Agricultural Industrialization: Implications for Economic Development and Public Policy

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Abstract

Industrialization is rapidly becoming a topic of great attention. Driven by fundamental economic forces, industrialization seems likely to advance more quickly in the coming decade to more industry segments. By changing the way agriculture does business, industrialization will also bring change to public policy and agricultural institutions. Commodity policy will increasingly be out of step with a product-oriented industry And as industrialization blurs the lines between producers and processors, land grant universities and the extension service will face challenges assessing who their customers are.

Key Words: industrialization, agricultural markets, commodity policy, land grant universities, extension service, rural development

Industrialization has rapidly taken the stage of public attention and debate in the past few years. The subject is not a new one to the south; indeed, the industrialization of the broiler industry some thirty years ago led a few observers to label similar, more contemporary trends in other agricultural industries, "broilerization." What has propelled industrialization to the center of the agricultural stage more recently is an apparent acceleration in its development, and its new inroads into midwestern agriculture, industry segments such as grains and pork that have long been viewed as quintessential commodities produced on family farms.

By changing the way that agriculture does business, industrialization will carry enormous implications for the structure of the industry, for the rural economy, and for public policy. Agriculture in the United States developed as a commodity industry, and public policy has long been made on that premise. Thus, the validity of policy tools such as *commodity programs* will increasingly be called into question. Whether industrialization will be a major factor in the 1995 farm bill debate remains to be seen, but its influence will only increase as time goes on.

This paper explores the outlook for industrialization in U.S. agriculture and the impacts it may have on public policy. The first section defines industrialization and examines why it is happening. The second section explores the outlook for industrialization in agriculture. The third section examines the implications of industrialization for public policy.

The Revolution That Is No Longer Quiet

Nearly four years ago, we coined the term "quiet revolution" to describe the trend to more

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J. Agr. and Applied Econ. 27 (1), July, 1995: 13-20

vertical coordination in U.S. agriculture.[1] Though the trend is still very much a revolution, it is no longer so quiet. Indeed, the new approach to agriculture products and market relationships is spawning a raucous debate across the countryside. With the debate heating up, it is useful to define industrialization and examine why it is occurring.

Industrialization has become the most widely used name for this revolution. What exactly is meant by industrialization? Though many changes fall under the term, two stand out as defining features. First, industrialization brings a shift from food *commodities* to food *products*. Second, it leads to a shift from spot auction markets to more direct market channels, such as production contracts.

Why is industrialization happening? At root, it is the result of two powerful forces--a new consumer and a new producer--and the impact these two players have on the markets where they meet (Barkema). The new consumer is a highly demanding sort, the kind of buyer that has learned that its actions can humble even huge corporations like Sears and General Motors. The new producer is armed with a panoply of new technology and management tools that enable food to be engineered--from the farm to the dinner table. A more demanding consumer and a more capable producer would seem to be a match made in heaven--and it is to a considerable degree. The only problem is that the traditional markets that have moved food from farmers to consumers don't broker these kinds of marriages very well.

New lifestyles, shifting demographics, and a growing appreciation for the link between diet and health are leading to wholesale change in the way Americans eat and the foods they buy. The most fundamental implication of these food consumption changes is the splintering of the mass food market into myriad niches (Kinsey). Food companies can no longer launch a broadside of standardized products at a mass market and be assured of marketing success. Rather, they must market customized products, each aimed at a separate food market niche. Some products may derive from common production processes, but many do not. Rather, a new generation of technology is permitting more and more products to be driven by the characteristics consumers want--from *start to finish*.

This trend is increasingly recognized, but it is worth noting that the food industry is actually just sharing a broader trend that is evident in all consumer goods industries. Whether a firm makes pens or planes, buyer demands are lengthening and their patience is shrinking. "Instead of choosing from what you have to offer, the new consumer tells you what he or she wants. You figure out how to supply it" (*Fortune*). To be sure, shifts in food consumption partly reflect a food consumer that has been given more food choices by the industry. But consumers are demanding more than choice; they also want quality, consistency, and value. To a considerable extent, therefore, industrialization is about converting agriculture from a "here's what we produce" mentality to "here's what consumer's want" credo.

Advances in agricultural technology increasingly make possible food engineering from farm and ranch to consumer. The new technology can be usefully divided into biotechnology and information technology (Phillips 1994). Although U.S. agriculture appears to be only on the verge of a new frontier of biotechnology advance, the possibilities are quantum in scale. And, more important, they lead to a precision unknown before. Biotechnology will enable the food industry to isolate and incorporate specific traits into food products, a paramount demand of the new consumer.

