INDUSTRIALIZATION OF AGRICULTURE: WHAT ARE THE POLICY IMPLICATIONS?

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The agricultural sector, particularly the livestock industries, are in a period of major change and transition. This transition is commonly referred to as the industrialization of agriculture. Since Tom Urban popularized this term in an often cited article in *Choices*, many have asked what it really means. What is this threatening, insignificant (or at best not new) or innovative and creative transition (depending upon your viewpoint) in agriculture?

Industrialization of agriculture seems to defy definition (everyone has their own perspective), but let us try to describe it. A short, simple description might be: The application of modern industrial manufacturing, production, procurement, distribution and coordination concepts to the food and industrial product chain.

What are the themes or dimensions of this process? The following discussion will develop seven themes of industrialization: a manufacturing mentality; a systems approach; separation and realignment; negotiated coordination; risk; power and control, and information. Then we will identify seven policy issues that this process will impact and that will likely require new or different policy responses.

The Themes of Industrialization

A Manufacturing Mentality

Manufacturing Food Products vs. Producing Commodities—The transition of agriculture from a commodity industry to one with differentiated products, especially when combined with a focus on the food consumer and a manufacturing approach to production, is a dramatic paradigm shift for the industry. The produce and then sell mentality of the commodity business is being replaced by the strategy of first asking consumers what they want as attributes in their food products and then creating or manufacturing those attributes in the products. This may, in fact, require changes in how the raw material is produced and what it doesn't contain (i.e. chemical residues), as well as what it does contain.

Systemization and Routinization—One of the characteristics of the manufacturing process is systemization and routinization. With increased understanding and ability to control the biological production process, routinization becomes increasingly possible. Tasks become more programmable. Routinization gen-

erally fosters more efficient use of both facilities and personnel, as well as less managerial oversight and overhead. Thus, agricultural production is becoming more of a science and less of an art.

Specialization—An additional manufacturing mentality concept now being utilized in modern production systems is that of specialization, not only with respect to business venture and focus, but also with respect to individual employee tasks or function. This specialization is increasingly feasible because of better understanding and control of the biological process.

Scheduling and Utilization—A further implication of the manufacturing paradigm in agricultural production is increased emphasis on facility utilization, flow scheduling and process control. Many production units have, in essence, maintained excess plant capacity as one means of accommodating the uncertainty of the output of the biological production process. But again, as a result of increased ability to predict and control that process, facility use can be more accurately predicted and controlled, and process control concepts to improve efficiency and reduce cost are more applicable and useful than in the past.

A Systems Approach

Systems/Process Flow—The manufacturing mentality places increasing emphasis on the entire value chain from raw materials supplier to end-user. This system, rather than stage or segment focus, reduces the chances for sub-optimization within a stage or sector and dead-weight losses because stages are not well matched in terms of product flow, characteristics, quality or other critical attributes.

Systems Cost—Although cost control is critical in any production system, the manufacturing approach focused on end-user products recognizes total production and distribution systems cost as being more critical than the cost in each stage of the value chain. And as more resources are out-sourced, the cost structure of the business changes with a higher proportion of the cost being variable in nature and a lower proportion fixed. An industry in which more firms have a higher proportion of their total costs that are variable costs is more responsive to changing market conditions.

Input Packages vs. Mix and Match Strategies—With the increasing capacity to control and understand the biological process through biotechnology and genetic engineering techniques, producers will be more capable of developing optimal input combinations that match chemical and biological attributes to obtain the optimum quality and characteristics of output. For example, crop genetics are being matched to pesticides for optimal pest control as exemplified by Synchrony STS—a seed/herbicide system. In some cases the producer will

purchase pre-specified input packages that are optimized in terms of their biological and chemical characteristics; in other cases the producer will be warned that certain nutritional and genetic inputs respond better when used together, and their performance may be sub-optimal if used in other combinations. But this matched inputs strategy has risks—the risk of reduced flexibility and ability to adjust if supplies of an input decrease and/or prices increase.

