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THEME OVERVIEW: FUNDAMENTAL FORCES AFFECTING AGRIBUSINESS INDUSTRIES

Kent Olson and Mike Boehlje

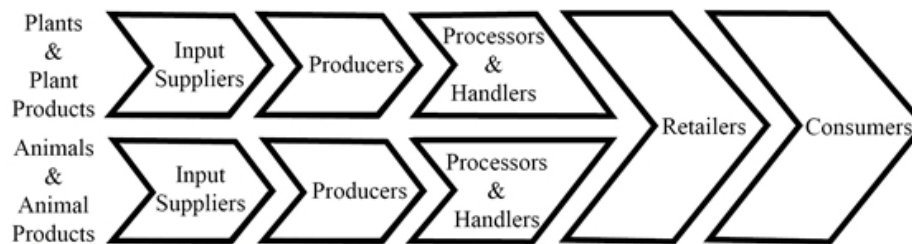
JEL Classifications: Q13, L10, L22, M22, L80

Keywords: Agribusiness, Market Forces, Structural Change, Porter's Five Forces

Agribusiness industries are facing numerous challenges and opportunities resulting from various fundamental forces. An understanding of the forces that are shaping and shifting the competitive landscape is useful to not only understand the strategic positioning decisions of the firms in these industries, but also the dramatic structural changes that are occurring in the food production, processing and distribution sector. This series of articles discusses the fundamental forces creating change in the agribusiness industries, and how companies and decision-makers are being affected by, and adapting to, changes in these forces.

We frame this discussion using the analytical concepts of value chains and Porter's Five Forces. We describe the agribusiness value chain as two chains which become one at the consumer end (Figure 1). One value chain follows plants and plant products, and another chain follows animals and animal products. These two chains blend into one chain at the processing and retailing stages of the chain. We also view the value chain rather simply as four stages: (1) input suppliers; (2) producers; (3) processors and handlers; and (4) retailers. While the value chain could be viewed as specific for different products, aggregating to these two chains, plants and animals, permits the discussion of the major forces and impacts of interest to most readers.

Figure 1: Value Chain for Plants, Animals, and their Products



This theme is split between the current and next issues of *Choices*. In this issue, the papers explore the forces affecting retailers and the plant and plant products value chain including the input industry (Olson, Rahm, and Swanson); crop production (Bechdol, Gray, and Gloy); processors and handlers (Boland); and retailers (Senauer and Seltzer). In the next issue, the forces affecting the animal and animal products value chain will be discussed, along with those impacting the specialty crop sector.

To provide a common thread for the articles, the authors use Michael Porter's Five Competitive Forces (plus two additional forces) to guide discussion of how economic forces are creating opportunities and threats, and how companies and the value chain as a whole are changing. Porter identifies five forces that shape an industry: (1) rivalry among existing competitors, (2) threat of new entrants, (3) bargaining power of suppliers,

(4) bargaining power of buyers, and (5) the threat of substitute products (Porter, 2008). Two additional forces affecting competition have been described as: (6) technology and (7) other drivers of change (Boehlje and Hofing, 2005). These last two forces introduce an external dynamic to Porter's forces. These seven forces are described briefly below.

Rivalry among Established Firms

The level of rivalry within an industry can depend, in large part, on the number of firms, demand conditions, and exit barriers. Due to the number of firms involved, many agricultural industries are often described as perfectly competitive—as opposed to monopolistic competition, oligopoly, or monopoly. However, government regulation and intervention, as well as the size and dominance of a few firms, can provide different degrees of perfect competition.

Rivalry also varies depending on whether demand is growing with new customers, growing with existing customers, stagnant, or declining. With growing demand and new customers, firms can find customers more easily and expand production. With only existing customers, firms will have to compete more on price and nonprice factors to capture customers from competitors and keep current customers. Rivalry is greatest when demand is declining as firms vie for a share of a shrinking market.

Higher exit barriers can increase rivalry and competitive pressures. This can happen when profitability is low for an industry, but firms are unable to exit—or exit quickly—due to investments in specialized assets, high exit/shut-down costs, emotional attachments to an industry, or contractual or other relationships between firms.

Threat of Entry by Potential Competitors

Potential competitors may be across the road, across the nation or across the ocean. The threat of entry depends on the height of barriers to entry. These barriers include: the extent to which established firms have scale economies, the extent to which established firms enjoy a market or cost advantage over potential entrants, high capital requirements for new entrants, the extent to which established firms have better access to distribution channels for inputs and outputs, the extent to which government regulations restrict entry, and the extent to which established firms have brand name loyalty with customers.

Bargaining Power of Suppliers

Suppliers are a threat to firm and industry profitability when they are able to increase the price of their product or affect the quantity and quality of the products supplied. Fewer suppliers mean they have greater power. Improved communication technology has taken away the power of many local suppliers. The recent mergers of suppliers and the consolidation of input technologies, such as seeds and pesticides, have increased the suppliers' bargaining power with farmer-customers, as well as changed the competitive pressures within the input industries. Suppliers have power if they are more concentrated than their buyers, do not receive a high percentage of their revenues from one industry, have customers with high switching costs to change suppliers, have a differentiated product, have a product with no substitutes, through either real differences or patent protection, or could forward integrate into additional stages in the value chain.

Bargaining Power of Buyers

The number of buyers has a very large impact on how the market works. Fewer buyers mean they have greater power. If sellers cannot easily ship their products to other markets, or they do not have price information from other markets, a few local buyers can have considerable power even though the total number of buyers is large in the broader market. The increasing use of contracts can increase the power of the buyer through controlling the amount of price information in the marketplace. In ways similar to suppliers, buyers have power if they are few in number or a few buy a large percentage of the product in the market, products are undifferentiated commodities, or buyers could integrate backwards in the value chain. Buyers will also bargain harder if the product constitutes a major portion of the buyer's total costs, or if the product has little effect on the quality of the buyer's product or other costs.

Substitute Products and Services

Substitute products limit the price that producers can seek or ask for without losing customers to those substitutes. Competitive pressure comes from the attempts of the producers of the substitutes to win buyers to their products. The advertising campaigns of the pork, beef, and poultry industries are an obvious example of the competitive pressures due to substitute animal protein products; each industry feels forced to advertise to keep customers, and cannot charge as much as they would like without pushing their customers into buying other products.

Technology

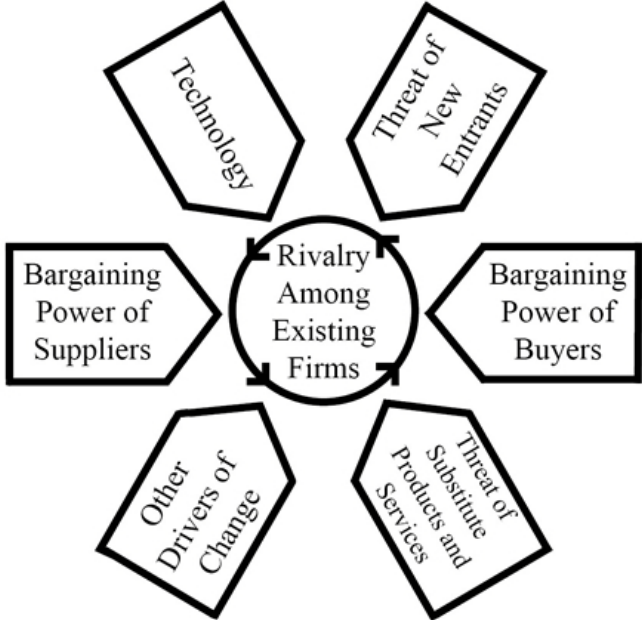
Changes in technology can have a large impact on the production of and demand for a service or product of a firm. The risk from technological change depends on the size and the role of technology in the industry, as well as the speed of technical change. Advances in technology can be disruptive; they can cause leaps that leave users of old technology far behind. The expected lifespan or change in technology can put businesses on the treadmill of continually having to retool to keep up with their competitors. New technology can alter not only the efficiency and cost of the production process, but the actual products and services offered and demanded by others in the value chain. New chains may be created due to a new technology in communication as well as in products and services.

Other Drivers of Change

Other drivers of change include changes in government policy and regulations, changes in international trade agreements, demographic changes, and other factors not included in the first six forces. Competitive pressure comes from differing abilities of firms to respond and adapt to these changes. The impact of these forces depends on the scope of the change, the speed at which change is anticipated or actually felt, and the depth and breadth of the responses needed to adapt to these changes.

