U.S. AGRICULTURE IN AN INCREASINGLY COMPETITIVE GLOBAL MARKET

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Abstract

Dramatic changes are occurring in the agricultural sector today. These changes provide opportunities for some, but threats for others. Longer-term, four fundamental forces or drivers will shape the business climate that the industry faces. These forces include expanded global production; expanded and diversified global demand; technology and in particular simplification technology; and changes in competitive metrics and expectations as to the acceptable returns to contributed resources. The interaction among these four fundamental forces will determine whether the future business climate for US agriculture is characterized as one of opportunity or one of challenge/threat.

These four fundamental forces have the potential to shape a very different agricultural industry compared to that of the 20th century. Twenty-first century agriculture is likely to be characterized by the following: increased concentration and consolidation; expansion of industrialized agriculture; production of differentiated products; precision (information intensive) production and distribution; emergence of ecological agriculture; formation of food supply chains; increasing risk; and more diversity. In this new agriculture of the future, successful companies will need to be better, faster, and cheaper to have a sustainable competitive advantage.

Keywords: global production, diversified demand, simplification technology, concentration and consolidation, differentiated products, food supply chains, precision production

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Dramatic changes are occurring in the agricultural sector today. These changes provide opportunities for some, but threats for others. Longer-term, four fundamental forces or drivers will shape the business climate that the industry faces. These forces include expanded global production, expanded and diversified global demand, technology and in particular simplification technology, and changes in competitive metrics and expectations as to the acceptable returns to contributed resources. The interaction among these four fundamental forces will determine whether the future business climate for US agriculture is characterized as one of opportunity or one of challenge/threat. How might one characterize these forces and what specific impact are they likely to have in shaping the future business climate for agriculture?

Four Fundamental Forces

Expanded Global Production

Globalization and internationalization are not new to agriculture – since the 1970's farmers incomes have been heavily dependent on their success in selling products in international markets. That dependence has ebbed and flowed over time. One cause of the Revolutionary War was Britain's denial of access to its markets for tobacco from the American colonies. More recently the development of agreements such as GATT and NAFTA and debates concerning the WTO have been the focal point of much of the globalization discussion with the emphasis on broader access to world markets and expanding exports of agricultural commodities, and particularly further processed agricultural and food products.

With the increased globalization of resources and market opportunities, the changing relative efficiencies of transportation and distribution systems becomes an increasingly important determinant of the opportunity for trade. Dramatic improvements in transportation efficiencies and technology have meant that parts of the globe that previously could not supply products on a global basis are increasingly able to do so. One only has to look to the fresh fruit, vegetable, flower, fish, pork, and beef markets to see how transportation technology has not just "shrunk the world", but increased the relative comparative advantage by substantially reducing the cost of production for regions previously too great a distance from the population base or demand centers to be competitive. In some products today, distance is no longer a factor and that will be increasingly the case if transportation/distribution costs continue to decline from technological advances in logistics and distribution systems. A further issue is that as the agricultural industry transitions from a commodity to a differentiated product industry, transportation/distribution systems that are more compatible with this type of agriculture, including identity preserved distribution channels that have protocols for quality assurance and maintenance, will become more important relative to the commodity oriented bulk transportation distribution systems that are dominant in today's agriculture. Consequently, those who can put a differentiated product distribution system in place more rapidly and cost effectively compared to a commodity distribution system will have a comparative advantage. And sometimes it is easier and more cost effective to build a new system "from scratch" rather than retro-fit an old system; consequently new production regions might actually have an advantage in differentiated product agriculture because they can put transportation distribution systems in place more cost effectively to service that agriculture compared to older production regions that have a commodity transportation distribution in place that must be abandoned or retro-fitted.

As distribution and logistics costs become relatively less important, the value of geographic diversity is becoming increasingly important in agricultural production. Seed corn companies have recognized for years the benefits of producing seed in both the northern hemisphere and the southern hemisphere to accelerate the speed of genetic improvement and bring new varieties to market more quickly. Vegetable producers, particularly those supplying the fresh fruit and vegetable market, also understand the value of producing in both northern and southern hemispheres so as to be able to supply fresh products to the market 365 days a year. Geographic diversity has been one way that specialty crop growers have managed production and supply risk to minimize the impacts of disease, weather, and other climatic and biological forces on supplies of product. Advances in logistics technology and reduction in transportation and distribution cost have redefined the boundaries of geographic diversification – no longer is that diversification limited to a contiguous set of counties, or a set of selected states in the U.S., or a country or continent. Increasingly geographic diversity is now defined in a global context.