This unfolding scenario of new consumers and new producers has one difficulty, however. That difficulty lies in the general nature of agricultural markets and the market institutions where consumers, producers, and processors meet. Historically, bulk commodities have flowed through commodity markets to food processors, who in turn have marketed standardized products to consumers. But consumers now want tailored foods, and to ensure that they get them, processors want more specific farm products.

In response, processors and producers in many segments of U.S. agriculture have gone around traditional spot markets to more direct market channels. These end runs range from

market contracts to outright ownership, or complete vertical integration. This trend was first established in broilers and vegetables, but more commodities have moved in this direction over the past three decades. The move to production contracts and vertical integration is not happening evenly across agriculture, but the past three decades have brought quite a bit of change. Broilers were almost completely "industrialized" thirty years ago, and grains still resist the trend. Today, products where production contracts or direct ownership account for more than half of all production include: vegetables (both fresh and processed), citrus fruit, potatoes, sugar, seed crops, eggs, fluid milk, broilers, and turkeys (Figure 1).

The Outlook for Industrialization

To date, industrialization has been associated with mostly specialty crops and a few livestock segments. Looking ahead, the trend seems likely to spread to many more parts of U.S. agriculture. What forces will encourage or discourage the spread of industrialization? And what changes seem mostly likely to occur?

Forces for change

A number of forces point to more industrialization ahead. Three will be particularly important: scale economies, new technologies that enhance coordination, and the emergence of strong "integrators."

Scale economies have played an important role in industrializing segments like the broiler industry, and they remain important today. Economies of scale have long been a feature of agricultural production, but new technologies and processes make for dramatic cost differentials across size units today. One of the primary reasons that the hog industry is moving toward more vertical coordination is an industry cost curve where large, industrialized operations have unit costs that are a third or more less than traditional family operations (Figure 2). What is more, a key feature of the largest operations is not only the number of hogs that they produce, but also the quality controls that ensure a highly graded, consistent product. Small hog farms simply cannot compete against lower cost and superior product.

New technologies will encourage more industrialization. A key feature of the new pork industry is genetics--enhancements that improve feed conversion while also reducing fat in the finished cuts. In the main, these genetics have been in the private sector, and only capital-strong producers have been able to pay for them. Similar genetic gains lie ahead for other agricultural products, and a growing share of them will also be in the private sector. Such proprietary technology will only encourage more vertical coordination in order to capture fully the returns.

Information technology will also encourage more industrialization. To date, the power of scanning technology at the retail level has not been fully harnessed in the food industry. But the day may soon come when retailers will influence food production much more than they do now. Scanning information is potentially the most potent tool in fine tuning products for consumer palates and pocket books.

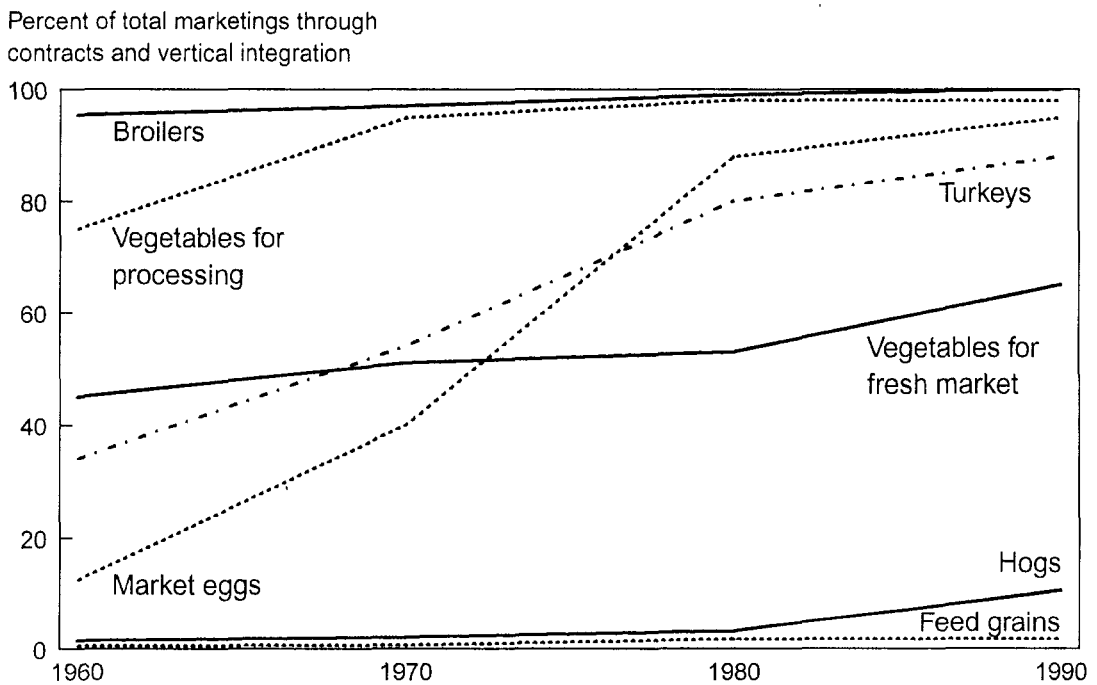
A final force for change will be a new generation of food industry players who might be called "integrators." In some cases they are input providers, in other cases they are processors, and in still others they might be retailers. Through the course of the 1980s, many of these firms have become bigger (mainly through consolidation) and broader (more diverse line of products).