Figure 2 provides a pictorial summary of the modified Five Forces framework. This framework was used by each of the authors of the articles for this theme to analyze the challenges, opportunities and changes for the various stages of the agribusiness value chain.

Figure 2: Value Chain for Plants, Animals, and their Products



For More Information

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MARKET FORCES AND CHANGES IN THE PLANT INPUT SUPPLY INDUSTRY

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JEL Classifications: Q13, L10, L22, M22, L80

Keywords: Agribusiness, Input Supply Industry, Fertilizer, Plant Nutrients, Seed, Capital, Market Forces, Structural Change, Porter's Five Forces

The plant input supply industry is composed of many diverse segments and companies that supply farmers with seed, nutrients, pesticides, machinery, capital, labor, and many other inputs. These segments, companies and their markets are both domestic and international, so any review of market forces needs to have a global focus in how they will likely continue to evolve into the future. Since we do not have space in this article to cover every segment of this large industry in detail, we explore the impact of the major forces driving change using examples from the different segments and companies of the plant input industry.

Rivalry among Existing Competitors

The plant input industry has seen a dramatic reduction in the number of competitors. But the lower absolute number of suppliers has not diminished the price competition between industry players. Most of the plant input suppliers have high fixed cost structures in land, capital equipment, and significant permitting, approval, and regulatory costs. This gives existing competitors a strong economic incentive to strive for market share more aggressively than if they had low fixed costs. Each additional percent of the market allows them to spread their fixed costs and brings a better net margin. Given the regulatory and technological requirements to stay competitive in these sectors, the high fixed cost aspect of market share competitiveness will only continue to be a prominent feature.

Another aspect of rivalry is market segmentation. Within each plant input sector, similar aspects of segmentation make internal rivalry a complicated dynamic. For example, in the agricultural finance sector, a limited number of firms have the capital and expertise to make loans in excess of \$10 million, but literally thousands of local banks and credit unions can make loans under \$10 million. Even though we might expect it due to the fewer number of firms, competition is not diminished even in the large loan segment, due to electronic communication making market information available to borrowers and the ability and willingness of large borrowers to seek better terms beyond traditional geographic areas.

In the case of plant nutrients, there are three distinct markets and industries: nitrogen (N), phosphate (P) and potash (K). While there are common demand drivers for these nutrients such as grain prices, there are different supply drivers. Each primary nutrient requires different natural resources as well as different mining and processing technologies. These natural resources are located in different parts of the world. In the case of nitrogen, regions with low cost natural gas such as the Mideast, Russia and the Caribbean Basin are key producers and exporters. In the case of phosphate, regions with rich deposits of phosphate rock and access to low cost sulphur and ammonia are the main producers. These regions include Morocco and a few other North African countries; the United States; China; Russia; Israel and Jordan. In the case of potash, only 12 countries mine this mineral; Canada, Russia/Belarus, Germany, Israel and Jordan are the largest producers.

Despite fewer producers today compared to a couple of decades ago, these are large global markets and prices of crop nutrients in the middle of Illinois are impacted by fundamental developments from around the world. For example, nitrogen and phosphate trade account for about 40% of global use (Table 1). Potash

trade—excluding the large movement from Canada to the USA—accounts for approximately 70% of global potash use. These percentages compare to 13% for the major grains. Even though these large global markets are served by fewer companies today, industry concentration, as measured by the Herfindahl-Herschman Index (HHI), is low for each nutrient (Table 2). Following the procedures described by the U.S. Department of Justice and the Federal Trade Commission, HHI is the sum of the squared market shares by firm with a market categorized as “unconcentrated” if the HHI is less than 1500, “moderately concentrated” for an HHI between 1500 and 2500, and “highly concentrated” if the HHI exceeds 2500.

Table 1

Table 1. World Fertilizer and Grain Trade (Million Tonnes)

	World Use	Total Exports	Exports as a Percent of Use
Coarse Grain	1,047.8	116.4	11%
Wheat	626.5	124.7	20%
Rice	425.6	30.3	7%
Total Grain	2,099.9	271.4	13%
Nitrogen (N)	98.4	39.2	40%
Phosphate (P ₂ O ₅)	37.1	14.8	40%
Potash (K ₂ O)	25.5	18.9	74%
Total Nutrients	161.0	73.0	45%

Source: USDA, IFA, Fertecon, Mosaic
Five Year Averages 2005/06 - 2009/10

Note: Nitrogen includes urea, ammonia, ammonium nitrate, ammonium sulphate and calcium ammonium nitrate. Phosphate includes phosphoric acid, DAP, MAP, TSP, SSP. Phosphate rock is not included. Potash includes MOP, SOP and potash exports do not include Canadian shipments to the United States.

Table 2

Classification of Plant Nutrient Industry Concentration

Plant nutrient industry segment	Herfindahl-Herschman Index (HHI)
N	<400: unconcentrated
P	<400: unconcentrated
K	1,050: unconcentrated

Firms throughout the entire supply chain compete on the basis of price and cost efficiency. A good example is the proliferation of unit train movements of fertilizer to ‘big barn’ retail warehouses primarily in the Midwest.

Today, nearly all of the phosphate shipped by Mosaic—the world's leading producer and marketer of concentrated phosphate and potash—via rail from central Florida to domestic customers moves in 65 to 80 car unit trains with 'turns' as low as 12 days. That was not the case 10 years ago. More and more retailers are investing in large warehouses (15,000+ tons) capable of unloading unit trains in order to capture significant freight savings and compete with the dealer down the road or, more likely, in the next county.

The farm machinery and equipment manufacturing industry (North American Industry Classification System (NAICS) code 333111) is obviously a key input industry in the plant and plant product chain and faces many of the same forces described in this article for other input industries. While there have been mergers and acquisitions within this industry, they have not been as substantive or pervasive as in the plant nutrient and the seed/biotech/crop protection segments. Concentration is moderate and has decreased very slightly as seen in the HHI for the 50 largest companies which totaled 1,707 in the 1997 Economic Census of the United States and 1,657 in the 2002 census. This slight decrease in HHI is contradicted by an increase in the market share of the four largest companies, as measured by the value of shipments, which increased from 53% in 1997 to 58% in 2002; market share for the eight largest increased from 60% to 65%.

Acquisition by and purchase of competitors is a highly cyclical activity that is exacerbated by fluctuating currency exchange rates and international financing factors. With the U.S. dollar near all-time lows for its broad-weighted exchange rate, the value of U.S. agribusiness assets—including all companies in the input supply industry—has been very attractive to foreign firms that have access to capital in non-dollar markets. Consequently, the acquisition of U.S. agribusinesses by foreign companies has increased dramatically recently. This increasing globalization of input segments increases the volatility of rivalry by introducing competing firms from other geographic areas.

Another important point is that there is a big difference between industry consolidation and the loss of a segment's competitive advantage. The U.S. nitrogen and phosphate industries are good examples. The U.S. nitrogen industry is about 60% of the size it was 15 years ago. The U.S. industry simply could not compete with foreign producers when domestic natural gas prices began to increase relative to values in other regions early last decade. Strong global demand growth coupled with lower relative natural gas prices resulting from the development of large shale gas reserves domestically has stabilized and may even breathe new life into the U.S. nitrogen industry. Nevertheless, the United States now imports roughly one-half of its nitrogen needs.

In the case of phosphate, some firms depleted their rock reserves and went out of business and others did not invest in new mine development because returns were so low during the first half of the last decade. The largest U.S. phosphate producer, IMC Global, merged with the Crop Nutrition business of Cargill to form Mosaic in 2004. U.S. phosphate rock production today is about one-half of its peak a dozen years ago. The competitive advantage of U.S. phosphate producers has eroded over time due to the higher costs of developing, extracting and processing lower quality secondary and tertiary reserves, as well as complying with more restrictive environmental regulations. Needless to say, the United States plays a much smaller role in the global phosphate market today than it did a decade ago.

