



Center for Food and  
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# Strategic Issues in the Changing Agricultural Industry

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# Structural Changes in Agriculture

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The U.S. food production and distribution industry is in the midst of major structural change – 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 value chain. Food retailing is increasingly more customer responsive, more service focused, and more global in ownership. In addition, the input supply and product processing sectors are becoming more consolidated, more concentrated, and more integrated.

What are some of the themes and dimensions of these changes, and how might they impact your business? In the following discussion, we identify ten themes that might characterize the new agriculture. These themes include: global demand; development of differentiated products; more global

competition; biotechnology; expansion of information intensive or precision production; biological manufacturing; formation of value chains; emergence of ecological agriculture; increasing risk; and more diversity. For some of these themes the evidence is clear from research and business behavior and the direction of change is well established; for others it is still emerging or yet unclear.

Our purpose is to identify (not advocate) these potential changes so agribusiness managers can gather information and industry intelligence to determine if in fact the changes develop as we expect, assess how important those changes are for their business, and identify and evaluate alternative strategic issues and directions that the change might suggest for their firm. The discussion will emphasize: 1) the expected direction of the changes identified, 2) the research undertaken in Purdue's Department of Agricultural Economics to understand the implications and consequences of the changes, and 3) some of the important strategic questions that should be answered to position your company to compete in the changing agriculture. Our goals are to stimulate and frame the discussion and debate about the potential changes in the industry and how one might strategically respond to these potential changes.

- Global Demand
- Differentiated Products
- More Global Competition
- Biotechnology
- Precision Production
- Biological Manufacturing
- Formation of Value Chains
- Ecological Agriculture
- Increasing Risk
- More Diversity

# Global Demand

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The structure of the domestic and international food demand has changed considerably over the past three decades. Food demand in the U.S. is relatively mature, but growing demand abroad provides important marketing opportunities for the U.S. food production and distribution industry. In particular, as household incomes have increased globally, consumers have transitioned from vegetable to animal protein diets. The fastest growing market opportunities for U.S. firms consist of delivering value-added animal protein products to foreign markets. Regions in Asia, Latin America, and Africa, provide important export markets for U.S. agribusinesses, with rapid export growth. Although the new global demand provides rich marketing opportunities for U.S. based firms, their success depends crucially on two key factors, the exchange rate and the level of international competition. The intensity of international competition depends not only on foreign firms' competitive strategies, but also on the foreign countries' domestic agricultural policies as well as international trade agreements. Consequently, increasing international food demand may not be transformed into expanding U.S. agricultural exports of agricultural products.

- Drivers of Global Demand
  - Increased demand for value-added animal protein products
  - Substitution possibilities of oil for grain products in the industrial products industries
- Competitiveness of U.S. agribusinesses in global markets depends on the exchange rate, foreign countries agricultural policies, and trade agreements

The domestic demand for grain in the U.S. may also increase in the near

## Key Strategic Questions

- ✓ *How can your firm capitalize on changes in global demand?*
- ✓ *How may fluctuating exchange rate, changing foreign agricultural policies, and trade agreements influence your business' profitability?*

future. Concerns about the dependence on nonrenewable resources have spurred research on technologies that could substitute grain for oil in the production of energy and industrial products, for example ethanol, bio-diesel, and plastic-polymers.

# Development of Differentiated Products

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The transformation of crop and livestock production from commodity to differentiated product industries is driven by advances in technology and the need to minimize total costs of production, processing, and distribution as well as by consumer demand for highly differentiated food products, food safety, and trace-back. Differentiation may occur by science or marketing. Differentiation by science may occur as a result of acquiring exclusive rights

to genetics or owning exclusive technology in processing systems. Marketing differentiation may include branding, advertising, packaging, food safety, product quality, product attributes, and product bundling.

Product differentiation is affecting firms at all stages of the value chain and often results in the ability to capture a higher selling price but also incur higher costs. For example, farmers growing specialty grains face

higher transportation and management costs, in addition to higher seed costs. Changes in the seed industry include product proliferation and shortened product lifecycles.

