

CO-OPERATIVES AND FARMERS  
IN THE NEW AGRICULTURE



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Centre for the Study of Co-operatives  
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## INTRODUCTION

**A**GRICULTURE IS CHANGING, so much so that for many farmers it is no longer recognizable. There are many facets of this change. Computers, for instance, are increasingly used, not just for keeping farm records or for accessing marketing opportunities, but as part of the new monitoring equipment that is more and more essential to the machinery used by farmers. There is a greater range of crops to grow, some of which are the product of genetic modification, and specialized chemicals exist to deal with a wide range of pests. Food safety, identity preservation, and property rights issues are increasingly prominent components of agricultural production. Marketing has also taken on greater importance, arguably becoming the most important role carried out by the farmer. Marketing options for many crops and livestock products have proliferated and are increasingly complex, linked as they often are to input use, quality attributes, and/or contract terms.

In addition to changing the manner in which farming is carried out, the transformation underway in agriculture has changed farmers' relationships with the rest of the agricultural and food industry. The major component of this change is an increasing interdependence of the farm production sector with the rest of the supply chain, an interdependence that is reflected in the trend towards closer vertical co-ordination in the agri-food industry (Hobbs and Young 2001). This trend is illustrated by the increased use of contracts, which govern such things as the type of agricultural commodities produced, the manner in which production occurs, the timing of production, and the timing of marketing.

A key reason for this greater vertical co-ordination is a concern over quality. Examples abound in the industry. Biotechnology advancements, for instance, have led to the development of new, closely co-ordinated supply chains for identity-preserved products such as

high-oil corn and high-oleic soybeans (Hobbs and Young). To meet stringent quality standards and retain their customer base, Warburton's Ltd., a family owned British bakery, created a supply-chain partnership to guarantee product quality (Kennett et al. 1998). In the pork and beef industries, processors are increasingly concerned about product quality and consistency (Lawrence et al. 2001).

The Agricultural Policy Framework (APF) set out by the federal government reflects these changes (Agriculture and Agri-Food Canada). The APF advocates a competitive advantage for Canadian agriculture through the production of safe food in an environmentally sustainable manner, through improved product quality that meets market specifications, and through agri-food value chain innovations. The APF will have significant production and marketing implications for farmers. The adoption of food safety and quality programs, including tracking and tracing, throughout the food supply chain will require compliance with on-farm safety programs and environmental plans. As primary suppliers to the food industry, farmers will incur increased risk and liability. They will be required to adopt and bear the cost of new farming practices and management systems (e.g., reducing the risks of water and soil contamination by adopting different methods for waste management and crop treatment). They will also have to deal with technological innovations, such as patent rights and identity preservation, which are advocated in the APF.

The purpose of this paper is to explore the implications of these changes in the agri-food system for farmers and agricultural co-operatives. The structure of the paper is as follows. The next section outlines the transformation that is underway in the food and agricultural system, and provides details on the changes that are taking place in the grain and livestock sectors. The paper then considers the impact of these changes on farmers and on agricultural co-operatives. In examining the impact on co-operatives, two issues are analyzed in some detail—the greater interdependence of farmers with other players in the food system and the increased emphasis on quality. The paper concludes with a short discussion.

## THE TRANSFORMATION OF THE AGRICULTURE AND FOOD SYSTEM

**A**GRICULTURE AND THE FOOD SYSTEM are in the process of a major transformation. Table 1 shows a comparison of traditional agriculture with the “new” agriculture. Key elements of this transformation are that markets are less commodity driven and more product driven; production is more capital intensive; decisions made by firms at all levels of the market are increasingly interdependent; price and production risks are replaced with risks surrounding relationships and food health and safety; and information becomes a prime source of control and power. These changes are resulting in increased vertical co-ordination and integration; in addition, firms are more and more being asked to deliver products of a consistent quality at an appropriate time (Boehlje 1996).

The following sections highlight these changes by examining the transformation underway in the North American grains industry and the U.S. and Canadian livestock industries.

**Table 1: Comparison of Traditional Agriculture with the “New” Agriculture**

<b>Traditional Agriculture</b>	<b>“New” Agriculture</b>
• Commodities; spot markets	• Differentiated products; negotiation; contracts
• Farms carry out many activities	• Specialization; separation of production stages
• Product chain stages seen as independent	• Focus on a system; stages seen as interdependent
• Price and production risk	• Relationship risk; food health and safety
• Concerns about monopoly pricing	• Concerns about access to information
• Money and assets prime source of control	• Information as prime source of control

Source: Adapted from Boehlje.

## The North American Grains Industry

In the grains industry, contracting has increased in importance as grain moves from being primarily a bulk commodity to a product that is increasingly differentiated. This differentiation is often the result of biotechnology or advanced breeding methods. Among the new products that have been introduced are insect- and herbicide-resistant corn, soybeans, and canola; high-oil corn; white corn; high-amylose corn; high-oleic soybeans; low-linolenic soybeans; and laurate canola. The introduction of these products has been carried out with some sort of contract between the farmer and either a seed company or a grain-handling firm (Hobbs and Young 2001).

Contracts have also been introduced to segregate certain varieties or certain qualities of grain. Examples include the selection of high-quality grain in the Farmland Industry grain handling system (Hobbs and Young) and the contracting done by Warburton's to ensure a supply of particular wheat varieties (Kennett et al. 1998).

The Warburton's case illustrates a number of characteristics outlined in Table 1. A number of years ago, the company discovered that the quality of its bread—which it sells at a premium—was linked directly to the varieties of grain used in preparing the flour. To ensure an adequate supply of these specific varieties, Warburton's has entered into identity-preserved contracts with the Canadian Wheat Board (CWB) and two elevator companies operating in Manitoba. The companies administer the identity-preserved contracts with the producers.

Contract stipulations include the use of certified seed, the employment of good production practices, and the proper protection and storage of the harvested crop. Producers must keep detailed records on inputs and weather conditions as well as crop-yield information and samples. Because monitoring the contracts and product quality is costly, trust and reputation are important components in the awarding of contracts. Warburton's purchases all grain that meets the required criteria at a \$20-per-tonne premium; the company also pays a CWB surcharge for the additional administrative and logistical costs associated with the identity-preserved contracts (Kennett et al. 1998).

The Warburton's case clearly shows that wheat is no longer a commodity and that prod-

uct quality is important. Different varieties of wheat have different values in the marketplace, with the consequence that decisions made at the farm level now affect the value that can be obtained elsewhere in the system. These different segments are no longer independent. To capture the value that exists in the system, decisions have to be co-ordinated, with contracts used as the co-ordinating mechanism. While contract monitoring is important, trust also plays an important role.