Separation and Realignment

Separation of Production Stages—The old paradigm in production agriculture has been to combine various stages of production within one firm—for example, to combine in swine production the breeding, gestation, farrowing, nursery, growing and finishing activities in one firm at one location, and furthermore to integrate these activities with feed production and processing. The new paradigm is geographic and stage separation of many of these stages of production. A further dimension of this separation is in the ownership and operation of the resources. More assets in production agriculture are being out-sourced—for example, 41 percent of the farmland today is owned by a non-operator compared to 22 percent in 1945 (Wunderlich). Geographic and stage separation, in turn, frequently implies larger scale and more specialized capital, labor and management resources at each individual plant site or facility location. Implications of separation for flexibility are unclear—more specialization in resource use decreases flexibility, but participation in only one stage may increase the options for negotiating with other partners in other systems, *if other systems are in the market.*

Partnering and Alliances—At the same time that geographic and stage separation is occurring, the stages are being relinked by various forms of alliances. Increasingly, producers are partnering with other resource suppliers in various ways to expand volume with limited capital outlays. In livestock production, this phenomena is occurring through contracting arrangements; a hog integrator may own the breeding, gestation and farrowing facilities, but contract out the nursery and growing phases. In essence, the integrator is leveraging volume by investing his funds in only part of the total fixed assets needed to produce hogs, while maintaining a high degree of control of the other phases through the ownership of the livestock and the specification of the growing conditions. The critical dimension of such partnering or alliances is that more resources and services are out-sourced, if that is a less expensive technique for obtaining production inputs, and more linkages up the value chain to the end-user are used to capture value in additional stages of the chain.

Negotiated Coordination

Spot Markets—Production agriculture in the past has focused primarily on commodity products with coordination through impersonal spot markets. The

increased specificity in raw material requirements combined with the potential for producing specific attributes in those raw materials is transforming part of the agricultural market to a differentiated product market rather than a commodity product market. The need for greater diversity, more exacting quality control and flow control will tax the ability of spot markets to coordinate production and processing effectively. Open spot markets increasingly encounter difficulty in conveying the full message concerning attributes (quantity, quality, timing, etc.) of a product and characteristics (including services) of a transaction.

Information Flows—Related to the difficulty of spot markets conveying the proper information is the speed of information flows and the rate of adoption with different coordination mechanisms. In general, negotiated coordination results in more rapid transmission of information between the various economic stages, and consequently, enhanced ability of the system to adjust to changing consumer demands, economic conditions or technological improvements.

This ability to respond quickly to changes in the economic climate is critical to maintaining profit margins as well as extracting innovator's profits. Likewise, quickly recognizing erroneous decisions and making appropriate adjustments and corrections are essential to survival and success.

These arguments suggest that, in traditional commodity markets, where specific attributes are not demanded, supplies are fully adequate and can be obtained from various sources, and information flows between the various stages is minimal, traditional spot commodity markets can function quite effectively and efficiently. As one deviates from these conditions—which is increasingly the case with more specificity in raw materials, information flows and fewer potential sources of acceptable supplies—various forms of negotiated coordination systems become more effective and necessary for efficient functioning of the production and distribution system.

Risk

Sources and Strategies—Risk has been a hallmark of the agricultural sector, and the industrialization of agriculture is both a result of, and has implications for, the business strategies that will be used to reduce risk. One risk is that of prices of inputs or products. A common business strategy is to reduce the risk of high prices for inputs by contracting for supplies. A related strategy is to reduce the price risk exposure on products by contracting product sales. Some firms reduce price risks by vertically integrating into the input supply or product distribution channels.

A second source of risk is related to quantity and/or quality features. Food packaging and processing unit costs have become very sensitive to operating at

full plant capacity; thus flow scheduling is critical to being cost competitive. Matching the physical capacity of various stages (for example, hog finishing capacity with packing plant kill capacity, or turkey grower space with processor dressing capacity) is critical to overall efficiency of the system. Furthermore, some food distribution channels may require particular quality characteristics which may not be available in predictable quantities in open, spot markets.