Threat of New Entrants

Potential entrants into the plant input sector are both domestic and international, with the latter being a larger threat. The entry of a new local competitor is a small risk in most plant input sectors. In the rapidly changing dynamics of plant inputs, foreign competitors can be enabled by governmental financing without regard to short-term or even intermediate profitability of the entrant. The entrance of Chinese glyphosate producers is a very clear example. All of the new producers emerged as a result of capacity added to existing Chinese petrochemical facilities. Each of these new producers saw a chance to increase local employment and export opportunities. It seems unlikely that they engaged in a market analysis that took into consideration a long-term profit potential. Increasingly, growing economies such as China and India see agricultural production as a strategic need that should be supported by direct government investment and assistance as needed, versus indirect support by the United States and the European Union. The ability for this new capacity to disrupt international trade and prices will be very difficult to assess for strategic planning purposes in more mature markets.

Expiration of patents, such as Monsanto's Round-up, create the potential for new producers in the plant input sector. The sector has followed the lead of the pharmaceutical industry by looking for patentable improvements to its existing technologies. This, plus the higher cost of certification of generics under the

current administration, has helped to provide some additional intellectual property barriers. Given the increasing technological content and environmental scrutiny, this will be an increasingly important tactic to extend existing barriers.

The importance of barriers to entry varies with segments of the input industry. In the case of plant nutrients, there are increasing barriers to entry. Nitrogen requires cheap hydrocarbon feedstock and an investment of a billion dollars; phosphate relies on high quality phosphate rock, access to low cost sulphur and ammonia, and an investment of \$1.5 to 2.0 billion; and potash needs mineral deposits found in a few locations, an investment of \$2.0 to 3.0 billion, plus 5-7 years to develop. The recent hostile takeover attempt of Potash Corp., the world's largest potash producer based in Saskatoon, Saskatchewan, by BHP Billiton, the world's largest iron ore mining company based in Melbourne, Australia, highlighted the attractiveness of the potash industry but also illustrated the difficulty of entry. The \$40 billion bid by BHP was deemed grossly inadequate by Potash Corp. but no white knight emerged to up the ante, indicating either the offer was adequate or there are not many knights whose kings can come up with \$40 billion to invest in a potash company. In the end, the Canadian government, based on the criteria from the Investment Canada Act, concluded the proposed deal would provide no net benefit to Canada, and BHP withdrew their bid.

Bargaining Power of Suppliers

For many suppliers of commodity inputs such as steel and energy for the plant input sector, the agricultural market's profits are relatively opaque and their total consumption of the suppliers' output small. This makes the agricultural input sector a price taker, but it also helps them maintain margins. For example, steel suppliers set the steel price primarily based on global construction and automotive demand; consequently, agricultural implement manufacturers have little power over the steel price they pay. But because they represent a small portion of the sellers' markets, they are unlikely to be scrutinized heavily by steel sellers in an effort to wring special margin advantage. While this is not to say that steel sellers will not bargain hard with agricultural implement manufacturers, the majority of the steel seller's focus will be on larger consumer driven manufacturers and contractors.

Similarly with energy prices, even large producers of plant inputs are a small part of an energy company's market. So the energy producer has considerable power over the plant input supplier but the energy price is set by the consumer market, not the plant input supply market.

The power of human capital, as a supplier of labor, varies regionally, not necessarily due to the power of the individual worker but due to the demand for labor, especially specific skills, from other companies. For example, Mosaic faces considerable competition for skilled labor from other mineral industries as well as the tar sands developments in Western Canada. Thus, labor costs are high in this area and affect the size and type of capacity expansions.

Bargaining Power of Buyers

Even though farm size has increased and the number of farms has decreased, there are still many farmers. So they have minimal power in dealing with their input suppliers. Plus, farmers sometimes decrease their own bargaining power by maintaining preferred suppliers and relationships, and being unwilling to consider competitors' products, because they are risk averse. In addition, many suppliers work to decrease compatibility with other suppliers and thus increase switching costs for farmers.

Farmers may see borrowed money as a commodity, but many do not shop their business to other lenders or even do a serious consideration of other lenders. This is seen anecdotally in the United States., and was found in a survey of German farmers (Musshof, Hirschauer, and Wassmuss, 2009). Farmers could make themselves more "bankable" which would increase the number of lenders who would bid on their business. Farmers, who maintain their financial records in an easy to supply and verify format and take the time to fill out the information required for a serious counterbid, can reduce spreads and fees and remove covenants—thus making lenders more competitive in their market area.

Plant nutrient distributors are consolidating and gaining bargaining power with input suppliers. Agrium is growing a large retail distribution business. More buying groups are emerging. Large distributors are building more import terminals and developing expertise to source product globally. These larger distributors are forcing their input suppliers to be more competitive in their pricing. However, since these distributors sell to

many farmers, they are able to keep a larger share of the supply chain profit for themselves.

Threat of Substitutes

While a plant cannot substitute one nutrient for another, changes in seed technology have had and will continue to have significant implications for plant nutrition. That is, the efficacy of alternative nutrient forms and delivery methods may create products that can substitute for each other even though the basic nutrients do not. The development of genetically engineered pest resistant varieties is another example of products that create substitutes for current pest treatments and alternative seed choices. These new substitutes have resulted in a substantive convergence of two previously fairly independent value chains, seed and crop protection, and a large transfer of value from crop protection companies to seed/biotech companies. Those input producers who can create these products or partner with seed producers will have an advantage in marketing and, if successful, gain market share.

Patent expiration does not create a substitute product directly. But generic products are substitutes for the original product and create competition for the original producers, as discussed earlier in the example of Monsanto's Round-up.

Technology

Changes in seed technology that will increase plant populations to 60,000 per acre will have significant implications for plant nutrition. There simply will be more 'mouths' to feed per acre. Providing plants the right amount of the primary nutrients—nitrogen, phosphorus, and potassium—as well as secondary nutrients, such as sulphur, and micro nutrients such as zinc, at the right time becomes more critical and a bigger challenge. Retail distributors likely will play a greater role in managing plant nutrition with this more complicated technology. In addition to advances in application technologies, new plant nutrient products may emerge, such as Mosaic's MicroEssentials® line of products which contain nitrogen, phosphate, sulphur and different micronutrients depending on the crop. The increased use of GPS enabled equipment allows farmers to increase seeding density, increase the accuracy of nutrient and chemical placement, and decrease fuel use per acre. These new technologies will have different impacts on different inputs and geographical areas. In some cases, they will increase demand for nutrients. In others, they might increase the crop canopy to eliminate the need for weed spraying. Again, those input suppliers and distributors who respond with these new products and services will have a competitive advantage in the future.

The increasing rate of technological change and its significant interactions among inputs puts a premium on technological adoption as a primary farm management skill. Those suppliers who can educate the buyers on these interactions to take advantage of combined effects will gain significant market share. Suppliers can also benefit from the fact that their knowledge has increasing returns to scale, since informing one operator does not restrain another operator's usage of the same knowledge. The information dissemination will be facilitated by increasing applications of information technology (I/T) infrastructure. This large investment in I/T resources will be another "economies of scale" issue for input suppliers. Once the I/T system is in place, the owners of the system have a huge incentive to drive as much volume through the system as possible.

Other Drivers of Change

The growing role of national, state, and local governments and their regulations are important drivers of economies of scale. As governments make it more difficult to comply with environmental issues, those suppliers who can overcome the barriers to entry will find advantage. Smaller companies will most likely look to be acquired by larger companies that have the regulatory expertise to comply. However, their inability or difficulty to comply easily diminishes their value as a stand-alone enterprise, and buyers will use this to bid down the values of those smaller companies.

In other instances, governmental regulations may be met, but other groups use the courts to change the rules or even take away permission to use resources. As an example, environmental groups sued the U.S. Army Corp of Engineers which had issued Mosaic a permit to mine a large track of their own phosphate deposits in central Florida. A Federal District judge granted the groups a preliminary injunction causing Mosaic's largest and most efficient mine to sit idle until the legal issues are resolved through the judicial process. The permitting process has taken seven years, thousands of man-hours, hundreds of thousand pages of documents, and the commitment of significant reserves set aside for resource protection. The use

of the courts has caused the permitting process to be more costly in terms of time, resources and concessions. Again, larger companies have the advantage and capacity to follow the permitting process to completion where smaller operations are less likely to have this capacity.

In many instances, drivers of change are coming to the input suppliers due to pressure farther down the chain, closer to the consumer. For example, concerns over the environment are causing consumers to ask, and even pressure, processors and manufacturers to change their processes and sources of raw inputs. Thus, processors put pressure on farmers to change, and the farmers, in turn, ask their suppliers for specific characteristics in inputs in order to meet demands by the farmers' buyers.

