farms faced with diminishing profit margins per unit of output hinges in part on their ability to expand operations. In this study, the solution to this problem of taking advantage of economies of scale through farm-level resource sharing arrangements is considered. While significant attention in the literature has been dedicated to cooperatives designed to market products, purchase farm inputs, and other forms of vertical integration, there has been little academic research regarding farm-level horizontal integration for reducing equipment and labor costs. This study is the first academic investigation and analysis of U.S. farms to fill this void in the research.

Through a two phase data collection procedure, groups engaged in informal and formal resource sharing arrangements were identified and thoroughly investigated through a case study approach. The results of the identification survey indicate that farm-level resource sharing arrangements are common and varied with respect to the nature of their cooperation. To supplement the information gathered through the identification survey component of this study, ten case studies were conducted to gather detailed information on a sample of cooperative arrangements. The cases were selected in order to span the breadth of scales, scopes, and complexities of resource sharing arrangements. Evidence from the case studies suggest that sharing of equipment and labor can yield not only financial benefits but also enable expansions in cultivated acreage, access to better technologies, greater operational efficiencies, and improved access to information.

As well, a cost-benefit model is developed to explore the potential economies of scale in sharing equipment available to farmers given current equipment costs and

efficiencies. The model indicates that there is significant potential for equipment cost reductions through cooperation.

CHAPTER 1: OVERVIEW

1.1 Introduction[1,2]

As the U.S. agriculture industry continues to become increasingly concentrated, the viability of small- and medium-sized farms faced with diminishing profit margins per unit of output hinges in part on their ability to expand operations. Large-scale farms, through exploitation of economies of scale, are able to attain the critical mass to purchase inputs and market their products under more favorable terms while simultaneously reducing fixed costs per acre and obtaining more effective technologies and equipment than their counterparts operating on a smaller scale. In part, the efficiencies of larger farm operations accounts for the burgeoning U.S. farm size across many traditional agricultural production enterprises. For example, in 1987, small- and medium-sized farms accounted for approximately 63 percent of total agricultural sales in Iowa[3]. Forward a decade, in 1997 the market share of these farms had plummeted to 40 percent. Concurrently over this time-period, the number of small- and medium-sized farms in Iowa contracted by more than 20 percent. At the national level, small- and medium-sized farms accounted for approximately 47% of total sales of agricultural products in 1987. A decade later, the market share of these farms had dropped to 28% (U.S. Census of Agriculture).

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[1] This introductory chapter is adapted with permission of the authors from the original project grant proposal written by Georgeanne Artz and Roger Ginder entitled "Cooperation: A Survival Strategy for Small- and Medium-Sized Farms". The proposal was submitted to the Leopold Center for Sustainable Agriculture in October of 2003.

[2] Portions of this thesis have been adapted to and/or derived from several publications including: Ginder, Artz, and Colson (2004), Colson, Artz, and Ginder (2006), Artz, Colson, and Ginder (2007), and Ginder and Artz (2008)

[3] Small farms are defined here as those whose 1997 value of sales were less than $50,000. Medium farms had sales less than $250,000 but greater than $50,000.

There are a number of market forces driving U.S. agriculture production towards a larger scale. For crop and livestock farms, equipment and facility requirements are becoming increasingly capital intensive and frequently require specialized knowledge and scale-dependent management practices. Implementing modern technologies requires substantial investments of resources and often entails a minimum production scale. Food processors, faced with a mounting demand for traceability, are pursuing well-managed large volume suppliers with precise formally documented production processes. These market pressures show little indication of abatement or reversal. They tend to favor larger farm operations with more production under a common protocol. These changes have compelled many smaller scale farmers to seek off-farm income to supplement their farming revenues, or to exit farming altogether.

For those small- and medium-sized agricultural producers with limited ability to remain competitive, alternative business structures and operational strategies have potential benefits. One such alternative is active cooperation with similar farm businesses. Farm input and supply cooperatives facilitate acquisition of inputs at lower costs and more profitable marketing of agricultural products. Processing cooperatives convert raw materials into higher valued goods. Both types are commonly implemented in U.S. agriculture and have received considerable attention in the academic literature. Relatively little research has been focused on using cooperatives at the farm level to purchase farm machinery, hire and share labor, standardize processes, or capitalize on participating farmers' individual expertise.

Studies of Canadian agriculture have identified potential benefits from farm-level producer resource sharing arrangements. In a contemporary study of farm machinery

cooperatives in Saskatchewan Canada, Andrea Harris and Murray Fulton estimated that machinery costs for a member of a farm machinery cooperative are 35 percent lower than for a farmer operating independently (Harris and Fulton 2000). In addition to the machinery cost savings, the authors describe several related benefits including access to specialized and better equipment, the ability to draw on the experience, labor, and expertise of other co-op members, and access to volume discount on farm inputs. In a comparative study of fifteen Saskatchewan group farms, comprised of three to ten operators each, with fifteen neighboring one- or two-operator family farms, Michael Gertler found that the group farms reduced machinery investment per acre by about one-third while concurrently having access to larger and more efficient equipment. Furthermore, cooperative members utilized new technologies and personal safety equipment with greater frequency, had more crop diversification, and an average of 50 percent more livestock per unit of land area (Gertler and Murphy 1987).

There is a lack of comparable academic research on farm-level production resource sharing arrangements employed by agricultural producers in the United States. Lawless, et al. (1996) addressed potential advantages and disadvantages of various business structures for multi-family dairy operations in Wisconsin, but did not analyze any other aspects of these arrangements. Evidence of cooperative agreements between producers for sharing equipment, labor, and expertise is therefore largely anecdotal. The benefits and potential pitfalls to such arrangements for U.S. farmers have not, to date, been well documented.

In a recent survey conducted by Georgeanne Artz and Roger Ginder in collaboration with *Iowa Farmer Today*, two questions were posed to readers of the

journal regarding sharing of machinery. Thirty-one percent of the 616 respondents reported that they currently or plan to share equipment with another farming operation. Of these respondents, the types of equipment most commonly shared were combines (61%), tractors (56%), and planters (51%). The results also indicated that farmers who manage larger operations are less likely to share equipment with other farm operations. Although the survey does not provide specific information of the nature of the arrangements producers employ for sharing equipment, it does provide evidence that these arrangements are relatively common in Iowa in one form or another.

Informal equipment sharing agreements are likely the most common form of resource sharing among farmers. However, there is evidence of producer groups who have developed more formalized cooperative business structures to collectively own and operate machinery. Although they are organized around machinery, most of these more formal arrangements go beyond simple sharing of equipment. They often involve shared labor, common production schedules, standardized production processes and, in some cases, marketing of their product in volume. This study is unique in its focus on these previously unidentified and unanalyzed formal and informal[4] cooperative arrangements between multiple independent farmers in their production processes (e.g. equipment and labor sharing).

1.1.1 Study Objectives

Since the extent and nature of production-level resource sharing strategies currently employed by agricultural producers is not well understood, the first objective is

[4] In this study, an agreement is referred to as "formal" if there is a written contract and/or business entity formed by the partners. "Informal" is used to refer to arrangements where the agreement is verbal (unwritten).

to simply identify whether these forms of arrangements exist and to compile a database of producers engaged in sharing production resources.

To accomplish this objective, a comprehensive survey of 207 University Extension professionals knowledgeable about the farming operations in their respective regions in five Midwestern states was conducted. The survey was designed to gather general information about who is engaged in these forms of agreements and the nature of cooperation.

The survey yielded new knowledge regarding the prevalence of resource-sharing arrangements among farmers. However, it was not designed to provide sufficiently detailed information about the arrangements to pursue a comprehensive analysis. In order to fully understand production cooperative agreements, a comprehensive study of each individual operation was necessary. Given the unique nature of each group identified, a case study approach was the appropriate investigatorial method in order to accomplish the second objective.

Following Yin (2002), a case study protocol was developed outlining a multiple case design for the project. Ten case study analyses were conducted of producer groups who were currently participating or previously had been involved in resource-sharing agreements in the Midwest. The producer groups were selected for inclusion in the study based on their willingness to participate, the length of time in operation, type of farming operation, and organizational complexity. Given the wide variation among agreements identified by the Extension professionals, groups were selected in order to include a broad range of cooperative agreements according to the taxonomy matrix displayed in figure 1.

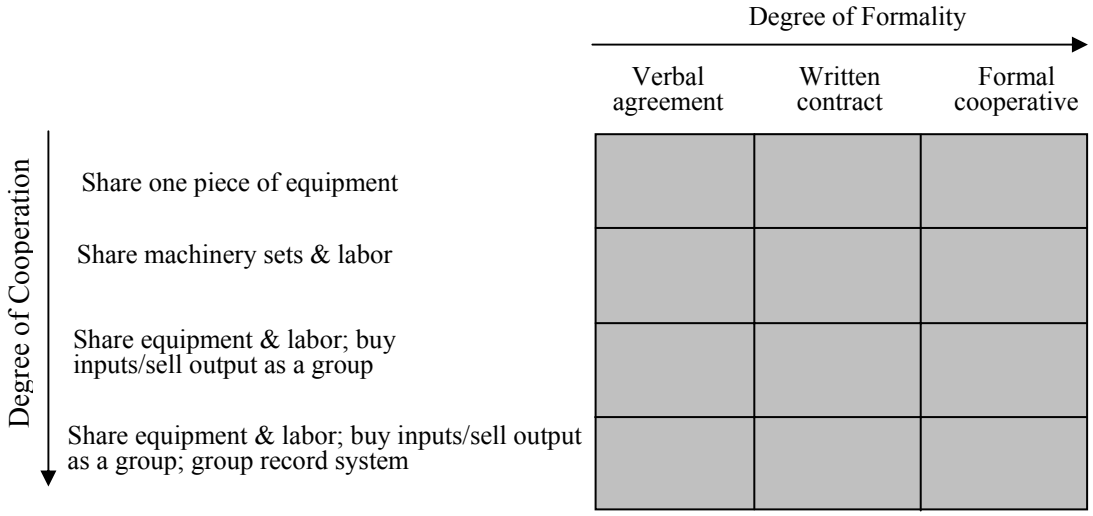


Figure 1. Taxonomy of Cooperative Arrangements

For each producer group selected for the case study phase of the analysis, an in-person interview was conducted with group members. The case studies were designed to elicit information about numerous issues including: (1) how the agreements are structured including operating agreements, (2) governance and internal control provisions, (3) dispute resolution provisions, (4) daily operations, including handling credit and liens, timeliness of field operations, and internal scheduling, (5) planning techniques and record-keeping, (6) perceived benefits of the agreement, such as a comparison of production costs with and without the sharing arrangement, (7) improvements in efficiency, productivity, and marketing of products, and (8) perceived disadvantages of the arrangement including previously encountered problems.

To synthesize the data collected through the case studies a series of cross-case analyses were conducted following guidelines provided by Yin (2002). Similar groups based upon the classification scheme in figure 1 were analyzed according to a series of

pre- and post-study points of comparison. The cross-case analyses yielded a structured documentation of the similarities and difference among the producer groups.

The final objective of this study was to analyze a series of priors developed during the initial phase of the project design. These were based on economic contracting, industrial organization, and partnership theories. The priors, which are detailed in chapter 3, involve issues such as the role of trust within a partnership, the correlation of contractual complexity with agreement scale and risk, non-financial metrics for operational success, and specialization of labor activities within a group setting.

1.1.2 Thesis Outline

Chapter 2 provides a brief literature review of studies and media articles focused upon farm-level resource sharing agreements. Chapter 3 describes the protocol and research questions for the identification survey and case studies. Chapter 4 presents the results of the identification survey. Chapter 5, 6, 7, and 8 include summaries and analyses of the ten case studies. Each chapter includes a subset of the case studies defined by the number of members and the degree of cooperation. Chapter 9 includes an analysis across all of the case studies. Chapter 10 develops a financial model of individual and joint equipment ownership. Finally, chapter 11 offers some concluding comments and chapter 12 contains relevant appendices.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction – Machinery Cooperatives

In the academic and nonacademic literature, significant work has been conducted on cooperative activity for marketing of agricultural products and purchasing farm inputs, but relatively sparse attention has been given to cooperation between farmers with regards to machinery.

An article in Farm Industry News entitled "Common Ground" (Olson 2000) discusses two pairs of Indiana farmers who have benefited by operating cooperatively. They have greatly decreased their equipment costs by eliminating their duplicative equipment and conducting field operations jointly. Similarly, a 2003 article in The Corn and Soybean Digest (Lamp 2003) provides a description of a group of four farmers in Iowa who share labor, individually owned equipment, and jointly owned equipment. Issues such as scheduling of field operations and worries about working in a joint venture are described in each of the articles as factors that required forethought and planning before forming the partnerships.

In this section, an overview of several different forms of cooperation involving machinery sharing is provided. They illustrate alternatives for machinery sharing among independent farms.

2.1.1 Saskatchewan Canada Farm Machinery Cooperatives

In a study of alternative farm business structures, Andrea Harris and Murray Fulton (Harris and Fulton 2000), examine legally incorporated farm machinery

cooperatives in Saskatchewan, Canada.[5] As of 2000, only thirty-eight farm machinery cooperatives had been registered in Saskatchewan, of which the preponderance were established during the 1970's through assistance from the Saskatchewan Department of Cooperation. Of the thirty-eight organizations, the majority of the groups operate as cooperative farms where individually owned land is managed by the cooperative and crops are pooled amongst the farmers. Most machinery cooperatives in Saskatchewan consist of only a few members (five or fewer).

In order to incorporate in Saskatchewan, cooperatives must establish a set of bylaws defining the organization's governance structure, rules, and regulations. A board of directors voted upon by members (typically the board simply consists of all members), has the authority to make decisions for the cooperative. While each member has a single vote on all decisions, each member's obligatory share of machinery costs and operating expenses is determined in accordance with a specific formula established in the group's bylaws. In some groups, all costs (and revenues if applicable) are shared equally, while in other groups each member's share is dependent upon their respective percentage of the group's total contributed acreage. For example, if a farmer contributes 1000 acres and the group farms a total of 4000 acres, then the farmer would be responsible for 25 percent of the expenses. Due to variations in the productivity of land contributed to the group, costs and income may be adjusted in order to ensure greater equity in the bearing of costs.

[5] To the knowledge of the author, no comparable study of legally incorporated U.S. farm machinery cooperatives has been done.

A fundamental operational distinction of many of the groups in Saskatchewan is that individual farmers forgo autonomy in favor of highly integrated operations in which all revenues are pooled by the cooperative and distributed amongst the members. Under this form of agreement, the cooperative manages all field operations making all farm decisions such as what crops to plant, what duties each member is responsible for, and which brands and models of equipment are purchased or leased.

While the revenue sharing attribute of the incorporated machinery cooperatives in Saskatchewan is common, there are groups who favor maintaining individual sovereignty over decisions on their respective acreage and do not adopt this feature. The Kipling Agricultural Machinery Cooperative Ltd. (KAMCO) was established by four farming families in 1996 as a means to reduce machinery costs and solve mutual difficulties in acquiring skilled seasonal labor. The cooperative owns equipment while other assets such as land and harvested grains are owned individually. Daily operations are dictated by the cooperative (e.g. which field to plant or harvest), but members determine their own cropping program. Expenses for shared equipment are assessed on a per-acre basis according to the number of acres planted during the spring seeding. The group pools their labor resources to jointly cultivate their fields. For labor shortages, a ten dollar per hour fee is charged. Within KAMCO, members have specialized in certain activities such as bookkeeping and equipment maintenance according to their respective expertise. Sharing of equipment has been particularly lucrative for the group. The smaller farms have reduced their equipment-related costs by 65 percent from $40 per acre to $14 per acre while larger farms have experienced a 30 percent decline from $20 per acre to $14 per acre. Equally beneficial has been the reduction in time necessary for field operations

through labor pooling and using larger equipment owned by the cooperative. For one member, the time required for planting and harvesting has been reduced by 79 percent and 80 percent respectively.

2.1.2 CUMA Cooperatives

Another form of farm machinery cooperative (primarily utilized by dairy farmers in Quebec) is the CUMA or Cooperative d'Utilisation de Materiel Agricole, loosely translated as "cooperative for the use of farm implements" (Harris and Fulton 2000). In the nine years following the establishment in 1991 of the first Canadian CUMA in Saint-Fabien with assistance by Camille Morneau (a Quebec Ministry of Agriculture, Fisheries, and Food representative), forty-seven CUMA's were established in the Quebec region with over a thousand farm operations participating. CUMA's are organizations that purchase equipment on the behalf of members and rent the equipment to participants at the lowest feasible cost.

A CUMA differs from other machinery cooperatives in that they are designed to facilitate the sharing of single pieces of machinery among a group of members as opposed to sharing an entire set of equipment among the group. Each CUMA is segmented into one or more "activity branches" where each branch denotes a single piece of equipment or service. To gain access to the piece of equipment, a farmer must join the activity branch and sign a subscription contract committing to use of the machine for a specific duration (typically three to five years). In figure 2 is a diagrammatic representation of the organization of a CUMA.

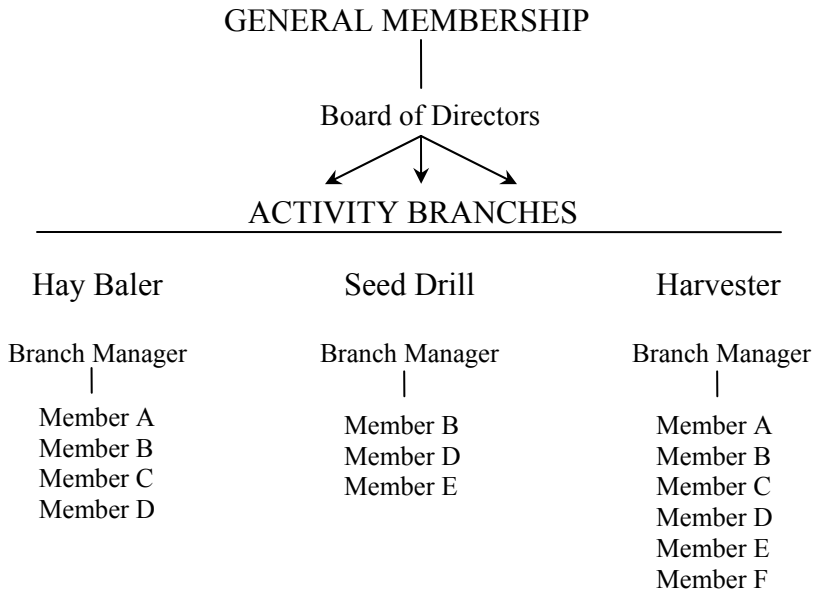


Figure 2. Sample Organizational Structure of a CUMA

Source: Harris and Fulton 2000

For a farmer to join a specific activity branch they must purchase a specified number of investment shares endowing the CUMA with sufficient equity to finance typically twenty to thirty percent of the purchase cost of the machine. The remainder of the equipment cost for an activity branch is acquired through loans taken out by the CUMA. To cover the remaining capital and interest cost of the equipment and other expenses such as insurance, storage, and repairs, members are required to pay regular membership fees that are determined by each member's proportion of use. At the end of each year, differences in collected membership fees and actual costs are either retained by the CUMA or returned to members based upon their payments.

As depicted in figure 2, there are four core administrative positions managing the CUMA: the membership, the board of directors, the branch manager, and the equipment manager. A board of directors is elected from the membership to supervise CUMA

activities. A branch manager is assigned to each branch activity to oversee contractual agreements and administer schedules. In some cases a separate equipment manager is charged with managing delivery and repair of equipment. If equipment breakdowns occurs, the branch and equipment managers are tasked with determining the cause and whether or not the member in current possession of the machine is at fault and responsible for the cost of repairs. For no-fault damage, the activity branch is responsible for the repair expense.

The rapid expansion in the number of CUMAs indicates that they have been a successful cooperative effort for reducing equipment costs for dairy farmers in Canada. Several CUMAs have extended their resource sharing to encompass labor as well as equipment. The Leclercville CUMA, which consists of twenty-two members and sixteen machinery branches has a "personnel branch" that provides replacement employees for branch members who choose to be absent for a period of time. Each year the personnel branch hires a laborer who is assigned to each of the branch members according to a schedule voted upon every three months. By sharing labor, members have the opportunity to be absent from their farm operations without encountering the typical troubles in finding short-term skilled labor.

2.1.3 Long Distance Equipment Sharing

Another established method for sharing equipment and machinery with other producers was developed by the firm MachineryLink. In this type of arrangement, producers share machinery across geographical regions, taking advantage of differences in growing seasons for the same or similar crops.

In 1997, Dave Govert, a 1,500 acre wheat farmer in Kingman, Kansas and founder of MachineryLink, was faced with the increasingly common dilemma of requiring a $150,000+ combine whose investment cost could not be justified based upon his expected use. Govert's solution was to jointly purchase and share a combine with a corn and soybean farmer in Nebraska whose harvest season did not conflict with his own. Through this arrangement, the two farmers were able to greatly reduce their initial investment for the combine but did incur additional costs for transportation of the machine between their respective farms. Stemming from this successful experience sharing equipment over an extended distance, Govert founded MachineryLink to facilitate and simplify the process for other farmers nationwide.

Figure 3. MachineryLink Equipment Movement Paths

Source: MachineryLink Web Materials

Initially a web bulletin board was developed to match farmers in different regions of the country looking to share equipment. MachineryLink later evolved and began offering the Innovation Managed Lease Program, which gives farmers access to modern efficient combines and tractors at highly competitive leasing rates. MachineryLink is

able to offer lower rates by moving equipment across the country throughout the planting and harvest seasons, thereby allowing multiple farmers to utilize the same piece of equipment. The Innovation Managed Lease Program requires a farmer to enter into a three-year lease agreement where they reserve a specific brand and model of equipment for a set of dates with a commitment to purchase a minimum number of hours of usage. The equipment is guaranteed by MachineryLink to arrive cleaned and in full working order, ready for the field by the farmer's specified date. While in possession of the equipment, farmers are only responsible for daily maintenance such as greasing or cleaning of air filters if necessary. In the event of a breakdown, MachineryLink has agreements with local dealers throughout the country and guarantees a replacement machine will be provided if repairs require more than forty-eight hours. Once a farmer finishes with the equipment for the season, they simply contact MachineryLink who inspects, services, and handles the transportation of the equipment to the next farmer in another region of the country.

The principal benefit of the MachineryLink leasing program is that it offers small- and medium-sized farmers access to the latest and most efficient technologies at a fixed predictable cost below that of a typical lease agreement. In addition to these benefits, the MachineryLink model avoids potential problems that can arise between two or more farmers who independently develop an equipment sharing arrangement. Problems such as scheduling, fee determination, repairs, and other potential contract disputes are reduced or eliminated by the MachineryLink contract and its prescribed operating policies.

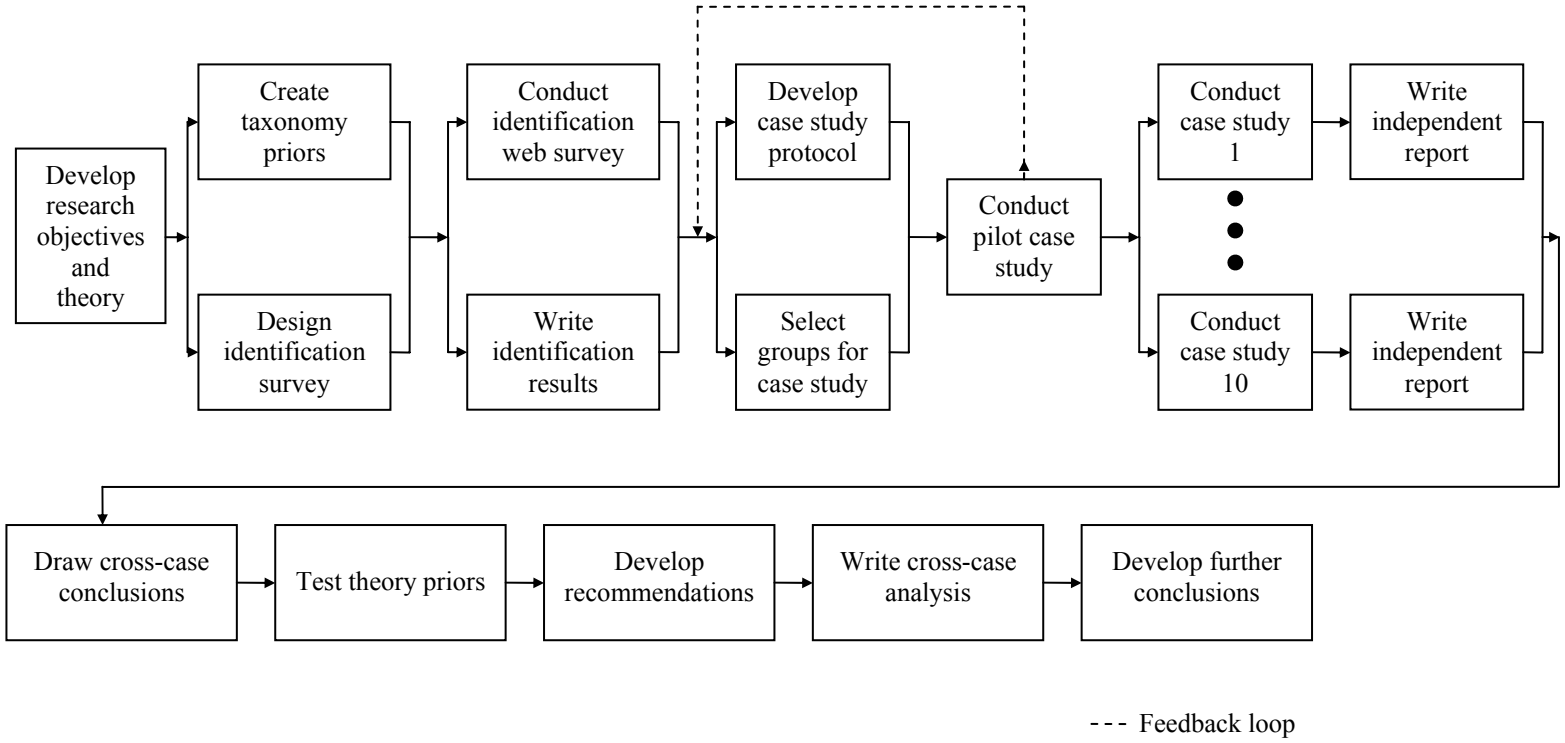
CHAPTER 3: IDENTIFICATION AND CASE STUDY PROTOCOL

3.1 Introduction

For the data collection stage of this study two phases were undertaken: (1) an identification phase to locate and gather basic information on a variety of independent farmers engaged in formal or informal production resource sharing arrangements, and (2) a case study phase to gain a more complete understanding of the organizational structure, mechanics, and efficiencies for a subset of producer groups representing the full range of organizations. Considerable attention was dedicated in the planning stages of the project to ensure a scientific approach to data acquisition was applied. Planning in the design stages and adherence to guidelines put forth by Yin (2002), were used to manage the potential pitfalls of case study analysis. In particular, efforts to avoid interviewer bias (e.g. induced reflexivity) when gathering information from case study participants were made. A pretest interview was conducted to test the approaches and refine the design.

