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**BARRIERS AND OPPORTUNITIES FACING COOPERATIVES
IN IMPROVING THE ECONOMIC COORDINATION
OF THE FARM SUPPLY INDUSTRY**

By

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ABSTRACT**BARRIERS AND OPPORTUNITIES FACING COOPERATIVES
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Farm supply cooperatives are major actors in the agricultural input industry, providing a wide range of products and services for their farmer members. But there is a growing concern that farmer cooperatives are no longer living up to their potential. Problems within the federated cooperative system surface at two levels. In a vertical sense, there has been an erosion of patron-owner commitment to their cooperatives. Manifestations of this problem are evident in patronage and capitalization issues. A second problem involves the coordinating relationships among cooperative firms. Poor horizontal coordination is demonstrated by the often aggressive and detrimental competitive behavior among local and regional cooperatives.

This research examines the barriers and opportunities to improved micro and macro coordination of federated supply cooperatives by utilizing a systems approach. The systems analysis is supplemented with game theory and transaction cost economics. Transaction costs

demonstrates the effect asset-specificity has on the coordination and performance of the input system and the response of farmer-members to these class of inputs. Game theory emphasizes the structure of incentives to explain the behavior of various players in the input system. Finally, a case-study of farmers, local and regional midwest supply cooperatives is the primary research method used to illustrate these conceptual tools.

An important finding of the study is that vertical coordination in the federated system is hindered by the structure of incentives facing participants and the specialized nature of many inputs used by farmers. A mean-variance model of farmer decision making showed that a producer's major incentive to forward contract is the discount premium attached to the purchase, not a desire to minimize risk. Finally, the confluence of a competitive ideology, economic necessity and the vested interests of persons in positions of power, are the major reasons why competition among cooperatives persists.

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CHAPTER 1

INTRODUCTION

1.1 The Problem

This research focuses on farm supply cooperatives and their role within the input sector of agriculture. It recognizes cooperatives as a unique form of business organization with potential to improve the coordination and performance of the farm supply industry. Like their proprietary counterparts, cooperatives have recently been subject to powerful evolutionary forces that are transforming the nature of the farm supply business. Markets are becoming increasingly global; competitors larger and more aggressive. Agriculture is struggling out of a down-turn characterized by farmer and agribusiness bankruptcies, loss of major export markets, chaos in farm credit, and greater levels of volatility and uncertainty than ever before (U.S. Department of Agriculture, October 1, 1987). In response, massive restructuring has occurred at all levels of the food system. Merger, acquisition, consolidation and integration by input manufacturers and distributors have resulted in more crucial challenges to input cooperatives (U.S. Industrial Outlook, 1987). A further complicating factor is the relentless move towards

higher levels of agricultural specialization. Its primary manifestations are a growing disparity between large and small farms and increasing specialization of inputs, capital equipment, and production methods. These forces are placing new pressures on cooperatives to meet the needs of an increasingly diverse membership.

And yet cooperatives should be well-suited to dealing with these problems. Since cooperatives are owned and controlled by patron-members, benefits that accrue to the organization should be returned to them, not to "outside" investors. Also, because patrons have invested in their cooperative, they are more likely to communicate their needs and desires through their Board of Directors.¹ To the extent that management and customer have capitalized on this relationship through effective communication, errors in forecasting product demand should be minimized. This has particular relevance to highly specialized and risky inputs.

At another level, one might anticipate that since the fundamental purpose of cooperatives is to improve the economic position of farmers, and because farmers are both patrons and owners, cooperative firms would be more inclined to coordinate activities where economic

¹These two characteristics, ownership and control, suggest that patron loyalty may be greater for a cooperative than for a proprietary firm. For a more in-depth discussion of this topic, see Staatz, 1987a.

opportunities presented themselves. In other words, because of the ownership element that links the cooperative vertical system, traditional barriers that prevent improved inter-stage coordination should be less obstructive than for investor-owned firms (IOFs). Under this assumption one would not expect excessive capital under-utilization or poor inter-stage coordination within the cooperative system. Hence, the analog to investor-owned firm efficiency through competition could be characterized as cooperative efficiency through cooperation.

In reality, however, it is clear that cooperatives are not living up to their potential. The cooperative system is in apparent disarray as evidenced by the emergence of two practices carried out by many cooperative participants: (1) in a vertical sense, a growing lack of commitment on the part of patron-owners, and (2) in a horizontal sense, more intensive competition among cooperatives--at both the local and regional levels. The potential impact of this behavior on the coordination and performance of cooperatives is profound when one considers its root causes. Altering this behavior is essential for the long-term survival of the cooperative way of doing business, but the antidote for some firms may be a bitter pill to swallow.

These issues will be dealt with in more detail shortly. First, however, the objectives and hypotheses of the

research are presented. These are followed by a discussion of past farmer difficulties that precipitated the formation of input supply cooperatives.

1.2 Research Objectives and Hypotheses

The primary purpose of this research is to examine the opportunities and barriers to using cooperatives for improving micro and macro coordination of farm supplies. Micro coordination refers to the coordination of functions and activities between firms. Coordinating total supply with total demand for a product or an industry at each step in the production-distribution process constitutes macro coordination (Shaffer, 1987). Hence, the research involves examining cooperative performance in both vertical and horizontal dimensions. The following objectives and hypotheses form the central structure of this research:

1.21. Micro Coordination Objectives

- * Identify major vertical coordination problems within and between the economic stages of the cooperative system.
- * Discuss barriers that hinder cooperative vertical coordination.
- * Recommend opportunities for improving system performance and demonstrate potential effects from their use.

1.22. Micro Coordination Hypotheses

- * The adoption of explicit purchasing agreements between members and their cooperative could improve vertical system coordination and reduce risks and costs to participants on both sides of the market.
- * Current use of purchasing agreements is impaired because of the unwillingness of certain participants to share the risks of commitment.
- * As inputs become more specialized, the cost and risks of handling them becomes greater. Inputs with more asset-specific characteristics are handled differently than are more fungible inputs.

1.23. Macro Coordination Objectives

- * Identify critical horizontal coordination problems within the cooperative system, at both the local and regional levels.
- * Discuss existing coordinating mechanisms used by cooperatives and identify barriers that are preventing a wider and more effective application of these mechanisms.
- * Recommend changes in the structure of incentives that would make individual member behavior more consistent with the goals and objectives of the group.

1.24. Macro Coordination Hypotheses

- * The process of macro coordination by cooperatives is impaired by competition and vested interests among patron-owners, board members and management.
- * Once a new level of macro coordination occurs (e.g., joint ventures or mergers), performance may be reduced because: a) firms participating in the joint activity are economically incompatible; b) the incentive structure is incapable of maintaining a stable environment for participants, or; c) vested interests prevent the implementation of sound economic decisions.

1.3 Cooperative Entry into the Farm Supply Industry

Farmer cooperatives represent the coalescing of agricultural producers for purposes of achieving benefits unattainable through individual action. Cooperatives evolved for two seemingly different reasons, supply management (the Sapiro approach) and a "competitive yardstick" approach (advocated by Nourse), by which system production and performance might be evaluated (Shaffer, 1987). The first reason directs benefits to producers by matching supply with demand in a way that achieves prices at or above costs of production. The competitive yardstick concept was developed with the aim of keeping firms serving farmers honest by providing a mechanism (via the

cooperative) for comparing input prices or the costs of providing processing and marketing services. This latter argument helps explain the evolutionary growth of farm supply cooperatives.

Historically, there was concern by U.S. farmers about the prices charged and the uncertain quality of some key farm supplies. Two inputs, feed and fertilizer, were prominent in this respect. During the 1920's and 1930's unsatisfactory performance of feed manufacturers and distributors created interest in purchases through cooperatives (Heflebower). Apparently, farmers were convinced that the margins of some investor-owned retailers were above necessary costs (Harper; Wysor, p.14). A more effective stimulus was the usual low quality formula feeds, whose ingredients were largely unknown. Ricky and Abrahamsen claim the industry during this period was essentially in a "patent medicine" stage.

Heflebower documents how this dissatisfaction led to the "open-formula" movement, where each bag of feed had its ingredients clearly labeled (p.79). In Indiana, Cooperative Extension workers published research findings of significant productivity gains from livestock raised on these labeled products (Hull). This served further to encourage the practice of open formula labelling.

Similar experiences were documented for fertilizer products during the same period. Again, suspect prices and

dubious quality stimulated cooperative activity by farmers.

Early in this century fertilizer was identified only by brands; what it contained was a mystery. Yet different crops and different soil conditions require different combinations of active ingredients. Without knowledge of the contents, farmers could not relate a fertilizer to their experience or to the recommendations of the Agricultural Extension Service (Heflebower, p.81).

Open-formula packaging, pioneered by cooperatives, soon dominated as a marketing practice, yet this did not solve the farmers' problem of fertilizer prices. Cooperative entry into the fertilizer business began at the retail level and, once established, integrated further into mixing and blending, where investment barriers were not too high. However, a period followed where additional advances were negligible, and for good reasons. First and foremost was the prohibitive cost associated with the very specialized plant and equipment used in fertilizer manufacturing. A second problem involved establishing supply sources for phosphate and potassium fertilizers. This could be achieved through either direct ownership or indirectly by contract arrangements with mine owners. Eventually, the financial obstacles were overcome and cooperatives eased into the manufacturing process (Vogelsang).

Rising costs of transportation also stimulated farmer interest in supply cooperatives. For a number of reasons, including population concentrations caused by

industrialization and agricultural specialization, farmers found themselves operating further and further from industrial centers. Although many investor-owned firms (IOFs) operated in these areas, farmers often discovered that, because of their location, costs were either high or services unobtainable. To ameliorate this situation, farmers organized cooperatives to purchase their inputs. In addition to securing a steady source of farm supplies, cooperatives were able to reduce costs by placing large orders near points of production. Even today, when transportation is no longer a serious constraint, cooperatives have managed to assist patron members when IOFs vacated less profitable regions.

1.4 Farm Supply Cooperatives: Current Problems

The current decade has been difficult for the U.S. agricultural sector. Expanding domestic production in the mid-to-late 1970s led to a situation where the supply of farm products outstripped effective demand. Excess production, weak export demand and depressed grain prices became manifestations of this over-supply that caused substantial restructuring within industries producing farm inputs.

Both marketing and farm supply cooperatives are similarly affected. Cooperatives continued to adjust and reposition operations in 1985 in response to a depressed

agricultural economy. These adjustments were reflected in declining revenues (farm supply down 25 percent from 1984), net margins (down 45 percent), total assets (down 8 percent), and other financial conditions (USDA, Vol.53, 1986).

Either in spite of or because of industry difficulties, farm supply cooperatives have continued to increase their total market share of most inputs (Table 1.1). Most of this growth has occurred in three areas, fertilizer, petroleum and agricultural chemicals.² With the exception of chemicals, cooperatives are active in all the major economic stages (i.e., manufacturing, wholesaling and retailing). Feed and seed have shown no real gains over time, largely because of the highly competitive nature of the industry or due to the intervention of government in certain activities. This overall growth in market share conceals some of the important problems afflicting the cooperative form of organization. These problems are deep-rooted, multi-dimensional, and fall under two broad classifications---vertical and horizontal coordination. The primary focus of this research is on critical aspects of vertical coordination as they affect cooperative performance in a federated system. However, it is nearly

²This growth should not be construed as a consequence of increased patronage by members. Regional respondents asserted that manufacturing cooperatives rely heavily on non-member business like IOF wholesalers/retailers and international markets to maintain demand.

Table 1.1. Trend in Cooperative Market Share of Farm Supplies Purchased by Farmers, 1951-1985.

Supply Item	Year and Percent Share of Total Market				
	1951	1961	1971	1981	1985
Feed	17.8	18.2	16.9	18.1	16.0
Fertilizer	15.7	25.8	30.1	36.1	44.0
Petroleum	18.8	24.9	35.1	35.2	44.0
Chemicals	11.6	15.5	19.8	33.9	29.0
Seed	16.7	15.7	15.3	14.5	15.0
Machinery	4.2	4.6	5.8	5.4	2.1
Average	14.1	17.4	20.6	23.8	25.0

Source: 1) USDA, ACS Research Report No. 37, 1984.

2) _____. Service Report No. 17, 1986.

axiomatic that there is a close relationship between vertical and horizontal coordination. Consequently, issues of a horizontal nature are also dealt with in this research.

1.41. Problems of a Vertical Nature

As just mentioned, farm supply cooperatives have established themselves at the three major stages of the input system. Regional and local cooperatives currently perform these functions and their purpose is intendedly singular--to improve the economic position of their farmer members. Indeed, during the growth period of the mid-to-late 1970's, it was through the impetus of patron-owners (who were concerned about securing a source of supplies)

that cooperatives vertically integrated upstream for their major input needs. Many farmers, their local cooperatives and the highly integrated regionals fared well during this period. However, with the subsequent downsizing of U.S. agriculture and the growing threat of domestic and foreign competition (in conjunction with increasing agricultural specialization), new problems surfaced for the cooperative way of doing business.

The first problem concerns an erosion of patron-owners' commitment to their cooperatives. It is evidenced in two fundamental ways: (1) the practice of circumvention at both the farmer and local levels, and (2) inadequate levels of equity capital.

Traditionally, farmer members have purchased supplies from their local affiliate, which in turn obtained its needs from the regional cooperative. Historically this practice made good economic sense given the scale economies at each stage of the vertical system. Recently, however, and perhaps in part due to more efficient and less expensive transportation systems, some large local cooperatives (which have become known as super-locals or mini-regionals) have begun bypassing their regionals and purchasing directly from manufacturers or even competing regionals. Similarly, at a lower level, some large farmers circumvent their local cooperative and acquire supplies from a manufacturer, a regional, or a competing investor-

owned firm (IOF). In both cases, the impetus for this practice lies in either the volume discounts and, in some instances, special services passed on to these large buyers, or the fact that their needs are simply too great for the cooperative supplier to handle adequately. In sum, the current problem is one of the cooperative system needing to evolve and what this evolution entails in terms of adjustment costs and the distribution of these costs among system participants.

An insufficient level of equity capital is a second indicator of cooperative difficulty at the local and regional levels. To illustrate, in 1962, equity capital represented 52.4 percent of total capital assets of the 100 largest cooperatives. By 1970 this fell to 39.1 percent and by 1980 equity capital had fallen to 28.6 percent (Davidson, 1985). Since then, cooperatives have sought to strengthen their equity balance by divesting assets and substantially reducing or terminating patronage refunds.³ As a consequence, by 1985, equity to asset ratios had increased to 34 percent for the 100 largest cooperative firms (Davidson and Royer, 1987). Equity capital is typically generated in three ways: (1) direct investments in cooperative shares, (2) per-unit capital retains on purchases or sales, and (3) retained patronage refunds from

³In 1985, total patronage refunds (cash and retained allocations) dropped 20.2 percent to their lowest level in five years (Davidson and Royer, 1987).

net savings. The latter two practices have been used to augment insufficient capital from direct member investments. However, with declining volume for many cooperatives (due to member purchases from competing cooperatives or IOFs), these sources have been similarly reduced.

Patron-owners' incentives to circumvent their cooperative could stem from better input prices from competitors or just overall poor performance by the cooperative for an extended period of time. In either case, because of the unique ownership characteristics of farmer cooperatives, there are tradeoffs involved from this behavior that are not present with an IOF/customer relation.⁴ In the short run, the effects of circumvention may be a cost savings to those patrons who practice it. But the longer-run outcome to both patron and firm is doubtful due to the consequences of "system leakage." Farmers are undermining their locals and locals are undermining their regionals. In effect, the demand curve facing individual cooperatives shifts to the left, thereby reducing the volume of sales. Lower volume implies higher

⁴There are two elements to this argument. First, because IOF patrons are not owners of the firm, performance of the firm affects them only through price. If the price is unacceptable, the patron simply goes elsewhere. Second, this "ownership linkage" is not present with IOFs in the input industry. Each economic stage is independent of the other and, as a consequence, the system leakage problem does not exist.

per-unit costs, and eventually, higher factor prices. This makes the circumventors' cooperative less competitive, providing additional incentive for other members to adopt this behavior. Further, since most equity capital is generated through retained earnings from net savings, the firm's financial position deteriorates as does its capacity to revolve member investments. In turn, uncertainty with regard to equity redemption programs discourages financial support from remaining owners.

In different terms, lack of commitment affects the overall coordination of the cooperative system in two fundamental ways. First, it complicates the synchronization of the various economic stages within the input system. A "stage" in production is defined as "any operating process capable of producing a saleable product or service under appropriate circumstances" (Mighell and Jones, p.7). Coordination is jeopardized when firms' planning capabilities are mitigated by the practice of circumvention. Regional manufacturers experience less reliable product demand estimates, which makes production decisions riskier (through the increased likelihood of under- or over-production). Similarly, wholesalers and retailers are less confident of their purchasing decisions and unfavorable inventory levels are more likely to occur. Finally, the agricultural producer may be faced with an inadequate supply of inputs if upstream players

significantly misjudge demand. At the very least, farmers face higher prices as manufacturers and distributors compensate themselves for greater levels of risk.

A second manner in which cooperative coordination is affected is by a firm's inability to respond to economic opportunities because of its poor financial position. Marion (1976) identifies this as "adaptive coordination," since it may involve changing the system to improve its longer run performance. A high debt-to-asset ratio is indicative of this problem among some cooperatives. By raising the firm's cost of money, the supply cooperative has little choice but to recover this cost through higher input prices. Higher prices make the firm less competitive, reduce its income through lower sales volume and diminish its ability to retain earnings for equity. Absent sufficient levels of this low-cost money, firms will be unable to invest in or upgrade their fixed assets. Scarce resources will be directed at more urgent priorities like servicing debt and paying employee salaries.

1.42. Problems of A Horizontal Nature

The total number of marketing and farm supply cooperatives declined from 7,535 in 1976 to 5,625 in 1985 (Farmer Cooperative Statistics, 1985). Measured by annual average gross business volume, farmer cooperatives increased in size, due in part to mergers and

consolidations. Despite this growth, the majority of cooperatives are small (90 percent have business volumes of less than \$15 million) and serve local areas. Many are faced with deteriorating balance sheets or, in extreme cases, bankruptcy. Local cooperatives are confronted with numerous problems, including under-utilization of capital that may be a result of unsound investment policies. These difficulties appear to surface at two levels. At one level, there are barriers that hinder or prevent cooperatives from taking advantage of certain economic opportunities. For instance, consider a situation where two local cooperatives individually possess insufficient membership to achieve fertilizer plant size economies. In other words, the fixed costs of the plant would be less prohibitive if volume were increased. This in turn would lower the per-unit cost of producing fertilizer. Clearly it is in their mutual interest to combine membership. Certain forces, however, prevent the reorganization from taking place. This coordination problem is referred to as a pre-restructuring barrier.

A second level addresses coordination problems that transpire after a partnership arrangement has already been established. In the above example, assuming the ex ante barriers were overcome and a merger occurred, consider the effect on operating efficiencies if, because of resistance from certain member groups, disposal of redundant assets is

not forthcoming. This behavior would act as a financial drain to the new firm and result in a poorer earnings statement. Absent efficacious behavior on the part of membership, adoption of coordinating mechanisms to improve performance is a potentially fruitless undertaking. Hence, this coordination problem is referred to as an post-restructuring barrier.

Explication. Pre-restructuring barriers fall under three categories: (a) competition among firms, (b) patron-owner heterogeneity, and (c) vested interests.

Cooperative competition stems from multiple sources. One is an underlying philosophy of many members that competition is inherently good; it is a disciplinary mechanism that keeps IOFs and cooperatives honest and performing well. Unfortunately, this view fails to account for the fundamental difference between the two forms of organization-- a cooperative member is both customer and owner. Thus in a cooperative, the same farmers may own each of the competing firms and hence are competing with themselves. The second aspect concerns internal and external pressures that may encourage competition. Internal pressures develop because individual incentives push managers, board members and patron-owners to encourage it. An internal pressure could be a cooperative policy of keeping costs down by increasing volume through such

practices as brand labelling and aggressive advertising. A depressed agricultural economy is an example of an external pressure. It effectively reduces the size of the pie available to competing firms.

Cooperative heterogeneity is a second problem which has implications for vested interests of certain groups. Consider, for example, large and small farmers who are members of the same local cooperative. Although these farmers may each produce similar crops and use similar inputs, because of their size differentials, their needs are substantially different. Large farmers may benefit appreciably from a consolidation if sufficient size economies could be captured. Small farmers may resist the restructuring if they believe it could weaken their long-standing position. In this case, their own vested interests may take precedence over the welfare of the larger cooperative. For instance, since any reorganization must be approved by the cooperative Board and, depending on the association's by-laws, often by at least two-thirds of its members, inter-group bargaining could arise between competing interests. A potential danger is that during the negotiating process the plan's integrity and worth to the cooperative is jeopardized.

Post-reorganization problems affect the long-term viability of collective action. For instance, cooperatives that form joint ventures have been known to compete

actively against each other for the same business (Turner). In situations where members are not on equal footing, the gains of one can be at the expense of the partner. Impetus for this behavior is that participants face individual incentives to act independently, even though they could gain more through collective action (Staatz, 1987b).

Vested interests may slow or stop the necessary disposal of redundant assets. Adopting a coordinating mechanism does not ensure better performance. Consolidation as a response to excess capacity is of value only if the asset base is reduced to an efficient size. In these circumstances, cooperatives might be more susceptible to pressures of vested interests than would their IOF counterparts.⁵

⁵The major concern of IOF's owners is the end-of-year profit statement and the subsequent appreciation of their stock. Assets are of value only to the extent they contribute to these objectives. Owners of a cooperative, on the other hand, may have ulterior motives to sustain redundant assets. For instance, consider a farmer living near a town where "redundant" co-op facilities are to be closed because there is sufficient co-op capacity in a town 25 miles away. Here, the farmer's cost (in terms of time and transportation) of using the co-op is raised if the "redundant" facilities close.

CHAPTER 2

A FRAMEWORK FOR THE ANALYSIS OF FARM SUPPLY COOPERATIVES

2.1 Principle Components of the Framework

This section introduces a systems approach for analyzing problems and opportunities facing farm supply cooperatives. In the first part, the approach is applied to the vertical dimension of a federated cooperative system. The second part uses the approach to evaluate coordination issues from a horizontal perspective. In both instances, the emphasis is on how individual firm (micro) behavior ultimately affects system-wide (macro) performance.

Game theory and transaction cost economics are then applied to cooperative coordination issues. Their purpose is to support the systems approach by explaining why a particular behavioral trait might have developed. Once the cause for the behavior is identified, specific actions can be recommended to improve cooperative firm and system performance.

2.11 A Systems Approach

Even though the systems approach was initially designed to improve the performance of the food marketing system,

its application is well suited for other industrial sectors (Bouma; Hammonds). In simple terms, the concept views activities in the context of the larger system in which they exist, not in isolation. Abdalla suggests that the approach is useful for two main reasons. First, it emphasizes that activities are interconnected. Individual decisions produce external effects that may lead to a sub-optimal macro results. Second, from an organizational standpoint, it permits the identification of opportunities for changing individual behavior in a manner that leads to improved system-wide performance. Application of the systems approach is useful in both the vertical and horizontal dimensions.

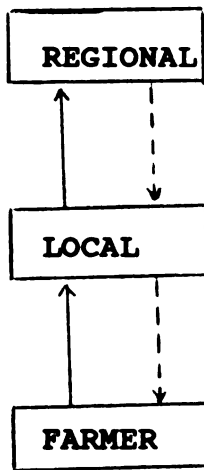
A. The Cooperative Vertical System

The broader vertical systems orientation stresses the performance of the total sequence of activities carried out in the production and marketing of a commodity. The concept implies that system performance depends not only on the performance of the individual stage, but also on the coordination of the many vertically aligned stages (Abdalla, p.14). Further, as the system becomes increasingly specialized and complex through the industrialization process, synchronization of these economic stages becomes more difficult.

In a federated cooperative system there are three tiers

that constitute the marketing channel for input supplies-- the regional cooperative, the local cooperative, and the farmer or patron-owner. A simplified model of these participants and their economic functions is shown in Figure 2.1. Given the unique owner relationship between farmers and their cooperative, the consequences of individual actions on the larger system are more direct than for IOFs. For example, some farmers, instead of purchasing fertilizer from their local cooperative, may choose to buy from competing IOFs because of lower prices (Figure 2.2, path 1). Even though the farmer realized an immediate cost savings, this behavior has detrimental effects on both individual cooperatives and eventually the farmers themselves. By purchasing outside the system, farmers impose costs on their local cooperatives through a reduction in volume sales and unplanned inventories. Lower product volume translates into lower retained earnings, which diminishes the cooperative's operating capital and its ability to revolve equity accounts. Furthermore, unintended inventories result in higher storage costs that places additional pressure on an already shrunken pool of operating capital. Since per-unit costs have risen, the local cooperative has little choice but to raise input prices.

This problem arises because co-op members do not pay the full cost of their actions. They can, in the short run

**ECONOMIC STAGES**

- * Manufacturing
- * Distribution
- * Wholesaling
- * Retail

- * Consumer

Figure 2.1 A Simplified Illustration of the Federated Cooperative Vertical System.

(Ownership)

(Service)

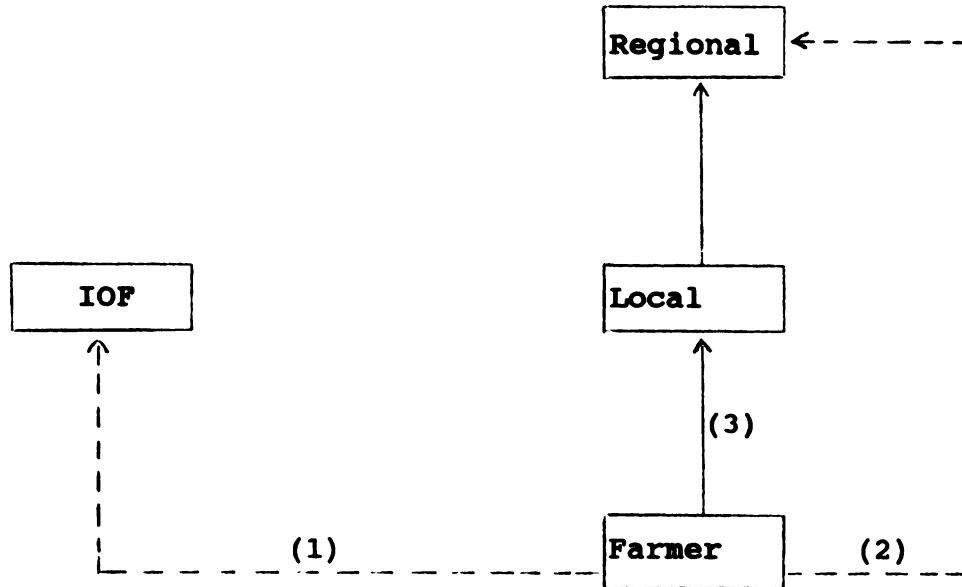


Figure 2.2 Conceptualization of Farmer Purchasing Practices for Inputs. Path 1 represents the case of system leakage, path 2 depicts circumvention, and path 3 represents the traditional purchasing method.

free-ride on the cooperative, buying only the lowest-priced services and obtaining other goods and services elsewhere. Although this behavior is economically rational in the short-run, longer-term consequences have detrimental implications.

In summary, patron-owner behavior of buying outside the cooperative system results in greater costs to the cooperative, greater costs to all members through lower equity redemption, and higher prices for those owners that

remain loyal to their association. Finally, to the extent higher prices erode the firm's competitive position in the marketplace, both loyal and disloyal owners bear the financial consequences of uncommitted membership.

Another effect of uncommitted behavior is that local managers who experience surplus inventories will have an incentive to reduce upcoming purchases from their regional. If this practice is sufficiently widespread among local firms (prompted by farmers buying outside the cooperative system), regionals may be faced with an unwanted inventories. The regional must then either lower prices to move the product or accept the consequences of excess inventories--either way, margins are reduced. Lower earnings by the regional imply lower patronage rebates to member-locals and a constrained capacity to retire equity accounts. These actions erode the regional's competitive position and provide additional incentive for locals to purchase outside the system. Furthermore, to the extent that patronage payments and equity retirements have been reduced, locals will be unable to pass these benefits on to their patron-owners. The net effect of "system leakage" is that not only is cooperative performance compromised, but confidence in the cooperative way of doing business is undermined as benefits derived from patronage slowly disappear.

On the other hand, there are potential changes that

might involve higher costs at one stage, but create savings for another stage which exceed these costs. For instance, a continuing trend in agriculture is a growing divergence between large and small farms. Some of the largest operations are of a size and scale that may preclude effective servicing by the local cooperative.¹ In other words, the large farmer's incentive for doing business with the local is mitigated in the absence of differential pricing; or the large farmer's volume may simply be too large for the local to accommodate adequately. If the large farmer by-passes the local and purchases directly from the regional he avoids one value-added stage in the marketing sequence (Figure 2.2, path 2) and realizes a cost savings.² In this situation, the local firm suffers from a significant loss in sales volume. As a consequence, retained earnings, operating capital and storage costs are all adversely affected. But now, since the agricultural producer remains within the cooperative system, total system effects are less severe than in the earlier case (where members purchased outside the system), since demand facing the regional firm is unchanged. Only the local cooperative is worse off (with the farmer being better off)

¹The "80/20" rule holds here, i.e., 20 percent of the members account for 80 percent of the business. A local co-op that loses this class of patrons faces a very uncertain future.

²This assumes that the regional can in fact provide these marketing services cheaper than the local.

and this may be partially offset by the regional through patronage refunds and dividend payments. Still, remaining members of the local may be hurt by circumvention, as the local's unit cost of serving them may increase with the loss of the large patron's volume.

There is an additional dimension to this "circumvention" practice as well. The *raison d'etre* of the local and regional cooperative is to improve the financial position of its members. Inability to meet the needs of a particular class of patrons undermines cooperatives' economic and philosophic justification to participate in the market. To the extent this is true, local cooperatives must reassess their own role and capacity within the input sector of agriculture and determine a course of action that will satisfy their primary mission.

In summary, application of the systems approach to improving performance of farm supply cooperatives requires an alignment of goals and objectives from members of the three-tiered federated system. This implies altering the structure of incentives so that the goals of the larger system and those of cooperative members are in harmony. In situations where membership is highly heterogeneous and interests diverse, the process of achieving true cooperation becomes increasingly complex.

B. A Horizontal Perspective

A systems approach is also useful for evaluating performance at the macro or industry level. It is particularly germane to problems of cooperation. This perspective stresses that individual firm (micro-level) decisions have "spill-over" effects to adjacent firms and to the performance of the industry as a whole. Indeed, it was recognition of the cumulative effect of individual decisions on industry performance that first led to the formation of large-scale commodity cooperatives. At the time, farmers were making rational decisions for their individual firms but lacked a mechanism that created individual incentives for farmers to take those effects into account. As price takers they had no individual incentive to limit production even though they may have known that if everyone behaved in this manner, producers as a whole would be worse off. Implementation of supply control by these commodity cooperatives had some success in bringing prices more in line with costs of production (Knapp).

The first chapter mentioned that farmers created supply cooperatives to obtain "fair" prices and acceptable quality in their inputs. These cooperatives were usually formed to carry out a specific business function like bulk fuel delivery or fertilizer retailing. Since the local firm had a limited market and limited capital resources, local

associations pooled their needs for larger volume by forming a regional cooperative. This horizontal and vertical process resulted in the three-tiered structure shown in Figure 2.3. In time, both locals and their regional added business activities, with members' needs serving as the linkage (Hull). However new technology (and other factors) placed pressure on cooperatives to expand their customer base in order to achieve improved cost efficiencies. As trade territories continued to grow, many cooperatives found themselves competing against one another, even when they were owned by the same farmers (Ratchford).