Closing Comments

In summary, the increasing importance of the triple bottom line— economic, environment, and social— multiplied by the internationalization of the value chain and the increasing demand for food, fuel, and fiber as the population grows will put performance demands on all aspects of the value chain, including on input suppliers. These interactions increase the need for companies to manage and mitigate the increased risks of the global economy. Those suppliers who can respond to these new dynamics will be the suppliers of the future.

For More Information

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FORCES AFFECTING CHANGE IN CROP PRODUCTION AGRICULTURE

Elizabeth Bechdol, Allan Gray, and Brent Gloy

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Keywords: Agricultural Competitiveness, Crop Production, Agricultural Biotechnology, Agricultural Sustainability, Agricultural Inputs, Agricultural Profitability

A number of factors are significantly reshaping crop production agriculture in the United States. Consider the following:

- Concentration has been on a steady rise for several decades. Today, 75% of the value of primary field crop production—corn, soybeans, wheat, cotton, rice, sorghum, and barley oats—is produced by 40% of U.S. farms (USDA-NASS, Census of Agriculture, 2007).
- Productivity increases have been significant. Corn yields increased from an average of 55 bushels per acre in 1960 to 165 bushels in 2009—a 300% increase in 50 years. Wheat and soybean yields have seen 215% and 169% increases, respectively, over the same period. Meanwhile, according to the cost and returns survey of USDA's Economic Research Service, variable costs of corn production have declined on a real basis from \$0.94 per bushel in 1975 to an estimated \$0.63 per bushel in 2005.
- Producers are adopting larger pieces of equipment and more sophisticated technologies. Some estimate the time to plant and harvest the crop, two of the most time consuming operations, has been cut in half in the last decade, allowing producers to effectively manage more acres within one operation (Table 1).

Table 1

Estimated Row Crop Planting and Harvesting Capacity over Time

	Planting Efficiency		Harvesting Efficiency	
1970	40 acres/day	4 Rows @ 2 mph	4000 bushels/day	4 rows @ 12hr/day
2005	420 acres/day	16 Rows @ 6 mph	30000 bushels/day	12 rows @ 12hr/day
2012	945 acres/day	36 Rows @ 6 mph	50000 bushels/day	16 rows @ 12hr/day

Source: Land O'Lakes Member Services Interview with Great Lakes Manufacturing Experts, 2008.

Crop agriculture is clearly no stranger to change. This article examines the key forces affecting change in U.S. crop production. We describe some of the major industry drivers of change and use Porter's Five Forces analysis to examine the economic conditions, opportunities, and threats facing this industry (Porter, 1979). Through this discussion, we describe how major crop production businesses are adapting to a changing

competitive landscape. We begin with an overview of the drivers of change for the industry and then discuss the factors influencing profitability and the implications for the future.

Drivers of Change for the Industry

There are several key factors shaping the economic conditions of the crop agriculture industry. Four dominant forces are currently at work—Growing and Diversified Demand; Technology; Resource Availability; and Societal Influences. Each in isolation, and also in combination, has implications for the structure of crop production, including farm size, the business models used, and relationships to other parts of the industry.

Growing and Diversified Demand

The food, feed, and fiber industries are being challenged to meet a growing and diversified demand. According to the Population Reference Bureau’s 2010 Population Data Sheet, the global population is expected to reach almost 9.5 billion by mid-2050, with the majority of the additional 2.6 billion people located in developing countries where the need for affordable, abundant supplies of basic plant and animal based nutrients is greatest (Table 2).

Table 2
World Population Growth Estimates.

Region	Population Mid-2010	Population Mid-2025	Population Mid-2050	Population Allocation 2010-2050	GNI PPP per Capita (US\$) 2008
	billions				
Less Developed	5.66	6.82	8.16	2.50	5,150
More Developed	1.24	1.29	1.33	0.89	32,370
World	6.90	8.11	9.49	3.39	\$10,030

Source: Population Reference Bureau. 2010. World Population Data Sheet. Using the United Nations region/country classification system.

Note: GNI PPP per Capita is Gross National Income Purchasing Power Parity/midyear population

In addition to growing demands for food, feed and fiber, industrial applications for agricultural production are emerging as well. The energy, polymers, chemicals, and pharmaceuticals industries are increasingly looking to the agricultural sector to supply renewable raw materials for their processes.

Technology

Monitoring and information technology, biotechnology, and a variety of other technologies are converging in agriculture to fundamentally change the way crops are grown. Today, yield monitors and GPS, global information systems (GIS), satellite or aerial photography and imagery, weather monitoring and measuring systems, and plant and soil sensing systems are commonly used tools.

Biotechnology applications shorten the cycle time to develop new hybrids and varieties with higher yield potential and stronger resistance to pests and environmental conditions. By combining biotechnology with

mechanical and other technologies to control the growth environment—moisture, pest and disease infestation, etc.—the process control approach that defines the traditional mechanical manufacturing assembly line also transforms agriculture into a biological manufacturing industry.

Resource Availability

The availability and cost of natural resources for the agricultural sector has a significant impact on its capacity to respond to growing demand. In some cases, higher prices will be required to bring additional supplies onto the market or to use existing resources more intensively. This is the case for resources such as land, fertilizer, and irrigation. In contrast, supplies of phosphorus and potash are nonrenewable. As agricultural product demand increases, the owners of land, water, and fertilizer resources will benefit.

Societal Influences

The development of the “bioeconomy” and the growing use of renewables have intensified the discussion of the complementary or competitive nature of the economic motivation of creating value and the social motivation of environmental responsiveness and sustainability. Likewise, societal concerns over the use of genetically modified organisms have shown that public opinion can significantly influence the ability of agricultural operations to utilize new technologies in crop production.

Agribusinesses that rely heavily on natural resources cannot ignore the environmental and social issues that are prevalent today. Faced with increasing government regulations and strengthening public opinions, businesses are ever more accountable for their impacts on society and more transparent in their corporate social responsibility activities. In fact, Rankin (2010) found that 68% of agribusiness firms surveyed were either planning or actively implementing broad sustainability initiatives.

Factors influencing Crop Production Profitability

The above drivers will significantly shape the U.S. farming sector. The potential profitability of farmers is influenced in part by the economic characteristics of the industry. These economic characteristics can, in large part, be examined using Porter’s five forces model. Porter posits that the key economic features of an industry can be identified by examining how suppliers, buyers, rivalry, substitution, and barriers to entry affect it. We use this framework to analyze the economic characteristics of crop production agriculture.

Suppliers

The major supplies, or inputs, for grain/oilseed producers are genetics, crop chemicals, equipment, fertilizers and land. Nonfamily labor on farms is becoming a more important input as well. However, in general, producers are able to substitute capital equipment for labor.

Input suppliers to grain/oilseed production tend to be dominated by large agribusiness firms that compete vigorously for farmer business. The substantial investment required to develop new genetics, crop protection chemicals, and automated equipment necessitates that the firms competing in this sector must achieve substantial economies of scale. The investments required to breed and engineer new crop varieties and traits require significant time and substantial costs for regulatory approval. In the short run, intellectual property rights may allow some firms to capture a significant amount of the value created by their technologies. However, the similarity of many competing seed traits and chemistries allows producers to switch products at relatively low costs, thus reducing the bargaining power of input suppliers.

Recent large price increases have drawn attention to consolidation in the fertilizer industries. In particular, the potash market has relatively few raw input suppliers. Grain/oilseed producers are subject to substantial price shocks as suppliers are able to pass cost increases in the short-term on to farmers. In the longer-term, there are alternatives that have the potential to reduce this supplier control. There is substantial potential for grain/oilseed producers to better recycle and more efficiently utilize livestock waste nutrients for crop production. However, those crop producers without access to these alternatives will likely continue to face pressure from volatile fertilizer markets.

Capital is a critical input to modern agricultural production. The U.S. capital markets are extremely efficient

and competitive. This presents U.S. producers with a significant advantage over many of their foreign competitors. The establishment of the Farm Credit System was a strategic response to the competitive situation in agricultural lending. Today, agricultural credit is widely available to creditworthy producers.

Buyers

The grain/oilseed sector markets its products to three major sets of customers: grain merchants and handlers, livestock producers, and renewable energy/industrial users. While exports are also critical to the sector, we focus on the domestic and international markets where grains/oilseeds are used.