Figure 4 is a diagrammatic representation of the development and implementation stages of the study. In this section, an abbreviated version of the identification and case study protocol is presented detailing the design of the data collection and analysis. This protocol was developed prior to starting the study and followed during the course of the project. Deviations from the protocol during the project are noted as footnotes in this section.

Figure 4. Data Collection Protocol



3.2 Introduction to the Study and Objectives

Increased concentration in the agricultural industry has amplified the pressure for small- and medium-sized producers to adapt in order to sustain their profitability. Many small- and medium-sized farms lacking the resources to expand independently have devised innovative strategies to compete more successfully. One such strategy is active cooperation with similar farm businesses. Cooperation on a small scale (e.g. trading a few days labor or sharing a small piece of equipment) is common among farmers. However, some farmers have established more formalized agreements to share equipment and labor on a routine basis. There are a wide variety of approaches to cooperation including joint purchase or lease of high value farm machinery, sharing of labor, standardization of production processes, and sharing of individual expertise.

To date, relatively little information has been compiled about production resource sharing, its nature, scale, or the overall effectiveness. The primary overarching objectives of this research project are (1) to determine the nature and extent of formal and informal cooperative farming arrangements for production resources in the Midwestern United States and (2) to understand their potential as alternative business strategies for small- and medium-sized farms. Of particular interest are independent farms that participate in a cooperative arrangement to share resources, yet retain decision making sovereignty over their assets and labor. To further expound, the following four primary objectives have been developed to define the purpose of this study.

Objective 1 *– Create a database of small- and medium-sized farms in the Midwestern United States who have engaged in formal and informal cooperative agricultural agreements.*

Objective 2 *– Using a case-based approach, conduct comprehensive analysis of a subset of producers engaged in production level cooperation and evaluate the relevant strengths and weaknesses of these arrangements.*

Objective 3 *– Synthesize the collected case study data to: (1) provide a broad analysis of the issues pertinent in resource sharing arrangements, (2) identify the effective and ineffective agreement and operation attributes, and (3) analyze the identified attributes and formulate recommendations for successful implementation of a production resource sharing arrangement.*

Objective 4 *– Evaluate a set of economic theory based predictions against case data collected in the study.*

3.2.1 Identification Questions and Propositions

The first phase of this study is unique in that it systematically attempts to identify, characterize, and catalogue previously unstudied groups engaged in this form of activity on a formal or informal basis. Three key questions and related propositions have been developed to aid in categorizing groups.

1. Who (what types of farmers) are engaging in machinery and/or labor sharing arrangements?

   Proposition: Farmers who are resource-constrained find these arrangements advantageous. Resource constraints may include financial, physical (near retirement for example), technical knowledge, and managerial capacity.

2. Why do producers enter into these arrangements?

   Proposition: Sharing machinery/labor results in: (1) cost savings, (2) access to technology that is otherwise not feasible, (3) better information and record-keeping, (4) balance of labor, (5) less risk, and (6) less stress

3. How are these arrangements organized?

   Related Proposition: There are management and/or marketing benefits, beyond those associated with machinery sharing that may result from these organizations. The more interaction between groups members, the greater the potential for these added benefits.

Information gathered about the three proposed questions will provide a general overview of how the target groups operate, and will serve as a platform for more detailed case analysis.

3.2.2 Operational and Efficiency Questions

To develop a fuller understanding of the groups beyond identification and taxonomy, more detailed information is required regarding their constitution and

performance. Information about the motivations for cooperation, development and evolution of the partnership, contractual agreements, scale and scope of labor and equipment sharing, difficulties and successes, financials, and overall performance are critical for understanding each group. Below is a general framework of topics and questions to guide the specific questions posed in the case study phase.

1. Motivations for the cooperation.
2. Planning and measures undertaken prior to formation. What alternatives were considered?
3. Current and historical cooperation with respect to labor.
4. Current and historical cooperation with respect to equipment.
5. Current and historical cooperation with respect to land and structures.
6. How are field operations, equipment scheduling, and group decisions conducted and agreed/voted upon? Is there specialization of duties?
7. General financial positions before and during cooperation[6], contracts, bylaws, and other written agreements. Details about how records are kept.
8. Benefits and negatives. What is known now that would have been beneficial earlier in the life of the partnership? What would have been done differently?

3.2.3 Analytical Questions and Propositions

Although there is little academic research about farm-level cooperative arrangements, economic theories of contracting, organization, and partnership behavior provide testable hypotheses about cooperative arrangements. By comparing the data

[6] Due to the confidentiality concerns of participants, little documented financial information was gathered during the study.

collected through the case studies through the lens of economic theories, greater insight into the unique nature of the target cooperative agreements can be gained. The following four propositions and related corollaries are proposed based upon basic economic theory as platforms for analysis.

1. There exists a positive correlation between the number of farms and/or the scale of operation with the degree of formality of the group's agreement and record keeping.

   Rival Explanation: Formal agreements are deemed less necessary when there is joint financing of equipment since the contractual agreement with the financial institution may serve as a proxy.

   Corollary 1: Given the potentially greater degree of accountability between family members (as opposed to independents) this proposition may fail in arrangements between related parties.

   Corollary 2: As a group expands in members, acreage, and/or scope, the agreement will also evolve to account for these changes (conditional on the expansions being unanticipated at formation).

2. Reduction in per acre equipment and labor costs through cooperation will trump all other benefits as participants' measure of the success of their collaboration.

3. Given the natural synergies (e.g. increased efficiency) and time constraints, equipment sharing will occur coincidental with labor sharing (conditioned on the equipment being major/vital pieces).

   Corollary 3: Specialization of field operations will be a natural occurance among joint labor operations.

4. Intangibles such as personal traits conducive to "teamwork" are essential for successful pooling of labor resources.

3.3 Identification Survey Procedures

In order to identify groups of farmers sharing production resources, a mail and web survey was administered during late 2003 and early 2004 of University Extension agricultural field specialists and county directors in five states (Iowa, Illinois, Nebraska, North Dakota, and Wisconsin). Extension agricultural field specialists and county Extension directors usually have knowledge of the farming operations in their respective regions and the farmers themselves. The five states selected for the survey were chosen because of their proximity, similarities in crops predominantly grown, and willingness to participate of their respective extension agencies. The survey asked respondents to identify groups they think fit the description of production level resource-sharing arrangements provided:

> *Independent farms that are participating in cooperative arrangements to share resources for production, yet retaining decision making sovereignty over their assets and labor.*

Contact information of the groups (if known) was also requested in addition to other general questions, which were posed following the framework outlined in the section 3.2.1. Through this survey, it was expected to yield sufficient numbers of groups (but by no means a complete list) to develop a database cataloguing different existing arrangements. Given the likelihood of incomplete or incorrect data submitted by survey

respondents, the survey was only intended to serve as an identification tool and for developing a sample of groups for possible case studies.

3.4 Case Study Selection and Procedures

3.4.1 Case Selection

Determining appropriate criterion for selection of groups for case studies was a critical part of this investigation. As detailed in the research objectives, two of the primary objectives of this inquiry are (1) to obtain comprehensive information about various types of production resource sharing agreements according to figure 1 and (2) to synthesize the data to conduct a cross-case analysis (i.e. to compare and contrast different producer groups).

Given the inherent differences that might exist between any two *individual* farming operations, it was expected that the cooperatives identified through the phase-one survey would vary to an even greater degree. Under ideal circumstances, a well designed multiple case study would consist of a single specific type of partnership with several replications (i.e. several groups that are very similar). While this design would be optimal for cross-case analysis, it would fail to satisfy the objective of gathering detailed information on a variety of cooperative arrangements. If the selected groups for the case study were all dissimilar, the problem would simply be reversed. To further complicate the problem, there is no single appropriate standard for determining which groups are "similar" enough to be considered replicating cases. For example, if the standard for determining similarity is "cooperatively engaged in farming", then clearly all cases identified would be appropriate for cross-case analysis. If the standard is "number of

years in operation", then it is quite possible that none of the cases would be suitable for cross-case analysis.

In light of these tradeoffs, it was judged appropriate to use two standards for case selection. The first standard used was to consider all identified cooperative arrangements as "similar" and suitable for cross-case analysis (care was exercised to allow for rival explanations). Thus comparisons could be made among all types of arrangements.

A second standard was then applied based on the scale of cooperation. It was proposed to select two or three cases for three[7] different subsets based upon (1) the number of members, (2) the amount of machinery shared, and (3) the formality of the contractual agreement between members. Explicitly, the criteria for selecting groups were:

Criteria 1 – *A group of farmers engaged in farm-level resource sharing (includes all cases).*

Criteria 2.a – *A small group of farmers engaged in minor levels of cooperation (includes 3 cases).*

Criteria 2.b – *A small group of farmers engaged in moderate levels of cooperation (includes 3 cases).*

Criteria 2.c – *A large group of farmers engaged in moderate levels of cooperation (includes 2 cases).*

Criteria 2.d – *A large group of farmers engaged in high levels of cooperation (includes 2 cases).*

[7] After completion of the identification phase of this study, it was determined that four subsets were more appropriate.

Hence, under criteria 1, all groups selected for case studies would be considered "similar" enough to qualify as replicating cases. Under criteria 2.a-d, only a subset of groups would be considered "similar" enough to qualify as replicating cases. Thus, by (1) utilizing the scale of cooperation as the main criteria for selection of groups and (2) including multiple groups for each subset of the cooperation spectrum; it ensured that a variety of forms of cooperation were studied and that cross-case analysis within each subset could be performed because there are replicating cases within each category.

3.4.2 Procedure for Contacting

Each cooperative group that was identified through the phase-one survey and selected for inclusion in the case study according to the selection criteria was contacted and solicited via phone for inclusion in the study utilizing a structured phone script. Basic information regarding the study was provided. For those groups willing to participate, further contact information and a set of dates conducive for meeting were requested. Interviews were conducted in a prearranged neutral location such as a local hotel conference room or suitable alternative conveniently located for the group members. One week following the initial contact, a second phone call was made to solidify the date and location of the interview.

3.4.3 Preparation, Meeting Location, and Compensation

Given the potential for prolonged interview sessions, drinks, snacks, and comfortable seating were arranged. To ensure accurate documentation, interviews were recorded[8] and conducted by at least two of the three project members[9]. Each interview

[8] Due to technical difficulties, one case was not recorded. A second case was also not recorded due to impracticalities in the interview location.

commenced with an explanation of the purpose of the research and a required signing of a disclosure and privacy statement. Due to the potentially sensitive financial disclosures that occurred during the study, names and distinct identifying information are not divulged. Following the interview, each group member was compensated fifty dollars.

3.5 Case Study Questions

3.5.1 Preliminary Questionnaire

Prior to the case study interview, a small questionnaire (see appendix 12.2) was submitted to each of the group members requesting contact information and details regarding their individual and group farms, equipment, and labor as well as some basic historical information concerning the group. This questionnaire served two purposes: (1) to facilitate a more informed interview and (2) to yield documentation for later cross checking.

3.5.2 Case Study Interview Questions

In order to fulfill the study objectives and develop a clear understanding of the disposition, operational logistics, and efficiencies of each group, a large set of information was necessary for collection. Appendix 12.1 contains a general framework of questions that served as guidance for avenues of data collection. To reduce potential biases and interviewer induced reflexivity (i.e. where an interviewee expresses what they believe the interviewer wants to hear), an open conversational approach with minimal interviewer interaction was utilized in conducting meeting. Hence, while the questions

[9] Due to scheduling conflicts and travel distances, one full case interview and a portion of a second were administered by only one interviewer.

detailed in Appendix 12.1 were not explicitly employed in administering the interview, by the conclusion of the dialogue responses to each of the applicable questions was collected.

3.6 Outline of Individual Report

For each group included in the case study phase of the study, a summary detailing their respective operation was composed. The report provides information regarding the history, motivations, agreement, operations, benefits, and difficulties of the group and individual members. Below is a general framework for the report. Given the unique features of each group, additional sections or subsets of sections were found to be appropriate and necessary for inclusion.

1. Background – A brief description of the individual and group farming operation.
2. Motivations – The factors that led the independent farmers to pursue a cooperative approach to agriculture.
3. Labor Solution – Including issues such as transfer payments, specialization, and operational details.
4. Equipment Solution – Including issues such as financing, purchase decision dynamics, and independent versus joint expenses.
5. Group Dynamics – An overview of the group decision-making process, record keeping, entrance and exit from the group, etc.

6. Benefits and Difficulties – Other attributes not directly pertaining to labor or equipment
7. Concluding Remarks

3.7 Pilot Case Study and Protocol Modifications

In order to refine the data collection component of the case study protocol, a pilot case study was conducted in which a producer group identified through contacts at Iowa State University was interviewed. The group was selected for a pilot inquiry, as opposed to being included in the formal case study phase, because it was infeasible to interview several of the participating members due to geographical constraints. However, it was useful to test and refine the interview process. As a result of the interview, several refinements of the case study protocol were implemented regarding the (1) interview location, (2) collection of information not disclosed during the interview, and (3) interview report.

3.7.1 Interview Location

As stipulated in the original case study protocol, interview locations were to be selected to facilitate participation of group members and for overall convenience. The pilot study was conducted in one of the group member's residence. Several problems arose due to the familiar location including interruptions (phone calls and visitors) and a lack of formality. Following the interview, the case study protocol was modified to specify that interviews would be conducted at neutral third-party locations

3.7.2 Post-Interview questionnaire

In order to account for potential omissions of sensitive or negative information during a group interview session, the following section was added to the case study protocol.

Following each interview, members were given a post-interview questionnaire which could be returned via a pre-paid post envelope. The document asked members to, if willing and applicable, provide any information they (1) may have forgotten to mention that they believe is relevant or (2) may have felt uncomfortable providing during the interview. Since each group was interviewed collectively, as opposed to each member separately, there is potential for bias through omission of sensitive aspects regarding specific members, decisions, or the group as a collective. It was hoped that the post-study questionnaire would provide members a non-threatening avenue to provide this type of information

3.7.3 Interview Report

From the pilot case study it became evident that the general structure of the interview report detailed in Section 3.6 would likely require adaptation or modification for each specific cooperative group in order to result in a fully encompassing analysis. While the interviewed pilot group consisted of only two family farms operating cooperatively, several specific and relevant components of their partnership arose during the interview that did not directly correspond with the framework detailed in the case study protocol. As well, from the interview it was evident that for more complicated or highly integrated groups, that the notion of an “equipment solution” or “labor solution”

may not be applicable. As opposed to omitting pertinent details or imposing a restrictive design on the interview reports, a more malleable structure to the reports was taken.

CHAPTER 4: IDENTIFICATION SURVEY RESULTS

4.1 Phase One Identification Survey Results

For the identification phase, a total of 207 surveys were distributed to University Extension agents and county directors in Iowa, Illinois, Nebraska, North Dakota, and Wisconsin. In the survey, respondents were asked to identify groups of farmers matching a provided description of production-level resource sharing (see appendix 12.1). A total of forty-seven surveys were completed and returned for a response rate of approximately twenty-three percent. The survey responses identified fifty groups of producers engaged in resource sharing arrangements matching the provided description. An average of 0.24 groups were identified per survey distributed, and an average of 1.05 groups per survey returned. The majority of the groups identified are located in Iowa (28 groups), followed by Illinois (10 groups), Wisconsin (7 groups), Nebraska (4 groups), and Indiana (1 group). A map of their locations is displayed in figure 5. In addition, several groups of producers were located through either word-of-mouth or through agriculture workshops attended by project participants.

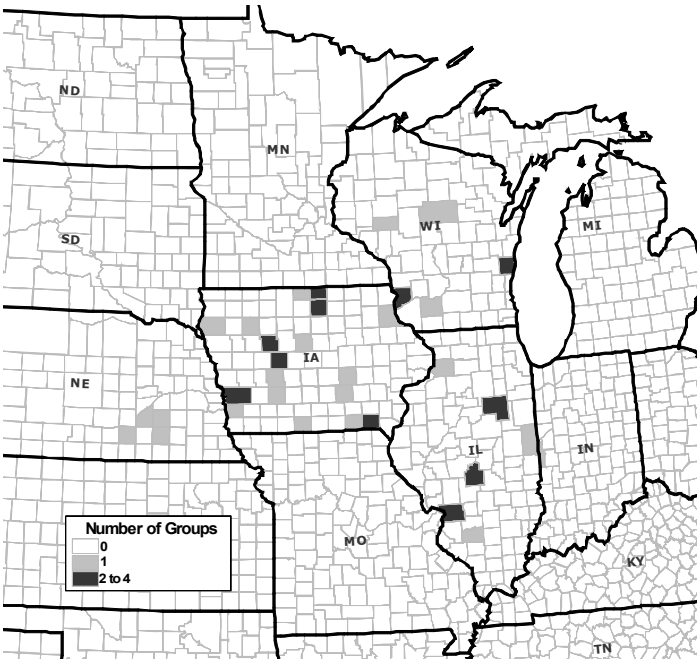


Figure 5. Location of Producer Groups Identified Through Survey

4.1.1 Size of Group (Number of Members)

The majority of identified groups are small, with two or three members (39 of 50). Fourteen percent (7 of 50) have four or five members, while eight percent (4 of 50) have six or more members.

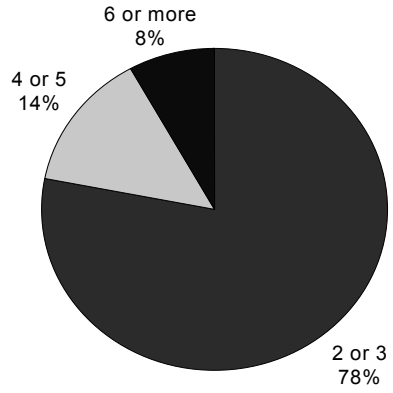


Figure 6. Number of Group Participants

4.1.2 Relationship of Group Members

Half of the identified groups contained no family members. Thirty percent of the groups were comprised solely of family members and eighteen percent were a combination of family and non-family members.

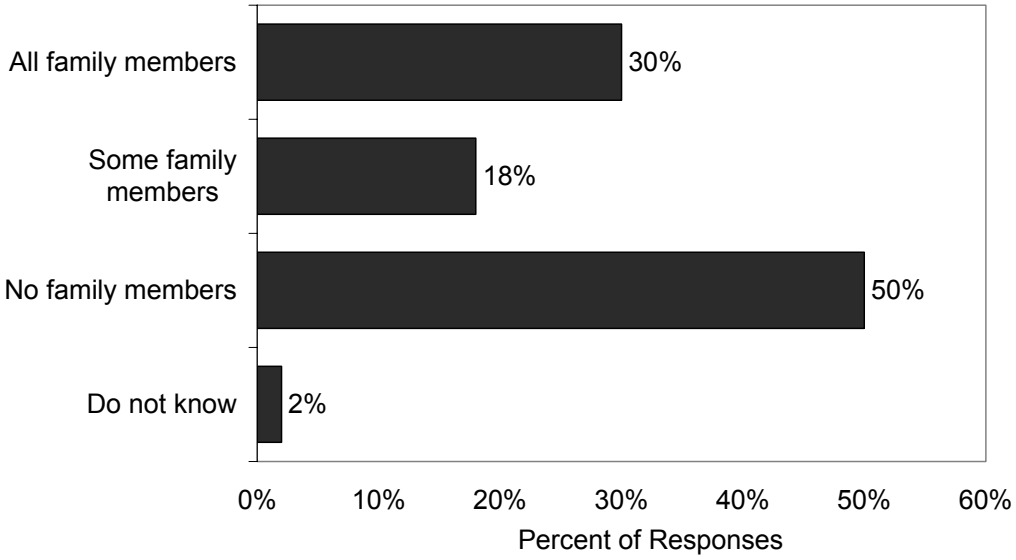


Figure 7. Relationship of Group Members

4.1.3 Age of Group

Approximately half of the identified groups have been in existence for more than five years. Slightly less than half have been operating less than five years. For six percent of the groups the survey respondents did not know the length of existence.

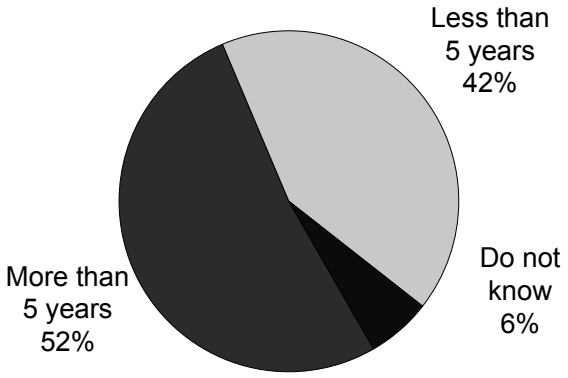


Figure 8. Age of Group

4.1.4 Resources Shared by the Group

The majority of identified groups (70 percent) share both machinery and labor. Fourteen percent were reported to share only machinery, while ten percent reportedly share only labor. It is not known what resources are shared by the remaining six percent of the groups. A variety of equipment types were identified in the respondents' comments. A number of groups share sprayers, combines, and harvest equipment. Also mentioned was equipment for haying, manure hauling, seeding, and irrigation.

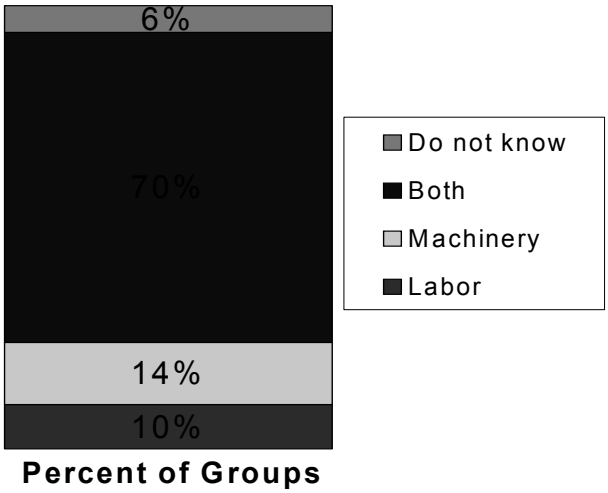


Figure 9. Resources Shared by Groups

4.1.5 Type of Agreement

Approximately half of the identified groups have a verbal agreement for sharing resources. Only eight percent of those identified have a written agreement. However, for a significant portion of the groups (40 percent) the type of agreement is unknown.

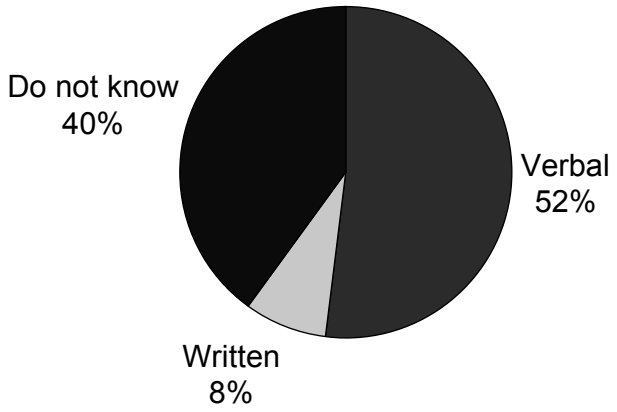


Figure 10. Type of Agreement

4.1.6 Identification Survey Discussion

The identification survey was successful in answering two pertinent questions: (1) Are there farmers operating cooperatively with respect to production activities, and (2) ff these groups exist, what are their general characteristics. As expected, the response rate of the survey was relatively low, but the total number of groups identified and the identification rate for those surveys returned indicate that this form of cooperation does occur with some degree of frequency in the Central and Western corn belt. This, combined with the relatively even equal division for the age of groups above and below

five years, indicates that this from of cooperation has existed for years with little attention in the research literature.

The vast majority of identified groups share both equipment and labor (70 percent). This tends to agree with the expectation that joint integration of equipment and labor between two or more farms is more efficient than either component individually. The large percentage of family groups and verbal agreements viewed concurrently could indicate that groups primarily consisting of family members deem formal agreements as less necessary. As expected, these and the many other questions and propositions outlined in this study cannot be adequately answered from the data collected in this preliminary identification survey. More detailed and exhaustive interviews are required to obtain information that is more comprehensive.

CHAPTER 5: CASE REPORTS AND ANALYSIS FOR: FEW MEMBER, MINIMALLY INTEGRATED COOPERATIVE GROUPS

5.1 Introduction

As farming continues to evolve into an evermore capital intensive business, the cost of machinery has become a major factor in success and profitability. As new technologies and greater machine efficiencies have been introduced, prices have continued to escalate. For farmers in the Midwest, no single equipment piece commands comparable costs or greater capital outlay than the combine. While the cost of a modern combine is substantial, most farmers see the increased harvest speed, productivity, and superior technologies as vital for maximizing yields and profits.

Despite the indispensability of the combine, many farmers struggle to justify the expense of individually owning a piece of equipment that is utilized for only a few weeks out of the year. In this section, the case studies of three different groups of farmers are presented detailing their differing cooperative approaches in gaining access to modern combines while controlling their costs. All three groups grow corn and soybeans and operate in Nebraska, North Dakota, or Minnesota.

