Evaluating Changes in Agricultural Market Structure

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Paper presented at the
Western Agricultural Economics Association Annual Meetings
Logan, Utah
July, 2001.

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The industrialization of agriculture, as described by Urban, is driven by consumer demand and technology. There is a growing body of literature related to the subject in which industrialization is defined as a shift from homogeneous commodity production to differentiated product production and a shift from spot market transactions to more direct, coordinated or integrated market channels. This development coincides with a broader trend in all consumer good industries.

In agriculture, bulk commodities or raw products of differing types and qualities have traditionally flowed through commodity markets to processors. Farm level differentiation of products is now becoming more prevalent. Examples of farm level differentiation are corn with high oil content, hard white wheat for bakery products, "leaner" pork, and soybeans for specific end users.

But, industrialization of animal production has environmental implications. The concentration of by-products at a single site increases the potential for a large-scale accident (Martin and Zering). This problem is what motivates this research. The concentration of animal production has given rise to waste management problems.

Broiler Industry

The broiler industry was different from other meat sectors in the early recognition and development of products wanted by the consumer. The primary product was a whole bird. The first step was cutting up whole chickens and selling them as whole, cut up birds. The packaging of breasts, leg quarters, thighs, etc. soon followed. A consumer today has the choice of fresh, frozen, marinated and precooked products at the grocery store. The development of the fast food industry was also an important factor in the

evolution of the poultry industry. The fast food industry created a demand for large volumes of meat with highly specific characteristics, which had not existed.

The requirement of certain size and quality birds was the main factor that led to the integration of the industry. Companies that produced deboned birds needed birds of a specific size in order to operate plant machinery efficiently. Marinated products require a smaller bird. Farmers must produce a chicken of a specific size and the processing plant must be set up to process birds efficiently to meet consumer demand. The necessity of a standardized bird and constant communication between growers and processors led to the vertical integration of the industry.

This means an individual company performs or controls all or most facets of production. A contract system between growers and poultry companies is used to control the stages of production. Resources are utilized with maximum efficiency to produce uniform birds. Broilers are typically grown in enclosed houses that provide maximum control over the birds' environment.

Improvements in technology, and integration of production, processing, and marketing have transformed the broiler industry. What was once a disorganized group of small individual farms is now a concentrated and efficient operation. High quality meat can now be produced with reduced production costs due to advances in breeding, nutrition, housing, equipment and disease control (McIntosh, Park, and Karnum).

This has led to enormous growth in the number of broilers produced and increased geographical concentration of production. This has caused negative impacts on the environment. One of the biggest concerns for poultry growers is how to dispose of

the waste from production. The main waste product is litter, which is a combination of poultry feed, manure, and bedding materials.

A typical broiler house will produce 125 to 150 tons of litter material annually. Before building a poultry house, a producer must have a plan for poultry litter disposal. The standard method of disposal of poultry litter is land application to permanent pastures close to the source site (Sauer et al.). However, in areas of concentrated poultry production, overfertilization of land can occur. The cost of transporting the litter to other areas results in a tendency for the litter to be over applied close to its source (Chang, Janzen, and Cho). This may contribute to excess nutrient and chemical runoff into the surface and ground water supplies.

Repeated application of manure can result in buildups of nitrogen, phosphorous, others nutrients, and salts in soils. When rates of application exceed the crops needs for nitrogen, the excess can leach into the groundwater. The excess nitrogen can also be lost to the atmosphere (McCalla, 1974; Chang and Entz, 1996). Areas with intense livestock production are of concern regarding the environmental damage this may cause. The impact of repeated application can only be determined with long-term studies.

Public concern regarding manure management has received more attention in recent years. This is due to concerns about odor, water quality, collection, storage, and application of animal manure (Boland et al.). Animal production practices are being closely scrutinized for their impact on water quality throughout the United States (Martin, 1997).

Most land application is largely unregulated. Therefore, there is potential for contamination of ground and surface water in areas near the land application sites

(Madison and Brunett, 1985; Edwards et al., 1996; Bosch et al., 1997). Some states have imposed nutrient management regulations on land application of manures (Carson and Smeltz, 1993), but no national regulations are in place currently.

