The Quiet Revolution in the U.S. Food Market

By Alan Barkema, Mark Drabenstott, and Kelly Welch

A quiet revolution in the U.S. food market is underway that may change the way farmers and food processors deliver food to consumers. While consumers will still see grocery shelves stocked with the foods they want, the revolution will significantly alter the way producers and processors do business.

Driving this revolution are changes in both consumer tastes and technology. Today's consumer wants nutrition, convenience, and an ever-widening variety of food products. Meanwhile, advances in production and processing technology are enabling farmers and food processors to target specific consumer niches more precisely than ever before. Combined, these changes in consumer demand and food technology are changing the way the food market links producers, processors, and consumers.

The food market is the elaborate system that moves food from producers and processors to consumers. Historically, raw and partially processed farm products en route to the grocery have been sold in a series of generic commodity markets. These markets are becoming obsolete, however, as food processors aim their products at a growing number of smaller consumer niches. Instead, contractual agreements and vertical integration, or mergers, among producers and processors are becoming increasingly common in the food market.

This article considers how changes in the U.S. food market will affect consumers, farms, rural communities, and farm policy. The first section reviews changes in consumer food demand and in food production and processing technology. The second section showshow those changes are leading to more contracting and vertical integration in the U.S. food market. The third section shows how

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the changing food market may encourage lower food prices,bigger farms, fewer viable rural communities, and an overhaul of farm policy.

Changes in Food Consumption and Technology

The U.S. food market is changing from a mass market to many niche, or specialty, markets. The change appears driven by the consumer's preferences for a wider variety of foods that are both nutritious and convenient. The multiplying niches put new production and marketing demands on farmers and food companies accustomed to a general market. The demands may be met by promising technologies just now emerging from the pipeline of agricultural research.

How is U.S. food consumption changing?

U.S. food consumption has evolved steadily over time, causing food companies to respond with new food products. The shift in food consumption is so great today that it is changing not only the *types of food* brought to the market, but also the *market* itself. The mass food market has splintered into many niche markets. Quaker Oats, for example, used to sell one type of oatmeal. Today, it markets three types and 12 flavors of oatmeal, and the types and flavors vary by region of the country.

The emergence of niche markets for food consumed at home can best be seen at the local supermarket. More than 10,000 new food products were introduced in 1990, five times the number of new products a decade ago (The Food Marketing Institute). To make way for all the new products, supermarkets keep expanding; the floor space in the average supermarket grew by 50 percent during the 1980s. While the increase was partly due to industry consolidation and economies of scale, a doubling in the number of products was also an important factor.

Niche markets are also developing for food consumed away from home. Consumers want more restaurant choices, including more ethnic food. The number of ethnic category restaurants (including Mexican, Italian, Asian, and others) increased 9.3 percent a year from 1985 to 1990, more than four times as fast as the total number of restaurants (*RE-COUNT*). Moreover, the average menu at individual restaurants now features more choices than a decade ago (*Nation's Restaurant News*).

Changes in U.S. food demand represent a consumer revolution that is transforming the way food is marketed, whether at home or away from home. Niche marketing is the only way to reach consumers effectively (Clausi). Products aimed at the mass market are now being overtaken by products aimed at specific consumer segments. From Campbell soup to McDonald's hamburgers, food companies are aiming at smaller market niches, a strategy that requires more careful product development and marketing.

Why is food consumption changing?

Three forces are behind the recent shift to smaller food market niches: a new emphasis on nutrition, changes in the American lifestyle, and changes in demographics. Together, these forces translate into strong consumer demands for a greater variety of healthier, more convenient foods.

A new emphasis on nutrition is leading to demand for substantially different food products. U.S. consumers increasingly believe that their diet influences the risk of several major chronic diseases, including

Table 1

Foods with Biggest Increases and Decreases in Consumption

Food consumption gains	Percent change 1976-78 to 1986-88
Fresh broccoli	231.8
Low-calorie sweeteners	193.2
Fresh cauliflower	174.1
Fresh grapes	134.8
Rice	95.1
Yogurt	89.4
Fresh carrots	77.0
Frozen broccoli	67.6
Turkey	62.7
Cheese (excl. cottage)	46.0
Food consumption losses	
Veal	-46.1
Whole milk	-33.8
Canned grean peas	-32.8
Canned peaches	-27.8
Distilled spirits	-25.2
Nonfat dry milk	-23.2
Canned corn	-19.6
Beef	-17.8
Coffee	-7.5
Lamb	-8.8

Source: *Food Consumption, Prices, and Expenditures*, SB-804, U.S. Department of Agriculture, ERS, May 1990.

heart disease and cancer. A shift away from a traditional high-fat, high-protein diet appears underway. Illustrating that shift, one consumer group recently called for the four basic food groups, the historical benchmark of good eating, to be overhauled.[1] As some consumers adhere to a more traditional diet and others adopt newer diets, the number of products consumed in the food market will increase.