5.2 Johnson and Olson

Number of Current Members:	2
Year Cooperation Began:	2003
Total Acres Farmed (approx):	1600 (800/800)
Major Shared Equipment:	Combine

Agreement Type:	Verbal

Table 1. Johnson and Olson Group Characteristics

Background

Gary Johnson and David Olson are two fairly typical neighboring Nebraska corn and soybean farmers who found a solution to their labor and equipment problems through cooperation, trust, and flexibility. Gary Johnson has progressively taken greater control over management of his family's 800-acre farming operation as his father, now in his early seventies, has begun to ease into retirement. Johnson's brother, who has a fulltime off farm job, contributes labor to the family operation, particularly during the busy planting and harvest seasons. In addition to crops, Johnson has a livestock operation that includes a 150 cow-calf operation and a 25 sow farrow to finish operation. David Olson, who operates on a bordering 800-acre tract of land, has been operating independently since his father passed away in 1999. A retired farmer friend who still enjoys getting out in the field has been Olson's only source of additional labor during busy seasons.

Motivations

In 2003, Gary Johnson and David Olson found themselves confronted with remarkably similar situations. Johnson was faced with the prospect of finding a reliable skilled person to help fill the labor void left by his retiring father. Analogously, the retired farmer assisting Olson was unfortunately experiencing progressive health problems requiring Olson to consider finding additional help, especially during planting and harvest. In addition to their common skilled labor shortage, both farmers owned

aging combines that would soon need to be replaced. Productivity, in particular, was a major concern for Olson who had lost several days in the field during harvest because of increasingly common combine breakdowns. After discussing their mutual problems, Johnson and Olson decided that they might be better off if they pooled their labor and capital and shared a larger combine. Working together they could eliminate the need for hiring outside labor and upgrade to a new combine with a larger capacity and more advanced features and potentially reduce their costs per acre in the process.

Equipment Solution

Purchasing a top-of-the-line combine was not an economically feasible possibility for Johnson or Olson individually. As individuals, trading in their old combines for a newer used combine was the only reasonable solution for eliminating their productivity losses from breakdowns. They realized that if they were to buy a combine together, they would be able to purchase a new, larger combine with additional technologies that both operators desired (e.g. GPS mapping, yield/moisture monitors). Neither one would be able to afford a machine with these features individually. To purchase the combine both farmers traded in their old combines, corn heads, and platforms and financed the remaining balance 50/50. While each owns 50 percent of the new combine, Johnson's brother contributes 25 percent of the total payment (one-half of Johnson's share). Neither farmer noted any difficulties with arranging their joint combine purchase with their lender. They receive separate statements and bills for their respective half of the equipment payments. In the event of repairs or breakdowns, the two farmers have agreed to share the expenses evenly. Both farmers noted significant advantages from purchasing

the combine together. Aside from the primary benefit of a reduction in their capital expense and per-acre combine costs, both farmers expressed great satisfaction with the speed and added technological features of the new machine.

Labor Solution

To solve their common labor problem, Johnson and Olson decided to work their fields together, thus avoiding the expense of hiring additional labor. During harvest, they view their neighboring fields as one farm, combining crops on each farmer's land when they are ready to be taken off. Generally, when operating on Johnson's land, Olson runs the combine while Johnson handles storage and drying and vice versa when operating on Olson's land.

This may be done because they view storage and drying as the more critical function. They do not have an established schedule or order for selection of fields to harvest. At the end of each day they discuss a start time for the next as well as which fields should be tended. Both Johnson and Olson are experienced farmers and did not cite any difficulties or complaints from harvesting together to note. By operating together, both farmers said that their labor costs have been reduced because they no longer need to hire outside help. Additionally, the combination of a new combine and labor sharing has resulted in greater efficiency and improved work hours for both.

Benefits and Difficulties

The decision by Johnson and Olson to jointly purchase and share a new combine and to harvest their crops together was not a radical alteration of their independent farm

operations, but it has been highly successful in solving their common problems. Purchasing the new combine, which was not feasible individually, eliminated their productivity losses from breakdowns, reduced their respective combine costs, increased the speed of harvest, and facilitated access to modern combine technologies. By harvesting together, each farmer has been able to eliminate the expense of additional labor as well as the difficulty in finding trustworthy skilled labor. Overall, neither farmer had any negatives to report from their cooperative efforts.

Concluding Remarks

Johnson and Olson entered into the cooperative agreement because of their corresponding difficulties in acquiring skilled labor and their respective underutilization of individually owned combines. Their common need for peak season skilled labor and the inefficiency of individually owning an expensive combine made cooperation a logical solution to their problems.

The success of the cooperative arrangement is largely the result of three key factors. First, utilizing a common combine has in fact yielded the equipment savings they desired in addition to permitting the members to gain access to technologies, such as GPS mapping, that would not have been obtainable individually. Second, there is a strong mutual trust between them. While the benefit of avoiding the expense of hiring outside labor is certainly valued among the members, this benefit would not have been obtainable without a level of trust that permits each member to operate unsupervised and, to an extent, independently on the other member's land. Both Johnson and Olson agreed that they were of the mentality that "we want it done and we want it done right, but we aren't

going to lose sleep over it". The third key for the group's success is the degree of flexibility each member exhibits in their operation. Operating as a group inevitably leads to some alteration in the scheduling and routine of field operations and possibly a different approach to operations from how they are conducted individually. A need for some flexibility was cited by both farmers as being a necessity for a cooperative arrangement to be successful. "You have to be flexible in your partnership" and "you have to do some give and take".

5.3 Smith and Stevens

Number of Current Members:	4
Year Cooperation Began:	2002
Total Acres Farmed (approx):	3250 (1500/1300/450)
Major Shared Equipment:	Combine
Agreement Type:	Verbal

Table 2. Smith and Stevens Group Characteristics

Background

Beginning in 2002, John Stevens and the Smith brothers, Bill and Joe, embarked upon a simple, yet successful, labor and combine sharing arrangement that has not only reduced their equipment and labor costs, but has made field operations more enjoyable for all of them. Since the formation of their cooperative effort, the group has added a fourth member, Sam Peterson, who is a young family acquaintance of the Smiths, to the group. In total, the group operates approximately 3250 acres of corn and soybeans split

fairly evenly among the three primary members. While Stevens and the Smiths have similar operations in terms of acreage, they have different cropping systems (Stevens is ridge till while the Smiths are predominantly no till). In this respect, their arrangement differs fundamentally from most of the arrangements analyzed in this study. Most of the cases included in this study involve producers with either similar or identical production practices.

Motivations

Prior to the formation of the group, Stevens and the Smith brothers faced the common problem of a labor shortage during the peak periods of the crop season. In 1998, the Smiths tragically lost a third brother who had farmed with them, leaving the remaining two brothers short a skilled operator. The Smiths had expanded their hog operation and were having difficulty meeting the cumulative labor demands of their grain and livestock operations without the third brother. Stevens as well found himself shorthanded during peak periods of the growing season following the retirement of his aging father in 2002.

In conjunction with their common labor shortage, all three farmers shared a similar view regarding the unproductive nature of individually owning a combine that was not utilized by an individual operator to its full capacity. They felt that by forming a partnership and working their fields together with a larger more technologically advanced combine would significantly increase their efficiency. As one member stated, “three people go [harvest] twice as fast as two”. The fourth member Sam Peterson, was a new farmer without equipment of his own, joined the group as a means to address his lack of

sufficient capital. He believed that trading his labor to the group for access to their equipment would permit him to enter farming and eventually become a profitable independent operator.

Equipment Solution

After finalizing the plan for their partnership, Stevens and the Smiths decided to purchase a new Case International combine from a local dealer. They jointly financed the purchase 50-50 between the two parties. While the Smiths had been loyal to a different equipment brand, they agreed to purchase an International combine at Stevens' request because of his expertise in the mechanics of the particular brand. To maintain their parity in contributions to the group, Stevens supplied the headers for the combine while the Smiths purchased the air reel. To handle expenses such as repairs and parts, Stevens and the Smiths have a dual account with the local dealer. Insurance for the combine is covered under Stevens' blanket farm policy.

Labor Solution

During harvest, the group treats their individual land as one continuous unit, working fields based on soil conditions and maturity of crops. Differences in preferred working hours, which potentially could have been a source of conflict, has turned out to be a positive benefit. Stevens, who is an early riser, starts his day well before sunrise, while the Smiths prefer to start their day post sunrise and work later into the evening. The group has found that staggering the labor schedule is highly beneficial. The combine is running in the fields more hours per day than would be the case if they were operating

individually or as a group during a shorter workday. In particular, the Smiths have found that the addition of Stevens and Peterson has alleviated their peak season labor problems as they attempt to balance the labor demands of their growing livestock operation with their crop labor demands during harvest.

Benefits and Difficulties

By all accounts, the combine and labor sharing arrangement has been a success. In addition to the savings from jointly bearing the costs of the combine, Stevens' skill as a mechanic has allowed the group to avoid the expense of hiring the local dealer for repair work and end of season maintenance. It is important to note that Stevens is not compensated for providing additional skilled labor for equipment maintenance. Stevens did the same work for his combine before the group formed.

The cooperative labor effort, which eliminated the need for hiring outside help, has also had the bonus of avoiding the problem of training and overseeing new help every season. The group noted that with the contribution of additional members the stress and hurried rush of harvest has diminished. As one member noted, it permits group members to "take time off without feeling guilty". Aside from the financial and time advantages, the group noted that the social aspect of working as a group has been a significant benefit and find working as a group more enjoyable than working alone. There seems to be a level of satisfaction in getting the job done while being a part of an effective and successful team.

Concluding Remarks

The group was formed out of a realization that each of their individual combines were being underutilized. There was a desire by two of the original members to invest more capital in their livestock operations and by the other original member to obtain more labor at key times in the crop year. The addition of a fourth farmer providing labor, but no capital, appears to have furthered the goals of the original group members as well as benefiting the new farmer in starting to operate his own acres.

Although the group members are similar in their goals and preferences, there are differences among them. Rather than permitting these differences to become problems, they have learned to capitalize on them and use them to their advantage. Early recognition that differences existed, tolerance and a strong mutual respect among the partners appears to be a key to the success of the group. Their willingness to jointly and amicably determine which fields should be worked first and to cohesively operate their land as a single unit has proven profitable.

Utilization of one combine at very low unit costs is also an important factor in the success of the group. The mechanical skills of Stevens and his willingness to search for a discounted demonstration machine with few hours of prior use contributed to the overall equipment savings. Likewise, the labor provided by the Smiths and the beginning farmer is an important factor for the group's continuing success. This pooling of labor during the harvest season is also vital in meeting the labor needs confronting Stevens since the retirement of his father.

Finally, it appears that the social component of working together during the periods of peak time pressure is an important factor. The group's friendly relationship

helps ease some of the tensions during harvest as well as permitting members to on occasion "take some time out" for other activities during without detrimental effects for the overall operation. The combination of equipment savings, access to skilled labor, and an enjoyable working dynamic has resulted in a profitable arrangement that the members plan to continue well into the future.

5.4 The Duncans and Fergusons

Number of Current Members:	3
Year Cooperation Began:	1996
Total Acres Farmed (approx):	5500 (4500/1000)
Major Shared Equipment:	Combine
Agreement Type:	Written (LLP)

Table 3. The Duncans and Fergusons Group Characteristics

Background

In 1996, the two Ferguson brothers began looking to trade one of their combines that they used on their farms in north central North Dakota. Due to the escalating cost of machinery, they were searching for a better way to utilize such a high priced piece of equipment. The idea of sharing a combine was sparked by a MachineryLink exhibit at the Minot Agriculture Show. At the time, MachineryLink was primarily engaged in trying to help farmers find partners for forming long distance equipment sharing arrangements. The exhibit had a list of farmers who were looking to share equipment from which the brothers contacted three perspective partners located in Minnesota

regarding possible sharing a combine. They chose the Duncan brothers, who farm in southwest Minnesota, based on the number of machine hours they required, the timing of their needs, and the fact that they were currently running the same brand of combine. The arrangement has now been operating for eight years and has survived a number of obstacles including the death of one of the original partners and serious financial difficulties experienced by the Duncan brothers. In the two preceding years the Duncans had lost their sugar beet crop and their local sugar processing cooperative had closed. While these events had serious implications for the agreement and potentially could have resulted in failure, the agreement has survived for eight years.

Motivations

For the Ferguson brothers, the primary motivations for entering into this sharing arrangement were escalating machinery costs and inefficient use of the machinery. The combine they share with the Duncans is a second combine for the operation. Having access to a second combine is most crucial for harvesting small grains, which comprise the bulk of their crop acres. Timely harvest is more critical for crops such as wheat and barley where harvest delays can result in loss of grade and quality. For their fall harvested crops, including sunflowers and corn, timing is somewhat less critical and the added machine capacity is less critical. Since a smaller percentage of their acres are planted with these crops, one combine is sufficient and the harvest takes place over a longer period.

Equipment Solution

Once the two parties had agreed to share a combine, each member farm of the partnership solicited quotes from their local dealer for a new combine. They settled on a Minnesota dealer, since the North Dakota dealer would have needed to fit the machine with special tires to accommodate the corn and bean rotation employed by the Duncans. The Duncan brothers traded in their combine, while the Ferguson brothers sold their old machine outright. The sale triggered recapture of depreciation for the Fergusons, but they were able to offset the loss with depreciation on the new machine and felt it was worth it in the long run.

Originally, the Duncans and the Fergusons had planned to trade the combine every two years as the warranty expired. Unfortunately, a combination of escalating machinery costs and financial difficulties suffered by the Duncans made this infeasible. Therefore they kept the original combine for seven years. In 2004, they found a hold-over combine in southeast North Dakota that made trading in their shared combine financially feasible. They not only received a good price for the combine, but they also negotiated with the dealer to provide all maintenance for the machine and to store the combine for the following two years.

Organization Structure, Financing, and Logistics

The two farms established a limited liability partnership (LLP) that owns the combine and pays all associated expenses, but has no other assets. Any profits left at the end of the year rolls back to the owners on a 50/50 basis. Each farm pays the LLP $80 per hour to use the combine. This adjusts for any differential in use between the two

partners. This payment covers their expenses, including the $1300 one-way transportation cost of trucking the combine between their farms.

The Fergusons financed the combine and then used a contract for deed to transfer ownership to the LLP. The bank preferred to loan funds to the Fergusons rather than to the LLP, since the LLP has no other assets.

A lawyer was hired to draft the LLP agreement and an operating agreement that outlines the terms of operation, purchase, liability, and an exit strategy. One of the Ferguson brothers does all of the bookkeeping for the LLP and pays the bills. Repairs are taken care of as needed and since the combine is under warranty, repairs can be performed at either location by their respective local dealer. Both farms do maintenance as needed.

Until the recent agreement with the southeast North Dakota dealer, they had stored the combine in Minnesota. The machine moved to the Ferguson farm in the spring in time for small grain harvest and on September 20, it moved to the Duncan farm for corn and bean harvest. This September 20 date is somewhat flexible depending on the harvest conditions in any given year. For example, in 2004, harvest was late in both locations, so the Fergusons kept the combine past this deadline before transporting. They try to be as flexible as possible and to communicate with each other to work out solutions that benefit both parties.

Benefits and Difficulties

Both farms have been generally happy with the arrangement since they invested only $100,000 to obtain access to a $200,000 piece of machinery. Upgrading to the

bigger, newer machine they currently own has also saved time in the field. One of the biggest issues with long distance equipment sharing is trust. Farmers do not typically enter into an agreement with someone they do not know well or not at all. One of the Ferguson brothers said that any worry he had about this was reduced by the limited liability agreement they put in place. There was some comfort in having an explicit written contract that detailed the terms of the agreement. Although they have been willing to be flexible in enforcing the agreement, it still provides an underpinning that serves to protect all parties. In some respects, the agreement makes the partnership more willing to be flexible when conditions make it desirable to do so.

Financial disclosure prior to the formation of the LLC was also a factor. The partners shared financial information (e.g. balance sheets) with one another before forming the partnership. This also helped alleviate doubts about the viability of the equipment sharing LLC and increased the level of trust between the two operations. The more formal agreement along with financial transparency was an important factor in their ability to deal with the encountered unexpected problems.

Concluding Remarks

The machinery arrangement between the Duncan and Ferguson brothers is unique among the cases included in this study in that they exploit geographical differences to facilitate their equipment savings. This form of arrangement alleviates some of the complications of sharing a combine locally, but presents other potential pitfalls. A partnership between two parties of no relation and with no direct contact inherently involves greater uncertainty than in the case of two farms located in close proximity. By

sharing financial records the two parties were able to partially allay concerns regarding the arrangement. Additionally, the formal contract governing the agreement assists in insulating each party from potential financial or operational risks in the event of complications.

Flexibility in timing of combine transfer and equipment upgrades appears to be a critical factor in the longevity of the agreement. Both parties have been amenable to delays in relinquishing use of the combine when weather has resulted in timing changes during harvest. Although, it is unclear whether the Fergusons would agree as readily to transfer date changes if they did not possess a second combine.

The overall cost savings of the arrangement for the two parties is without question. Each party was able to halve their initial investment and financing costs for the combine while only incurring an additional expense of $2600 for yearly transportation fees. Over the course of the eight year arrangement this has resulted in significant cost savings.

5.5 Cross-Case Analysis

A common thread underlying each of the groups described in this section is their desire to reduce their combine costs without incurring losses of efficiency in the field or costly delays in harvest. Yet the approaches pursued by the groups distinctly differ, with two groups sharing a combine locally and one group sharing a combine over a geographical distance. There are trade-offs involved between these two types of arrangements. Given the nature of corn and soybeans and the relatively short window for optimal harvest, both machine time and labor are at a premium. Sharing a combine

locally permits pooling of labor and may eliminate the need for hiring additional workers while allowing each partner sharing the combine to harvest their fields in a timely fashion. However, the machine itself must have the capacity to harvest all of the partners' fields within the relatively narrow harvest window with little or no loss of quality or yield.

In contrast, the "sharing over distance" arrangement entered into by the Ferguson group does not entail harvest time competition for machine time since there are differences in cropping programs and harvest seasons between the members of the group. However, there is no opportunity for sharing labor among the partners during the peak labor demand period of harvest. Thus, while the machine is available for each partner's exclusive use during harvest, hiring additional labor during harvest may be necessary.

While sharing over distance has the added benefit of not introducing direct competition for machine time, it does have other complications not present in a local sharing arrangement. Aside from the added cost of transportation of the combine between member farms, sharing over distance could create serious conflicts regarding timing of harvest and combine delivery. Depending upon the weather, crops, locations, and harvest seasons for the members involved, there is potential that one member may not have completed their harvest prior to the subsequent member requiring the combine to begin working their own fields. This potential pitfall is partially alleviated in the case of the Fergusons. Since the combine they share is not their primary machine, minor delays in delivery are not as consequential. However, if this were not the case, some type of contingency plan would be advisable.

Although the combine sharing arrangements have resulted in satisfactory cost savings for each of the groups described in this section, sharing a combine between two farms does not necessarily result in a reduction of combine expenditures by half for each party. The two groups sharing locally both purchased combines that were larger and more technologically advanced than those that they initially owned individually. The decision to purchase a "better" combine arises from the group's requirement for a machine capable of handling their combined acreage and for access to more modern features such as GPS mapping. Hence, while the expenditure for the new combine is evenly split among the cooperating members, the collective expenditure by the group is greater than what one member might incur individually if not cooperating. Stated differently, each member's combine payment is more than fifty percent of what they were paying before entering into the cooperative arrangement. This may explain why many groups form when the partners face a need to replace their existing combines. When a combine must be purchased the farmer is likely facing greater combine expense whether or not they enter a sharing arrangement. The added expense is, however, lower if some type of shared arrangement is pursued. In the case of the group sharing their combine over a distance, the requirement for a larger combine capable of simultaneously harvesting each member's fields is not required. However, in some cases a larger machine may be selected to provide some cushion to ensure that the exchange date is met or relieves time pressure in the event of delays. The additional expense of roundtrip transportation for the combine each year is also incurred.

One of the most attractive features of the arrangements of each of these groups is the sheer simplicity of their cooperation. Sharing only one piece of equipment allows

each farmer to remain largely autonomous with dependence upon the other party only during a few weeks out of the year. While neither of the groups sharing locally have a written contract detailing how they would handle certain contingencies (e.g. a member deciding to leave the partnership), because they jointly finance their combine through the same lender they, in a sense, do have a written contractual arrangement. By financing together, they have an "exit strategy" in that the group can sell their combine (if owned) or terminate their lease and resume their original status as an individual combine owner. This attribute is particularly appealing during the initial formation of a cooperative. If there is some uncertainty about whether or not the arrangement will succeed, it provides an escape option. If at any point in the future, the projected financial gains are not realized, the group can simply part ways with minimal capital losses as a result of attempting to share the combine.

Overall, the cooperative arrangements detailed in this section demonstrate that it is feasible to reduce the cost of a single expensive piece of machinery, such as a combine, with minimal risk through a simple sharing arrangement. In the two cases where the machine is shared locally, the agreements also demonstrate the benefits of sharing labor and working together during the harvest period when demands for high quality labor are greatest.

CHAPTER 6: CASE REPORTS AND ANALYSIS FOR: FEW MEMBER, MODERATLY INTEGRATED COOPERATIVE GROUPS

6.1 Introduction

Historically, a much larger number of hours of labor per acre have been required to successfully operate a farm compared to present day farm operations. Technological advances, changes in tillage practices, and larger capacity farming equipment have drastically reduced the number of operators needed for field work. However, the skills required to effectively operate modern machinery have created additional problems in obtaining dependable and capable labor during the busiest periods of the growing season. The complication and expense of acquiring proficient outside labor has led many farmers to pursue alternative arrangements in order to meet labor demands without incurring additional labor expenses. In this section case studies of three groups of farmers who have engaged in cooperative resource sharing arrangements as a strategy to pool their labor for field operations as well as reduce per acre equipment costs are documented. In all of these cases, the participants share a wide variety of equipment and work together in planting, pest control, as well as in harvesting their crops. While access to labor was an important factor for the formation of the resource sharing groups described in this section, access to machinery and a reduction in equipment costs were also motivating factors. These partnerships are characterized by a broader scope than those described in chapter 5.

Since these groups are larger in scale and involve more complex interactions among the participants, there is greater risk involved. The story of the failure and the

ultimate collapse of the Bennett group illustrates the need for exercising caution and understanding the potential consequences of entering into a cooperative arrangement without adequate information and prior planning. This case underlines the necessity for detailed advanced planning, full understanding of any financial limitations that individual partners may have, and the importance of selecting compatible partners. Each of the groups described in this section are located in Iowa or Illinois and primarily cultivates corn and soybeans.

6.2 Anderson and Parker

Number of Current Members:	2
Year Cooperation Began:	1997
Total Acres Farmed (approx):	4600
Major Shared Equipment:	Combines, tractors, planters, sprayer , etc.
Agreement Type:	Verbal

Table 4. Anderson and Parker Group Characteristics

Background

After striking up a conversation during a local farm sale in early 1997, two farmers in Southwest Iowa established an informal agreement to share labor and machinery to mutually benefit their individual farming operations. Both had reputations as hard working careful operators, but they knew each other only casually before they began working together. Both farmers owned land near town and had small livestock operations. During the first year of their partnership, they planted and harvested their soybeans jointly but harvested their corn separately using their own combines. Since the

initial success of working together in 1997, the two farmers have steadily increased their level of cooperation as well as expanding their acreage. Over the years, they have rented more land, both individually and jointly, and have expanded their total acreage from 2000 acres in 1997 to approximately 4600 acres in 2005. In addition to operating the owned and leased land, they have occasionally provided custom planting, spraying, and harvesting services for other neighboring farms.

Motivations

In 1997, when the two farmers initially began their cooperative efforts, they were motivated to enter into the arrangement for starkly different reasons. Anderson's operation was financially sound and performing well, but he faced a skilled labor shortage after the retirement of his father. His options, as he saw them, were to either scale down (or possibly eliminate) his livestock operation or to take on the additional expense of hiring a full time operator. In contrast, Parker's operation was experiencing financial difficulties. Disease had decimated his hog operation, leaving his farm with insufficient capital to afford equipment upgrades and replacements for the crop side of his operation. Parker was looking for options that would allow him to exit his hog operation, and his dependence upon its revenues, while permitting him to revamp and concentrate his efforts on his cropping operation.

While the financial states of the two farms were quite dissimilar in 1997, their assets and needs meshed well. Anderson had equipment that was nearly sufficient to handle the workload of both their farms, but required skilled labor. Conversely, Parker had labor to provide, but predominantly owned outdated equipment that was resulting in

efficiency losses from breakdowns in the field. A cooperative effort seemed to be a logical and mutually beneficial strategy for both farmers to use in meeting their individual needs.

Equipment Solution

During their first season working together Parker retained all of his equipment but both farmers used farmer Anderson's equipment on each other's acreage. Since the initial success of their first season operating together, Parker has gradually sold the majority of his outdated equipment while Anderson has expanded his equipment ownership to handle the growing acreage of their farms. The reduction in equipment requirements has enabled Parker to lease a new combine of his own, which he trades in on a yearly basis. Without the arrangement, he would not have been able to afford a combine of the same quality and size of the one he now owns.

Currently, Anderson owns the majority of the equipment used by the group. His contributed pieces include a combine, three large tractors, two twelve-row planters, and a sprayer. Parker contributes a combine and a small tractor of his own. In addition to their individual pieces of equipment, the farmers have jointly purchased a V-ripper, a water semi, and a grain cart. They financed these purchases through a local dealer using a dual account system on a fifty-fifty basis. On all of the equipment used by the group, the farmers equally split all maintenance and repair costs.