- The transformation to differentiated products is driven by:
  - Advances in technology
  - Need to minimize total costs of production, processing and distribution
  - Consumer demand for highly differentiated food products, food safety and trace back
- Product differentiation results in increased direct and indirect costs
- Margins are generally higher for differentiated products but decline quickly

## Key Strategic Questions

- ✓ *What product differentiation strategies can your firm develop to increase the profitability of your business?*
- ✓ *What direct and indirect costs are you incurring in your market because of differentiated products?*

The production and distribution of differentiated food products tend to increase the inventory costs, carry over costs, and stock-outs costs. However, the margins for the differentiated products are usually higher, although they decline quickly as the product market matures.

# More Global Competition

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Globalization refers to broad economic integration involving capital flows, foreign direct investment, trade in products and services, and immigration rules. There are four drivers of globalization. (1) Information Technology: Advances in information technology have improved firms' ability to evaluate and monitor consumer demand and created an expanded geographic market for firms. (2) Improvements in transportation: Firms can now supply markets in previously unattainable regions of the world due to improvements in

transportation, logistics, scheduling, and delivery.

(3) Capital Mobility: Financial and speculative capital, previously available primarily in Western Europe and North America is more mobile and available worldwide.

(4) Technology transfer:

As firms operate globally the nature of worldwide technology transfer and R&D activity changes to within firms through foreign direct investment and subsidiaries. Large food retailers that are on a global expansion path, such as Wal-Mart and Carrefour, are gradually changing the competitive nature of the entire value chain, as they increasingly source food products worldwide.

- Four drivers of globalization include:
  - Information Technology
  - Improvements in Transportation
  - Capital Mobility
  - Technology Transfer
- Capital and technology now available throughout the world
- Increased global sourcing and selling

## Key Strategic Questions

- ✓ *How is your firm positioned to compete in a more global market?*
- ✓ *What is your marketing strategy for accessing global markets (such as foreign direct investments, participating in joint ventures with foreign firms, or accessing foreign markets through other sources)?*

The longer-run consequence is an increase in worldwide production capacity in different regions of the world. This increased efficiency, productivity, and capacity in other production areas along with the worldwide sourcing and selling strategies of global food companies, means that the United States and Europe may not be as dominant and will face increased competition in world markets in the future.

# Biotechnology

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Biotechnology is one of the most profound scientific advances in the last twenty years and is moving rapidly from the laboratory to the field. Bioengineered corn and soybean varieties, first introduced in 1996, comprised almost 50% of corn and 80% of soybean acreages in the U.S. by 2003. The popularity of these varieties result from the value to the producer since they are herbicide resistant (e.g. Roundup Ready) or resistant to particular pests (e.g. Bt corn). However, the real growth potential in biotechnology may still be on the horizon. Genetic engineers are currently developing crops to produce chemicals for textiles, plastics, and polymers that may have profound impacts on the chemical manufacturing industry. In addition, crops with output characteristics designed to enhance traits (e.g. specific protein characteristics) important to animal and human diets, are just beginning to have impacts.

- Biotechnology is one of the most profound scientific advances in the last 20 years
- Substantial benefits to the manufacturing industry
- Future adoption may depend on the production of bioengineered crops that benefit consumers and allay concerns about possible impacts on human health and the environment

Acceptance of biotech food products by consumers has become a controversial issue. Future adoption of this technology may depend on the production of bioengineered crops that both benefit consumers and allay

## Key Strategic Questions

- ✓ *What is your company's biotech strategy (e.g. leader, adopter of proven products, no biotech)?*
- ✓ *How can you carve out a position in the marketplace with this strategy?*

concerns about the possible impact of these crops on human health and the environment. Satisfying current concerns about the applications of biotechnology in agriculture may be pivotal to the future of agriculture since this new technology has the potential to transform a significant portion of the agricultural industry into biological manufacturing.

# Information Intensive and Precision Production

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The management of production is expected to trend toward more micro management of each specific production site, specific room, and specific areas or animals. This shift will be driven by the influx of information about environmental and biological factors and how they affect production.

