Forces Influencing the Evolution of Agricultural Value Chains

#2 in "The Evolution of Agricultural Value Chains" series

Abstract

Agriculture is increasingly following manufacturing industries in the formation of more tightly aligned value or supply chains. Building effective strategies during this transition will require an understanding of the forces and barriers that will influence the pace of the evolution. This article examines some of the forces of value chain evolution and considers some of the factors that will influence the timing of key events.

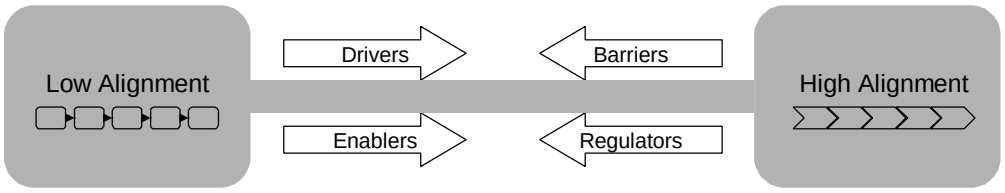
Key Words: agriculture, value chains, vertical coordination, vertical alignment, managing risk, consumer preferences, life cycle, agribusiness strategy, government regulations

Introduction

On the surface, the evolution of aligned value chains in agriculture appears to be happing in a somewhat random fashion. However, we know that this is not the case, it is just difficult to understand the complexity of the events in real time. It is sometimes possible to look back on change that has already occurred and develop insights about the events that came together to cause the change. This paper will propose a set of factors that can influence the rate of alignment in agricultural value chains and use the recent consolidation of the pork industry as an illustration of how these factors played out in that sector.

The forces that will influence the rate and degree of value chain alignment can be grouped into four categories as illustrated in the following diagram.

Classification of Forces Influencing the Rate and Degree of Alignment



Drivers—Forces that create pressure on the sector to move towards a higher degree of alignment, e.g. the customer demands a product that can only be produced through coordination of efforts across the value chain.

Enablers—Forces that provide the opportunity to move towards a higher degree of alignment, e.g. advances in biotechnology that allow the production of attribute specific grains.

Barriers—Forces that slow or reverse the movement towards a higher degree of alignment, e.g. lack of trust and willingness to enter into contracts.

Regulators—Forces that provide temporary impediments to a higher degree of alignment, e.g. a relatively new production facility that would need to be replaced to realize the value of increased alignment.

Each of these forces is described and illustrated in the following sections.

Drivers of Alignment

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. managing and allocating risk (quality, quantity, and food safety), and
3. responding to consumer demands for attributes.

Efficiency/Lowering Cost—High fixed costs at all stages of agricultural production and distribution provide a strong incentive to stabilize volume processed. Coordinated flow scheduling and capacity utilization across multiple segments of the value chain can provide greater cost savings than is possible within individual segments. Alignment across firms can also lead to the realization of economies of scale from better utilization of fixed assets and improved bargaining position for inputs.

Managing/Allocating Risk—Risk is a hallmark of the agricultural sector and strategies to manage risk can be significant drivers towards higher degrees of value chain alignment. One risk is that of changes in prices of inputs. A common strategy to reduce the risk of high prices for inputs is to contract for supplies. A related strategy to reduce the price risk exposure is by contracting product sales. Firms may be able to reduce price risks by vertically integrating into the input supply or product distribution channels.

A second source of risk is related to quantity and/or quality features. Tighter coordination may be required to obtain particular quality characteristics that may not be available in predictable quantities in open, spot markets.

A third source or type of risk in the food chain that has become more significant in recent years is that of the safety/health of food products. This risk has two dimensions, the health risk of food-borne disease; and the risk of polluting water, air and land resources in the food production processes. System coordination in some fashion will be necessary to implement traceback or HACCP (Hazard Analysis Critical Control Points) programs.

Responding to Consumers—Another key driver of aligned chain formation is the reward from responding to increased specificity in consumer demand. Today's consumers expect quality control and products with specific characteristics to be available when desired. At the same time, product diversity is increasing. Products are differentiated based on what they do not contain as well as what they do. Some of these attributes are achieved through processing, others in production. Consumers are also specifying how products are produced — examples include free range chicken, organic, and non-GMO foods. Given the expected continued increase in standard of living and increased ethnic diversity of markets, the trend toward product diversity will continue.

As stated earlier, these three drivers seem to follow in sequence. This seems logical due to 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 since they are measurable, and techniques to accomplish those cost reductions are more easily identified and implemented. Reductions in risk from chain formation tend to be more difficult to measure and identify. In addition, new risks including contractual or 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 among participants in the chain may discourage tighter alignments.

Finally, benefits realized from 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.

Enablers of Alignment

Some of the forces pushing for increased alignment are not necessarily new. However, practical considerations make the cost of alignment too high relative to the return. Advances in technology in the food production and distribution system are changing the economics of the formation of more tightly aligned value chains. These improvements in technology and productivity include:

- information technology,
- monitoring and measuring technology,
- automated controls,
- biotechnology,
- transportation and logistical technology, and
- economies of scale.