Labor Solution

The partnership farms their land both together and separately. During planting, they tend to work the fields individually, although it is not necessarily the case that each plants their own fields. In recent years, one person has started on the lands east of town, the other on the lands west of town and they have moved toward one another, ending in the same field on the last day of planting. They harvest jointly due to the amount of equipment and people required in the field at any one time. Working together has allowed them to forgo some of the cost of hiring extra help, although they do hire seasonal help during harvest, consisting mostly of local retirees and Anderson's stepson. Despite the fact that they work together, the need for outside help has increased somewhat over the years due to the increase in the size of their operation. They have also considered hiring someone to run their sprayer, but mentioned that finding a careful operator has proven difficult.

Parker also supplies some labor to Anderson's cattle operation when needed. They use the Iowa State University custom rate to value their labor on a per acre basis with Anderson generally compensating Parker for his labor since he has considerably more land.

Benefits and Difficulties

Anderson and Parker deem their cooperative efforts as a success and intend to continue their collaboration into the future. The arrangement has enabled both farmers to expand significantly beyond the level that they believe they could have achieved individually. Parker has been able to recover from the financial difficulties caused by his

hog operation and to expand his crop operation despite the severe capital limitation he faced upon beginning their cooperation. He feels significantly more relaxed now because the partnership has alleviated some of the financial risk he faced when working alone prior to the agreement. Anderson has avoided the expense and difficulty of hiring and supervising a skilled operator with sufficient trustworthiness to operate his equipment on his land and gained access to the additional equipment provided by Parker.

Additionally, the group has begun purchasing inputs (seed, chemicals, and fuel) jointly from a single dealer. By purchasing together, they feel that they not only have cut their input costs by fifteen to twenty percent (largely the savings are from seed costs), but also receive improved service from their dealer since they purchase a much larger volume of inputs. They attribute their success in working together to having a similar work ethic and adhering to the same general management principles. They talk everyday and spend much of their time together, making decisions about their operations jointly. This has not only made farming more enjoyable for each, but has also given them a like-minded partner with whom to share ideas or from whom to get a second opinion on certain topics. For example, even though they market their crops separately, they routinely discuss marketing strategies.

Concluding Remarks

While the two farmers initially engaged in their cooperative arrangement out very different needs and farming situations, their partnership has addressed the needs of both and provided a logical and cost effective means for them to accomplish their long-term goals. Even though they had very different financial positions going in, both understood

what the situation was and were willing to accept it. This appears to be an important factor in their success. Another key factor in their success and longevity appears to be their amenable and flexible approaches to farming. While the particulars of their arrangement, given the equipment shortage of Parker and labor shortage of Anderson, is reminiscent of a common dilemma faced by a new farmer and a more senior farmer, their approach of equality in operating and decision making has played a significant role in their success. Despite the initial unequal sizes of their farming operations, they view one another as equal partners and seem to easily maintain a sense of balance. As one of the farmers explained, "You don't ask somebody to do something that you wouldn't do yourself."

6.3 Erickson and Zimmerman

Number of Current Members:	2
Year Cooperation Began:	1984
Total Acres Farmed (approx):	1530 (800/730)
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Verbal

Table 5. Erickson and Zimmerman Group Characteristics

Background

For more than twenty years, two neighboring corn and soybean farmers in Iowa, Bill Erickson and Ray Zimmerman have maintained a high level of labor efficiency and minimized equipment costs. The arrangement has thrived during significant expansions

of their farming operations through an evolving labor and equipment sharing agreement. In 1984, Erickson farmed about 300 cash-rent acres consisting primarily of river and creek bottomland. Over the years, he has expanded his crop operation to 800 acres and has built a livestock operation that finishes about 10,000 hogs annually. During the same span of time, Zimmerman has expanded his 300 upland acres (a combination of owned and rented land) to 750 acres and has developed his own hog finishing operation that now averages about 7,500 head per year. Despite the close proximity of their farms, Zimmerman's land is primarily located on a higher elevation resulting in different soil characteristics and tillage, planting, and harvesting timelines than Erickson's bottom land.

Motivations

Erickson and Zimmerman began their collaborative effort through a custom combining arrangement in 1984. Through their initial work together, the farmers had two key insights that led to their decision to pool their labor and work their fields together as one large joint operation. Like most single operators in the Midwest, both Erickson and Zimmerman would sequentially till and then plant fields, repeating the process as they moved throughout their total acreage. They observed that "rather than switching from tillage to planting on their own fields, we could be more efficient if one did tillage and the other followed with the planter". They believed that by working together and specializing in tasks, they could decrease the time and effort spent preparing fields and planting.

The second key insight into their crop operations was the difference in timelines for working their respective fields. The elevation and soil differences between their fields generally result in Zimmerman's upland fields being ready to be worked sooner than those of Erickson's bottomland. The two farmers concluded that if they were to work together, treating their fields as one single operation, they could avoid timing problems (i.e. working bottom ground before it is ready and working upland too slowly). By pooling their labor, they could increase the rate at which they could work a field, which would allow them to concentrate on fields at their optimal point, thus maximizing yields.

As their labor sharing arrangement evolved, Erickson and Zimmerman came to the conclusion that they could reduce their equipment costs by eliminating their duplicate pieces of machinery. Instead of each owning a planter, sprayer, and combine, they could share the cost of a single piece of equipment with more capacity that would be used on both farmers' land.

Equipment Solution

The central goal of the equipment sharing arrangement between the two farmers is to maintain a "rough parity" between the equipment they contribute to their collaborative effort, including the expenses they bear for joint purchases and the number of acres each partner operates. Together they have purchased a combine, 4WD tractors, planters, augers, and field cultivators. All of the joint acquisitions and repairs are split 50/50. Since they both finance through the same lender they are able to easily jointly title their

equipment and arrange for their bills to be automatically divided in half for each to pay individually.

In addition to joint purchases, their concept of rough parity extends as well to the individually owned pieces of equipment they share. Each farmer tries to contribute equipment of roughly equal value to the partnership. For example, recently Zimmerman purchased a new front-wheel assist tractor for planting that was capable of linking with the monitors on their new planter. To maintain parity in expenses, Erickson purchased a semi and a sprayer, thus approximately balancing out their personal financial outlays.

Neither farmer had any complaints regarding their equipment sharing arrangement. They felt that while the exact amount they each contributed towards purchasing the shared equipment is certainly not precisely 50/50, that they have achieved and maintained a fairly balanced arrangement. Despite any minor inequality that may exist between their contributions, they both believe they have obtained significant savings through sharing machinery when compared with what their equipment costs would have been individually.

Labor Solution

The partners concluded that they could improve their efficiency during field preparation and planting and potentially increase yields by improving their timeliness in planting and harvesting fields at the optimal point. Erickson and Zimmerman began to pool their labor and view their individual fields as one operation. This occurred with minimal difficulties due to the differences in soil conditions. As in their equipment sharing agreement, they attempt to maintain a rough parity in their treatment of each

other's land, typically letting the conditions of the fields dictate their activities. Both are experienced farmers that feel comfortable having the other work on their land without "supervision". Generally, they simply discuss the plan for the day and the fields to be addressed and go to work, often times working individually in separate fields and on different tasks as needed.

Benefits and Difficulties

Both Erickson and Zimmerman are very satisfied and proud of their equipment and labor sharing arrangement, and plan to continue working together into the future. By pooling their capital, eliminating duplicate equipment, and maintaining a rough parity in individual equipment purchases they have significantly reduced their overall equipment costs. "As an individual, payments on $300,000 worth of equipment versus payments on $150,000 worth of equipment, when jointly owned, amounts to a sizable change in cash flow".

By farming their fields together, they have avoided the potential need for hiring outside labor as their operations have expanded and have improved their timing and efficiency in working fields. Additionally, their labor sharing agreement has allowed them to specialize in those tasks they most prefer. Zimmerman, who particularly enjoys combining, typically runs the field operations during harvest. Erickson, who has obtained a commercial drivers license (CDL), handles the hauling and scheduling side of harvest which he finds much more enjoyable. Erickson also noted that Zimmerman, who is a particularly adept mechanic with diesel school training, is able to more effectively handle repairs for the group.

Concluding Remarks

The formation, evolution, and expansion of the collaboration between Erickson and Zimmerman is a direct result of the natural synergies that exist between their operations. The disparity in elevation between their acreages facilitates cooperation because it reduces competition at the optimal date for fieldwork on their respective lands. In effect, because of their different land types, cooperating and working their fields jointly extends the window of time for optimal planting and harvesting for each individual. Other advantages from working as a team include a reduction in the total number of labor hours required for field operations due to greater efficiency and larger more capable equipment. Working together has made it possible in most seasons to eliminate the need for hiring outside labor.

One of the keys to the success of the group is their willingness to accept approximate, but not precise, parity in their contributions. While they maintain equality in their shares of operating expenses, they are willing to accept "rough parity" in other contributions, such as the individually owned equipment and the number of acres each operates. The twenty year life of the partnership indicates that they have an established method of operating that provides significant benefits for both farmers. They have been willing to continue their relationship despite the fact that there is at some times not perfect equality. This indicates that the benefits they reap in terms of lower costs and higher productivity from operating together outweigh any perceived losses from differences in contribution to the partnership.

6.4 Bennett, Nelson, and Taylor

Number of Past Members:	3
Year Cooperation Began:	1996
Total Acres Farmed (approx):	3600 (1200/1200/1200)
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Verbal

Table 6. Bennett, Nelson, and Taylor Group Characteristics

Background

In 1996, three longtime friends, Ralph Bennett, Fred Nelson, and Marvin Taylor developed an equipment and labor sharing arrangement with high hopes of increasing their farming efficiency while reducing equipment costs. The projected benefits from their arrangement never came to fruition and the group dissolved in 1998. Since the dissolution of the group, two of the members have left farming completely and their once strong bond of friendship has since been severed.

Motivations

The key motivation prompting the formation of the group was the potential for substantial equipment savings from eliminating their duplicate pieces of machinery. They believed that acquiring larger more efficient equipment that could handle the workload demanded by their combined 3600 acres would provide benefits to all three partners. Given their long-standing friendship, the three members felt that combining

their labor would not only eliminate their need for outside help during the busy periods of the season, but it would also be an enjoyable experience farming with friends.

Prior to the formation of the group, the three farmers developed a plan outlining how their operation would function. While this plan was never formalized or analyzed by an outside party, the group felt that, given their friendship, the collaborative effort would indeed function smoothly and successfully. Furthermore, no financial data was shared among the partners at the outset and it was presumed that finances would not be a problem given the benefits they expected from their joint operation.

Machinery

As dictated by their plan outline, in 1996 the group members eliminated all their individually duplicative pieces of equipment and pooled their capital resources to lease equipment for use by the entire group. All three farmers sold their individual combines and planters and jointly leased a sixteen-row planter and a large combine. Additionally, Bennett traded his four-wheel drive tractor for a larger three hundred horsepower tractor to handle heavy tillage for the group. Nelson, who owned a small trucking company, contributed the semis for hauling to the group. Taylor provided a tractor to the group that was primarily used for planting. The group felt that these individual contributions were relatively equal and fair. While the leased combine and planter were covered for maintenance and repairs under an agreement with the dealers, repairs for the individually contributed pieces of machinery were the responsibility of the owner.

Machinery problems

During their first harvest working as a group, the farmers were unpleasantly surprised mid-harvest when they realized that their new larger combine was not capable of handling their acreage in a timely enough fashion. The group was forced to endure the additional expense of hiring a neighbor to combine a portion of their crop using his own equipment. Each farmer had previously sold their individual combine for a single larger shared combine that could not handle the entire workload. This additional expense was not received well by the farmers. Further rifts among the group members emerged over how repairs on individually owned equipment were handled. The owner of pieces of individually owned equipment (non-group purchases) were permitted to handle needed repairs themselves. During planting, the tractor provided by Taylor broke down in the field bringing planting to a halt. Since, under their agreement, Taylor was solely responsible for the cost of repairs, he choose to perform the work himself instead of promptly hiring dealer mechanics to help fix the problem. While he did eventually complete the repairs, several days of suitable planting weather were lost in the process. Other members of the group were annoyed at the slow progress in making repairs. The group found themselves behind schedule during the crucial planting period, causing further stress for the group.

Labor

To compliment their equipment sharing agreement, the three farmers agreed to work each other's fields together in a collaborative effort, with the expectation that they could increase their efficiency and avoid hiring outside help. Given that they all were

experienced farmers and enjoyed a friendship that had lasted since high school, they felt there would be little difficulty in transitioning from operating as individual farmers to operating jointly. However, it soon became clear that differences in work habits and preferred work schedules would impede their development as a cohesive labor unit. The first key problem arose from differences in desired work hours. Bennett was an early riser who preferred to be in the field by sunrise. Bennett was willing to operate in less than fully optimal field conditions in order to get the job done in a timely fashion. He approached farming with a sense of urgency and found waiting for minor improvements in conditions to be difficult. Taylor did not like to start early and was somewhat meticulous about the weather and field conditions that should prevail before starting. For example, he felt that machinery performed better once the dew had dried from the crop and that starting before that time was not a good practice. Nelson, who was the only member with a livestock operation, could not begin work in the field until he finished his livestock chores and maintenance on the trucks in his trucking operation.

While by itself these differences in desired working hours created some friction, their rift worsened when it became apparent that Nelson would not permit work on his fields unless he was present. This combined with his insistence about working fields only when they were, in his opinion, at their peak readiness was viewed unreasonable by the other partners. The combination of different work hours and the prohibition from operating until the arrival of Nelson proved to create a high level of unresolved tension among the members of the group.

During harvest, further disagreements arose regarding the order that fields would be worked. Because a large portion of the land operated by the group was leased, the

members felt that it was important to appear to be timely in harvesting certain fields so as to appease the landowners. This created conflict regarding the order in which to work fields as well as delaying any fall tillage until the entire harvest of all of the group's land was completed. Bennett was concerned about getting fall tillage done before weather prevented getting it completed. He hired his brother to begin fall work on his land while he continued working on the harvest with the group. This created some resentment among the other two farmers, who could not begin their individual fieldwork until later in the season after harvest, when cold and inclement weather created problems.

Dissolution

The combination of disagreements over differences in work hours and scheduling of fieldwork as well their failure to generate the expected equipment cost savings began to create doubts among the members of the group. Some members began to privately question whether their collaborative effort would succeed. After two years of operating together, the group finally fell apart. The breaking point occurred in August of 1998 when a disagreement occurred over the leasing of a combine for harvest. Bennett had become increasingly frustrated and concerned that the group should have a combine leased well in advance of the fall harvest to ensure an appropriate machine was available. Nelson, who was in charge of leasing the combine for the group, had not obtained a lease before the beginning of August. Upon learning this, Bennett withdrew from the combine lease agreement and arranged his own individual combine in order to ensure he would have the proper equipment in place by the beginning of harvest. After the departure of Bennett, Nelson and Taylor eventually leased their own combine and continued to work

together during the fall harvest, but terminated their relationship at the end of the season. The three farmers found that it was not difficult to extract themselves from their leases due to the strong market for machinery at the time. Unfortunately, the termination of the cooperative effort did not proceed cordially. Since that time, two of the three farmers have abandoned farming and none of the former friends is on speaking terms with one another.

Concluding Remarks

Several factors contributed to the group disbanding after two years, and the departure of two members from farming altogether. None of these factors, taken by themselves, would probably have been sufficient to cause the dissolution, but the combination was sufficient to overwhelm the perceived and realized benefits of working cooperatively.

Among the more important contributing factors were basic philosophic differences about: (1) how and when field operations should be conducted (2) the sense of urgency for completing field operations (3) the appropriate amount of lead-time for making and executing important decisions and (4) the responsibilities of individual members to consider the well being of the group. These four factors were not identified and reconciled at the outset when the group was formed and contributed to ongoing difficulties in operating effectively as a group.

An additional factor that certainly contributed to the dissolution was the time that the group attempted to organize. The group existed during a three year period when weather factors created production problems for all farmers. Weather conditions made it

difficult for all farmers in the region to plant and harvest. The life of the arrangement included only one "average" crop production year and two "below average" production years. This placed added financial and cost pressures on the group and made benefits from operating together difficult to clearly identify.

While these kinds of adverse conditions affect farmers regularly, most well established farmers find ways to hunker down and reduce expenses to survive during difficult periods. This group differed in two important respects. First, the group was not well established when the adverse conditions occurred resulting in less opportunity to respond. Second, the group had not put procedures in place to temporarily "tighten its belt" or control its costs during such a period. While as individual operators they most likely would have taken such actions, they appeared too reluctant to do so as a group. The problem became even more difficult because there were no clear provisions for cost control in place at the outset of the agreement. It became even more difficult to adopt cost controls once internal stresses started to occur among the group members.

The sale of individually owned equipment at the time the group was formed also appears to be related to this problem. All of the members had already sold their combines when the group was caught short of capacity in the first year. This resulted in unanticipated additional costs for combine leasing and custom work and timely completion of harvest which undoubtedly contributed to tensions.

Landlords and concern for the perceptions of landlords also appears to have been a factor in the group's failure. Communication with landlords about the purpose for the group prior to its formation was likely inadequate. Some concern may have been created even among cash rent landlords about the financial stability of the members. An

additional problem that was not effectively handled was the need to communicate with landlords about who was to be involved in the arrangement, the expected benefits, and how the group would function. Landlords needed be aware of and to accept the fact that operators other than the renter may perform some of the field operations on their land. Limitations on which members could conduct field operations such as planting, spraying, and harvesting slowed progress and led to suboptimal results in some cases.

Finally, it is apparent that there was not enough initial discussion outlining the specifics of how their joint operation would run. The members appear to have come into the group with different assumptions about (1) how it would operate (2) how problems would be settled when they arose (3) the financial position of the other group members (4) what other members expected from the group arrangement. Perhaps discussion with a third party prior to forming the group would have surfaced some of these issues early on and some of the misunderstandings that eventually proved fatal to the arrangement could have been avoided. At a minimum, a third party could have been beneficial in developing a more realistic cost budget and rigorously developed business plan. A better plan would almost certainly have prepared the group for the many pitfalls they encountered during the three difficult years they existed.

6.5 Cross-Case Analysis

The cooperative arrangements described in this section are significantly broader in scope than the simple agreements to share a combine and labor during the harvest season detailed chapter 5. Each of the groups in this chapter shared multiple pieces of

machinery, pool labor throughout the growing season, and in some cases even purchased inputs and land jointly. Yet, while the breadth of the cooperation of each of the groups is similar, the question as to why two of the groups have flourished through their arrangement while one ultimately failed remains unanswered. To shed light on this matter, it is necessary to look beyond the form of cooperation employed and consider the motivations of the partners and the unique features of the arrangement they formed.

Each of the groups in this section sought to exploit what is known as "economies of scale", and in particular "internal economies", which is the concept that a larger firm, under certain circumstances, can obtain greater efficiencies and a lower cost per unit of output than a smaller firm. For example, by purchasing their seed jointly, the Anderson and Parker partnership is able to command a lower price. Both the Anderson-Parker and Erickson-Zimmerman groups found that by pooling their labor that two operators working together with larger equipment during planting and harvest are able to accomplish more per hour in the field than two operators working independently. At the same time, the capital invested in equipment per acre was the same or less than each would have invested if farming independently.

While economies of scale are a motivation for expansion and partnerships, simply using larger equipment does not necessarily guarantee improved efficiencies. The two successful groups benefited from the natural synergies that led to their partnerships. The partnership of the Erickson-Zimmerman group benefits from the disparity in soil conditions of their respective acreages. This difference results in the optimal windows for working their fields to differ to a degree. Hence, not only do they increase the rate at

which they are able to tend their fields by working together, but they also have an extended period in which to optimally cultivate their land.

The synergy between Anderson and Parker arises in part from their complementary assets that they are able to provide and their respective shortages. When the group formed, Anderson was over equipped but facing a labor shortage while Parker was under equipped but had excess labor. Their partnership successfully utilizes members' strengths to satisfy their weaknesses.

In the case of the Bennett group, they not only lacked these elements for natural synergies or complementarities, but each member came to the group with insufficient equity to handle the risks they encountered. Thus, while there were potential gains from cooperation, the financial difficulties of each member created additional burdens and pressures on the group as a whole. This is distinctly different from the case of the Anderson-Parker group where Anderson was in a strong financial position. While Parker was experiencing financial difficulties from his hog operation, he had sufficient equipment and income to viably continue his crop operation even without the partnership with Anderson. Additionally, the Bennett group was unable to take advantage of their combined scale. Inadequate combine capacity and unsynchronized labor efforts resulted in minimal gains for the group, coupled with greater expenses and even losses in productivity.

One of the striking features of the Bennett group, which is unique among all of the surveyed cases, is the labor difficulties they encountered while operating as a joint unit. Although they agreed to pool their labor in the same fashion as the Anderson and Erickson groups, they were unable to work as a coordinated and cohesive labor force to

complete necessary field operations efficiently and in a timely manner. The root of this problem appears to stem from the differences in work habits of the members. It is an example of how selecting partners whose habits do not match or coalesce with one's own can be a serious problem unless it is acknowledged and fully understood by all partners at the outset. The partners must not only be willing to accommodate these differences but also to capitalize on them for the benefit of the group. The partners in the Bennett group had various obligations and preferences that were not complimentary to maximize work hours and efficiency. Instead, these differences became a source of conflict among the members.

The members of the Bennett group were also hindered by restrictions that certain members placed on when and by whom certain tasks could be performed on the land the owned or rented. This also made it difficult to fully realize the potential benefits from sharing labor and equipment. While they may have worked together, they appeared to have had serious difficulty working as a team. The willingness among the Anderson and Erickson group members to be flexible for the benefit of the partnership was simply not present among all members of the Bennett group. While there is no fail-safe way to predict success, groups who are in the planning stages need to frankly discuss their views about how they plan to operate. A potential partner should not hesitate to withdraw if they have serous doubts about whether they can tolerate what is required to make the plan a success. In some cases potential partners may have such strong beliefs about how and when things should be done that cooperation may not be possible.

Entering into a cooperative agreement inevitably involves risk. The cost savings from sharing or jointly owning equipment and increased the productivity from pooling

labor may not be realized (as was clearly the case in the Bennett group). Furthermore, after integration of partner's operations and equipment expenditures there are potential losses if the group is disbanded. The two successful groups managed the uncertainty and risk involved in forming a partnership by gradually increasing their scale of cooperation over time. Their cooperation evolved from small initial agreements to pool their labor during part of the growing season and to share only a few pieces of equipment into agreements to pool their labor throughout the growing season and to share the majority of their equipment. Neither of the groups initially sold all of their individually owned equipment. They did not jointly purchase new equipment for use by the group until after they had productively worked together and were more certain that their partnership would be a success. This enabled each member to discover whether working together and sharing equipment would in fact deliver the gains the sought.

The Bennett group did not progressively increase their level of cooperation, but instead launched a full-scale joint effort from the beginning. While this is not the reason for the ultimate failure of the group, it left them more vulnerable to poor crop years during the start-up period. Since the group sold off much of their large individually owned pieces of equipment and jointly financed new ones for use by the group, it was more difficult and expensive for them to part ways when they decided to disband. There were also too many assumptions and too little sound information about how things would operate. Perhaps because they were longtime friends, they assumed that they would be compatible and probably did not believe it was necessary to openly discuss how they would operate in depth. Though each thought they knew the others well, they had never

worked together in the field and were unaware of the conflicts in work practices that would arise and contribute to their losses.

Inaccurate assumptions were also made at the outset about the financial positions of other members. Assumptions made concerning production levels and weather risks were perhaps too optimistic given the way events unfolded. While the group did in fact develop a plan before beginning to work together, it did not include adequate provisions for potential risks. In hindsight, they did not perform the necessary due diligence beforehand to ensure that they had compatible work habits and beliefs about proper farming practices. As one of the members of the group admitted, if they had either been more careful in planning or had simply eased into a cooperative effort they may have never entered into the arrangement in the first place or at a minimum they may have reduced the losses from their failure.

The groups described in this section demonstrate that it is possible for smaller farmers to take advantage of economies of scale while maintaining autonomy over their land. The collapse of the Bennett group illustrates the need for adequate planning, attention to risks, and the careful selection of one's partners in order to maximize the probability for success while minimizing the costs of failure.

CHAPTER 7: CASE REPORTS AND ANALYSIS FOR: MANY MEMBER, MODERATLY INTEGRATED COOPERATIVE GROUPS

7.1 Introduction

The proceeding two chapters included several success stories of farmers who formed cooperative arrangements to share equipment and pool labor among a small number of partners. But how do similar arrangements perform on a larger scale with more partners and a greater degree of cooperation? As the number of members in a group expands, they have the potential to capture greater surpluses through exploiting economies of scale, but as a consequence, there are inevitably greater challenges and new costs involved in the management a larger and more complex group. In this section are the cases of two groups, with memberships ranging from four to eight members. They have engaged in cooperative labor and equipment arrangements similar to those of the smaller groups detailed in the previous chapters.

Each of the groups has had to devote greater planning and management efforts in the formation phase. Day to day operations in these arrangements have also been tailored to account for the larger number of members. The greater amount of capital invested in equipment for sharing, and the greater amount of acreage to be tended by their pooled labor force requires more structure and coordination. Issues such as the entry and exit of members from the group, accounting for differences in member's acreage and labor contributions, and the scheduling of daily field activities are among the problems that each group has had to manage. Despite the inherent increased management requirements that arise from operating on a larger scale, the two groups in this section demonstrate it is

possible. If proper attention and planning is devoted to the design of the arrangement, machinery sharing among a larger number of producers can be beneficial. If agreements are structured properly the risks involved in such a venture can be reduced significantly. The groups in this section are corn and soybean farmers located in Iowa and Illinois.

7.2 AgFields

Number of Current Members:	4
Year Cooperation Began:	1999
Total Acres Farmed (approx):	2125 (775/750/600)
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Written (LLC)

Table 7. AgFields Group Characteristics

In 1999, four farmers in Northwest Iowa joined together to form AgFields LLC, in the hopes that they would be able to benefit from increased economies of scale while maintaining autonomous ownership over their land. The creation of AgFields was initiated by Seth King, a particularly business-minded farmer, who was in the process of taking over sole operation of his farm from his previous partner, his father-in-law. King approached another local farmer, Harold Green, to discuss potential resource sharing ideas and together they found two other local farmers who were interested in forming an integrated group. Together the four initial members designed a set of bylaws and hired a lawyer to formally establish AgFields LLC. The original central concept and agreement among the members was to share all operating and machinery costs on a per acre basis

and to farm their land as a single unit. By pooling their labor and capital for equipment, the principal expectation of the group members upon formation of AgFields was to be able to reduce overall operating costs while gaining access to the latest technologies. It was generally agreed that these technologies would not be cost effective individually, but would be through a joint operation.