The major way local cooperatives compete is through price, although this competition is manifested in three different ways: (1) through competitive pricing, (2) by carrying a full line of products, and (3) by carrying a full line of services. The concern of this research is the impact this behavior has on cooperative performance. The source of the problem is that individual firms do not have the incentive to take into account the larger system effects of their actions. The impetus behind this behavior appears to stem from the social value communities place on their cooperative as well as the deep-felt belief that cooperative competition is inherently good.

Consider the following scenario. Over an extended period, two adjacent cooperatives independently build a

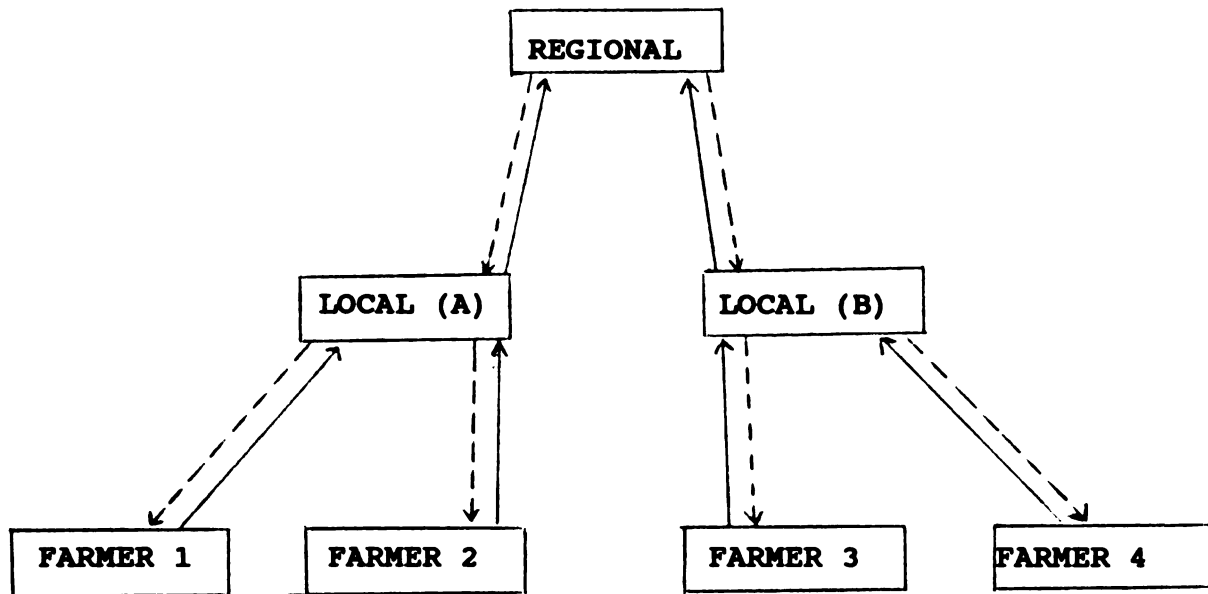


Figure 2.3 The Three-tiered Structure of a Federated Cooperative System.

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(Ownership) (Service)

fertilizer mixing plant and purchase fertilizer delivery vehicles. Both cooperatives financed their investments with a loan from a lending institution. In addition to monthly interest payments, these cooperatives have operating expenses that include salaries, equipment, and maintenance. A complicating factor is that sales for each firm have fallen in recent years due to a combination of less committed membership and government set-aside programs. As a consequence, these firms are experiencing substantial under-utilization of plant and equipment, with attendant higher unit operating expenses. Adding pressure to this high cost structure is managers' incentive to keep prices low as farmers (being members of both cooperatives) play the firms against one another to capture the lowest possible price.

In summary, each firm faces the following costs: (1) fixed costs--(a) the cost of money (interest on debt); (b) maintenance costs on plant and equipment; and (c) costs associated with duplicate administrative functions and personnel salaries; (2) variable costs--those that are due to inefficient production and marketing methods. Ironically, in their desire to maintain their own identity and competitive ideology, these cooperatives may unintentionally raise both cost categories. In adopting this behavior these firms must (eventually) raise input prices to defray higher costs (making them less competitive) and

will face a greater likelihood of financial demise if a feasible restructuring plan is not initiated. Lastly, each cooperative failed in its primary mission---to improve the financial well-being of its member-owners because its behavior has led to higher input prices, a larger debt load and a reduced ability to revolve equity accounts.

In this situation, performance was diminished at both the firm (micro) and system (macro) levels through competitive behavior. By taking collective action, coordination and performance at both the firm and system levels would be enhanced.

2.2 Additional Concepts for Analyzing Cooperative Coordination

This section introduces some additional concepts that complement the vertical systems approach to farm supply cooperatives. They are useful in that they help identify and explain technological, organizational and behavioral factors that complicate the coordination process. Any efforts to improve cooperative firm and system performance are contingent upon correct evaluation of problem sources. The following constructs are used with this in mind. Prior to this, a few supplemental assumptions about environmental conditions and human behavior are presented.

First, participants are assumed to operate within an uncertain environment. Second, information to reduce this

uncertainty is costly and difficult to obtain. This difficulty is due in part to the limited cognitive abilities of participating agents. Thus decision makers exhibit bounded rationality and must contend with impacted information. Finally, external effects from individual actions are pervasive and problems of a "public good" nature (non-excludability) are common.

2.21 Game Theory

At its most fundamental level, game theory is a mathematical analysis of principles of decision making in situations involving two or more players with conflicting interests and mutual interdependence. A game of strategy consists of a series of events, each of which may have a finite number of distinct results. The results of some events are determined by chance, and the results of others by the free decision of players. Because it emphasizes decision making under conditions of mutual interdependence and takes into account the allocations of benefits and costs from collective action, game theory is particularly useful in evaluating farmer cooperatives. The following sections briefly discuss two types of behavior analyzable using the theory of games as presented by Staatz (1987b). These behavioral types are classified as cooperative and noncooperative games and are differentiated by rules of communication and commitment (Figure 2.1). Unfortunately,

Rules	Cooperative Game	Noncooperative Game
Communication	yes	no
Binding Commitment	yes	no

Figure 2.4 Illustration of Rules for Differentiating Cooperative and Noncooperative Games.

real world problems do not always allow neat and tidy classifications as illustrated in the figure below. This is particularly true for some of the vertical and horizontal issues that surface in farm supply cooperatives. The following discussion is undertaken with these limitations in mind.

A. The Cooperative Game

In a cooperative game, participants are allowed to communicate in order to develop joint strategies and binding commitments. A presumption is that preferences among players are non-homogeneous. The game further assumes there are potential net benefits through joint action, but that participants must decide on how these benefits can be allocated in a manner satisfactory to all. If agents fail to agree on this allocation, the coalition will not materialize. Staats maintains that when a

cooperative game is applied to farmer cooperatives, two interrelated questions are of concern: (1) how do existing policies affect the payoffs to various coalitions within the cooperative, and (2) are these payoffs adequate to prevent defection by any of these coalitions (Staatz, 1987b)?

In applying the theory of cooperative games to inter-firm issues of a federated system, farmer-members, their local cooperative, and the regional firm are the crucial players in the game. Within an intra-firm context, managers and members of the board are also important players. Hence, potential bargaining positions include issues relevant to this vertical set of participants. Examples of bargaining positions within this framework could include: (a) governance relationships between the regional firm and member locals, such as their degree of autonomy and their representation on the board of directors; (b) investment issues, such as criteria for selecting business ventures (e.g., profitability, risk management, or market dominance); and (c) capitalization issues that include the desire to make financial commitments based on a longer-run view of system needs.

To illustrate, current governance disagreements between locals and their regional can be viewed in game theoretic terms. Local cooperatives argue for policies directed at satisfying their own members' interests. On the other

hand, a regional firm must take into account the interests of the larger cooperative system it is serving. Bargaining positions could split between those locals that are most dependent on the regional versus those that are least dependent. Conceivably, those locals least dependent on the regional are also the regional's largest sources of volume and, thus, potentially more capable of influencing the final outcome.³ However, if the large members are unable to influence this outcome in their favor and if they perceive higher payoffs outside the cooperative, they may choose to defect, in which case the coalition breaks down.

The underlying assumption of the cooperative game is that there are certain efficiencies to be gained by joint activity when compared to the payoff from independent action. These gains are represented by a superadditive characteristic function:

A characteristic function shows the minimum level of payoffs that any potential coalition of players can guarantee itself. Superadditivity of the characteristic function means that a single coalition of all players (the grand coalition) can always guarantee itself a higher level of payoff than can two or more disjoint subcoalitions that in total involve all the players (Staatz, 1987b, p.120).

³The cooperative practice of one-member, one-vote could mitigate this influence. However, if voting rules are not changed to increase the political power of the larger patrons, they may opt to exit the cooperative (see Staatz, 1987b, p. 126).

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Two conditions related to a superadditive characteristic function are noteworthy. First, two subcoalitions (individuals or groups) can always gain at least as much by working together as they can from working separately. This is not sufficient, however, to ensure that they will work together. If joint action is to occur, not only must this first condition hold, but each group's individual share of the joint "pie" must exceed the payoffs it could obtain by acting independently (Staatz, 1987b).

In their application to farmer cooperatives, these conditions imply that when allocating costs and benefits to patron-owners, management must take into account the effect this allocation may have on members' willingness to remain in the organization. To the extent members have non-homogeneous preferences and operate farms with varying degrees of size and efficiency, achieving some allocation that satisfies all parties simultaneously may be extremely difficult.⁴ In the interim, the many subcoalitions will be maneuvering their positions in a manner conducive to obtaining the best possible outcome for themselves.

To illustrate, in order to remain competitive, managers of farm supply cooperatives are frequently pressured into

⁴How difficult it is depends on how strongly superadditive the characteristic function is. If it is very strongly superadditive, the parties will be much better off (in total) working together. In this case it may be easier "slice up the pie" in a manner that makes everyone happy than if there are only small gains to cooperation.

buying new and (or) highly specialized inputs. Typically, however, only a portion of the farmers may want or require the product and yet, depending on the pooling practices of the cooperative, the investment risk may be borne equally by all members. More generally, as the practice of supply cooperatives handling diverse products increases, the potential for conflict of interests among members, hence governance problems, is compounded. Hansmann has noted that some cooperatives (e.g., Land O' Lakes) have attempted to ameliorate this situation by computing patronage refunds separately, often at considerable accounting expense. Apparently, the benefits derived from this exercise (minimizing patron-owner defection) justify the financial investment in discriminatory bookkeeping.

Staatz asserts there are two factors that determine the ability of players to extract concessions from their cooperative: the cost the member could impose on other members of the cooperative by leaving and the other players' perceptions of the cost he would impose on himself if he were to exit (p.122). These have important implications for the bargaining positions of large farmers and super-locals in their efforts to achieve concessions or preferred treatment within their organization.

B. The Noncooperative Game

Two characteristics of the noncooperative game are that

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players are unable to communicate with one another and to make binding agreements. It is this first feature that qualifies a prisoner's dilemma as one special case of a noncooperative game. In situations where a noncooperative game is a prisoner's dilemma, an inferior outcome to the players result. Further, because they cannot make binding commitments or credible promises, noncooperative games are typified by a complete lack of trust among the players (Schotter and Schwodiauer, p.480).

A salient feature of a non-constant sum game or so called Prisoner's Dilemma, attributable to A.W. Tucker (see Luce and Raiffa [1957 p.94]), is that even though the choice of a joint strategy could improve each player's position, the incentives facing them encourage individual defection and ensure an inferior outcome. More generally, the game illustrates the situation where cooperation could improve the welfare of those who participate. If the players could find a way to agree on a joint strategy and, just as important, a way to enforce the agreement, both would be better off than if they acted independently.⁵ This last aspect of any joint strategy, enforcement, is important because, it is still in the interests of both to secretly break the agreement.

An alternative to the static prisoner's dilemma is a

⁵Key to a prisoner's dilemma is that no mechanism exists to enforce such cooperation; hence a Pareto-worse outcome results.

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supergame in which a single-period game (constituent game) is infinitely iterated and "the payoffs are the net present values of the stream of payoffs from the constituent games" (Staatz, 1987b, p.130). There are numerous circumstances under which even a supergame made up of infinitely iterated prisoner's dilemmas will itself be a prisoner's dilemma although it need not be (for details under each scenario, see Staatz, 1987b).

Perhaps one of the best examples of a prisoner's dilemma supergame has to do with system leakage problems of vertical coordination. Consider the two subcoalitions, large versus small farmers. If both groups would remain perfectly loyal by purchasing all input supplies from their cooperative, both would be better off. The cooperative would gain from size efficiencies and all the benefits associated with planning that influence the marketing process. Hence, although the payoffs to each player are higher if they both cooperate, the incentives facing the players are such that each has an individual incentive to defect, although they know the other player is acting similarly. In contrast to IOFs that specialize along one or two product lines, farm supply cooperatives typically carry a full line of products and services. There are situations where this can provide incentive for members to defect. For instance, by carrying a complete set of inputs, it may be impossible to maintain the lowest prices

across all commodities at all times. However, a full complement of inputs may allow the co-op to keep the average price of the inputs competitive even though individual prices may at times be noncompetitive. Lower prices on inputs from competitors constitute incentive to defect. In fact large farmers may have a stronger incentive to defect than small farmers. However, even though each player may gain initially from their "tit for tat" strategy,⁶ because these players are both owners of the cooperative, repeated defections will ultimately undermine the co-op and, hence, their own position as well.

A second example in which behavior of cooperatives resembles a prisoner's dilemma regards competition among locals. There are many instances when joint action by two or more farm supply cooperatives could increase their net earnings. Examples of under-utilized storage and transportation equipment are indicative of the problem. Through cooperation they could combine facilities and equipment and, with a larger total membership, reduce per unit costs of providing products and services. In spite of potential longer-term gains from collective action, it often fails to materialize. This uncooperative behavior might be the result of poor communication lines due to a lack of mutual trust, high information costs, or vested

⁶A tit for tat strategy is simple: A player's first move is to cooperate, then s/he does whatever the partner did on the previous move.

interests of certain decision-makers who are protecting their own self-interest. Whatever the cause, potential members of a profitable coalition eschew collective action and act independently.

2.32 The Transaction Cost Approach

The transactions cost approach, as presented by Coase and later expanded by Williamson, explores microeconomic issues of market and firm hierarchies by examining their functions, behavior, and organizational structures. The approach focuses on how characteristics of a transaction affect the cost of handling it through various forms of organization. A transaction occurs whenever "a good or service is transferred across a technically separable interface" (Williamson (1985) p.1). Transaction costs include the costs of gathering and processing relevant information; reaching a consensus among firm decision-makers; and drafting, monitoring and enforcing contracts among other participants. These costs are the direct consequence of environmental uncertainty, bounded rationality and opportunism (taking advantage of another's weaker position). To avoid being taken advantage of, each side may desire an extensive contract that describes exactly what is to be bought or sold and how the contracting parties will deal with various contingencies. However, because of uncertainty and the limitations of

human intellect (bounded rationality), it is impossible to design a contract that specifies all possible future contingencies. Given these constraints, complete contingent claims contracting must ultimately fail.

An alternative to striving for an all-encompassing contractual arrangement is to employ a series of short-term, sequential contracts. The problem with "sequential spot contracting" is that the good or service under consideration may possess unique features requiring specific information regarding how best to establish the exchange arrangement with the customer. This is acquired over time, and the supplier who achieves this first and best benefits from a "first mover advantage" (Ouchi, p.133). Essentially this eliminates threatening competitors and the exchange reduces to a small numbers situation or a bilateral monopoly. Under this condition, each party may act opportunistically by claiming greater production costs in order to justify higher prices. A possible solution is for the trading partners to monitor the actions and performance of the other. If the associated costs are prohibitive, the exchange will eventually fail "due to the confluence of opportunism with small numbers bargaining, even though the limitations of uncertainty with bounded rationality have been overcome" (Ouchi, p.133).

The above scenario captures the essence of Williamson's

"Organizational Failures Framework" (1975). It stresses that markets will fail when the costs of completing the transaction across a market become greater than those of handling the transaction via vertical integration. At that point, internal organization will be superior to market organization. Integration internalizes system problems and allows solution through the firm's organizational and administrative processes. The organizational form that will succeed best in handling the transaction will be the one that minimizes the sum of both transaction and production costs for the activity.

2.23 The Transactions Approach to Cooperative Organization

A. Cooperatives versus Investor-Owned Firms

Shaffer (1987) and Staatz (1987c) have outlined some convincing reasons why the cooperative form of organization should be distinguished from other organizational forms. Shaffer asserts that within a free-market economy, a cooperative represents a third mode of economic coordination (where markets and integration represent the first two modes). An important feature of a cooperative association is that although patron-members collectively own the firm, their individual farm units remain operationally independent. Staatz (1987a) likens the relationship between a cooperative and its members to a contingency contract where the final product price is

ultimately contingent upon firm performance. He argues that cooperatives may have an advantage over IOFs because farmers may believe their firm will not use this practice dishonestly. This trust or "loyalty factor" may in part be explained by the longstanding agreements which typify the cooperative-patron relationship. Williamson refers to this as a "relational contract", where the desire to continue this relationship facilitates settlement of unspecified contingencies.⁷ Actually, there are many instances where informal implicit contracts (verbal agreements) supercede the more costly formal arrangements. Indeed, it is this incentive to preserve long-term relationships that supports the assertion that transaction costs involving contracts may be lower for a cooperative than for an IOF.

Another important element regarding the trust between

⁷Williamson actually discusses three classes of contracts: classical, neoclassical and relational (1985, pp. 69-72). Classical contracting assumes a high degree of knowledge by the contracting parties, since all the relevant future contingencies are accounted for in the contract. As such, it is characteristically rigid and relatively easy to enforce.

Neoclassical contracting is more pragmatic in that it allows for flexibility in the agreement to handle possible future disputes between trading partners. This form of contract acknowledges people's limitations within a complex and uncertain world and so recognizes the economic necessity of utilizing arbitration or, in the event it fails, litigation.

Whereas the reference point for neoclassical contracting remains the original agreement, relational contracting focuses on the long-term relationship as it has developed through time. In other words, continuing the ongoing relation takes precedence over obstacles that may have developed because of some unforeseen event.

contracting parties is its mitigating influence on risky investments, particularly those of a highly specific nature (Staatz, 1984, pp.164-170). Asset-specific investments, once made, are characterized by a salvage value considerably below their acquisition price. There are clear short-run incentives for a trading partner to act opportunistically under these circumstances. The level of trust often found within a cooperative association has potential to ameliorate this condition.

B. Asset Fixity, Uncertainty, and External Effects

Williamson (1985) asserts that within a given market environment, the organizational structure that minimizes the sum of production and transaction costs will tend to dominate. He states further, however, that four principles for efficient organizational design ultimately determine the type of organizational structure that evolves: the asset fixity principle, the uncertainty principle, the externality principle, and the hierarchial decomposition principle. This section examines the first three principles as they influence the organization and performance of farm supply cooperatives.

1. Asset Fixity and Uncertainty Principles. The asset fixity principle states that as assets become increasingly specialized or unique, the desirability of the spot market

as a mechanism for exchange diminishes (Williamson, 1981, p.1548). Assets exhibiting this "specificity" characteristic have fewer alternative uses than do more general purpose assets and, as a consequence, the cost of transferring them to these alternative uses is greater. As this specificity increases, so too does the divergence between the asset's acquisition price and salvage value. Furthermore, as long as the value of the asset lies within these upper and lower bounds, the asset remains fixed in its current use (Johnson and Quance). It is this divergence between an asset's purchase and resale values that gives rise to rents that are potentially appropriable through market transactions if one of the exchange agents decides to act opportunistically (Klein, Crawford and Alchian).

The uncertainty principle states that autonomous market contracting becomes a less preferred exchange mechanism as the uncertainty surrounding the transaction increases (Williamson, 1979b). This is because uncertainty creates incentives for some individuals to act opportunistically against those in a more vulnerable position (e.g., through the occurrence of some unforeseen event). In the case of farm inputs, increasing specialization implies a corresponding increase in uncertainty. For instance, it is unlikely that farmers would regard the risks associated with the purchase of diesel fuel in the same category as a

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costly host-specific insecticide that demands application precision. Clearly the impact of an "unforeseen event", like unfavorable weather, weighs heavily on a farmer's mind when considering the purchase of this specialized input. It is this characteristic that provides decision-makers with an incentive to move from autonomous market contracts to their less risky counterparts, like contingent contracts and vertical integration (Staatz, 1987b). Within this environment, a decision-maker must ascertain the potential tradeoffs between these alternative modes of exchange. This relationship is conceptualized within a transaction cost framework in Figure 2.5. For lower levels of asset specificity (k), the spot market (sm) is the preferred medium of exchange; for higher levels of k , contracting (c). At $\bar{k}$, the decision-maker is indifferent to either mechanism.⁸

Baumol, Panzar, and Willig, in their theory of contestable markets, view this problem somewhat differently. They argue that the exercise of market power is most likely to occur in situations where assets are immobile (fixed) on both sides of the market. Even though the immobility of assets in farming creates incentives for the farmer's trading partner to extract appropriable rents,

⁸This figure is an amended version of Williamson's application of transaction cost economic to financing investments. The idea was borrowed from him after attending his seminar in May, 1988, at Michigan State University.

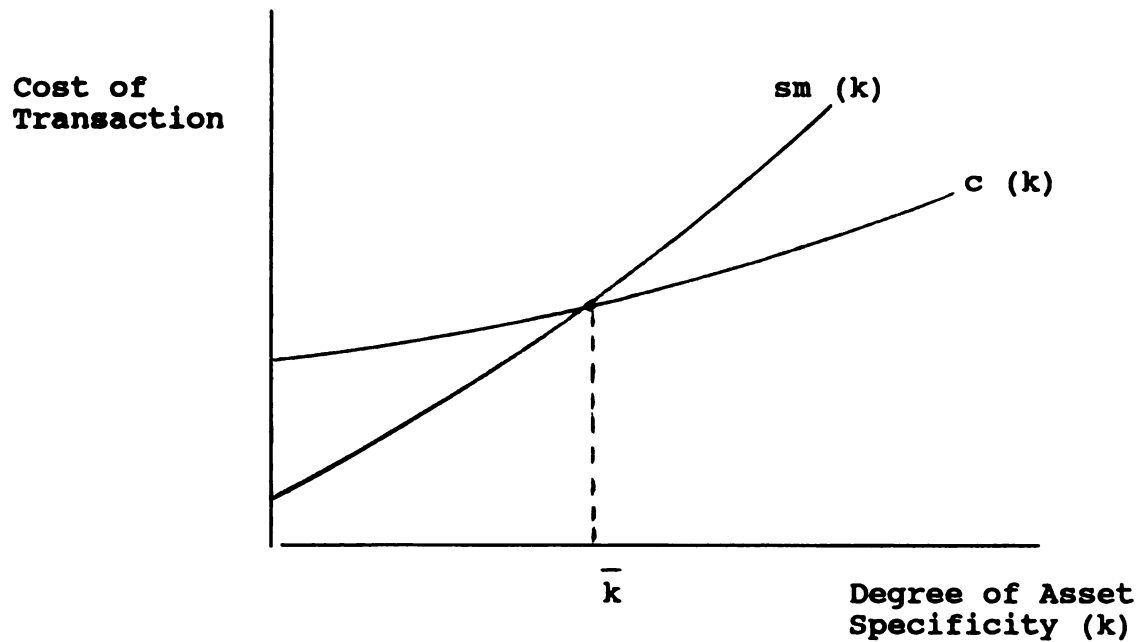


Figure 2.5. Cost of exchange (assuming uncertainty and opportunism) for farm inputs as their specificity increases, using spot market (sm) or contract (c).

the ability to do so is contingent upon the assets of the trading partner being immobile as well (Staatz (1987b) p.90). Absent these barriers, there are incentives for other firms to enter the market as long as the extractable rents are positive.

Staatz (1987b, pp.90-91) further argues that, within the context of the asset fixity principle, two of the most common rationales for the creation of farmer cooperatives are the need to build countervailing power and the need to preserve market access. In discussing countervailing power, he states that when farmers form cooperative supply firms to compete directly with IOFs, this behavior improves economic efficiency by compelling the IOFs to expand output and increase their X-efficiency (Leibenstein). This is the competitive yardstick rationale for forming cooperatives discussed earlier. A second way farmer cooperatives can increase economic efficiency is by mitigating the threat of opportunism in the face of fixed assets. This action encourages investment in specialized capital which is subsequently employed to expand farm productivity.

Shaffer (1987) points out, however, that upstream acquisition of specialized manufacturing facilities by cooperatives often increases (rather than diminishes) the uncertainty they face. Indeed, asset fixity and the presence of opportunism has affected patron-owners and their supply cooperatives in two important ways: through

higher levels of risk and more complex problems in coordination.

Growing agricultural specialization is forcing farmers to purchase (rather than produce on the farm) a greater proportion of their total input needs. Individual farmers are faced with larger and more risky investments as these inputs become more asset-specific. Farms in general are being pushed to greater levels of efficiency and, as a result, the spread between the high-cost and low-cost producer is narrowing (Goldberg; Hopkin and Associates). This means that the efficient farmer, with his large investment but small cost advantage, is more vulnerable to outside conditions. He can no longer afford simply to ride out the downside of a price-cycle while the inefficient (or highly leveraged) producers are eliminated.

Regional manufacturers are similarly confronted with growing levels of risk. Many of the manufacturing plants built in the 1970s are under-utilized due to excess capacity in various industries (e.g., fertilizer and agricultural chemicals). Most of these investments are highly asset-specific. In a depressed and more competitive agricultural economy, cooperatives (and firms in general) require more management flexibility, not less. In response, some large cooperative manufacturers (e.g., Farmland and C.F. Industries) have closed under-utilized

plants and now operate with a "make-versus-buy" strategy.⁹ Increasing specialization, affecting both the inputs and the capital used to produce them, has made the market environment less predictable. Returning to Figure 2.5, this implies that more inputs are now located to the right of $\bar{k}$. Those firms that rely on autonomous market contracting for transactions involving asset-specific inputs or investments expose themselves to greater risks and costs.

The second manner in which inputs are affected by asset specificity is in the coordination process. With agricultural specialization, not only are inputs themselves becoming more specialized, but the number of inputs used for the maintenance of a particular crop have grown considerably. "Broad spectrum" inputs (e.g., agricultural chemicals) have been replaced by "target-specific" inputs using refined application techniques. Knowing when, where and how to apply these inputs is requiring higher levels of precision, more sophisticated and costly equipment, and increasingly specialized knowledge (Stebbins). In other words, the risks to both buyers and sellers are greater since both the "use" (application) period for the farmer

⁹A "make-versus-buy" strategy allows the firm to reduce risk by supplying products under the two alternative methods--manufacturing and/or purchase, depending on the supply and demand conditions of the market. Manufacturing provides a core supply with plant size adjusted for efficient production. Additional needs can be met through purchasing agreements with other manufacturers.

and the distribution period for the seller are appreciably reduced. With specialized inputs, higher levels of precision are necessary both to sell and use the products. Clearly, even small errors in judgement can have important adverse effects to either party.

2. The Externality Principle. Williamson (1981) applies this principle to demonstrate the effect externalities have on a firm's tendency to vertically integrate. More precisely, he states that a firm will have incentive to vertically integrate when participants in adjacent stages impose externalities on the firm or when the firm imposes positive externalities on adjacent firms (pp. 1549-50). In the following discussion, the externality principle is extended to account for both vertical and horizontal issues affecting farm supply cooperatives.

Vertical issues--lack of patron-owner commitment. An important externality arises when patron-owners (farmers or local cooperatives) fail to commit themselves to their cooperative. There are two dimensions to this problem. The first is the practice of circumvention by large farmers or super-locals (those firms with the strongest economic incentive to behave in this manner). For example, a local cooperative may choose to bypass the regional and purchase supplies directly from another manufacturer (i.e., an IOF).

If the local is sufficiently large, it could reap net benefits from possible volume discounts offered by the manufacturer and from the omission of one or more value added stages in the distribution process. However, since this is practiced by the larger patron-owners, the regional cooperative could experience substantial declines in its sales volume. Over time, this loss in volume could effectively increase the average operating cost of the regional and, as a consequence, the prices it must charge the remaining patrons. In the longer run, this practice will serve to weaken the regional's competitive position within the industry.

The cooperative principle of one-member, one-vote currently allows many small patrons to over-rule the demands of the large patrons. This "equal" treatment, prevents large loyal patrons from obtaining certain benefits that are associated with their size (e.g., volume discounts). In effect, because of the intransigence of the "majority," the co-op is imposing negative externalities on large producers. The externality principle suggests that failure of the cooperative to resolve this discrepancy could result in these members integrating (probably contractually) with alternative distributors.

Horizontal issues--pre and post reorganization barriers. A pre-reorganization barrier is one that prevents a

cooperative from seizing an economic opportunity (e.g., acquisition or consolidation). A major barrier hindering horizontal coordination is competition among cooperatives. Competition has a pejorative connotation when it results in needless duplication of capital equipment, labor activities, and management functions. Those members who ardently support and encourage this practice frequently impose negative externalities on the cooperative and members who depend most on the firm, i.e., those with fewer alternatives. A second pre-reorganization barrier involves vested interests in cooperatives with diverse membership. For example, consider the prospect for a cooperative acquisition. Continual bargaining among various groups within the organization can erode the integrity of the original plan or, in the event the groups fail to reach a consensus, the acquisition may never materialize. Members not involved in the dispute would have also absorbed these negative externalities.

Post-reorganization barriers hinder the performance of a coordinating mechanism once it is adopted. Many cooperatives form joint ventures for purposes of achieving benefits unavailable through independent action. However, some of these cooperatives actively compete against their partners. For instance, cooperatives may have substantial differences in the types of service equipment available to them--trucks versus ownership or access to railcars. In

such a partnership, competitive behavior by the lower-cost rail shipper could weaken the partner's financial position.

A second post-reorganization barrier is the intervention by certain vested interests to slow or stop the disposal of redundant assets. There are numerous examples of cooperatives that consolidated in response to problems of excess capacity, and yet, ex post facto, failed to eliminate the redundant assets (Smith, Turner). Hence, even though the coordinating mechanism may have been appropriate, horizontal coordination did not improve because of the detrimental behavior of individual groups within the newly formed organization. Put differently, opportunistic behavior by these groups lowered the welfare of remaining members. It is then arguable that cooperatives may be more susceptible to pressures of vested interests than are their IOF counterparts. This is because cooperative owners (as well as the local community) have more at stake in their firm than do stockholders of an IOF. Stockholders of an IOF base their decisions solely on the performance of the firm as reflected in the end-of-year profit statement and changes in stock value. Repeated poor performance in an IOF would likely mean the termination of management.¹⁰ As a consequence, vested interests--as they

¹⁰This statement is not meant to infer that control mechanisms of IOFs always guarantee acceptable performance; many times they do not. This may be especially true in situations where management has instituted takeover defenses.

affect profits--are apt to be dealt with in a more efficacious manner. On the other hand, vested interests play a more significant role in cooperative organization. For instance, the local cooperative is often the town's single largest employer. Patron-owners may have family members or relatives employed by the firm and, as such, will have more incentive to participate in crucial decisions affecting them.