These firms are capital intense and thus must be adept at managing their risks. Staring at the consumer with one eye and at Wall Street with the other, these firms see industrialization as an effective way to manage risks that are greater and more complex. Industrialization can reduce many types of risks. It reduces supply risk by assuring a steady flow of food inputs. It reduces quality risk by guaranteeing consistent, trait-specific products. It reduces financial risk by reducing the variability in input prices.

Potential changes ahead

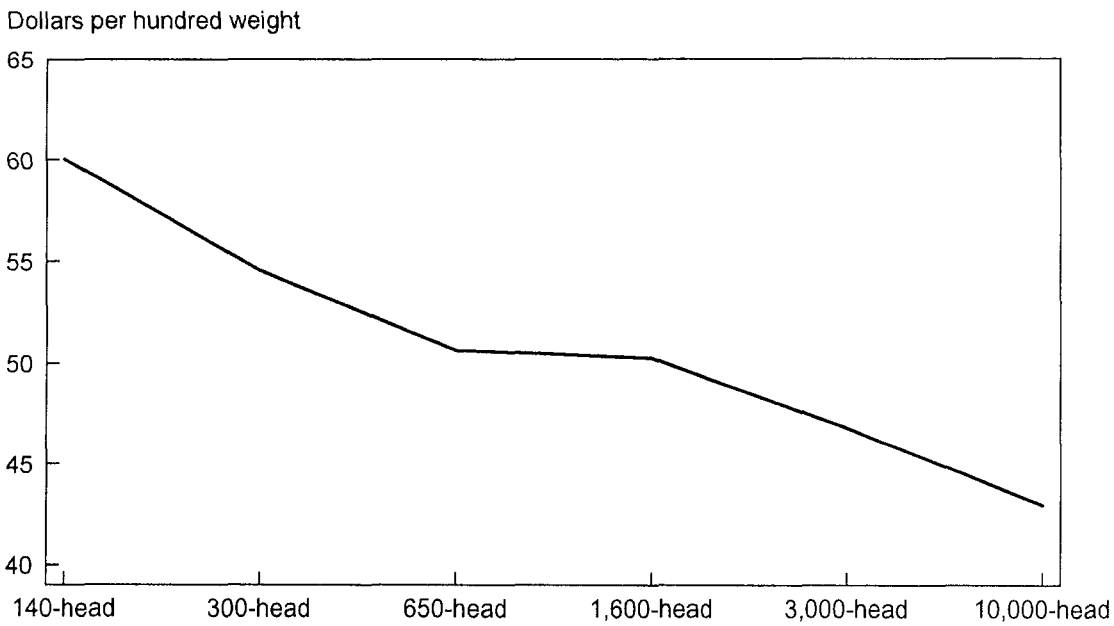
Taken together, economic forces, new technology, and well-capitalized, market-savvy firms are pushing agriculture in the direction of more industrialization. How much more? Though the precise amount cannot be estimated, the tempo of change probably will quicken. The period ahead

Figure 1. Production Contracts and Ownership Integration



Source:
Manchester, Alden, "Transition in the Farm and Food System," USDA/ERS, March 1992, and updates.