Farming Operation

The initial four AgFields members had a total joint operation of approximately 2800 acres, with a fairly even spread among members (there was a 150 acre difference between the largest and smallest members). While their land is not contiguous, it does have a general North-South orientation. The group originally began planting corn in the North working Southward, retracing their path South to North planting soybeans. They decided that while this process was efficient, it gave the farmland in the middle of their joint acreage an inequitable advantage year in and year out. To rectify the imbalance, the group devised a circular planting scheme in which they rotate starting points. For harvesting, the group strives to harvest fields at their optimal time for crop maturity while maintaining a balance between working each member's lands to avoid inequity. Prior to the formation of AgFields, only one member had utilized a crop scout. All members now employ the same crop scout who assists the group with decisions on whose fields to spray and optimal timing. It is generally agreed that the scouting program increased profitability.

Despite farming the combined acreage as a single unit, each member individually chooses their crop hybrids and varieties. The members are aware of the disadvantages

involved in farming incongruous crops, such as labor spent on planter, sprayer, and combine cleanout and a more dissimilar timing in crop maturities. Despite some exceptions, the group predominantly plants Roundup Ready soybeans and utilizes the same herbicide for corn, which helps alleviate the need for sprayer cleaning between fields. The group vocalized that they have considered standardization of crops but cited individual loyalties to seed and chemical companies as a major impediment.

Group Dynamics

Each member of AgFields has an equal voice in making decisions. While their "majority rules" voting arrangement could potentially lead to disagreement and resentment among members, Green pointed out that when differences have arisen there has been a mutual effort to find a satisfying compromise for all parties. He noted that the greatest disagreement thus far among the group occurred when they were forced to decide on a new equipment dealer after their previous dealer closed. However, after discussing the matter the group was able to reach a consensus to use a local dealer.

There exists little specialization or division of duties among group members even though the greatly increased complexity of their new technologically advanced equipment has required a greater dedication of time to become comfortable with the equipment. The group feels that while the learning curve may require more effort in the short term, in the long run having all group members knowledgeable on all equipment will provide much greater flexibility. King handles all of the bookkeeping for AgFields (these hours are billed to the group). He maintains a small capital fund to handle unanticipated expenses, thus reducing the frequency with which he must collect from the

other members. He keeps the records using Quicken accounting software and generates monthly summary reports for all members. In particular, Green felt the group bookkeeping was an excellent added benefit, allowing him to track his own costs more accurately and efficiently than he had when working independently.

The membership of AgFields has undergone some changes since formation. One of the original partners significantly expanded his livestock operation and left the group in 2003 feeling that he could no longer contribute his proportionate share of labor to the group. The group did not have a specified agreement in place to handle the situation, so the group attempted to negotiate an amicable exit strategy. The members took a complete inventory of all equipment and each party made an estimate of the value so that they could split the balances and buy out the departing member's share.

Although there was a book value for the equipment, this approach proved to be problematic. The two parties' assessments of the equipment market values did not coincide. Eventually the departing member agreed to take a combination of cash and custom harvesting for his share of the jointly owned and leased equipment. This agreement was mutually beneficial in that the custom harvesting was not a cash expense for AgFields and the departing member received the labor he needed at below market cost. However, the departing member later decided to terminate the custom harvesting component of the agreement before it was completed. For two years, the group took on a fifth member who then left the group because the land he had rented was sold. The group did not note any problems with handling his exit.

Labor

While each AgFields member maintains independent decision control over their land, all members contribute labor as they farm their individually held acres as one unit. Individual members are responsible for keeping a record of the number of hours of labor they provide. There is no distinction between tasks (for example, one hour of spraying is equivalent to one hour of bookkeeping). Periodically the group meets as a whole in order to "settle up" any differences in the number of hours contributed to the group. Payments for differences in labor are paid directly between members, not through the AgFields capital account. In order to induce each member to contribute to the joint farming effort, the group has a set hourly rate of $15 for labor, and $10-12 per hour for hired help. The differential is intended to recognize the higher value of member labor and to encourage each member to commit their fair share of labor. The rates were purposely set at different levels to ensure that no member could take advantage of the group by hiring less skilled outside labor to fulfill their commitment while benefiting from the more skilled labor of other members. While this labor sharing agreement has worked successfully thus far, members are currently considering increasing the compensation rate from $15 to $20 to keep pace with the perceived increased value of labor over the preceding five years.

Equipment

When initially designing AgFields, the partners believed that all costs and ownership should simply be divided on a per acre basis. While this design functions well for variable inputs and labor, it is difficult for equipment ownership due to the difficulty

of adjusting ownership and depreciation for tax purposes as acreage fluctuates (the group has a CPA which handles the LLC's taxes). To solve this problem, the group agreed to equally own all equipment (making equal down payments) while making loan payments based on the number of acres they have operated by AgFields. Typically, the combined group puts in 10 percent of the purchase price for the down payment and finances the remainder. While the group originally leased most of their shared equipment, they have recently made a transition towards purchased equipment in order to take advantage of low interest rates and the favorable buy out conditions on their leases.

The group noted several benefits from their equipment sharing arrangement. The superior quality and technologies (such as GPS mapping software) of the group's equipment would not have been cost efficient for any of the group members independently. In particular, the group has seen a dramatic decline in their spraying costs. By approaching equipment dealers collectively, the group feels that they have received improved service over levels they might receive as individuals. After encountering some difficulties with a new combine, the manufacturer sent two engineers to work with the members of AgFields to resolve the troubles as well as to solicit future information from the group regarding potential improvements to the combine.

While the group has seen a reduction in their per unit spraying costs, other expenses have not declined as much as expected. The group feels this has occurred because they are presently "over equipped" after the loss of a member and have a current equipment capacity that could handle an additional 1000 acres. In some cases, the new equipment itself has posed difficulties because its technical nature and high learning curve makes skilled labor more critical.

Concluding Remarks

While prior to the formation of AgFields each of the members ran independently successful farms, the general consensus among the members is that their joint operation and mutual equipment ownership has been fairly lucrative. The benefits of cooperative labor, modern equipment, and decreased spraying costs outweigh the diminished flexibility of operating without complete autonomy. Bradley in particular, who was faced with the prospect of replacing his ageing equipment in 1999, feels that he has profited from avoiding the expense of making equipment purchases as an individual. By gaining access to the group's labor, King has been able to use more capital to expand his livestock operation. This has allowed him to diversify his cash flow and risk exposure, while at the same time permitting him to avoid hiring additional help to cover his grain operation. The risk exposure to loss of rented acres is lower when capital equipment costs per acre are lower and when another member may increase their acres rented.

Currently the group feels that they could further reduce their costs by expanding their operated acreage if land becomes available for rent or by introducing a new member into the LLC. The group hopes that others in the community will see their success and the future possibilities for AgFields and be attracted to join. The key attributes the group see as necessary in new members are ability to be flexible and a willingness to be a team player. Currently the group is considering offering a reduced rate for one year as an incentive for a new member. Since they now incur fixed costs per acre that are higher due to underutilized equipment, they could afford to pass part of the gain from adding

new acres to the new member as an "incentive offer". As well, it would allow the new member and the group to discover whether the addition is an appropriate fit for AgFields.

The main disadvantage encountered by the AgFields arrangement is the difficulty in handling the addition or the departure of a member. Given the depreciation of jointly owned equipment and ever changing market values, the group has of yet been unable to determine a fair equitable process for determining what a fair "buyout" price is when a member leaves the group. Aside from the actual departure process, a member leaving results in the group being temporarily "over equipped" in the sense that they have more capacity than they are utilizing. This reduces the cost savings from collaboration for the remaining members. Despite this difficulty, the current members of AgFields are proud of their innovative approach to farming and foresee continued success in their future.

7.3 The Sanders Family

Number of Current Members:	4 Primary & 4 Secondary
Year Cooperation Began:	Pre 1986
Total Acres Farmed (approx):	4010 (1350/1100/1200/360) by Primary Group Members
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Verbal & Written

Table 8. The Sanders Family Group Characteristics

Background

The Sanders family consists of eight individual family members who farm corn and soybeans on land spread across forty miles of central Illinois. The Sanders family has developed a successful arrangement for pooling their capital and labor resources to reduce expenses, increase efficiency, and provide economic support for younger family members who are starting farms of their own. The current collaborative state of the family's farming operation has evolved from an initial partnership between two brothers who began to farm together during college and later took over the main operation of their family farm as their father began to phase out of the operation and retire. Since this initial partnership, the brothers expanded their individual operations and raised families of their own. They have each helped bring one son into the cooperative effort. In addition to the four core members of the group (the two brothers and two sons), their father, father-in-law, a third brother, and a son-in-law all contribute labor and some land to the group.

Motivations

Following college, the two brothers began to work together and shared a planter because "it seemed logical" since they were managing their father's land in addition to their separately rented acreage. The nature and scope of their initial experience working together was not explicitly planned or designed. But the two brothers found their arrangement to be advantageous and have over the years increased their degree of cooperative efforts. As their sons began to branch off on their own and begin their personal farming operations, the brothers saw the potential for a mutually beneficial

arrangement where their sons would trade labor for use of their father's equipment. This would allow the sons to viably enter into farming and accumulate capital before they would be expected to make their own contribution to the equipment used by the group. The brothers noted as well that given the current initial costs of starting to farm, their support of their sons for a limited period of time (two years) was necessary. As one of the initial partners stated, "you have to get the cash flowing in and you have also got to live", in reference to starting into farming.

Equipment Solution

In previous years, the family operation would jointly lease one-year-old pieces of equipment, trading in for leases on new equipment every year. The lease payments would then be divided among the members on a per acre basis. However, as the sons have entered in the cooperative effort and begun to expand, the group has found that charging on the basis of acreage to be increasingly complex. This is further complicated by the fact that some members have individually acquired equipment (used by all other members) which duplicates equipment jointly leased by the group. To address this difficulty, the group has begun using a balance sheet system to track individual investments in equipment utilized by all members to aid in determining fair payments between members. Currently the group is leasing two combines, a planter, and a sprayer. Additionally, between the group members, they own a bulldozer, backhoe, track hoe, and a tile plow. These additional pieces of equipment permit the group to make improvements to farms they rent. Ownership of these pieces has not only been lucrative

for the group as a source of income, but it has made the group more attractive to potential landlords.

Labor Solution

The Sanders family farms all of their land as a group, moving equipment as needed between their farms. The group does not keep track of individually contributed hours. Some friction has begun to grow between the four core members who farm full time, and those members who have off farm jobs preventing them from providing an equivalent share of labor during the peak periods of the season. Commitments during the busy periods of the season by some members due to off-farm jobs is particularly troubling to the full time farmers who feel that they are forced to provide a disproportionate share of labor. Currently, the group is considering an agreement in which those members providing a lesser share of labor would pay a per-acre fee to account for the difference. This would serve as an incentive to provide labor and would compensate the core group if that labor was not provided

Benefits and Difficulties

The Sanders family feels that working together has yielded a number of benefits. They believe that equipment costs, especially for the sons entering farming, are minimized by pooling their individually owned machinery and their capital for joint purchases. Additionally, they are able to afford newer and near top of the line equipment with beneficial added features such as GPS yield mapping. Currently the group is working with the University of Illinois on a variable rate nitrogen application project. As

a group they have greater amounts of capital available, enabling them to take advantage of opportunities to more efficiently purchase or rent land when it becomes available. By pooling their labor, the group has completely eliminated the need for hiring outside help, as well as adding a bit of extra enjoyment to farming by operating with family.

Besides equipment and labor sharing, the group jointly purchases some inputs such as common chemicals and seed. Given the quantity of inputs the group purchases, they receive a three dollar an acre rebate on chemicals and typically receive bags of free seed. The Sanders feel that because of their size that their "buying power" affords them a better relationship with their machinery dealer and local elevator. For example, in the past year the elevator remained open an extra hour to receive grain from the group during peak harvest.

Concluding Remarks

The nature, scope, and longevity of the successful ever-evolving cooperative arrangement among the Sanders family members is unique among the groups analyzed in this study. Sustaining the arrangement over the years is a high level of trust and accountability among group members. In part this trust is derived from the fact they are united by being members of the same extended family. It is questionable whether a similar group arrangement of the same scale between non-related members would be as efficient or fruitful without a formal written contract and a more concrete organizational structure.

Setting aside the issues of trust and accountability, which becomes increasingly difficult for a group this size, there are a number of other key factors that have been

essential to the success of the group. Despite the dispersion of the individual member's land across forty miles and the disparity in acreage of individual landholdings, the members are flexible in the scheduling of field operations permitting an amenable agreement as to the timing in which each individual's fields are worked. Given the number of individuals involved, this result is only possible if there exists a strong sense of equality among members coupled with a willingness to be flexible with regards to scheduling.

Another key factor for success, which ties closely with the attribute of flexibility, is the existence of a sense of fairness with regards to equipment and labor contributions to the group. Given the size of the group, the yearly changes in individual acreage, individually owned equipment shared by the group, and jointly owned equipment shared by the group it is inevitably difficult to properly account for each member's "fair share" of expenses. This dilemma is further compounded by the presence of members in the group who provide widely varying hours of labor throughout the year. While the group has implemented a common balance sheet system to account for equipment contributions in order to aid in determining fair payments, such a system, given their size and complexity, is almost surely not perfect. Despite some inequalities that arise and change from year to year, there is a sense among the group that the arrangement is fair. If inequalities rise to a level where fairness is in question they are committed to modifying their agreement to account for the inequalities. This is illustrated by their current discussions about whether or not they should charge a labor fee to members currently providing a significantly lesser share of labor.

The concept of fairness can be further extended to account for the success of the group in handling the entrance of younger members into the group operation. All of the senior fulltime members hold the common belief that it is "fair" to permit new entrants a two-year grace period before they are required to begin contributing their share towards equipment expenses. If this belief was not commonly held among all core members there would be potential for conflict, particularly since the new members are direct relatives of some core members.

The apparent reason for the longevity of the group's operation despite the imperfections in their arrangement and the added complications and complexities of operating jointly is that the arrangement yields real financial benefits for all participants. The group has been able to reduce per unit equipment costs, achieve a high level of efficiency, reduce input costs by purchasing inputs in bulk quantities, purchase or rent additional land, and eliminate the necessity for hiring outside labor. While unable to explicitly quantify the level of savings, the group feels that their level of obtained financial success would not have been feasible had they been operating as individuals.

7.4 Cross-Case Analysis

The gains in profitability of these larger groups through decreased equipment costs and their increased efficiency in the field demonstrate the benefits from cooperating on a larger scale. Sharing equipment across several partners better utilizes equipment capacity capabilities and eliminates the expense of duplicative equipment. Pooling labor reduces the need for hiring additional labor during busy periods of the growing season.

The more consequential lessons from these groups involve the management issues that arise as a result of their increased partnership size.

The problem of scheduling field activities is an important matter that each of the groups has had to address. Operating as an individual with one's own equipment yields a farmer absolute control over when their fields are tended. In a cooperative setting, where labor and equipment are shared, some autonomy is forfeited and replaced with joint decisions as to when each partner's fields are cultivated. Given the small optimal window for corn and soybean planting and harvesting, this leads to the likely possibility that some member's fields will, in any given season, not be worked optimally from a timing perspective. The ability to buy or lease larger equipment and operate for more hours lessen this problem by may not totally eliminate it. If appropriate measures are not taken by the group, it is possible for certain members to be disproportionately affected by suboptimal timing of the work in their respective fields.

This dilemma can be clearly seen in the case of AgFields. During the first years of their cooperative efforts, the group utilized a planting scheme that moved across their combined acreage from North to South when planting corn and then retraced their path when planting soybeans. This practice yielded advantages for those with farms centrally located and disadvantages for those with farms towards the North or South. To maintain greater equality, the group implemented a new scheduling routine that started in different locations each year. While their new scheduling practice is more equitable, it does not necessarily work in the optimal order. In some case it results in additional fuel costs and labor expenditures by utilizing a less efficient procedure for moving between the group's fields. While neither AgFields nor the Sanders were able to quantify what these losses

might be, the issue of timing and fairness appear to become more significant as the group becomes larger.

An important common issue for cooperative groups of all sizes, but in particular for those that are larger, is how to allocate costs, transfer payments, and ownership shares among members whose acreage and contributions to the group differ in magnitude. For example, if one member's farm is twice the size of the others in the group, what should their share of machinery expenses be? If one member provides more labor hours than others in the group do, should they be compensated, and if so, what compensation scale should be used? These questions become increasingly complicated in the setting of a large group, especially when taking into consideration factors such as equipment depreciation and the different labor tasks required by group members (e.g., planting, hauling, and bookkeeping).

A rather straight-forward approach to managing these issues has been used initially by both AgFields and the Sanders family. They assign a per hour value to labor and divide all variable equipment and labor costs among members on a per-acre basis. This ensures that members with more acres pay a greater share of the total equipment expenses incurred by the group and that they compensate the other members for the disproportionate share of labor required to cultivate their fields.

It is interesting to note that each of the groups value all forms of labor that benefits the partnership as equal. Although not a significant attribute of either group, equal valuation of different forms of labor would appear to enable members to specialize by performing those tasks for the group where they have most proficiency or simply prefer.

Although both groups over the years have primarily retained their policy of dividing equipment expenses based on member acreage, several complications with this procedure have developed. For instance, dividing down payments for equipment purchases on a per-acre basis is potentially problematic. If the number of acres farmed by individual members varies from year to year the potential exists for one member to pay a disproportionate share of the down payment. For example, if the group purchases a combine and the following year one member's acreage decreases significantly, that member paid a greater proportion of the down payment than they would have incurred if the combine purchase had been delayed by a year. To prevent this inequity, AgFields requires that all members pay equal shares of down payments for all equipment purchases but they divide financing expenses on a per-acre basis. This ensures that year-to-year fluctuations in acreage do not result in disagreements regarding the timing of equipment purchases. Required down payments are typically modest (e.g. 10-15%) and viewed as a fixed cost for participating in the use of the equipment.

Another issue facing both groups is how to value equipment that is individually owned but utilized by the group. Determining valuations for equipment and the corresponding payments from the group for using it is particularly difficult. Annual fluctuations in equipment prices and depreciation benefits that the individual owner obtains complicate the process of arriving at a fair value. To address this problem it is necessary for the group to determine the fair value of individual equipment annually. This process is not only complicated but also potentially divisive since group members determine the fair value of the equipment rather than an outside party. Nevertheless the

Sanders family has been successful in implementing a process for valuing individually contributed equipment that appears to be acceptable to all members.

Perhaps the most challenging issue that arises in larger and highly integrated cooperative arrangements is managing the entry and exit of group members. When a new member enters and gains access to the group's equipment, how is a fair payment to compensate the existing members who have already invested equity in the group determined? When a member leaves the group, how is their share of the group's equity decided and how and when are they compensated? Like the problems encountered when valuing individually owned equipment contributions, it is especially difficult because of the complexities involved in valuing depreciated equipment. Since valuations must be made via a group decision, there is potential for disagreement between the remaining partners and the departing member.

The first crucial measure for managing changes in group membership noted by both AgFields and the Sanders family is to have an agreed upon detailed plan for handling the exit process. Without a plan, the groups invite potentially detrimental consequences in the event of a troubled departure. Second, it is important that each group maintains detailed records and regularly updates them to reflect equipment valuations using local dealers as a reference. This ensures that all machinery is properly accounted for using fair market values and that the group has historical data as a reference.

A third measure, which has not been properly addressed by either group, is a set procedure and timeline for payments from entering or to exiting members. Once the amount for an entering or exiting member of the group is determined, a workable

schedule for making payments must be established. If a member exits and is entitled to a sizable compensation, immediate payout could potentially result in a liquidity crisis for the remaining members. The departing member, depending upon circumstances, may prefer to receive reimbursement either immediately or distributed across several years for tax purposes. In the case of a new member entering, it may be financially difficult for them to immediately contribute their fair share of equity.

To compound these problems, the group may find themselves under or over equipped after a change in their membership. In order to continue functioning efficiently, the group could face additional costs as they readjust their equipment ownership. Both groups are aware of the problems that can arise when there are changes in the group membership and have taken some steps to prepare themselves for the event. But neither group has properly specified the procedures in sufficient detail to fully deal with the situation of succession.

Overall, the cooperative arrangements in this section are successful demonstrations of relatively large groups of independent farmers working together and benefiting form economies of scale. Yet, with their increased size and membership, new management and planning issues arise. It is critical to address in order to maximize the probability of success and to handle potential hurdles that may arise.

CHAPTER 8: CASE REPORTS AND ANALYSIS FOR: MANY MEMBER, HIGHLY INTEGRATED COOPERATIVE GROUPS

8.1 Introduction

Integrating multiple independent farming operations into some form of a cooperative arrangement entails a loss of individual autonomy in favor of the partnership. The groups described in the previous sections have varied widely in their level of cooperation and the degree to which their individual farming operations have been integrated into a collaborative effort. But in all cases two elements of independence have been maintained, individual ownership of farmland and title to crops yielded from member's respectively owned acreage. Ownership (including rental arrangements) of farmland and the production yields of those fields are perhaps the two fundamental components of independent farming in the view of most producers. Descriptions of two cooperative farming operations that abandon nearly all the elements of a typical farm structure of a single operator in favor of a highly integrated partnership are shown in this section.

Lakeside Cooperative, a group consisting of several farms in Saskatchewan Canada, not only jointly owns all equipment and operates their farmland as a joint workforce, but all crops harvested on member's lands are pooled and sold jointly with profits being distributed amongst the members. Valhalla, a group located in Western Nebraska and Eastern Colorado, takes the process a step further. All harvested crops are pooled and all land operated by the group is leased and controlled by the partnership rather than individual members. The attributes of these two groups are described in this

section. Their particular approaches to operations and management activities has avoided or alleviated some of the difficulties faced by the groups in the previous sections while creating or augmenting other problems. Overall, although the cooperative approaches of Lakeside and Valhalla have been simultaneously profitable and successful, the problem of succession of members who wish to retire has emerged as a critical problem.

8.2 Lakeside Machinery Cooperative

Number of Current Members:	5
Year Cooperation Began:	1970
Total Acres Farmed (approx):	8000
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Written (Ltd.)

Table 9. Lakeside Machinery Cooperative Group Characteristics

Background

In 1970, seven farming families confronted with the common challenges of depressed grain prices and surging machinery costs in the Dafoe area of Saskatchewan Canada embarked on a bold venture. The families believed that pooling their labor and equipment would enable them to reduce their machinery costs and improve their overall efficiency in the field. They made the decision to abandon their autonomous farming operations and formed the Lakeside Machinery Cooperative.

Lakeside cooperative is a legal entity with asset holdings. Members of the cooperative individually own or rent land, but they farm their land jointly using equipment owned by the cooperative. They pool crops grown on member's land and divide profits among them, with individual shares of the profits based on the amount of land contributed to Lakeside. The coop has evolved over two generations into a multi-million dollar venture with a diversified set of subsidiaries including Lakeside Seed Ltd., Lakeside Processors Ltd., and Lakeside Pulse and Special Crops Ltd. As with the cropping operation, profits generated by the subsidiaries are divided based on land contributions.

The cooperative is governed by a set of bylaws and managed by a board of directors. Membership in the cooperative gives each associate a seat on the board of directors and an equal vote on all decisions. The bylaws require decisions to be made on the basis of majority vote, although typically members strive to achieve a unanimous or consensus agreement.

Grain Pooling

When forming Lakeside, the farmers recognized that pooling their labor might offer greater efficiency in the field, but it also had the potential to create controversy over the timing of operating on the member's respective acreage. To avoid this conflict, the group decided that pooling and selling their harvested grain collectively would provide an equitable arrangement. Since all members would hold an interest in all fields, all members would benefit by the timing of field operations to maximize returns to the whole operation. In accordance with Lakeside's bylaws, the cooperative sells grain on

behalf of the members retaining fifty percent in order to pay expenses and to provide some cash reserves. It distributes the remaining revenue to the members based on their acreage share. In the members' view, this system "eliminates all unfairness" and prevents any one member from being unduly harmed or helped by the timing of operations on their land. As one member expressed, "I don't own one bushel, I own 20 percent of every bushel."

While pooling grain solves the problem of inequitable timing, it created other issues that the group addressed through their bylaws. Even though most of the acreage operated by the cooperative is located in relatively close proximity, the quality of the land varies. To account for differences in productivity, the group adjusts each owner's entitlement to revenue based on a third-party assessment of the land. This adjustment is particularly important for a small portion of the group's land because it is sandier and rockier than the rest. Pooling of their grain also restricts the types of land rental agreements utilized by members. The group said that crop-share arrangements are too complex given their system and have the potential to create new problems with landowners. All of the land farmed by Lakeside cooperative is either individually owned or cash rented.

It is important to emphasize that the members of Lakeside cooperative own or rent all of their land individually and that the cooperative itself has no land holdings. This is because under Canadian tax laws, if the group were to pool their land and hold it as an asset of Lakeside, they would lose their tax status as individual farmers.

Labor

While the members of Lakeside cooperative operate jointly on their combined acreage, there are inevitably differences in the number of hours contributed by each member of the group. Some members engage in time-consuming activities that are beneficial to the group but not directly related to field operations such as record keeping and equipment maintenance. In order to ensure that each member contributes a fair share of total hours of beneficial labor for the group, all members keep track of the total number of hours they engage in Lakeside related work and submit a monthly timesheet. The cooperative currently values labor at fifteen dollars an hour regardless of the type of work being performed (i.e. harvesting is valued the same as bookkeeping). By equally valuing labor, regardless of form, this has allowed members to specialize and exploit their own particular talents for the benefit of the group. For example, within the current membership of Lakeside certain members specialize in welding, mechanical work, and bookkeeping.