Precision farming in crop production includes the use of global positioning systems (GPS), yield monitors and variable rate application technology to more precisely apply crop inputs to enhance growth, lower cost and reduce

environmental degradation. Examples in animal production include medication treatment by animal rather than by the entire group or herd, nutritional feeding to the specific genetics, sex, age, health and consumer market, and continuous adjustment of the ambient environment to maximize returns.

The adoption of precision technology varies from firm to firm and depends on competitive pressures, the goals of the firm and the extent of firm level

## Key Strategic Questions

- ✓ *How can your company use site/animal specific information to create new business opportunities?*
- ✓ *How does your business intend to create value in a more information intensive industry?*

- More micro management of each specific production site, room, or area
- Nutrition management more closely matches the nutrient supply with the needs of plants and animals
- Buildings and equipment may get larger to fit industrialized model

resources. Increased use of monitoring technology will greatly expand the amount of information available regarding what affects plant productivity, animal growth and well-being. This understanding will then be designed into management systems that more closely match the nutrient supply with the needs of plants and animals at a micro level. An important offshoot is that buildings and equipment continue to move toward larger scale to fit the industrialized model.

# Biological Manufacturing

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Farming is transforming from growing crops to manufacturing biological based specific attribute raw materials. Biological manufacturing has characterized the fruit and vegetable and poultry sectors for a number of years. Industrialized pork production and distribution is becoming the norm. In the beef industry, cattle feeding follow the industrialized model but the brood cow industry is much less affected. In the grain industry, the specialty crops production is rapidly adopting industrialized production systems, with commodity grains following.

Industrialization of production means the movement to large-scale production units that use standardized technology and management and are linked to the processor by formal or informal arrangements. Size and standardization are important in lowering

production costs and in producing more uniform crops and animals that fit processor specifications and meet consumers' needs for specific product attributes, as well as food safety concerns. The movement to large-scale production units that use standardized technology and management is an integral part of biological manufacturing.

- Farming is transforming from growing crops to manufacturing biological based specific attribute raw materials
- Expect more linkages along the value chain
- Larger scale operations that use standardized technology in order to gain efficiencies are expected
- Requires a process control technology mindset

Process control technologies that are critical in biological manufacturing are: monitoring/measuring information technology to real time monitor and trace

## Key Strategic Questions

- ✓ *What value can be created in agriculture from biological based manufacturing?*
- ✓ *Have your business developed a strategy that can capitalize on the gains from biological manufacturing?*

development and/or deterioration of attributes; biological/ nutritional technology to manipulate the attribute development and deterioration process in plant and animal production and processing; and intervention technology to intervene in these processes at appropriate times.



# Formation of Value Chains

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The delivery of specific-attribute consumer products requires a more holistic approach in agricultural production, processing, and distribution. The emphasis on managing and optimizing value chains from genetics to end-user/consumer is increasing. Efficiencies are achieved through better flow scheduling and resource utilization; increased ability to manage and control quality throughout the chain; reduction of risk associated with food safety and contamination; and increased ability to quickly respond to changes in consumer demand for food attributes.

Coordination along a value chain can be an important way to reduce some of the additional costs resulting from differentiated products. In particular, increased

costs associated with inventories and transportation can be minimized when the stages of the value chain work together.

- Efficiencies are achieved through:
  - Better flow scheduling/resource utilization
  - Increased ability to manage/control quality
  - Reduction of risk with food safety
  - Rapid responses to consumers
- Competition is not only between firms but between value chains.
- Benefits of an integrated system are likely to result in the development of interdependent food production-processing centers.

A value chain structure is a fundamentally different approach than

## Key Strategic Questions

- ✓ *What linkages does your business have with other firms in the value chain?*
- ✓ *How can you work with the other businesses in your value chain, to increase the profitability of the value chain?*

traditionally used. The focus is on the function performed and not on the firm or individuals that performed it. There is an increased interdependence between the various stages of the food chain. Competition and rivalry is no longer between individual firms but between value chains competing for their share of consumers' food expenditures.

# Emergence of Ecological Agriculture

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In recent decades, there has been an increased awareness of the importance of the perspective and practice of ecological agriculture. Proponents of ecological agriculture argue that agriculture cannot function as an isolated system and must consider the limits of the natural resources used to produce agricultural commodities, as well as the limits of the sinks needed to dispose of the wastes from agricultural and nonagricultural activities.

