

# **VALUE CHAINS IN THE AGRICULTURAL INDUSTRIES**

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## Preface

The U.S. agricultural industry is in the midst of major structural change — changes in product characteristics, in worldwide production and consumption, in technology, in size of operation, in geographic location. And the pace of change seems to be increasing. Production is changing from an industry dominated by family-based, small-scale, relatively independent firms to one of larger firms that are more tightly aligned across the production and distribution chain.

And the input supply and product processing sectors are becoming more consolidated, more concentrated, more integrated.

Agriculture in the 21<sup>st</sup> Century likely to be characterized by: 1) adoption of manufacturing processes in production as well as processing, 2) a systems or food supply chain approach to production and distribution, 3) negotiated coordination replacing market coordination of the system, 4) a more important role for information, knowledge and other soft assets (in contrast to hard assets of machinery, equipment, facilities) in reducing cost and increasing responsiveness, and 5) increasing consolidation at all levels raising issues of market power and control.

These profound changes in the agricultural industry present new challenges and new opportunities that require new opportunities that require new ideas and concepts to analyze and implement. They require new learning and thinking. Some of those new ideas and concepts are presented here, not as empirically verified truths, but as “thoughts” to stimulate different and better thinking. They have been developed based on observations, analysis and discussions with numerous managers and colleagues in agribusinesses in North America and Europe. This series focuses on Value Chains in the Food Production and Distribution Industries; companion series are also available on Farming in the 21<sup>st</sup> Century (Staff Paper 99-9), and Financing and Supplying Inputs to the 21<sup>st</sup> Century Producer (Staff Paper 99-11).

Our purpose in sharing these “thoughts” is to invite discussion, dialogue, disagreement — in general to encourage others to develop better “thoughts”.

Keywords: Value chains, value decay, product differentiation, information, structural change

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## **Value Chains in Agriculture: Why and How Fast Will They Come?\***

Agriculture is increasingly following the manufacturing industries in the formation of more tightly aligned value or supply chains. Why is this occurring, and how quickly will more tightly aligned value chains develop in various segments of agriculture?

### **Incentives for Formation**

As evidenced by both the poultry and pork sectors, the pressures for chain formation appear to surface in a three phase sequence: 1) capturing efficiencies and controlling costs, 2) reducing risk (quality, quantity, and food safety), and 3) responding to consumer demands for attributes.

Efficiency/Lowering Cost High — High fixed costs at all stages of agricultural production and distribution provide a strong incentive to stabilize volume processed. Flow scheduling and capacity utilization are essential to cost control. Plants and animals bred or engineered for specific end uses will also require production practices tuned to the specific end use. Conformance to specific quality standards may be accomplished at a lower cost with a contract or integrated system compared to a market coordinated system. Compliance with regulations on the use of drugs and chemicals also requires a greater degree of coordination of activities at more than one level of the food system. Some technologies, such as pelleting feeds may not be economical at the scale of a single firm. Numerous other examples could be provided and are well recognized by those analyzing and actually forming food supply chains.

Managing/Allocating Risk — Risk has been a hallmark of the agricultural sector, and strategies to reduce risk have significant structure and coordination implications. One risk is that of prices of inputs or products. A common strategy is to reduce the risk of high prices for inputs by contracting for supplies. A related strategy is to reduce the price risk exposure on products by contracting product sales. Some firms reduce price risks by vertically integrating into the input supply or product distribution channels. These coordination methods attempt to reduce the impact of market fluctuations that are part of the open market spot pricing system.

A second source of risk is related to quantity and/or quality features. Tighter coordination may be required to obtain particular quality characteristics which may not be available in predictable quantities in open, spot markets. The coordination needed to ensure both quality and quantity for efficient operations may be better achieved through contracts, ownership of more than one stage, joint ventures, or similar arrangements in the food production and distribution chain.

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A third source or type of risk in the food chain that has become more serious in recent years is that of the safety/health risk in food production. This risk has two dimensions, the health risk of foodborne disease; and the risk of polluting water, air and land resources in the food production processes. System coordination to implement traceback or HACCP (Hazard Analysis Critical Control Points) systems to reduce or control these risks may be in part a response to the broad sweep of product and environmental liability law as well as maintaining brand value.

Responding to Consumers — One of the prime arguments for chain formation is the reward from responding to increased specificity in consumer demand. Richer consumers are more demanding consumers. They expect quality control and products with specific characteristics to be available when desired. Product diversity is increasing. Products are differentiated based on what they do not contain as well as what they do. Low fat, low salt, and low cholesterol claims are common. Some attributes are achieved through processing, others in production. Consumers are also specifying how products are produced — examples include free range chicken and organic vegetables and grains. Given the expected continued increase in standard of living and increased ethnic diversity of markets, the trend toward product diversity will continue.