The externality principle would predict that, if these cooperatives do not evolve into larger and more efficient organizations (because of the intransigence of certain members), they will eventually be absorbed (integrated) by stronger, better performing firms. A second possibility is that members will leave (integrate with others) and the cooperative will fail. This is the ultimate tradeoff that confronts many poor performing cooperatives.

2.3 Concluding Remarks

This chapter introduces a systems approach for analyzing problems and opportunities facing farm supply cooperatives. The emphasis of the approach is on how individual firm (micro) behavior ultimately affects system-wide (macro) performance. But there are certain coordination problems that are unique to farm supply cooperatives and, as such, require special treatment. Game theory and transaction cost economics are two theoretical

constructs that are particularly well suited to some of these coordination problems. The major purpose of this research is not merely to identify system problems but to ascertain their underlying causes. As we shall see in subsequent chapters, the source of many cooperative problems lies in the structure of incentives facing participants and the nature of the inputs that are utilized by farmers. Game theory and transaction cost economics are used to illuminate the idiosyncracies that affect the coordination and performance of the cooperative system. Prior to their application, research methods are presented in chapter 3 followed by an explication of the scope and depth of coordination problems in chapter 4.

CHAPTER 3

RESEARCH METHODS

3.1 General Approach

The information used to accomplish the objectives presented in the first chapter came from three major sources. Secondary data were obtained by conducting a comprehensive literature search. An initial set of primary data came from pilot interviews with general managers of local cooperatives in Michigan. Finally, case study interviews provided the largest single source of information used in the research. The latter involved personal interviews with senior executives of regional cooperatives, general managers of local cooperatives and patron-owners of these firms.

3.2 Literature Search and Pilot Interviews

The primary purpose of the literature search was to identify key problems facing the agricultural input industry in general and farm supply cooperatives in particular. Since the focus of the research was on the current and potential role of cooperatives within this industry, information was desired in the following areas:

- (1) current problems affecting farm supply cooperatives,
- (2) effects of these problems on cooperatives and their

members, (3) probable causes of these problems and, (4) geographic location--where were these problems most pronounced and, if possible, involving what firms?

After a significant portion of the literature review was completed pilot interviews within Michigan were initiated with four general managers of local cooperatives. These served to verify findings from the literature search and were crucial because of the time lapse between dated publications and current problems. These pilot interviews were also supplemented by phone interviews with cooperative experts from government and academia.

3.3 Case Studies

3.31 Rationale

There were a number of reasons why the case study approach was employed in this research. A fundamental reason was the nature of the study--it involved problem solving within a complex intra and inter-firm environment. Personal interviews were necessary to obtain a detailed understanding of the dimensions of the problem as well as the causes and effects of certain participant behavior, and to explore the feasibility of possible solutions.

Second, there was a need to verify the working hypotheses of the research, principally that some current cooperative institutional arrangements were not conducive to effective coordination of the cooperative system, in

both vertical and horizontal dimensions. Regarding vertical coordination, a working hypothesis was that cooperative firm and system performance was compromised by a general lack of commitment between farmers and their local cooperative and between local firms and their regional cooperative. From a horizontal perspective, the hypothesis was that ubiquitous competition at both the local and regional levels had effectually made cooperatives less competitive suppliers of farm inputs by raising individual firm costs and attenuating system coordination and performance. Personal interviews were deemed highly suitable for flushing out causes for this apparent detrimental behavior within and among cooperative firms. Personal interviews permit the researcher to obtain detailed information on specific issues and explore unexpected avenues that surface throughout the interview process. These opportunities would be unavailable using alternative means like mail surveys.

3.32 Interview Design

Since the research explores vertical and horizontal relationships within the cooperative system, the design has two levels of focus. The first major focus (delving into micro issues) concentrates on three parties: regional cooperatives, local cooperatives and farmers. The second level of focus (dealing with macro issues) involves

regional and local cooperatives only. In analyzing the micro issues, since the three parties each represent alternative sides of a transaction, a "mirror image" approach was adopted (Purcell). The technique involves asking decisionmakers who are located at opposite ends of an exchange (for example, buyers versus sellers) their perceptions of a particular problem. Since each party's understanding of the problem will be based on its own experience of the transaction, the interpretations should differ. Uncovering participant perceptions (and potential misconceptions, as Hamm notes) is vital to the problem solving emphasis of the study.

The interviews were carried out with people who were thought to be most knowledgeable about the above-mentioned issues. Typical respondents for the regionals were either the vice-president for economic planning or the vice-president for farm supplies. At the local cooperative level, general managers were interviewed. The sample of farmers interviewed consisted of both board members (roughly one-third) and non-board members. It was felt that board members might have different views than non-board members. Another aspect of the interview process regards confidentiality. Even though the information sought was largely nonsensitive to those interviewed, respondents were promised that names of individuals or firms would not be used. One reason for this procedure is

that, given the nature of the research, little would be gained by attributing names to statements. Secondly, it was felt that respondents might be more open if they knew their views and opinions would be held in confidence. Since the research method is a case-study, detailed information was desired.

The second major focus of the research dealt with coordination issues at the regional and local levels (i.e., regional-to-regional and local-to-local). In a sense, the mirror image approach is applicable here as well, even though these firms are not, in strictly defined terms, on opposite ends of a transaction. However, given that they are each competing for the same members' business (whether farmers or locals), they are in a sense at opposite ends of the same problem. Regional and local firms were interviewed with this in mind.

3.33 Cooperative Firm Selection

A. Regional Selection. These firms were selected on a purposive basis. They had to meet the criteria set forth in the first chapter--namely be strongly affected by problems of member commitment and inter-firm competition. Selection was accomplished by obtaining a consensus from experts in government and academia. These cooperatives also had to be major suppliers of farm inputs.

B. Local Selection. These firms were also selected on a

purposive basis, but conditional on satisfying some logistical constraints. All locals had to meet the same micro and macro criteria as the regionals. The problem was that in order to cover the vertical issues effectively, the locals would have to be members of the pre-selected regionals. In addition, since the sample was small and organizational relationships between the regionals and locals could be expected to differ, it was necessary to ensure that the ratio of regional to locals was roughly the same for each federation. Since several thousand locals were members of these firms and their affiliations unknown, a random selection method was not considered feasible. The most obvious method was to request that each regional select the sample of locals to be interviewed. However, given that some of the vertical coordination issues dealt with the relationships between these firms, it was felt that regionals might have cause to select locals that were particularly loyal. The research required interviewing both loyal and disloyal members. Consequently this was not an acceptable method. In the end, the Agricultural Cooperative Service (ACS), with its comprehensive knowledge of farm supply cooperatives (and management personnel), was able to develop a "short list" of local firms that met the aforementioned criteria. Final selection was based on the local's proximity to the regional. In other words, to avoid needless expenditures of time and money, locals that

fell within a predetermined distance from the regional were selected.

C. Farmer Selection. These were accomplished by requesting the general manager to arrange an interview with at least two farmers.¹ The only criterion was that the farmers' major income be generated on-farm (to avoid obtaining co-op employees, which was the managers' first inclination). It was felt that since off-farm income would act as a cushion against economic conditions, "hobby farmers" would not be sufficiently aware of key issues and problems.

Table 3.1 summarizes the three categories of respondents and lists the number of persons interviewed.

3.34 The Interview Process

Once the appropriate firms and individuals were identified, an interview request was made. This was done by phone and was followed up with a letter confirming the date and time as well as information on the purpose and approximate subject matter of the interview. A questionnaire had been developed for the interview that included both closed and open-ended questions. The letter and the questionnaire can be found in the appendix.

¹The researcher acknowledges that the same potential for sample bias is present in farmer selection. However, given constraints of time and money, there simply was no feasible way to select farmers except through the general managers.

Table 3.1. Interview Breakdown for Case Studies.

Cooperative and Number Persons Interviewed					
<u>Regional</u>	<u>No.</u>	<u>Local</u>	<u>No.</u>	<u>Farmer</u>	<u>No.</u>
A	1	A1	1	A1	3
		A2	1	A2	2
		A3	<u>1</u>	A3	<u>3</u>
Subtotal	<u>1</u>		3		8
B	1	B1	1	B1	3
		B2	1	B2	2
		B3	<u>1</u>	B3	<u>0</u> ¹
Subtotal	<u>1</u>		3		5
C	1	C1	1	C1	3
		C2	1	C2	0 ¹
		C3	<u>1</u>	C3	<u>2</u>
Subtotal	<u>1</u>		3		5
Total	3		9		18

¹ For various reasons, farmers were not available.

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Two separate questionnaires were used, one for local and regional firms, the other specific to farmers. The latter questionnaire was much smaller in that only those issues that involved the farmer directly were asked. Because of the large geographic area to be covered (five states) and the total number of interviews, two sets of interviews in the midwest were covered each day. A "set" included both a manager and two or more farmers. Managers were interviewed individually; farmers as a rule were not. Local manager interviews took approximately two hours (as did the regionals) and farmers, 30-45 minutes. Because of the breadth and depth of the questionnaire and because of the interview schedule, a request was made to tape the interview conditional upon confidentiality. All respondents graciously complied. An important benefit from taping was that the interviewer was able to concentrate on the quality of answers (i.e., did they adequately address the question?). Undoubtedly there was information that would have been lost had the interview process relied on some form of written response or notetaking.

CHAPTER 4

PATRON-OWNER COMMITMENT AND VERTICAL COORDINATION

4.1 The Commitment Dilemma

This chapter begins a discussion of coordination issues gleaned from case studies and lays the foundation for most of the remaining chapters. It has two major sections. The purpose of the first section is to verify the problem of cooperative patron-owner commitment. It draws on the expertise of management personnel of local and regional farm supply cooperatives. The second section lays out management's perceptions regarding the effects of diminishing patron-owner commitment on the coordination and performance of cooperative firms and the larger cooperative system.

4.11 Patronage and Commitment

A. Farmers' Patronizing their Local Cooperative

Senior management of the regional firms interviewed were unanimous in their opinion that farmers "shop around" more now than they did ten years ago. Farmers as a group are presently viewed to exhibit less loyalty to their cooperative than they had in the past. When asked to identify the major alternative suppliers farmers were frequenting, perceptions differed (Table 4.1). The

**Table 4.1 Regional and Local Cooperative Managers'
Perceptions of Farmers' Alternative Sources of Input
Supplies.**

<u>Alternative Suppliers for Farmers</u>	<u>Cooperative View Number</u>	
	<u>Regional</u>	<u>Local</u>
Primarily IOFs	-	3
IOFs and Locals	2	4
Primarily Locals	1	2

**Table 4.2 Regional and Local Cooperative Managers'
Perceptions of Locals' Alternative Sources of Input
Supplies.**

<u>Alternative Suppliers for Farmers</u>	<u>Cooperative View Number</u>	
	<u>Regional</u>	<u>Local</u>
Primarily IOFs	1	5
IOFs and Regionals	2	2
Primarily Regionals	-	2

senior manager of one regional thought that other local cooperatives constituted the primary source of alternative supplies. The remaining two believed that both other co-ops and independents (i.e., IOFs) constituted the local firms' competition.

Local managers also strongly affirmed that farmers tend to shop around more now than they did in the past. Like the regionals, however, perceptions differ as to whether their primary competition is other independents or simply other cooperative firms (Table 4.1).

B. Local Cooperatives Patronizing their Regional

Most respondents believed that the loyalty problem as expressed through patronage is also significant at the local-regional level. Some local managers commented that not only is it highly advisable to shop around, but that members actually expect them to behave in this manner. Others asserted that such behavior by locals is counterproductive but pointed out that regionals compound the problem by competing with one another. Simply put, not only do many farmer and local cooperative philosophies underscore the economic benefits derived from uncommitted behavior, but ironically the regionals seem to encourage it actively by competing for the same customers.

Both the local and the regional respondents were split as to the source of locals' alternative supplies. This is

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apparently due in part to geographic circumstances. In some regions of the midwest, proprietary firms tend to dominate the wholesale and retail input markets whereas in other areas cooperatives do. Referring to table 4.2, three of the five locals identifying IOFs as their primary competitors are positioned in the same geographic area as the one regional in that same category.

4.12 Capitalization and Commitment¹

A. Farmer Investment in Local Co-ops: A Local Perspective

Two-thirds of local managers agreed that equity levels among local cooperatives are (generally) inadequate for meeting current needs (Table 4.3).² A prevailing sentiment was that even though healthy firms may operate efficaciously,³ a major weakness of the cooperative institution lies in its inability to infuse additional capital into the system. Equity levels are determined by

¹The reader should recognize that, although this section recounts the opinions of case study respondents and in this sense is original, the findings themselves are not new. A more exhaustive study was conducted by Cobia et al. some years prior to this research. The reason these questions are reiterated in this study is to establish the extent to which these problems are present within the case-study firms.

²This perception held in spite of the fact that most of these firms were well-financed. Their experience related to other local firms in the area and general views heard "through the grapevine". Of those that disagreed with the statement, all were financially healthy firms.

³That is, healthy firms had adequate equity to meet operating capital needs and still revolve equity accounts.

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Table 4.3 Regional and Local Cooperative Managers' Views on Equity Investment and Redemption Practices.

<u>Equity Issue</u>	<u>Cooperative View*</u>			
	<u>Regional</u>		<u>Local</u>	
Investment Practices	<u>Agree</u>	<u>Disagree</u>	<u>Agree</u>	<u>Disagree</u>
a) Inadequate	3	0	6	3
b) Misdirected	3	0	9	0
Redemption Practices				
a) Inadequate	3	0	8	1

* Agree column includes those respondents that agree strongly plus those that agree. Disagree column includes those respondents that disagree strongly plus those that disagree.

the firm's capacity to generate net earnings and the particular equity redemption program it has adopted. Managers pointed out, however, that with a tightened agricultural economy and intense price competition, margins for many inputs have diminished. Lower margins imply a reduction in net margins that are used to build up cooperative equity through retained patronage refunds. Another important element of low net margins is the disparity it creates between new, large entrants and long-term (older) members. Many of the older members have accumulated substantial equity from years when cooperatives enjoyed sizable margins. At the same time, these members may also be paring down operations as they approach the terminus of their economic life cycle. Conversely, entrants who have come on-line in the past 5-6 years may

be aggressively patronizing their cooperative but, because net earnings (and concomitantly, retained patronage refunds) are low, these patrons fail to accumulate equity capital.⁴ Hence, managers complain that some members who are the largest users of the cooperative are grossly under-invested whereas other older members who may be downsizing operations are substantially over-invested. More than one-third of these local managers suggested instituting sizable front-end (direct) investments based on proportionality as a mechanism for rectifying this inequity. Others agreed in principle but felt that direct investments would be extremely difficult to implement.

B. Local Investment in the Regional Firm: A Regional Perspective

As Table 4.3 indicates, senior management of regional cooperatives believed unanimously that equity levels are inadequate based on regional firms needs. Furthermore, according to one individual, substantial investment inequities persist among local membership. In particular, patronage-to-equity ratios are severely misaligned by both farmer and local members--significantly more so now than in the past. A disparity between large under-invested new

⁴A major flaw of retained patronage refunds is their dependence on net earnings, which fluctuate with the fortunes of the cooperative. Hence, in a period when a cooperative is financially stagnant, accumulation of equity capital through retained patronage refunds is negligible.

entrants and smaller, over-invested long-term members is an area of growing discord among local and regional cooperatives.⁵

Another senior management view is that locals have a poor understanding of a regional firm's need for equity. Even though many local co-ops have substantial equity invested in their regional, a regional's financial requirements (like costly but necessary advertising programs) often exceed its ability to acquire additional equity capital.⁶ This argument is considered even more salient when one accounts for the growing concentration of most input markets. To ameliorate this capital constraint, one regional is creating subsidiary organizations with some of its more successful business lines for purposes of selling stock to the public while retaining majority ownership. This practice, however, is seen as only a partial solution to deficient capital resources.

⁵Case study regionals are aggressively trying to resolve their equity investment dilemma. One in particular is examining alternative programs and doing so in conjunction with its members. A base capital plan is one method that is currently under consideration for this regional. Some local managers who were knowledgeable of this plan viewed it favorably but had reservations regarding implementation because they felt young farmers would be unable to provide the capital requirements. This is consistent with findings from Cobia, et al.

⁶Advertising is made even more "necessary" by the practice of inter-cooperative competition. This is a good example of how individual (micro) behavior has deleterious system-wide (macro) consequences.

C. Equity Redemption Programs

Although regional cooperatives recognize their equity redemption programs are inadequate in some areas, their perception is that current difficulties are more pronounced at the local level. According to one senior executive, redemption programs for the cooperative system as a whole are basically unsound. A complicating feature is the difference in membership base between regional and local firms. A membership base at the local level is defined by the farmer-member, who has a limited lifetime. There are three components of redemption programs that exert pressure on a local cooperative's equity capital. The first concerns patron-owner demands for their investments as they near retirement. The second is the growing insistence by younger farmers that their equity accounts be revolved in a more timely and systematic manner. Unlike their parents, many are unwilling to be placed in a situation where they must "die to get it." A third component that can severely strain a cooperative's equity balance involves settling the estates of deceased members. Some of these accounts constitute prodigious amounts of investment capital.

In short, the membership base at the local level is characterized by a growing insistence of patron-owners to have their investments returned to them in a more expedient and systematic fashion. This entails: (1) revolving equities more frequently, (2) returning member investments

at retirement, and (3) settling estates propitiously. All three areas of contention place acute pressure on local management and directors to divest the firm's scarce cash resources.⁷

Conversely, the regional firm is not constrained by this human economic lifecycle. A regional farm supply cooperative has local organizations for its members, which, for all practical purposes, have no lifetime limit. Hence, equity redemption is not deemed as critical an issue at this level--i.e., regional firms are not pressured to retire equities to the same degree and with the same sense of urgency that are local firms.⁸ As a consequence, local equity capital invested in the regional accumulates as non-cash assets and shows up in the their balance sheets. In the opinion of one senior executive, this discrepancy in

⁷These issues are indicative of the "horizon problem" discussed by Staatz (1984, pp. 96-106). The core of the problem lies with the lack of a secondary market for cooperative equity certificates. Therefore, the stock grants to the holder a residual claim on the earnings of the firm only so long as s/he patronizes the co-op and if management and the board of directors deems the move in the best interest of the firm (i.e., does not jeopardize the co-op). Hence, the lack of a secondary market for cooperative stock prevents the smooth intergenerational transfer of ownership of the firm and leads members to push for the development of mechanisms to increase the liquidity of their investment in the cooperative.

⁸This may be true to an extent, but locals are shifting this pressure upward as farmers become increasingly adamant about the future of their investments. Also, patron-owners may view failure to revolve equities as a rationalization since, at the time of these interviews, all three regional firms had still not resumed redeeming equity to their members.

membership base partially explains why equity redemption is currently a source of friction between regional and local firms.

Another regional vice president acknowledged that his firm had recently ceased retiring equities--a move prompted by a more urgent need to meet certain financial goals. One pertains to improving the regional's financial position by reducing its debt-to-equity ratio. The second is linked with a recent policy of moving to estate programs where 100 percent of deceased farmers' investments in the regional are returned to families of deceased members.⁹ In some ways this policy is considered to be a "financial millstone" for the regional, as the refundable amount under the estate program can equal the total equity redemption funds available to the firm.

Local managers' views concerning equity redemption programs are consistent with respect to the desirability of systematic programs but differ in terms of how these

⁹A farmer indirectly invests in the regional through investment in the local cooperative. Through patronage, the local acquires equity in the regional firm, just as a farmer accumulates equity in the local firm. When a local co-op decides to settle an estate, it redeems to the member's survivors the appropriate amount of qualified equity. In addition, the regional redeems a proportion of the equity equal to the ratio of the local's investment in the regional to the local's total allocated equity.

A local co-op with total allocated equity of \$100,000 and an investment of \$20,000 in the regional would receive \$2,000 in equity redemption from the regional when faced with redeeming \$10,000 held by an estate.

programs should be financed.¹⁰ A few mentioned that their practice of redeeming equities at age 65 is not fair to members (i.e., because of the time value of money, equity should be revolved on a more frequent basis), but perceive no feasible alternative unless effective proportionality is instituted.¹¹ Another general manager was insistent that equity redemption should come from net earnings and not from direct investments by members. In other words, if the co-op is managed properly (and assuming "normal" economic conditions), redeeming equities would not be an issue among membership. An exception might be at the regional level, where new ventures could dictate the need for an infusion of patron-owner capital through direct investments.

Two less viable local co-ops admitted to having no systematic program but contend that they need flexibility

¹⁰There are good reasons why some managers' hesitate to implement equity redemption programs. Barton has shown that some types of equity redemption methods actually determine the financial structure, especially of local cooperatives. More succinctly, some redemption methods (e.g., estate only and age of patron) reduce the control the co-op has over its own financial structure because the amount of equity tends to be predetermined by the method.

¹¹Proportionality simply infers that members' equity investment should be aligned with their use of the cooperative. A current complaint among regionals is that a severe misalignment has developed, largely because of the recent low earnings of cooperatives. Further, many of the chronically underinvested members are large, new entrants. To the extent this is true, these members are receiving benefits from patronage without providing equity or risk capital (financing the co-op) in the same proportion.

to adjust to big swings in earnings.¹² They argued (as did managers of other locals) that handling estates is an important issue among farmers, and yet it has significant adverse effects on their capacity to redeem equity accounts. Many local managers mentioned that some individual farmer accounts were between \$100,000 and \$200,000--an amount sufficiently large to financially cripple many smaller cooperatives.

A final opinion places the onus of responsibility on regional firms. According to the argument, these firms are financially impaired to the point they are unable to retire their stock within a reasonable time period. A few managers noted that some stock had not been retired in more than 20 years. A general consensus of local managers was that regionals should write down their stock to reflect accurately the current value of assets because the stocks inflated value has adverse affects on their borrowing capacity. For instance, local managers complained that, due to over-valued regional stocks, lending institutions are highly reluctant to consider these stocks in a local's balance sheet (i.e., as assets). Since many locals are

¹²This belief was affirmed by nearly all cooperatives, even the largest and most successful of the locals. Regional firms also subscribed to this "flexibility policy" where equity retirement is at the discretion of the board of directors.

invested 25-30 percent in their regional,¹³ a stock devaluation could destroy poorly performing locals, but it would also give surviving firms a more promising future. But local respondents assert that regionals resist this stratagem because it underscores faulty management practices that caused the depreciated assets in the first place.

D. Misdirected Investment Policies

Personnel interviewed at both the regional and local levels acknowledged that in recent years cooperatives have made many unsound investments (Table 4.3). Poor investment policies are attributed to both regional and local firms. Regionals have over-invested in costly plant and equipment for basic sources of supplies (e.g., mining and manufacturing). Local cooperatives have over-invested in a wide range of input services, including fertilizer mixing and feed blending plants, as well as unit train facilities like trackage, loading equipment, and storage units. One regional respondent believes that the underlying impetus for this behavior is farmers' preoccupation with fixed assets. From a farmer's point of view, physical capital is tangible and represents substantive proof that his or her money is at work. The problem is that decisionmakers

¹³That is, 25-30 percent of a local's total assets are invested in the regional firm.

employed little discriminatory behavior in that any investment was considered good. Now, in hindsight, the consensus among respondents is that many of these cooperative investments were not a very wise use of farmers' money.

4.2 Member Commitment and Economic Coordination

This section discusses local and regional cooperative views on the impact member commitment has on the coordination and performance of their firms. Commitment effects are evaluated through patronage loyalty and member investment in the cooperative system.

4.21 Commitment through Patronage

A. A Regional Perspective

Senior management of regionals are acutely aware of the consequences an absence of local cooperative commitment has on the economic performance of their firms and the larger system they serve. According to those interviewed, the effects of "shopping around" influence all aspects of production and distribution of farm supplies. At the most basic level, this behavior limits a regional firm's ability to plan--a procedure that is vital to the efficient running of any complex organization. Absent effective planning,

scarce resources like time, money, and materials are used to develop costly contingencies because future demand is both volatile and uncertain. Erratic fluctuations in volume purchases raise per-unit manufacturing costs because capacity is set at a predetermined level. Plant and equipment is designed optimally to handle a certain level of output. Purchase orders for manufacturing inputs, once implemented, are difficult to alter. Personnel policy is also geared for longer term conditions since repeated hiring and firing can be an expensive and time-consuming process. It also undermines the morale and subsequent productivity of employees. Further, controlling inventories is a more problematic and expensive process since the likelihood of being long or short on basic supplies is a greater possibility. "Specialty" items--those inputs that are less common because of their specialized functions--become more risky to handle.¹⁴ From the respondents' point of view, price is the critical factor leading to the commitment problem. Individuals or firms that exhibit disloyal behavior appear to be sensitive

¹⁴Specialty items are generally characterized by low margins at the wholesale and retail levels. Large margins are said to exist at the manufacturing stage for this class of inputs. Respondents stated that basic supplies like fertilizer or feed may have a 10-15 percent (or more) margin whereas "specialty" items are closer to 3-5 percent. This suggests that the manager has less price flexibility when reacting to competition for the specialty items. A constrained ability to adjust price increases the odds of "carryover" stock hence the risk associated with these costly, low-margin items.

to small changes in input prices. However, because cooperatives (as a rule) carry a full line of products and services, it is impossible to consistently have the lowest price on every product. This suggests that current cooperative policy may be incompatible with the goals and objectives of this class of patron-owners. Conventional wisdom purports that "shopping around" makes cooperatives more competitive--it is the stick patron-owners use to maintain acceptable performance. In practice, however, it may make cooperatives less competitive because cost structures at every stage of the production-distribution system are adversely affected due to poorly coordinated economic functions and activities. Furthermore, the consequences of this behavior eventually filters down and throughout the entire cooperative system.

The preceding discussion is a rather orthodox view of how competitive behavior affects coordination in a cooperative system. It does not account for how competition influences factors like x-inefficiency within the firm. Numerous times respondents noted that competition is primarily responsible for the improvement in management performance at the regional level. Some respondents (including regional managers) argued that mismanagement and excessive slack within the regional organization is just as detrimental to performance as is poor vertical coordination. Hence, the combination of financial duress

(due to both internal and external forces) and outside competition can also be construed as a positive influence on cooperatives if it improves the organizational performance of the firm.

Another concern is that commitment is often unidirectional. Regional respondents noted that for a long time local co-ops insisted that regionals limit input sales only to members. The impetus behind this demand was to mitigate the threat of competition at the local level. At the same time, however, these members were practicing the option of purchasing their supplies from the regional's competitors. Hence, locals wanted a firm commitment from the regionals but they were unwilling to impose that same restriction upon themselves. This practice effectively tied the regionals' hands by restricting their marketing options. By focusing exclusively on their membership these firms were forced to raise or lower volumes based on uncertain supply and demand conditions while still trying to swing their prices with the market to remain competitive.¹⁵ The end result was that earnings fluctuated substantially. This was because these regionals were heavy into manufacturing and were forced to contend with the rigidity of fixed costs. When a period developed where their prices were non-competitive, volume fell, thereby

¹⁵In the absence of this agreement the regional can better stabilize volume by arranging for alternative demand sources, like domestic IOFs and international markets.

raising unit manufacturing costs. Higher costs eventually translated into higher prices and lower margins, which created additional incentives for members to purchase elsewhere. As a consequence, regional management was eventually able to convince the board of directors to change this policy of selling only to members.

B. A Local Perspective

Local views on the commitment issue appear to take two polar positions--either local managers believe in commitment (and practice it) or they don't. One third of the local managers interviewed were in this latter category. Farmers as a rule were perceived to be much less loyal to their local cooperative than were locals to their regionals. This observation was iterated consistently by all respondents. Commitment is currently one of the most talked about and controversial words in the cooperative vocabulary.

Respondents who support a farmer's or local manager's decision to shop around justify the behavior by asserting a simple but far-reaching tenet. There are two aspects to the argument. First, uncommitted patrons keep management "on their toes". The only way cooperatives can attract uncommitted patrons is by having the lowest prices and highest quality products. Managers acknowledge that it is impossible to continually have the lowest prices across all

product lines, but they also believe farmers recognize this. A more reasonable efficiency target takes into account the larger "cooperative package." In other words, when one averages out prices and takes into account patronage refunds and cooperative services, this "package" should be the most attractive alternative available to customers.

The second argument for condoning uncommitted behavior is essentially a special case of the first--that it strengthens cooperatives at all levels through more informed decision making.¹⁶ Informed decisionmakers are more efficient and therefore more competitive. At the farmer level, for instance, knowledgeable producers put pressure on local management to be informed through competitive purchasing practices. In turn, this behavior by locals exerts pressure on their regionals to be efficient, low-cost suppliers. The view asserts that well-informed participants both promote and facilitate improved performance in the cooperative system. On the contrary, commitment tends to breed complacency, which undermines the system's capacity to perform efficaciously.

¹⁶Apparently informed decisions are highly valued by many patron-owners. Even though they may trust their co-op, information is viewed analogous to an insurance policy as protection against unfavorable performance. This trust varies significantly across membership. One manager stated that his farmers knew the price of basic inputs in a 60 mile radius of their cooperative and knew the price of farm equipment across the entire state.

Local managers who adhere to the commitment philosophy recognize that shopping around may keep firms more alert but believe the costs of this behavior greatly exceed its benefits. Their concern is that many farmers lack an adequate understanding of the cooperative's economic role in the input industry and the agricultural sector in general. In other words, they fail to consider what alternative market structures might develop in the absence of the cooperative. According to these managers, farmers are unduly concerned about price as the prime indicator of performance and in the process overlook vital services offered by cooperatives. For instance, local managers complained that some farmers will buy inputs elsewhere if prices are even marginally lower, and then request special cooperative services (like tire repairs and soil analysis) that did not accompany their purchases.¹⁷ Managers who adhere to the commitment philosophy believe that the time has come for farmers (and the system in general) to reevaluate the types of functions and activities that are feasible for co-ops in today's competitive environment. Farmers should not expect their cooperatives to have the lowest prices on all their inputs and still maintain a complementary line of services.

¹⁷Some managers believe that the price issue was instigated by IOFs since they generally specialize along one or two product lines, offer fewer services than co-ops and then concentrate on being the lowest priced suppliers.

Most local managers echoed their regional counterparts in stating that, with membership demand volatile, firms' planning capacity is compromised. If a local co-op's customers are consistent buyers, for example, the manager is better able to determine manpower needs, equipment needs, and inventory levels. Other tasks like employee work loads, the distribution of products, and the execution of service functions can be scheduled more efficiently. A component of the "demand volatility" problem is the fairly common practice of farmers joining more than one cooperative. For instance, some farmers were said to be members of five different cooperatives. Under these conditions, management planning strategies can be impaired seriously. It also means that all five cooperatives are expending resources (and increasing their costs) in efforts to lure customers to their association.

In conclusion, case study interviews confirmed that uncommitted member behavior as expressed through patronage severely impedes the harmonization process (i.e., routinizing and stabilizing various economic activities) of the cooperative system. At the firm level, logistical coordination of human and physical capital resources is weakened at each stage in the production and marketing chain. This results in needless inefficiencies like underutilized plant and equipment, over or under stockage of inventories, and a lower productivity of employees through

a less efficient use of their time.¹⁸ From a systems perspective, the practice of "shopping around" increases the uncertainty of demand at each major stage. Regional firms are less sure of local cooperative needs and local managers are less sure of farmer-member needs. The entire system performs at a reduced capacity.