### **The U.S. Livestock Industry**

In the U.S. livestock industry, the changing nature of agriculture is reflected in the dramatic decline in the role of the cash market. Consider first the hog industry. In 1993, 87 percent of slaughtered hogs in the U.S. were purchased in the cash market. By 2000, this number had fallen to 26 percent (Lawrence et al. 2001).

There appear to be a number of motivators for the increased use of long-term marketing contracts. Interestingly, the motivators are quite different for processors than for producers. For processors, the most important factors have been identified as the need to secure a consistent supply of quality hogs and the desire to obtain even higher-quality animals. The ability to ensure food safety was also rated highly, as were reducing plant-operating expenses, reducing the cost of searching for hogs, and reducing supply and price risk. The desire to purchase hogs more cheaply ranked well below considerations of quality (Lawrence et al.

In the beef industry, packers are also moving away from making their purchases on cash markets, although this movement is much slower than with hogs. As of 1999, about two-thirds of the cattle marketed in the U.S. moved through cash markets. Of this total, about 55 percent were purchased on a live basis, with 45 percent purchased on a carcass weight, or grid basis. Thus, while there is still a significant portion of cattle sold at live or carcass weight, there are signs that carcass merit is becoming more important (Lawrence et al.).

For cattle processors, the reasons for entering into marketing contracts and agreements are similar to those expressed by hog processors. The most important reasons are to obtain a higher and more consistent quality of cattle. Improving price management, reducing plant-operating costs, and assuring food safety are also significant. Purchasing cattle at a lower price was not an important factor (Lawrence et al.).

While hog processors have increasingly used contracts to secure their raw product, they

are not currently using contracts for the sale of the processed goods—about 72 percent of pork was sold on the cash market in 1999. This number, however, is expected to change dramatically over the next five years. A number of packers have or are beginning to establish their own branded, fresh-pork merchandising programs, or are setting up arrangements with retailers. The branding of further processed products is already significant and is expected to grow substantially as well. Since branding products requires much higher standards than supplying generic goods, the need for quality and quality control can be expected to increase significantly (Lawrence et al.).

For beef, the situation is quite different. While cash sales to customers are similar to that in the hog industry (in 1999, 70 percent of sales were to the cash market), branded products comprise a much smaller percentage of sales compared to pork (4 percent as opposed to 18 percent respectively). There is expected to be a significant growth, however, in branded products, which in turn will mean a greater reliance on long-term contracts, both with customers and with beef producers (Lawrence et al.).

The growing use of contracts in the livestock industry requires both processors and producers to agree to contract terms. Interestingly, farmer motivation for signing livestock contracts—the impetus is quite similar in the hog and beef industries—is significantly different from that which drives the processor. As Ward et al. (2001) outline, farmers have been signing contracts for a number of reasons, including:

- access to capital—There is growing anecdotal evidence that lenders are requiring some producers to have contracts in order to obtain financing, or to have access to better credit terms.
- growth and expansion—Interestingly, many of the contracts are horizontal—that is, between producers—rather than between a producer and a processor. These contracts represent a way for one producer to expand production and alleviate environmental concerns and/or issues around labour availability.
- margin assurance/price risk management
- market assurance—This factor is particularly important in the hog industry, where from time to time producers have been unable to sell their hogs to the processors because of a lack of processor capacity.
- reduced transaction costs—The cost of negotiating price and terms on every animal

sold is very high, particularly for larger producers. Contracts represent one way in which these costs can be reduced.

The extent to which contracts provide higher prices to producers is unknown, but is expected to be rather small. Indeed, there is some evidence that producers are able to negotiate higher cash-market prices than contract prices (Ward et al. 2001). This relative price relationship is consistent with the argument that contracts provide other benefits to producers besides price enhancement, and that farmers are willing to give up some price premium for these additional benefits. Buhr and Smith's (1998) study of the U.S. hog industry suggests that contracts are used by producers to reduce transaction costs, ensure a market for their output, and reduce price risk. With this reduction in risk, however, comes lower returns and limited operational flexibility.

### **The Canadian Livestock Industry**

Detailed information on the changing structure of the Canadian livestock industry is not available (Hobbs and Young 2001). There is evidence to suggest, however, that contracting is not as prevalent in Canada as it is in the U.S. The presence until fairly recently of provincial marketing boards with exclusive marketing rights is in part responsible for the lower level of packer-producer contracting observed in Canada. While contracting is not as prevalent, there is nevertheless recognition in Canada of the growing importance of quality.

In the beef industry, a number of brand-name beef products are beginning to show up on retail shelves, suggesting that the industry is starting to address the need for product differentiation and to cater to the niche markets offering price premiums. The emergence of brand-name products may also be a sign of the inefficiency of the current Canadian grading system. Since the system does not necessarily reflect the qualities that consumers look for in a beef product, a number of processors are attempting to bypass the system by establishing their own brands.

A number of aspects of the beef industry in Canada work against the provision of consistent quality. Grading and sorting occurs at the packer/processor level, while the returns for carcass cuts meeting quality standards that offer a premium are currently earned only at the packer and retail level. Although traceability through the supply chain is currently an objective of the Canadian beef industry, the current national tagging program only extends from

birth to the point of slaughter. This program does not require genetic or production information to be kept on the animals, which makes research on meat quality more difficult. Without this information and without individual carcass grading, it is difficult for feed-lots and producers to participate in the premiums associated with improved meat quality. As a result, there is generally little incentive for producers and feedlots to improve the quality of meat in the cattle they sell. The return for these supply-chain members is strictly dependent on animal weight—they are rewarded only for reduced production costs and increased output. The incentive is such that the producer will look for the genetics and input combination that improves weight gain at the lowest cost, which is not necessarily related to the carcass qualities desired by consumers.

For the producer to incur the additional costs of improved carcass quality, there must be individual carcass grading and a return to the producer for the improvement. One method of achieving this supply-chain co-ordination is through contracting. Since the return to the producer will be based on quality grading, however, he or she will need to trust that the packer will accurately report the grade and provide the appropriate return. Given the concentration at the packer level relative to the number of producers, and the high cost of monitoring the grading of carcass quality, farmers often believe that packers will underreport the grade and keep a higher portion of the return for improved quality. This belief may be part of the reason why producers have not made the investments required to increase quality. Currently, those producers who wish to obtain a premium for meat quality (e.g., organic) are marketing directly to the retail level and performing all of the intermediate supply-chain functions themselves. This behaviour is consistent with the notion that producers lack trust in the ability of the system to reward quality, an issue that is examined in further detail later in the paper.