Recent food consumption data confirm that consumers are shifting their spending to different foods. Half of the ten foods for which per capita consumption increased the most over the past two decades were fruits or vegetables (Table 1). Notwithstanding President Bush's disdain, broccoli was the food with the biggest gain in consumption. On the other hand, half of the ten foods with the biggest decline in consumption were red meat or dairy products. In short, consumers appear to want nutrition and freshness while reducing cholesterol and fat.

The shift in consumption places new demands on food suppliers. Producers of traditional foods in decline, such as red meat and dairy products, are forced to explore ways of eliminating unwanted food qualities, like saturated fat. The increased demand for fresh fruits and vegetables calls for improving existing delivery systems.

Lifestyle changes point to greater demand for convenience foods. Nearly three-fourths of the women aged 25-54 are now in the work force, compared with about half 20 years ago. Thus, most households have cut back sharply on the time spent preparing food, choosing instead to eat out or buy foods that are at least partially prepared. The shift to convenience will mean that food companies will process foods more fully and package them differently before they reach the consumer.[2]

Demographic shifts are resulting in consumer demands for a wider variety of foods. Two shifts stand out: the aging of the baby-boom generation and the increasing ethnic diversity of the population.

The aging baby-boom generation, composed of persons born between 1946 and 1964, may be one of the most powerful forces in the food market of the 1990s. The Food Institute, for example, estimates that the baby-boom segment is essentially the only population

group that will increase spending on food at home in the 1990s.[3] As they age, baby boomers are becoming more health-conscious and eating a more diverse diet with less protein and more fruits and vegetables.

Meanwhile, the U.S. population is becoming more ethnically diverse, supporting a move toward a more diverse array of food products. The Asian and Hispanic segments of the U.S. population recently have grown two to three times as fast as the general population, a trend that is expected to continue in the 1990s (*New York Times*). The ascendance of these groups comes at a time when the American palate is already becoming more internationalized. The increasing cultural diversity of the nation's population will only amplify the trend to more food market niches.

The promise of technology

The splintering food market leaves farm producers and food companies with many smaller targets instead of the mass market of the past. Fortunately, emerging technologies make it possible to hit these smaller targets. The technologies will be important for both the farmer and the food company.

Farm technology. In the past, advances in agricultural technology have mainly cut costs while increasing farm output. Two classic examples are hybrid seed corn and herbicides. Technologies now becoming available promise to lower costs *as well as* give the producer more control over the final food product. That element of control—the ability to fine-tune farm products for final markets—would mark a breakthrough in putting farmers in touch with consumers.

Biotechnology offers the greatest benefits in controlling farm product characteristics.[4] With biotechnology, scientists can assess the genetic blueprint of plants and animals, insert a gene that produces a desirable trait, and then reproduce plants or animals that carry the gene. With consumers demanding food products with specific nutritional and quality traits, the advantages of biotechnology are enormous. As one observer put it, "the beauty of modern biotechnology lies in its specificity" (*Food Technology*).

A number of prospective biotechnologies offer promise for delivering the food products consumers want. Animal scientists may be able to change genes so that beef cattle and hogs convert feed into lean tissues instead of fat (National Research Council). That breakthrough in leaner meat could spread quickly if scientists perfect current attempts to clone animals, that is, to replicate the genetic profiles of animals. Scientists may also be able to isolate the gene that controls the production of cholesterol in beef, pork, and eggs, offering the possibility of inhibiting its production.

Similar advances are possible in plants. To satisfy the expanding demand for fresh fruit, scientists may be able to insert genes that would keep fruits from bruising and losing flavor once picked. Genetic alteration in the protein composition of major grains would make it possible for farmers to produce corn or wheat for a specific livestock feed or food product requirement.

While none of these technologies is commercially available today, all are being actively pursued in the laboratory. Many industry observers believe that a number of the products could be introduced during the next five years, certainly within the decade of the 1990s.[5]

Food technology. Additional technologies will give food companies new ability to control food characteristics more precisely (*Food Technology*). Several technologies are aimed at reducing fat and cholesterol. A new means of removing substances, supercritical fluid extraction, is being

tested to reduce fat in red meats and cholesterol in eggs. Another method would replace saturated fats with unsaturated fats from non-animal sources in a "restructured" product. An example of this technology already in the market is McDonald's McLean hamburger, which substitutes water and carrageenan, a seaweed derivative, for saturated fat. In a different technology, food processors may be able to add genetically engineered microorganisms to the fermentation of cheese, yogurt, and sausage. The microorganisms would cut fermentation time while reducing the cholesterol level of the final product.

In short, the food chain is being fundamentally changed as new technologies make it possible to design food products from the farm through the processor to the retail shelf. While each technology alone has promise, the integration of the technologies along the entire food chain offers enormous potential for controlling precisely the final cost and characteristics of retail food products.