Best management practices (BMPs) are a means of preventing or reducing the amount of pollution generated by nonpoint sources to a level acceptable with water quality goals (Bailey and Waddell, 1979). The major BMPs for handling and disposal of poultry litter entail three practices. That is, nutrient management, waste utilization, and pasture and hay land management. Nutrient management is defined as managing the amount, form, source, placement, and timing of applications. Waste utilization is defined as using agricultural waste or other waste on land in an environmentally acceptable manner while maintaining or improving soil and plant resources. Pasture and hay land management consists of proper treatment and use of pasture and hay land (Soil Conservation Service, 1992).

Large, integrated poultry companies may recommend and in some cases require the use of BMPs for handling and storing poultry litter. They may also claim that the responsibility for protecting surface and groundwater lies with the individual growers (Gerstenzang, 1997). The responsibility of controlling non-point source pollution will raise the growers' cost of production.

Green Marketing

Regulatory command and control schemes have historically dominated environmental policy. Market-based incentives and voluntary programs have begun to compete with the traditional regulatory policies. Each strategy attempts to achieve the same goal, but using different motivation. Command and control mechanisms induce

behavioral change through fear. Volunteer policies attempt to induce changes in behavior by appealing to social responsibility. Market-based incentives rely on greed to induce changes in behavior. Regulatory costs diminish when market-based incentives are used, although they do not disappear.

An example of a market-based approach is the use of green marketing. Consumers' demanding more environmentally friendly products has increased the voluntary adoption of ecolabels. An ecolabel is a seal of environmental approval awarded by public or private organizations (Ravenswaay).

Voluntary labeling dates back to the early 1970s in the United States. Ex-Cello Corporation advertised that its Pure-Pak milk cartons were biodegradable. Standard Oil of California claimed its gasoline additive reduced emissions (Grodsky). Environmental labeling increased substantially in the 1980s in response to a growth in "green consumerism". This has been attributed to heavy news coverage of global warming and ozone depletion and the publication of books on environmental issues.

Abt Associates prepared a study for the U.S. Environmental Protection Agency and found that the percentage of new products with voluntary environmental labeling increased from 5.9 percent in 1989 to 11.4 percent in 1992 (U.S. EPA 1993). The largest number of labels is found in the foods and beauty aids product categories. The most common claim was nonuse of certain chemicals in production or product formulation (e.g., organic, no pesticides). The second most common claim related to solid waste (e.g., recyclable, degradable) (Ravenswaay).

Most of the labels are related to consumption and not production of a product. However, few pertain to the environmental impacts of the process used to produce the

product. The most widely known label of this kind is "dolphin safe". Some wood products are advertised as coming from sustainably harvested forests. The greatest potential for production related claims is in agriculture.

Either reducing a firm's costs or increasing its revenues can encourage the adoption of innovative environmental technologies. Creating or facilitating markets for the firm's output can create revenue. The potential of ecolabeling as a means for enhancing revenues is examined in the conclusion of this paper.

Agricultural Potential

There is little empirical work on the subject of ecolabeling. One exception is a study of dolphin safe labeling by Teisl, Roe, and Hicks. Nimon and Beghin evaluate the worth of ecolabels in the apparel industry. A survey conducted by Wessells, Donath, and Johnston evaluated the consumer preferences for ecolabeled seafood. A contingent valuation survey was also used by Blend and Ravenswaay to estimate consumer demand for ecolabeled apples. Govindasamy and Itallia empirically evaluated which demographic characteristics cause consumers to be more likely to purchase Integrated Pest Management (IPM) products.

The USDA is authorized to develop specific organic production and handling standards and permit use of a USDA seal on certified products that meet those standards (Ravenswaay and Blend). Any labels used in addition to this organic label would be required to comply with Federal Trade Commission anti-deception rules on environmental marketing claims (U.S. Federal Trade Commission, 1992). These rules are intended to protect consumers from false claims. This could impede the widespread use of ecolabels in agriculture. Specific claims are encouraged; a general claim such as

the use of sustainable farming methods may require statutory authority (Ravenswaay and Blend).