The discovery of a case of BSE (bovine spongiform encephalopathy), or so-called mad cow disease, in the Canadian cattle herd in the summer of 2003 has further raised the issue of quality. One of the ramifications of the BSE discovery will be increased regulation on cattle production, as well as increased traceability and inspection. The need to effectively and efficiently implement these measures is likely to lead to much greater use of contracts and co-ordination in the industry (Hobbs 2003).

For the hog industry, animal weight and fat level currently determine price. Traceability is not yet possible, and given the current state of the market based on volume production, will not be actively pursued in the foreseeable future. There seems to be little demand for

“organic” or “natural” hog production, and these niche markets are not large enough to warrant the attention of large producers and processors. This would suggest that such markets are likely to be served by smaller producers who are unable to obtain direct contracts with processors, or who are unable to obtain the pricing premiums that come from large-volume deliveries.

## IMPLICATIONS OF THE CHANGING AGRICULTURE FOR FARMERS

THE CHANGING STRUCTURE OF AGRICULTURE has important implications for farmers. The movement towards specialized production and much greater integration with input suppliers or processors means farmers can no longer view themselves as independent. The result is a loss of control over a number of aspects of production. The new agriculture means a new set of risks for farmers. Critical among these risks is that of contract renegotiation. Each of these changes is examined in more depth below.

Integration and interdependence of supply-chain members bring with them a distinct business environment. For a number of traditional and specialty agri-food products, the producer must “shop around” for the best input and marketing deals to a much greater extent than before. The resulting transaction costs of selecting input suppliers, choosing processors, negotiating market terms, and so on, can be considerable. In an attempt to economize on these costs, new organizational forms often arise (Hobbs and Young 2001). Ward et al. (2001) provide the example of how large livestock producers in the U.S. have moved to contracts to reduce these transaction costs.

The increased interdependence of the various sectors in the agricultural system requires that decisions at the farm input level, farm production level, and processing level be co-ordinated—whether it be to achieve economies of scale or to ensure product quality. One way of achieving this co-ordination is through contracting.

As outlined above, contracts provide producers with a number of benefits, including reduced price risk, greater access to financing, and greater market access. Contracts also have their disadvantages, one of the biggest of which is a loss of managerial control (Hennessy and Lawrence 1999; Featherstone and Sherrick 1992). Because of the need to co-ordinate decisions and maintain product quality, agri-business firms are likely to have the power to set production terms. As a result, farmers can expect to increasingly give up control over farm-level production decisions.

Bogetoft and Olesen (2002) provide a number of examples from Denmark of how contracts influence farm-level production decisions. In pea production, the processor chooses the producers with whom to contract, as well as determining the timing of both sowing and harvesting. In the egg industry, contracts give the processor the ability to set flock size and production schedules; producers must also buy their chicks and feed from suppliers approved by the processor. In the fruit industry, contracts allow the processor to set harvest times in order to make the most effective use of limited processing capacity. In the production of special pigs, the processor determines the location of production in order to economize on transportation costs.

With greater contracting, farmers also face new risks, such as the possibility that a processor, for instance, will change the contract terms once farm production has occurred. This risk increases as the assets needed for agricultural production become more and more specific to a particular product.

As assets become more product specific, the producer's investment risk increases. Investment risk is closely linked to the risk of contract renegotiation, which arises when the value of an asset in its next best use is low relative to the cost of acquiring the asset. This asset specificity, as it is called, means that producers' options are reduced, since they cannot easily switch to the production of an alternative product. This reduction in options lowers the producers' bargaining power and makes them more vulnerable to the renegotiation of price or other terms of the contract.

Grading is an important aspect of the contracting process and is one area where renegotiation risk can occur. In many contractual situations, the payment made to producers depends on the grade or quality of the product. Protein content, for instance, is a significant determining factor in the price received for wheat. If grading is difficult and/or costly for the producer to undertake, processors may possess the ability to over- or undergrade, and pro-

ducer awareness of this ability may provide a disincentive to improve product quality.

Asset risk—or renegotiation risk—can be an issue for both producers and the firm with which they contract. A recent study of contracting in the Saskatchewan grain industry, for instance, revealed inconsistency in contract terms, a lack of contract transparency, and a large risk of default on contract terms for both the producer and grain buyer (Martin 2000). Both parties showed a general lack of respect for the terms of the contract and were willing to default on its provisions if it was to their advantage. It is possible that the high cost of litigation relative to the loss incurred by not enforcing the contract may explain why both parties so easily abandoned the terms of the contract. Evidence suggests, however, that where property rights to the seed were at stake, contracts for identity-preserved crops were closely maintained.

In a 1995 paper, Weleschuk and Kerr described contracting in the emerging specialty-crop markets in western Canada. Given the present forms of governance in the industry (ex ante contracting and ex post bargaining), the small-numbers bargaining problem, and the absence of futures contracts, they concluded that there was a disincentive for efficient levels of investment in production in these markets. Producers had little bargaining power due to the limited number of buyers, comparatively large number of sellers, and small individual volumes of product. For producers to realize appropriate returns from diversification into alternate crops and land uses, it is essential to have access to as many buyers as possible.

## THE ROLE OF CO-OPERATIVES IN THE NEW AGRICULTURE

THE NEW AGRICULTURE presents a number of challenges for co-operatives. This section examines two broad challenges for co-ops as they focus on product differentiation and attempt to become more integrated into the agri-food system. One challenge is connected to the new conceptual framework that many observers believe is a key part of the new agriculture. The second concerns the ability of the co-op to successfully contract with farmers for higher-quality products.

## The Conceptual Framework of the New Agriculture

Historically, farmers used co-operatives as a way of addressing the challenges they faced in the traditional agriculture, and the co-ops they formed had the same characteristics as the larger agricultural system of which they were part. As Table 2 shows, traditional co-ops adopted structural features that mirrored those found in the larger agricultural environment.<sup>1</sup> For instance, spot markets and generic commodities characterized traditional agriculture; correspondingly, the traditional co-operative sold generic products to members on demand (i.e., whenever farmers wanted them).

Table 2: Comparison of Traditional Agriculture with Traditional Co-ops

Traditional Agriculture	Traditional Co-ops
<ul style="list-style-type: none"><li>• Commodities; spot markets</li><li>• Farms carry out many activities</li><li>• Product-chain stages seen as independent</li><li>• Price and production risk</li><li>• Concerns about monopoly pricing</li><li>• Money and assets prime source of control</li></ul>	<ul style="list-style-type: none"><li>• Sell generic products to members on demand</li><li>• Multipurpose co-ops serving diverse members</li><li>• Co-ops concentrated near the farm level</li><li>• Major supporters of government price supports</li><li>• “Competitive yardstick”; co-ops source of counter-vailing power</li><li>• Investment in physical capital; little investment in intellectual capital</li></ul>

Historically, farms carried out many activities. Mixed farms were common until roughly thirty years ago, and even specialization—e.g., a move to produce only pigs—meant carrying out multiple functions. In the case of hogs, for instance, the standard model until recently was the farrow-to-finish operation. Co-ops mirrored this multiple activity, serving a diverse membership by offering a wide variety of crop inputs and handling or processing a wide variety of farm products.