Figure 2. Average Hog Production Costs in the United States
1990 Estimates



Source: Hog version, 1988 FCRS data.

will almost certainly bring wholesale change in the hog industry. And while hogs may not be a good barometer for all other industry segments, the onward crush of new technology will encourage more product engineering from the farm to the consumer. A spate of farm rollovers to a new generation of operators may hasten the tempo.

What changes is industrialization likely to bring? Change will come first to the livestock industry, where the hog industry is already well on its way to being "industrialized." Cattle feeding is probably next, although ranching probably never will be industrialized, simply because there are too many people for whom ranching is mostly a way of life and for whom market incentives are not decisive in business decisions. Crops will also move toward industrialization, although much will depend here on the future direction of commodity programs. Cuts in these programs would make "government contracts" less attractive to growers. While only a small percentage of the nation's major grain crops are produced under contract to private firms, the vast majority *are* grown under contract. It just happens that the contractor is the federal government and commodity programs are the marketing vehicle. Moreover, geneticists seem likely to unlock more special-use grains--a development that almost certainly will encourage identity-preserved products.

Industrialization will bring a further polarization to agriculture. Increasingly, the nation will have two agricultures. Even though industrialization is increasing at a faster rate, it does not follow that commodity agriculture is over and done with. One can think of commodity agriculture as the "sea" that covers most of the farm belt. But emerging out of this sea will be an ever-increasing number of islands of specialized production outside traditional markets. Some of the islands will be big, such as the pork industry, while others will be small, such as white corn for corn chips. The big difference between these two agricultures will be profit margins. Commodity agriculture will be low margin, and producers and processors will operate at low cost and high volume. The islands of specialized production will be more profitable, because more value is added. The question will be how the profits are divided between producers and integrators.

The Implications of Industrialization

Industrialization changes the way that agriculture does business, and thus carries many fundamental implications. For the purposes of this paper, three implications merit discussion. First, industrialization will change agricultural policy. Second, industrialization will change the economic and spatial impact of agriculture on the rural economy. Third, industrialization will change the institutions connected to agriculture, including land grant universities.

Industrialization and agricultural policy

Industrialization cuts to the core of many fundamental farm and agricultural policies because it makes agriculture more like many other industries. It becomes less defensible to argue that agriculture is special, and thus deserving of special treatment. This will have a major impact on the future of commodity programs and the role of government in agricultural markets. At the state and local level, laws on farm corporate structure and environmental regulations will influence where industrialized production takes place.

A commodity policy for a product industry?

Industrialization blurs the lines that traditionally separated links in the food chain, raising doubts about whether programs aimed at supporting commodity prices are an effective means of boosting farm incomes or stabilizing food prices. Industrialization will tie farm incomes more directly to the consumer marketplace. There will be battles between producers and processors over how the value pie is divided. But commodity prices simply become less germane to farm incomes, whereas delivering customized products to consumers becomes much more relevant. Sooner or later, therefore, industrialization becomes one of the more compelling arguments for abolishing commodity programs. Will sooner include the 1995 farm bill? That seems unlikely at the present time.

Should the federal government monitor agricultural markets?

Traditionally, government has played a key role in agricultural markets: helping them become

established, providing information on market trades to all participants, and overseeing the operations of those markets. Industrialization will challenge all three roles.

As more products move to consumers outside traditional markets, one obvious question is what role the government has in facilitating private contracts. The public will want to assure a workable environment in which parties can count on sound contracts and clear provisions for nonperformance. Whether the public wants to be the umpire for private contracts between producers and processors, however, is much less clear.

Meanwhile, the overall justification for many USDA market information programs has diminished considerably. For instance, why should there be a market information program for eggs when nearly all the eggs are now moving under contract? Put another way, there is much less need to facilitate markets than in the past. It is time for a comprehensive review of these market information programs and a phasing out of unneeded programs.

With a more concentrated food industry, on the other hand, there may be greater public interest in preventing firms from influencing prices. But what does that mean for the U.S. Department of Agriculture in an industry where private contracts are replacing open market trades? Does the public want to eavesdrop on private contracts between pork processors and producers, for instance? Policymakers may want to invest more in tracking retail market outcomes and improving our overall understanding of how the structure of the market is linked to those outcomes. This presents new research opportunities to economists.

Can state and local policies stop industrialization?