The first key customers are grain merchants and handlers that aggregate farm output into meaningful quantities that can be delivered to end users and processors. These customers also have the key role of storing a crop that is harvested in a few months and consumed over the course of a year. These firms are typically private companies and traditional farmer cooperatives. Today, there is substantial concentration among the private grain handling and merchandising companies. Crop producers, however, are still able to market their products on reasonable terms. And, the U.S. Department of Justice has shown a willingness to eliminate potential market power advantages in this industry segment when necessary. Overall, the economic structure of this portion of the grain/oilseed supply chain is unlikely to adversely impact the profitability of grain/oilseed producers because they can easily switch between competing handlers and/or invest in their own storage and handling facilities.

The second key set of customers for grain/oilseed producers is the animal agriculture sector. Feed use currently accounts for roughly half of grain/oilseed demand. Although livestock farms, too, have undergone dramatic consolidation in recent decades, they remain, by and large, unable to exert significant pressure on grain/oilseed producers. However, the expansion of animal protein markets is important for expanding demand for grain/oilseed production. Beef, pork, and dairy producers have all recently experienced significant financial hardship as feed costs escalated from increasing overall grain/oilseed demand. In the future, a healthy and vibrant animal agriculture sector is critical to the long-term profitability of grain/oilseed producers.

The renewable energy and industrial food manufacturing sector is the third key customer of grain/oilseed producers. This sector has recently undergone dramatic growth and also significant concentration, with a number of mergers and acquisitions among ethanol and food manufacturers. However, because grains/oilseeds are traded as commodities, the ability of the sector to exert significant buyer power over producers is limited.

Customers likely will not exert significant, negative influences on industry profitability in the future due to traditional concerns over concentration. Instead, the impact of these industries will be driven by their fundamental profitability. Here, there is some cause for concern. The large increases in demand associated with renewable energy production, for example, are largely policy driven. Should the policy become less attractive to renewable energy production, there could be significant declines in biofuel demand. Likewise, these industries are highly competitive and dependent upon energy prices. Sustained low, energy prices would significantly reduce demand from these customers. Animal agriculture should significantly benefit from rapid population and economic growth in China and India. However, animal protein is generally a higher cost source of protein, and slowing economic growth in these countries would significantly reduce demand for animal protein and hurt grain/oilseed producers.

Rivalry

Agricultural production is characterized by a high degree of competitive rivalry. Efforts to develop branded or specialized products are quickly and effectively copied, and meaningful differentiation is difficult to achieve. The competitive rivalry plays out most clearly in bidding for productive resources. Here, producers typically bid most of their long-term potential profitability into the price of fixed assets such as farmland. As a result, rivalry has a very detrimental impact on individual profitability in the sector. However, it also encourages firms to be extremely efficient and productive as cost competition is the most likely source of competitive advantage. Rivalry has also clearly manifested itself on the global stage as South American agricultural production has rapidly increased to the point where Brazil and Argentina are key world soybean producers. Further, continuing genetic improvements, such as drought resistance, are allowing production of crops in

regions once not suitable.

Substitute Goods

There are important substitution considerations for grain/oilseed producers. Movements away from or towards animal proteins in the diet can have a significant impact on grain consumption. Grain products also compete in a variety of industrial based markets, such as energy and bioplastics where they serve as a substitute for petroleum-based products. These markets are quite large, but are also highly competitive. The large quantities of these available substitutes will limit producer profitability.

Barriers to Entry

There are few meaningful barriers to entry in production agriculture. While the capital requirements can be substantial to a young person trying to begin a career in farming, these requirements are not prohibitive for most businesses considering large-scale entry. For larger investors and pension funds considering entry into agriculture, the barrier in the United States is typically finding enough land in one geographic area to make a significant investment. While still limited in number, there are more farm management companies pursuing large scale farmland investments operated through both internal and external management arrangements. Funding for these enterprises increasingly comes from equity markets. The relative ease with which parties with access to capital can enter crop production will limit the upside profitability potential for current producers.

Conclusions and Implications

An increasing and diverse demand, rapid adoption of new technologies, limitations on global agricultural resources, and a society with increasing expectations of agriculture to produce a safe, abundant, affordable—and now "sustainable"—supply of food, fiber, feed, and energy will all shape the future environment for crop producers. In addition, crop producers' ability to generate profits will change with the profitability prospects of input suppliers, customers, competitors, substitutes, and new entrants.

The drivers of change suggest it will be critical for crop producers to be diligent in their pursuit of ever increasing productivity. To meet the demands of a growing global population with limited natural resources and increasing societal requirements, producers will need to continue to increase yields per acre at increased rates. At the margin, total production can be increased by bringing new lands into production, but those available, productive lands are limited. Thus, technology adoption will continue to play a crucial role in enhancing the sector's productivity. The pace with which these technologies are developed and adopted will depend on both the economics of crop production and society's willingness to accept the new technologies. We believe it is not a matter of if new technologies will be adopted, just a matter of the speed with which they are adopted.

An analysis of Porter's Five Forces that affect profitability indicates that scale efficiencies will continue to be a critical driver of a crop producer's competitive position. In particular, while customer buying power and input supplier power are not considered to be major deterrents to profitability, inter-firm rivalry and the relative ease of entry into the sector will continue to place pressure on the industry. While competition in the customer segments will keep buyers from significantly influencing the general market, the number of producers in a given crop producing area and the lack of differentiation make bargaining against customers very difficult without significant scale. Bargaining power usually requires some form of scale which allows the amount of product controlled to be significant in the marketplace. This is either done through scale within the operation or formal collaborations with other firms to appear bigger to the marketplace. This may be in the form of cooperatives, partnerships, LLC's, etc. and may include local, regional, national, and/or international collaborations.

In addition, the competition for limited, available land is fierce, and those producers with greatest efficiency are at a competitive advantage in acquiring those resources. While scale efficiencies normally suggest expansion of the farming operation size, producers will also have to purposefully improve the productivity of the land they manage. This will require the adoption of technologies that allow producers to drive down costs per unit, including a combination of information, biologic and other technologies.

In the future, crop producers likely will also have increased opportunities to differentiate their businesses and

commodity production. Synergistic activities including marketing fertilizer from livestock waste, providing services to other producers including grain storage and trucking, and even off-farm employment all could become viable business opportunities. Producers able to meet unique contract specifications or negotiate preferred supplier contracts may ultimately increase their profitability by reducing their reliance on traditional commodity production and markets.

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INCREASING COORDINATION IN THE PLANT AND PLANT PRODUCT PROCESSING AND HANDLING SECTOR

Michael Boland

L10, L16, L66, Q13

Keywords: Agribusiness, Food Economy, Industry Analysis, Five Forces, Food Processing

By the end of December 2010, the U.S. Department of Justice and U.S. Department of Agriculture will have held five hearings on competition and regulation in agriculture. The objective of the workshops is to “address the dynamics of competition in agriculture markets, including buyer power (monopsony) and vertical integration. They will examine legal doctrines and jurisprudence, as well as current economic learning, and will provide an opportunity for farmers, ranchers, consumer groups, processors, agribusiness, and other interested parties to provide examples of potentially anticompetitive conduct and to discuss any concerns about the application of the antitrust laws to the agricultural sectors.” The purpose of this article is to conduct an industry analysis of the U.S. plant and plant products sector of the food economy with a focus on processors and handlers. It provides an overview of issues that impact the competitive situation in these industries as noted by the U.S. Department of Justice and U.S. Department of Agriculture. Figure 1 provides an overview of how the data was collected that was used to analyze the five forces and drivers of change since 1997.

Five Forces Model for the Plant and Plant Products: Processors and Handlers

The five forces model—developed by Professor Michael Porter at the Harvard Business School—is a common and well-known step in conducting an industry analysis. It is comprised of five forces: 1) Internal rivalry between firms, 2) Threat of entry by potential competitors, 3) Presence of substitute products, 4) Power of sellers or suppliers, and 5) Power of buyers. A five forces model essentially is a process for a manager to understand how the conduct and performance of firms in an industry might be determined by changes in its structure over time.