Convenience appears to be increasingly important to US and European food consumers. Higher income consumers in particular tend to be less price sensitive — more willing to pay for higher quality, variety, and convenience. Demand for take-out, fast-food, and home delivered foods is increasing. Less time is being spent preparing meals eaten at home, in part because equipment such as micro-waves are more readily available. The food products that maintain quality and taste when prepared with a microwave oven may require different characteristics of the protein, starch, fat or carbohydrates in raw agricultural products.

One reason the process of chain formation appears to follow the sequence of first focusing on cost reduction, then on risk reduction and finally on consumer responsiveness is the relative ease of capturing value and generating results from each of these motivations. In general, reducing costs from chain formation is the easiest to accomplish of the three motivations. Opportunities for cost reduction are easier to measure and more obvious, and techniques to accomplish those cost reductions are more easily identified and implemented. Reductions in risk from chain formation are not only more difficult to measure and identify, new risks including contractual or more generally relationship risk may be introduced as more tightly aligned chains are formed to reduce traditional price, quality and quantity risk. Thus, the total risk reduction benefits may be ambiguous, and the reallocation of those risks between participants in the chain may discourage tighter alignments.

Finally, increased responsiveness to the consumer may be the most difficult to measure and improve. Consumers may not be consistent in their signals or their behavior, and thus give mixed messages as to what they are really willing to pay for. Even though more tightly aligned chains may improve the content, accuracy and speed of messaging, the natural variation of biological production processes may still make it difficult for producers to respond efficiently and effectively to consumer and end-user signals. Thus this objective of chain formation may be the most difficult to accomplish and the most unpredictable of the incentives for chain formation.

## **Speed of Formation**

Given the incentives for chain formation, the timing and rapidity with which supply chains will be formed in a fragmented, market coordinated sector depends in part on the windows of opportunity for structural change. These windows of opportunity are a function of: 1) the investment life cycle and the replacement of obsolete facilities and equipment; 2) the human life cycle and the transformation from a late career core of entrepreneurs and managers to an early to mid-career core of managers; 3) the technology life cycle which involves a rapid, intense period of technological change and 4) the product life cycle and the transformation from a commodity to a differentiated product. Individually these cycles provide windows of opportunity for structural change in an industry; when they converge, as they have in the swine industry, structural change is dramatic.

Investment Cycle — A significant portion of the current plant capacity (particularly in the production stage of the pork industry) — specifically in the Corn Belt of the U.S. — is in need of replacement or modernization if it is to remain productive. Many Midwest facilities, particularly those owned by small and mid-size producers, are of a size and technology that can continue to produce if capital and investment costs have already been recovered, but will likely not be profitable if major remodeling or upgrading investments are necessary to remain in operation. Many of these production facilities (which embody the technology of the early 1980s) are likely to be phased out of production rather than upgraded and modernized in place because of technological, size, environmental or managerial conditions and limitations.

Manager/Producer Life Cycle — Until recently, most pork production has occurred in owner/operator firms where the entrepreneur provides most of the labor and management for the production enterprise — the classic family farm. For many of these family farms, the human resources as well as the physical resources are aging. For example, the recent Census reveals that 40.5 percent of Iowa family farmers are 55 years of age and older. Unless the firm has plans for managerial succession, producers of this age logically have a shorter planning horizon than those who are younger when considering major expansion and/or replacement decisions. Particularly with small and modest size livestock operations, fewer family members or others are available and/or interested in taking over the business. For a number of small and moderate size family farmers the logical strategy is to sequence the human and physical resources so that they can wear out at the same time — that is, when the farmer is ready to retire, the building and facilities can be shut down with the investment costs fully recovered.

Technological Life Cycle — Dramatic changes have occurred in the technology of pork production, processing and distribution. Genetic and nutrition technology now allow pork producers to produce those specific attributes that consumers want. Until recently, the knowledge and technology were not available on a practical, commercial scale. Technical change in production facilities and structures in the last five to seven years has been profound. The traditional approach has been to integrate the farrowing, nursery, growing and finishing phases of pork production in one inter-connected plant at a single location. Modern technology (primarily for disease control and bio-security) suggests that the farrowing facilities should be physically separated from the nursery facilities with the growing/finishing facilities at a third site. Production of breeding stock may occur at a fourth location. Physical separation of the

facilities and the economic stages of production facilitates (but does not require) that separate firms be responsible for each of the stages of production. Additional technological advances such as split sex feeding, all-in-all-out production, feeding different rations during different phases of the growing/finishing process, etc., renders much of the technology embodied in production facilities constructed even in the late 1980s obsolete.

The Product Life Cycle — Pork has been fundamentally a commodity product with most of the preferred consumer attributes added in the sorting and processing activity. Increasingly, certain attributes such as leanness and specific size portions such as loin eyes are difficult to obtain efficiently through processing. A more efficient way of obtaining these attributes may be by changing the raw material — the live animal. This transformation of the pork product from a commodity to a specific attribute raw material (SARM) provides the opportunity for (or requires) new coordination options and structural change to most efficiently source and merchandise this new product.