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1. The notion that organizations might mirror the larger environment of which they are part is an important element of a contingency view of management. Kast and Rosenzweig (1985) argue that there should be congruence between the organization and its environment. Indeed, they view the primary role of management as the maximization or optimization of this congruence.

Agricultural co-ops are commonly concentrated at the input-supply and first-handler level (Rogers and Marion 1990). This pattern is consistent with a view of the world in which the product-chain stages in agriculture are conceived as independent—precisely the way in which traditional agriculture was viewed. At the farm production level, price and output risk were major concerns, and government addressed these concerns with specifically directed policies, which, typically, co-ops supported strongly.

Finally, traditional agriculture was concerned with market power, derived mostly from the wealth and physical assets of large investor-owned firms. Co-operatives were one of the mechanisms by which greater competition was introduced into the market. Indeed, the co-operative has often been billed as the “competitive yardstick” (Cotterill 1984; Torgerson et al. 1998). To provide countervailing power, co-ops themselves used “bricks and mortar,” investing heavily in storage, handling, and processing facilities.

The new agriculture means a very different operating environment for agricultural co-ops. Table 3 presents the structural elements of the new agriculture and asks the question: What will be the corresponding structure of co-operatives? The answer is that co-operatives will begin to adopt elements such as contracting; they will begin to focus on very specific products; and they will increasingly engage in activities at numerous levels of the supply chain.

**Table 3: Comparison of “New” Agriculture with “New” Co-ops**

“New” Agriculture	“New” Co-ops
• Differentiated products; negotiation; contracts	• Contractual relationship with members
• Specialization; separation of production stages	• Greater specialization; focus on niche products
• Focus on a system; stages seen as interdependent	• Device for farmers to network with rest of system
• Relationship risk; food health and safety	• Vehicle for farmers to avoid relationship risk
• Concerns about access to information	• More attention paid to providing farmers with information
• Information as prime source of control	• More attention paid to using the information farmers possess

These elements have already begun to emerge in the form of New Generation Co-operatives (NGCs). Indeed, the structural form adopted by the NGC appears to be well suited to the new agriculture. The vertical integration inherent in the co-operative form allows for a

systems focus, rather than a focus on each separate link in the chain. And the up-front purchase of delivery shares provides a high degree of commitment by both the co-op and each member, thus reducing concerns about opportunistic behaviour and relationship risk (see McNeill 2001 for a full discussion of this point). In short, NGCs can be seen in part as an evolutionary adaptation to the changing environment of which they are part. NGCs differ from traditional co-ops in precisely those ways that are required to better operate in the new agriculture (see Harris et al. 1996 for the key features of NGCs, and Fulton 2000 for an overview of the differences between traditional co-ops and NGCs).

While the changes that co-operatives will need to make are well known, accomplishing them will not be easy. One important reason is that the characteristics co-operatives will have to adopt (see Table 3) represent significantly different conceptual and philosophical foundations from those that co-ops have traditionally espoused.

This different philosophical foundation can be seen by examining the changes that are currently underway in agriculture and the way in which they have been portrayed. Michael Boehlje, for instance, has argued that agriculture is in the process of industrialization—“the application of modern industrial manufacturing, production, procurement, distribution, and co-ordination concepts to the food and industrial product chain” (Boehlje 1996, 30).

In some ways, the term “industrialization” does capture the changes going on in agriculture. The increased ability of agricultural technology to control the biological processes that are at the heart of agricultural production, for instance, has clearly enabled farms to become more like factories. Viewed in this way, agriculture appears to have come into the industrial age—an age other sectors of the economy entered as long as 150 years ago during the Industrial Revolution.

When the changes underway in agriculture are put into this historical context, however, the term industrialization is not reflective of the transformation. The Industrial Revolution is associated with many things besides the development of factories, including the advent of the electric and internal combustion engines, the rise of a philosophy of reductionism, and the formation of large monopolies in the economy. These other features have long prevailed in agriculture. Indeed, the traditional agriculture described in Table 1 has all the features characteristic of industrialization. Outside the farm production sector, the factory model dominated, particularly in the handling and processing of grain and livestock. The monopoly ownership structure of these factories was one of the impetuses to the formation of co-operatives. The application of the scientific method—with its inherent philosophy of

reductionism—was instrumental in allowing agricultural productivity to increase substantially over the last 150 years. Even at the farm level, the electric and internal combustion engines have long been an extremely important factor in determining the manner in which farm production has been carried out and the nature of farm size.

The degree to which agriculture has long been industrialized can also be discerned by examining some of the structures that have been in use in the industry for the last 100–150 years. Two examples will be presented—the North American land-survey system and the organization of the entire agricultural and food sector.

Both examples are captured diagrammatically by the industrial structure illustrated in Figure 1, which is rigidly hierarchical, with limited connections between the various parts of the system. This is precisely the way in which the sectors of the economy were viewed starting approximately a hundred years ago, when the notion of economic sectors began to arise—be they agriculture, steel, textiles, or petroleum. Each of these sectors was viewed as being made up of a number of subsectors. In the case of agriculture, these sectors included farm production, handling, processing, wholesaling, and retailing. Each of the subsectors was viewed as being relatively independent of the others, as was each sector. While decisions needed to be co-ordinated among subsectors and sectors, this co-ordination could effectively take place through simple market prices.