4.22 Equity Capital and Coordination Issues

A. Regional Effects

At the time these interviews were conducted, regional firms were still in the process of restructuring and revitalizing (i.e., redeploying assets) their organizations. They were keenly aware of the consequences of poor firm financial health and the various constraints imposed on cooperatives in their efforts at generating capital. They were also cognizant of the many financial opportunities available to their proprietary competitors. A theme frequently enunciated by regional respondents was the double burden that attends highly leveraged cooperatives--financial impairment is both a source and a cause of poor performance. On the one hand, because the firm is weak, few credit institutions are willing to risk lending additional capital. When (or if) the leveraged

¹⁸Understockage or "stockouts" are considered more detrimental to a firm in the longer-run than is overstockage. This is because market share is affected by the former. A customer is less likely to return to a firm when a desired commodity is unavailable.

firm locates a capital source, it invariably comes at a high cost. On the other hand, owners of the cooperative are also reluctant to invest additional (equity) capital into a venture that could turn into another "sunk cost". Hence, the available supply of both debt and equity capital is severely restricted.

Another assertion of respondents was that cooperatives experience a greater demand on their cash resources than do their proprietary counterparts. A regional's earnings are usually apportioned across some or all of the following alternatives: (1) improving the balance sheet by increasing capital investment, (2) paying cash patronage refunds, (3) revolving equities and, (4) settling estates. Because of different organizational characteristics, IOFs face only the first decision and the need to pay dividends. The reason the latter three constitute a cash demand for co-ops is because cooperatives have not instituted equity appreciation opportunities. The only cash owners receive is in the form of patronage refunds and equity redemption. Conversely, IOFs allow equity markets to appreciate the value of their stocks while still retaining their cash earnings. This practice allows IOFs to pay relatively small stock dividends since equity markets serve to pacify their owners.¹⁹

¹⁹This was particularly true in the past when the tax rate on capital gains was less than that on ordinary income, such as dividends.

In summary, regionals respondents argue there are effectively two opposite financial forces that disadvantage them in the market place--a restricted supply of money and a significant (owner) demand for cash balances. Because of poor performance, debt capital is both scarce and costly. Similarly, patron-owners of regional firms resist committing additional funds that may never be remitted. Regionals further assert that the demand for net earnings are greater for cooperatives than for their IOF counterparts. The combination of these "supply-demand" constraints greatly hinders the performance goals of regional firms and creates incentives for additional members to indulge in "disloyal" pursuits.

B. Local Effects

A weak financial structure affects local firms in much the same manner it does regionals. Both short- and long-run economic performance is impaired by this "supply-demand" squeeze mentioned above. Not only does this place upward pressure on the firm's cost structure but it inhibits the firm's ability to capitalize on specialized purchasing options like forward contracting.²⁰ One short-run benefit of forward contracting is that it contributes to the cooperative's competitive position through the

²⁰Forward contracting as a coordinating mechanism is discussed extensively in chapter 6.

acquisition of (generally) lower cost farm supplies (i.e., lower cost than may be experienced through spot purchases immediately prior to or during planting season). It also positions the local well in terms of supply logistics. Input shortages at planting time (when demand is greatest) were mentioned as a key source of concern at both the wholesale and retail levels. Positioning input supplies in strategic locations prior to the planting season strengthens a firm's competitive edge by reducing the time required to satisfy unexpected demand. For instance, this strategy can be crucial in years when the crop season begins early. Firms with well-positioned inventories will capture a good portion of their competitors' market share.

Longer run performance is similarly affected. For instance, without access to affordable capital, a firm is unable to take advantage of investment opportunities that could diminish or spread risk--like forming a joint venture with another cooperative, where project costs are shared, or investing in new technology that could improve the efficiency of operations. An example of the latter are computerized merchandising and accounting systems that some of the larger locals (super-locals) have installed.

Another observation was that poorly performing cooperatives may respond to financial stress by terminating their equity redemption programs. Managers noted that these programs are generally eliminated first because they

are under the direct control of the firm.²¹ This type of discretionary control also affords a certain amount of financial flexibility during lean periods. Other capital outflows, like paying employee salaries and servicing the firm's debt, are associated with substantially less discretionary slack. However, managers voiced concern that paring back or eliminating redemption programs has a debilitating effect on membership morale and undermines farmers' incentives to do business with cooperatives. Managers believe that equity must be perceived as a reasonable investment alternative. This implies that owners should systematically receive a financial return. Failure to redeem equities of inactive and other overinvested members means that incentives to invest in cooperatives is undermined because the level of benefits from the co-op are not contingent upon the level of capital investment. As a consequence, the equitable implementation of equity redemption programs is considered to strongly influence farmer loyalty.

C. System Effects

The following synopsis represents a regional perspective of capitalization issues and their effect on the performance of the cooperative system.

²¹Another perspective is that retired members may have lost their voting rights and, hence, are unable to pressure the board of directors.

In a federated system, regional decisionmakers have a degree of control over how cash resources flow (downward) from the regional to the local to the farmer. This is because the flow of money is determined by the patronage refund policies and equity redemption programs instituted by the regionals and locals. But there is no control whatsoever with respect to the flow of resources in the opposite (upward) direction. This is because there are no federation by-laws that establish the amount of equity capital farmers should invest in their local and the locals in their regional.²² In the view of one regional respondent, the cooperative federated system is designed for "controlled liquidation"--the degree to which the regional and the local can assuage member demands for cash is the degree to which the cooperative avoids liquidation. This situation is applicable to most federated systems and it prevents cooperatives from evolving into more viable and competitive forces in the market. The cooperative system needs to develop the capacity to be responsive to a changing economic environment. Inability to generate adequate capital strongly impedes this adaptive process. Absent some mechanism for infusing capital into the system,

²²This is partially misleading. Membership policies of cooperatives do establish how much new entrants must invest in their co-op. The problem is that the amounts are so small that they contribute little to the regional's equity position. The membership fee for a local to join a regional is typically \$25 (as it has been for over 50 years) and a farmer's fee to join a local is as low as \$1.

cooperatives could continue to lose their competitive edge and may, as a consequence, be relegated to carrying out some secondary market function.²³

In conclusion, capitalization issues hurt the adaptive component of coordination--the ability of a firm or the system to adjust to changing economic conditions. Cooperative respondents noted that capital constraints are essentially due to the following conditions: (1) poor firm performance; (2) difficulty in obtaining financial resources (money supply constraint) when they are needed; and (3) a large member demand for cooperative cash resources. In the absence of sufficient equity capital, money is purchased at a high cost which in turn raises a firm's fixed costs and further deteriorates its competitive position. More and more resources are consumed servicing debt and meeting basic operating requirements rather than being directed at new technology items that reduce unit costs or investment opportunities that improve a firm's market share and subsequent net earnings.

²³This perception of some respondents indicates how frustrated they are. This view varied considerably at the local level (from strong concurrence to complete disagreement), but was generally affirmed at the regional level. This assertion also illuminates the fact that managers have an inherent interest in increasing the capitalization of the firm. A relevant question is, if this horizon problem is endemic in co-ops, why have they survived up to this point?

4.3 Chapter Summary

This chapter examines a key vertical coordination problem currently afflicting many midwestern farm supply cooperatives. The process involves two steps. First, the research establishes the scope and depth of the problem among the cooperatives' interviewed. A second part delves into the effects of the problem on cooperative firms.

The vertical coordination problem is confirmed to be an erosion of member commitment and is manifested in two fundamental ways. The first is that, in recent years, member patronage of their cooperatives has fallen. A tendency to "shop around" has become a more prevalent and time consuming practice at both the farmer and local cooperative level.²⁴ The second manner in which commitment is manifested is through patron-owner financial support of their cooperatives. Respondents confirmed that equity management is a significant problem in the cooperative system today. Both local and regional managers cite a growing disparity in investment among its membership--specifically, the trend towards over-investment among long-term patrons and underinvestment among larger, relatively new entrants. In other words, the practice of membership financing their cooperative according to use has not been

²⁴To a certain extent, this shopping around may be a problem brought on by the cooperatives' success in making input markets more competitive, thus giving farmers more options.

effectively implemented and is a cause of growing concern and dissension among cooperative participants. Even though investment per member in the 1984-85 period was up for farmer cooperatives as a whole, of the 10 types of co-ops examined by Richardson, per member investment of farm supply firms ranked ninth, nearly 70 percent below the average (Richardson, 1986).

A related problem concerns equity redemption programs. Both locals and regionals recognize that unfair redemption practices are undermining the credibility of cooperatives. Various reasons were given, including a difference in membership base between locals and regionals and the need to satisfy other more urgent goals, like improving the financial structure of the firm.

The second section of the chapter examines the effects of an erosion of patron-owner commitment on cooperative firms. In terms of commitment through patronage, the most crucial way "shopping around" influences firm performance is by a reduced planning capacity of firms. An ineffectual planning mechanism raises cost structures through increased inefficiencies within and among the various production and distribution stages of the cooperative system. Performance is affected adversely because both the firm and the system are unable to routinize and stabilize fundamental economic activities.

In terms of equity capital, regional firms believe

there is an inadequate supply of equity and an excessive demand on existing cash resources. Local firms also recognize these constraints, claiming that they affect both the short- and long-term performance of cooperatives. A major problem cited by regional managers is that, in periods when the regional experiences low net margins, equity control (patronage refunds and equity retirement) is limited to the "outflow" component of the system ($R \rightarrow L \rightarrow F$), but there is no effective control (infusion of capital) in the opposite direction ($F \rightarrow L \rightarrow R$). In their view, failure to reconcile this discrepancy has severely hindered the system's ability to adapt to new economic conditions and threatens the viability of the cooperative way of doing business.

CHAPTER 5

PROBABLE CAUSES OF PARTICIPANT BEHAVIOR

Two different analytical frameworks are employed in this chapter. The first is a game-theoretic approach that examines certain behavioral characteristics of cooperative members. The purpose of the approach is to reveal certain economic incentives that help explain the economic behavior of participants. There are two components to this section. Each component investigates the commitment issue but as expressed through two alternative mediums--either through patronage or through equity investment.

Transaction cost economics is then used to investigate additional factors that influence the coordination and performance of farm supply cooperatives. Two important areas considered under this framework are (1) asset fixity and uncertainty and (2) external effects. The latter topic discusses implications of externalities on the evolutionary development of the cooperative organization.

5.1 The Structure of Incentives

In the second chapter an application of game theory to farmer cooperatives was introduced. In particular, two types of group behavior using the theory of nonzero-sum

games were presented. The first was called a "cooperative game" because it involves a situation where members of a group are able to communicate and make binding commitments with one another. Within this framework there are gains from joint action by a potential coalition of players but participants must first agree on the distribution of the potential payoff. Failure to agree on an allocation prevents the coalition from developing. The second type of group behavior is known as a "prisoner's dilemma," which is a special case of a noncooperative game. This situation can arise when, because of various impediments, like vested interests or lack of trust, members of a potential coalition eschew joint action and choose to act independently (Staatz, 1987b).

There are two fundamental features that distinguish a cooperative game from a prisoner's dilemma. In a cooperative game there are rules that permit the players to communicate with one another and to make binding commitments. For a noncooperative game, neither condition is present. These rules have implications for examining farmer cooperatives. In reality, because cooperatives represent a legal and economic coalition of individuals or firms, formation of the organization necessitates communication among potential members. On the other hand, there are few situations where cooperative members are bound by a formal commitment to patronize or in any other

way support the firm.¹ This absence of a mechanism to enforce cooperation among members is key to the prisoner's dilemma. A limitation of the static prisoner's dilemma model in the context of farmer cooperatives is its single-period application. Since the game is played only once, patron-owners are not concerned with their reputations as reliable members, for even if they defect, they will not face reprisal from other members in the cooperative. An alternative is to consider a supergame in which a single period game is infinitely iterated and where the payoffs are the net present values of the stream of payoffs from the individual games (Staatz, 1987b). In a supergame, binding commitments have less importance since, if one member chooses to cheat, payoffs may be affected adversely and the coalition could be destroyed.² In other words, in situations where the receipt of benefits is conditional on the continued existence of the coalition, an implicit commitment develops since it is in the players' self-interest.

¹An exception is when members do make explicit agreements with their cooperative. An example would be a production forward contract where the member agrees to supply a specified quantity of a commodity at some future date. A second example is an input contract where the member forward buys a specific input for delivery at a future date. These are both formal contracts with enforcement clauses.

²Staatz discusses in some detail situations where a prisoner's dilemma supergame reduces to a prisoner's dilemma itself.

Staatz (1984) discusses one aspect of the supergame that is particularly germane to this study--whether or not mutual conditional cooperation based on a "tit-for-tat" strategy is ever an equilibrium result.³ A player will "conditionally cooperate" only so long as the other players, or some critical mass of them, continue to cooperate (1987b, p. 144). Staatz has shown that if certain conditions are met, such an equilibrium outcome will obtain. These conditions are represented mathematically by the relationship:

$$a_i \geq \frac{y - x}{y - w} \quad (1)$$

where: x is the payoff to each player if they both cooperate, y is the payoff to a defecting player if his or her partner does not defect, and w is the payoff to each player if both defect. The essential characteristic of a prisoner's dilemma is that $y > x > w$, that is, each player has an individual incentive to defect (since $y > x$) even though if each defects they are both worse off than if both had cooperated (since $x > w$).

Additionally, a_i is a discount parameter (one minus the discount rate) of player i . From equation (1), it is

³A tit-for-tat strategy is one where the player first chooses to cooperate, then s/he does whatever the partner did on the previous move.

apparent that the equilibrium outcome depends upon the value of the discount parameter (a) and the payoffs for cooperation and defection in the constituent games. In particular, if the discount rate is too high,⁴ then mutual cooperation will not be a rational strategy in the supergame. Secondly, the greater the incentive for defection in the constituent game (that is, the greater is the payoff $y - x$) the less likely mutual cooperation will emerge as an equilibrium outcome. Conversely, the greater the punishment that is inflicted on a defecting player by the partner's defecting in subsequent games (that is, the greater is the payoff $y - w$), the more likely mutual cooperation will emerge as a final result (1984, p. 413). As will be seen shortly, some of these very conditions emerge as issues among case study cooperatives.

Within the context of this research and game theory, one point should be emphasized. It may not be appropriate to view the entire vertical coordination issue as a prisoner's dilemma supergame. The type of game that should be employed depends on how one views players and which game brings out best the fundamental issues surrounding the argument. For some players and in some circumstances it is a prisoner's dilemma. For others it is a cooperative game where the question is how best to apportion the new pie. The point is, one obtains different incentives into

⁴The discount rate equals $1 - a_i$

problems by viewing them from alternative perspectives. Consequently, section 5.11 employs a supergame to analyze an age-of-patron issue and 5.13 applies a cooperative game to the size-of-patrons.

5.11 Commitment through Patronage

A. Farmer Commitment: A Farmer-Local Perspective

This section synthesizes the opinions of farmers and general managers on issues influencing farmer commitment. The intent is to identify incentives that help explain the economic relationships of farmers with their cooperative. Results indicate that incentives affecting farmer commitment can be classified under two general headings: the age of patron and the size of the firm. Table 5.1 summarizes some of the key features that differentiate the two groups within the age of patron category. Some elaboration might be useful.

Older members are perceived as having a much larger stake in the financial health of their cooperative. In the first place, these members were responsible for the original formation of their cooperative. Additionally, at the cooperative's inception, these members may have had opportunities to imbue the association with their own ideological beliefs and economic priorities. Recognition that one has influenced the philosophical and structural underpinnings of an organization clearly enhances that

Table 5.1 Factors that Influence Commitment as Reflected by Age of Patron.

<u>Nature of Incentives</u>	<u>Age of Patron</u>	
	<u>Old</u>	<u>Young</u>
Helped form co-op ^a	yes	no
Investment in co-op	large	small
Exercise control ^b	significant	negligible
Financial position	strong	weak

^aThis has two connotations. First, by participating in the formation of the cooperative, members have a greater likelihood of ensuring that the firm's goals are consonant with their own. Second, in the early days of the co-ops, immediate benefits were in the form of improved price and quality. Not only were these benefits tangible, they were also significant.

^bHistorically, older members have dominated the board of directors. This practice is changing as some co-ops are restricting the number of years a member can serve on the board.

member's identification and subsequent loyalty to the firm. Another factor influencing loyalty is the perception of the benefits associated with the cooperative. Supply co-ops were organized initially for three major reasons: to provide a reliable source of quality inputs at a fair price. Not only were these benefits readily apparent to farmers, they were important because (in many cases) the cooperative's presence altered undesirable behavior of independent suppliers. Today these price and quality advantages of cooperatives have been largely eliminated. In fact, investor-owned firms quite often have input prices lower than cooperatives. Remaining benefits that may be

specific to cooperatives are generally less tangible or are taken for granted by members (e.g., services that may be cross-subsidized by high-margin products).

Typically, because younger farmers are relatively recent entrants, they have little capital invested in their cooperative. There are at least two reasons for this. First, the very fact that they are new entrants precludes equity growth through patronage. Secondly, a firm's capacity to generate net earnings also affects equity levels of individual members (see chapter 4). Recent agricultural difficulties have mitigated the performance of many midwestern cooperatives. Entrants who have joined co-ops during this period accrue equity at a lower rate than those who arrived during a more profitable period. Respondents noted that farmers with large investments in their cooperative tend to support their organization to a greater extent than do farmers with little invested.

A person's capacity to exercise control is a third important determinant of loyalty. Farmers affirmed that cooperative membership is preferable to an IOF affiliation because they are given a voice in the organization through their vote and through the board of directors. Young farmers and most managers noted, however, that older members often have more influence in these positions. As a consequence, concerns and opinions of younger members are at times ignored. Nearly all managers observed that this

discrepancy in control is driving a wedge between young members and their cooperative. Some cooperatives have responded by instituting a mandatory nine-year limit on directorships.

Member loyalty is also affected by the overall wealth of members. Older members who are near retirement have usually secured their financial needs. As a consequence, these members are less sensitive to unfavorable price changes and are more apt to allow nonpecuniary payoffs like ideological beliefs heavily influence their decision to remain loyal.⁵ Conversely, younger farmers who may also be highly leveraged can ill afford to subsidize a poorly run cooperative. Their less-flexible economic position may countermand any sense of loyalty that may persist.

A fifth variable that appears to have recently entered the "loyalty equation" is a discrepancy in the pervading attitudes between older and younger farmers. Farmers and general managers claimed that, unlike their parents who view farming as "a way of life,"⁶ younger producers measure the farm enterprise more in terms of its capacity to

⁵For example, they may derive utility by supporting their cooperative, knowing that in the process they improve the welfare of the larger community. This notion was mentioned by a few older farmers who were interviewed.

⁶This class of farmers derive substantial utility from the farm itself (owning the land and stewardship), the "wholesome lifestyle," and the deep-felt satisfaction that attends the ritual of planting, cultivation and harvesting of crops.

generate income. Stated differently, farming is perceived of as a means to an end; if this "end" is not met adequately, alternative means of acquiring income should be considered. This attitude takes into account both the farm business and the cooperative in terms of their ability to contribute to the operation's net earnings. Consequently, loyalty to farming and the cooperative is linked directly to a member's end-of-year income statement.

In a prisoner's dilemma, although the payoffs to each player are greater if they both cooperate, the incentives facing the players are such that they are encouraged to defect, even though each knows his other opponent is acting similarly. In the context of this research, cooperative managers recognize that, if all members were perfectly loyal, the cooperative and all its members would be better off.⁷ As we shall see, however, there are numerous conditions that create incentives for patron-owners to act in a manner that prevents the actualization of this ideal outcome.

Explication

1. Member financial position. Staatz (1987b) hypothesized that a farmer's loyalty decreases as he or she becomes more

⁷This belief was affirmed most strongly by regional respondents, somewhat less by general managers of locals, and much less by farmers. In other words, system awareness seemed to diminish as one moved closer to the end user.

highly leveraged. In the interview process, some young farmers indicated that cash-flow constraints are a recurring problem. Since most of their farm inputs are purchased inputs and these inputs represent a sizable investment, young farmers are less able to afford the same degree of loyalty as are their older counterparts. Furthermore, because cooperatives are not consistent low cost suppliers for all inputs and because independent suppliers (and other cooperatives) frequently engage in intense price competition, well-informed farmers can readily benefit from substantial savings on selected inputs. Thus, in situations where young members have high discount rates, the incentive to practice disloyal behavior may overwhelm their belief in cooperative loyalty. This is consistent with a large "a" value in equation (1).

2. Exercise Control. Earlier it was noted that, in contrast to their elder counterparts, younger members are often not afforded the same degree of control (specifically through the board of directors). This means they may have little influence in key policy areas that directly affect their welfare.⁸ As a consequence, not only is their identification with the co-op mitigated, but their

⁸For example, investment options, patronage refund policies (younger members who are highly leveraged are more likely to argue for greater cash refunds than might older members, who have interests in redeeming equities) and equity redemption programs. It was also observed that younger farmers tend to be less forgiving of poor management performance.

financial position could be affected adversely by decisions of older members. To the extent this is true, certain actions by older members not only diminish the total size of pie available to all players but they have distributed smaller portions to the younger group of players. In game-theoretic terms, even though the payoffs to the group as a whole are higher if they both cooperate, the potential coalition breaks down because one group (older members) has effectively limited the size of the payoff to the other group (younger members). Consequently, if younger members perceive greater potential benefits outside the coalition, this subcoalition has incentive to defect (i.e., practice disloyal behavior by "shopping around"). Indeed, by limiting the size of the payoff to this group (the numerator in equation 1), older members have increased the likelihood of defection by the younger members.

3. Investment in co-op. As a rule older members have substantially more invested in the cooperative than do younger members. This means that the safety of their investments is related directly to the performance and subsequent financial health of the cooperative. Equation 1 shows that member loyalty to the cooperative increases as the penalties for disloyalty are increased (1987b, p. 131). Among the cooperative managers and farmers interviewed, the consensus was that older members exhibit the strongest sense of loyalty. They also have the most to

lose (their investments) in the event the cooperative fails. Managers noted further that this same group of members are currently placing considerable pressure on cooperative decisionmakers to redeem equities summarily. In those situations where patrons are large equity holders but are also disloyal, one might hypothesize that they are members of a highly leveraged cooperative and have dim expectations regarding the co-ops longevity. For members that view their investment as a sunk cost, there may be little incentive to remain loyal to their cooperative. Indeed, if investment losses can be mitigated by shopping around, they are behaving rationally do so.

4. Helped form the co-op. In some ways this is analogous to the control issue mentioned above. One might anticipate that loyalty would increase as one's opportunity to influence the philosophy, goals, and policies of the cooperative increased.⁹ Older members may negotiate to increase the revolvment rate of redemption programs and perhaps to improve the financial position of the cooperative. Younger members might argue for higher cash patronage refunds and investment in certain plant facilities (e.g., grain drying equipment) to improve the quality of their commodities. In cooperatives where members do have an influence on cooperative policy, they

⁹Having helped form the co-op may also increase a farmer's ideological commitment to the co-op and hence his/her perceptions of the benefits derived from it.

might be more prone to utilize voice over exit in conflict situations or if dissatisfied with the performance of the firm (Hirschman).

A second subcoalition of disaffected members are large farmers. This issue is prominent and a current source of concern among local managers. Many local cooperatives are now comprised of both large and small farms, with the continued disappearance of the middle category. A number of issues surface.

1. A different set of needs. First, large farms are placing increasing pressure on management and the board of directors to institute differential pricing of inputs. Because of their size, not only does this class of firms constitute the majority of business volume for many local cooperatives, they also represent the least expensive source of revenue (i.e., unit purchasing and handling costs are appreciably lower for large volume). Although some of the local co-ops acknowledged giving volume discounts, they admit this practice does not fully address the "size" issue confronting them. First of all, many cooperatives resist giving substantial discounts to large farmers since this conflicts with "equal" treatment. Secondly, managers of co-ops that do differentiate prices claimed they were constrained by board members from giving the full amount they felt was justified. Board member resistance was attributed to the fact that differential pricing had not

been explicitly endorsed by the membership and so exceeded their limits of power.

A second point is that members with large operations are requesting that input services be based on actual cost. Many large farms are moving towards custom application services, particularly for fertilizers and chemicals. This is because (a) inputs are becoming increasingly specialized, requiring ever more sophisticated handling and application procedures; (b) the equipment used to apply the inputs has become highly use-specific and very costly; (c) the rapid rate of technological development makes unexpected obsolescence a very real concern. This trend toward custom application is expected to continue as pressure mounts to reduce groundwater contamination. Even though service at cost is considered an essential characteristic of cooperatives (Roy, p. 259), pricing is implemented through a pooling mechanism in which each member pays the average cost of service. Consequently, depending on how broadly the pools are defined, large members may be subsidizing the higher cost smaller patron.

Third, there is an "output" component that also affects large members' income. Local cooperatives are increasingly confronted with the realization that they serve no useful purpose for some large farms. In some areas of the midwest, the primary function of the co-op is to transport grain to central terminals, where it is then sold through

the regional. Many large producers are large enough and possess the resources to carry out this activity independently of the local cooperative. Assuming they can transport cheaper than the co-op, this practice allows them to reduce costs (hence, realize a larger unit margin) by avoiding a redundant activity.

2. Equal versus equitable control. Even though the small producer contributes much less patronage to the cooperative, has fewer market alternatives and faces less on farm risk, cooperative control still resides with this member. Managers concurred that the " 80/20" rule--where 80 percent of the volume is accounted for by 20 percent of the patrons--is a very real phenomenon. Most cooperatives, which rely on volume to generate earnings, could not survive in the absence of the large producer. Benefits that accrue to the cooperative through the patronage of this class of patrons are shared by all members.

Large producers, who are the lifeblood of many cooperatives, have many market alternatives. Manufacturers are willing to service them directly and frequently strive to establish purchasing agreements with them. Conversely, the small member has fewer options and yet adamantly resists relinquishing the one-member, one-vote principle.

Finally, those large producers who generate all (or nearly all) their income from the farm face more risk than do the small patrons, who often have supplementary off-farm

income.¹⁰ As a result, large producers' income could tend to be more volatile over time, and in this sense, mechanisms are needed to stabilize their earnings. Some cooperatives recognize this need and are beginning to develop programs that could ameliorate this problem.¹¹

To summarize, cooperative members who operate large farms are foregoing potential income or are otherwise constrained by the following developments:

(1) A circumvention option. First, absent appropriate volume discounts from the local, this patron could obtain input needs at a lower price by purchasing directly from a regional or an independent manufacturer. Second, on the output side, these producers often absorb needless costs through superfluous cooperative functions.

Circumventing the local and exchanging directly with central terminals would eliminate this cost.

(2) Service at cost. Managers confirmed that unit costs associated with servicing large operations are substantially less than for smaller ones.

¹⁰It is doubtful that all large farmers are more dependent on farm income than small farmers. A reasonable conjecture is that a U-shaped relationship exists, with the percent of nonfarm income being highest for very large and very small farms, and those in the middle being most dependent on farm income.

¹¹Because of the size and scope of these large producers, regional firms will have to assist the locals in their efforts at instituting effective programs. Indeed, one regional is currently in the process of initiating programs of this nature.

(3) Faces greater income risk. Some large producers, those whose income is derived primarily from farm sources, face greater risk than do smaller members with multiple income sources.

(4) A lack of effective control. The principle of democratic rule ensures that the needs of small farmers supersede those of larger farmers.¹² This is coupled with the fact that, in many ways, large producers are less dependent on the cooperative for agricultural needs than their smaller counterparts.

In terms of a game-theoretic analysis, a number of points are now clear. First of all, growth in the size of one subcoalition has altered the opportunity set it faces. In particular, the opportunities available to the large member have provided greater incentive for defection from the coalition. In addition, defection by the former group could severely impair many local cooperatives. Second, in spite of this condition, small farmers currently resist acceding to the demands of large producers. Most managers attribute this to small farmers' lack of understanding of the consequences of defection by large producers. Third,

¹²This may be a simplification. It assumes that control comes largely through the board and there only through one-member, one-vote. In reality, there are multiple paths to influence both the management and the board indirectly, and in most of these paths, large members have certain advantages. Staatz discusses this in considerable detail (1984).

if small farmers would accede to the demands of the large ones, they would be better off, at least more so than in the absence of the large producer. Fourth, given the opportunities of large members and in the absence of binding commitments, there will always be situations where they can obtain a higher payoff outside the coalition. Hence, in the absence of a binding commitment, the incentive to defect will always threaten the stability of the cooperative.

Pressure is mounting to alter the distribution of benefits within the cooperative. It is becoming increasingly apparent that defection by this class of patrons will clearly result in a Pareto-inferior outcome for all members, but more so for the subcoalition of small patrons. It is also apparent (at least among those interviewed) that large members enjoy strategic opportunities for obtaining services outside the cooperative that are not available to others. As a consequence, these large members are exerting greater pressure to receive "equitable" treatment. Managers strongly believe that intransigence on the part of small members will result in nothing less than financial ruin for many cooperatives. Most respondents affirmed that the cooperative system has the capacity to satisfy the needs of large members, but that time is fast running out.

B. Local Commitment: A Local-Regional Perspective

Some of the issues that surfaced at the farmer-local level also appear as loyalty issues at the local-regional level. Perhaps the most significant is a size heterogeneity among local co-ops. Many of the same forces that reshaped the distribution of farm size have also affected cooperatives. In particular, as many smaller locals are liquidated or acquired by larger, more viable locals, the size distribution of cooperatives is becoming bimodal. The advent and relative proliferation of super-locals is indicative of this phenomenon. Accordingly, local cooperatives are now delineated in two fundamental ways. First, through growth, super-locals have market opportunities that are unavailable to their smaller counterparts. For instance, many large IOFs (and other regional cooperatives) that are basic in manufacturing cater to them aggressively. Secondly, through this evolutionary growth, the needs of these cooperatives are now much different from those of smaller firms. Many traditional services and functions carried out by regionals are superfluous to these firms. Regionals are in the process of designing alternative programs to prevent the disappearance of large producers from the system, but some fundamental issues like one-member, one-vote are unresolved. Hence, not only has the payoff matrix been expanded for this subcoalition of locals (in terms of

potential earnings and market alternatives), but the "grand coalition" has largely resisted meeting their demands (i.e., differential treatment conflicts directly with the principle of democratic rule).¹³

Another variable influencing the "loyalty equation" regards the performance of the regional. This has two major components:

- (1) An unreliable source of supplies. A contingent of locals expressed past dissatisfaction with regionals' reliability in delivering supplies.¹⁴ Locals depend heavily on having inputs available to their farmers upon request. After repeated supply disruptions, and in spite of their vociferous complaints, these locals felt compelled to turn elsewhere for some of their basic supplies.¹⁵
- (2) Uncompetitive prices. Largely because of mismanagement (inefficient operations and unwise investment decisions), cooperative prices became less competitive. Local managers asserted that many previously loyal co-ops were "driven from the fold" due to this unacceptable behavior.

¹³Another aspect is that the super-local constitutes the majority of volume for the regional. In game theory, this has importance in terms of the member's ability to extract concessions from the regional.

¹⁴These same locals pointed out that regional performance has improved in recent years. However, they believe there remains substantial room for improvement.

¹⁵Failure to satisfy demand hurts the retail firm in the short run through forgone sales and in the long run through loss of market share as dissatisfied customers turn to alternative suppliers.

A third major factor influencing the loyalty of local cooperatives is a complaint of unequal treatment. This was experienced by two different categories of members. One was new versus long-term members. Some managers noted that regionals concentrate their best efforts on acquiring new members and in the process take longer-term, loyal members for granted. The second category includes large and small members. A few managers of small co-ops complained that, when supplies were tight, regionals reshuffled their distribution. Some co-ops were left without supplies (in the words of one manager, "They threw us a curve ball.").