Consider, for example, the ability to design fresh beef products. At the beginning of the food chain, the producer may select a genetically engineered steer that will convert feed mostly to lean meat. The feed lot operator may then be able to gauge the fat content "on the hoof," through new monitoring technology. Based on the reading, he or she can shift the mix of nutrients and genetically engineered grains to discourage fat levels. New computer software will make these daily decisions routine.

Once the steer is passed to the beef packer, additional steps can be taken to cut fat. After trimming, the processor might select some beef cuts for further processing and fat reduction. Through selective extraction and fat substitution, a variety of low-fat beef products could be sent to the retail market.

All of these steps work together toward achieving with precision what the consumer wants: a low-fat, nutritious food product. Yet technological innovation alone will not guarantee a well-functioning food market. Innovation in the structure of the food market itself is also vital.

The Changing Structure of the Food Market

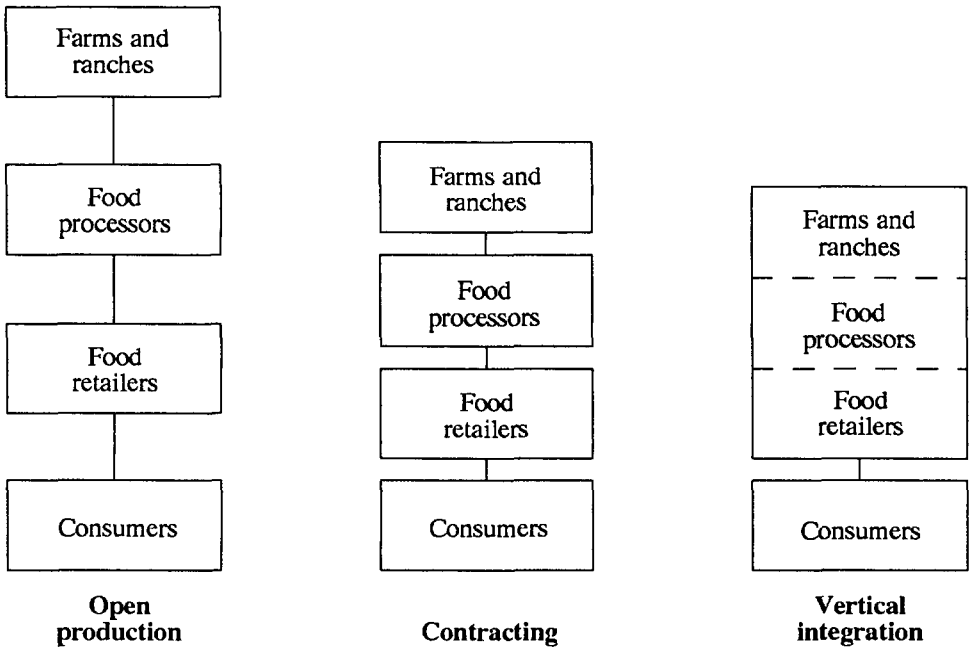
The food market is the elaborate communication and trading system linking farmers and ranchers, food processors, and consumers.[6] Its primary task is to turn raw farm products into the myriad of food products appearing in the grocery store. If the market is working smoothly, the huge produce from the nation's farms and ranches will reach grocery store shelves in exactly the form and quantity that consumers want. The sweeping changes in consumer food demands and in farm and food technologies, however, have triggered a revolution in the food market's structure.

Why is the traditional market structure changing?

The food market's traditional way of matching food demand and food supply is rapidly becoming outmoded, as consumer demand splinters into smaller niches and as farm and food technologies evolve. Aiming the growing number of new food products at new consumer niches takes more precision than the food market's traditional structure can offer. As a result, other ways of coordinating the food market are becoming more common. The new market structure shortens and clarifies the communication channels among farmers and ranchers, food processors, and consumers, reducing the odds that a targeted consumer niche will be missed.

Market analysts view the food market

Figure 1
The Vertical Structure of the U.S. Food Market



vertically. At the top of the market are farms and ranches, and at the bottom are consumers (Figure 1). Food processing and marketing firms fill the middle stages of the market.[7] More value is added to raw farm products at each successive processing and marketing stage. Eventually, finished food products are distributed to retail outlets for sale to the nation's consumers. The food market's task of synchronizing the flow of raw, intermediate, and finished food products is called "vertical coordination."

The traditional form of vertical coordination for many of the nation's major farm products—especially livestock, grains, and oilseeds—is called "open production." Under this coordinating method, the entire production process is completed before any marketing commitments are made. As a result, both farmers and buyers of farm products are exposed to price, quantity, and quality risks during the time after production begins but before marketing commitments are struck. Farmers, for example, are vulnerable to unexpectedly large supplies of farm commodities, which can push prices down. Food processors, on the other hand, are vulnerable to unexpected shortages, which can push prices up, slow processing plants, or force plants to use inferior substitutes.