Figure 1: The Industrial Structure

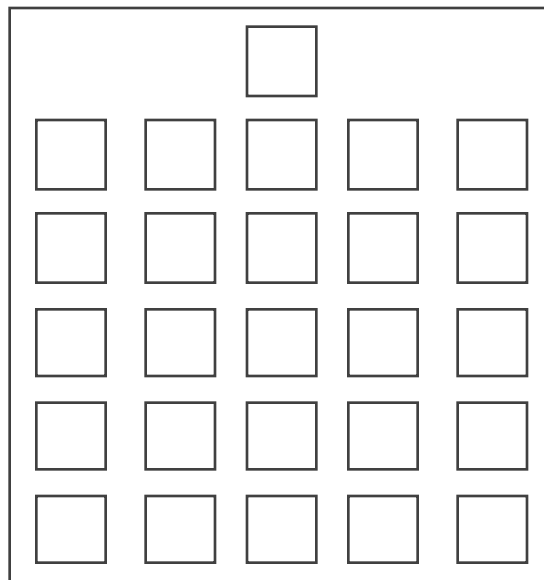
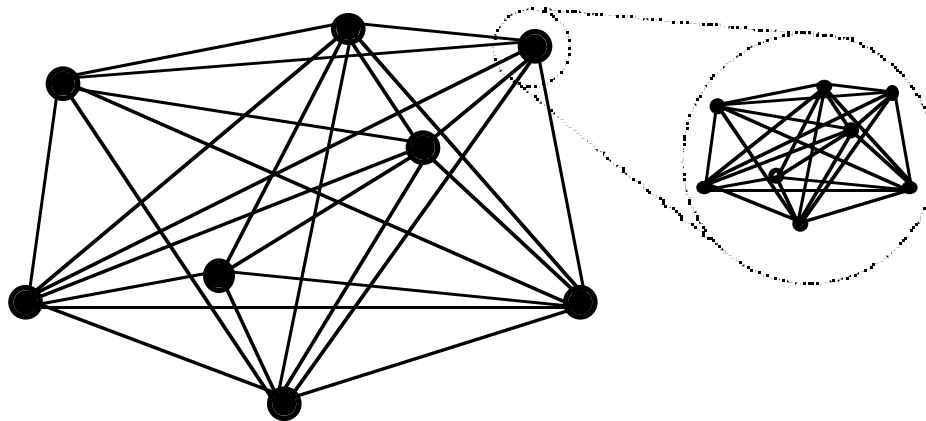


Figure 1 also captures the nature of the North American land-survey system (townships, sections, quarter-sections) devised under Thomas Jefferson's guidance in the 1780s. As Manning (1995) argues, this system closely reflected the notions of enlightenment, rationalism, and abstraction. For Jefferson, this system was both a way of ordering the landscape (without regard to local conditions) and of creating a framework for democracy—the idea of dropping a voting democrat into every little box on the survey chart.

Figure 1, of course, could also represent an organizational chart in a company, a classroom, or the structure of a university—and indeed, the industrial model has heavily influenced all of these structures. The key point is that Figure 1 mirrors the machines upon which the industrial structure is based: each element is a separate link in the chain, without any necessary contact between units, all governed by a single, over-riding management. Philosophically, Figure 1 is built on reductionism—that things can be best understood by taking them apart and examining the components.

This structure, however, is changing. Indeed, in many sectors of the economy it has changed dramatically. The new structure is much more fluid, recognizes both interdependencies and independence, and is built upon a significantly different philosophical and scientific basis. One way of visualizing this new structure is presented in Figure 2, which illustrates a network.

Figure 2: The Network Model



In a network, the individual units are still autonomous, but they have access to other nodes in the network. Networks require co-ordination for their effective operation, since they explicitly recognize and allow for synergies and complementarities, thus replacing the notion of reductionism with that of system analysis. The network is based on a computer, or genetic, model, rather than on that of a machine. It is the interaction of independent agents and actors that gives rise to an outcome.<sup>2</sup>

To see why substantial co-ordination is required to achieve the effective operation of a system organized as a network, consider the Warburton's example presented above. While market prices were an effective way of providing Canadian wheat to Warburton's, market prices alone could not ensure that this wheat would be of the requisite variety. Faced with a single market price, Canadian farmers would produce whichever variety gave them the greatest returns. Some additional elements of co-ordination were required. As outlined above, the use of contracts is one useful means of co-ordinating the activities of the various decision makers in the agricultural system.

Viewed from a larger conceptual perspective, market prices thus provide an effective way to co-ordinate the relatively limited interaction that is required in an industrial system. By themselves, however, prices are insufficient to co-ordinate the decisions that are required in a network, where interactions are important. Specifically, independent action means that each decision maker optimizes his or her own situation without considering the implications for decision makers elsewhere in the system. Thus, in a network model, co-ordination becomes important. However, the need for co-ordination must always be examined relative to the benefits obtained when individual agents in the network are allowed to experiment and act on information to which they alone have access.

The idea that agriculture is becoming a more networked industry has some important implications for farmers and for the co-operatives that they might form. In particular, the rise of a network model requires a change in thinking. Farmers need to contemplate what it means to be part of a network, what they can bring to this structure, and how they can manage the relationships that exist within it.

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2. Potts (1999) provides an overview of how to model and understand the relationships that exist between the various elements or nodes in the network system. Lazzarini, Chaddad, and Cook (2001) apply network analyses to supply chains through an examination of netchains.

### *Network Thinking*

There is some evidence that not all farmers are able to think in terms of networks, and are much more comfortable with the conceptual foundation that underlies the traditional organizational model. This may make it difficult for them to form co-operatives that would be able to successfully operate in the new agriculture. As Michael Boehlje (1996) says:

Farmers have generally been eager to try new hybrids, new chemicals, new tillage practices, new feeding regimes and new equipment, but new ways of doing business have met with more resistance, possibly because they change relationships and frequently substitute interdependence for independence in the decision-making process.

This inability to identify with the philosophy and the organizational structures of the new agriculture was clearly illustrated in presentations made recently to CEOs and board members of New Generation Co-ops in the U.S.<sup>3</sup> When asked which structure—the industrial or the network—they were most comfortable with, and which structure they thought the majority of farmers were most comfortable with, these officials responded as expected. While the NGC leaders identified closely with the network view of the world, their impression was that the average farmer related more easily to the traditional organizational structure. Indeed, the participants believed that this inability to identify with the network model was a major reason why more NGCs were not being formed.

### *Competencies and Uniqueness*

Even when farmers are able to accept the new structure of agriculture and believe that a co-operative organization will allow them to effectively network with the rest of the industry, the issue arises of how they are going to specifically manage their involvement. Goldsmith and Gow (2001) point out that merely acknowledging the requirement of increased linkages with other players in the industry is not a sufficient condition for actually undertaking this greater independence in the form of a producer-owned organization. Before producers invest in such an organization, they must understand the core competencies or capabilities (e.g., knowledge, history, collective learning) that they possess, and must design their organization

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3. Presentation made by Murray Fulton to an NGC executive leadership forum in Minnesota, December 1999.

around them. More specifically, the venture must create some fundamental value and must bring some unique quality to the supply chain. The competencies of the producers must be linked in some way to this uniqueness.<sup>4</sup>

Holmlund and Fulton (1999) echo this point when they note that strategic alliances can be thought of as networks. In successful strategic alliances, all parties must have a strategic intent, and this intent must be linked to the partners' abilities. Partners should know what resources they have and how to make the most of them. Resources that are not being used optimally are brought to the partnership, and those that are lacking, but critical to attaining the strategic vision, are what that party is looking for in an alliance.