In economic theory, uncompensated environmental damage is treated as a negative externality. Consumers or producers in the product market do not account for the damage. This means the environmental cost is not included in the equilibrium price reached in the market. Consumers are now learning that money is not the only thing they sacrifice to buy a product which by its production caused environmental damage. The idea behind ecolabels is that disutility from the damage associated with production of the product offsets the utility gained from use of the product. There is a tradeoff. A successful ecolabeling program requires that the additional costs associated with a new method of production that does not harm the environment must be less than or equal to the marginal value of the environmental improvement to the consumer.

The cost of creating and implementing an ecolabeling program would include fees for research and development of standards, training programs, collecting information on producers, and consumer education. This is in addition to the direct costs of the labeling fees, higher input costs, and the transaction costs. A precise measurement of environmental improvement would also be required. Higher costs would be associated with growing ecolabeled products, which would have to be covered by a price premium for the product. The feasibility of an ecolabeling program would differ for each commodity. The costs of techniques required to lower environmental impact vary greatly between agricultural commodities. Whether or not consumers are willing to pay a premium for ecolabeled agricultural products determines the feasibility of such a

program. Little scholarly work has been done in this regard, other than the studies mentioned previously.

Proposed CAFO Regulations

Concentrated animal feeding operations (CAFOs) are currently regulated under the Clean Water Act. Public concern about contamination of rivers, lakes, streams, coastal waters, and groundwater from livestock operations has been growing. The U.S. Environmental Protection Agency (EPA) is proposing regulations to reduce the amount of water pollution from large livestock operations. The revisions to the Clean Water Act would affect 39,000 CAFOs nationwide, including poultry houses.

There are two proposed definitions of a CAFO. Under one definition, 91 percent of all poultry growers in Mississippi would fall under new regulations. With the other definition, 98 percent of poultry growers in the state would be affected. The proposed changes in regulation would include purchasing a permit at an undetermined price. Each CAFO will prepare and implement a site-specific permit nutrient plan. Records of manure transferred to others or applied must be kept. Manure applied to land must be certified as applied at proper rates. The new regulations would prohibit applying manure within 100 feet of surface water and a zero discharge requirement for poultry houses. Routine inspections would be conducted and public access to records would be improved by publishing a quarterly list of CAFOs and any changes to the site-specific permit nutrient plan. The EPA estimates that these proposed regulations would result in total compliance costs to CAFO operators of $850 to $940 million annually (EPA).

Potential impacts on individual farmers are hard to estimate. The cost of regulation could potentially raise the cost of meat at the grocery store. Poultry

production costs will increase due to added amounts of labor, management, and land needed to dispose of litter (Bosch et al). These costs have been estimated at as much as $3500 per farm and from 5-103% of total gross sales per farm (Westenberg and Letson). Little direct evidence of the costs directly associated with best management practices of poultry litter exists. Clouser et al. did identify cost increases associated with nutrient management plans for dairy farms in Florida. When BMPs were in place, their research indicated an 8 percent increase in variable costs. Bosch and Pease found that land application restricted by nutrient management plans to the lesser of the limiting nutrient (nitrogen or phosphorous), decreased net returns to livestock production by 38 to 142 percent. The land required for manure application was five to ten times greater when manure management was based on phosphorous versus nitrogen (Moore et al.).

Conclusions

The broiler industry continues to grow. Poultry has the highest per capita consumption of any of the major meats. According to the USDA's Economic Research Service, per capita broiler consumption in the U.S. went from 71.9 pounds in 1997 to 77.6 pounds in 1999. It was expected to increase to 81.9 pounds in 2000.

However, stricter regulation threatens to eliminate small poultry growers. The cost of meeting the proposed regulations would eliminate the thin profit margin that exists. Developing a market for ecolabeled chicken products could allow producers to pass the cost of regulation onto consumers. By voluntarily regulating itself, the broiler industry could increase revenue. The increase in costs due to adoption of environmentally friendly techniques could be less than the premium consumers are willing to pay for the reduction in environmental damage.

One market-based incentive alternative to regulation has been presented in this paper. This would require voluntary regulation on the part of the poultry industry. However, regulations may eventually be put in place that would require compliance. By voluntarily reducing environmental damage caused by poultry production, profits are possible.

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