Open production relies on market prices to tell farmers exactly what food processors—and ultimately consumers—want. The grading and pricing system for farm products

must be detailed enough to differentiate among different types or quality grades that are important to food processors.[8] Price signals can be inaccurate or easily misinterpreted, however, as product specifications become more detailed and as consumers begin to shop for more specialized products. Open production works well in the marketing of generic commodities that are sorted into a few, broadly defined quality grades. But the system is becoming outmoded in the increasingly specialized U.S. food market.

The marketing of beef cattle reveals the shortcomings of open production. Most beef cattle destined to become steaks and roasts are grouped into one of three quality grades—prime, choice, and select.[9] Cattle feeders get a higher price for prime and choice cattle, which tend to produce juicier, more tender steaks than select cattle. To achieve the prime and choice grades, feeders often overfatten cattle, which boosts feeding costs sharply. Thus, by encouraging feeders to produce excess fat, the grading and pricing system has not only driven up production costs but also caused feeders to fall out-of-step with the shift in consumer demand toward leaner beef.[10]

Open production of beef cattle also exposes cattle feeders and beef processors to large price and quantity risks. Until the cattle are sold, cattle feeders are vulnerable to unexpected drops in beef prices.[11] Meanwhile, processors are vulnerable to unexpected shortages of fed cattle, which push cattle prices higher and hold processing volume in processing plants below the optimum level. Processing costs rise much faster in modern, high-speed processing plants than in older processing plants when processing volumes fall short of the optimum.

What are the alternative market structures?

Two other ways of coordinating the food market overcome many of the shortcomings of open production. Under *contracting*, firms bypass the open market and instead strike formal agreements that control the price, quantity, and quality of goods traded in a future transaction. Under *vertical integration*, previously separate stages of the food market are combined in a single firm. As a result, transactions that would otherwise take place in the food market are replaced with the internal administrative actions of a single firm.[12]

Contracting. The distinguishing feature of contracting is that it locks in marketing commitments before or during the production process. These commitments reduce the risks caused by variable price, quantity, or quality. Reducing these risks is a key to targeting new consumer niches.

The simplest type of contract, called a *market-specification* contract, sets the price, quantity, and quality of products to be traded in a future transaction.[13] A contract of this type between a cattle feeder and a beef processor, for example, controls price risks for the cattle feeder and the beef processor. In addition, the processor is ensured a steady supply of cattle to keep high-capacity processing plants running.

The *production-management* contract can give the food processor direct control of farm production methods. This type of contract is useful when farm production methods influence the quality of the food processor's product. The steady advance of farm and food technologies promises to make this type of contract more popular in the future. For example, say a beef processor wishes to market a new line of fresh, low-fat, low-cholesterol beef products. The processor may contract with a feedlot operator to feed cattle specifically for

the new product market. The contract may specify certain production practices, such as the mix of feed ingredients or the length of time on feed. The contract may even ensure compliance by dictating periodic inspection of the cattle and feedlot by the food processor. Ultimately, the contract helps ensure that the contracted cattle will yield the right beef products to reach the targeted consumer niche.

Processors can assume even tighter control over the quality of farm products with a *resource-providing* contract. With this contract, processors provide all or part of the inputs used to produce farm products. For example, a beef processor may provide cattle of a specific genetic makeup to be fed by a feedlot operator. The contract ensures that the cattle are fed to the processor's specifications. In exchange, the feedlot operator is guaranteed a reasonable return for feeding the contractor's cattle. The control of both the cattle placed on feed and the feeding process ensures the contractor that the cattle will meet strict quality standards when slaughtered.

Each of the contracts described above reduces risk by shifting control of production to the food processor. The farmer's relationship with the food processor gradually approaches that of an employee of the food processor, as the contractual agreement becomes more extensive. Vertical integration takes the sequence of control a step further.

Vertical integration. Vertical integration shifts complete control of farm production to the food processor.[14] Much of the uncertainty present in open production is eliminated, by ensuring greater control over product price, quantity, and quality.

Vertical integration is especially well-suited for controlling risks associated with investment in highly specialized assets.[15] Many new production and processing technologies require expensive investment in research or capital equipment. Because few other uses are available for an investment in such specialized property, the investment exposes the investor to substantial loss if the investment cannot be used as planned. For example, assume that a processor invests in a new technology for producing low-fat, low-cholesterol beef from cattle with genetically reduced fat levels. The processor may wish to own the cattle feeding operation in addition to the processing facility. Then a steady supply of cattle of the proper genetic makeup would be available to ensure the new processing technology could be used as planned.[16]

The food market structure of the future

Contracting and vertical integration are supplanting open production in the food market. Yet the three structures actually form a continuum rather than three distinct ways of coordinating the food market.[17] Contracting provides tighter linkages between separate stages of the market than open production, and vertical integration provides tighter linkages than contracting. Still, some forms of contracting differ only slightly from open production, and others differ only slightly from vertical integration. How far and how fast the food market will move along the continuum from open production toward vertical integration remain open questions.