The movement of the past two decades to fewer restrictions in inter-country trade of products and services has profound implications for the agricultural technology markets in particular. In reality, the most significant implications of globalization and reducing the barriers of exchange between countries may not be increased product movements across borders, but the increased sharing of resources. In particular as related to technological advance is the elimination of geographic boundaries on technology transfers, investment capital, scientists and researchers, managerial skill to commercialize technology, and information and knowledge. Consequently, parts of the world that have had productive soils and favorable climates but did not have endogenous sources of technology, money, knowledge and information, scientific skills or managerial capacities now have broader access to those previously limiting or constraining resources on their technological advancement capacity.

In summary, expanded market access is important to the future of global markets and international trade, but the international transfer of capital and global access to technology and research and development are equally important dimensions of open trade. Most of the private sector technology transfer and R&D activity has focused on North American and Western Europe in the past. Today these are relatively mature markets in terms of acreage growth and expansion of livestock production capacity. Growth opportunities are likely to be greater outside these regions (i.e., Mexico, South America, Eastern Europe, Asia, etc.). With the opportunities for global-oriented companies to expand their markets in these areas, one would expect substantial expansion in the technology transfer and R&D activity of companies specifically focused on geographic regions outside North America and Western Europe. And as the capital markets become less locally focused and more global, debt and equity funds which have been geographically available primarily in

Western Europe and North America are also available throughout the world. The longer-run consequences are a narrowing of the gap in production potential between these parts of the world and that of the traditional dominant production regions, as well as an increase in world-wide production capacity. This increased efficiency, productivity and capacity in other production areas along with the world-wide sourcing and selling strategies of global food companies means that the United States and Europe may not be as dominant players and will face increased competition in world markets in the future.

Growing Demand

A second major determinant of the business climate for production agriculture is the rate of growth in the demand for agricultural raw materials. Given that the demand for food products is relatively mature in the U.S., the food demand question is primarily determined by U.S. export potential. In recent years, U.S. exports of value added food products have grown significantly and rapidly (at rates in many cases exceeding 10% per year), whereas exports of commodities (particularly corn, soybeans and wheat) have grown only modestly in value and have actually remained relatively flat or declined in quantity or tonnage. In fact, a fundamental concern about recent U.S. farm policy has been that it is predicated to a large degree on growing exports which have not materialized.

The prospects for future U.S. agricultural exports are unclear at best. Certainly, the growing incomes of consumers in Asia, Latin America, and selected other parts of the world hold promise for increased export demand. With these growing incomes and the prospects of dietary transition from vegetable protein to animal protein diets, the growth in export potential seems strong if not endless. Note that this growing export potential is not driven primarily by population growth, but by growth in incomes which create an increase in effective demand for food products and particularly animal protein products.

But export potential is driven by more than just effective demand. As has been noted earlier, increased competition from expanded production in the rest of the world dampens the prospects for U.S. agricultural exports. And a strong dollar compared to currency values of importing countries and of competing exporters will also dampen the prospects of U.S. agricultural exports. So growing incomes in the rest of the world may not be transformed into expanding U.S. agricultural exports of agricultural products.

But in the agriculture of the future, biological based raw materials will not just be used for food production, and their demand will not be dependent only on food demand. Biotechnology is creating new markets for agricultural products including pharmaceuticals and industrial products. Ethanol and bio-diesel have been talked about for years, but now a Cargill/Dow joint venture is manufacturing polymers (plastics) from corn. And some talk about the potential for biological sources of carbon to replace petro-chemical sources of carbon in a broader base of synthetics including fibers and chemicals. It is yet not clear how large the pharmaceutical and industrial products markets that use biologically based raw materials will be, but this increased source of demand also has the benefit of diversifying the end-use markets for agricultural products so that demand growth is not exclusively dependent upon expanding food and nutrition uses.

New Simplification Technology

Technological change has been a dominate theme in agricultural production for more than a century. Most of the innovations and technological advances of the past have been productivity increasing or cost reducing, and thus have been adopted by producers because of the benefits they receive from cost reductions, productivity/efficiency gains, volume increases from a given set of capital and labor resources, etc. In more recent years, selected new technology has focused on product characteristics and enhanced the revenue stream by creating products that have more value, not just more volume. This form of technology has created opportunities for production agriculture to move from a commodity industry to one that produces differentiated products, and frequently those differentiated products have higher and more sustainable profit margins.