To compensate those who contribute a larger share of labor, Lakeside uses an "over/under" system in that members performing a lesser number of hours compensate those of greater labor hours at the agreed upon rate. The "over/under" system ensures that distributing payments is simple and that the number of "over" hours equals the number of "under" hours. The labor rate charged by the group was decided by the board of directors who felt that it was a fair rate that would create an incentive for each member to actively play their role in group operations without creating an undo hardship for those who at times could not provide a roughly equivalent number of hours. The group feels that this system is fair and accommodating for circumstances in which a member may be

unable to provide a sufficient number of work hours during a season. For example, during a past year one member was only able to work a significantly reduced number of hours due to a family health problem. Despite being unable to work, his fields were still tended to by the other members of the cooperative and he simply compensated them for the difference in work hours. As well, the group in past years has set a lesser per hour rate for contributions by member's children who have assisted in operations.

Equipment

In 1970, when the founding members of Lakeside cooperative initially banded together, one of the motivating factors was the high cost of machinery. Their solution was to rid themselves of their individual pieces of equipment and purchase new, more capable machinery sufficient for handling the demands of their combined acreage while avoiding ownership by members of duplicative pieces. This practice is still utilized by Lakeside today. Among the currently owned equipment of the cooperative are two combines, two four-wheel drive tractors, a swather, a sixty-two foot Flexi-Coil air seeder with a forty-foot air drill, a semi, two grain trucks, assorted augers, a one hundred foot tube conveyor, and seventy-two bins. In the opinion of the members, their equipment sharing arrangement has had several positive benefits including cost savings, reduction in capital needed for equipment, and access to better technologies (such as global positioning system). Additionally, the group feels that pooling resources has enabled them to reduce the risk and spread the cost of experimenting with new equipment and procedures. This has permitted the group to be more innovative compared to an individual operator. For example, Lakeside cooperative was the first set of farms in the

area who purchased an air seeder, attempted seeding by airplane, used deep-banding, and started to grow lentils.

Group Dynamics

During the course of the thirty-five year existence of Lakeside cooperative, membership has risen and fallen as new members have joined and other members have left or retired. The procedure for new members to join the coop, as detailed in Lakeside's bylaws, dictates that in addition to the fifty percent of revenue the cooperative retains to pay for expenses, another ten percent of the revenue (that would normally be distributed to a new member) is withheld in order to build an equity account. The ten percent is withheld until the new member has built up a sufficient equity account to match, on an acre percentage basis, that of existing members. In order to determine the cooperative's equity value, the group on an annual basis agrees on values using prices acquired from local dealers. This procedure allows a new member to gradually build equity (instead of requiring a full "upfront" investment), thus permitting even new younger farmers the ability to join with little capital and land of their own. For members who have either chosen to retire or have been asked by the group to leave, their share of the equity is bought out by the other members over a three to five year timeframe. Spreading the payments over several years eases the financial burden on the remaining members and reduces the tax liability for the departing individual. This procedure, by all accounts has been successful in managing the participant transitions within Lakeside which has seen its membership swell to as many as eleven and as few as the current number of six.

In recent years, the members of Lakeside have engaged in only a handful of formal meetings per year in addition to their regular Monday morning board meetings (which have just recently been phased out). Informally, the group meets on a near daily basis as they head to the field for work. One of the problems in the early years of Lakeside was the large amount of time devoted to meetings and decision-making. To combat the time drain of meetings, many information-gathering tasks (such as determining local input prices) are delegated to members who can report to the entire board for a vote. The group has also found that with time and familiarity many managerial tasks have become "automated" reducing their time requirements.

Expansion and Diversification

The current scale and scope of Lakeside cooperative is significantly greater than the initial grain operation founded in 1970. In 1971, the cooperative only grew four different crops. Over the years, the diversity of their operation has grown to include twelve different crops and over thirty different varieties. In 1984, the cooperative in an effort to diversify, voted to create a subsidiary called Lakeside Seeds in order to enter the seed business. They built and completed their own seed cleaning plant in 1987 that currently cleans lentils, canola, hard red wheat, CPS wheat, flax, peas, 2-row barley, coriander, and mustard. In 1996, the cooperative formed Lakeside Processors as a joint venture with the Saskatchewan Wheat Pool. They built a sixty thousand metric ton special crops cleaning facility on the railroad track in Dafoe, which utilizes the existing elevator. The venture custom cleans and exports crops around the world and specializes in lentils, mustard, peas, flax, and canola for birdseed. In 2000, the cooperative once

again expanded and further diversified by forming Lakeside Pulse and Special Crops Ltd. to specialize in the marketing of specialty crops worldwide. Lakeside Pulse and Special Crops currently has offices in Wynyard and Winnipeg. The subsidiary researches and secures export markets for Western Canadian specialty crops to customers including importers, brokers, wholesalers, and end users worldwide. They have contracts with buyers in Brazil, Colombia, Germany, India, Mauritius, Mexico, the Netherlands, Pakistan, Saudi Arabia, Sri Lanka, and the United Arab Emirates. Through these series of expansions, Lakeside has significantly diversified their sources of revenue and enabled them to concentrate on increasing their profitability without continually expanding their total acreage.

Concluding Remarks

Lakeside cooperative has successfully flourished over thirty-five years with a continually evolving membership and scope of operation. The group has successfully reduced their equipment costs, increased labor efficiency, and freed capital for use in diversifying expansions. By pooling their grain, the group found an amicable solution to the difficulty of field timing that arises from the cooperation of a large group. Thus far, their system of gradual equity buildup and dispersal for new and departing members has been successful in handling transitions in their partnership. As one member said, "I wouldn't be a farmer if not for the coop taking a chance on me. I came in with virtually nothing but labor and built equity over time". Yet these benefits do not come without a cost. Membership necessitates that you lose elements of your individual decision making authority and reduces the ability to make quick decisions due to the group voting process.

"If you are the type of person who has to have your own way, don't join a coop". While the creation of the several Lakeside subsidiaries has been lucrative, the substantial increase in equity creates new problems for the entrance and departure of members. There are concerns regarding the future if current members do not find sufficient numbers of new members to take over the cooperative as they begin to retire. Current members may have difficulty in liquidating their equity because so much of their investment is tied up in businesses and structures that could be more difficult to sell off. Despite these concerns the members of Lakeside cooperative are, by all accounts, pleased with and proud of their operation and the growth it has experienced over the years. They could not imagine farming any way but the cooperative way.

8.3 Valhalla[10]

Number of Current Members:	6
Year Cooperation Began:	1986
Total Acres Farmed (approx):	8400
Major Shared Equipment:	Combine, tractor, planter, sprayer , etc.
Agreement Type:	Written partnership and landholding LLC

Table 10. Valhalla Group Characteristics

Background

In 1986, six residents of Western Nebraska faced with the loss of their jobs at the local elevator, established a farming partnership that has profitably endured and expanded

[10] Portions of this section were reproduced in Colson, Artz, and Ginder (2006).

for two decades. Each of the founding six members (three of which are brothers), were employed in the land management activity division by their local elevator until it was sold to a successful regional line elevator company. Under new ownership, the land management activities and much of the previous staff were abandoned, leaving many former workers in need of new employment. After much discussion and planning, six former employees of the elevator decided to form a partnership and build a farming operation around the now orphaned land holdings and clients of the elevator's land management division. An atypical feature of the partnership is that while each of the members at the time possessed farming knowledge and had worked in agriculture related fields, none were ever actively engaged in farming or had significant experience as a farm operator. Despite the daunting prospect for success of six inexperienced operators building a new farming venture with little capital and no landholdings, the group organized a partnership. The partnership has thrived by using their collective management expertise, taking a rigorous approach to financial forecasting and operations planning, and the member's overall strong work ethic. Currently the group operates a total of 8400 acres of dry land and irrigated cropland in Western Nebraska and Eastern Colorado.

Group Dynamics and Financing

The Valhalla group is organized as an ordinary partnership with each member holding an equal share. In accordance with their annual budget, a portion of profits are dispersed equally to member as a monthly cash "draw" while cash in excess of this distribution remains in the business to finance growth and retire debt. This policy has

permitted the partnership to grow at a rate that members agree is healthy while maintaining sufficient equity for the group to be selective in evaluating growth opportunities. The strong balance sheet and credit position present a favorable package to potential landlords.

Since its inception, the group has obtained financing as a unit through a single credit line (master note) issued by a single lender. Prior to the planting season each year, the group builds detailed monthly cash flow projections for the coming year based on anticipated acreage, types of crops, expenses, prices, and yields. While developing a detailed annual budget with monthly cash flow projections is a time intensive activity, the group's efforts has permitted greater precision in forecasting capital needs for the operation (additional credit during the year has only been requested twice in twenty years) and led to greater confidence by their lender. By utilizing a single lender, the group has avoided the inherent difficulties of managing multiple sources of credit.

In the opinion of the group, one of the most critical necessary components for successful operation of a partnership is regular and detailed communication among the partners. Year-round on a daily basis, the group meets in their shop to discuss the day's activities, progress, and any pending decisions. There is a strong commitment and sense of pride among the partners in "showing up" for work every day. As noted by one member, group, rather than independent, operation and decision making may be unusual and unwelcome for farmers accustomed to working autonomously, but given the members' background as employees it is natural. Regular communication and consensus on decisions throughout the year has contributed to smooth implementation during the spring, summer, and fall work periods with few disagreements over the years. With each

member arriving at work every day on a regular basis, there is little reason for concern that any one member may not be performing their fair share of work. As one partner noted, "From the outset everyone has known what has to be done and there was a responsibility to do it."

Labor

As previously noted, when their partnership was formed, none of the members possessed significant experience as a farm operator. Over time, the members have specialized in various aspects of farming based upon their respective experience and specialties gained while working at their local elevator. Chris Tobin had been involved in budgeting, accounting, marketing, and cropland leasing. Will Moore had knowledge and experience in operating irrigation equipment. Gary Worthington, Todd Tobin, and Wilson Tobin had some machine operation skills as applicators for the elevator. Despite their relative inexperience, the group has been able to operate their sizable acreage with very infrequent use of outside labor. In order to minimize labor costs, the group attempts to develop a yearly operation plan such that only in extreme cases will they resort to hiring help (typically in the form of custom operators for harvest).

In addition to members providing labor for farming, management, and planning activities, the group has a provision for partners to provide community service if they choose. One member serves on the board of directors of a local cooperative while another serves on the state Wheat Board. While these commitments involve travel and time away from the group's operation, the partners feel that these absences are an important part of the leadership responsibilities of the group and provide some benefits.

Equipment

The vast majority (more than 90%) of equipment is owned by the group rather than leased. Among the group members, there is a strong bias toward equipment ownership and for maintaining solid relationships with dealers for heavy engine and combine repairs. This approach to machinery acquisition is in part born out of the high number of hours they run their equipment and the additional penalties imposed under lease agreements. They believe that ownership is more profitable under these circumstances. The group feels that ownership provides more flexibility, particularly in the event of difficult financial times when it may be more lucrative to utilize a depreciated owned piece of equipment rather than leasing which requires a cash payment. When equipment is leased by the group, it is typically to evaluate new production practices on an experimental basis prior to adoption. While they are not among the very first adopters of new practices, they feel the size of their operation enables them to experiment with new systems with minimal risk to their bottom line.

Land

Over the years, the acreage operated by the partnership has fluctuated around its current level of 8,400 acres with a maximum of 10,000. All land holdings, about 15% of total acres operated, are held within a separate Limited Liability Company which is jointly owned by the five current members. All of the land farmed by the partnership is either leased from the landholding LLC that the partners own or leased from other landlords by the partnership. No land that is individually owned or leased by any of the partners is operated by the group. Currently Valhalla leases land from seventeen

landlords with various agreements including cash rent, 60-40 crop share, and 66-34 crop-share leases. Given the large number of landlords, the group expects the land base for the operation to change annually as landlords acquire and dispose of land, change lease terms, or simply let leases expire without renewal.

The group evaluates each individual lease on an annual basis and decides whether to retain it for the next year based on the terms and past performance. Due to the size of their overall operation, the group feels that they are able to forgo less profitable leasing arrangements even when it means less acreage, without developing financial difficulties. Through their careful budgeting, strong financial position, and sufficient credit line, the group has developed a reputation among cash rent landlords for reliable and early payments. In addition, they are well positioned and attractive to crop-share landlords because they can provide timely and effective cropping operations. The group's strong balance sheet has proved to be an asset in dealing with non-local landlords who are less acquainted with farm operators in the area. The group has authorized its lender to discuss the financial position of the partnership with potential landlords and real estate agents representing landlords. The group believes that their willingness to be transparent creates additional confidence that more traditional tenants may not be able or willing to match.

Benefits and Difficulties

In addition to the many benefits of operating as a partnership mentioned in the previous sections, the group has been able to save on input purchases and handling due to their size. Since the financing for the entire operation is centralized, inputs can be purchased in large quantities from the source with the best overall value. A centralized

operating credit line also permits timing of the purchases so as to take maximum advantage of prepayment and cash discounts reducing per unit costs and increasing profit margins. Seed is typically available from many suppliers who offer a sliding scale of volume discounts. The group also purchases fuel and liquid fertilizer by the transport tanker load and stores these inputs in facilities they own. This practice not only offers input cost savings, but also increases farm level efficiency through handling inputs in bulk. Since the group is able to extend these input cost savings to landlords who are willing to sign crop-share leases, this enables the group to offer a more attractive crop share package to potential landlords. This is viewed as an advantage since crop share carries lower rents than cash rent.

While the group noted few difficulties or conflicts in their cooperative arrangement, one significant impending dilemma persists. Group members are concerned that in the near future they will have to manage the departure of several partners within a short time period as they retire. Currently, three of the five members are over sixty years of age and will soon be seeking to exit the partnership. The group has had discussions regarding this issue and several proposals have been proffered. These include bringing in new partners or downsizing to a level that could effectively be handled by the remaining two members. However, at present no plan has been finalized. With such a large portion of the group likely seeking to retire concurrently, this issue could pose significant financial difficulties for the remaining members.

Concluding Remarks

Embarking upon a new career as a farm operator is a relatively daunting and financially risky endeavor for a group with no land and insufficient capital. Despite the potential for failure, the Valhalla group has operated profitability for twenty years. There are a number of reasons behind their success. The relevance of the group's "business world" style approach to farming cannot be understated when determining the drivers of their success. Their corporate like dedication of time and effort in creating cash flow projections and seasonal operations plans has aided in reducing financial risk, building a strong relationship with their lender, minimizing costs for equipment and inputs, increasing their flexibility in attracting new land, and improving their attractiveness to potential land owners. Continuing the practice of arriving on a daily basis to report for work they did while they were elevator employees has been helpful to the farming operation. This work ethic and their daily meetings have eliminated potential complications and inequalities in labor effort and promoted effective communication and coordination.

The partnership's approach to acquiring the land they operate predominantly through leasing arrangements rather than ownership has had dual effects. A positive aspect of this approach is that over the years it has enabled the group to direct profits toward growth opportunities and the retiring of debt. The downsides of leasing the majority of their land are twofold and principally a result of the group's large size. First, with so many different landlords and lease agreements to manage, a greater amount of time is required for administering and evaluating arrangements. Second, given their approach to leasing, there are fluctuations from year to year in the group's total acreage.

This annual irregularity, coupled with the group's policy of equipment ownership (as opposed to leasing) makes it more difficult to have the optimal cost minimizing equipment available for any given year. With more land ownership, the net increases or reduction in total acreage would be dampened. This might potentially enable greater savings and efficiency on equipment purchases.

8.4 Cross-Case Analysis

As in chapter 7, Lakeside Cooperative and the Valhalla group are two more examples of the potential to increase profitability by cooperating through increases in labor and management efficiency and decreases in equipment costs. Aside from the shear size of their operations, the key attribute that distinguishes these two groups from all of the previously detailed cases is their practice of pooling grain and revenues. For both Lakeside Cooperative and the Valhalla group this system has proven successful in eliminating the difficulty in scheduling field operations in an equitable fashion for all members. The need for designing fair, but likely inefficient, field schedules as in the case of AgFields is avoided, which offers the potential for greater overall profitability.

One particularly interesting aspect of these two case studies is that revenue sharing was not cited as being motivated by concerns about member incentive alignment. In the absence of revenue sharing, one of the concerns that may arise within a group is that an individual farmer may not provide the same quantity or quality of work on fields that do not profit them directly. As the size of a group increases the cost and difficulty in monitoring the efforts of members also increases. Thus the potential for individual members to provide less effort is greater.

Profit sharing is a commonly applied means of aligning the incentives of individual workers so as to maximize the profit of the group as a whole. Under such a system the profit of each farmer depends not only on their own respective fields but also those of the entire group, thereby providing incentive to work as intensely on other member's fields as on their own. Interestingly though, neither Lakeside Cooperative nor the Valhalla group was specifically motivated by this incentive alignment attribute to implement a revenue sharing scheme. Although it could be argued this is a result of the relatively low cost in monitoring the labor contributions of other members, the more likely reason for these two cases are the motivations and work ethics of participating members. In both groups, there is a palpable inherent sense of accountability to the group that is not derived from a profit.

In addition to aligning labor contribution incentives, grain pooling has an effect on the incentives of members for specialization. Under the weak assumption that most farmers, if only entitled to the revenues from their own acreage, prefer to be more actively involved in field operations on their own fields compared to the fields of other group members, this reduces the incentive for non-farming specialization. Since revenue from all fields is equal from the perspective of any given group member, there is a greater incentive to capitalize on the potential gains from specialization in beneficial activities for the group not related to field operations.

For example, the subsidiaries of Lakeside Cooperative require a great deal of management and oversight which necessitates a significant allotment of time in addition to the field operations. A likely efficient allocation of labor resources for these activities would be for one (or perhaps more, but not all) to assume these responsibilities while

leaving farming activities to other members. This would mean some members would not be actively involved in operations on their own land. Under a grain pooling arrangement, each member is indifferent as to when their respective fields are tended in relation to those of the other group members. Since each member is less reliant on his particular fields for income, the incentive for undertaking these outside farm specialized tasks is increased.

As seen in chapter 7, one of the greatest difficulties facing groups as they increase in scale is managing the transition of members into and out of the arrangement. This is particularly true for the departure of existing members. Lakeside Cooperative and the Valhalla group differ greatly with respect to the investment opportunities they have pursued. Lakeside Cooperative over the years has primarily concentrated on diversification and adding value to commodities through the creation of subsidiaries involved in seed cleaning and exporting. These activities have involved significant investments in facilities not directly related to farming operations. At the other end of the spectrum, the Valhalla group has engaged in relatively little investment in buildings or farmland in favor of maintaining low debt levels and focusing resources on production. While the group has not yet designed a plan for managing the departure of members from the group, it is foreseeable that they will be able to handle the situation with minimal difficulty and financial burden by simply selling a portion of the jointly owned equipment and land. For Lakeside Cooperative, it is unclear how the group will manage a decrease in the number of members in the group. Since assets owned by the group largely consist of subsidiary operations and facilities that are not readily divisible, adjusting the level of assets could be more difficult. Given the group's current scale, it seems more likely that

the group will have to rely on the entrance of new members into the group to replace those who may retire, rely more heavily on hired labor, or significantly reduce the scale of their operation at a potential loss.

Overall, Lakeside Cooperative and the Valhalla group are profitable examples of large cooperative farming arrangements that operate with minimal individual member autonomy. Their successful and enduring implementation of revenue sharing is unique among all of the cases in this study and demonstrates an alternative efficient means of managing the complications of equitable field operation schedules.

CHAPTER 9: ANALYSIS ACROSS ALL CASES

9.1 Introduction

From the four proceeding chapters it is evident that there are a number of similarities in motivations, operational dynamics, and difficulties among groups engaged in farm-level resource sharing agreements of comparable scope and scale. In this section, the analysis is expanded to consider all of the case studies as a whole to provide further insight into cooperative arrangements. As detailed and expected in the methodology section, it is difficult to examine all of the cases together due to the significant differences that exist in the scope of cooperation. To facilitate comparison, several key issues are selected as focal points including 1) Motivations for cooperation, 2) Formality of the scale and agreement, and 3) Management of group dynamics. Furthermore, as detailed in Chapter 3, a number of propositions based on economic theory of contracts, organization, and behavior within partnerships were developed. In this section the propositions and corresponding corollaries are evaluated utilizing the data collected through the case studies.

9.2 Motivations for Cooperation

The two most common motivations for entering into a cooperative arrangement among the case studies was to reduce equipment costs and to either gain access to skilled labor or to reduce the expense of hiring outside labor. This conforms to the expectations laid out in the methodology section. Yet, the cost reduction motivations only capture part of the picture. For several of the small and medium size cases, the impetus for

cooperation was linked to a specific hurdle such as an outdated combine or the loss of a skilled laborer. Faced with these problems, groups entered into cooperative agreements that addressed these issues specifically. Thus they viewed cooperation as the least cost solution to their problems. AgFields is a contrasting case. The members were not motivated by a similar shortage. Instead, the group predominantly pursued a cooperative arrangement in order to gain access to desirable, but not absolutely necessary, advanced technologies. In the case of the Valhalla group, a combination of a capital shortage, risk due to uncertainty and inexperience, and efficiency were the main drivers for their cooperation. Overall, the most common overarching motivating factor found for farm-level resource arrangements was financial in one way or another. Whether the financial motivator appeared in the form of outdated equipment, insufficient capital for expansion, or access to technology varies a great deal across groups. While the point may be subtle, it is important to reemphasize that in the majority of cases the impetus for cooperation was linked to a more or less acute financial issue, not merely a belief that cooperation could yield lower costs or greater efficiencies.

9.3 Scale and Agreement Formality

By design, the groups selected for case studies differ greatly in terms of the scale and scope of their cooperation. Groups vary from sharing a single piece of equipment (a combine) to entire machinery sets, structures, and separate business entities. The degree of labor sharing, which is common to all groups except the long distance arrangement of the Duncans and Fergusons, varies from only a few weeks during harvest season to fully

integrated labor operations year-round. At a minimum, the selected cases demonstrate the breadth of possibilities for farm-level resource sharing arrangements.

As will be further discussed in a later section, the types of agreements between members of groups can be largely characterized as either verbal contracts or written contracts. Groups involving less than four members, regardless of the number of equipment pieces being shared or the level of integration of their labor operations, predominantly utilize a verbal agreement. For larger groups with a significant scale and scope of operations a written contract including the formation of a business entity like an LLC is common. The correlation between complexity of operations and formality of agreements corresponds with what would be expected. One reason for using complex agreements forming business entities, which as a component requires a written contract, is the potential tax and farm subsidy implications of operating as a highly integrated unit. In these cases a clearly written contract may be critical to avoid loss of benefits or appropriate tax treatment.

9.4 Management of Group Dynamics

The single most commonly cited negative aspect of cooperative agreements is the issue of managing the departure of members from the group. While all groups were aware of this issue, few had designed specific plans for dealing with this possibility. Among those groups with succession plans, there is significant uncertainty. There are concerns about whether the plan can be successfully managed, the expense involved, the impact on remaining members, and whether cooperation could continue without finding a replacement member. The potential financial consequence of members leaving a

cooperative group increases as the scale and scope of cooperation increases. For groups sharing only a single piece of equipment, succession was found to not be of significant concern to the group members. In the event of the dissolution of the cooperative arrangement, these groups felt that they could easily sell their shared equipment (or terminate the lease) and resume operations as autonomous farmers.

For groups sharing entire sets of equipment, the problem becomes more significant. If a member leaves the group two primary issues have to be addressed: 1) How to compensate the departing member for his share of capital tied up in equipment and 2) How to rescale the equipment set to appropriately and cost effectively match with the scale of operation for the remaining members, given that valuing depreciated equipment is difficult and imperfect. Thus the first issue presents a reasonably high potential for disputes as was seen in the case of AgFields. Most groups sharing large equipment sets take preventative measures by annually determining values for all shared equipment. While this aids in avoiding disputes over equipment values, it does not solve the problem of where the capital for compensating departing members comes from. Furthermore, as illustrated in the case of AgFields, when a member leaves, the cooperative group may very easily be left over-equipped for the remaining acreage in the short run. Rebalancing an entire equipment set to be cost effective for the remaining acreage is likely to prove expensive and potentially lead to significant losses. This problem is even more pronounced for groups that are highly integrated. A significant amount of capital in Lakeside Cooperative is tied up in business subsidiaries and structures. Liquidating these assets to compensate a departing member would be highly costly and result in a significant loss in revenue for the remaining members.

As noted earlier, nearly all groups have considered the problem of succession, but few had developed any detailed plans for the possibility. This is surprising, particularly since there are members who are nearing retirement age in many of the groups. None of the groups has taken explicit measures to gradually set aside capital outside of operations for easing succession. Nor have any groups developed plans for operation post-departure. None of the groups have seriously considered issues such as leasing versus ownership of equipment and rental versus purchase of land in the event members choose to leave the group. Again, this is surprising. There is considerable uncertainty regarding the benefits and costs of entering into a cooperative arrangement and much can and has been done to reduce this risk by the groups during formation period. But the issue of succession, which either already has or will in the future be a problem, has not received a great deal of attention in most groups.

9.5 Proposition 1 – Scale and Agreement Formality

The first proposition put forth in section 3.2.3 is

Proposition 1*: There exists a positive correlation between the number of farms and/or the scale of operation involved with the degree of formality of the group's agreement and record keeping.*

Rival Explanation*: Formal agreements are deemed less necessary when there is joint financing of equipment since the contractual agreement with the financial institution may serve as a proxy.*

***Corollary 1**: Given the potentially greater degree of accountability between family members (as opposed to independents) this proposition may fail in arrangements between related parties.*

***Corollary 2**: As a group expands in members, acreage, and/or scope, the agreement will also evolve to account for these changes (conditional on the expansions being unanticipated at formation).*

The data collected through the cases support the proposition that there is a positive correlation between the number of farms involved in cooperation and the formality of their agreement. All groups with four or more member farms have a formal written agreement between members. Statements by the Sanders family, who have the most incomplete written agreement of the cases, supports the first corollary that formal agreements are potentially deemed less necessary when contracting between related members of a family. Few conclusions can be made regarding the second corollary due to the relative short time the majority of arrangements have been in force. Few consequential changes to agreements were found among groups that have remained relatively static or expanded significantly over the duration of their cooperation.