A change in the costs of disloyal behavior is a fourth and final consideration. Even just a few decades ago, transportation, information, and communication constraints nearly ensured a member's loyalty. Today, technology has greatly reduced the affects of these constraints on members. The costs of shopping around are negligible and the immediate savings are significant enough to rationally justify the behavior.

5.12 Commitment through Equity Investment: A Synthesis

This section synthesizes key capitalization issues at the farmer and local levels of the cooperative system. The justification for this "aggregation" lies in the similarity of issues between these two groups.

In an earlier chapter we discussed three traditional methods of capital generation utilized by cooperatives: (1)

direct investments, (2) deferred patronage refunds plus unallocated capital reserves, and (3) per unit capital retains. Only the second method is actually relevant to farm supply cooperatives.¹⁶ Furthermore, because there are no opportunities for capital growth and there are limitations on dividends, voting rights, and the transfer of shares, capital stock of a cooperative has little appeal to outside investors. In other words, because benefits of stockholders are derived through patronage (as opposed to an IOF that distributes them through dividends and the value of its stock), the potential pool of investors is limited.

Finally, certain financial decisions taken by regional and local cooperatives have had an impact on both real and perceived payoffs to members. The affects of these decisions on the behavior of farmers and local cooperatives are discussed below.

Explication

1. Cash patronage refunds. In an effort to improve their financial position, regional firms either terminated cash patronage refunds or sharply reduced them. Prior to these actions refunds ranged from 30 to 50 percent of qualified

¹⁶Per-unit capital retains are primarily used by marketing cooperatives. Few supply co-ops utilize them as a source equity. Direct investments are historically of little value since amounts are negligible.

allocations and often constituted a large proportion of the local's total net earnings.¹⁷ Many poorly performing locals depended heavily on regional refunds and interest earnings from their members' equity to maintain their operations. This sudden termination of a reliable and significant flow of income had a profound impact on the financial welfare of many local cooperatives.

2. Revolvment of equity. Most cooperatives use the revolving fund method to redeem investments (Cobia et al.; Barton). A simple interpretation is that the method retires equity investments to owners in the order they were provided. Remittance, however, is conditional upon approval by the board of directors, which evaluates the financial needs of the cooperative, against the total value of the investment. In 1976, the length of the revolving period ranged from three to fifteen years (ACS, Report No.1, Section 9, 1981). As co-ops began to experience financial difficulties they extended this revolving period. Today, many midwestern cooperatives have equity turnover rates (annual equity redemption/total allocated equity) of

¹⁷A qualified allocation is a patronage refund that the cooperative can exclude from its taxable income and that the patron agrees to have taxed, as if received in cash. At least 20% of a qualified patronage refund must be paid in cash. In farm supply cooperatives, patronage refunds are called "overpayments," after operating costs and expenses have been deducted. Thus, unless there is a net margin, there is no patronage refund (USDA, 1976, p. 479). At the time of these interviews the case-study regionals that terminated refunds were not earning net margins.

4 percent. This is equivalent to a 25-year revolving fund. Given the time-value of money and the high discount rates of some members, this practice is disconcerting and may discourage potential members from joining the cooperative.

3. Financial performance of the firm. Although the regionals have bettered their financial position from the early 1980s, there is still substantial room for improvement. Poor performance and unsound investment policies have contributed to a depreciation in regional and local cooperative assets.¹⁸ For instance, one regional wrote down its stock by 35 percent. Members of the other two regionals believe their firms should respond similarly even though (on paper) this represents a significant loss of wealth.

4. Inequitable settling of estates. This practice is considered an important problem at the local level. Nearly all managers affirmed that some estates are so large that they have the potential capacity to jeopardize the financial integrity of their firms. In these circumstances the co-op either remits what it can or totally reneges on its financial obligation. Ironically, the growth of these

¹⁸Regional firms are still operating at a loss in some business lines, most notably in their petroleum and fertilizer operations. These firms depend on other businesses (for example, food processing) and cash patronage refunds from interregionals to offset these losses. Respondents at both the local and regional level consistently blamed management for the poor performance of cooperatives.

estates is directly attributable to the exceptional loyalty of these patron-owners. Failure to redeem these investments effectively penalizes members for their loyalty. Furthermore, to the extent that small estates stem from disloyal behavior and are given precedence over extremely large ones, one could argue that these members are actually rewarded for their disloyalty. In this sense, cooperative redemption practices appear to encourage defection by its members.

5.13 Commitment: A Cooperative Game Analysis

The theory of cooperative games¹⁹ addresses the issue of group choice "when the preferences of members are at least partially conflicting" (Staatz, 1987b, p.118). The game focuses on two major questions: (1) how do cooperative policies affect the payoffs to various subcoalitions within the cooperative; and (2) how does the payoff affect the willingness of these subcoalitions to remain active in the co-op, as opposed to obtaining their needs elsewhere?

A fundamental aspect of the cooperative game is the characteristic function. Consider the two subcoalitions, super-locals and locals (henceforth denoted as S-L and L, respectively).²⁰ For these players both to remain active

¹⁹This section draws heavily from Staatz, 1987b.

²⁰Actually two different sets of subcoalitions have been identified as affecting commitment--large vs. small and young vs. old. It seems clear, however, that the former

in the cooperative, it is essential that they gain at least as much in total by working together as they can by working separately. This means that each subcoalition's individual share of the joint "pie" must exceed the payoffs each could obtain by acting independently.

Under current cooperative policies, the following observations are made with regard to the payoffs confronting the two subcoalitions (S-L and L):

1. Market alternatives--Evaluating defection by either subcoalition first requires differentiating between temporary and permanent defection. The first connotes a free-rider behavior in which both subcoalitions face incentives to "shop around"--i.e., selectively pick low-cost products and services while still extracting the remaining benefits of the cooperative. Permanent defection is conditional upon feasible market alternatives. Consequently, this is considered as an option only for S-L. Furthermore, it is possible that alternative payoffs facing large firms could exceed current payoffs within the cooperative.
2. Cooperative performance--poor performance by regionals and locals raises the costs to loyal members. In general it is manifested in four major ways: a) unreliability of

is currently the major cause of concern to local and regional cooperatives. Hence, the subsequent analysis concentrates on this subcoalition of members and is applicable to both local and regional firms.

products and services; b) uncompetitive prices; c) devaluation of assets; and d) failure to respond adequately to a changing membership.^{21,22} Hence, either directly or indirectly, these four performance factors have effectively reduced the "cooperative pie." They may also affect the core since, with a smaller pie, there may be fewer alternative ways to slice the pie and keep the coalition intact.

3. Reduced costs associated with disloyal behavior.

Since errant members do not face retribution from their co-op,²³ the major costs of temporary defection are the costs involving information, communication and transportation. In recent years, however, these costs have been substantially reduced and no longer act as a crucial barrier to uncommitted behavior.

²¹Poor performance is certainly not indicative of all cooperative firms. Many perform at high standards and enjoy a thriving business. The problems cited above surfaced as contributing factors to the uncommitted behavior of members. In general, problems (a), (b), and (c) are attributed to one or more of the regional firms interviewed and (d) is a problem for both regional and locals, but primarily for locals.

²²The emergence of the large member (farmer or local) has created a fundamental difference in needs between the two classes of patrons. When the cooperative fails to satisfy these needs, the loyal member suffers through less competitive performance.

²³Recall that many farmers and managers fully endorse a competitive ideology.

From these four observations, the following conclusions can be drawn:

1. Differential pricing of products (inputs) and services to members is, in the view of the respondents, essential and probably inevitable if cooperative stability is to be preserved. Both regional and local firms recognize that not only do large members substantially influence their cost functions, but they also enjoy strategic opportunities outside the cooperative. Consequently, large members have partially succeeded in extracting concessions from their regional or local firm.²⁴
2. Managers of regional and local co-ops believe it will be necessary to revoke the one-member/one-vote principle and replace it with a voting procedure based on proportionality. In other words, they believe it will be necessary to either introduce a mixture of one-member, one-vote and patronage-based voting and/or to translate equity investment into voting power but perhaps with less weight than patronage. Failure to alter the political distribution of power could, in the event the subcoalition of small members still controls the cooperative, result in the permanent defection of large

²⁴"Partially" needs to be emphasized because currently differential treatment is implemented on an ad hoc basis. Members within the large coalition negotiate independently for concessions. This is because the "grand coalition" is still controlled by the small member who resists this action. Hence, differential pricing cannot be institutionalized.

members.

3. As one would expect, both members and management concurred that if the federated system would work as a system, substantial benefits would accrue for all members (an assurance that the core of the game is not empty). More importantly, this implies that the primary task facing cooperatives is one of ascertaining an acceptable allocation of benefits and costs. Preferably this would be implemented under a revised distribution of power based on some form of proportionality. Failure to choose an allocation that lies within the core and is acceptable to both subcoalitions could result in members leaving the cooperative.

4. To date the subcoalition comprised of smaller members still controls the cooperative and has effectively safeguarded their interests. A change in the voting structure would likely shift the distribution of power towards the larger member. Still, bargaining over the "distribution of the pie" could be an intense and exhaustive undertaking; however, it need not be.

Regionals (and most local managers) are convinced that the potential benefits from a committed membership, acting in a unified manner, would be substantial. In game-theoretic terms, the opportunity to expand the core of the game is present (i.e., convert an apparent zero-sum game into a nonzero-sum game). Within this new

environment, even small members would have incentives to support a specified allocation even though it may favor the larger producer. This would be true if the gains to small members from compliance exceed their potential gains through noncompliance.

5.2 Asset Fixity and Uncertainty

Recall the asset fixity and uncertainty principles discussed in chapter 2. The asset fixity principle states that as assets become increasingly specialized, the desirability of the spot market as a mechanism for exchange diminishes. Similarly, the uncertainty principle asserts that "autonomous market contracting" becomes a less preferred exchange mechanism as the uncertainty surrounding the transaction increases (Williamson, 1981; 1979b). The purpose of the forthcoming analysis is to illustrate how conditions of asset fixity and uncertainty influence the exchange process for buyers and sellers in the farm input supply industry. The analysis is comprised of three sections. Part one relates the "fungability" characteristic of inputs to firms' management practices. The second part examines the risks and costs to cooperative system players and their behavioral responses when they deal with asset-specific inputs. The third component discusses the implications of specificity to economic coordination of the cooperative input system.

5.21 Input Fungability and Management Practices

A. A Classification of Inputs

As a first step in analyzing the role and impact of specificity on economic coordination, it is necessary to establish the extent to which inputs carried by cooperatives and used by farmers exhibit this characteristic. Table 5.2 identifies major inputs of farm supply cooperatives and ranks them according to their degree of specificity. These rankings represent a consensus opinion of experts within the farm supply divisions of those regionals interviewed.

A simple definition of input fungability is the degree to which an input is interchangeable across uses. However there are at least three dimensions to fungability. Perhaps the most common is in terms of the input's purpose or function. Farm inputs are designed to fulfill a particular role within the agricultural production process. Seeds, for example, represent the most fundamental ingredient in the production process because they actually create the commodity; fertilizers enhance the growth and production potential of the plant by providing nourishment; and chemicals protect the plant from pests and in this way increase the likelihood of maturation. The extent to which these different inputs (with their idiosyncratic functions) can be applied to different uses characterizes their degree of specificity. Time, in the sense of an input's use-

Table 5.2 Major Farm Inputs of Farm Supply Cooperatives and their Degree of Fungability.*

Type of Input	Fungability		
	GP	MED	AS
1. Petroleum-----			
a) Oil	x		
b) Gas (liquid)	x		
c) LP	x		
2. Ag Chemicals-----			
a) Insecticide			x
b) Herbicide			x
c) Fungicide			x
3. Fertilizer-----			
a) Nitrogen		x	
b) Potassium		x	
c) Phosphorous		x	
4. Feed-----			
a) Complete feeds	x		
b) Supplements	x		
c) Premixes	x		
5. Seeds-----			
a) Hybrids			x
b) Other			x

*This taxonomy of inputs represents general categories only; it is not intended to be an exhaustive list. GP = general purpose; Med = medium; AS = asset-specific.

period, is a second crucial element affecting an input's fungability. As inputs become more specialized, their use is designed for a greater degree of precision. The input's efficaciousness is increasingly conditional on the punctilious timing of application. In this sense, the length of an input's use period is inversely related to its degree of specificity. A final dimension to input fungability relates to physical location and the extent to

which an input is interchangeable across geographic regions. For instance, seeds are limited in terms of geographic substitutability because of differences in plant photosensitivity. Referring to table 5.2, petroleum is classified as general purpose because it satisfies all three dimensional requirements. It can be readily used in any part of the country, for a large array of equipment and at nearly any time of the year. Conversely, many agricultural chemicals are designed for a specific crop, to arrest a specific pest, and to be applied at a precise time when the pest (i.e., bacterium, virus or insect) is most vulnerable. Pre-emergence corn herbicide was developed for corn and should be applied after seeding but prior to plant emergence. This affords an effective use period of roughly one week. Fertilizer, on the other hand, is interchangeable among different crops although it is moderately restricted by optimal application periods. These periods constitute a window of a few weeks; hence, this input falls within the middle category.

The prohibitive costs and risks associated with highly specialized inputs have prevented their manufacture by case-study firms. Respondents pointed out that historically cooperatives have been averse to investing in inputs involving high research and development (R&D) and marketing costs--which are characteristic of specialized inputs. The respondents attribute this behavior to

farmers' understanding of the government's role in agriculture and the ownership of cooperatives by farmers. Farmers believe strongly (perhaps due to years of positive reinforcement) that government is responsible for undertaking necessary but risky R&D to help mitigate the risk inherent in agriculture. As a consequence, cooperatives limit their marketing activities to wholesaling and retailing of asset-specific inputs. Three important components of wholesale and retail operations are the planning process, alternative exchange arrangements and handling practices. The following section examines how an input's specificity affects various aspects of these three marketing activities.

B. Management Effects

B.1. A Regional View of Asset-specificity

1.The planning process. The planning component is very important for inputs exhibiting a high degree of asset-specificity. Because these inputs are designed for a specific use, their duration of use may be extremely small. This affects the reliability of forecasting demand for both manufacturers and distributors. Manufacturers must ascertain demand within the various segmented markets and, depending on the type of input and its degree of asset-specificity, account for the influence of unforeseen events (like weather) that significantly alter this demand. They

must also contend with substitute products from competitors that may be unknown to them at the decision-making period (i.e., have competitors developed an effective substitute?).

Distributors must deal primarily with logistical constraints. Regionals noted that the planning process requires considerable time and expense because of the highly differentiated markets associated with specialized inputs.²⁵ This differentiation is related directly to the three dimensions of fungability mentioned earlier. Decision makers must ascertain with more precision where sales are apt to occur and what quantity will be demanded in that market. These decisions affect strategic factors like locating central distribution points and deciding on the proportion of inventories to hold at central terminals versus localized facilities. Clearly logistical tradeoffs are involved. To the extent one anticipates demand correctly, locating inventories close to the point of sale is desirable. However, when demand estimates are wrong, it is easier and quicker to readjust if inventories are more centrally located. The problem is that the likelihood of

²⁵Regional respondents pointed out that manufacturers freely exchange market forecast information with them. The motive for this behavior is that the regionals are the major distribution network of highly specialized farm inputs. By minimizing logistical and demand forecast errors for individual markets, the regional actually helps the manufacturer achieve greater sales. (Since the manufacturer still retains ownership of asset-specific inputs, over-estimates of demand will not increase its total sales.)

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incorrectly estimating demand increases with market segmentation. Hence, not only is the probability of error greater for asset-specific inputs, but the consequences of error can be more significant than for general purpose inputs.²⁶

2. Exchange arrangements. Purchase commitments are useful for all classes of inputs but are more desirable for specialized inputs because of the greater inherent risks. Manufacturers of specialized inputs and regional cooperatives habitually establish written exchange agreements prior to each production year. In addition to specifying standard terms of trade (like price, quantity, quality, and date of delivery), many of these contracts include a stewardship arrangement. These arrangements specify responsibilities of both parties (buyer and seller) and often include safety, quality control, and technical training. Largely through use of market power, regionals have also succeeded in negotiating special arrangements to mitigate some of the risks of purchasing these inputs. Two inter-related arrangements are (1) a buyback or return arrangement and (2) a credit rebill program. In a buyback arrangement the buyer has an option to return some portion

²⁶This significance is reflected in the specialized function and limited application period of these inputs. Failure to satisfy these constraints could eliminate further opportunities to sell the product until the following season. Unit costs of specialized inputs are greater than general purpose inputs and therefore have a larger opportunity cost.

of the total quantity of input purchased (usually 10-20 percent) to the manufacturer. This percentage is renegotiated annually and is based on current market conditions. Regionals may in turn pass this option on to their local affiliates.²⁷ The credit rebill program is a subcomponent of the buyback agreement and was initiated to eliminate needless movement of inventories. In the event the regional has over-purchased inputs, the manufacturer simply reimburses the regional for the amount remaining unsold and the following season resubmits the bill for this amount.

3. Handling practices. There are two ways in which handling practices differ between specialized and general purpose inputs. Perhaps the most important has to do with technical and safety procedures. Agricultural chemicals are notable in this regard. Handling and storage of these chemicals requires technical expertise both in terms of use and safety. These precautions must be implemented throughout the entire vertical system. All players at each major stage must deal with the high cost of their care, distribution and final application. A second manner in which handling practices differ for asset-specific inputs is inventory security. Costly inputs that have little

²⁷To qualify for this buyback option, the local must purchase 100 percent of the respective input from the regional. Absent this safeguard, locals could easily return supplies that were purchased elsewhere.

volume or mass are more subject to "opportunistic behavior" than are low cost, bulky items.

B.2. A Local View of Asset-specificity

General managers of local cooperatives are well aware of the differences in the risks and costs between specialized and general purpose inputs. Their perceptions and responses differed little from their regional counterparts. In terms of planning, local managers stated that their purchasing practices are more conservative with specialized inputs because demand is less predictable. Another factor that influences inventory planning is that the lifespan of inputs is becoming shorter as new products continually come on-line. Even though these products may not be obsolete, manufacturers pare back promotional activities on these items in favor of newer products.

Responses concerning exchange arrangements were also consonant with regional firms. Most locals renegotiate special return arrangements with their regionals (or other firms) on an annual basis. They noted that regional competition can be keen when offering special return programs. One regional offered a 100 percent buyback option to locals and in the process was able to attract many new customers. This underscores the importance local firms attribute to safeguards for risky inputs. It also highlights the intense competitive behavior that persists

among regional firms.

5.22 Asset-specificity and Risk

This section synthesizes perceptions of regional, local, and farmer respondents regarding the risks associated with specialized inputs. This approach is used because of the similarity in views among participants. Risks are evaluated for the three major system players: farmers, locals, and regional cooperatives.

A. Farmer Risk

There are different types of risk that participants face depending on their location in the vertical system. Currently there are three major risks confronting farmers when using asset-specific inputs. The first is price risk--the risk that prices may change unfavorably after the input has been purchased. Use risk is a second concern of farmers, and it has three components: (i) an inability to utilize the input because of some unforeseen event, such as bad weather; (ii) misapplication risk--because these inputs are more concentrated, the likelihood of under- or over-application is significant; and (iii) diagnostic error--this is directly influenced by the continued proliferation of highly specialized inputs. As this arsenal of inputs continues to expand, the probability of judgement error is

more likely.²⁸ Finally, the third risk farmers face is "carryover"--an unintended residual that may be particularly harmful under extreme agro-climatic conditions. For example, the combination of dense soils and drought can result in an unanticipated herbicide residue that could damage subsequent crops.

Farmers have no viable strategy to mitigate input price risk when their response to "use risk" (2i) is to delay purchases until the last possible moment. This behavior shifts the risk upwards to the local firm. Farmers have adapted to misapplication and diagnostic errors by moving towards custom application services. Even though immediate costs may be higher, responsibility ultimately lies with the applicator.

B. Local Risk

Inventory and misapplication risks were mentioned as the two most important risks facing local cooperatives. These firms also distinguish between (merely) specialized and highly specialized inputs. The former category constitute "manageable" risks, in which adverse effects are mitigated through special buyback or exchange programs. The latter program is coordinated by the regional

²⁸Trying to sort out all the possible combinations of symptoms and treatments could be a daunting and intimidating task. This is precisely why more and more farmers are moving away from self-application to custom services.

cooperative and involves a simple exchange (money for inputs) between two or more locals that are either long (surplus) or short on a specific commodity. Some general managers have also instituted aggressive marketing programs in efforts to reduce inventory errors. Field staff try to accomplish this task by working closely with farmers to ascertain their needs and offer information on products and services available to them. In this manner cooperatives are able to reduce some of the uncertainty surrounding demand for specialized inputs. Highly asset-specific inputs represent a second category of special concern to local managers. The combination of high cost and uncertain demand has relegated these inputs to a "special order only" distinction. In other words, these items are purchased only upon request and are listed under a separate accounting system in which costs are not pooled with remaining inputs.

As locals move more into basic services like fertilizer and chemical application in response to member demand, these firms will face greater risks of making diagnostic and application errors. Managers believe, however, that given the trend toward growing agricultural specialization, this venture is a necessary undertaking for cooperatives. First of all, cooperatives have access to highly trained technicians who have the knowledge and expertise to cope with these problems effectively. Secondly, the growing

risks and costs to individuals can be substantially reduced through a mechanism like cooperatives.

C. Regional Risk

A combination of high costs, high risks and low margins has stimulated the development of very formalized exchange arrangements between regional firms and manufacturers. Regionals have been effective at shifting their risks to manufacturers (as have locals and farmers), although this has resulted in higher prices to buyers. All exchange between these two parties is now undertaken on a written contractual basis for asset-specific inputs. These contracts are of two basic types. In the more traditional agreement, the regional actually purchases the input and negotiates for special programs that mitigate inventory risks. Under the more recent arrangement, regionals act merely as a distributing agent in which they contract to handle certain inputs and for their services receive a percentage of profits based on sales. Although the regional never actually takes ownership of the supplies, it actuates all other services (e.g., buyback programs) for the manufacturer. Regional and local cooperatives are satisfied with this latter arrangement, asserting that it involves less risk, has good profits, and adequately meets members' needs.

5.23 Input Fungability and Economic Coordination

Local and regional firms claim that manufacturers of asset-specific inputs are trying to find new ways to establish a more secure foothold in these markets. They cite two major reasons for manufacturers' desire to stabilize demand. One relates to the highly sensitive nature of asset-specific inputs to "exogenous" forces. (For farm inputs, these outside forces are largely weather related.) These external forces cause demand to fluctuate widely, thereby complicating production planning. Second, despite a relatively concentrated industry, the environment surrounding these inputs is surprisingly competitive. Competition is considered intense because the user group (farmers) is very tightly circumscribed and the seasonal use period is so restrictive that even minor marketing errors by input distributors can create major problems for them.²⁹

Since farmers are the primary users of specialized agricultural inputs, cooperatives are clearly a crucial element as a mechanism of exchange. Manufacturers recognize that cooperatives represent a well established and intricate network to the farmer market. This pipeline is critical for specialized inputs when market

²⁹For example, missing the strategic placement of an agricultural chemical by even a few days may result in losing that market altogether. This is particularly true for pest infestations, where the window of opportunity is often very small.

opportunities can come and go overnight. Given the intense competition among independent manufacturers, cooperatives should be ideally positioned to extract favorable concessions. A limiting factor is that cooperative federations (regional and local firms) do not represent a unified coalition. Manufacturers have responded by segmenting this federation and, consequently, undermining the potential bargaining power of cooperatives.

Manufacturers approach cooperative federations in the following manner. First, by means of a contractual arrangement, they use regional firms as their primary distribution and merchandising channel. But the IOFs recognize that this market is essentially limited to "loyal members". Hence, they capture the remaining market (disloyal members) by selling directly to the local or to the farmer. In the case of the former, manufacturers offer three exchange options to potential buyers: (1) a forward contract in which the buyer pays in advance of receipt of goods, obtains a discount premium, and qualifies for a buyback program; (2) a forward contract in which the buyer pays on the date of delivery and qualifies for the buyback program; (3) purchases on an as-needed basis, in which case there is no buyback agreement.

Regional firms also offer these same programs to locals, but many of these locals are not loyal customers, usually because they are highly price-sensitive.

Manufacturers are ideally positioned to deal with these buyers because of the price advantage they can offer them (i.e., by eliminating the wholesale distribution step in the distribution chain--also called circumvention).

Another aspect relates this practice to the competitive market environment of highly specialized inputs. In other words, competing manufacturers may use extremely low prices to undermine the contractual mechanism established by his/her opponent. This rather common tactic allows a new entrant to establish a foothold in a tightly-knit market.

At this point the coordination problem should be viewed in terms of finding the most efficient method (in a system-wide sense) of getting the input from the source (the manufacturer) to the end user (the farmer). It is also apparent that this coordination problem is exacerbated when asset-specific inputs are involved. Let us review this process by starting with the end user.

Farmers are the ultimate recipients of farm inputs. For various reasons they choose to purchase the majority of inputs on an "as needed basis"; this behavior is prominent for asset-specific inputs. First of all, only that class of producers who plan future operations in advance tend to forward buy their inputs.³⁰ Even those that do forward buy

³⁰This is discussed in considerable detail in the following chapter.

limit their advance purchases to inputs with relatively little use-risk involved. Most chemicals, for example, are specialized inputs. Herbicides fall into this category but are generally used habitually each year. Insecticides have extremely high use-risks because their use is based on infestation of a particular pest which is not a regularly recurring event. Hence, because farmers have no advance knowledge of when this need will materialize, they purchase these inputs on an as-needed basis. Unfortunately, this practice complicates the logistical procedures of distributors considerably.

Local cooperatives note that in order to remain competitive it is essential to position inventories in advance as much as possible. However, because of the inherent risks and costs of specialized inputs and the unpredictable buying behavior of farmers, locals are resigned to mimicking the same behavior as farmers--i.e., purchasing on an as-needed basis. This effectively shifts supply and coordination responsibilities up to the regional firm. Traditionally, regionals have purchased asset-specific inputs from manufacturers using the best means at their disposal to estimate future demand.³¹ But obstacles

³¹One method was already mentioned, exchanging information with manufacturers. Regionals also utilize private forecasting firms to obtain forecast estimates. They complement this information with their own market researchers who work with local firms and farmers. Finally it was noted that some larger locals also have market research programs which they may share with the regional.

to efficient distribution and merchandising of these inputs are substantial. Because of the high-cost, low-margin nature of these inputs, investments are both large and risky. Purchasing practices of farmers and locals compound the uncertainty of sales, which in turn complicates the logistical placement and distribution of inputs. In response, regional firms have turned to alternative exchange arrangements with manufacturers. The most recent is a written contractual agreement in which the regional's primary function is to distribute and merchandize asset-specific inputs with ownership retained by the manufacturer. Under this strategy, all risks to the regional are removed and the firm receives a percentage profit based on sales.

Unfortunately, this is only a partial solution to the coordination problem. Even though a more reliable and less risky linkage has been established between the manufacturer and the regional, no similar arrangement is present for the other two participants in the vertical chain. The source of the problem is the eleventh-hour buying decision of farmers--and this is precisely what locals, regionals and manufacturers must react to. The problem is that, with asset-specific inputs, the closer the product moves to the end user, the greater is the risk of commitment because of

the non-substitutable nature of the input.³² Hence, farmers are making rational decisions based on the needs of their own farm operations, even though this behavior may lead to greater costs to distributors and eventually themselves.³³

5.3 Chapter Summary

The purpose of this chapter is to reveal some of the key incentives that might explain the adverse behavior of certain cooperative participants. Two different theoretical approaches are applied, game theory and transaction cost economics. The findings in each section suggest that participants are making rational short-run

³²The three dimensions of fungability are directly related to this problem. Although each participant is affected by the non-substitutable nature of asset specific inputs, the consequences become less severe as one moves up the vertical system. When the manufacturer produces a specialized input, options still exist in the event a market becomes inaccessible (e.g., relocate the input). Options are still available at the regional level, but less so at the local level because of time and geographic constraints. When the input reaches the farmer, those options that were present for upper level participants are now non-existent.

³³For asset-specific inputs, forward commitment by the farmer may not be entirely practical because of the use-risk involved. However, if the local knew that, in the event the farmer did need the input, it would be purchased from that local, some preparations could be made. The point is that use-risk facing the local is less than for the farmer. Even if that particular farmer does not use it, someone else will. Another aspect is that upper system players may need to "up the ante" if they want more commitment from farmers--in other words, compensate them better for their risk.

decisions to maximize returns to their firm, but in the longer run this behavior is jeopardizing the viability of the cooperative system.

The game-theoretic approach looks at the structure of incentives to bring to the fore the basic economic rationale for uncommitted behavior by patron-owners. In the process, two subcoalitions of disaffected members surfaced. At the local level, there is a growing disenchantment among younger members of cooperatives. These members often have little influence in their association and many believe that the current cooperative system has failed to meet their economic needs. In comparison to their older counterparts, young members are generally more highly leveraged and have little invested in their cooperative. As a consequence, they are extremely responsive to a competitive market and are less affected by an ideology based on loyalty.

Large patron-owners (either farmers or local firms) are the second class of disaffected members. Even though they contribute proportionately more patronage to the cooperative than their smaller counterparts, they still receive "equal" treatment. But pressure is mounting to alter the current distribution of benefits. It is becoming increasingly clear that defection by large members will result in a Pareto-inferior outcome for all members, but particularly for the small patron. This is because large

members enjoy strategic opportunities outside the cooperative that are not available to others. In time, it is anticipated that "equitable" treatment will supercede the current practice of equal treatment.

Transaction-cost economics is the second approach used in the analysis of member behavior. The approach shows how conditions of asset fixity and uncertainty have influenced the exchange process for buyers and sellers in the input industry. Uncommitted behavior by farmers and local cooperatives is shown to be a rational decision based on the risks and costs associated with asset-specific inputs. Specialized inputs have also greatly complicated the coordination process among buyers and sellers. Upper-level players in the vertical system must contend with the risk-averse behavior of buyers and the rigid production and marketing constraints inherent in specialized inputs.

CHAPTER 6

FORWARD CONTRACTING AS AN EXCHANGE MECHANISM

Previous chapters have discussed how certain actions of participants undermine the performance of supply cooperatives. A fundamental problem is the inability of decision makers to plan their activities in a manner that facilitates the coordination of the input system's four economic stages. The cooperative mode of organization has potential for more effective micro coordination between farmers and their local firms and between locals and their regional firms. Shaffer believes that more specific agreements between cooperatives and manufacturing IOFs offer significant promise in this area. In particular, he has recommended that more extensive use of contracts between farmers and their supply cooperatives should be instituted. This would allow participants to capture some of the benefits of the vertically integrated firm while still maintaining the advantages of decentralized decision making (1987, p.83).

This chapter explores some of the obstacles and opportunities for using forward contracting of inputs as a mechanism of exchange. In the first section, forward

contracting is examined in the context of the larger cooperative system. A major thesis of this research is that, from a cooperative standpoint, the greatest potential benefits could be derived from the application of forward contracting on a system-wide basis. This means adoption and implementation at each of the major stages in the input system. But obstacles are anticipated as well. Impediments to forward contracting are identified and examined in an effort to isolate their location in the system and ascertain appropriate steps for their removal.

A three-period mean-variance model of farmer decision making is presented in the next section. Inasmuch as farmers are the ultimate users of agricultural inputs, they are considered the critical link in the cooperative system. This theoretical model seeks to determine the incentives that underlie farmers' decisions to forward contract for inputs. The results of the model are tested empirically using fertilizer and corn price data and from this hypotheses are developed.