In addition, the increasing awareness of ecological systems questions the sustainability of the predominant paradigm, which claims that production problems are most effectively solved by bringing an external counterforce to bear (e.g. applying a pesticide to a pest).

It is argued that this approach creates a treadmill phenomenon where new rounds of pests are ever present, since nature is evolving. In contrast, an ecological approach would determine why the pest is a pest and discover how improving internal relationships in the system could solve the problem. These differences in fundamental approach to production have significant structural implications since the external counter force method tends to be more capital intensive.

- Increased awareness of ecological agriculture
- Traditional agricultural production is more capital intensive
- Smaller farms may initially have an advantage if ecological farming practices increase

## Key Strategic Questions

- ✓ *How can your firm gain a competitive advantage by focusing on these issues?*
- ✓ *What are the marketing opportunities for your firm to participate in a value chain that markets ecologically produced food products?*

Although the market for ecological food product is relatively small, consumers that are demanding ecological food products usually have a higher willingness to pay. Thus, value chains that supply ecological products can charge a substantial premium over the normal product prices. However, as the market matures, the premiums are likely to decrease substantially.

# Increasing Risk

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Risk is nothing new to agricultural production. The traditional sources of risk in agriculture are price, weather, and disease. However, the extent and nature of risk is changing with industrialization, the development of differentiated products, and the formation of value chains.

New sources of risk that occur as a result of differentiated products, include: consumers' and end-users' attitudes and willingness to pay for certain attributes may change over time; as others develop the expertise to produce the new product it becomes commoditized; and the risk of brand value declining as a result of defects or quality lapses.

- Traditional sources of risk include price, weather, and disease
- Differentiated products results in new risks associated with the stability of consumer demand, commoditization of the product, and brand risk.
- Relationship risk must be managed in a Value Chain

The movement of firms to be part of tightly aligned value chains results in efficiencies but also additional risks associated with whether the product attributes are measurable and demand for the attribute is predictable. In addition, relationship risk must now be managed. As value chains become more dominant, the traditional markets become “thinner” and often take on the role of “salvage” markets. The fundamental issues of access to information, transaction transparency, equitable sharing of risk and rewards

## Key Strategic Questions

- ✓ *How do you manage your value chain relationships to produce value while maintaining flexibility to respond to increased risk?*
- ✓ *How do the unique properties of your company's product create long-term value for your customers?*

by non-participants as well as participants in tightly aligned value chains, and the risk associated with market access are all important market risk and performance issues that impact the structure of agriculture.

# More Diversity

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Agriculture of the future will exhibit more diversity among businesses with individual businesses becoming more specialized. The representative “Iowa corn farm” or “Texas beef farm” will be a thing of the past. One source of diversity arises from the separation of production activities by phase (e.g. separate firms for breeding, gestation and farrowing in pork production).

A second source of diversity is development of differentiated products. As farms move from producing commodities to specific attribute raw materials, diversity results (e.g. corn farms diversified according to white corn, high oil corn, etc.). Other forms of diversity involve differences in dependency

on farming as a source of income, differences in size, and differences in marketing and financial strategies. A final source of diversity is the firm’s production technology and degree of capitalization.

Important conclusions from the Center for Food and Agricultural Business Commercial Producer Project provide consistent results. Producers are

- Individual firms may become more specialized but there will be more diversity among businesses
- Sources of Diversity include:
  - Production activity
  - Type of product
  - Sources of income
  - Size
  - Differences in marketing and financing
  - Production technology

## Key Strategic Questions

- ✓ *How is your business tailoring its product, information, and service offerings to meet increasingly diverse market segments in production agriculture?*
- ✓ *Many producers used to incorporate new technology after watching the success of the innovators. How can you reach these customers when following the neighbor is no longer relevant?*

confident, successful professionals who use information and technology to make complex and effective business decisions. In dealing with producers it is important to not only remember that “One Size Does Not Fit All” but that one size may fit only one or a few producers. Success in the future may require increasingly sophisticated market segmentation.

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