Internal Rivalry between Firms

One measure of firm concentration in an industry is the Herfindahl-Hirschman Index (HHI). The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. The U.S. Department of Justice defines an industry as being moderately concentrated with an HHI between 1000 and 1800 and horizontal mergers above an HHI of 1800 must be reviewed. The HHI ratios suggest that concentration is increasing in fats and oils refining and blending; frozen food manufacturing, frozen fruit, juice, and vegetable manufacturing; dried and dehydrated food manufacturing; retail bakeries; commercial bakeries, frozen cakes, pies, and other pastries manufacturing; and other food manufacturing. The HHI has decreased in flour milling; fruit and vegetable canning; bread and bakery product manufacturing; and roasted nuts and peanut butter manufacturing. Industries with HHI's greater than 1800 were: malt manufacturing, soybean processing, breakfast cereal manufacturing, beet sugar manufacturing, specialty canning, tortilla manufacturing, and snack food manufacturing.

The data suggests that new entrants have been primarily farmer-owned cooperatives entering an industry—

Figure 1

Description of the Data Used

An extensive database was developed to prepare this article. The U.S. Department of Commerce conducts an economic census every five years to collect information on the U.S. economy. The North American Industry Classification System (NAICS) is used for the economic census. Within the Manufacturing data (NAICS 31), there are data on Food Manufacturing (NAICS 311) which were used to determine specific industries to serve as the horizontal boundaries for plant and plant products processors and handlers. The data relevant for this study are grains and oilseeds milling, sugar and confectionery product manufacturing, fruit and vegetable preserving and specialty food manufacturing, bakeries and tortilla manufacturing, and other food manufacturing. Within these six broad categories, there are 28 different industries. The choice of these industries was limited to those using agricultural inputs provided principally by U.S. farmers and producers.

Firms that report to the U.S. Securities and Exchange Commission publish a variety of reports and data, including annual 10-k reports which were examined for each of these firms for the 1997 to 2010 time period. This information was supplemented by an extensive review of industry and trade publications including Bakery and Snack, Biofuels Business, Food Business News, Milling and Baking News, World Grain, and Food Technology for the 1997 to 2010 time period. Of these articles, 211 are relevant for this study. These articles are written for the practitioner audience.

A second set of data was refereed articles written by agricultural economists and designed for the academic audience. These included case studies published in Review of Agricultural Economics, International Food and Management Review, Food Distribution Research Journal; and relevant cases published by the Harvard Business School Press. In addition, the University of California's Giannini Foundation of Agricultural Economics has funded research on various agricultural industries at different times. The number of articles in this data was 37. This extensive review helped illuminate changes in the industrial organization of these industries over the 1997 to 2010 time period. Finally, using industry contacts, the author interviewed at least one individual in each industry—31 interviews in all, to review the industry analyses and drivers of change.

two cooperatives were formed in the soybean processing industry which may account for its HHI decrease from 2035 to 1817; four cooperatives entered the other oilseeds industry—or a firm buying into that industry. Unlike these cooperatives, very few new plants were identified as having been built by an entrant into the industry. The overwhelming majority of changes in ownership have occurred between existing firms in these industries adding additional capacity through acquisitions, mergers or changes in ownership patterns—for example, Pinnacle Foods, a frozen foods company acquiring Birds Eye Foods, a frozen vegetables firm; J.M. Smucker, maker of spreads and other products, acquiring Jif peanut butter from Procter and Gamble.

Excess capacity is difficult to calculate but some data exists for flour milling and new construction announcements with capacity data may be tracked for many industries in trade and industry articles as long as what actually gets built can be determined and announcements of plants being closed—it is important to check actual closure. Industries where excess capacity might exist during this time period include wet corn milling, flour milling, breakfast cereal manufacturing, dry pasta manufacturing, and various industries in the fruit and vegetable preserving and specialty food manufacturing sector. The rationale for these observations is that per capita consumption has declined in these industries over the 1997 to 2010 time period and plant closure announcements decline in fixed increments where a decline in consumption occurs continuously. But it is important to note that excess capacity has many costs and it appears that firms are quick to make the adjustments to reduce capacity through reductions in shifts or actual plant closures.

Actual empirical studies of demand are limited in the plants and plant products processing and handling sector. One way to measure a component of demand is via the U.S. Department of Agriculture's Economic Research Service Food Availability (Per Capita) data system. These can be used in conjunction with U.S. Department of Commerce Bureau of Labor price data to plot a demand curve over time. It is limited in that the prices and industries do not match up perfectly but it is one way to better understand changes in demand in certain industries at various points in time. While data are unavailable for all industries—for example, per capita tortilla wholesale disappearance—what data does exist provides some generalities. It appears that flour for use in bread, processed sugar, corn sweetener, frozen vegetable, canned fruits, and canned vegetable demand have declined over the 1997 to 2007 time period, while frozen food demand has increased.

While there is no good proxy variable for buyer switching, there is no obvious reason why buyers cannot switch, at least in the long run. Some contracts specify six to twelve month increments with competitive bidding; for example, corn sweetener contracts for soft drinks. Probably the biggest situation where it may not be so easy to switch is in industries where a buyer has leased a plant they owned to another firm with whom they then sign a supply agreement. Those agreements can be longer than one year, but the new plant owner may not have another buyer for its products if it becomes unhappy with the terms of the agreement over time. Such contracts provide legal remedies, but there may be some short-term switching costs.

It is readily apparent that there has been an increase in differentiation including ingredients such as use of organic ingredients, use of ingredients with antioxidant properties, or use of whole grains; changes in the texture of the food, such as reduction in carbohydrates or sodium; changes in packaging or product volume, such as reductions in portion size, use of recycled paper, less air in the package, pull off tops on steel cans; and product variety, such as, more microwaveable foods, more individual serving size packaging; and similar efforts that are familiar to the reader. However, an increase in quality is more problematic to measure in plant food products due to lack of data. But there is little doubt that the adoption of six sigma quality management techniques has improved quality—for example, metal filings are practically unheard of in packaged food—and increased standardization—for example, packaging is designed to optimize space in trucks or railcars or oceangoing vessels. Note that this is different than food safety standards which are a regulatory issue that all firms must achieve.

Threat of Entry by Potential Competitors

As noted earlier, farmer cooperatives have entered a number of industries including wet corn milling, soybean processing, and other oilseed processing—for example, sunflower seed processing and dry edible bean processing. However, consider breakfast cereal manufacturing. Variables such as the fixed costs of building a state-of-the-art plant with the needed research and development as well as various temperature controlled facilities, strong brand preferences exhibited by many buyers, capital requirements for the research and development needed to substitute whole grains in place of previous product formulations and maintain the same or better taste profile, experience in working with wholesalers in packaging and shipping product, and experience in working with retail supermarkets in product placement, and before and after sale service are very high barriers for entering firms. It would be highly unlikely that a new firm would enter this concentrated industry except through acquisition or joint venture.

On the other hand, industries that are closer to the perfectly competitive norm of many firms with similar sizes as evidenced by a low HHI may have much smaller barriers to entry. Consider retail bakeries which have the smallest HHI at 7.2 with 7,079 firms in 2002. There are many stores that make bakery products from flour, not prepared dough, in their store and this is a fairly standardized process with few barriers to entry and low volumes.

A number of industry segments saw an increase in entrants over the 1997 to 2002 time period—rice milling; wet corn milling; cane sugar refining, caused by the divestiture of individual plants by a multinational firm; beet sugar manufacturing, caused by the divestiture of individual plants by a multinational firm; dried and dehydrated food manufacturing; retail bakeries, caused by more retail supermarkets putting in bakeries; and roasted nuts and peanut butter manufacturing.

Government regulation is important in food manufacturing. Food safety regulation is an obvious example. Less obvious to many consumers are regulations governing product packaging and labels. The standardized nutrition labeling information took time to implement and it is conceivable that it will undergo another change if the glycemic index is mandated for inclusion.

Presence of Substitutes

Identifying substitutes can be problematic when comparing between industries using broad data. For example, pasta is made from durum wheat and is similar in nutritional composition to potato or rice. These are not substitutes, but rather other types of pasta are substitutes. Pasta with reduced carbohydrates—for example, Dreamfields brand—is a substitute for pasta with a typical amount of carbohydrates—for example, Barilla, AIPC, and Dakota Growers. It is fairly easy to switch products although some performance features may create some differentiation—for example, Birds Eye steam-in-a-bag frozen vegetables, Campbell's pull off soup can, a pizza crust that rises—but generally, there are many substitutes in plant-based foods.