But a third type of technology is now being introduced to agriculture through both biotechnology and the monitoring and measuring tools and techniques that are part of information technology. This technology might best be described as simplification technology. In essence, simplification technology reduces the labor and/or the managerial requirements in crop or livestock production. Consequently, it simplifies the production processes, making it possible to be an efficient crop or livestock producer with not only less labor input, but fewer managerial skills.

The implications of simplification technology for production agriculture are three-fold. First, simplification technology dramatically increases the size of operation that a given labor force can operate. Second, simplification technology reduces the production skill requirements needed to be successful as a farmer. And third, simplification technology (particularly in the form of monitoring and measuring equipment combined with servo mechanisms to automatically adjust production systems when they are not operating properly) significantly reduces the managerial requirement and simultaneously increases the span of control of a farm manager. In essence, simplification technology dramatically relaxes the resource constraints that limit the growth and expansion of farm businesses.

What are some examples of simplification technology? Roundup Ready soybeans and no-till production systems are one example. The standard procedure in soybean production today is to apply Roundup pre-plant to kill weeds, plant with a no-till planter that also applies appropriate insecticides, treat a second time with Roundup after planting if adequate weed control was not obtained with the pre-plant application, and harvest the crop. In contrast to more conventional production systems, labor is no longer needed for pre-plant tillage, hand weeding or cultivation after planting, and possibly even for the Roundup applications since a custom spraying service may be used. And managerial inputs are reduced as well because scouting and other inspection and over-sight activities to make sure that weed and insect populations are not reaching threshold levels that require treatment or cultivation are no longer required. Both the labor and the managerial skills needed to produce a high yielding soybean crop have been significantly reduced with this new technology. What happens to the opportunity to expand dramatically the size of corn/soybean farms if similar technology comes to corn production?

The technology used in the finishing phase of hog production further illustrates the concept of simplification technology. Confinement production with automated feed and water dispensing systems, mechanized waste handling and disposal, automated ventilation systems, and systemized daily work schedules have made it possible to finish hogs with not only less labor input, but with less managerial input. Similar systems of production are common in the poultry sector, and the modern milking parlor that contains a rotary milker or similar technology reduces the labor and managerial input in those production activities as well.

In general, electronic monitoring/measuring technology and automated servo mechanisms to correct or adjust performance as is now commonly available in combines, tractors, and forage harvesting equipment and will be increasingly available in poultry, pork and dairy barns are a different type of technology than the cost reducing/productivity enhancing technology of the past. This simplification technology dramatically influences the efficiency and productivity of both the labor and the management resources in agriculture, and dramatically expands the span of control of one very good farmer. The implications for farm size growth are already evident – 10,000 acre corn/soybean farms and 15,000 cow dairy farms are becoming more common-place not just in the West and South, but in the Midwest.

Competitive Metrics and Returns to Contributed Resources

The agriculture of the past has been primarily a commodity business, and consequently the key to long-term success in farming has been to be a low-cost producer. Although in the short-run prices may be sufficiently above cost to generate handsome, above normal profits as evidenced by $5 corn and $60 hogs only a few years ago, over time a number of producers expand their operations sufficiently that supplies increase and prices decline, thus reducing profit margins. As producers increase their efficiency through better management and adoption of technology, cost declines and margins increase, but over time adoption of the cost saving technologies by more producers again results in increased production and margin pressures. So in the long-run the only way to compete successfully in the farming business dominated by commodity production is to be a low-cost producer.

Some producers are low cost because they do not consider all costs in their decision making. Some producers have been willing to use their equity capital and even their labor in agricultural production and not require market compensation for those contributed resources. Given the significance of capital and labor in the production of most agricultural products, if these resources are assumed to be free or are costed at low compensation rates, costs of production are substantially reduced. Consequently, those farmers that are willing to give their time and money away or require low rates of return on their money and low wages for their labor will continue to produce even though prices may not cover cost computed at market rates of return. This puts additional margin pressure on those producers who want market rates of compensation for their resources. Commodity industries where a large proportion of the producers are willing to use their resources to produce, even though they are not fully compensated to do so, will continually suffer from very low or negative margins until those producers exit the industry.