The final section uses case study information to test the hypotheses set forth in the dynamic model. This includes an assessment of changes in the distribution of benefits and costs that could facilitate the adoption of forward contracts.

6.1 Forward Contracting and the Cooperative System

A hypothesis of this research is that, for the benefits of forward contracting to be maximally achieved, implementation on a system-wide basis is essential. The following section addresses this issue by presenting the opinions of regional and local cooperative respondents. These respondents all have direct experience with forward contracting for inputs.

6.11 Benefits to Firms and the System

In one sense, forward contracting can be viewed as an orderly marketing mechanism in that it is meant to increase the likelihood that the correct amount of an input is produced and distributed in a timely fashion to farmers. Neoclassical theory suggests that prices convey the necessary market signals to ensure that supply and demand are equilibrated. A forward contract, however, represents a fixed price and quantity for a certain period of time, which constrains this adjustment role of prices. Hence, there are tradeoffs involved when discussing the effects of "fixed" and "flexible" prices. A fixed price can be associated with reduced price uncertainty which implies lower search costs for buyers. It also can facilitate the planning and coordination of activities throughout the input system. On the other hand, fixed prices may impair coordination if their rigidity masks market signals so that inappropriate

levels of production occur or markets do not clear. Hence, when considering the forward contract mechanism and its coordinating role in the input market, it is important to recognize the inherent tradeoffs between fixed and flexible prices.

The cooperative input system is composed of four major players--manufacturers (regional),¹ wholesalers (regional or super-local), retailers (super-local and local), and end-users (farmer). Currently, forward contracting for inputs is used at each of these economic stages. Respondents were generally enthusiastic about the potential of this mechanism to ameliorate some of their coordination problems. This section discusses these potential benefits to farm supply cooperatives. First, however, it may be helpful to identify the types of contracts that are currently in use.

Contracts differ in accordance with the level of commitment that is agreed upon between the various parties. Commitment in a forward contract is usually expressed in terms of time and money. For instance, a fertilizer manufacturer prefers contracts that are paid for and consummated immediately after the fall harvest (usually

¹Regional firms are established in the manufacturing stage of the farm-input industry. Although they produce many types of inputs, these are usually of a general purpose nature. Highly specialized inputs that involve substantial R&D expenditures are not in the production domain of regionals. An exception are those inputs whose patents have expired.

October or November) for delivery in March or April. This degree of commitment can be difficult to extract from buyers. Hence, in return for the advance payment, manufacturers provide discount premiums that just exceed the cost of money, usually some amount at or near the prime interest rate. To illustrate, if a farmer purchases 50 tons of fertilizer in December at \$100 per ton for delivery in March, and if the prime rate is 8 percent, the farmer would receive at least a 2 percent discount below the December market price. For additional incentive, some offer a buyback option and price protection.² A second class of contracts consists of a down payment or "good faith" money. The amount of the down payment may vary considerably, although 10 percent is common. A "booking" is a final type of forward contract, which simply signals an intent to buy. No money changes hands and few concessions are given on the part of the seller except the "booking price," which is the price of the input at the time of the transaction. For all three programs, concessions on the part of the seller are reduced as the new season approaches.

Benefits of forward contracting are apparent at each of the four economic stages. Regionals (that manufacture farm inputs) believe that early commitments help them achieve

²All three components of this contract are negotiated between buyer and seller. They are a function of current supply/demand conditions in the market, behavior of other firms, and the size or economic importance of the buyer.

their goal of cost minimization. When manufacturers are able to cover a plant's fixed costs by ensuring a minimum volume, the certainty of attaining capacity utilization becomes less problematic. Inability to cover fixed costs is considered to be a major contributor to the failure of many fertilizer plants in the early-to-mid 1980s. A second benefit of early commitment is that it allows firms to smooth out their production over a longer time period. This facilitates the efficient utilization of plant and equipment, production materials and labor.

Planning is also an important benefit of forward buying at the wholesale and retail levels. Regionals noted that wholesaling is basically a logistics operation--the objective is to be positioned in a manner that allows products to be moved efficiently, quickly, and in a cost-effective manner. Regionals utilize railcars, barges, trucks and warehouses to move and store their products in strategic locations. The crucial element is to have the product available when the customer wants it--which may constitute a window of only two days. Firms caught out of position may lose potential sales or be forced to absorb higher costs as alternative means of transportation are employed.

Local respondents noted that forward contracting gives them more flexibility in terms of supply and price. By early buying a portion of their needs, the co-op is

positioned well in the event the crop season begins early. This practice can reduce price risk when they blend the forward and spot market prices.³

Cooperative system benefits need to be visualized within a "length of run" framework. For benefits actually to accrue, it is essential that players at each economic stage participate. Respondents conjecture that manufacturers would gain the most in the short run from a comprehensive forward purchasing program. This is because manufacturers may have large investments in idiosyncratic equipment, production materials and personnel. Once a binding purchase commitment is made, the risk is automatically shifted down through the system. Regionals and locals would benefit similarly in the short run. With binding commitments, risk is passed on to the farmer. Nearly all the respondents believe that, for most inputs, price risk is the primary uncertainty facing farmers when they forward contract.⁴ But

³By and large, forward contracting between farmers and local cooperatives is poorly established, with many locals having minimal forward contract programs with their farmers. Those co-ops that have established sizable contracts with farmers noted that this exchange was limited mostly to large producers. However, regardless of farmer participation, most locals still use the contract mechanism to obtain supplies from their suppliers in order to reduce the local's own price risk.

⁴When a forward purchase specifies a fixed price at the time the contract is signed, the buyer faces the risk that prices will drop prior to planting. However, the farmer faces the same price risk in the event s/he chooses to delay purchases and buy on the spot market (i.e., by not forward contracting, the farmer risks a price increase in a later period).

this risk is considered negligible when weighed against the potential benefits to the system. Furthermore, since farmers own the cooperative and net savings are rebated to members, in the long run farmers would be the ultimate beneficiaries of forward contracting.

6.12 Obstacles to Forward Contracting

Respondents identified three factors that hinder the effective application of forward contracting in the cooperative system. The first is viewed as a risk problem and it concerns the implications of selling a product (from a manufacturer or distributor perspective) that, at the time of the agreement, has yet to be produced. This practice involves both output and input price risk. Output price risk is important mainly to the extent it influences production decisions. In other words, knowing ex ante whether the product's price (consider, for example, fertilizer as the "product") will be high or low can affect decisions regarding production levels. Input price risk is important because, under a forward contract, a manufacturer agrees to supply an input at a fixed price without knowing all the costs. If some inputs (like natural gas for anhydrous ammonia) used in the manufacturing process are subject to wide intra-year price fluctuations, this could prove to be an important deterrent to a forward sell agreement. At the wholesale and retail levels of the

system, this argument has less validity.

The second problem influencing efficacious application of forward contracting is a lack of contract enforcement. Like any form of exchange, contracting is conducted within a competitive environment. Regional firms assert that forward contracts are usually offered in surplus markets when there is a need to reduce inventories. Under these conditions, there are incentives on the part of contractors to make the purchasing terms favorable to the buyer, i.e., making the contract a less binding commitment. When competition is intense among sellers, the integrity of these contracts may be impaired significantly.⁵ Absent a viable enforcement clause, forward agreements may be little better than a spot market exchange. This statement, however, may be less true in the context of farmer cooperatives. Since the customer also owns the firm, the patron-owner may have more incentive to honor the commitment than would a patron of an IOF.

Regional and local respondents hold that farmers not only constitute the most critical link in the input system, they are also the single greatest impediment to instituting a viable contract mechanism. According to the respondents, farmers as a whole do not like to forward commit. They view contracting as an indulgence in speculation and, hence, an

⁵The purpose of a forward contract is to reduce the uncertainty facing the seller. This facilitates the planning process of these firms. When the contract is riddled with escape clauses for purposes of attracting customers, the actual worth of the agreement is highly doubtful.

unwarranted risk. Part of this aversion may be that farmers simply do not understand the purpose and function of forward purchasing or comprehend the significance of belonging to a cooperative system. They are accused of focusing narrowly on short-run profits at the expense of longer-term cooperative growth. Yet the effective implementation of forward contracting ultimately rests on the endorsement of the farmer group. It is essential then to determine key factors that influence their decision to forward commit. The following section is designed to explore these issues and establish credible hypotheses regarding incentives to forward purchase farm inputs.

6.2 Forward Contracting in Factor Markets⁶

Most research on alternative responses to agricultural production risk has focused on the output side of the production process, particularly when considering forward contracts and futures contracts (e.g., McKinnon, 1967; Chavas and Pope, 1982; Anderson and Danthine, 1983). There has been some attention given to the impact of risk and uncertainty on factors of production. For instance, Batra and Ullah (1974) showed how introducing output price risk into a certainty model altered output levels but left

⁶This section was a joint collaborative effort between the author, Stanley R. Thompson and Robert J. Myers. The paper was written for the NCR-134 meetings in St. Louis, Mo., and presented April 27, 1988. The title of the paper is identical to the heading for section 6.2.

relative input quantities unchanged. Robison and Barry (1987) evaluated input demand under four conditions: (a) output price risk, (b) input price risk, (c) quality of input risk, and (d) production function risk. They also introduced "flexibility" [as have Hartman (1975) and Holthausen (1976)] by allowing the firm to select one input after the uncertainty is revealed. This approach allows the decisionmaker to respond to new or changing conditions. In each of these cases, however, the research has assumed spot markets only, with no forward contracting of inputs. But many farmers forward purchase some of their inputs in order to manage price risk and ensure reliable supplies and quality. This facilitates planning and allows farmers to diversify their input purchases over time.

In this section the forward contracting of inputs is incorporated into a three-period mean-variance model of farmer decision making. Explicit in the model is the tradeoff between the quantity of input to be purchased in advance (prior to planting) at the forward price and the remaining portion to be purchased subsequently on the spot market. Empirical results are obtained using fertilizer and corn price data.

In the first part, a descriptive analysis of the forward contracting problem facing agricultural producers is presented. Of major concern is the decision environment facing the contract participants, the economic incentives

that underlie the agreement, and the possible tradeoffs involved when operating in an uncertain environment. The second section presents the model and derives decision rules for optimal use of forward contracting of inputs. Finally, an empirical application of the model is illustrated by estimating an "optimal" forward contract ratio. This ratio establishes the quantity of input that should be forward purchased prior to planting.

6.21 Exchange in Forward Contracting for Inputs

As indicated above, forward contracting for farm inputs is usually initiated by the manufacturer. The manufacturer's primary incentive to forward sell is to improve the firm's planning capability. For the manufacturer, forward contracting may be analagous to purchasing an insurance policy to cover operating expenses. The insurance premium is the lower, fixed price necessary to obtain a forward purchase from the farmer. On the other hand, the farmer's incentive to forward purchase may be attributable to the following inducements: (a) a certain price; (b) a certain supply, and (c) a likelihood of cost savings.

The forward contract price is largely a function of manufacturing costs, current input prices and expected input prices. Although contracts often vary across firms, typically they are of short duration (less than one year),

have a fixed price, and may require up to a 100 percent advance payment. This financial commitment by the purchaser is compensated for by a price discount below the current spot price. A five to ten percent discount is common. Once the contract is consummated, a future increase in the market price implies an ex-post consumer (farmer) gain whereas a price decline implies an ex-post producer (manufacturer) gain. Given the influence of seasonality on input prices, the price usually rises.

Prices, however, do not always dominate farmers' purchasing decisions. Supply assurance is also a highly important consideration for essential inputs (Eversull, 1983). Input availability consists of four individual, yet interrelated dimensions of coordination-- quantity, time, form (quality) and place (location). Clearly perfect coordination is not possible, or even desirable, since it could very well be infinitely costly. Nevertheless, these four components of coordination must enter into the decision maker's production equation, at least within some acceptable levels. These levels may differ considerably by the type of input, its function, and the biological and agro-climatic constraints imposed on the production process. For instance, to achieve an effective "kill rate" for the pink bollworm, insecticides must be applied at precisely the right developmental stage of the larvae. This may constitute a "window of opportunity" of only a few days, or

even less. Under these circumstances, supply certainty takes on a more imposing and urgent function.

To investigate some of these issues further, consider a simple two-period decision environment consisting of a preplant period ($t=0$), a planting period ($t=1$), and a subsequent harvest period ($t=2$), in which all buying decisions are restricted to the first two periods. Assuming the farmer is limited to a single forward purchase, the following choices are available at $t=0$: (1) forward contract total input requirements, (2) forward contract no inputs, or (3) forward contract a portion of total input needs.

Each choice is influenced by current ($t=0$) input prices, expected spot price of the input in period 1, and the expected output price in period 2. Initially, the decision maker must decide whether or not to forward contract in the first period. Failure to contract indicates the agent will postpone input purchases and, in effect, speculate that prices will turn favorably by planting time.

An opposite approach is to forward purchase all input needs during the preplanting period ($t=0$). This strategy eliminates price uncertainty, although there still remains some likelihood that prices will fall in the next period, thereby making the farmer regret his or her decision, ex-post.

A final option is to spread risk over time by

purchasing some input in $t=0$ and the remainder on the spot market. In this situation, a proportion of total input price is certain, while the balance remains uncertain.

6.22 The Model

The following model is based on the decision problem discussed above. Assume there is some predetermined level of output, y , that the decision maker intends to produce in $t=2$. The production technology is defined by a Leontief, fixed proportions production function:

$$y = \min (ax, bz) \quad (1)$$

where x is the total quantity of the input of interest used in the production process, z is a vector of other inputs, and a and b are input-output coefficients. Input x can be purchased in two time periods, as a forward contract in $t=0$ or in the spot market one period later ($t=1$). Input levels required to produce y with this technology are

$$x = \frac{y}{a} \text{ and } z = \frac{y}{b} \quad (2)$$

Furthermore, since y is fixed (and by definition so are x and z), the farmer's decision problem is reduced to determining the amount of input x to purchase at $t=0$ (i.e., x_0) and the amount to purchase at $t=1$ (i.e., x_1 =

$x-x_0$). Therefore, the demand for x_1 , which is conditional on x_0 and y , can be expressed as

$$x_1 = \frac{y}{a} - x_0 \quad (3)$$

and z remains as defined in (2).

Profit in period 2 can be written

$$\pi = p y - w_1 x_1 - r z - w_0 x_0 \quad (4)$$

where r is a vector of certain prices for other inputs, (z) , w_1 is the spot price of x at $t=1$ and w_0 is the forward contract price of x at $t=0$. From (2) and (3) we know the period 1 demand for inputs x_1 and z , and by substituting into (4) we obtain

$$\pi = p y - w_1 \left[\frac{y}{a} - x_0 \right] - r_1 \frac{y}{b} - w_0 x_0 \quad (5)$$

During the preplanting period ($t=0$) both p and w_1 are random elements in the decision process, while both r and y are given. Thus the problem in the preplanting period is to choose x_0 so as to maximize a linear function of the mean and variance of profit, conditional on information available at $t=0$:

$$\max E(\pi | \Omega_0) - \frac{\lambda}{2} (\pi) - \frac{\lambda}{2} \text{Var} (\pi | \Omega_0) \quad (6)$$

where Ω_0 is information available at $t=0$ and λ is a measure of the agent's risk aversion. The mean and variance of profit are:

$$\begin{aligned} E(\pi|\Omega_0) &= E(p|\Omega_0) y - E(w_1|\Omega_0) \left[\frac{y}{a} - x_0 \right] \\ &\quad - r \left[\frac{y}{b} \right] - w_0 x_0; \text{ and} \end{aligned} \quad (7a)$$

$$\begin{aligned} \text{Var}(\pi|\Omega_0) &= y^2 \text{Var}(p|\Omega_0) + \left[\frac{y}{a} - x_0 \right]^2 \text{Var}(w_1|\Omega_0) \\ &\quad - 2y \left(\frac{y}{a} - x_0 \right) \text{Cov}_0(w_1, p|\Omega_0) \end{aligned} \quad (7b)$$

The first order condition for this problem is

$$E(w_1|\Omega_0) - w_0 - \lambda \left[y \sigma_{pw}^2 - \left(\frac{y}{a} - x_0 \right) \sigma_w^2 \right] = 0 \quad (8)$$

where $\sigma_{pw} = \text{Cov}(w_1, p|\Omega_0)$ and $\sigma_w^2 = \text{Var}(w_1|\Omega_0)$

Solving for x_0 we obtain the following input demand function for x_0 .

$$x_0 = \frac{y}{a} + \frac{E(w_1|\Omega_0) - w_0}{\lambda \sigma_w^2} - \frac{y \sigma_{pw}}{\sigma_w^2} \quad (9)$$

From an empirical perspective, it would be of value to arrive at a decision rule for forward purchasing x . This can be accomplished by implementing a "forward contract ratio", where x_0 is some proportion of total x . Dividing (9) by x and recalling that $x = y/a$ we obtain our optimal

contract ratio,

$$\frac{x_0}{x} = 1 + \frac{[E(w_1|Q_0) - w_0]a}{\lambda\sigma_w^2 y} - \frac{a\sigma_{pw}}{\sigma_w^2} . \quad (10)$$

Notice from equation (10) that if the forward contract price is equal to the expected future spot price then the middle term drops out and we are left with the simple rule,

$$\frac{x_0}{x} = 1 - \frac{a\sigma_{pw}}{\sigma_w^2} \quad (11)$$

It is easily verified that (11) is also the forward contract ratio that minimizes the variance of profits (ignoring effects on expected profits). Given this simplified rule (11), increases in the covariance between output and input prices lead to reductions in risk and, hence, reductions in the quantity forward contracted.⁷ Similarly, increases in the variance of input prices, *ceteris paribus*, leads to an increase in the amount forward contracted.⁸

⁷When the covariance between input and output prices just offsets, in terms of profitability, the variance of input prices (i.e., when $a\sigma_{pw} = \sigma_w^2$), then it does not pay to forward contract. In this case, if the input price varies, the output price is expected to covary just enough to leave profits unchanged--hence, there is no incentive to forward contract. In this sense, indexing the output price to the input price (parity pricing) eliminates the farmer's incentive to forward buy.

⁸These results assume $\sigma_{pw} > 0$.

Returning to (10), now assume that the forward contract price is at a discount to the expected future spot price, that is, $E(w_1|\Omega_0) > w_0$. Then for a given level of $a\sigma_{pw}/\sigma^2_w$, the larger the difference between $E(w_1|\Omega)$ and w_0 , the greater the incentive a risk neutral farmer would have to forward contract. However, this is a risky strategy, implying that the more risk averse a farmer is, the less forward contracting the farmer would be willing to undertake (i.e. $dx_0/d\lambda < 0$).

6.23 Empirical Results

In order to estimate the optimal forward contract ratio, we need estimates of the parameters in equation 10. Suppose initially that,

$$E(w_1|\Omega_0) = w_0, \quad (12)$$

Then we get the simple decision rule (11), as before. Equation (11) is also appropriate if the individual is infinitely risk averse or if one pursues a minimum variance objective.

To estimate the simple decision rule represented by equation (11) we need the input-output coefficient, "a," and the conditional covariance between input and output prices along with the conditional variance of the input price. We estimated these variables for the case of fertilizer used in corn production on a representative corn belt farm.

Fertilizer data were obtained from two sources. Six years of monthly spot price data were purchased through a private fertilizer information service, and forward contract price data were obtained direct from a fertilizer manufacturer. The latter data however, were incomplete, and so were used only to establish a range of discount values that comprise the sensitivity analysis found in Table 6.2. These data were not used in the actual regression analysis. Monthly corn price data for the same period were obtained through departmental sources (Michigan State University) who collected the information from midwest grain elevators.

A plot of the estimated correlogram of the spot fertilizer price data indicated the possibility of a nonstationary data series. Dickey and Fuller suggest a procedure to test the null hypothesis that the price level has a unit root. The result of this test failed to reject the null hypothesis and the conclusion of nonstationarity was reached. Since the null hypothesis of unit roots could not be rejected, a first difference specification was estimated.

Assuming that the formation of both input and output price expectations is based on the information set at preplanting time (period 0), then the following estimation models are specified:

$$\Delta w_t^s = \beta_{10} + \beta_{11} \Delta w_0^s + \beta_{12} \Delta p_0 + e_{1t}, \text{ and} \quad (13a)$$

$$\Delta p_t^s = \beta_{20} + \beta_{21} \Delta w_0^s + \beta_{22} \Delta p_0 + e_{2t}, \quad (13b)$$

$$\text{where, } \Delta w_t^s = w_t^s - w_{t-1}^s \text{ and } \Delta p_t = p_t - p_{t-1}.$$

The null hypothesis of all the parameters in both (13a) and (13b) equal to zero was rejected at the 5 percent error level (Table 6.1).

To implement the optimal forward contract ratio (equation 11) two estimates are needed. First is an estimate of the ratio σ_{pw}/σ_w^2 . The residuals from (13a) and (13b) were used to obtain estimates of these conditional variances and covariances. Using the forecast errors from equations (13a) and (13b), $\sigma_{pw} = 0.0597$ and $\sigma_w^2 = 63.987$; hence, $\sigma_{pw}/\sigma_w^2 = 0.00093$. Myers and Thompson have shown that this ratio can be equivalently obtained as the estimate of in the following regression:

$$\Delta p_t = \delta_0 + \delta_1 \Delta w_t^s + \delta_2 \Delta w_{t-1}^s + \delta_3 \Delta p_{t-1} + \mu_t. \quad (14)$$

Second, the remaining unknown component in equation (11) is an estimate of the production function parameter "a". Given our problem, the parameter "a" in equation (1)

Table 6.1 Ordinary Least Squares (OLS) Estimates of Fertilizer and Corn Price Expectations Models.

Dependent Variable	Independent Variables			
	Constant	Δw_{t-1}^S	Δp_{t-1}	F-Statistic (3,72)
Δw^S	-0.340 (0.965)	0.469 (0.107)	8.345 (5.887)	9.85
Δp_t	-0.003 (0.019)	0.005 (0.002)	0.017 (0.114)	4.52

Where: $\Delta w_t^S = w_t^S - w_{t-1}^S$, $\Delta p_t = p_t - p_{t-1}$ and
the numbers in parentheses are standard errors.

Table 6.2 Optimal Fertilizer Forward Contract Ratios Under Alternative Degrees of Risk Aversion (λ) and Discounts (α).

Risk Parameter (λ)	Discount (α)			
	0.96	0.94	0.92	0.90
0.025	0.00 ^a	0.00 ^a	0.02	0.18
0.01	0.19	0.58	0.98	1.00 ^b
0.0075	0.45	0.98	1.00 ^b	1.00 ^b

Where: a = negative values constrained to be zero, and
b = values greater than 1.0

is defined as an input-output coefficient: bushels of corn per ton of nitrogen fertilizer. Based on a previous study of the effect of nitrogen on corn yield by Vitosh, et.al, the application of 115 pounds of nitrogen per acre can be expected to yield 100 bushels of corn.⁹ This relationship implies a value of the parameter "a" of 1740. If "a" was as large as 1740 and the covariance-variance ratio was 0.00093, the optimal forward contract ratio would be negative. Since we have not bounded our solution to lie between zero and one, negative values are possible. However, this should be interpreted as $x_0=0$ since we want to rule out $x_0 < 0$.

Initially, we believed that the decision maker's desire to reduce risk would be an important element in the decision to forward contract inputs. However, these results show that for fertilizer used by corn producers, even highly risk averse (variance minimizing) farmers would have little incentive to forward contract.¹⁰ Given values of σ_w^2 , σ_{pw} and "a" estimated here, there appears to be very little the farmer can do to reduce the variance of profit. In other words, the large size of this ratio (σ_{pw}/σ^2) relative to

⁹This study was considered to be representative of conditions for a typical midwest corn producing farm. A Michigan State University faculty member who has done considerable work in this area recommended this publication. The input/output levels picked were estimates for "average" soil conditions and were typical of those found in the corn-belt.

¹⁰Note that risk considerations would likely be much more important for less fungible inputs, like certain agricultural chemicals.

"a", reduces the incentive to forward contract, as increases in the price of inputs are offset by increases in the price of outputs. Given that forward contracting of fertilizer occurs, one might conclude that the impetus is largely due to the presence of discount premiums associated with these forward purchases.

In this simple technology model, the influence of the input-output coefficient for fertilizer was substantial. It is important to recognize that input-output coefficients will vary with the input employed, and hence so too will their impact on the contract ratio. For example, one could anticipate some agricultural chemicals have a very specific role in risk management, possibly overriding price discounts as the incentive to forward contract (i.e., σ_{pw} may be much lower for these inputs).

Returning to the optimal contract ratio, if we assume that the expected spot price exceeds the forward contract price (i.e. $E(w_1|Q_0) > w_0$), then equation (10) holds. By using the limited forward contract data obtained from manufacturers, discount premiums were determined for purposes of obtaining the range of discounts.¹¹ Using this information, hypothetical discounts (α) and levels of risk aversion (λ) were chosen to illustrate forward contract

¹¹Two and one-half years of forward contract data were obtained. But this represented only October through January data for each year--the usual contract period. This was incompatible for regression needs, where monthly data were used.

ratios (Table 6.2). Results support earlier conclusions that the more risk averse a farmer is, the less forward contracting s/he will undertake. This may be in part due to the possibility of an unfavorable price change in the next period. Also, the contract ratios increase with larger alpha values, indicating that a major incentive to forward purchase inputs is due to the presence of discount premiums.

6.3 Forward Contracting: Incentive Structure and the Distribution of Benefits

6.3.1 A Farmer View

Two hypotheses developed in the preceding section are that: (1) discount premiums are a major incentive for farmers to forward contract, and (2) there is an inverse relationship between farmers' risk-aversion and their tendency to forward contract. The validity of these hypotheses was then tested by a case study method based on interviews with farmers.

Although farmers generally agreed that forward contracting is a risky undertaking, the degree to which they believed this to be true varied considerably. Some viewed the forward contract as a useful mechanism to reduce risk and facilitate the planning of their operations. For these producers, the benefits associated with an input contract exceeded the inherent risks. Others had a much less favorable view. For them, a forward contract is synonymous with speculation that involves large risks and returns

minimal benefits. In order to encourage forward commitment, cooperatives would have to offer larger discount premiums or institute more comprehensive price protection.

Farmers cited the impact of uncertain events as the main reason some are reluctant to forward commit. An input contract fixes the price, quantity, and date of delivery. Farmers complained that the inflexibility of some contracts is a deterrent to use. For instance, regionals pressure locals that in turn pressure farmers to accept delivery on a specified date.¹² In 1987 some midwestern farmers had contracted to accept delivery of fertilizer by March 15 but were unable to initiate application because of incompatible soil conditions. Farmers who lacked adequate storage capacity were faced with the unpleasant task of resolving this dilemma with their cooperative. Government is another unknown quantity. Price support programs influence farmers' crop mix strategies, and set-aside programs can heavily affect input prices. When set-aside programs are large, input prices tend to drop in the spring as firms compete to reduce excess inventories. Locking into a forward contract under this circumstance has obvious negative connotations for a farm's earnings.

There are reasons other than risk that may discourage the use of forward contracting for inputs. Developing a

¹²This practice is based on manufacturers' need to relieve inventory pressures and to smooth out the distribution process.

comprehensive production plan to ascertain forthcoming input needs or to satisfy a credit institution is one such deterrant. Apparently there are two distinct classes of farmers in this regard--planners and non-planners. The latter group's attitude is not consonant with the underlying philosophy of forward contracting.

A third inhibitor is that many farmers are simply unaware of forward contracting as a purchasing option. One farmer stated that no one had ever sat down with him and explained the purpose of the contract or the potential benefits from its use. Indeed, even though forward contracting is used between farmers and local cooperatives, it is employed non-systematically and usually unobtrusively.

A final observation is that forward contracting is really tailored for large farmers. Small producers realize negligible savings because their volumes are inconsequential although the transactions and the commitment that attend the contract are significant. To illustrate, a producer who saves \$3 per ton of fertilizer on a purchase of 30 tons has less incentive to forward contract than does a farmer who buys 500 tons. This benefit disparity is even more pronounced when one considers that the cost of the transaction is nearly the same for each producer. For small farmers, a spot market purchase involves less cost and provides substantially more operating flexibility. Farmers who forward contract offered three reasons in

support of this practice. The dominant rationale is the cost-savings that is reflected in the product's price. Due to the seasonal nature of agricultural inputs, fall prices are usually lower than those in the spring. A low price in conjunction with a discount premium is adequate incentive to offset the risk of an unfavorable price change in the spring.

The benefits of planning were also cited as an important incentive to forward contract. As mentioned earlier, many producers have incorporated systematic planning into their farm business, and forward buying complements this practice. First of all, a contract eliminates price and supply uncertainty from a good portion of their farm expenditures. With margins continually narrowing, these farmers view risk management as an increasingly critical component of their operations. Secondly, forward buying improves one's time management by distributing this resource more evenly across the year. Time is a critical constraint at the onset of a new crop season. Purchasing inputs places additional pressure on farmers when they can least afford it. Early buying shifts input purchases to a less demanding period of the year, which frees the producer for more essential activities.

An income tax benefit was identified as a final incentive to forward contract. By purchasing inputs early, farmers list the input as a current expenditure even though

it is used the following season. The inducement is that farmers deduct a portion of this expenditure from their federal income tax. However, this "tax advantage" is an advantage only if the farmer's tax rate this year is higher than next year. This will occur if: (a) his/her income is higher this year than next year, or (b) tax rates will fall in the following year (as have occurred in recent years).¹³

6.32 A Local View

Price incentives and supply assurance are the two major reasons for locals to forward contract. As with farmers, low fall or winter prices and the discount premium are the major impetus to early purchase inputs. Depending on the supply and demand conditions in the market, locals may also try to negotiate some form of price protection. Under intense competitive pressure, regionals may offer a free price protection program even though their own price risk is greater in surplus years. A more normal response is for regionals to charge a premium for price protection in years when large surplus conditions prevail. Competitive behavior, especially among regionals, may cause them to react differently. Supply assurance is a moderate concern at the retail stage of the input system. The major

¹³Note that if inputs are purchased in the spring, they still can be deducted from that year's taxable income. The point is that the input's cost is deductible in the year it is purchased.

benefit of buying early is that it provides security in normal years and may give locals a strategic advantage in years when the season begins earlier than expected.

In the opinion of general managers, the major obstacle to system-wide contracting is its limited use among farmers. Even though it is well-established between regional and local firms, it is poorly employed at the local-farmer level. Regionals stated that roughly one-third of total factor sales are implemented through forward contracts. The largest proportions are in the area of fertilizer and feed, the smallest in agricultural chemicals.¹⁴ On the other hand, local co-ops sell around ten percent of their supplies to farmers on a forward contract basis. Hence, from the cooperative system perspective, forward contracting is a discontinuous and therefore imperfectly applied exchange mechanism. Benefits that could accrue to farmers and the larger cooperative system are forgone.

General managers cite two reasons for this lack of use at the farm level. One problem is that regional and local co-ops have ineffectively disseminated information to members on the benefits and opportunities of contracting inputs. Many farmers are simply unaware that the exchange option exists. A second reason is that farmers who are conscious of the mechanism itself may still fail to

¹⁴Recall that agricultural chemicals are distributed largely with regionals or IOF manufacturers bearing most of the risk via buyback provisions.

comprehend its fundamental features. Many producers do not recognize the tradeoff between the inherent price risk on the one hand and the benefits of lower input prices and improved management capabilities on the other. Even though farming involves substantial risk, many producers view early input contracting as a speculative mechanism that actually enhances risk. One might conclude that the combination of these two factors is preventing a wider adoption of forward contracts among farmers and, hence, through the entire federated system.