Many midwestern states have laws which limit corporate farming in their state, laws that become binding on the development of industrialized production. The pork industry is a good case in point. Iowa is having a major debate on what sort of pork production it wants. And community zoning boards and county commissions now constitute the many firing lines where the skirmishes over the future of Iowa's pork industry are now being waged.

Industrialization is too strong an economic force to be stopped by these governmental efforts. To continue the example of the pork industry, it is already moving to regions and communities where it is welcomed. Big investments are being made in Oklahoma and Utah. These states have very little history in the pig business. What they do have is a business and regulatory environment that welcomes an industrialized industry, and natural resources with high absorptive capacity. Thus, state and local laws will only have the effect of rearranging the geographic profile of agricultural production. These regional shifts could be big and bear watching. Again, there will be significant opportunities for new research by economists.

Industrialization and the rural economy

Industrialization will have a major impact on the rural economy, though these impacts are not well-understood. Industrialization has a positive effect on a number of rural communities, because it brings value-added processing to them. The broiler industry is a good example. Packing houses have located near the production hubs, bringing jobs and income to those communities. But not all communities will benefit. Indeed, a casual survey of the broiler industry suggests that factories are mostly in larger rural communities, not in small towns. Moreover, industrialized production structures have a smaller indirect economic impact on communities where they do locate. More production inputs, including financial capital, are purchased from non-local sources. And more of the profits go to non-local owners of the firm.

In short, industrialization suggests a rural economy where economic impacts are much more concentrated than under the market structure of the past, when commodity production was the backbone for many rural communities. Moreover, industrialization will revamp agriculture's multiplier even in those communities that are hubs for industrialized production. This suggests that communities have much more complex economic development decisions than in the past.

The broiler industry offers a very clear example of industrialization's impact on rural communities. To my knowledge, this example has not been investigated by economic researchers. It

marks a major research opportunity for southern researchers in particular. I encourage you to pursue it.

Industrialization and agricultural institutions

Finally, industrialization will reshape many agricultural institutions, both public and private. Two public institutions that will clearly be affected will be the extension service and the land grant universities.

Although many forces confront the extension service, industrialization promises to force some critical decisions. By blurring the lines among the links in the food system, the extension service will have to decide who its customers really are. Should the extension system aim to provide services to contract growers, processors, rural communities, or all of the above? With more of the research and development in industrialized agriculture flowing from the private sector, does the extension service have a compelling role in technology transfer?

Land grant universities face some of the same choices in redefining their roles and their clientele. Is the food processor the client of the land grant university, and if so, what research does the public provide and what does the firm provide? Is the contract grower the client? If so, what does that suggest about the research and education programs of the university? Traditional farm education programs have focused on giving farmers the skills to manage production and market their crop. Under an industrialized structure, more and more farmers will determine their income through negotiation, not through savvy use of futures contracts. Do current curricula reflect that trend? Finally, the consumer is a growing client of the land grant university. Is the university providing quality standards and nutritional information on food products produced under an industrialized structure? In answering all these questions, the thrust of land grant agricultural programs is likely to undergo substantial change.

Conclusions

Industrialization is reshaping U.S. agriculture. Consumers want food that is consistently tailored to their tastes and preferences. Armed with new technology and production practices, farmers are increasingly able to fine tune food products from the earliest stages of production. The firms that bring farm products to consumers are forging new marketing arrangements to ensure that food supplies hit the new consumer targets. These capital-intensive firms are the "integrators" that are the real driving force behind industrialization. Facing both Wall Street and the whims of the new consumer, these firms have discovered that vertically coordinated business relationships reduce their financial and quality risks.

Though industrialization today remains confined to well-defined market segments--mostly produce and meat--it appears to be spreading to other segments. Moreover, the pace of change appears to be increasing. In the period ahead it now seems likely that industrialization will spread to more segments of agriculture, even spreading to grain production as government programs are reduced.

A new way of doing business, industrialization will bring change to many things that have long depended on a more traditional market structure. Agricultural policymakers will raise new questions about basing farm programs on commodities when more farm production is product-driven. As more products move to consumers outside of traditional markets, the federal government's role in monitoring such markets will be re-evaluated. State and local governments may try to resist the more corporate structure of industrialized agriculture, but the industry may simply go where it is welcome. Finally, industrialization will bring fundamental changes to the extension service and land grant universities as both try to assess who their new customers are.

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Endnotes

1. Sections one and two of this paper draw heavily on Drabenstott.