Information technologies are providing cost-effective communication linkages that make it possible to coordinate the flow of products through the value chain. New networking technologies coupled with automated monitoring and control systems provide opportunities to efficiently share and manage information among value chain participants. Further down the value chain, networked information technologies are also used by consumers to provide feedback about their preferences and to locate products that meet their specific needs.

Many of the advances in biotechnology involve the improvement of raw product quality that provides benefit to downstream value chain participants such as processors and end users. These provide an opportunity for producers, processors, and end users to work together to realize the added value.

Finally, transportation and logistical technologies make it possible to reach critical economies of scale while still achieving the goal of "mass customization" to meet the diverse demands of the customer.

Barriers to Alignment

While there are strong drivers and enablers of aligned value chains, there are also some significant barriers that need to be addressed. These barriers or constraints are not impossible to overcome, but must be mitigated if more tightly aligned value chains are to be successful. Some of these barriers include a lack of:

- mutual trust by chain participants,
- awareness of the benefits and costs of more tightly aligned value chains,
- knowledge about the use of the enabling technologies,
- willingness to adopt a collaborative vs. competitive business approach,
- commitment and willingness to invest in chain infrastructure,
- an acceptable governance system with equitable sharing of power and control,
- equitable sharing of the risk and rewards in a value chain, and
- an organizational structure that allows implementation of chain and systems approaches,.

A number of the barriers that exist revolve around the human factors related to adopting to change. Establishing new relationships and contact points involve building trust—in some cases, building trust

with a party that was previously considered to be an adversary. Participating in the new relationships may also involve learning new skills such as use of technologies or evaluation of new operating agreements. Individual efforts to invest in change will only occur if there is a perceived threat associated with not changing, or a strong perception of benefit from the change.

Another key barrier relates to the lack of comfort with a proven governance system. Some of the new value chain systems will need to rely on untested self-governing approaches and value sharing arrangements.

Regulators of Alignment

Regulators in this context are like temporary barriers that are a result of anything from changes in the physical plant and production processes to changes in government regulations. That is, they provide resistance to increased alignment for a period of time, but then will dissolve as time passes and possibly even result in windows of opportunity for structural change. These windows of opportunity are a function of:

- the investment life cycle and the replacement of obsolete facilities and equipment,
- the human life cycle and the transformation from a late career core of entrepreneurs and managers to an early to mid-career core of entrepreneurs and managers,
- the technology life cycle which involves a rapid, intense period of technological change, and
- 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.

Contrast this to the grain industry where some of the technologies needed to move to the next level of efficiency can be added to existing machinery. For example, yield monitors, variable rate control systems, and sensing devices can be added at incremental cost and do not require a complete re-tooling.

Manager/Producer Life Cycle—Until recently, most agricultural 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.

For the grain farmer, this is less of an issue because the physical production assets are much more transferable. For example, it is relatively easy to rent the land to another operator and sell or lease existing equipment at a value that provides reasonable recovery of remaining investment. Perhaps the manager/product life cycle is more of an issue when it comes to participation in aligned value chains. A

producer who is a few years from retirement may elect to forgo opportunities to participate in a new system. The "investment" required to participate is knowledge, and the producer may decide that it is not worth that investment at this stage. As the next generation of producers takes over the land, there will be a significant jump in acres controlled using the new concepts and technologies.

Technological Life Cycle—Dramatic changes have occurred in the technology of pork production, processing and distribution. Genetic and nutrition technology now allows 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., render much of the technology embodied in production facilities constructed even in the late 1980s obsolete.

Similar examples can be seen in the crop sector. The rapid adoption of Roundup Ready technology is an illustration of how quickly a new technology can sweep across the industry. With advances in traditional and biotechnology approaches to plant improvement, we will continue to see waves of adoption of new technologies at an increasing pace.

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.

Government Regulations and Policies—Changes in the role of governments worldwide to simultaneously reduce subsidies and protection from international competition, and to increase regulation with respect to consumer concerns is resulting in increased pressures to form more tightly aligned value chains. Important changes in government policy that encourage value chain formation include:

- regulations,
- reduced farm subsidies,
- harmonization of trade regulations,
- increased privatization, and
- shift from market protection to global market access.

Over time government regulations and policies will evolve, sometimes stimulating the formation of aligned value chains and other times hindering them.

Strategic Questions

Participants of this emerging agricultural sector will need to continuously monitor these forces and be able to assimilate how the resulting change will impact their role in the market. As the inter-relationships of the sector become more complex and dynamic, new tools will need to be employed to create

knowledge and strategy. For example, in addition to traditional methods of strategy development and implementation, AEC uses tools such as System Dynamics, simulation modeling, and data visualization to better understand the complexities and facilitate real-time strategy development and monitoring.

Understanding the speed which value chains will evolve hinges on the following key questions:

- What consumer preferences will have the strongest impact on output needs; preferences for functional qualities (low fat), preferences for perceived qualities (free-range chicken), or social qualities (non-GMO)?
- How will public policy help or hinder the evolution of aligned value chains?
- How much of the land is currently in control of farmers who will resist change because they are waiting to retire?
- What is the knowledge capital needed by participants in different sectors and how fast will they be willing to build that capital?

This article was developed by Ag Education & Consulting as a way to share our thoughts about the future of the agriculture sector. For reprints of this or other series of articles, please contact us or visit our web site listed below:

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