Yet, while the case studies tend to support the main proposition, the exceptional case of the Duncans and the Fergusons reveals an important component missing in the original proposition and potential rival explanations. In their case, a formal written agreement was not regarded as necessary to handle the difficulty in managing operations between numerous farms or because they were faced with greater financial risks than other comparable farms. It was instead viewed as a necessary set of rules governing how and when a single combine would be moved between farms and jointly financed. If one

were to consider an operation similar to that of the Lakeside or the Valhalla group, but with only three members, it would be unlikely that members would participate in such an arrangement without a formal written contract detailing equipment, grain pooling, and revenue sharing terms. The reverse could easily be argued for the smaller groups if they were to significantly expand over a short period of time. Hence, while the collected data tends to support the main proposition, it is insufficient to counter a potential rival explanation of: *The formality of a group's agreement is dictated by the scope, complexity, and uncertainty of operations.*

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9.6 Proposition 2 – Cost Savings and Success

The second proposition put forth in section 3.2.3 is

Proposition 2*: Reduction in per acre equipment and labor costs through cooperation will trump all other benefits as participants' measure of the success of their collaboration.*

All of the groups interviewed as case studies cited that one of the primary motivations for entering into a cooperative arrangement was to either reduce their current equipment and/or labor costs or to facilitate expansions in operation (also through cost savings). However, this was not the "measure of success" in several cases used by members to evaluate the success of their cooperation. For the cases that involved the sharing of a single piece of equipment or that consisted of only a few members, cost savings was cited as one of the dominant benefits of cooperation. But, for the groups consisting of a larger number of members sharing entire equipment sets, the responses varied.

In the case of AgFields, the members noted that little cost savings had actually been attained due to fluctuations in membership. They felt that the principle benefit they obtained from cooperation was gaining access to bigger and better equipment and more advanced technology while reducing the risk facing individual members. In the case of the Sanders family, the two primary members both noted that a major benefit of cooperation was that it enabled and eased the introduction of their sons into the business of farming. Even if it led to short term losses to them, they felt that some loss is a necessary part of the process and losses might be even greater had they been operating as individuals. For the members of Lakeside Cooperative, their measure of the success of their cooperative operation has little to do with minimizing the cost of field operations. Their expansion into diversified revenue generating and value added activities was seen by the group as the main benefit of cooperation. A common thread in many of the case studies (both the larger and smaller groups) was a major benefit from increased flexibility in work hours and greater opportunity for time off generated by greater efficiencies in the field due to pooling of labor resources.

Although in several of the cases reducing per acre costs was a primary motivation for entering into a cooperative arrangement, other less readily quantifiable benefits occurred after the group formed. These benefits included technology access, flexibility in hours, camaraderie, and risk reduction. For some, these benefits were viewed as every bit as important as benefits in terms of cost savings.

9.7 Proposition 3 – Equipment and Labor Synergy

The third proposition put forth in section 3.2.3 is

Proposition 3*: Given the natural synergies (e.g. increased efficiency) and time constraints, equipment sharing will occur coincidental with labor sharing (conditioned on the equipment being major/vital pieces).*

Corollary 3*: Specialization of field operations will be a natural occurrence among joint labor operations.*

In each of the case studies, except for the long distance sharing arrangement between the Duncans and the Fergusons, the groups shared both equipment and labor during at least the harvest season. Every group interviewed shares a combine, reflecting the fact that the most effective use of machine time requires one person to operate the combine and another to haul grain away from the combine. The relatively short harvest window for corn and soybeans makes it unlikely that two or more operators would rely on a single combine unless they also pooled their labor. This makes it difficult to evaluate whether or not the cases provide support for proposition 3. Since nearly all groups were motivated to enter into a cooperative arrangement by equipment costs, labor shortages, or expenses, it is not possible to clearly determine whether they occur simultaneously in each group because of the synergistic attribute.

However, with regard to corollary 3, more concrete conclusions can be drawn. Among all of the groups very little specialization in field activities occurs. As a cooperative group increases in numbers, it is likely that more opportunities for efficiency gains from specialization will occur. At the very minimum, there should be more opportunities for members to perform tasks that they find personally more enjoyable. Only one group, Erickson and Zimmerman, appeared to take full advantage of the specialization opportunities that exist in a cooperative group by concentrating on the

harvest tasks that they individually preferred. For non-field activities such as record keeping, equipment repairs, and management of seed and chemical supplies and orders, specialization was common among the case studies.

9.8 Proposition 4 – Intangibles and Success

The fourth proposition put forth in section 3.2.3 is

Proposition 4*: Intangibles such as personal traits conducive to "teamwork" are essential for successful pooling of labor resources.*

Of the four propositions put forth, none can be as resoundingly confirmed as the importance of personal tolerance, work ethics, work habits, and willingness to be part of team. These traits appear to be critical for the success of a farm-level resource sharing agreement. In all of the case studies members cited that a critical component for their agreements' success was that each member was not only a skilled and dedicated farmer but also willing to be sufficiently flexible to consider the good of the group as well as one's own. As noted in several cases, most members did not mind small individual losses or decisions by the group that ran counter to their own preferences. They tended to believe everything evened out in the long run and that they were better within the group than outside the group.

The evidence from the Bennett, Nelson, and Taylor group certainly supports the proposition. There were several contributing factors to the group's failure. But a major cause was the absence of "teamwork" characteristics and willingness to be collaborative. Precisely quantifying the intangible attributes required for a group to be successful in a cooperative farming arrangement is difficult. However, the evidence from the cases in

this study certainly supports the proposition that characteristics conducive to teamwork are a vital ingredient for success. Where these intangible personal traits are uncertain or missing, a group should be cautious about entering a cooperative agreement. At a minimum, additional study at the outset and perhaps proceeding more slowly is advisable.

CHAPTER 10: FINANCIAL MODEL OF INDIVIDUAL VERSUS JOINT EQUIPMENT OWNERSHIP AND OPERATION

10.1 Introduction

In this section, a financial model is developed quantifying the potential gains from machinery sharing as compared to individual ownership. The set of major equipment pieces required for grain farming is fairly congruent throughout the Midwest. The profit maximizing equipment size, or the actual performance and efficiency attained in the field, are affected by differences in acreage, soil, weather, and other factors. To address this issue, the equipment costs for several hypothetical groups engaged in equipment sharing were modeled. The intent was to compare what might be achieved through cooperation to a base scenario of an autonomous farmer.

Equipment cost and performance is estimated utilizing an amalgam of sources including the Saskatchewan Agriculture and Food's 2006-2007 Farm Machinery Custom and Rental Rate Guide, Joint Machinery Ownership (Edwards 2001), Farm Analysis Solution Tools provided by the University of Illinois, and local dealer list prices.[11] It should be noted that the financial projections are based on estimates using current economic conditions and several additional assumptions. The results may not be directly applicable to any specific farm or group of farms. However, sensitivity analysis shows that the general conclusions on cost savings are robust to reasonable alternative assumptions.

[11] A complete list of sources for data used in this analysis include: Edwards 2001, Hanna and Edwards 2002, Kastens 1997, Harris and Fulton 2000, Farm Analysis Solution Tools (FAST) software, Machinery Cost Calculator Software, web listings of new and used equipment for sale, and interviews of university extension researchers at Iowa State University.

10.2 Methodology

In this chapter, four theoretical farming scenarios are considered where each scenario is designed to approximate the farms engaged in equipment sharing analyzed in the previously discussed case studies. Scenario 1, the base case, is an individual farmer who cultivates 800 acres. Scenario 2 is designed to represent the farms detailed in chapter 5, and consists of two farmers each cultivating 800 acres. Scenario 3 also consists of two farms, but it is assumed that each farm cultivates 1200 acres. This scenario is designed to represent those farms detailed in chapter 6, as well as the equipment costs on farms under scenario 2 that expand their acreage. The final scenario is designed to approximate those farms in chapter 7, in which equipment is shared among many farms.

	Number of Farms	Acres per Farm	Total acres for cooperative
Scenario 1	1	800	800
Scenario 2	2	800	1600
Scenario 3	2	1200	2400
Scenario 4	4	800	3200

Table 11. Summary of Analyzed Farming Scenarios

For each farming scenario, five pieces of machinery are considered, including a (1) combine, (2) PTO sprayer, (3) air seeder[12], (4) small tractor, and (5) large tractor. For each scenario, a specific assumption regarding the size of equipment utilized by the hypothetical farmers is made based upon (1) the case study interviews and (2) a

[12] Air, versus conventional seeding, is purposely considered in this analysis to demonstrate the financial hurdle typically encountered for individual farmers in making the transition to a more advanced and expensive technology.

collection of materials offering machinery guidance and cost estimates provided by researchers at several universities. It must be noted that even the recommendations of the referenced sources for ideal machinery size selection may not be appropriate for all conditions. Instead the assumed equipment sets for the four scenarios are intended to serve as a generalization of potential cost savings for cooperative farming arrangements.

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Combine	<300 hp with <250 bu hopper	300 hp with <300 bu hopper	>350 hp with >300 bu hopper	>350 hp with >300 bu hopper
PTO Sprayer	400-500 Gal. 60-75 Ft.	400-500 Gal. 60-75 Ft.	400-500 Gal. 60-75 Ft.	700-800 Gal. 80-90 Ft.
Air Seeder	24-25 Ft.	34-35 Ft.	46-47 Ft.	50-55 Ft.
Small Tractor	100-119 Hp. (2WD)	140-159 Hp. (2WD)	180-199 Hp. (2WD)	180-199 Hp. (2WD)
Large Tractor	200-225 Hp. (2WD)	350-399 Hp. (4WD)	400-425 Hp. (4WD)	450-500 Hp. (4WD)

Table 12. Assumed Equipment Size for Scenarios 1-4

Work Rate

The assumed work rate for the selected machinery (except for the tractors) is derived from the Saskatchewan Agriculture and Food's 2006-2007 Farm Machinery Custom and Rental Rate Guide and detailed in appendix 12.3. The total number of hours

required for a piece of equipment is calculated as the total acreage of the involved farms divided by the machine work rate. For example, under scenario 1, an individual farmer cultivating 800 acres using a combine with an assumed work rate of 10 acres per hour will use the combine 80 hours during the year. Under scenario 2, two farmers cultivating 1200 acres using a larger combine with an assumed work rate of 12.5 acres per hour will use the combine 128 hours during the year (64 hours on each member's farm).

Given the difficulty in generalizing tractor work rates and use across farms, specific assumptions regarding hours of use during a year are made based upon acreage and gathered information. An individual operator (Scenario 1) is assumed to use a small tractor 0.075 hours per acre and a large tractor 0.2 hours per acre. For a member of a cooperative, a small tractor is assumed to be used 0.05625 hours per acre (25 percent less than an individual operator) and a large tractor 0.15 hours per acre (25 percent less than an individual operator). The assumed values roughly correspond to the number of hours required for drawing the sprayer in the case of the small tractor and an air seeder and field cultivator in the case of the large tractor.

It is important to note that, while the work rate for the cooperative scenarios (scenarios 2-4) is greater than for the individual farmer (scenario 1), the total number of hours of use for the equipment by the cooperative is greater. In all of the case studies (except the long distance sharing arrangement of Fergusons and Duncans), the groups pooled their labor and farmed together. While having additional laborers does not increase the work rate capabilities of a particular machine, there are efficiency gains that reduce the number of field hours required as compared to operating individually. For example, a single operator during harvest must pause combining in order to empty the

combine and, when the cart is full, transport grain. Two or more operators working jointly can greatly reduce the length of the interruption in combining activities by dividing combining and transporting activities and using practices such as on-the-go emptying of the combine hopper. The gains in efficiency during harvest, planting, and other field work are not considered in this model. Hence, while the total number of combine hours during a year is estimated to be significantly larger for the cooperative scenarios, this does not represent the total number of hours required for different farming tasks (e.g. harvesting).

Equipment Costs

In the four scenarios modeled, only ownership of new equipment is analyzed. Consideration of older used equipment is purposely omitted from the analysis in order to explicitly capture the situation of an independent farmer seeking to obtain access to the most modern and efficient equipment, which may possess new technologies not present on older machines. As the results detailed in the subsequent sections demonstrate, new equipment may potentially be prohibitively expensive for an individual farmer while feasible for a cooperative.

The total cost of equipment is divided into two major cost subsets, Total Fixed Costs (TFC) and Total Operating Costs (TOC). Total Fixed Costs are the sum of investment costs (assuming a 7 percent interest rate and a 20 percent down payment), depreciation (assuming a 10 percent salvage value), and housing and insurance costs. Total Operating Costs include estimated repair expenses and fuel and lube costs for

machines that are self-propelled. A detailed explanation of the formulas used in the analysis is available in appendix 12.4. Assumptions for these costs reflect prices in 2007.

10.3 Cost Comparisons

10.3.1 Combine

In this section, the cost of a combine (typically the most expensive single piece of equipment utilized in a grain farming operation) is considered under the four scenarios. For the assumed work rates of the selected combines in each scenario, the total hours of use per farm ranges from a maximum of 80 hours for an individual farmer under scenario 1 to a minimum of 40 hours for a group of four farmers operating 3200 acres (scenario 4). The total annual use is lowest for the individual farmer (80 hours) and the greatest for the group of four farmers (160 hours). A summary of the estimated cost savings[13] of sharing a combine between multiple farms (scenarios 2-4) over individual ownership is presented in table 13. A detailed breakdown of the specific costs of combine ownership and operation for the four scenarios is presented in table 14.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Fixed Cost	-	33%	43%	55%
Total Operating Cost	-	14%	30%	41%
Total Combine Cost	-	29%	40%	52%

Table 13. Per Acre Combine Cost Savings from Cooperation

As can be seen from table 13, substantial cost savings are feasible through sharing a combine between multiple farms. In scenario 2, which consists of two farmers

[13] Per acre cost savings from cooperation is calculated as [(per acre cost for scenario 1)- (per acre cost for scenario 2, 3, or 4)]/ (per acre cost for scenario 1).

operating a total of 1600 acres, per acre combine cost is reduced by 25 percent over what an individual would incur. For the case of four farmers (scenario 4) sharing a significantly larger combine (as compared to the individual scenario), combine costs per acre are reduced by 48 percent. Under scenario three, the combine cost per farm is only approximately 3,000 dollars less than for the individual farmer per year, but per acre combine costs are considerably lower (over 15 dollars less).

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
FARM ASSUMPTIONS					
Number of Farms		1	2	2	4
Acreage per Farm		800	800	1200	800
Total Coop Acres		800	1600	2400	3200
COMBINE INFORMATION					
Assumed Type (Horsepower / Hopper Size)		<300hp / 250bu	300hp / <300bu	>350hp / >300bu	>350hp / >300bu
Original Cash Cost		187,000	233,000	300,000	300,000
Salvage Value		18,700	23,300	30,000	30,000
Lifetime	**years**	15	13	13	12
Repair Cost Factor		0.3200	0.2667	0.2667	0.2133
Work Rate	**ac/hour**	10.0	12.5	20.0	20.0
TIME REQUIREMENT					
Annual Hours Use	**total**	80	128	120	160
Annual Hours Use	**per farm**	80	64	60	40
FIXED COSTS					
Depreciation	**per hour**	140	126	173	141
Investment Cost	**per hour**	144	112	154	116
Housing & Insur.	**per hour**	23	18	25	19
TFC	**per hour**	308	256	352	275
TFC	**per farm**	24,609	16,407	21,125	10,995
TFC	**per coop**	24,609	32,814	42,249	43,980
TFC	**per acre**	30.8	20.5	17.6	13.7
OPERATING COSTS					
Repair Costs	**per hour**	59.85	62.13	80.00	63.99
Fuel Costs	**per hour**	16.0105	19.2126	25.6168	25.6168

Lube and Oil Cost	**per hour**	0.7216	0.9020	1.0824	1.0824
TOC	**per hour**	77	82	107	91
TOC	**per farm**	6,126	5,264	6,402	3,628
TOC	**per coop**	6,126	10,528	12,804	14,510
TOC	**per acre**	7.7	6.6	5.3	4.5
TOTAL COMBINE COSTS					
	per hour	384	339	459	366
	per farm	30,736	21,671	27,527	14,623
	per coop	30,736	43,341	55,053	58,490
	per acre	38.4	27.1	22.9	18.3

Table 14. Combine Cost Calculations

10.3.2 Air Seeder

In this section, the cost of an air seeder is considered for the four scenarios. An air seeder was selected instead of a conventional seeder in order to demonstrate the potentially prohibitive cost for an individual farmer to adopt direct seeding on a smaller acreage. For the assumed work rates of the selected air seeders in each scenario, the total hours of use per farm ranges from a maximum of 73 hours for an individual farmer under scenario 1 to a minimum of 33 hours for a group of four farmers operating 3200 acres (scenario 4). The total annual use is lowest for the individual farmer (73 hours) and the greatest for the group of four farmers (133 hours). A summary of the estimated cost savings of sharing an air seeder between multiple farms (scenarios 2-4) over individual ownership is presented in table 15. A detailed breakdown of the costs of air seeder ownership and operation for the four scenarios is presented in table 16.

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Total Fixed Cost	-	36%	44%	50%
Total Operating Cost	-	12%	14%	31%
Total Air Seeder Cost	-	33%	40%	48%

Table 15. Per Acre Air Seeder Cost Savings from Cooperation

As can be seen from table 15, substantial cost savings are feasible through sharing an air seeder between multiple farms. In scenario 2, which consists of two farmers operating a total of 1600 acres, per acre seeder cost is reduced by one-third. For the case of four farmers sharing a significantly larger air seeder (as compared to the individual scenario), seeding costs per acre are reduced by nearly one-half. For scenario 3, the total cost of the air seeder system for the partnership is nearly double that of the individual farmer ($15,902 versus $8,827) but the seeding cost per acre is 40 percent less.

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
FARM ASSUMPTIONS					
Number of Farms		1	2	2	4
Acreage per Farm		800	800	1200	800
Total Coop Acres		800	1600	2400	3200
AIR SEEDER INFORMATION					
Assumed Type		24-25 Ft	34-35 Ft	46-47 Ft	50-55 Ft
Original Cash Cost		62,509	79,827	105,354	117,801
Salvage Value		6,251	7,983	10,535	11,780
Lifetime	**years**	18	18	18	16
Repair Cost Factor		0.2500	0.2500	0.2500	0.2000
Work Rate	**ac/hour**	11	16	22	24
TIME REQUIREMENT					
Annual Hours Use	**total**	73	100	112	133
Annual Hours Use	**per farm**	73	50	56	33
FIXED COSTS					
Depreciation	**per hour**	44	41	49	51
Investment Cost	**per hour**	53	49	58	54
Housing & Insur.	**per hour**	9	8	9	9
TFC	**per hour**	106	98	116	115
TFC	**per farm**	7,690	4,911	6,481	3,819
TFC	**per coop**	7,690	9,821	12,962	15,275
TFC	**per acre**	9.6	6.1	5.4	4.8
OPERATING COSTS					
Repair Costs	**per hour**	15.63	19.96	26.34	23.56
Fuel Costs	**per hour**	0	0	0	0

Lube and Oil Cost	**per hour**	0	0	0	0
TOC	**per hour**	16	20	26	24
TOC	**per farm**	1,137	998	1,470	785
TOC	**per coop**	1,137	1,996	2,940	3,141
TOC	**per acre**	1.4	1.2	1.2	1.0
TOTAL AIR SEEDER COSTS					
	per hour	121	118	142	138
	per farm	8,827	5,908	7,951	4,604
	per coop	8,827	11,817	15,902	18,416
	per acre	11.0	7.4	6.6	5.8

Table 16. Air Seeder Cost Calculations

10.3.3 PTO Sprayer

For the assumed work rates of the selected PTO sprayers in each scenario, the total hours of use per farm ranges from a maximum of 44 hours for a group of two farmers each cultivating 1200 acres (scenario 3) to a minimum of 23 hours for a group of four farmers operating 3200 acres (scenario 4)[14]. Total annual use is lowest for the individual farmer (30 hours) and the greatest for the group of four farmers (91 hours). A summary of the estimated cost savings of sharing a PTO sprayer between multiple farms (scenarios 2-4) over individual ownership is presented in table 17. A detailed breakdown of the costs of sprayer ownership and operation for the four scenarios is presented in table 18.

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Total Fixed Cost	-	47%	65%	30%
Total Operating Cost	-	11%	11%	-82%
Total PTO Sprayer Cost	-	40%	54%	7%

Table 17. Per Acre PTO Sprayer Cost Savings from Cooperation

[14] Only one field spraying is considered in the cost model. Under a direct seeding system two sprayer passes are typical.

As can be seen from table 17, the cost savings from sharing a sprayer largely depends on the selected sprayer size. There is a substantial increase in the original cash cost between a 400-500 gallon 60-75 foot sprayer and a 700-800 gallon 80-90 foot sprayer. For the individual farmer and the two smaller cooperative scenarios, it is assumed that the same size of sprayer is utilized. This yields substantial cost savings (40 percent for scenario 2 and 54 percent for scenario 3). Under scenario 4, which models the case of four farmers cultivating a cumulative acreage of 3200 acres, a larger sprayer is assumed. Given the increase in initial cost and repair expenses, the cost savings are minimal (only 7 percent) despite the increased work rate of the larger machine.

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
FARM ASSUMPTIONS					
Number of Farms		1	2	2	4
Acreage per Farm		800	800	1200	800
Total Coop Acres		800	1600	2400	3200
PTO SPRAYER INFORMATION					
Assumed Type		400-500 Gal, 60-75 Ft	400-500 Gal, 60-75 Ft	400-500 Gal, 60-75 Ft	700-800 Gal, 80-90 Ft
Original Cash Cost		10,373	10,373	10,373	27,691
Salvage Value		1,037	1,037	1,037	2,769
Lifetime	**years**	18	16	16	16
Repair Cost Factor		1.0333	0.9152	0.9152	0.9152
Work Rate	**ac/hour**	27	27	27	35
TIME REQUIREMENT					
Annual Hours Use	**total**	30	59	89	91
Annual Hours Use	**per farm**	30	30	44	23
FIXED COSTS					
Depreciation	**per hour**	18	10	7	18
Investment Cost	**per hour**	22	11	7	19
Housing & Insur.	**per hour**	4	2	1	3
TFC	**per hour**	43	23	15	39
TFC	**per farm**	1,276	673	673	898
TFC	**per coop**	1,276	1,345	1,345	3,591

TFC	**per acre**	1.6	0.8	0.6	1.1
OPERATING COSTS					
Repair Costs	**per hour**	10.72	9.49	9.49	25.34
Fuel Costs	**per hour**	0	0	0	0
Lube and Oil Cost	**per hour**	0	0	0	0
TOC	**per hour**	11	9	9	25
TOC	**per farm**	318	281	422	579
TOC	**per coop**	318	563	844	2,317
TOC	**per acre**	0.4	0.4	0.4	0.7
TOTAL PTO SPRAYER COSTS					
	per hour	54	32	25	65
	per farm	1,594	954	1,094	1,477
	per coop	1,594	1,908	2,189	5,908
	per acre	2.0	1.2	0.9	1.8

Table 18. PTO Sprayer Cost Calculations

10.3.4 Small Tractor

In this section, the cost of a small tractor is considered for the same four scenarios. Given the difficulty in generalizing tractor use across farms, a specific assumption of 0.075 hours per acre of small tractor use was assumed for an individual farmer and 0.05625 hours per acre of use for a member of an equipment sharing arrangement. This corresponds to 60, 90, 135, and 180 hours of small tractor use for the four scenarios respectively. A summary of the estimated cost savings of sharing a small tractor between multiple farms (scenarios 2-4) over individual ownership is presented in table 19. A detailed breakdown of the costs of small tractor ownership and operation for the four scenarios is presented in table 20.

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Total Fixed Cost	-	28%	37%	53%
Total Operating Cost	-	-6%	-38%	-38%
Total Tractor Cost	-	22%	25%	38%

Table 19. Per Acre Small Tractor Cost Savings from Cooperation

As can be seen from table 19, significant cost savings are feasible through sharing a small tractor between multiple farms. Given the larger size of the assumed tractors for the cooperative scenarios and the small number of assumed hours of use, there is a loss with respect to operating costs but large savings on fixed costs. In scenario 2, which consists of two farmers operating a total of 1600 acres, per acre tractor cost is reduced by 20 percent. For the case of four farmers sharing a tractor, per acre costs are reduced by over one-third. For scenario 3, the total cost of the assumed tractor for the partnership is more than double that of the individual farmer ($22,168 versus $9,720) but the tractor cost per acre is 24 percent less.