Two opposing forces will influence the outcome. On one hand, advances in farm and food processing technology will encourage more contracting and vertical integration. On the other hand, new information technology will help extend the usefulness of open production.

The same technologies that make it possible to target consumer niches will also require improved communication among the various stages of the food market. The technologies

Table 2

Percentage of Farm Production under Contract and Vertical Integration

	Production and marketing contracts				Vertical integration				Combined			
	1960	1970	1980	1990	1960	1970	1980	1990	1960	1970	1980	1990
Broilers	93.0	90.0	89.0	92.0	5.4	7.0	10.0	8.0	98.4	97.0	99.0	100.0
Fed cattle	10.0	18.0	10.0	17.5	6.7	6.7	4.5	5.0	16.7	24.7	14.5	22.5
Hogs	.7	1.0	1.5	8.5	.1	.1	.1	6.0	.8	1.1	1.6	14.5
Feed grains	.1	.1	7.0	NA	.4	.5	.5	NA	.5	.6	7.5	NA
Food grains	1.0	2.0	8.0	NA	.3	.5	.5	NA	1.3	2.5	8.5	NA
Oil seeds	1.0	1.0	10.0	NA	.4	.5	.5	NA	1.4	1.5	10.5	NA

Source: Marion (1960 - 80) and industry specialists at the U. S. Department of Agriculture, the National Cattlemen's Association, and the University of Missouri (1990).

will also expose farmers and food processors to the risk of loss on huge fixed investments. Both contracting and vertical integration are better suited than open production for addressing the specific communication needs and special risks of the high-technology food market.

Developments in information technology, however, will slow the trend from open production toward integration. Advances in testing and grading techniques will allow processors to sort farm commodities quickly and reliably into a wide range of precisely defined categories. For example, new ways to test cattle may allow processors to identify exceptionally lean fed cattle when they are sold. As a result, the processor's need to control the feeding process through contracting or integration would diminish.

The outcome of these two opposing forces will differ markedly for different food products. Data on the current structure of the U.S. food market are limited. Thus, projecting future changes is difficult (Table 2).[18] Still, some general observations are possible. An almost complete shift toward contracting and vertical integration has already taken place in the broiler industry. Contracting is increasing rapidly in cattle and hog production. But open production still predominates in the grain and oilseed markets.

The drive toward contracting and integration in the broiler industry was spurred in the 1950s and 1960s by the need to keep pace with the high-tech developments of the day—feed formulation, poultry genetics, and mechanization (see the box in the next section). Later, the industry's high level of integration enabled the quick development of new poultry products to meet rapidly changing consumer preferences.

In the pork and beef industries, contracting between feeders and processors has grown rapidly in recent years. Processors have sought to keep high-capacity processing plants operating at peak efficiency. Advances in genetic engineering, processing, and transportation will result in a wider range of conveniently prepared red meat products tar-

geted at health-conscious consumers. The communication and control needs of the new technologies will encourage a further shift toward contracting and integration in the pork and beef industries.

Changes in market structure for grains and oilseeds will be slower. Continued government intervention in grain markets promises to keep grain supplies available at low cost. Grain processors have little incentive to contract for grain production when government policies ensure a steady supply of low-cost grain.

In addition, recent advances in testing techniques promise quick identification of grain and oilseed attributes for specialized uses. For example, near-infrared spectroscopy can now be used to analyze the composition of a grain or oilseed sample in less than two minutes (Hurburgh). The new testing technique will give grain buyers—both livestock feeders and grain processors—quick assurance that grain bought in the open market meets requirements for protein, moisture, and oil content. Thus, the new testing techniques could encourage the use of market prices, rather than contractual agreements, to ensure grain quality specifications.

Peering further into the future, advances in production and processing technology may eventually lead to more contracting and vertical integration in the grain industry. When it occurs, the drive to more contracting will likely be driven by two things. First, genetic advances will allow the precise targeting of grain or oilseed attributes for a specific food or commercial application. Second, the company that researches and develops the genetic improvement will use contracts or vertical integration to protect its investment in intellectual property. For example, a soybean processor may enter a joint venture with a plant science research company to develop a soybean variety with a high yield of a particularly valuable oil. Once developed, the processor would protect the investment by retaining sole control over the enhanced soybean variety, probably using exclusive production contracts to do so.

The United States, therefore, is likely to have two types of grain production in the future. The first will yield generic commodities, perhaps with somewhat more detailed market grades than in the past. The second will yield high-value grains and oilseeds for specific commercial uses. Bulk corn and soybean production, for example, are likely to dominate in the Corn Belt stretching from Columbus, Ohio, to Lincoln, Nebraska. But within that expanse will emerge several pockets where highly specific grains are grown under contract for processing. As scientists are able to engineer grains for more food and commercial uses, the pockets will expand and multiply, displacing more of the generic production.