Substitutes are increasingly based on product attributes as opposed to brand attributes and these are linked to calories, carbohydrates, nutritional benefits, saturated fats, and similar attributes. Ultimately, these may be associated with national brands as store-brands or private label brands may not be as quick to adopt these product attributes. Considering the growth in private label or store brands, it is apparent that substitutes are increasing.

Power of Suppliers

There is little to suggest that sellers of plants have much influence on price. There are many sellers of food grains, tree fruits, fruits and nuts, and other agricultural products. Many fruits and nuts are sold through cooperatives, brokers, and family-owned businesses that may be vertically integrated into production or control a large percentage of the production — for example, almonds and prunes. In general, it may not be costly to switch from one supplier to another because imports exist in most of these commodities. Marketing orders and bargaining cooperatives in some industries help growers achieve increased prices. Inputs are not generally short in supply because they can be stored, although there may be some seasonal issues which are short-term in nature with an occasional exception such as pumpkins available for canning.

Differentiation is generally not an issue although the supply of organic products was not sufficient for demand midway during this time period. In general, the percentage of total value that is attributed to the cost of the input is low. There is little vertical integration in this industry except in certain segments in fruits and nuts. Most vertical coordination is in the form of production contracts and these have been increasing in agriculture. Locally-produced foods, although relatively small compared to all foods, are increasing. The ability to source inputs from outside the United States further limits supplier power.

Power of Buyers

Consumers are able to switch from one brand to another fairly easily, but the development of store brands or private label brands have increased in retail supermarkets. There are several wholesalers that a retail supermarket can purchase from, though some retailers may bypass wholesalers by vertically integrating this function internally. Buyers in this sector are diverse. Integration has not occurred although processors and handlers face a more integrated wholesale grocery and retail supermarket sector. Information about the product is fairly well known as evidenced by the fact that many store brands or private label brands look similar and taste similar to their branded counterparts. Some buyers have moved to national, single desk purchasing of products. It is apparent that buyers have a lot of influence in this sector.

Drivers of Change

Growing buyer preferences for differentiated products was the most widely discussed driver of change during this time period which increased competition and provided increased profitability for processors that can produce and market such products. Many of these products were already discussed. Changes in the inputs or their characteristics used to produce the foods made from plant and plant products included less saturated fat, lower sodium, fewer carbohydrates, lower caloric content in foods and beverages, adoption of low sugar, foods supplemented with vitamins, increased use of whole grains, and increased marketing of health benefits reinforced by research. Suppliers must have the ability to control the plant production practices and handlers must segregate the inputs in order for processors to create the highest value for the use of such plants.

The second most identified driver of change was an increase in uncertainty and business risk which has helped increase profitability for firms that are engaged in hedging, marketing contracts, or supply contracts linked by price. The increase in input prices such as energy, packaging, and food inputs was widely mentioned. It is difficult to know the true impact on the finished good price of an increase in the price of wheat, since the contribution of the price of wheat to the value of a bakery product is small, or the impact of an increase in the price of a barrel of oil. But the 1997 to 2010 time period included a period of high input prices—caused by weather issues in 1996, the downturn in the economy after 9/11, and government policy changes regarding the corn-based ethanol mandates—and low input prices in the late 1990s and early 2000s. Finally, exchange rates and the strong dollar, which helped firms' source inputs globally, were discussed.

Regulatory influences and government policy changes were almost as widely discussed as the increase in uncertainty and business risk. Regulatory influences included implementation of new food safety regulations,

increase in nutritional label regulation, adoption of the corn-based ethanol mandate, proposed requirement to minimize climate change, increased regulations on transportation due to biosecurity, local government regulation of fast food, and other issues. These have added increased costs in this sector.

Globalization has brought many opportunities for firms to identify new suppliers and new buyers. While its impact is also included in the driver of business risk through exchange rates, the number of articles addressing globalization justifies its inclusion as a fourth driver. The most widely cited geographic markets were Asia, especially China and India. The benefits from trade agreements were widely discussed in many articles. Most of the discussion focused on the availability of inputs from outside the United States. Trade was widely mentioned as one of the key benefits for plant and plant products processors and handlers. However, the potential to expand profitability in a mature food sector by exports is not likely to occur for much of these differentiated processed food products.

Concluding Comments

The U.S. Department of Justice and U.S. Department of Agriculture's hearings on competition are likely going to recognize that the increased demand for these types of plant products is going to require closer vertical coordination between plant producers and those handling and processing these plants into food products. Such coordination requires more information about the plants being produced and sold to handlers and processors. If market power exists, it is likely going to be in retail supermarkets and food service where the demand for such products is known and can be communicated by price to processors and handlers, and ultimately to producers.

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THE CHANGING FACE OF FOOD RETAILING

Ben Senauer and Jon Seltzer

JEL Classifications: L1, M1, L2, L8

Keywords: Food Retailing, Food Trends, Food Consumers, Grocery Purchasing

This article explores current and possible future trends in the food retail value chain, particularly in relation to Michael Porter's five forces, plus the impact of technology and another major driver of change, the most severe economic downturn since the Great Depression. (Porter, 1979)

The rapid spread of supercenters and deep-discount food retailers illustrates Porter's threat of the entry of new competitors, after supermarkets had been the predominant food retail format for several decades. The growth of private-label products reflects both Porter's risk of substitute goods and the power of product buyers. In terms of technology, the analysis of the point-of-sale (POS) data generated by checkout scanners and barcodes has helped shift bargaining power from the product suppliers to the increasingly-concentrated retailers. The next major technological innovations may be the use of radio frequency identification, with substantial effects on the food retail value chain, and mobile-marketing coupon distribution through cellular phones. Finally, the deep recession caused households to economize on their food spending, which may have longer term impacts on consumer food purchasing behavior.

New Food Retail Formats

Porter's threat of the entry of new competitors is well illustrated by the rapid growth of supercenters—big-box stores such as Walmart, Target, and Costco that sell both general merchandise and a full-line of the most popular food products. Costco is actually a wholesale club store and shoppers must be members as is the case with Sam's Club, owned by Walmart, but the club stores compete in many respects with supercenters and conventional retailers. In addition, deep-discount, limited assortment food retailers selling less than 2,000 items, such as Aldi and SUPERVALU's Save-A-Lot, have grown rapidly. Aldi is one of the largest German food retailers and by early 2010 had 1,084 stores in 31 U.S. states (Bustillo and Martin, 2010). The expansion of Aldi's U.S. operations and its sales have clearly benefited as households looked to save on their food purchases.

These new formats have increased the competitive rivalry/pressure on traditional supermarkets. Virtually all the new Walmart stores opened in the last several years have been supercenters and a number of older stores have been remodeled and enlarged into supercenters. Walmart is now the largest U.S. food retailer and groceries accounted for 51% of its total store sales in 2009 (The Packer, 2010). Target, considered more upscale than Walmart, has been opening most of its new outlets as Super Targets, with a full grocery operation on one side of the store, while also remodeling older stores.

Supercenters have a different objective for their grocery operations than traditional supermarkets, whose ultimate objective is the profitability of their food operations. For Walmart and Target supercenters, the goal is overall store sales and profitability; food is often used to raise customer traffic and the spillover of shoppers to the general merchandise side of the store, increasing the sales of higher profit margin categories. Food more than general merchandise is particularly useful for driving up the frequency of shopper visits. Therefore, supercenters are willing to accept lower margins on food sales than traditional supermarkets, according to food-retailing executives. In addition, most supercenters operate with far fewer distinct product items, called

stock keeping units (SKU's). Walmart, in particular, usually has the lowest prices in most market areas, with the exception of the deep-discount stores.

Both Walmart and Target supercenters have greatly improved their grocery operations since they first started, especially in the fresh produce section. Target has used its own distribution system for dry groceries, but has sourced its fresh produce through SUPERVALU, the largest U.S. food wholesaler/distributor. Walmart at first depended on other firms to source and transport products to its distribution centers. For example, Walmart relied on C.H. Robertson and others to buy from the growers in California and elsewhere, and deliver to Walmart distribution centers a large share of its fresh produce. Walmart has since changed its whole approach and is now doing more of its own sourcing and distribution, with the goal of driving costs out of the system, which has always been a key competitive advantage (Birchall, 2010). Walmart now has its own produce buyers in the major growing regions, such as California and Florida.