6.33 A Regional View

Benefits from forward contracting at this level depend on the particular economic function carried out by the regional. If the regional is a manufacturer, the objective of covering fixed costs is the most important reason to institute forward selling. An equally important reason but less urgent is the goal of cost minimization. Conversely, if the regional purchases supplies from an interregional or an IOF, then supply assurance becomes the critical feature of forward buying. In either case this practice allows the firm to be more competitive through improved performance, which is disseminated down through the system.

A major shortcoming of current forward contracts is that benefits from their use exhibit a public good characteristic of non-excludability. More precisely, the

efficiency gains derived from forward contracts are distributed only in the aggregate, which encourages free-riders and hinders broader use of forward contracts. One regional has responded by segregating services between adopters versus non-adopters. Thus, a service incentive is directed at those members who are willing to commit through forward contracting.¹⁵

Regionals assert that currently the primary reason locals and farmers forward purchase is because of the price incentive and discount premium. They believe, however, that as margins of producers continue to diminish, forward contracting as a risk management tool will soon become the dominant incentive. This trend will also be the primary impetus for its increased use at the cooperative system level.

One final observation has to do with risk sharing among the participants in the vertical system. There was a consensus opinion that price uncertainty remains the key risk factor influencing each economic stage. Farmers and locals were quick to point out that a comprehensive price protection program was the best way to expand the use of forward contracting. This meant that (IOF) manufacturers or regionals should compensate local cooperatives in the event

¹⁵These services include manpower assistance, financial and technical support, and information services. Financial support can be an important incentive to a highly leveraged cooperative.

prices drop to a level below the contract price.

Interestingly, they elicited surprise when asked if they were willing to compensate the regionals if prices rose above the contract price. Apparently risk sharing is an unknown concept among many participants at the lower levels of the system.

6.4 Chapter Summary

Three different aspects of forward contracting as a mechanism of exchange are discussed in this chapter. In the first section the emphasis is on system-wide implications of forward contracting. This included examining both the benefits that are derived from its application and the obstacles that prevent its implementation. In terms of the former, all four system players benefit from forward contracting. Manufacturers are better able to achieve their goal of cost minimization by ensuring sufficient volume to cover fixed costs and by extending the manufacturing period to utilize factors of production more efficiently. Wholesalers and retailers (regionals and locals) gain from more competitive prices and an assured supply. Supply assurance can be critical at the wholesale stage because volumes are large and movement of supplies can be a time-consuming process. When the season begins and demand suddenly mushrooms, it is crucial that firms have strategically deployed their inputs to

maximize their sales. Finally farmers gain by the lower input prices and the assured competitiveness of their cooperative firm.

Farmers are the critical link in the cooperative system but they also are recognized as the most significant obstacle to effective implementation of forward contracts. This is primarily because of their unwillingness to commit. Price risk is usually the cause for this behavior by farmers. But price risk is experienced by each major player in the cooperative system, since players at the bottom of the system have shifted much of this risk up. Finally, a lack of contract enforcement is identified as undermining the integrity of forward contracts. This form of exchange is prompted in surplus periods when dealers try to reduce inventories. One practice that entices customers is to incorporate slack into the contract by offering a less binding commitment. The problem is that when sufficient numbers of firms engage in this behavior, the effectiveness of contracting as a forward buying tool is greatly jeopardized.

In light of the need to understand farmers' incentive to forward contract better, a mean-variance model of farmer decision making was used to derive an optimal decision rule for forward contracting. By interpreting this rule, it was discovered that a farmer's major incentive to forward contract for fertilizer used on corn is the discount

premium or price incentive, and that risk management is of minor importance. However, risk considerations could play a much more dominant role for asset-specific inputs. A second finding of the model is that there is an inverse relationship between farmers' degree of risk aversion and their decision to forward commit. In other words, greater levels of risk aversion imply lower levels of forward contracting.

The final section uses information from case studies to test the two preceding hypotheses. Respondents concurred that farmers' primary inducement to forward buy inputs is a price incentive, which can translate into an appreciable savings. Respondents also confirmed that many farmers view forward contracting as a speculative venture that entails more risk than the spot market. This is largely attributed to their lack of understanding of the input contract mechanism. There is a consensus, however, that as farming becomes more competitive and margins continue to narrow, forward contracting as a risk management tool will become increasingly prevalent.

CHAPTER 7

THE COOPERATIVE SYSTEM AND HORIZONTAL COORDINATION

7.1 Introduction

A continuing focus of cooperative strategy over the next decade will be in balancing market power between farmers and firms in the food system. This will necessitate increasing horizontal coordination to maximize the bargaining strength of farmers. Past efforts by the cooperative system at increasing market share has not been sufficient relative to the strength of investor-owned firm competitors. Cooperatives must do a better job of coordinating activities among themselves in a manner that translates into a more efficient cooperative system. This means eliminating needless duplication and increasing the size and scope of their operations through orderly merger or consolidation.

This research has concentrated on coordination problems afflicting federated farm supply cooperatives. Federated co-ops are viewed as being generally responsive to unique local needs--at least this has been their affirmation. But there are many opportunities of a horizontal nature facing these firms that are largely ignored. Through joint-

ventures or mergers cooperatives can gain greater leverage from their limited capital, pool risks, expand markets, and enter activities that they may otherwise have to forego (ACS, 1987). A combined organization may also be viewed as less risky in the market place, leading to increased availability of funds or improved lending rates, or both. Better cash flow management may also occur through upgraded accounting procedures. Improved accounting systems could also enhance the new firms' planning and control. Marketing and administrative areas also have synergistic potential. For example, the new organization could unify advertising and utilize the strength of individual product lines to upgrade the overall marketing effort. Finally, in the manufacturing area, synergistic effects may be possible, but only in the longer term. This is because activities like plant closures, construction of new facilities, changes in production processes, and joining operations of the combining cooperatives all take time and effort (Swanson, 1985). In fact, it is precisely these types of activities and the issues that underlie them that hinders the inception of reorganization. But relentless competition from IOFs is rapidly altering the nature of the game in the input markets. Cooperatives are beginning to feel this pressure and are recognizing that time to respond is fast running out.

Reorganization is a major horizontal activity open to

cooperatives but they have yet to respond to the degree that is necessary.¹ Competition at the local and regional levels is pervasive, as is the excessive and redundant investment in facilities and distribution systems.² It is clearly one of the most significant dilemmas facing cooperatives in this decade. This chapter will address these and other issues relevant to horizontal coordination. There are two components to the chapter. In the first part, the emphasis is on identifying and examining impediments to improved collective action among cooperatives. Issues that surface are analyzed as a prisoner's dilemma supergame and as a cooperative game. The second and final section explores the structure of incentives that may be inhibiting the performance of newly

¹Merger, consolidation, and acquisition are the most common forms of horizontal reorganization. Although these terms are often used interchangeably, the terms refer to different types of joining. Merger involves combining the net assets of two or more firms, with one surviving. When two or more firms consolidate, their net assets are transferred to a new firm organized for this purpose. Acquisition results in control of a purchased business. The acquired organization may survive or be absorbed (Swanson, 1985).

²One general manager stated that a reorganization feasibility study conducted for his cooperative by the ACS found that a consolidation would save three local firms \$1.5 million in the first five years. Given the small size of the co-ops, this was substantial. The manager further stated that the board of directors blocked the reorganization outright.

A regional respondent claimed that a study examining a reorganization with two other midwest regionals found that savings from a consolidation were in the neighborhood of \$400 million in the first five to ten years. Restructuring negotiations are ongoing at this time.

reorganized firms, particularly joint-ventures and mergers or consolidations.

7.11 Rationale for Behavior

A. A Local View

General managers of local cooperatives identified three major reasons for the competitive behavior that pervades the cooperative system. Perhaps the most obvious incentive is simple economic necessity. Three different dimensions to cooperative competition are: (1) local to local, (2) regional to regional, and (3) regional to local, or vice-versa. All three relationships are driven by the same underlying force--economic survival. Cooperatives are compelled to behave competitively because the number of patron-owners is dwindling and the average farm size is growing larger. Compared to the past, each current or potential customer has a much greater impact on the financial well-being of the cooperative. At the same time, outside forces are adding pressure to keep costs low. Supply cooperatives accomplish this through larger volumes, but this implies infringing on territories of neighboring cooperatives.

Competition among cooperatives is not limited to parallel stages either. Regionals compete directly with locals by selling supplies to large farmers (the circumvention issue) or indirectly by providing financial

support to poorly performing firms. The former practice is understandable when the needs of these patrons have outgrown the local's ability to provide them. Traditional methods or practices are no longer adequate for large members. On the other hand, it is questionable whether a regional that assists a financially impaired local does so ostensibly for "the good of the system." Local managers contend that the impetus is rather the regional's fear of losing the customer to a competing regional. Hence, direct regional to regional competition is also manifested indirectly in a vertical sense between locals and regionals. One consequence of this behavior is that regionals may be perpetuating inefficiencies within their federated system. Not only does this weaken the system's overall competitive posture but it also prevents its natural (and necessary) evolutionary development.

A competitive ideology is a second and perhaps the most basic force that explains the behavior of farm supply cooperatives. This fundamental, pervasive, and deep-rooted belief of farmers may in part be traced back to the early years of cooperatives when the input industry was dominated by a few firms that often acted dishonestly. In a larger context it may be attributed to the free enterprise spirit of American society. The oft-recurring antitrust legislation is testimony to this social concern. Whatever the reasons, this ideology may be responsible for

the competitive posture cooperatives are in today. Farmers, for instance, may join more than one cooperative to encourage competition among local firms. Competition in turn leads cooperatives to offer lower prices for certain products or services, which creates incentive for patron-owners to "shop around." In addition, members pressure management to adopt similar behavior with regard to their regionals. Nearly all locals interviewed were members of more than one regional firm. The following experience of one manager may illustrate how deeply ingrained this behavior is among farmers. When the manager first arrived there were two cooperatives in the immediate area. The community had two fertilizer mixing plants, two feed mills, duplicate service equipment, and two-thirds of the farmers were members of both cooperatives. Furthermore, neither cooperative's investments were sufficiently utilized. After surveying the situation the manager suggested that the two cooperatives merge. Farmers were adamant in their disapproval. Their response was "but if we merge, we won't have any competition."

The third and final impediment to horizontal cooperation is the effect of vested interests. Vested interests at the local level can be delineated according to personal or community interests. Managers believe that communities attach a tremendous weight to the economic role and function of the cooperative. Rural areas in the

midwest are in a period of transition. Small towns are disappearing as the farm population continues to dwindle. Many communities have lost their schools, businesses and even churches. One of the last vestiges of their past and the last shield between themselves and economic obscurity is the farmer cooperative. As a consequence, even though the economics may dictate the necessity of consolidation, board members usually resist this action outright.³ Every local firm interviewed had at some point tried to merge, consolidate, or form a joint-venture, but very few were successful.

Personal interests are also a serious obstacle to different forms of collective action. Vested interests are most acute among managers and board of directors. Managers have a strong incentive not to merge or consolidate since doing so places their positions at risk. They are also expected to supply low-cost items in a shrinking market. Absent some form of joint-venture with another co-op, this requires increasing volume, which further exacerbates the competitive dilemma.

Vested interests among local board members is reflected in their hesitancy to relinquish control. Even though a local board position has little direct remuneration, these members are able to influence the investment, patronage,

³Mojdeh Hojjati found exactly the same barrier to the consolidation of cooperative apple-packing stations in Norway.

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and equity redemption policies of their cooperative, which indirectly affects their wealth. One might also argue that they receive a certain amount of prestige or "psychic income" from being a board member. As we shall soon see, these interests appear to be more substantial for regional board members.

B. A Regional View

The understanding of regional respondents concerning factors that impede horizontal coordination is consonant with that of their local counterparts. The first key problem is the practice of multiple membership.⁴ Each local and regional cooperative reacts to economic necessity by striving to capture 100 percent of the same patron's business. Consequently, these firms view each other as their biggest competitors. Regionals attribute the cause of multiple membership to the low entry requirements of cooperatives.

Despite the fact that members allow their competitive ideology to dominate their behavior and influence the practices of their cooperatives, this ideology is applied inconsistently. One respondent highlighted the fickleness of members--they wear two hats depending on their economic circumstances. On the one hand, they wear a "customer hat"

⁴This practice is attributed to the competitive ideology of farmers, as discussed in the preceding section.

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in which they (erroneously) believe they are always better off by instigating competition among their cooperatives. They allow short-run gains to take precedence over long-term performance. In 1980, for example, members of this regional would not have approved a merger because the firm did not appear to be in serious financial difficulty. On the other hand, when financial hardships surface, members quickly switch to their "owner hat." When their equity investments are in jeopardy, they begin to discuss options for interregional cooperation. In the words of one respondent:

It has taken the failure of Agri Industries, Farmarco, Illinois Grain Corporation, and the near collapse of the Farm Credit Service to enlighten them to the reality that the cooperative system is in trouble. But when the regionals are on their feet again, these members will once again don their customer hats.

It is interesting to note that this empirical observation is related to a deduction in cooperative theory. In his expanded review of co-op theory, Staatz comments that the theoretical literature argues that reaching an optimum in a co-op with respect to pricing and output levels involves striking a balance between customer benefits (as measured by consumer surplus) and owner benefits (as measured by producer surplus).

Vested interests of regional management and board

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members are another serious impediment to improved horizontal coordination. Respondents pointed out that the board's decision to reject or accept a reorganization proposal is not a simple process. Some directors may favor a merger, others will not. Clearly tradeoffs and bargaining are involved. All perceive some benefits, but some perceive a large "collective" benefit relative to their own potential loss, whereas others perceive the near opposite.

There are three components to this gain/loss analysis that are in the decision set of board members: (1) their personal gain or loss; (2) the gain or loss of their immediate constituency; and (3) the gain or loss to the cooperative system. The weight they attach to these components relative to other board members determines the outcome of the group's decision. Personal stakes for regional directors are considerably higher than for their local counterparts. Not only do these directors have opportunities to influence their well-being through the control mechanism, they are also paid handsomely for services rendered.⁵ Furthermore, because they are representing local firms and not farmers directly, one

⁵Board members of regional firms earn in the vicinity of \$30,000 per annum in addition to per diem and travel expenses. Actual time spent in board meetings is measured in hours per month. However, depending on how seriously s/he takes the job, a board member may spend several days a month preparing for board meetings.

would anticipate that member pressure would be less severe than for a local board. Hence, the benefits from control plus remuneration on the one hand, in addition to less stringent demands from members on the other, could suggest a disproportionate emphasis on "personal gain." Simply stated, regional board members have more incentive to protect their vested interests than do directors of local firms.

But by no means is this the end of the process. Even if the board and the members agree in principle to merge or consolidate, the major stumbling block still remains--haggling over the distribution of gains and losses. Negotiating issues range from the trivial to the consequential.⁶ Board members or managers who may have approved the collective action "in principle" can still use the negotiating table to impede or eliminate altogether the possibility of its immediate inception. To illustrate, it is not unusual for intransigence over the firm's name to cause the complete collapse of negotiations. Hence, absent some outside force like financial duress or direct and implacable pressure from members, a merger or consolidation is unlikely to materialize. Recognizing this, some local

⁶Examples of negotiating issues are the name of the new organization, its location, values of assets prior to consolidation, size of the board of directors, a determination of which directors will be moved immediately to the newly reorganized firm versus those that must stand for election, and who the CEO will be of the new organization.

firms have instituted "area management councils." These are coalitions of ten to thirty area managers who use this council to address issues of concern. Typically these councils are comprised of locals who are members of competing regionals. This is because a major motivation for their inception was the restructuring of their regional firms. By speaking with one voice through this council (as they have done), local cooperatives are able to exert considerable pressure on regional decisionmakers.

Basically, the formation of these councils suggests that members have little faith that they can assure good performance of the co-op through the board. This is a serious indictment of the co-op system and implies that consolidation may need to be linked to better monitoring and member-control mechanisms within the co-op.

Ironically, consolidation may lead to a "competitive yardstick" problem just like the one that gave rise to co-ops in the first place. Farmers may feel the need for some competing firm (IOF or cooperative) to act as a competitive yardstick to measure the performance of a large, consolidated cooperative.

7.12 A Noncooperative Game Analysis

This section examines the cooperative issues mentioned above within the context of a prisoner's dilemma

supergame.⁷ This approach is particularly useful for analyzing the behavior of members with their cooperative. Unlike the patron of an IOF, a cooperative patron is also a part owner of the firm and therefore may be more concerned about preserving a long-term relationship. Thus, opportunistic behavior by a member in one period may have adverse consequences in the next. In spite of the "soft hearted" reputation of farmers, it is not beyond cooperatives to punish recalcitrant members.⁸

Staatz discusses situations where a supergame will itself become a prisoner's dilemma. Three of these situations were presented mathematically in chapter 5 and are particularly germane to this analysis: (1) A supergame will be a prisoner's dilemma if players fail to punish those who defect or otherwise act disloyally in subsequent iterations of the game; (2) Even if there is punishment, a supergame is still a prisoner's dilemma if members have

⁷Recall that if a single-period "constituent" game is infinitely iterated, this becomes a supergame in which the payoffs are the net present values of the stream of payoffs from the constituent games (Staatz, 1987b, p. 130).

⁸A general manager related an incident where his cooperative had signed an acreage contract with a processing firm. Under this agreement farmers were obligated to deliver the total production from the contracted acreage. A few farmers acted dishonestly by selling part of their crop to another firm. When area farmers learned of this behavior, they expelled these individuals from their co-op and made it difficult for them to become members of neighboring associations. This made it very clear that reputations do matter in a cooperative context.

sufficiently high discount rates. This is because a gain from defection in the present period may exceed the discounted value of the punishments in the subsequent periods; and (3) The higher the return is for defection relative to cooperation in the constituent game, the more likely the supergame will be a prisoner's dilemma (1987b, p. 130).

As mentioned above, the interviews uncovered three socio-economic conditions that influence the behavior of cooperative participants: economic necessity, ideology, and vested interests. Depending on how one conceptualizes who the players are in the game, one could argue that these conditions could represent either a prisoner's dilemma supergame or a cooperative game. To a certain extent, the different players correspond to the three above causes of competition. In light of this, economic necessity is examined within the context of a supergame, in which the players are viewed as individual cooperatives (thereby ignoring the divergent interests within each cooperative). Ideology and vested interests are then evaluated in a cooperative game analysis where the players are viewed as individuals within their respective organizations.

1. Economic Necessity. As the number of patron-owners (farmers or local co-ops) continues to decline and the average firm size increases, the economic significance of

each member becomes greater. These larger, fewer, and more profitable accounts motivate cooperatives to compete aggressively. Because any single member has a greater impact on a co-op's financial welfare, its long-term stability is now more precarious. Each cooperative seeks to stabilize its market position by trying to secure 100 percent of the patron's business.⁹ Moreover, even though cooperatives could gain more through collaboration, if they view reorganization as an imminent development, they are still motivated to strengthen their own position relative to others prior to the reorganization. Economic strength determines a firm's ability to extract concessions and obtain favorable outcomes in the negotiating process.

2. Ideology. The pervasive belief among farmers that competition is desirable, even in the context of their own cooperatives, indicates a fundamental lack of trust. Patron-owners fear that by remaining perfectly loyal, management will grow complacent, which will deleteriously affect their own performance. Similarly, if area co-ops join together to form a single organization, members are concerned that, absent competition, which is a prime guarantor of performance, this new firm will become less reliable. In short, members are concerned that

⁹Recall that patron-owners are typically members of more than one cooperative.

reorganization could lead to the same competitive yardstick problems that gave rise to cooperatives in the first place.

Within a cooperative game analysis, players perceive, because of their ideology, that the payoffs to them would be lower both in the short-run and in the long-run if the co-ops collaborated. Because the reorganization has eliminated competition, there is no effective mechanism (including the board of directors) to ensure that the consolidated firm will perform well. As a consequence, members block the "grand coalition" from forming.

3. Vested Interests. It is important to distinguish between "communal" and "personal" vested interests. Both are significant forces that potentially affect cooperative horizontal coordination. Communal interests are more relevant for local cooperatives and are addressed first.

Consider a situation where two or more locals residing in different towns are confronted with the prospect of a merger or consolidation. Assume that by restructuring their firms, a synergy is achieved. Further, because the co-ops are located in different towns, one must be eliminated. A likely impact of a closure is that small members would suffer more than their large counterparts. Large patrons could gain from any size economies that were produced by the reorganization. Respondents noted that

small producers generally rely on off-farm income to maintain operations and to satisfy basic living needs. In situations where the co-op is the most important source of employment in a small town, the livelihood of many families would be jeopardized in the event the firm is closed. Hence, since they stand to lose more from the reorganization, they oppose it.

In cooperative game terminology, the formation of a grand coalition would mean that the slice of the new pie to these members is smaller than their old slice. Also recall that because of the one-member, one-vote principle, the likelihood of small producers preventing the coalition from forming is high.

Personal vested interests of managers and board members are now discussed. Managers clearly face strong incentives to oppose a merge or consolidation. Since managers earn their income directly from the cooperative, their welfare is jeopardized if a reorganization occurs. Their most feasible options are: (a) try to become the manager of the newly organized firm, or (b) find employment with another cooperative. The expected value of either scenario would certainly be disheartening in contrast to the value of current welfare. Furthermore, the positive outcome of either (a) or (b) becomes more uncertain as the number of total cooperatives declines or if they are managers of poorly performing firms.

Since remuneration is minimal for a local board member, benefits are largely relegated to exercising control. Directors can use their position to legislate policy that is consonant with their own goals and objectives. The most tangible benefits could accrue in the areas of patronage refunds and equity redemption programs. One might anticipate that board members of highly leveraged co-ops are less inclined to support a merger than are members of well positioned firms.¹⁰ In the negotiating process, issues like the number of board members and other cooperative personnel to be transferred from each organization will likely tilt in favor of the stronger firm.

In contrast to their counterparts, regional directors of either healthy or impaired co-ops have greater incentives to resist a reorganization. These members receive substantial remuneration in addition to the benefits that emanate from control. One might argue that, because of this cash income, regional directors attach a higher weight to their personal interests at the expense of the cooperative and the larger system.¹¹ By blocking a

¹⁰This may depend on how financially impaired the weaker co-op is. If board members of that co-op have substantial equity invested in the firm and if the options are bankruptcy or merger, the board will likely embrace the merger.

¹¹This was strongly affirmed by both regional and local respondents. General managers in particular acknowledged that a regional directorship is a highly

reorganization, these directors preserve their remuneration and their control. In a cooperative game analysis, players (management and board of directors) see themselves being worse off under a "grand coalition" (a merger or consolidation) than in the previous situation, so they block the new coalition from forming. If they do let it form, one could conjecture that they will make sure they are compensated for their loss of position and income. This aspect will be discussed in the next section.

Another important element is that board members' "payoff" is affected not just by actual benefits received but also by the concessions their constituency can extract from them.¹² Because regional directors are more removed from their members (i.e., they represent local firms directly and farmers indirectly), they are likely to encounter less pressure and therefore be more at liberty to pursue personal concerns.

A recent development is changing this environment considerably for both managers and board members of regional firms. In their frustration over the performance of the regionals, as well as the foot-dragging over reorganization, local managers have formed "area manager

lucrative and desirable post and, that once elected, directors have every incentive to maintain their position.

¹²If a director's constituency is comprised of an aggressive membership, and their interests are at odds with the director (e.g, patronage or equity redemption issues), then his or her welfare could be affected adversely.

councils." By forming a coalition of twenty or more co-ops, some of which are super-locals, this council is able to exert considerable pressure on regional firms. If the management and board choose to ignore the demands of the council, they risk defection by this group, which could significantly impair the regional firm as well as the security of their own positions. Simply put, these managers have raised the stakes in the benefit and cost consideration of the opposing players. Even though the benefits remain the same, the costs associated with non-compliance on the part of the board and management are now considerable and could be prohibitive.

7.2 Horizontal Coordinating Mechanisms: Destabilizing Forces

7.21 Introduction¹³

In the past, the major impetus for cooperatives to reorganize was financial difficulty. Berry found that many associations that elected to reorganize did so only after all other alternatives were exhausted. Garoian and Cramer conducted a case study of ten cooperative reorganizations that occurred between 1956 and 1960. In nearly every case the reorganizations were initiated by undercapitalized cooperatives experiencing operational difficulties. All of the firms were motivated to improve efficiencies by

¹³This section is a partial synthesis of Taitt's review of the literature on cooperative reorganization studies.

achieving economies of size. The authors found that most of these firms were more profitable before reorganization than afterwards. Five to twelve years after the reorganization had occurred, only three out of ten had increased their profitability (measured as net earnings per dollar of sales) above their pre-reorganization levels.

Haskell found similar results in a case study of four local cooperatives that reorganized between 1964 and 1966. Each reorganization involved a stronger firm merging with a financially weaker firm. One to three years after reorganization, all surviving cooperatives experienced a reduction in profitability. A study by Swanson (1975) compared the performance of 52 cooperative mergers, nine acquisitions and four consolidations before and after reorganization. The survivors of the mergers experienced greater sales volume but a decrease in profitability and no change in their leverage position one to three years after reorganization. Results were similar for firms involved in consolidations. Taitt analyzed the pre- and post-reorganization performance of local farm supply, grain, and petroleum cooperatives in Minnesota between 1979 and 1985. Her results indicate that improved financial performance was not achieved in the short run (one to three years) after reorganization. Specifically, of the four performance measures used, none was statistically

significant.¹⁴ A limitation of these studies is their inability to account for what would have happened in the absence of the reorganization. First of all, reorganizing allowed these firms to continue to provide customer services that may not have been available otherwise. Secondly, conclusions on performance should be treated with reservation because measurements were carried out in two different environments and in two different points of time. It is very difficult to say ex post that performance of reorganized firms is inadequate. However, in spite of these limitations, there is general recognition that the performance of reorganized cooperatives could in fact be improved. Failure of these firms to dispose of redundant assets once the reorganization has taken place is viewed as a major cause of this poor performance. At issue now is why? The following section addresses these questions by identifying possible rationales for cooperative participant behavior.

7.22 Incentives and Participant Behavior

Earlier it was noted that three major forms of horizontal coordination undertaken by cooperatives are joint-ventures, mergers and consolidations. Nearly all

¹⁴Performance measures were: (1) liquidity--acid test ratio; (2) efficiency--salaries/sales ratio; (3) solvency--total liability/local assets ratio; and (4) profitability--local net margins/sales ratio.

respondents had some experience with one or more of these coordinating mechanisms. Most agreed that newly restructured firms frequently face obstacles that prevent higher levels of performance. These obstacles fall under the general classification of vested interests.

Communal vested interests affect the performance of restructured firms. Asset disposal is one of the most contentious cooperative issues today, especially among local firms. A regional cooperative may face resistance terminating an entire business line but should face less resistance disposing of redundant assets within that business. Indeed, all three case study regionals have been aggressively disposing of redundant assets in efforts to ameliorate their debt/asset ratio. Davidson and Royer (1987) note that this ratio improved 6.4 percent between 1982 and 1985 for the 100 largest cooperatives. A local cooperative, however, faces a different environment. The manager and board are accountable to specific interest groups that have incentives to influence outcomes when their welfare is threatened. In other words, actions taken by a local manager or board members directly affect the welfare of the owners, whereas actions from their regional counterparts are more removed. One general manager who has participated in eight different mergers claims that in each instance serious problems arose over elimination of assets or services. In a few cases various groups became

deadlocked and were unable to agree on a liquidation procedure. Three of these firms eventually went bankrupt.

Personal vested interests are a second class of impediments to reorganized firms. Managers have vested interests in maintaining the performance of their own firm. To illustrate, consider a joint-venture between two cooperatives. Respondents assert that parent organizations may not infuse adequate capital into the new venture to give the firm time to "get on its feet." Each organization is concerned about the liquidity of its own firm and so provides the minimum equity necessary to meet the joint-venture's immediate needs only. This is because the board of directors of the joint-venture is composed of the managers of the parent organizations. But these managers are still accountable to the directors of their own firms. This means that the performance of the parent organizations is not directly linked to the performance of the joint-venture. Rather than seek to minimize the sum of the costs of all three firms, each firm minimizes its own individual costs. As a consequence, managers have incentives to influence policies that are most favorable to themselves and their cooperative, at the expense of the other firms. Also, if parent firms have not invested equally in the joint-venture, those with more invested may use this as a fulcrum to extract additional benefits.

Failure to internalize the activities of cooperating

firms significantly undermines their potential performance. Local managers related how some regionals had formed a joint-venture agronomy division. The joint-venture was established to carry out agronomic services like field scouting for pests, pesticide recommendations and application. Unfortunately, the regionals each maintain their own agronomy programs and compete for the same business. Structurally the firms cooperate but they still remain operationally independent. Even the employees of the joint venture are segregated according to their regional affiliation.

Other local managers related how lack of cooperation is often found within the same firm (intra-firm rivalry). The above joint-venture has implemented a farm input information system. The problem is that each division within the joint venture has its own networking system that includes both hardware and software. All three divisions have attempted to sell their own non-compatible systems to locals. In other words, there is no centralized control to coordinate activities across divisions. These managers believe that the joint-venture may have created more inefficiencies than it originally started with.

In summary, there are three interrelated conditions that mitigate the performance of some cooperatives engaged in joint-ventures. First, the two parent organizations and the joint-venture firm maintain separate profit centers.

Second, the original purpose of the joint-venture (reducing the final costs of producing and delivering a product or service to customers) never fully materializes if parent organizations maintain duplicate functions and services. This may be due to a fundamental lack of trust among cooperatives or from pressure from owners or employees who resist eliminating these activities. Third, the performance incentive of each firm's manager predisposes him or her to compete. Failure to perform adequately could result in retribution by the owners. Hence, the confluence of these three elements diminishes the performance levels of each individual firm and the potential synergy from cooperation.

Inefficiencies that result from a merger or consolidation appear to be the result of two related conditions. First, partners fail to establish explicitly the terms of the venture prior to the reorganization. A second problem is that participating firms fail to institute a binding agreement that is enforceable in a court of law. Absent this commitment, even if firms had agreed ex ante, there may be new incentives that may or may not have been previously considered to behave opportunistically in this new environment.

Both of these conditions could well be due to the effect of vested interests of certain individuals. From a cooperative game perspective, if certain members in

positions of power were unable to prevent the grand coalition from forming, they may have been able to obtain compensation for their loss in position and income. This explains why many of the potential benefits of the merger or consolidation never materialize. Indeed, if these individuals are sufficiently powerful, they may ensure that they are overcompensated, leaving no net benefits to the reorganized firm.¹⁵

7.3 Chapter Summary

This chapter examines the competitive behavior that pervades the cooperative horizontal system. The two questions of interest are: "Why isn't there more cooperation among cooperatives, especially when benefits appear so significant?" What are the underlying forces that may explain this behavior? Three reasons were identified and analyzed using a prisoner's dilemma supergame, and a cooperative game: economic necessity, ideology, and vested interests.

Economic necessity is attributed to the continuing phenomenon of fewer and larger patron-owners, each of whom

¹⁵One regional respondent commented that most senior management and board members (of a regional) should have little to fear from reorganization because, one way or another, the co-op will take care of them. If this statement is in fact true, it lends credence to the preceding argument.

has a growing capacity to adversely affect their cooperative. This is complicated by the fact that patron-owners are members of more than one cooperative. Therefore, each firm has a strong incentive to secure as much of the patron's business as possible. This is accomplished through head-to-head competition with other cooperatives. Secondly, if a cooperative believes that a merger or consolidation is imminent, it is in their interest to strengthen their own position relative to others prior to the reorganization. This behavior improves a firm's bargaining position at the negotiating table.