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
FARM ASSUMPTIONS					
Number of Farms		1	2	2	4
Acreage per Farm		800	800	1200	800
Total Coop Acres		800	1600	2400	3200
SMALL TRACTOR INFORMATION					
Assumed Type		100-119 HP (2WD)	140-159 HP (2WD)	180-199 HP (2WD)	180-199 HP (2WD)
Original Cash Cost		$69,995	$101,204	$131,692	$131,692
Salvage Value		$7,000	$10,120	$13,169	$13,169
Lifetime	**years**	20	20	20	20
Repair Cost Factor		0.1550	0.1550	0.1550	0.1550
Work Rate	**ac/hour**	13.33	17.78	17.78	17.78
TIME REQUIREMENT					
Annual Hours Use	**total**	60.00	90.00	135.00	180.00
Annual Hours Use	**per farm**	60.00	45.00	67.50	45.00
FIXED COSTS					
Depreciation	**per hour**	52	51	44	33
Investment Cost	**per hour**	72	69	60	45
Housing & Insur.	**per hour**	12	11	10	7
TFC	**per hour**	136	131	114	85
TFC	**per farm**	8,161	5,900	7,678	3,839
TFC	**per coop**	8,161	11,800	15,355	15,355

TFC	**per acre**	10.2	7.4	6.4	4.8
OPERATING COSTS					
Repair Costs	**per hour**	10.85	15.69	20.41	20.41
Fuel Costs	**per hour**	15	20	27	27
Lube and Oil Cost	**per hour**	0.3969	0.5412	0.6494	0.6494
TOC	**per hour**	26	37	48	48
TOC	**per farm**	1,559	1,652	3,237	2,158
TOC	**per coop**	1,559	3,305	6,475	8,633
TOC	**per acre**	1.9	2.1	2.7	2.7
TOTAL SMALL TRACTOR COSTS					
	per hour	162	168	162	133
	per farm	9,720	7,553	10,915	5,997
	per coop	9,720	15,105	21,830	23,988
	per acre	12.1	9.4	9.1	7.5

Table 20. Small Tractor Cost Calculations

10.3.5 Large Tractor

In this section, the cost of a large tractor is considered for the four scenarios. In particular, the upgrade from a two-wheel drive tractor to a four-wheel drive tractor is analyzed. As in the prior case, the difficulty in generalizing tractor use across farms is handled by making assumptions about usage. It is assumed that there is 0.2 hours per acre of large tractor use for an individual farmer and 0.15 hours per acre of use for a member of an equipment sharing cooperative arrangement is assumed. This corresponds to 160, 240, 360, and 480 hours of large tractor use for the four scenarios respectively. A summary of the estimated cost savings of sharing a large tractor between multiple farms (scenarios 2-4) over individual ownership is presented in table 21. A detailed breakdown of the costs of large tractor ownership and operation for the four scenarios is presented in table 22.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Fixed Cost	-	39%	52%	56%
Total Operating Cost	-	12%	23%	18%
Total Tractor Cost	-	30%	42%	44%

Table 21. Per Acre Large Tractor Cost Savings from Cooperation

As can be seen from table 21, even with the upgrade from a two-wheel drive tractor to a four-wheel drive tractor, significant cost savings are attainable through sharing the machine between multiple farms. In scenario 2, the two 800 acre farmers sharing a 350-399 horsepower four-wheel drive tractor have 33 percent lower per acre costs compared to an individual farmer using a 200-225 horsepower two-wheel drive tractor. In scenarios three and four, where quite large four-wheel tractors are assumed to be shared amongst multiple farms, there is a cost savings of over 40 percent.

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
FARM ASSUMPTIONS					
Number of Farms		1	2	2	4
Acreage per Farm		800	800	1200	800
Total Coop Acres		800	1600	2400	3200
LARGE TRACTOR INFORMATION					
Assumed Type		200-225 HP (2WD)	350-399 HP (4WD)	400-425 HP (4WD)	450-500 HP (4WD)
Original Cash Cost		$155,415	$189,420	$207,189	$239,932
Salvage Value		$15,541	$18,942	$20,719	$23,993
Lifetime	**years**	20	20	17	15
Repair Cost Factor		0.1550	0.1550	0.0867	0.0650
Work Rate	**ac/hour**	5.00	6.67	6.67	6.67
TIME REQUIREMENT					
Annual Hours Use	**total**	160.00	240.00	360.00	480.00
Annual Hours Use	**per farm**	160.00	120.00	180.00	120.00
FIXED COSTS					

Depreciation	**per hour**	44	36	31	31
Investment Cost	**per hour**	60	49	35	31
Housing & Insur.	**per hour**	10	8	6	5
TFC	**per hour**	113	92	73	67
TFC	**per farm**	18,121	11,043	13,068	8,018
TFC	**per coop**	18,121	22,086	26,136	32,071
TFC	**per acre**	22.7	13.8	10.9	10.0
OPERATING COSTS					
Repair Costs	**per hour**	24.09	29.36	17.96	15.60
Fuel Costs	**per hour**	29	32	36	42
Lube and Oil Cost	**per hour**	0.6494	1.3530	1.4883	1.6236
TOC	**per hour**	54	63	55	59
TOC	**per farm**	8,569	7,528	9,957	7,062
TOC	**per coop**	8,569	15,056	19,913	28,246
TOC	**per acre**	10.7	9.4	8.3	8.8
TOTAL LARGE TRACTOR COSTS					
	per hour	167	155	128	126
	per farm	26,691	18,571	23,025	15,079
	per coop	26,691	37,143	46,049	60,318
	per acre	33.4	23.2	19.2	18.8

Table 22. Large Tractor Cost Calculations

10.4 Over-equipped Extreme Case Scenario

In the previous sections, four theoretical farming scenarios were modeled under an assumed set of machinery that was purposely selected to reasonably approximate a typical Midwest grain farm. One of the complications in comparing equipment costs between an individual farm and multiple farms sharing machinery is that, despite an assumption of larger equipment with greater work rates for the cooperative scenarios, the total number of hours of use per year is greater. To an observer, the estimated total number of hours of equipment use for a machinery sharing arrangement may seem unsatisfactorily high. Although, as noted earlier, in the analysis presented there is no

consideration in the model for increased work efficiency of multiple farmers conducting field work as a group.

To complete the analysis, an extreme resource sharing case between two farmers each cultivating 800 acres is considered in this section. Instead of assuming equipment for the partnership that is reasonable for completing field activities in a timely manner, the machinery that is assumed to be shared between the farmers is chosen such that the total number of field hours is roughly equivalent to that of an individual farmer. For example, an individual farmer operating 800 acres with a 275 horsepower combine with a work rate of 10 acres per hours requires 80 hours of combine time per year. Two farmers, each cultivating 800 acres, operating a 375 horsepower combine with a work rate of 20 acres per hour also requires 80 hours of combine time per year (40 hours per 800 acre farm). In table 23, a summary of the two equipment scenarios considered in this section is presented.

	Scenario 1 **1 Farmer - 800 acres total**	**Scenario 5 (Over-equipped Case)** **2 Farmers - 800 acres each (1600 acres total)**
Combine	<300 hp with <250 bu hopper	>300 hp with >300 bu hopper
Work Rate (ac/hour)	10	20
Hours per Farm	80	40
Total Hours	80	80
PTO Sprayer	400-500 Gal. 60-75 Ft.	1250+ Gal. 110 Ft.
Work Rate (ac/hour)	27	53
Hours per Farm	30	15
Total Hours	30	30
Air Seeder	24-25 Ft.	46-47 Ft.

Work Rate (ac/hour)	11	22
Hours per Farm	73	37
Total Hours	73	74

Table 23. Assumed Equipment Size for Scenarios 1 and 5 (Over-equipped Case)

As can be seen from table 23, for the selected equipment sizes the number of hours of combine, sprayer, and seeder[15] use per year is equivalent between the two scenarios. Under a typical farming situation, most would agree that the two farmers under scenario 5 are largely over-equipped for their cumulative number of acres. A summary of the equipment costs for the two scenarios is presented in table 24. A detailed breakdown of the costs for each scenario is available in appendix 12.5.

	Scenario 5 (Over-equipped Case)
COMBINE	
Total Fixed Cost	20%
Total Operating Cost	20%
Total Combine Cost	20%
PTO SPRAYER	
Total Fixed Cost	-100%
Total Operating Cost	-104%
Total Sprayer Cost	-101%
AIR SEEDER	
Total Fixed Cost	16%
Total Operating Cost	14%
Total Seeder Cost	15%
ALL EQUIPMENT	
Total Fixed Cost	14.3%
Total Operating Cost	13.8%
Total Cost	14.2%

Table 24. Per Acre Cost Savings for Over-equipped Case

[15] Tractor use is omitted from the analysis due to the difficulty in estimating use for an individual or cooperative farming operation.

As can be seen from table 24, even under the over-equipped scenario there exists potential for significant savings from sharing a combine and air seeder between two farms (20 percent and 15 percent, respectively). In the case of the PTO sprayer, the greater capacity of the larger machine assumed for the cooperative group is not sufficient to overcome the substantially greater initial investment cost when compared to the smaller machine assumed for the individual farmer. Overall, by sharing the three pieces of equipment the total number of hours required of use is equivalent to that of the individual farmer, but with a 14.2 percent per acre savings. This lends credibility to the statements by the case study groups about the value of sharing both equipment and labor.

10.5 Conclusions

The model developed in this section quantifies several of the claims regarding equipment cost savings through sharing arrangements made by the case study participants. The analysis confirms the assertion that multiple farms sharing larger and more efficient machinery are potentially lucrative from a cost minimizing perspective. In table 25 is a cumulative summary of the cost savings under the four considered farming scenarios for sharing a combine, PTO sprayer, air seeder, small tractor, and a large tractor.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Total Fixed Cost	-	35%	45%	54%
Total Operating Cost	-	11%	19%	20%
Total Cost	-	30%	39%	46%

Table 25. Per Acre Cumulative Cost Savings from Cooperation

As can be seen in table 25, under the three cooperative scenarios the cost savings ranges from 30 percent to 46 percent. The largest portion of the cost savings comes from a reduction in fixed costs. Additionally, as shown in appendix 12.5, even under a purposely over-equipped equipment sharing scenario, reasonable cost savings may be attained.

CHAPTER 11: GENERAL CONCLUSION

As U.S. production agriculture continues to become increasingly capital intensive, small- and medium-sized farms face challenges if they are to remain competitive. In this study, a specific solution to this problem of taking advantage of economies of scale through farm-level resource sharing arrangements has been considered.

Through a two phase data collection procedure, groups engaged in informal and formal resource sharing arrangements were identified and thoroughly investigated through a case study approach. The results of the identification survey in chapter 4 indicated that these types of arrangements are common and varied. While the identification procedure was not intended to quantify how many of these groups currently operate in the U.S., the response rates and results are significant evidence that this form of cooperation is likely the most prevalent form among Midwestern farmers.

Chapters 5 through 8 provide a detailed summary and analysis of ten cooperative groups selected for case studies to provide a characterization of a broad spectrum of cooperation and types of agreements. Dividing groups into subsets based on basic characteristics was employed to make comparisons of parallel cooperative groups. A number of similarities and differences were found. But several key benefits and disadvantages of active cooperation resonated across the case study groups including:

Benefits

- Reduced equipment capital and operating costs.
- Access to more efficient equipment and new technologies.
- Access to reliable skilled labor.
- Improved labor efficiency due to 2+ skilled operators farming jointly.

Disadvantages

- Managing departures of group members is difficult and potentially costly.
- There is some loss of autonomy in operation and decision making.
- An additional time burden for coordinating farming operations and joint purchases.

Chapter 10 analyzed in a specific, although stylized, manner the potential gains from sharing equipment among multiple farmers. For sensitivity analysis, an extreme "over-equipped" cooperative arrangement was considered as well. Given the current costs and efficiencies of equipment, the developed model largely supports the theory that small- and medium-sized farmers can take advantage of economies of scale and reduce their equipment costs through cooperation. These results are simply based on a cost-benefit analysis and do not take into consideration other advantages from cooperation such as access to better technologies and greater efficiency in field operations through sharing of labor.

Through the case studies (in particular the Bennett, Taylor, and Nelson group) it is evident that there are several key factors that increase a group's likelihood and degree of success while minimizing potential risks and losses.

- A strong desire and willingness to work together with other farmers.
- Mutually accepted and clearly specified rules for selecting fields to be worked.
- Selection of an optimal set of equipment to work the group's aggregate acreage.
- A defined process for decision making and resolution of disagreements.

- Mutually accepted methods to account for differences in acreage and labor hours.
- An agreement for managing the departure of a member.

Overall, the evidence from the identification survey and the case studies suggests several conclusions that can be drawn including:

- Cooperation tends to be motivated by machinery costs and shortages of skilled labor.
- Many groups find that labor synergies and specialization are as important as cost savings.
- Managing entry/exit from a cooperative group is one of the biggest obstacles and drawbacks from cooperation.
- There are a variety of different kinds of sharing arrangements that can be effective.
- Written agreements are important if more than 2 or 3 farmers are involved.
- Personality intangibles such as beliefs, tolerance, and temperament are important.

One insight of this study is the need for more extensive academic research into farm-level resource sharing arrangements. None of the case study groups had access to information regarding how to design a cooperative arrangement, what issues they should consider, 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. This study provides a thorough first investigation and analysis of these issues and should

prove valuable to farmers and researchers alike in further investigations and implementations.

CHAPTER 12: APPENDIX

12.1. Case Study Interview Questions

Background

1. How many members are in the group?
    a. Who are they (contact information)
    b. Ages
    c. Are group members relatives?
    d. Where is the group located?
    e. When did the group initially form?
2. What type of production is the group involved in?
    a. What is the size of the joint operation (acres, number of livestock)?
    b. What types of production are the members involved in separately?
    c. What is the size of the individual operations (acres, number of livestock)?
    d. What does each member contribute to the group?
        i. Pieces of equipment
        ii. Labor
        iii. Specific responsibilities (i.e. book keeping, ordering inputs, etc.)
3. Why did the group choose to form?
    a. What were your expectations prior to forming/joining the group?
    b. What alternatives to forming the group were available?
    c. Do members' reasons for participating vary? If so, how are individual's objectives reconciled with group objectives?

d. What did you wish you had known before joining the group?
    i. Are there specific pieces of information (legal, financial, etc.) that would have been helpful?

4. What is the organization of the group? (verbal/informal, contract, business entity)
    a. Why did the group choose this type of organization?

Evolution

1. How has the group changed over time?
    a. Members joined/left (why?)
    b. Added activities to the group (i.e. Started sharing one piece equipment, now share several)
        i. Are these 'new' activities or things members were doing individually before?
    c. Added acreage

Group Dynamics

1. Does the group have an agreed upon plan for members leaving and or joining the group?
    a. What is this plan?
2. Have any members left/joined the group since forming the group?
    a. If a member has left the group why did they do so?
        i. How was their departure handled?
        ii. What problems were encountered handling their departure?
        iii. How would you rate the ease in handling the departure of the group member?

3. How are candidates for entering the group evaluated?
4. How are joint decisions made?
    a. Do all group members have an equal voice?
    b. How often does the group meet collectively?
    c. What decisions require unanimous agreement?
    d. What problems have been encountered making joint decisions?
    e. How would you rate the ease of making joint decisions?

Financing

1. Has the group sought financing jointly? What for (capital purchases, operating expenses)?
    a. If yes, were lenders more willing to offer financing to the group jointly rather than individually?
        i. Were the credit terms more favorable jointly versus individually?
    b. If no, why has the group not sought financing jointly?

Machinery

1. What pieces of machinery are shared?
    a. Is the machinery jointly owned or leased?
        i. If yes, what prompted the group to make the purchase jointly
            1. How was it handled, purchased by a business entity or as individuals
        ii. If no, why did the group not jointly purchase the equipment?
2. Why does the group not share other machines that are individually owned?

3. How are schedules for machinery usage arranged?
    a. What problems have arisen from machinery scheduling?
    b. If not all members' land is committed to the group, can you use the machinery on your other land?
4. How are minor repairs/maintenance performed (or by who)?
    a. What if one member is clearly at fault for a breakdown?
5. How are major repairs financed?
6. Did you expect to decrease your machinery costs through operating as a group?
    a. Were these expectations fulfilled?
7. If not a member of the group, would you individually have bought the same quality of machinery?
8. How does the group plan for future or replacement machinery purchases?
9. Which machines have worked well being shared? Poorly?

Operations/Management

1. Do you farm together?
2. Are members assigned specific tasks? If so, how is this decided?
3. Is there a common protocol for planting, harvesting, etc. (What do you all agree to do the same, if anything?)
4. Has participation in the group led to more/better information sharing among members? How so?

Labor

1. Do members contribute labor (own or hired) to the group's operations?

2. How are you compensated for your time?
3. Has joining the group changed your time worked on the farm, off the farm?
    a. How so, do you work more or less?
    b. Do you work more regular hours?
    c. Is it easier to take vacation time away from the farm?

Income

1. What has been the result of the group on your income?
    a. More/less diversified income
    b. Lower costs compared with before?
        i. Machinery
        ii. Labor
        iii. Other inputs
2. Have you seen any tax advantages from being a member of this group?

Benefits/Challenges

1. In your opinion, what are the most important advantages of the group?
2. In your opinion, what are the biggest drawbacks of the group?
3. What expectations have been fulfilled and which have not?

Documents (if applicable):

Copy of any contract between members

Copy of bylaws, rules of the organization

12.2 Preliminary Questionnaire Mailed to all Case Study Participants

Dear _____,

Thank you for agreeing to take the time to talk with us about your machinery-sharing practices. With your help, we expect this research to provide valuable information to farmers like you across the Midwest.

Prior to visiting with your group, we would like to learn a little about your members and what you are doing as a group. Would you please take a few minutes to respond to the following questions and mail your responses back to us in the enclosed envelope?

If you have any questions, please do not hesitate to call me at (515) ###-####. I look forward to meeting with you and thanks again for your cooperation.

Sincerely,

Background Information for _____

- In the space below, please briefly describe what your group does.

- Again briefly, please explain why the group formed.

- Are some members of your group relatives?

- How many years have you been working together as a group?

- Have new members joined your group since it started? If yes, which members?

- Have any members left the group? If yes, please briefly tell us why.

- Do you have a written agreement between group members?

- What kinds of records do you keep for the group?

	Member 1	Member 2	Member 3
Name			
Address			
Telephone Number			
Age			
Total number of acres farmed			
Acres farmed with the group			
Livestock operation?	Yes No	Yes No	Yes No
If yes, number of head			
Please list the equipment/ machinery that the member personally owns but is shared with other members in the group (ex. John Deere 9650STS Combine, New Holland 664 Round Baler			
List machinery the group jointly purchased/leased			
Provides labor to the group?	Yes No	Yes No	Yes No
Other tasks related to group activities (e.g., keeps records, orders inputs, etc.)			
Works off-farm?	Yes No	Yes No	Yes No
If yes, occupation?			

	Member 4	Member 5	Member 6
Name			
Address			
Telephone Number			
Age			
Total number of acres farmed			
Acres farmed with the group			
Livestock operation?	Yes No	Yes No	Yes No
If yes, number of head			
Please list the equipment/ machinery that the member personally owns but is shared with other members in the group (ex. John Deere 9650STS Combine, New Holland 664 Round Baler			
List machinery the group jointly purchased/leased			
Provides labor to the group?	Yes No	Yes No	Yes No
Other tasks related to group activities (e.g., keeps records, orders inputs, etc.)			
Works off-farm?	Yes No	Yes No	Yes No
If yes, occupation?			

12.3. Equipment Cost and Efficiency Data

Size	Acres per hour	Price	Fuel Cost (per hour)	Lube Cost (per hour)
COMBINE DATA				
<300hp with 250bu hopper	10	187,000	16.01	0.72
300hp with <300bu hopper	12.5	233,000	19.21	0.90
>300hp with 300bu hopper	16	260,000	22.41	1.08
>350hp with >300bu hopper	20	300,000	25.62	1.08
AIR SEEDER DATA				
24-25 Ft	11	62,509	-	-
28-30 Ft	13.5	77,211	-	-
34-35 Ft	16	79,827	-	-
40-41 Ft	18.5	88,757	-	-
46-47 Ft	21.5	105,354	-	-
50-55 Ft	24	117,801	-	-
SPRAYER DATA				
400-500 Gal, 60-75 Ft	27	10,373	-	-
700-800 Gal, 80-90 Ft	35	27,691	-	-
700-800 Gal, 91-105 Ft	41	34,276	-	-
1250 Gal, 100-110 Ft	53	41,492	-	-
2WD TRACTOR DATA				
80-89 HP (2WD)	-	44,469	11.53	0.31
90-99 HP (2WD)	-	53,308	12.81	0.34
100-119 HP (2WD)	-	69,995	14.73	0.40
120-139 HP (2WD)	-	80,278	17.93	0.47
140-159 HP (2WD)	-	101,204	20.49	0.54
160-179 HP (2WD)	-	117,260	24.98	0.61
180-199 HP (2WD)	-	131,692	26.90	0.65
200-225 HP (2WD)	-	155,415	28.82	0.65
226-250 HP (2WD)	-	181,663	30.10	0.65
251+ HP (2WD)	-	183,737	31.38	0.65
4WD TRACTOR DATA				
100-130 HP (4WD)	-	96,334	22.41	0.43
250-299 HP (4WD)	-	150,093	26.26	0.99
300-349 HP (4WD)	-	170,388	29.46	1.17
350-399 HP (4WD)	-	189,420	32.02	1.35
400-425 HP (4WD)	-	207,189	35.86	1.49
450-500 HP (4WD)	-	239,932	41.63	1.62
500+ HP (4WD)	-	260,588	43.55	1.62

Annual Use (hours)	Lifespan (Years)	Repair Factor
COMBINE DATA		
100	15	0.3200
120	13	0.2667
150	12	0.2133
180	11	0.1778
350	8.5	0.0914
AIR SEEDER DATA		
100	17.5	0.2500
150	15.5	0.2000
200	13.5	0.1500
SPRAYER DATA		
30	17.5	1.0333
60	15.5	0.9152
120	13.5	0.7972
2WD TRACTOR DATA		
200	20	0.1550
300	16.5	0.1033
400	14.5	0.0775
600	13	0.0517
800	11.5	0.0388
4WD TRACTOR DATA		
200	20	0.1300
300	16.5	0.0867
400	14.5	0.0650
600	13	0.0433
800	11.5	0.0325

12.4 Formulas for Equipment Cost Calculations

Interest Rate = 7%

Percentage of Original Cash Cost Finance = 80%

Salvage Value = 10% * Original Cash Cost

Total Fixed Cost = (Original Cash Cost – Salvage Value)/Lifespan

Investment Cost=(Original Cash Cost – Salvage Value)*80%*Interest Rate

Housing and Insurance = 1%*Original Cash Cost

12.5 Cost Calculations for Over-equipped Scenario

Combine

FARM ASSUMPTIONS		Scenario 1	Scenario 5
Number of Farms		1	2
Acreage per Farm		800	800
Total Coop Acres		800	1600
COMBINE INFORMATION			
Assumed Type		<300hp with 250bu hopper	>350hp with >300bu hopper
Original Cash Cost		$187,000	$300,000
Salvage Value		$18,700	$30,000
Lifetime	**years**	15	15
Repair Cost Factor		0.3200	0.3200
Work Rate	**ac/hour**	10.0	20.0
TIME REQUIREMENT			
Annual Hours Use	**total**	80	80
Annual Hours Use	**per farm**	80	40
FIXED COSTS			
Depreciation	**per hour**	140	225
Investment Cost	**per hour**	144	231
Housing & Insur.	**per hour**	23	38
TFC	**per hour**	308	494
TFC	**per farm**	24,609	19,740
TFC	**per coop**	24,609	39,480
TFC	**per acre**	30.8	24.7
OPERATING COSTS			
Repair Costs	**per hour**	59.85	96.01
Fuel Costs	**per hour**	16.0105	25.6168
Lube and Oil Cost	**per hour**	0.7216	1.0824
TOC	**per hour**	77	123
TOC	**per farm**	6,126	4,908
TOC	**per coop**	6,126	9,817
TOC	**per acre**	7.7	6.1
TOTAL COMBINE COSTS			
	per hour	384	616
	per farm	30,736	24,648
	per coop	30,736	49,297
	per acre	38.4	30.8

PTO Sprayer

FARM ASSUMPTIONS		Scenario 1	Scenario 5
Number of Farms		1	2
Acreage per Farm		800	800
Total Coop Acres		800	1600
PTO SPRAYER INFORMATION			
Assumed Type		400-500 Gal, 60-75 Ft	1250 Gal, 100-110 Ft
Original Cash Cost		$10,373	$41,492
Salvage Value		$1,037	$4,149
Lifetime	**years**	18	18
Repair Cost Factor		1.0333	1.0333
Work Rate	**ac/hour**	27	53
TIME REQUIREMENT			
Annual Hours Use	**total**	30	30
Annual Hours Use	**per farm**	30	15
FIXED COSTS			
Depreciation	**per hour**	18	71
Investment Cost	**per hour**	22	85
Housing & Insur.	**per hour**	4	14
TFC	**per hour**	43	169
TFC	**per farm**	1,276	2,552
TFC	**per coop**	1,276	5,105
TFC	**per acre**	1.6	3.2
OPERATING COSTS			
Repair Costs	**per hour**	10.72	42.87
Fuel Costs	**per hour**	0	0
Lube and Oil Cost	**per hour**	0	0
TOC	**per hour**	11	43
TOC	**per farm**	318	647
TOC	**per coop**	318	1,294
TOC	**per acre**	0.4	0.8
TOTAL PTO SPRAYER COSTS			
	per hour	54	212
	per farm	1,594	3,200
	per coop	1,594	6,399
	per acre	2.0	4.0

Air Seeder

FARM ASSUMPTIONS		Scenario 1	Scenario 5
Number of Farms		1	2
Acreage per Farm		800	800
Total Coop Acres		800	1600
AIR SEEDER INFORMATION			
Assumed Type		24-25 Ft	46-47 Ft
Original Cash Cost		$62,509	$105,354
Salvage Value		$6,251	$10,535
Lifetime	**years**	18	18
Repair Cost Factor		0.2500	0.2500
Work Rate	**ac/hour**	11	22
TIME REQUIREMENT			
Annual Hours Use	**total**	73	74
Annual Hours Use	**per farm**	73	37
FIXED COSTS			
Depreciation	**per hour**	44	73
Investment Cost	**per hour**	53	87
Housing & Insur.	**per hour**	9	14
TFC	**per hour**	106	174
TFC	**per farm**	7,690	6,481
TFC	**per coop**	7,690	12,962
TFC	**per acre**	9.6	8.1
OPERATING COSTS			
Repair Costs	**per hour**	15.63	26.34
Fuel Costs	**per hour**	0	0
Lube and Oil Cost	**per hour**	0	0
TOC	**per hour**	16	26
TOC	**per farm**	1,137	980
TOC	**per coop**	1,137	1,960
TOC	**per acre**	1.4	1.2
TOTAL AIR SEEDER COSTS			
	per hour	121	201
	per farm	8,827	7,461
	per coop	8,827	14,922
	per acre	11.0	9.3

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