The growth of supercenters has brought a wave of consolidation to the retail food industry. Many small, frequently family-owned operators of one to several stores have lost the most sales to the new formats and gone out of business or been taken over by larger chains. This trend is likely to continue into the foreseeable future. In addition, large traditional supermarket chains, such as Kroger and Safeway, may increasingly suffer from the intensity of the competitive rivalry from these new formats. Interestingly, Walmart has announced that much of its future expansion will focus on smaller urban stores, rather than big-box, suburban supercenters (Bustillo and Martin, 2010).

The Growth of Private-Label Products

An excellent example of two of Porter's forces, the risk of substitute products and the power of product buyers, is the rapid growth of private-label goods—also referred to as store brand or own brand—by supermarkets and other food retail formats. Grocery private-label sales grew by 9% in 2009 (*The Economist*, 2009). In 2008, 97.5% of food retailers indicated they were offering private label/store brands as a key part of their merchandising strategy. The private label share of total sales increased from 16.5% among U.S. food retailers in 2006 to 18.2% in 2008 (The Food Institute, 2009). Private label accounted for 35% of Kroger's sales, the highest share of any major U.S. supermarket chain. Most food retailers have substantial room to continue to grow their private-label offerings, when compared to Germany where they account for almost 40% of sales (*The Economist*, 2009).

The deep-discounters, Aldi and Save-A-Lot, offer around 95% and 80% private-label products, respectively (Bustillo and Martin, 2010). Trader Joe's, a unique U.S. grocery format focused on value-priced upscale products, enjoys very strong customer loyalty and has been expanding rapidly even in the recession. Trader Joe's, which is privately owned by the same German family as Aldi, relies extensively on its own store-brand products.

Private-label products typically cost consumers about 25% less than the national brands, such as Kraft, Kellogg and General Mills. Moreover, the quality of private-label goods has greatly improved and many consumers may never go back to the national brands, even when the economy fully recovers. Most supermarkets still stock the top national brands in a category, such as Kellogg and General Mills in breakfast cereal, but the brands that are not in the top one or two in terms of market share may have vanished from the shelves. Even for top national brands, stores may have cut back on the number of package sizes offered and facings to make room for more private-label items

In most stores, including Walmart and Target supercenters, private label is stocked close to the major brand, so customers can easily compare the cost savings. On a visit by one of the authors to the Walmart Supercenter in Stillwater, Minn., their store-brand, "Great Value" Frosted Flakes, selling for \$2.50 for 23 ounces, was right next to Kellogg's Frosted Flakes at \$2.98 for the same 23 ounces (prices for November 12, 2010). A 2-liter bottle of "Sam's" Zero Coke was 78 cents compared to Coca Cola's Coke Zero for \$1.48. Interestingly, "Sam's" soft drinks were shelved at the far end of the aisle in a very small area with Pepsi and Coca Cola products dominating the section, which might suggest some type of compensation for shelf placement, referred to as a "slotting allowance", or just the power of the national brands.

Many retailers are using a two tier private-label approach, one price-oriented and the other more quality-focused. Super Target is a good example, with its lower-priced "Market Pantry" products, while "Archer Farms", its other store brand is meant to denote quality. Store brands are attractive to retailers because their

profit margins are typically higher than on national brands. With their analysis of POS data, retailers are better positioned to forecast product sales and match production and inventory of private-label products to final customer demand than are manufacturers of national brands. Another reason for the rapid growth of store brands is that “retailers have masterfully shifted the consumer consciousness from generic to private label” according to Karl Halpert, CEO of Private Label Select (The Food Institute, 2009, p. 87). Many consumers now think of private label as representing the best value—quality at a lower price.

Most retailers do not manufacture their private-label products, but contract with a food processor for manufacturing. In a number of cases the store brands are actually manufactured by the national-brand companies in their plants, since they benefit from the economies of scale. Malt-O-Meal, known for its hot breakfast cereal, runs a large plant in Northfield, Minn., which produces private-label cold breakfast cereal. When one of the authors was on a plant tour several years ago, they were producing cereal for the Kroger supermarket chain. Some retailers, such as Kroger, do operate their own processing plants, most frequently in dairy (The Food Institute, 2009).

Technology Driven Value Chain Changes

One of the greatest changes in the food retail value chain in the last 25 years has resulted from the use of POS data by retailers to better understand consumer purchasing behavior, and thus improve everything from inventory management to product promotion. Because retailers have this data and the knowledge it provides, their bargaining power in relation to their suppliers has been greatly strengthened. The balance of power shifted from those previously with the most bargaining power, the suppliers, to the retailers starting in the 1980s. Much of the impact of this shift had largely occurred before 2000.

Retailers can now identify which items are selling well and which are not. Between 1996 and 2008, the number of SKU's carried by the average food retailer increased by 50% to 47,000. To streamline the shopping experience for customers, who had become overwhelmed with the number of choices, many stores have now reduced their product selection, by as much as 15% (The Food Institute, 2009).

The next major technological advance impacting retailers' supply chain is radio frequency identification (RFID), which involves microchips that can be read by radio wave from a distance, replacing barcodes. Walmart has taken the lead among retailers in investing in the new technology and requiring its suppliers to adopt RFID. Although adoption has been slower than originally planned because of technical and cost issues, most of Walmart's largest suppliers now must have RFID tags on every pallet and/or case shipped to its distribution centers. One industry analyst predicts Walmart will achieve annual cost savings of over \$400 million with pallet and case RFID, and much more if individual items are RFID tagged someday (Research Recap, 2010). One benefit would be the reduction in the occurrence of out-of-stock items in stores due to the improved inventory control made possible by RFID.

The growth of smart phones with a myriad of applications, including location pin-pointing, is opening a wide range of new marketing possibilities. One potential use is sending electronic product coupons based on a consumer's location in a grocery store, which is likely to evolve over the next few years as individual retail chains offer it on an opt in basis, meaning consumers will choose whether to participate.

The Great Recession: A Major Driver of Change

A major driver of recent change for retail food, including food stores, or groceries, and food service, or the restaurant side, of the business has been the substantial shifts in consumer food purchases due to the severe 2008-2009 economic downturn and very slow recovery. The food spending of households that were directly affected by the loss of a job or home to foreclosure changed the most. Even many families not directly impacted, given the uncertainty and concern for their future financial situation, became more frugal in their spending. Consumers ate away-from-home, at restaurants, less frequently and were looking for greater value in their grocery purchases. Many experts believe that, just as with the Great Depression, some of these consumer changes will become permanent, such as the greater frugality, and be part of what has been referred to as the “New Normal” (Davis, 2009). Consumer spending began to pick up in early 2010, although at a slower pace than when emerging from past recessions.

Some consumers, who had been buying natural and organic, began to question the price premium for these products. Whole Foods, the upscale natural and organic food retail chain, saw its identical, same store

sales—a key metric in retailing—fall by 4.3% in fiscal year 2009, after years of robust growth, as consumers sought lower prices (Whole Foods, 2009). In response, the company revamped its strategy to provide greater value to consumers. The “365” store brand, which is value-oriented with a lower price point than comparable products, was expanded to new categories. Whole Foods’ more value-oriented strategy, combined with the stabilization of the economy, has succeeded in turning the situation around with comparable store sales again growing.

Casual sit-down restaurant chains, such as Applebee’s and TGIF, suffered substantial sales declines in the recession, whereas some fast food chains saw sales grow, as consumers traded down to economize. In the midst of the recession in 2009, McDonald’s U.S. comparable store sales actually grew by 2.6% (McDonald’s, 2009). Restaurants are promoting more aggressively now than previously. Quick-service, fast food, outlets have adopted the “dollar menu”; casual family restaurants are doing more “kids eat free” and adding specific lower-priced menu selections on certain days; and more upscale, fine dining restaurants are discounting wine on slower nights, such as Sunday-Thursday. Across the board, restaurants have adjusted their menus to capture a more value-oriented consumer. In 2010, restaurant business began to improve along with the economy, albeit slowly (NRA, 2010). Although people are cooking more at home, take-out food has been less affected than dining out, since pizza delivery or a ready-to-eat meal from the supermarket can substitute for going out to a restaurant, providing a break for weary home cooks.

Concluding Observations

Most of these trends are likely to persist into the foreseeable future. The market share of grocery sales by supercenters and of private-label products should continue to grow, although perhaps at a slower pace. New technologies, such as RFID for logistics and electronic coupons sent to smart phones for marketing, will become more widely utilized.

For More Information

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