If farmers truly adhere to an ideology that cooperative competition is "good for the patrons," its basis must be a fundamental lack of trust, even in their cooperative association. The opposite of competition is cooperation. A much repeated concern of farmers is that multiple cooperatives restructuring into one firm for purposes of achieving size economies or improving capacity utilization could be offset by poor performance. By preventing the coalition from forming, farmers perceive they are maximizing both short- and long-run benefits.

Vested interests can be either communal or individual. In terms of the former, if these cooperatives are important sources of income, reorganization will likely threaten the welfare of at least one of the participating communities. Communities with relatively poorer performing co-ops will

tend to resist a merger more than communities with a financially sound cooperative. Personal vested interests are most pronounced for managers of local firms and board members of regional cooperatives. These individuals receive (at least) a major source of their income through the cooperative. As a consequence, they have a strong incentive to resist a reorganization attempt. Another factor that influences a director's incentive to resist a reorganization is the pressure exerted on them by his or her constituency. Because local board members represent farmers directly, they have less capacity to allow personal interests to supercede those of the members. Conversely, regional directors are more removed from farmers and so will have more incentive to allow personal interests to take precedence over constituency interests.

The final section addresses the question of why reorganized firms often perform below expectations. Three reasons are identified in the case of joint-ventures. First, both the parent organizations and the joint-venture maintain separate profit centers. A financial linkage is not established among the participating firms. Second (and because of the first), managers of these respective firms have incentive to improve their own firms' performance at the expense of their partners. Third, perhaps because of a lack of trust or because of pressure from owners and

employees, parent organizations often maintain the operations that the joint venture was intended to replace. Hence, the confluence of these three elements detracts from the performance capacities of each individual firm and the potential synergy from cooperation.

CHAPTER 8

CONCLUSIONS AND RECOMMENDATIONS

8.1 Purpose of Study and Approach

In a very real sense, the underlying purpose of this study has been an exploratory mission. Many or most of the problems facing farm supply cooperatives today have already been identified in previous studies. This research contributed little in this regard. The emphasis has rather been to come to a better understanding of why many of the cooperative coordination problems persist. To illuminate these problems, cooperative coordination was viewed within a systems context, which emphasizes that individual (micro) decisions often have industry-wide (macro) consequences. Further, two conceptual frameworks (game theory and transaction cost economics) that are extremely useful for analyzing the sources and causes of problems, were employed.

The purpose of this chapter is to proceed one step further by formulating conclusions and recommendations based on the findings of the research. This is accomplished by delineating cooperative coordination into vertical and horizontal coordination issues. A discussion of future research needs concludes the chapter.

8.2 Vertical Coordination Issues

8.21 Commitment

A. Major Findings

Commitment is expressed in terms of patronage and equity investment. Case study respondents felt that members tend to patronize their cooperative less frequently now than they have in the past. In other words, "shopping around" is a more prevalent practice. Equity investment is the other problem area for co-ops, but inadequate investment is the fault of members only inasmuch as they fail to patronize their cooperative. Other aspects are the mechanisms employed by cooperatives to generate equity capital (retained net earnings) in conjunction with the low net earnings of many firms.

In the game-theoretic analysis, two classes of disaffected members were analyzed: young versus old members and large versus small members. There were two conditions that affect the welfare of each group when they do business with their co-op. The first is that each has a different set of needs. Young farmers are generally more highly leveraged than their older counterparts and so have periodic cash-flow problems. Their need for patronage refunds is an over-riding concern. Older members, on the other hand, are generally more solvent but, because they are nearing retirement, their concern is more focused on redeeming equities and the propitious settling of estates

in the event of death.

Large members have a different set of needs from small members. Those large producers who obtain most of their livelihood on the farm are interested in ways to stabilize their income. Secondly, depending on how the co-op pools its costs, the large producer may in some sense be subsidizing higher-cost small producers (see below). To the extent this is true, large producers are being overcharged for doing business with the cooperative.

This problem of cross-subsidies and the desire by some groups to institute differential pricing has been and will undoubtedly continue to be an area of contention among cooperative membership. Faulbauer addresses the cross-subsidy issue in relation to public utilities. He states that a set of prices are subsidy-free if they provide no group with the incentive to break away from the joint utility and establish its own system. Within a cooperative context, cross-subsidies exist if a particular group pays more for a product or service than they would if they could obtain it cheaper by purchasing elsewhere, or by forming their own group (Staatz, 1984, p. 238). This is precisely the charge made by large producers and they use it as an argument to institute differential pricing.

Differential pricing introduces another dilemma for cooperatives and it involves distinguishing between two types of costs: (1) the direct attributable costs of

serving a particular type of client, and (2) the attribution of indirect fixed costs like plant and equipment. Schmid notes that any firm with a certain capacity and high fixed costs (relative to total costs) will have incentive to charge different prices to different groups of consumers in order to expand capacity. The problem of differential pricing is how to distinguish between the intramarginal and extramarginal producer. The crux of the problem is illuminated by Schmid:

Where marginal costs are falling, every consumer wants to be the last one on the plane or into the theater or hotel to pay only the marginal cost while the intramarginal consumers pay the fixed costs among themselves. But it is the system of property rights that determines who is the likely marginal consumer. From a profit standpoint, the producer may be indifferent toward young or old, black or white, and will charge among them on the basis of administrative convenience. But if the producer accommodates another of his tastes (we often call them prejudices), the situation is ripe for discrimination (Schmid, 1987).

Under current rules of competition, those with more market options can capture more benefits. This begs the question of whether we need economy-wide rules to enforce different distributive rules? In their absence, the incentive for cooperatives to differentiate prices is largely determined by what their competitors (IOFs) do and how this ultimately influences member behavior.

The ability to exercise control is the other concern of these two classes of disaffected members. Many cooperatives have board of directors that are dominated by older members. This can have two effects. First, one can assume that legislated policy will tend to favor the dominant group. Second, younger members will never feel as much a "part of the co-op" if their voice is not heard adequately. This has implications for the type of ideology (loyalty vs. disloyalty) that the member develops. Having a sense of belonging may increase members' ideological commitment to the co-op and hence the perceptions of the benefits derived from it.

Large members are confronted with a similar situation, in which many of their needs are not met because of the voting superiority of the smaller members. Even large, loyal members may become disenchanted with the co-op if this treatment persists.

B. Conclusions and Recommendations

A growing number of disaffected members is indicative of some fundamental problems facing farm supply cooperatives. These problems are of two types: (1) Unacceptable performance of many cooperatives and difficult times in agriculture have brought to the fore a previously dormant competitive ideology among cooperative members. (2) Failure to reconcile a divergence in membership needs

and the growing market alternatives available to many members is lowering the "loyalty tolerance" of patron-owners to their cooperative. In the event these problems are not addressed satisfactorily, cooperatives can expect this erosion of member commitment to continue and accelerate as their performance declines. In light of this, the following recommendations are made:

1) Institute viable equity investment programs. Equity investment according to use is not effectively implemented. There are too many under- or over-invested members, which may discourage patronage by both new and existing entrants. In other words, because cooperatives use retained patronage refunds as a major source of equity, failure to redeem them in a timely fashion could discourage future investments. Regionals need to adopt an effective program, like a base capital plan, that will better align investment with use of the co-op (proportionality).

Secondly, regional firms especially should implement some form of direct, front-end investment based on proportionality. It is an accepted tenet among many cooperative participants that member loyalty is positively correlated with their level of investment. Direct investments will benefit the cooperative in two other related ways: (a) by improving the firm's balance sheet, and (b) by raising the "entrance fee," members will be

discouraged from the practice of joining more than one cooperative. One would anticipate, however, that instituting direct investments could be difficult to implement. While it may be in the interest of all cooperatives to do this, each association faces individual incentives to keep up-front fees low in order to attract new members. Absent a merger or consolidation, instituting direct investments may not be feasible. However, part of the solution lies in the perceptions of the benefits that could be derived from this practice. If the perceived payoff is sufficiently large, it may not be too difficult for regional firms to agree on a uniform fee because of the small numbers involved. This type of cooperation at the local level where numerous firms are included could make success more problematic.

Third, regional and local firms need a more reliable mechanism for generating equity capital like per-unit capital retains that are used by marketing co-ops. By removing a fixed margin from each unit sold (unit tax), proportionality would also be guaranteed. Implementing this method may necessitate a reduction in net margins but, if it stabilizes the flow of equity capital and enhances the co-ops ability to revolve equity, this practice could improve the long-run performance of the association.

Finally, regionals that have greater capital requirements than local firms, may be motivated to

complement these mechanisms with alternative options for generating capital, such as creating subsidiaries and selling tradable stock. An ongoing concern, however, is the extent to which this practice could compromise the principles that distinguish cooperatives from investor-owned firms. Cooperative decision makers should use this mechanism with caution recognizing that generating capital from within the system is still the mainstay for the cooperative institution.

2. Implement systematic equity redemption programs.

Cobia, et al. found that nearly one-third of sample cooperatives had no equity redemption program whatsoever and that 39 percent did not have a systematic program (p. 4). These findings were consistent with cooperatives interviewed in this study. The important point is that unfair redemption practices are undermining the credibility of cooperatives. A viable equity investment program is wholly contingent on an attractive equity redemption program, at both the regional and local levels. Members will be encouraged to invest in their association if their investment is returned to them at a reasonable future date.

3.) Acknowledge the rights and contributions of large members. Cooperatives need to confront directly the large-member issue before it is too late (prior to defection).

This involves addressing differential pricing and voting policies that take into account a member's patronage and investment (i.e., his or her economic worth to the association).

4.) Determine ways to involve young and other disillusioned members. Many older members exhibit strong loyalty traits to their cooperative because they participated in its formation. This facilitates a member's identification with his or her co-op. Some general managers have recognized this problem and are using young members to devise programs that will encourage participation from disaffected members. This practice should be examined in greater detail with efforts to enhance its potential for inculcating cooperative loyalty to members. Regional firms in particular should take a leadership role in program development.

8.22 The Forward Contract Mechanism

A. Major Findings

Forward contracting for inputs is largely limited to those exhibiting general purpose or moderately specialized characteristics. Asset-specific inputs and their implications for forward contracting will be discussed in the following section.

Benefits of forward contracting are apparent at each of

the four major economic stages of the input system. Manufacturers are better able to achieve their goal of cost minimization by covering fixed costs and smoothing out production runs. Wholesalers and retailers benefit through enhanced logistical coordination. Forward contracting facilitates the quick and efficient movement of supplies by utilizing cost effective transportation methods. Secondly, it affords the strategic positioning of supplies in the event a crop season begins early. Finally, forward contracting reduces price risk when distributors "blend" contract supplies with spot purchases. Farmers benefit directly from forward contracting through a more efficiently run cooperative system that should lead to lower prices; indirectly they gain through a better performing firm that has more capacity of ensuring the safety of member investments. Currently the major incentive for farmers to forward contract for fertilizer lies in the low price and discount premium. This incentive, however, may be different for inputs with more asset-specific characteristics. Also, if conjectures by some industry leaders are correct that farmer margins will continue to narrow,¹ then forward contracting as a risk management tool could increase in importance.

¹Most case study respondents believe this phenomenon is occurring. Additional opinions asserting this view were found in the literature search (Hopkin and Associates; Goldberg), although this study has no empirical evidence to support the contention.

There are obstacles to forward contracting as well. The two most significant impediments are output and input price risk and problems associated with contract enforcement. Apparently, there is great deal of latitude in how these contracts are enforced. In spite of this assertion, it is interesting to note that both regional and local respondents stated that contract compliance was not a problem with members who participated.

B. Conclusions and Recommendations

A number of conclusions surface with regard to forward contracting as a mechanism for exchange and the cooperative institution. First, because of the ownership relation between customer and firm, cooperatives could possibly implement this mechanism at less cost and risk than their IOF counterparts. In other words, because members are also owners, they should be less inclined to act opportunistically against their cooperative. This implies that the transaction costs associated with drafting, enforcing, and monitoring the contracts would be less for cooperative firms.

A second point is that, from a systems perspective, farmers remain the critical link to forward contracting, but they only imperfectly utilize it. Part of this is explained by farmers' perceptions of the mechanism itself. An over-riding concern of uncertainty, especially from

weather, government or the demand patterns of consumers is a major source of reluctance to forward commit. Indeed, if weather or the government were the only source of uncertainty, there would be little that could be done to improve the situation apart from developing disease resistance strains and improving our weather forecasting abilities. It is important to recognize that the food system is comprised of an input and an output component, and that decisions at one end of the system will eventually reverberate back to the other. For farmers, many of the decisions by consumers constitutes a formidable uncertainty. Hence, locking into a rigid contract is considered a risky endeavor since this limits one's ability to respond to future events. Another important element is that, due to the benefit and cost relationship of large versus small purchases, forward contracts are designed more for large farmers. But large farmers often constitute the majority of sales for local firms. From a local perspective, it makes sense to concentrate on implementing attractive and efficacious contracts with this class of members since per-unit costs would be low relative to other members. One might conclude that there are sound economic reasons why forward contracting is only "imperfectly implemented"--because it is best suited for large patrons and not worth the time of others.

A third conclusion is that it is probably undesirable

for a regional manufacturer to implement forward contracting on a comprehensive scale. These firms may have a goal of cost-minimization, but they also have a need for sizable net margins to improve their equity capital position. By forward contracting only enough to cover fixed costs, manufacturers reduce production risks but, at the same time, increase their net margins if spot prices rise at the advent of the planting season.² It is therefore plausible that manufacturers have substantial incentive to restrict the application of the forward contract mechanism. A fourth conclusion is that forward contracting by farmers for asset-specific agricultural inputs is undesirable. This is not surprising even though it appears to contradict a major premise of transaction cost economics. In fact it does not. Because of the presence of use-risk, the end-user needs as much operating flexibility as possible. Spot purchases afford this flexibility. Farmers have instituted specialized arrangements for asset-specific inputs and they have implemented it through their cooperative. This is because use-risk is most acute at the farmer-level. This constraint is relaxed as one moves up the vertical system. As a consequence, it makes a great deal of sense for the

²With the fertilizer data examined in this study, prices rose in five out of six years between November and March. In one of these years prices nearly doubled the previous three years. In this situation, the price increase more than offsets the cost of storage for this period.

input to be strategically positioned higher in the system where it can be moved readily "as needed."

Since respondents generally agreed that forward contracting for inputs offers appreciable net benefits to all participants in the system, cooperatives should examine this mechanism in greater detail and determine how it might be optimally employed. Current application is not really geared towards a systems approach, where it is uniformly implemented through the system. Co-ops need to target (if they have not already done so) the group best suited for this mechanism (large members) and then institute it systematically and uniformly throughout the system. Given that cooperatives may be able to implement forward contracting at less cost than IOFs, this should be an additional incentive to endorse a comprehensive evaluation of the mechanism for farm inputs.

8.22 Farm Inputs and Asset-Specificity

A. Major Findings

Agricultural inputs are becoming increasingly specialized and this is complicating the coordination process from the manufacturer down to the final end-user (the farmer). The major cause of the problem is diminishing fungibility in terms of (a) the substitute uses of the input, (b) the input's use-period, and (c) the input's geographic substitutability. The effect is a

growing segmentation of factor markets. Manufacturers must make production decisions based on demand within each differentiated market. Distributors face logistical coordination problems--knowing when, where, and how much of each input to locate in the various markets. With asset-specific inputs, the closer one gets to the end-user, the greater the use-risk the individual faces. Farmers have responded by shifting this risk upwards in the vertical system. Local and regional co-ops have behaved similarly. Farmers have acted rationally by shifting this risk and accepting subsequent higher prices for these inputs. From a coordination standpoint, this practice does raise system costs. Given the alternative (substantial probability of non-use), however, it appears to be sensible behavior. This is justified in that redistribution opportunities increase as one moves upward in the system. Hence, even though farmers have transferred this risk elsewhere in the system, this practice mitigates the effect of non-substitutability by positioning the input where it has a greater likelihood of being redeployed if an unforeseen event materializes.

B. Conclusions and Recommendations

The cooperative system has responded well to the effects of asset-specific inputs. Manufacturers and regional cooperatives have developed formalized

arrangements for dealing with these inputs. Both manufacturer and distributor have something to offer. The manufacturer provides the specialized input and, since it maintains ownership of the product, accepts the ultimate risk of non-use. This risk is compensated for through higher factor prices. On the other hand, regional firms face little risk (they share some of the safety risk in handling the product), but they carry out a key economic function by making the input available to the farmer. Also, to ensure that logistical mistakes are minimized, manufacturers and regional cooperatives exchange market information.

Farmers are making rational decisions by delaying their purchases of asset-specific inputs. Even though this behavior means higher prices because of more costly distribution mechanisms (like the "redball express" that delivers a product within twenty-four hours), they minimize the probability of non-use. Further, because of the increasing precision required in the application of specialized inputs and their greater safety risks, farmers have responded by utilizing custom diagnostic and application services. This is also a rational decision in that "experts" who possess the technical expertise and who have access to costly and specialized application equipment are better qualified to carry out this increasingly complex task. Finally, this behavior is consistent with

Williamson's hypothesis regarding asset-specific inputs-- that specialized exchange arrangements will supplant the spot market as a preferred medium of exchange when idiosyncratic investments are involved. Farmers have instituted these specialized arrangements through the regional cooperatives they own.

Even though farmers have adapted well to the effects of specialized inputs, they have done so imperfectly. Cooperative federations do not represent a "unified coalition." The potential gains that cooperatives could obtain through market power are mitigated by uncommitted behavior of members. In other words, disloyal members give IOFs opportunities to undermine farmer cooperatives by selling directly to members. This may be justified for the class of patrons who are large enough to warrant this circumvention practice. Indeed, it is recommended that cooperatives participate actively as a "facilitator" for these members. But certainly all disloyal members do not fall within this category. Cooperatives must improve their performance through more proficient management and higher quality services to attract disaffected members back to the fold. Depending on how the cooperative is managed, they should be in a more consolidated position to bargain effectively with highly concentrated input manufacturers. In the end farmers could benefit from this cooperative effort.

The second aspect is that many of the programs offered by manufacturers are not passed on in a systematic fashion. Even though regional firms have access to special programs like price protection and buy-back options, these are not passed on to all local cooperatives. Similarly, local firms have unsystematically administered these programs to farmer members. Not only would a more comprehensive application of these programs increase the regionals bargaining position through greater sales, more farmers would benefit through lower prices and actual use of the program. By implementing these programs through the cooperative institution, member loyalty could be enhanced.

8.3 Horizontal Coordination Issues

8.31 Pre-reorganization Impediments

Three factors have been identified as being the major impediments to greater inter-cooperative cooperation: economic necessity, vested interests of individuals in positions of power, and the competitive ideology that permeates the cooperative institution. In spite of these hindrances, respondents affirmed strongly that more cooperation through joint ventures and reorganization through merger or consolidation is a necessity. The problem is, how to achieve it? Two conclusions immediately come to mind. The first is that the incentive to cooperate

should ideally be generated from within the system (i.e., not mandated). This will occur if (1) certain leaders within the cooperative institution take it upon themselves to initiate such a program or, (2) in the event they do not, firms that continue to perform poorly will eventually have no recourse but to consider reorganization. The second conclusion is that some acceptable "independent" arbitrator like a financial institution (e.g., the Bank of Cooperatives) may be needed to facilitate the reorganization. One would anticipate a certain degree of resistance to an outside authority intervening in the affairs of members; however, given the urgency of many cooperatives to restructure and the obstacles that prevent the restructuring, this option may not be unrealistic. For recalcitrant firms that are experiencing financial duress, the primary lending institution (which is probably the Bank of Cooperatives) may have to provide some form of gentle nudging. Simply put, the alternatives for many firms are fast running out and some sort of positive action should be implemented before its too late.

A third conclusion is that the resurgence of the competitive ideology and the development of "area management councils" suggest that reorganizing may need to be linked to improved monitoring and member control mechanisms to ensure an acceptable level of performance. One possibility would be to utilize a committee analogous

to the area manager council in which locals, which have a direct interest in regional performance, would monitor co-op performance. A second alternative would be to adopt the practice of some European cooperatives that attach a subsidiary firm to their major businesses and where tradable stock is available to the public. In this situation, stock values would be a gauge for firm performance, just as they are currently for IOFs. Cooperatives need to be sensitive to the consequences of this action (on the nature of the institution) and do so only if another more feasible control mechanism cannot be found.

8.32 Post-reorganization Impediments

Cooperative joint ventures, while a step in the right direction, only imperfectly address the competitive dilemma. This is due in part to the structural relationships that exist not only between parent firms but also between the parent firms and the joint venture. The second reason is that as long as members belong to more than one cooperative there will always be incentives for each firm to try and capture 100 percent of the members' business.

If co-ops continue to pursue joint ventures, then they need to address both inter- and intra-firm competition. Forming a joint venture for purposes of gaining certain

efficiencies makes little sense if participating firms end up creating more inefficiencies in the process. To address intra-firm competition (inter-divisional competition), federated cooperatives should begin considering more centralized decision control that coordinates functions and activities across divisions. Similarly, inter-firm competition could be ameliorated by instituting a centralized decision making body that would be responsible for eliminating competition in the areas (product lines) circumscribed by the joint venture. This would necessitate defining, in very succinct terms, the activities and functions of each firm.

Perhaps the single greatest hindrance to reorganized firms is the failure to dispose of redundant assets, *ex post*. There are two reasons why this outcome might materialize. First, in spite of a possible feasibility study identifying the costs and benefits of reorganization, the participating firms failed to agree, *ex ante*, on who would dispose of what. Participating firms, for instance, may be frustrated from the negotiating process and agree only in principle to dispose of redundant assets. This is an easy way out that may facilitate the restructuring but do so at the expense of performance, *ex post*. Second, even if they did agree, they failed to institute a binding commitment to ensure that disposal would occur. If both of these are carried out, the reorganization could perform as

anticipated. Given the vested interests that are inherent in these situations, it may be necessary to employ a third party arbitrator, preferably one with a financial background, to facilitate the implementation of the restructuring.

8.4 Future Research

At this juncture it is helpful to consider what aspects of the research are worth pursuing and developing in a more complete fashion. At the beginning of this chapter it was stated that this study is largely an exploratory effort in which some hypotheses were tested and others formed. In other words, a first step in research is to form some credible hypotheses concerning the subject matter one is studying. This necessitates implementing an analysis in which breadth of understanding (obtained from a large sample) is superseded by depth. A case-study approach is useful in this regard. But because the sample is extremely small, the generalizability of the research findings is really unknown. In this sense, research findings from a case study should be kept in perspective. A logical next step is to take the "credible hypotheses" and subject them to empirical testing through implementation of a broader-based survey, perhaps utilizing a mail questionnaire. In the case of this research, some of the findings and conclusions under both vertical and horizontal dimensions

could use additional testing (i.e., those highlighted in the sections above). More precise recommendations are now discussed.

1. Micro-micro issues. This research emphasized micro and macro aspects to coordination, with little attention directed at intra-firm problems. In spite of this, intra-firm problems surfaced in the research process. One senior manager of a regional firm noted that internal management inefficiencies were as much a problem for cooperative performance as were inter-firm problems. This became an oft-repeated concern among regional and local respondents alike. An entire research project could be undertaken on micro-micro issues that affect cooperative firm performance.

2. Centralization vs. Decentralization. Early on in the research some attention was given to the organizational structure of cooperatives and the effect this has on coordination and performance. There are tradeoffs involved in each structural form depending on the particular environment the firm is in. Currently, a combination of forces is placing extreme pressure on multi-level cooperative systems to reduce costs and strengthen coordination and controls within the systems. This was extremely apparent in this research. Recognizing their

problems, federated cooperatives have begun employing mechanisms to increase control over product flow through the system. But this is only a partial solution. The critical structural issue facing federated cooperatives is how to design the least-cost system for serving farmers' needs. Centralization and decentralization lie at the heart of these questions. For instance, circumvention is a growing practice by large farmers and super-locals, and there are good economic reasons to do so. Federated cooperatives must face this issue recognizing that, if they wish to keep the large member in the federation, the cooperative system must develop mechanisms to deal with it effectively. But within most current federated structures, circumvention has a detrimental affect on the local or regional firm that is by-passed. In a centralized system, this effect would not be felt at the intermediate marketing stages since ownership and control are from the top down. Hence, these types of issues warrant further investigation.

3. Forward Contracting for Inputs. This is an important activity of many cooperatives and IOF's and it should be examined in greater detail. One need is to ascertain the extent to which forward contracting for inputs is used within the input industry and how and in what ways do the terms of the contract differ.

In terms of the mean-variance model developed for this

research, it could also benefit from a few modifications. First of all, it would be useful to obtain more extensive contract data from various firms and for a longer time period. This is necessary to achieve a better understanding of the relationship between spot and forward prices. Secondly, the model should be applied to different inputs to determine how contract decisions differ across inputs. Third, it would be useful to employ a production function that exhibits some degree of diminishing returns and evaluate the affect on the forward contract ratio and an individual's risk preference function.

4. Exchange Arrangements. This study considered how the nature of transactions change with the specificity of the input. But the sample was small and most of the respondents had incomplete knowledge regarding some of the finer details of specialized inputs and the transactions that attend them. An in-depth analysis should uncover some interesting results. Findings from this research lay credence to the growing importance and role of asset-specific inputs in U.S. agriculture, but little information is written on them. More research is needed in this area.

APPENDIX

Cooperative Questionnaire

For questions ending with an underline (____), use the following scale to show how much you agree or disagree with the statements. Address all other statements as indicated.

1= Strongly agree; 2= Agree; 3= Neutral; 4= Disagree; 5= Strongly disagree

I--MICRO ISSUES

I. Problem: Commitment and Vertical Coordination

I.A. Patronage Issues

1. Farmer commitment to locals: Compared to 10 years ago, farmers "shop around more" prior to buying inputs i.e., less loyal _____

2. If yes, who are their major (alternative) suppliers? Classify generally--other co-op; IOF; etc.

3. Local commitment to regional: compared to 10 years ago, locals also shop around more--less loyalty? _____

4. If yes, who are their major (alternative) suppliers?

I.B. Capitalization Issues --how much do you agree or disagree

1. In the co-op system, equity levels are inadequate because many P-Os are underinvested in their co-op. _____

2. A policy of EI proportional to patronage is needed. _____

3. Investment policies are often misdirected e.g., used to purchase (duplicate) facilities or equipment in the spirit of competition. _____

4. Equity redemption programs are often non-systematic or unrealistic for P-O. _____

5. Identify other serious capitalization problems.

II. Coordination Effects from Lack of Commitment

1. Patronage commitment: When p-o "shop around" for their inputs (rather than being a steady customer), how does this affect the operations and performance of your co-op?
2. How does this behavior affect the performance of the larger co-op system e.g., uncertain demand and the coordination of (R-L-F)?
3. Financial issues: If equity management is a problem, how does this affect the performance of your co-op?
4. How does this affect the coordination and performance of larger co-op system?

III. Probable Causes for Participant Behavior

III.A. Structure of Incentives.

1. Why are some farmers more committed to their cooperative than others viz a viz patronage?
2. Why are some locals more committed to their regional than others viz a viz patronage?
3. Why are equity capital levels too low in many local co-ops?
4. Why are equity capital levels too low at the regional level?

III. B. Patron-Owner Heterogeneity (Ag. Specialization)

1. Farmers are becoming more diverse by size and performance? _____
2. As membership becomes more diversified, how does this affect the task of carrying out the co-ops functions i.e., within your firm and at the system level (R-L-F)?
3. Are co-ops better suited for dealing with problems associated with diverse membership than IOFs? Y N
In what ways?

III.C Asset Fixity and Uncertainty

III.C.1 Input Fungability and Management Practices

1. The costs and risks associated with AS inputs differ importantly from GP inputs _____

2. Do any of the following categories differ for AS versus GP inputs? If they do, explain.

- a) The planning process _____
- b) Production decisions (more/less risk averse) _____
- c) Exchange arrangements (spot vs relational) _____
- d) Handling practices & marketing strategies _____
- e) Other _____

3. For the following, which inputs can be classified under one or more of the "fungability" categories.

INPUT	GP	MED	AS
1. Petroleum (oil, gas)			
2. Ag Chemicals-----			
a) Insecticide			
b) Herbicide			
c) Fungicide			
3. Fertilizer-----			
a) Nitrogen			
b) Potassium			
c) Phosphorous			
4. Feed-----			
a) Complete feeds			
b) Supplements			
c) Premixes			
5. Seed-----			
a) New Varieties			
b) Other			

C.2 Asset Specificity and Risk

1. In your opinion, what are the types of risks and costs farmers face with the purchase of AS inputs?

2. Identify the risks and costs locals face with the purchase and sale of AS inputs.

3. Regional only-- do you manufacture AS inputs? Y N

4. What are the risks and costs regionals face with the (production) and sale of AS inputs.

C.3 Fungability and Coordination

1. Matching preferences. As agriculture and farm inputs become more specialized, how does this affect the task of estimating demand for specific inputs, at the M; W; R; F levels?

2. Coordinating economic stages. How has increasing specialization of farm inputs affected the task of manufacturing, distributing, and marketing these products i.e., within and across M-W-R-F?

3. Are co-ops (potentially) better suited for handling these AS inputs than IOFs? Explain

IV. PROBABLE EFFECTS OF FORWARD CONTRACTING

1. If you forward contract for inputs, what are your reasons?

2. If you do not FC for inputs, why not?

3. Forward contracting--what are the current costs and risks to

- a) farmers
- b) locals
- c) regionals (or manufacturers)

4. Consider (R-L-F); who gains the most from FC and why?

5. Among (R-L-F), who would potentially lose the most and why?

6. In what ways does/would FC improve co-op system performance?

7. Local (only): Could you identify some ways to improve current FC for inputs, that is, what changes should be made to make it attractive to you?

8. Because of their unique ownership characteristic, are cooperatives better suited for FC than IOF (e.g. spec. coord)?

9. REGIONAL (only): Specify the important dimensions of FC that are critical to the success of this exchange mechanism e.g., proportion of total sales; min. number months advance commitment; payment terms, etc.

10. Are there opportunities other than FC that might promote better "cooperation" between locals and their regional?

II--MACRO COORDINATION

I. An Ex Ante Condition--the Process of Coordination

1. From your experience, why isn't there more cooperation among local co-ops? What is the driving force (incentives) behind this competitive behavior?
2. More cooperation among regionals?
3. How important are vested interests in determining the likelihood of an M, C, or JV?
4. How critical is the need for more cooperation at the local and regional levels i.e., what are the potential consequences to the cooperative system from lack of better horizontal coordination?

II. An Ex Post Condition--the state of coordination

1. Some co-ops that form a "partnership" later compete against one another within this new organization. Why?
2. What are the critical dimensions to a "successful" partnership arrangement, like a JV?
3. Consider M or C.-- To what extent do you agree or disagree with the following statements:
 - a) in the negotiating process, competing groups "argue away" the integrity of the original plan _____
 - b) once the reorganization is in place, certain groups resist disposal of redundant assets or personnel. _____
 - c) over concern for equal representation, the BOD is top-heavy, impairing the decision making process _____
 - d) other _____
4. Can anything be done to change this behavior?
5. Do you believe that local cooperatives should be accountable at the system (regional) level for the external consequences of their actions? Y N If so, how?
6. What else can be done to reduce harmful co-op competition?

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