The Consequences of a Changing Food Market

The trend to tighter vertical coordination appears likely to spread, with varying speed and degree, to more parts of U.S. agriculture in the 1990s. What effects will a more integrated food chain have for consumers, producers, rural communities, and farm policy? Since U.S. agriculture has a history of mainly open production, the answers are difficult to predict. One food industry segment that is already dominated by contracting and integration, the broiler industry, does offer some helpful insights into what may happen (see box).

Consumers come out ahead

Consumers appear likely to reap several

benefits from the changing structure of the food market. As discussed earlier, the consumer's more specific food demands are the real impetus for change in the food market. With new farm and food technologies and tightened market coordination, consumers will get the foods they want. For example, they will be able to select from generic beef, branded beef, preprocessed beef entrees, and fat-reduced beef products.

The bigger question is whether consumers will see food prices rise or fall as a result of a more tightly coordinated food market. The evidence from the broiler industry suggests consumers received a variety of convenient chicken products *and* were able to buy them at lower prices, at least in part due to the industry's tighter coordination. Since the 1950s, when the shift to contracting and integration began in the broiler industry, poultry prices have fallen more than half in real terms. Prices for pork and beef, where contracting and vertical integration have proceeded much more slowly, have fallen much less.

Will food prices fall in other food industry segments as vertical coordination tightens? The answer depends on whether the firms that gain greater control in one food segment also control competing products in the same retail food category. For example, eight firms now control 55 percent of broiler production and processing, a relatively high degree of concentration. Such market power might be used to keep retail chicken prices high. But that has not happened for two reasons. First, competition remains keen among the eight dominant broiler producers; and second, chicken products must compete with many other meats and meat substitutes (including beef, pork, lamb, seafood, and dairy). The firms that control the broiler industry do not control the competing meats. The consolidation in the broiler industry, therefore, has simply passed the lower costs of production along to consumers in the form of lower chicken prices. Whether this pattern holds true for other food industry segments remains to be seen.

Large farms gain, small farms lose

Greater vertical coordination will favor large U.S. farms, accelerating a long-standing trend toward fewer farms in the United States. Again, the broiler industry offers insight. Over the past 30 years, large broiler operations (those that sell more than 100,000 broilers a year) increased their share of total broiler production from 29 to 93 percent, while many small producers went out of business.

A similar trend may occur as contracting becomes more extensive in cattle and hog production. The relatively high fixed costs of administering production contracts encourages processors to contract with large-scale hog and cattle feeders. Moreover, as production and processing technologies become even more sophisticated, only the large-scale feeders are likely to have the technical means and management skills required to satisfy the exacting requirements of the processors. Feeders who can meet the more demanding requirements of the new food market will receive a premium price, while those that cannot will face a smaller market for their lower-priced generic production.

Likewise, increased contracting in grains and oilseeds production will likely benefit larger producers who are better able to meet contract specifications while minimizing the processor's administration costs. The industry's financial landscape may change markedly, as farms in pockets of high contracting activity enjoy the benefits of the special-purpose market, while farms elsewhere are limited to generic production.

For the large producers that remain, farm-

ing will be substantially different than in the past. Managing farm production will be more demanding with increased scale, greater use of complex technologies, and more exacting product quality requirements. Yet even as production oversight becomes more taxing, authority for many business decisions may shift to food companies down the food chain. What seed is used, when it is planted, and how the crop is harvested may all be decided by the firm that processes the crop. Historically, farmers have taken pride in their independence. If the broiler industry is a guide, producers will take on many attributes of contracted employees and give up many attributes of sole proprietors as contracting and integration increase (*Wall Street Journal*).

Small rural communities lose

Just as large farms gain and small farms lose, so the move toward tighter coordination in the food market benefits larger rural communities at the expense of smaller communities. Rural economic activity has been moving to larger market centers for a long time. Tighter vertical coordination will just accelerate the trend.

Contracting generally encourages a shift in production to larger rural communities in one region of the country. Broiler production, for example, has concentrated in South Central and Mid-Atlantic states while declining in the Northeast and Midwest. As production has migrated to states like Arkansas and Virginia, it has tended to locate near large rural towns that are home to the processing plants. Thus, small towns have been hurt, both in regions that gained production and those that lost it.

Increased agricultural production is clearly an economic plus to a large rural community, but the benefit may be less than expected. The firms controlling the production will be large and probably will obtain inputs and credit from large urban centers. Thus, farm communities may increasingly resemble "branch plant" towns, or places dependent on economic decisions made elsewhere.