But the basis and dimensions of competition in agriculture are changing. As agriculture is transformed from a commodity to a differentiated product business, competition becomes multi-dimensional -- it is not just being cost competitive that will lead to financial success. Differentiated products typically have a broader spectrum of quality features than commodities, and those quality dimensions or features often improve over time. In most non-food products consumers purchase, quality standards have continuously improved over time, and thus consumers are expecting food products to exhibit similar continuous quality improvement. Furthermore, product differentiation is not a permanent phenomenon. Differentiating attributes become commoditized over time, so the successful farmer must constantly evaluate new opportunities for differentiation and be an early adopter or first mover in these new differentiated products before the premiums or margins are pressured by increased numbers of producers who enter the market. Consequently, in differentiated product markets producers not only compete with respect to cost, they also compete with respect to quality attributes of their products and with respect to the speed or response time to introduce new products as consumer demand and market conditions change. And speed of entering new value added or differentiated product markets may be critical not only to obtain the best premiums, but also because those who attempt to enter the market later might find that it is adequately supplied. Contracts and other business arrangements to produce the differentiated product may have already been negotiated and consequently new production and producers are not needed. Competition in this new agriculture is multi-dimensional and more intense.

The New Agriculture

These four fundamental forces are shaping a very different agricultural industry compared to that of the 20^{th} century. Twenty-first century agriculture is likely to be characterized by the following: increased concentration and consolidation; expansion of industrialized agriculture; production of differentiated products; precision (information intensive) production and distribution; emergence of ecological agriculture; formation of food supply chains; increasing risk; and more diversity.

Increased Concentration and Consolidation

Consolidation and concentration is occurring at all stages of the food production and distribution value chain. Mergers and acquisitions as well as endogenous or internal growth strategies of food retailers has resulted in that segment of the food industry being dominated by less than 10 firms (both in the U.S. and worldwide) with the largest food retailer in both the U.S. and the World being Walmart. With this concentration and consolidation at the retail end of the value chain, processors and distributors are also consolidating so they can position themselves as nationwide (or even worldwide) qualified or preferred suppliers to the food retailing industry.

At the same time as consolidation is occurring in food processing and retailing, similar consolidation is occurring in the input supply industries. For example, less than 5 manufacturers dominate the machinery and equipment industries worldwide, and a similar number of firms dominate the chemical and biotechnology industries. In the livestock slaughter industry the four-firm concentration ratio for the beef industry is approximately 80%, and the poultry industry worldwide is dominated again by less than 5 firms. Clearly this consolidation and concentration raises questions for producers concerning issues of market power of both buyers and suppliers, and the potential implications of concentration and consolidation on profit margins and market access for farmers.

Accompanying this trend to a more consolidated and concentrated industry is the introduction of new business models or ways of doing business in the food production and distribution industry. Vertical business arrangements across previously independent, market coordinated segments of the industry are becoming more prevalent. Contracts, strategic alliances, qualified supplier programs, and even vertical integration through ownership are rapidly becoming the norm in the livestock industries, and are increasingly being used in the crop industries as well. These new business models challenge the traditional independent, market coordinated structure of the agricultural production and food distribution industry -- they clearly change relationships from the traditional independent, transactional relationship of the past to a more strategic, longer-term relationship. And they also mean that some producers may have access to markets while others do not have that access. These new business models, which have been commonly used in the industrial sector, challenge the traditional open access, independent market structures that have dominated the agricultural industry for in excess of a hundred years.

This changing structure of the agricultural industry raises a number of questions. First, why is this structural change occurring? Is it a result of the economic benefits in terms of cost savings, efficiency gains, better quality, customer responsiveness, traceability and food safety, speed to market, etc., of larger and more tightly aligned food production distribution systems across the value chain? Or is it a result of larger and more powerful firms exercising market power and taking advantage of those who do not have that market power? A second key question is whether the benefits of these structural changes exceed the cost? Do the costs in terms of excluding some participants from the market, destroying traditional market competition, the potential of monopoly profits, reducing the opportunities for some potential participants -- in many cases the social cost of a more concentrated and consolidated industry -- off-set the benefits identified earlier? The distributional implications of this structural change are not unimportant -- because some current and potential players will lose whereas others will win.