### *Relationship Management*

The notion of co-ops and producer-owned organizations as part of a network suggests a change in operational and marketing strategy. As Goldsmith and Gow (2001) point out, relationship management has emerged as an important concept, which begins with the assumption that a relationship is not simply selling a bundle of attributes and services. Within a network, the ability to function properly and to prosper is linked to building relationships and to exchanging knowledge. Thus, relationship management is about market deference. Value is captured not by asserting rights to a particular market, but rather by increasing the size of the "pie" and then benefiting from this larger pie. This strategy can be implemented by exchanging important information and/or by undertaking activities that enable the other party to react more quickly or with greater precision.

Goldsmith and Gow (2001) illustrate the notions of core competencies and relationship management in the example of a small group of Wairarapa farmers in New Zealand, who recognized the need to develop an alternative to the traditional marketing channel in order to provide better economic returns to producers. Based on preliminary research, the group identified a potentially lucrative market and formed a closed co-operative to develop the market and establish an appropriate supply chain. The co-operative's mandate was to collect market-place information and acquire customer and client knowledge that could then be

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4. It is important to stress that the success of new co-operative ventures is also determined by traditional business variables such as the acquisition of sufficient equity, the maintenance of adequate business volume, the maintenance and distribution of accurate financial records, and the experience and continued education of board and management (Bruynis et al. 2001).

disseminated to supply-chain participants. Producers and processors used this strategic market information to deliver product and service attributes that met the needs of consumers and maximized the residual claims of supply-chain members. Rather than investing in traditional hard assets, this co-operative focussed on financial support of both market and supply-chain development. The success of this operation was attributed to the development of a flexible supply chain that could quickly relay timely, accurate consumer information to processors and producers.

### *Trust*

Network models also imply a high degree of trust. As Holmlund and Fulton (1999) point out, in an alliance it is necessary to give up independence and lateral flexibility in decision making. For some people, independent and competitive behaviour seems to be more instinctive than co-operation. Indeed, the market system and our general culture have encouraged independent competition. But the benefits of independence and interdependence are mutually exclusive. To capture the advantages of a strategic alliance, all parties must be prepared to relinquish something. Once a commitment has been made to an alliance, the investment in learning and trust supercedes opportunism.

## CO-OPS, CONTRACTS, CO-ORDINATION, AND QUALITY

AS OUTLINED ABOVE, contracts are an ever-increasing feature in agriculture, a feature that co-operatives will have to embrace if they are to adapt effectively to the new agriculture. As Bogetoft and Olesen (2002) point out, contracts need to address three key features in order to be effective:

- co-ordination—the right products need to be produced at the right time and place;
- motivation—all the parties involved in the contract must have the incentive to make the co-ordinated decision; and

- transaction costs—the co-ordination and motivation must be provided at the lowest possible cost.

Bogetoft and Olesen stress that these features are often in conflict, and that a key element of contracts is thus the manner in which these features are balanced off against each other. This section will examine the extent to which co-operatives are able to address these three features.

### **Co-ordination**

Co-ordinating the actions of many decision makers is likely the most important feature of contracts. The key issue for co-operatives in undertaking co-ordination is that it involves a loss of independence for the farmer members. This may take the form of the processor choosing the producers with whom to contract, the timing of sowing and harvesting, the specific inputs on the farm (e.g., chicks and feed), or the location of production (Bogetoft and Olesen).

Co-operatives have clearly illustrated an ability to introduce these elements into contracts with their members, and co-op members have, in turn, agreed to the terms. Manitoba Pool Elevators, for instance, was the grain company that first introduced the varietal contracts proposed by Warburton's (Kennett et al. 1998), while Farmland Industries has used contracts to source higher-quality milling grain (Hobbs and Young 2001). Bogetoft and Olesen outline a number of Danish co-operatives that are effectively using the co-ordination aspects of contracts. Examples include Danish Crown, which imposes restrictions on where special pig production can be located; Danaeg, which sets production schedules and can order the mandatory reduction of flocks; and DLF-Trifolium, which controls supply by limiting seeded acreage of grass and clover. Danish hog-processing co-operatives are also examining the introduction of codes of practice to ensure that all animals are produced within certain guidelines.

While some co-operatives have successfully introduced aspects of co-ordination into member contracts, not all appear able to make this move. A key issue may be the perception that farmers have of their role as independent actors in the agri-food system. Given this long-held view, accepting the necessity for co-ordination is likely to be difficult.

It will also be problematic if the co-operative does not have a history of open and trans-

parent dealings with its members. As outlined earlier, participants in network systems require a much higher degree of trust than their counterparts in industrial systems. Co-op members are more likely to develop trust in their organization if it has repeatedly demonstrated an ability to act as their effective agent. Factors associated with being an effective agent include greater member homogeneity, better-defined property rights, and governance structures that are more transparent and responsive and less subject to manipulation by member subgroups or by management (Fulton and Giannakas 2001; Fulton and Gibbings 2000).

### **Motivation**

Three key problems must be addressed when examining motivational issues in contracts—adverse selection, moral hazard, and contract incompleteness. In the context of contracts with producers, adverse selection would occur where farmers have differing abilities to produce the goods desired by the processor (e.g., products of high quality). The difficulty with adverse selection is to ensure that the farmers signing the contract have the greatest ability to produce the high-quality products.

Moral hazard arises in situations where farmers are able to exert different amounts of effort, which in turn determines the likelihood of producing the product desired by the processor. The problem here is to design a contract that provides farmers with the incentive to exert the appropriate effort and thus increase the likelihood of, for instance, producing a high-quality good.

Finally, contract incompleteness may become a problem where one of the parties to the contract has invested in a relatively specific asset (recall the earlier discussion about asset specificity). Since specific assets imply fewer options for the person who invested in the asset, the concern is that under some conditions the terms of the contract might be renegotiated. Since all contracts are incomplete—i.e., there are invariably situations not specified in the contract—there is always the possibility that one or more of the terms could be renegotiated.

The remainder of this section examines the strengths and weaknesses of co-operatives in dealing with these three contract issues. It concludes that co-ops may face greater obstacles than for-profit firms (FPFs) in dealing with adverse selection problems, but that co-ops may be better suited to deal with problems of incomplete contracts. Moral hazard issues do not

appear to pose any particular difficulties for co-ops, although the structure of the organization may have to change in order to deal with them.