New questions for farm policy

By reducing the number of farms and by changing the nature of the farm business, tighter vertical coordination in the food market may force a new debate on the goals and programs of agricultural policy. Current programs distribute benefits largely on basis of how much a farmer produces. Commercial-sized farms (those with annual sales greater than $100,000 a year) receive about 60 percent of commodity program payments despite Congressional attempts to limit payments to large farmers. A trend toward larger contract farming operations will only push this figure higher. Thus, taxpayers and Congress may ask why the public should support farm businesses that have higher income and more wealth than average citizens.

The trend to tighter vertical coordination in the food industry seems likely to result in a substantial exodus of small farmers. In the past, this problem has gone largely untreated by policymakers, partly because the farmers leaving agriculture were able to find new jobs elsewhere in the economy. In the 1950s and 1960s, for example, millions who left agriculture found high-paying industrial jobs. Most of the jobs created in today's economy, however, are in the service sector. These jobs may be more difficult for many rural emigrants to enter. Thus, vertical coordination may lead policymakers at federal and state levels to give more attention to retraining programs for displaced farm families.

The spread of contracting between food companies and agricultural producers may also reduce the need to stabilize farm prices through farm programs. Commodity programs have

been justified in the past because they stabilized otherwise volatile agricultural commodity prices. The advent of more contracting, however, will stabilize prices. In short, the food company increasingly shares the farmer's price risk, reducing the need for government intervention.

For policymakers concerned with rural development, greater vertical coordination in the food market may encourage new approaches to spurring economic growth in rural places. Farm communities will increasingly pin their economic growth on the performance of the food industry that may be located there, while depending much less on the production of bulk commodities. Thus, traditional farm programs—which are still aimed at commodities—will be increasingly out-of-step with the new economy of farm communities. In the place of farm programs, policymakers may look at ways to invest in rural infrastructure, train rural workers, and encourage rural business starts.

Conclusions

The steady evolution in consumer demand and in farm and food technology is driving the U.S. food market toward more contracting and vertical integration. While new consumer niches are evolving, new farm and food technologies are enabling food producers and processors to engineer foods for these niches. The new technologies require much tighter coordination, however, as raw farm products are transformed into retail foods. Both contracting and vertical integration tighten the coordination between food producers and processors, ensuring that new food products reach targeted niches.

While tighter coordination of the food market will help meet consumer needs, the changes will create winners and losers among farmers and rural communities. An increase in contracting will benefit larger farmers with the scale and technical means to meet rigorous product requirements.

Smaller farmers and those in areas without ready access to the specialty-product market, however, will find fewer opportunities for marketing their generic production. Economic activity will rise in some rural communities and fall in others, as contracting and integration create a new patchwork of specialty-product and generic production. The widening gap between the winners and losers may call into question farm programs aimed at bulk commodities. In their place, policymakers may turn to a broader mix of farm and rural programs designed to improve the skills of rural workers and encourage entrepreneurship.

The broiler industry shows how consumer demands and innovations in technology can turn agricultural production and processing into a highly integrated and concentrated structure. This case study will briefly show how the broiler industry has changed and how each major player—consumers, farmers, and rural communities—has gained or lost.

The structure of the broiler industry in the 1950s severely limited its ability to grow. The surplus roosters of egg production, or spring chickens, made up most of the nation's chicken supply. This limited out-of-season chicken purchases to Sunday dinners and special occasions. To meet year-round demand, many small farmers began producing broilers. But retail chicken prices fluctuated widely, and markets were limited to urban areas.

Integration began as a reaction to these limits on production, but new technologies made the process possible. Mechanical innovations in equipment and housing design increased production efficiency and economies of scale. Biotechnological advances in breeding, feeding, and disease control cut feed consumption per pound by 50 percent from 1945 to 1972. In addition, new types of production contracts and ownership agreements helped coordinate each of the growing and processing stages. As large-scale production became attractive, technology was adopted faster. By the mid-1960s, vertical integration in the broiler industry was nearly complete.

In the early 1970s, the industry faced rapidly changing consumer demands. Consumers wanted a variety of convenient, nutritious, and high-quality products. In response, the large broiler integrators created new products from the basic whole broiler. They cut up broilers into parts and further processed them to add value. Processors began to use brand names and target market niches with diversified products. By 1987, cutup parts production accounted for well over half of total broilers processed, compared with 19 percent in 1965. The volume of further processed products (extending beyond the cutup stage) expanded even faster, accounting for 22 percent of the broilers processed in 1987, compared with 9 percent in 1979. This gain reflects an array of new products such as patties, fillets, and nuggets.

The most obvious beneficiaries of these changes in the broiler industry have been consumers. Their demands are met with a variety of more convenient, nutritious products at less than half the 1950s prices in real terms. Technological advances and lower cost integrated enterprises have lowered retail prices despite greater concentration among the largest broiler firms.

Whether growers have benefited from a more tightly integrated broiler industry is unclear. As the industry began to consolidate, processors chose to contract with larger, more efficient growers, forcing many small growers out of business. But even for the large growers that stayed in business, their incomes have not necessarily increased. Growers did reduce unit costs by expanding. Over time, however, unit costs have increased due to rising input prices. Meanwhile, revenues to contract growers have not increased as fast, leaving growers with declining profits.