And finally, can or should we regulate the structural changes that are occurring in the food production and distribution industry? One approach is to "let the markets work" subject to anti-trust and other laws currently in place to police excess market power. An alternative approach would be to prohibit contracts, alliances, mergers and acquisitions, packer ownership of livestock, etc., and maybe even restrict firm size, to eliminate the prospects of excessive profits, and market exploitation; and maintain a more open access, independent, traditional structure of the agricultural industry. A third alternative might be to shape the structural change through rules and regulations that allow new business models to be used in the industry, but reduce the potential of market power or exploitation through the implementation of those business models.

Consolidation, concentration and structural change are likely to continue in the industry, and the controversy and debate concerning the implications and desirability of these changes will also continue and likely intensify.

Expansion of Industrialized Agriculture

Industrialization of production means the movement to large scale production units, that use standardized technology and management and are linked to the processor by either formal or informal arrangements. Size and standardization are important characteristics in lowering production costs and in producing more uniform crop products and animals that fit processor specifications and meet consumers' needs for specific product attributes, as well as food safety concerns. Smaller operations not associated with an industrialized system will have increasing difficulty gaining the economies of size and the access to technology required to be competitive, except perhaps in niche markets. Smaller operations can however remain in production for a number of years since they may have facilities that have low debt and are able to utilize family labor. Technological advances combined with continued pressures to control costs and improve quality are expected to provide incentives for further industrialization of agriculture.

The current movement toward industrialized production units in the U.S. is nearly complete for some livestock species, but lagging for others. The poultry industry moved to an industrialized model from the 1940s through the 1960s. Cattle feeding moved to the industrialized model in the 1960s and 1970s. The dairy and pork industries are in the midst of a dramatic movement to the industrial model, with the current transition largely to be completed by 2010. The brood cow industry continues to be much less affected by industrialization, as technologies have yet to be found that can greatly increase the productivity of the brood cow through confinement and intensive management. Specialty crops have or are rapidly adopting industrialized production systems. The grain industry is moving more slowly to this type of agriculture, but even segments of the commodity markets are increasingly adopting a biological manufacturing approach.

Production of Differentiated Products

The transformation of crop and livestock production from commodity to differentiated product industries will be driven by consumers' desire for highly differentiated food products; their demands for food safety and trace-back ability; from continued advances in technology; and from the need to minimize total costs of production, processing, and distribution. Food systems will attempt to differentiate themselves and their products by science and/or through marketing. Ways to differentiate through science include gaining exclusive rights to genetics through patentable biotechnology discoveries; by exclusive technology in processing systems; and by superior food safety integrity. Marketing may include: branding, advertising, packaging, food safety, product quality, product attributes, bundling with other food products for holistic nutritional packages, and presentation of products in non-traditional formats.

In the grain industries, high oil corn acreage has grown rapidly in some areas, and new crops such as high protein wheat and specific amino acid composition soybeans are expanding. In pork, differentiation on lean content is increasingly common. In the future at least two types of pork sire lines are likely to be developed for different markets. One sire line will be selected to produce extremely lean and efficient pigs, with an objective of least-cost for reasonably acceptable lean pork. Other lines destined for export and restaurant markets will be selected for high pork quality. These lines will be darker in color and contain approximately 3 percent intramuscular fat.

Precision (Information Intensive) Production

The management of production is expected to trend toward more micro management of each specific production site, specific room, and possibly even specific acres or animals. The shift will be driven by the influx of information about the environmental and biological factors that affect production. The motivation will be to minimize costs and enhance product quality.

Increased used of monitoring technology will greatly expand the amount of information available regarding what affects plant and animal growth and well-being. This will be made possible by innovations in sensors to use in individual monitoring and control systems. In addition, greater understanding of how various growth and environmental factors interact to affect biological performance will be forthcoming. This understanding will then be designed into management systems which incorporate the optimum combinations and apply them at a micro or localized level.

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 the herd; nutritional feeding to the specific genetics, sex, age, health, and consumer market for the individual animal; and continuous adjustment of the ambient environment, including such factors as temperature, humidity, air movement, and dust and gas levels within buildings, to maximize economic returns.

Nutrition management is expected to more closely match the nutrient supply with the needs of individual animals. This will include the matching of specific grains with individual species and perhaps specific genetics, body conformation, gender, phase of life cycle, or even the end-use for the animal. Greater emphasis also will be placed on nutrition to minimize odor and nutrient levels in manure rather than on traditional economic factors such as feed efficiency and rate of gain. For example, phase and split-sex feeding in pork production can reduce total costs of pork production by 4-6 percent. An additional benefit to phase feeding is a 15-percent reduction in nitrogen and phosphorous excretion.