### *Co-operatives and Adverse Selection*

To deal with the problem of adverse selection, contracts have to be designed so that farmers are screened in some way—whether it is by collecting information on them or by offering contracts that are only acceptable to certain types of individuals (Bogetoft and Olesen 2002). Theory and empirical evidence suggest that adverse selection problems may be difficult for co-operatives.

Designing contracts that are only acceptable to particular farmers is certain to pose a challenge. Indeed, substantial tensions are likely to emerge if the co-op attempts to limit the contracts to a select group. And gathering information on members—for example, running a tournament and only renewing contracts for those who perform better than the average—will inevitably create considerable difficulties for co-operatives.

Another problem involves patronage returns. The need to return the profits generated by the co-op to the members can create problems for the organization as it tries to restrict the types of farmers it wishes to have as members. In short, the existence of patronage returns may attract members who are less efficient at producing the desired goods (Fulton and Bon-tems 2002). While this problem can be partly overcome by limiting the membership of the co-op—e.g., through the creation of something like an NGC—such a strategy will have only limited success, since the co-op is unlikely to be able to attract only one type of farmer. In addition, as Zago (1999) shows, when the co-op is populated by members with different abilities to produce the desired product, those goods are likely to depend critically on which group represents a majority of the membership.

Bogetoft and Olesen's examination of Danish agricultural contracts illustrates the difficulty that co-ops have with the adverse selection problem. Of the contracts in which adverse selection was a problem and was dealt with through contract terms, none involved co-ops.

### *Co-operatives and Moral Hazard*

The problem of moral hazard has at least two implications for co-operatives. The first is that the co-op likely has to adopt a closed membership structure, or find some other way of limit-

ing production, both of which are required to generate profit that can be returned to the member as an incentive payment. The second implication is that the co-op must be able to introduce some kind of monitoring system, since quality is unlikely to be enhanced if there is no way of measuring it. As Bourgeon and Coestier (2001) point out, for example, monitoring is a critical element in ensuring that a producer group maintains its collective reputation for high-quality goods.

A number of co-operatives have successfully addressed the moral hazard problem. Both Danish Crown's special pig contracts and U.S. Premium Beef's grid-system pricing, for instance, have elements that provide farmers with an incentive to produce a specific product. Note, however, that the number of special pig contracts offered by Danish Crown is limited, and that U.S. Premium Beef is an NGC, and thus has closed membership.

The moral hazard problem does not appear to pose any particular difficulty for co-operatives, although it does have implications for co-operative structure. In fact, as Henriksen and Hviid (2003) show, the co-operative structure may allow monitoring to be undertaken more effectively, thus providing the co-operative with an advantage.

#### *Co-operatives and Relationship Risks*

There can be a number of issues associated with the relationship risks that arise from incomplete contracts. In all cases, the problem is how to encourage both parties to make decisions that provide the best returns for each of them considered together. In theory, because co-ops are able to make a more credible commitment to not taking actions unilaterally (Sykuta and Cook 2001), they should be better placed to deal with this relationship risk than FPFs.

Part of the reason for the more credible commitment lies in the governance structure of co-ops. Since co-ops are owned and controlled by their members, it is reasonable to assume that their leadership will be less likely to allow contract renegotiation that negatively affects the investment of its members (Hansmann 1996). The principle of patronage payments adds further credibility that the contract terms will not be renegotiated to the detriment of producers. Since any excess returns generated from the sale of the high-quality product belong to the members, the members have some assurance that they will receive proper compensation for the specific investments they have made.

There is considerable evidence that co-ops do, in fact, manage commitment issues better

than FPFs. The sugar beet industry in the United States is an example of integrated ownership being necessary to allow high-quality goods to be produced. The NGCs in this industry have developed new, extractable-sugar contracts that contain incentives for growers to supply higher-quality sugar beets (Koenig Balbach 1998). Unlike other contracts in the industry, this one pays the producer for the exact amount of recoverable sugar the grower produces.

The high costs of monitoring quality make it uneconomical for an FPF to use this type of contract. Because of these high costs, there is an incentive for the FPF to underreport the quality/quantity of the sugar—this is the contract renegotiation problem referred to above. The extractable-sugar contract has been introduced in producer-owned processing facilities, however, where there is a greater trust that the quality measurement will be accurately reported. Since processing and storage costs are inversely related to sugar content, this improvement in quality has lowered the cost per pound of recoverable sugar and created a higher per pound return from the sugar beets sold through co-operative organizations (Koenig Balbach).

The beef industry provides a second example of co-operatives successfully addressing incomplete contracts. As outlined earlier, there is currently little incentive for producers and feedlots to improve the quality of the carcasses they produce, since they are paid based on weight, while the processor and retailer receive any premiums from quality. This leads to inefficiencies in the market and underinvestment in quality improvement, as the producer and feedlot operator presently have no means of receiving information about carcass quality. A payment system based on carcass quality would require a trust relationship among the producer, feedlot operator, and processors. Producer-owned co-operatives that either performed the processing function or monitored processor grading would provide producers and feedlots with the assurance that carcass information was accurate.

Pierce and Kalaitzandonakes (1998) provide evidence that these types of vertical co-ordination are emerging in the U.S. beef industry. Producer co-operatives such as U.S. Premium Beef (see Fulton and Gibbings 2000 for a brief case study) are forming an alliance with packing and processing firms for the supply of identity-preserved, branded beef. Premiums and discounts for predetermined quality attributes, and the provision of detailed, individual-carcass feedback to producers are typical features of these systems.

A third example is found in Denmark, where the co-operative DLF-Trifolium can order its members to plough up their fields to reduce the total supply of grass and clover seed. The

contracts used by the two FPFs involved in the industry, Hunsballe and Wiboltt, do not have this option. Bogetoft and Olesen (2002) suggest that the co-operative has been able to introduce this contract provision because of a high degree of goal congruence between it and its members.

The co-op structure alone, however, is not always sufficient to address the investment-risk problem. McNeill (2001) argues that investment risk is often dealt with in market systems by the various parties each making highly specific investments, a point echoed by Sykuta and Cook (2001). Since each party is vulnerable to contract renegotiation, they are all thus more likely to abide by the terms of the contract and not act opportunistically. McNeill finds evidence of this joint investment by both the co-op and its members in the case of the North American Bison Cooperative.

### **Transaction Costs**

Transaction costs in contracts arise because time, effort, and money are required to examine, research, analyze, bargain over, and renegotiate (including conflict resolution) contract terms. Transaction costs can be reduced by keeping contracts simple and transparent and by providing the parties with information.