Moreover, the large growers have seen the nature of their business change. With contracts setting the payments received per broiler, growers are not subject to the previous risks of

market prices. On the other hand, they now have more capital investment at risk while controlling fewer production decisions.

The effects on rural communities have been mixed. As larger broiler integrators have gained efficiency, production locations have shifted across regions. Broiler operations have concentrated in just a few states in the South and Mid-Atlantic regions. The operations have also converged on agribusiness centers within those states, resulting in benefits to only a few rural communities. The advantages of the southern states included a favorable climate, depressed agricultural conditions, and ample surplus labor from underemployed farmers willing to adapt to new technologies and methods.

Endnotes

[1] The Physicians Committee for Responsible Medicine advocates the four basic food groups be: whole grains, vegetables, legumes, and fruit (Physicians Committee for Responsible Medicine). The U.S. Department of Agriculture's standing recommended group of basic foods are: meat, fish, and poultry; dairy products; breads and cereals; and fruits and vegetables.

[2] Consumer concerns about the environment represent another major factor influencing food packaging. McDonald's for example, recently gave up its foam packaging in favor of paper products because foam cannot be recycled. This trend to "environmentally friendly" packaging seems certain to continue, but it will affect food processors much more than producers.

[3] A slight increase in spending is forecast for 75+ year-olds.

[4] Information technology will also be a major contributor in controlling agricultural production. Many biotechnologies will place new management demands on farm operators that will be met only with more sophisticated information technology.

[5] For a fuller discussion of biotechnology, its prospective adoption, and possible positive and negative effects, see Julie Stanley, "Agricultural Biotechnology: Dividends and Drawbacks" in this issue of the *Economic Review*.

[6] The food market is in fact an international market linking farmers, food processors, and consumers around the globe. Many food companies are multinational corporations. This article, however, focuses solely on the linkages among farmers, food processors, and consumers in the United States. Changes in foreign food supply and demand will affect the domestic food market, but the domestic changes described in this article will dominate. U.S. trade in farm and food products is relatively small compared to the overall size of the U.S. food market. In 1990, for example, U.S. imports of foods, feeds, and beverages ($26.6 billion) were less than 5 percent of consumer spending on food ($624.7 billion) (Survey of Current Business).

[7] In their much earlier, comprehensive study, Mighell and Jones define stages as "...any operating process capable of producing a salable product or service under appropriate circumstances." They also warn that "the image of chronological vertical succession is only a general symbol to aid our thinking; it should not be taken too literally."

[8] Marion summarizes the function and importance of the grading system in the food market. "Grades may reduce quality uncertainty and transaction costs, but their benefit may be limited if not based on the product characteristics that determine the product's value to the customer."

[9] The National Research Council, Chapter 5, provides a more detailed review of the beef grading system.

[10] The cattle industry has recently launched an initiative to lower the cost of producing beef and to make beef more attractive to modern consumers. An important part of the initiative is an effort to reduce the production of excess fat. See Barkema and Drabenstott for a more detailed analysis of trends in the beef industry.

[11] Price risks can also be hedged in commodity futures markets before marketing commitments are made.

[12] This is the generally accepted definition of vertical integration. According to Blair and Kaserman, for example, "...the distinguishing feature of vertical integration is the replacement of a market exchange by an internal (within the firm) transfer."

[13] The classification scheme outlined in this section groups contracts "...in accordance with the number of stages transferred from their traditional place with the farmer to the control of another firm" (Mighell and Jones).

[14] Integration can also occur between any other stages of the food market.

[15] Williamson (1979) argues that idiosyncratic investment is the primary motivation for vertical integration, stating, "More generally, the economizing problem includes choice between a special-purpose and a general-purpose good or service. A general-purpose item affords all of the advantages of market procurement, but possibly at the sacrifice of valued design or performance characteristics. A special-purpose item has the opposite features: valued differences are realized but market procurement here may pose hazards."

[16] Contracting can also protect the value of an idiosyncratic investment, but to a lesser extent than vertical integration. A long-term contractual agreement can tie two firms together almost as tightly as if they had merged into a single firm. The drawback of a long-term contract, however, is that it provides less flexibility than full ownership to meet unanticipated changes in market conditions. Thus, a high risk of loss on idiosyncratic investments tends to encourage vertical integration rather than contracting. See Williamson (1979 and 1986) for a fuller explanation of the relative merits of contracting and vertical integration.

[17] Other authors have recognized the continuum extending from open production through vertical integration. For example, Blair and Kaserman suggest, "the metric that varies as we move from the one end of this continuum to the other is the degree of control that one of the parties to the exchange exercises over the other."

[18] A comprehensive, up-to-date estimate of the current extent of contracting and vertical integration in the U.S. food market is a critical research need.

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