Buildings and equipment will continue to move toward larger scale to fit the industrialized model. Inside the buildings, expect enhancement of monitoring and control systems to help detect gases, temperature, humidity, and disease organisms that could adversely impact the economic performance of animals, and correct problems when they reach critical thresholds. Further advancements can be expected in cleaning systems to maintain higher sanitation, improve conditions for workers and in animal handling systems to reduce injury to animals in movement and marketing.

Emergence of Ecological Agriculture

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 (i.e., as having no exchanges of matter or energy with its environment). They argue that agriculture 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 activities.

Others argue, additionally, that our increasing awareness of ecological systems questions the sustainability of our predominant agriculture paradigm. One view of agricultural productivity is that production problems can most effectively be solved by bringing an external counter force to bear on a given production problem – applying a pesticide to a pest, for example. Ecological knowledge suggests that a more effective approach might be to determine why the pest is a pest and discover how improving internal relationships in the system could solve the problem – improving predator/prey relationships, for example. Such approaches argue that the predominant paradigm for pest management has been one that mandates "therapeutic intervention" where pest problems are solved by bringing an external force into the system to eliminate the pest. Since nature is always evolving, this approach inevitably invites a new round of pest problems that puts farmers on a treadmill. Further, this treadmill results from both chemical and biotechnological approaches since both ignore the original conditions that produced the opportunity for pest invasion.

These differences in the fundamental approach to production have significant structural implications since the "therapeutic intervention" method tends to be more capital intensive because it requires the annual purchase of "external force" inputs. The natural systems approach may require initial capital outlays, but moves to the establishment of self regulatory systems.

Some practitioners (notably biointensive integrated pest management operators and organic farmers) have put these ecological principles into practice. These operators have made fundamental shifts in their management practices to apply ecological principles. In particular, they tend to use nutrient cycling instead of nutrient flows, self-regulating pest management systems instead of pesticide applications, and diverse crop/livestock systems instead of monocultures. Some practitioners have developed rather sophisticated systems of production that have significantly reduced their energy inputs, substituted management skills for purchased inputs and, in many instances reduced their aggregate production costs. It is possible that smaller farms may take advantage of these new management practices more rapidly since they often have more flexibility to adapt the necessary changes.

Formation of Food Supply Chains

Much of U.S. plant and animal agriculture will be a part of industrialized food systems by the year 2020. Industrialized food systems are those which are holistic in production-processing-marketing, and organized to deliver specific-attribute consumer products by development of optimized delivery systems or through differentiation by science or branding.

An increasing emphasis will be placed on managing and optimizing supply chains from genetics to end-user/consumer. This supply chain approach will improve efficiency through better flow scheduling and resource utilization, increase the ability to manage and control quality throughout the chain, reduce the risk associated with food safety and contamination, and increase the ability of the crop and livestock industries to quickly respond to changes in consumer demand for food attributes.

Food safety is a major driver in the formation of chains. One way to manage food safety risk is to monitor the production/distribution process all the way from final product back through the chain to genetics. A trace-back system combined with HACCP (Hazard Analysis Critical Control Points) quality assurance procedures facilitates control of the system to minimize the chances of a food contaminant, or to quickly and easily identify the sources of contamination.

A supply chain approach will increase the interdependence between the various stages in the food chain; it will encourage strategic alliances, networks, and other linkages to improve logistics, product flow, and information flow. Some have argued that in the not-too-distant future, competition will not occur in the form of individual firms competing with each other for market share, but in the form of supply chains competing for their share of the consumers' food expenditures.

Increasing Risk

Agricultural production has always been a risky business, but this may become increasingly so in the future. Not only will the traditional variables of price, weather, disease, etc. continue to buffet the industry, new sources of risk may be encountered. Some food distribution channels may require particular quality characteristics that are not available in predictable quantities in open, spot markets. The risk of changing consumer preferences or a food safety scare may be a much more critical and important risk to manage than price or availability of raw materials. One reason for a contractual arrangement to source raw materials from a qualified supplier is to reduce price and availability risk as well as food safety risks from contamination, and simultaneously obtain the attributes needed in the final product from the specific attribute raw material. But this arrangement may reduce flexibility and introduce relationship risk -- the risk that the qualified supplier arrangement is terminated.