In northern Europe, one way of reducing transaction costs appears to be through the development of producer associations. In the Netherlands, for instance, seventy-four new fruit and vegetable grower associations were formed between 1995 and 2001 (Hendrikse and Bijman). One of their tasks has been the negotiation of contract terms as their industry has restructured. This restructuring has involved the proliferation of quality classes, each with its own contract. Fruit and vegetables were previously sold by an auction clock, the grading system component of which did not adequately distinguish quality. In Denmark, pea and sugar beet contracts are negotiated between the processor and a producer association, which also plays a role in conflict resolution.

Having producer associations carry out contract negotiation and conflict resolution is one way of reducing transaction costs, since these activities are then dealt with once, rather than by each farmer separately. Producer associations can even play this role when the processor is a co-operative. In California, a producer association used to negotiate contract terms with Tri-Valley Growers, a co-operative canning firm. Hueth and Marcoul (2003),

in a survey of co-operative bargaining in the U.S., argue that bargaining associations can play an important role in ensuring contract reliability and can aid in price discovery.

One conclusion to reach from the discussion above is that co-ops should not be seen as the only means that farmers have for dealing with contracting issues. Given the changes underway in agriculture, producer associations are likely to become more important as a way of reducing transaction costs, providing important contract information, and generating bargaining power for producers.

## CONCLUDING COMMENTS

**A**GRICULTURE IS CHANGING. Two of the major components of this change are an increased interdependence of the farm production sector with the rest of the agri-food system, and a growing concern about quality. To deal with these changes, the organizational structure of agriculture is being transformed, relying less on traditional cash markets and significantly more on contracts. These contracts are being used to co-ordinate decisions in the system and to provide the players with the motivation to produce goods of the desired quality.

The changes underway in the agri-food system require adaptation from all those involved. As this paper has outlined, co-operatives have successfully adapted to this new environment. The movement has created new organizational forms—the most visible of which is the New Generation Co-op—and a number of co-operatives have begun to focus specifically on quality. Examples include U.S. Premium Beef (grid pricing systems), U.S. sugar beet co-ops (payment schemes based on sugar content), Farmland Industries (identity preservation of high-quality grain), and the Danish pork processors (special pigs for the U.K. market and the development of codes of conduct for production).

The analysis undertaken in this paper suggests that the changes taking place in agriculture are likely to have a number of implications for co-operatives. These include:

- To successfully operate in the new agriculture, co-operatives are more and more

likely to take on aspects of the New Generation Co-op model (Fulton 2000; Sykuta and Cook 2001).

- More specifically, co-ops are expected to increasingly adopt a closed membership structure, which will help to control quality and will give members the incentive to make the major investments required to operate in the new agriculture (Sykuta and Cook 2001).
- The NGC structure will allow co-ops to use contracts more frequently as a way of co-ordinating production decisions. The pricing mechanisms employed will need to be relatively transparent and more or less free from cross-subsidization (Sykuta and Cook 2001; Fulton and Gibbings 2000). This transparency is particularly important as co-operatives exert more and more control over the decisions of their members (see discussion below).
- The NGC model allows for greater up-front investments by members, a feature that will be increasingly important as a way of reducing relationship risk between the co-op and its members (McNeill 2001; Sykuta and Cook 2001). As will be discussed below, co-ops appear to have some advantages in dealing with the relationship risk that is an important feature of the new agriculture. To be fully effective in dealing with this risk, however, may require new organizational structures.
- As co-operatives adapt to the new agriculture, they need to pay particular attention to motivational and co-ordination issues.
- Motivational issues fall into three areas—adverse selection, moral hazard, and contract incompleteness. Co-operatives may have trouble dealing with adverse selection problems—i.e., ensuring that only farmers capable of producing high-quality goods, or producing them in an environmentally friendly way, actually sign contracts to undertake these activities (Fulton and Bontems 2002). Co-ops require a greater understanding of the prevalence of this problem and the steps that can be taken to deal with it.
- Co-operatives appear able to deal with moral hazard problems—namely, how to ensure that members make the extra effort required to produce high-quality products. To be effective at dealing with this problem, co-ops need to introduce quality monitoring. While some co-ops have done this (see Bogetoft and Olesen 2002 for examples), others may face resistance from their members (see below for a fuller discussion of this issue).

- Co-operatives appear to have an advantage in dealing with relationship risk, which is an increasingly important feature of the new agriculture. Examples of co-ops that have dealt effectively with relationship risk include U.S. sugar beet co-ops, with their sugar-content contracts, and the Danish co-op DLF-Trifolium, which works with its members to control seed production. Because they are able to make a more credible commitment to not taking actions unilaterally (Sykuta and Cook 2001), co-operatives are more likely to allow the production of agricultural goods that involve highly specific assets, and also deal well with situations where the cost of monitoring the grading activity is high. Part of the reason for this is their governance structure (Hansmann 1996). The principle of patronage payments adds further assurance that the contract terms will not be renegotiated to the detriment of producers.
- Co-operatives will have to work increasingly with their members to co-ordinate production—e.g., by exerting control over the location of production or by providing members with input instructions that need to be followed.
- Some co-operatives will have difficulty introducing this co-ordination because of the unwillingness of some farmers to give up control over elements of their farm operation. This reluctance stems, in part, from incongruence between the conceptual model that many farmers have of the agricultural sector and the framework that now governs its operations.
- Co-operatives and government need to address this incongruence, since it has a number of implications for the effective operation of both co-operatives and the agricultural system in general. Co-operatives must deal with it because their ability to co-ordinate production decisions and produce high-quality goods is determined by the willingness of farmers to participate in these activities.
- Government needs to address this incongruence because Canada's ability to be a world leader in high-quality products, food safety, innovation, and environmentally responsible production hinges on farmers being willing and able to co-ordinate production decisions to a much greater extent than they have to date.
- Government can address this incongruence in at least two ways. Just as it had to help create the "industrial" commodity organizations during the 1920–1940 period, it may also have to help create new organizations now (one example would be the producer bargaining associations outlined below). These new organizations, however, must be

based on a “network” model and have to embody issues of food quality and safety, environmental responsibility, and innovation. As well, government has to consider an enhanced educational role—one that supports networking among farmers and that encourages the development of network ways of thinking. The policy rationale for these new forms of agricultural extension initiatives is that Canada’s ability to develop an agricultural industry along the lines of that outlined in the recent Agricultural Policy Framework (Agriculture and Agri-Food Canada 2002) depends on the capacity of farmers to understand the new role they are playing in the system.

- Co-operatives and government also have to pay attention to ways in which they can reduce transaction costs within the new agriculture. One mechanism that appears to be emerging in Europe is the use of producer associations to research and negotiate contracts. Both co-ops and government need to consider ways in which they can encourage the development of similar organizations in Canada.

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