The transformation of a segment of agriculture from a commodity to a differentiated product industry introduces at least three new risks. First, differentiated products are positioned to respond to unique market segments that value the attribute that is differentiated. Assuming this attribute is measurable (which may be a risk in itself since many food attributes, including quality, are difficult to measure), one risk is that consumers' and end-users' attitudes and willingness to pay for some attributes may change over time. For example, consumer attitudes with respect to food additives, biotechnology, and genetically modified organisms (GMOs) do not appear to be stable or predictable across cultures and across time.

Second, alternative techniques to accomplish product differentiation may develop over time, and those firms or individuals that can produce the differentiated product could increase. Thus, differentiated products are regularly commoditized over time, and initially higher margins are eroded as new competitors appear. This speed of commoditization is also a source of uncertainty.

Finally, differentiated products in the food market, particularly if that product is a branded product, also carry the risk as well as the reward of branding. Brand value can be quickly destroyed by defects or quality lapses, and in the food product markets, food safety is a risk that can quickly destroy brand value.

More Diversity

Production agriculture in the future may also be characterized by increasing diversity. But increased diversity is different than more diversification – diversification refers to expanding the number of activities or enterprises managed and controlled by one firm or business. Diversity refers to the differences between the firms and businesses that comprise the industry. In fact, the agriculture of the future may exhibit more specialization (i.e., less diversification) within a business, and at the same time more diversity between businesses.

The agriculture of the past could be reasonably accurately characterized by typical or representative farms for various geographic regions and crop or livestock enterprises. Certainly farms were not identical in terms of the technology used, the size of the business, the financial characteristics, the ownership structure, etc., but in a particular locale and for a particular crop or livestock sector they exhibited many similarities – in fact more similarities than differences. But increasingly agriculture is not characterized by similarities among firms, but differences between firms. Not only do we now have enterprise specialization (i.e., corn/soybean farms or hog farms rather than diversified farms of the past that included corn/soybeans and hogs produced on the same farm), we are further separating production activities in livestock industries such that firms may be involved in only one phase of dairy, pork or beef production. For example, some firms specialize in breeding, gestation and farrowing in pork production; and separate firms specialize in finishing or the final feeding phase of pork production.

Diversity is also increasingly characterizing the types of products produced even within a segment or sector of agriculture. With increasing diversity in consumer demands and the opportunity for product differentiation at the production level, farmers are no longer just producing commodity crop and livestock products. For example, some farmers are producing high oil corn, while their neighbors are producing white corn or high starch corn. A further form of diversity in the farm sector is in terms of commitment to and dependency on farming as a source of family income. Many farm families combine farm and off-farm employment, or home-based businesses, not only as a way to start farming but also as a permanent and satisfying way of life.

There is more diversity in size of farming operation today than in the past. Even though large scale businesses are growing rapidly as the dominant size in some parts of the livestock industries, smaller scale production units continue to be a significant part of these industries as well as other segments of agriculture. This occurs most often in segments focused on niche markets and local customers, such as fresh fruit and vegetable production for local consumption and roadside stands.

Differences in marketing and financial strategies between firms are an important part of the new diversity in agriculture. Farmers are using various methods of raising capital, not just borrowing money and obtaining equity from their own savings. Longer-term lease arrangements for land and machinery and buildings are becoming an important part of the farm capital structure for some businesses, and yet are not part of that structure for other businesses. Some farmers are using equity capital from outside investors rather than relying strictly on their own retained earnings or family sources. And different farmers use different strategies for marketing their crops – some use cash markets whereas others forward contract their production. Some producers sell at the farm gate, while others are in value-added cooperatives that retain ownership further down the distribution channel towards the final food consumer.

A Final Comment

This new agriculture profoundly changes the competitive environment in the industry. In the commodity agriculture of the past, most farms and agribusinesses had to compete only in terms of cost. If one was a low-cost supplier and did not expand beyond the sustainable growth rate of the business, one could expect to be a successful -- to survive and maybe even thrive in the long-run. In the new agriculture that includes differentiated products and more tightly aligned marketing/distribution systems with producers being raw material suppliers for manufacturers and food processors, competition includes quality features and responsiveness or time to market as well as cost. In the agriculture of the future successful companies will need to be better, faster, and cheaper to have a sustainable competitive advantage.

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