A third source or type of risk in the food chain that has become more serious in recent years is that of the safety and health risk in food production. This risk has two dimensions, the health risk of foodborne disease; and the risk of polluting water, air and land resources in the food production processes. These risks can result in significant direct costs and liability exposure for not only the responsible firm in the food chain, but also firms that supply related inputs and purchase products from the "responsible" firm in the case of strict (joint and severable) environmental liability related to chemical use. Thus, system coordination to reduce or control these risks may be in part a response to the broad sweep of product and environmental liability law.

Relationship Risk—The expanding use of contractual and other forms of negotiation-based linkages between the various stages within the agricultural production and distribution system, and the decline in impersonal market-based transactions, will result in price risk being replaced by relationship or contractual risk for many agribusiness firms.

Niche Markets—The food and industrial use markets for agricultural commodities are increasingly characterized as segmented or niche markets that can appear and disappear rapidly. For many agribusiness firms that are in the food processing and distribution business, the risk of changing consumer preferences or a food safety scare may be a much more critical and important risk to manage than price or availability of raw materials. One reason for a contractual arrangement to source raw materials is to reduce price and availability risk as well as food safety risk from chemicals, and simultaneously obtain the attributes needed in the final product from the specific attribute raw material.

Power and Control

Position Power—Traditionally, discussions of power or control in an economic system have focused on issues of size and the ability to exercise monopoly or monosopy power as a function of volume or size—in essence market dominance. With the increasing importance of the role of information in economic decision making combined with more negotiated coordination systems, the potential of economic power associated with a particular stage in the production and distribution process has surfaced. In essence, the question is whether there is economic power or control associated with a particular stage

in the production and distribution system—is there *position* power as well as *size* power!

Points of Control—The basic argument is that there are two fundamental points of control and one fundamental source of power in a negotiation-based coordinated agricultural production and distribution system. The first point of control is the end-user or consumer and those firms that have intimate contact with the consumer. Consumers are more discriminating in their food purchases, want a broader spectrum of attributes in their food products, and increasingly have the purchasing power to convert wants into effective demand. Those firms that are close to the end-user and understand the increased specificity of his/her demands have a unique capacity to communicate and/or dictate those demands to the rest of the production and distribution chain.

The second point of control in the agricultural production and distribution system is the raw material suppliers. But not all raw material suppliers have the same degree of power and control. In essence, the relative control of raw material suppliers depends upon the degree of substitutability for their input or contribution to the production and distribution process. The one input with the fewest substitutes—the most essential in the agricultural production and distribution chain—is the genetic material in plant and animal production, the seed and breeding stock. Biotechnology and increased predictability and control of genetic manipulation provides additional power to those who control genetic material.

Knowledge and Information—Note that the points of control in the agricultural production and distribution chain are at the beginning and the end—the genetics and the end-user/consumer. The source of this control is knowledge in both cases. By the very nature of their business, retailers or food processors and genetics companies have better access to information at these points of control. Given that the source of control is knowledge and information (not physical resources, not capital, not land), then the only way a firm between the end-points of the end-user and the genetics company can obtain control is through superior information. The implication is that it is very difficult for those in the intermediate stages to obtain superior information and, thus, the power base for control of the system.

At this early stage in the process of shifting from impersonal markets to contract or ownership coordination, there may be a first-mover advantage for very large producers or producers' cooperatives to play the control role. Thus, initiative now by the intermediate firm level may offset the perceived advantage of firms at the end-points. Coordination by producers' cooperatives has the potential for the more traditional producers to retain a more prominent role. But unless such firms make preemptive moves early in the transformation from open markets to closed systems, the opportunity for control will likely be lost.

The Role of Information

An Increasing Role—The increasing role that knowledge and information play in obtaining control, increasing profits and transferring risk in the agricultural sector is occurring for two fundamental reasons. First, manufacturing food and industrial products has become an increasingly sophisticated and complex business in contrast to producing commodities as in the past. This increased complexity means that those with more knowledge and information about the detailed processes, as well as how to combine those processes in a total system (i.e. the value chain approach), will have a comparative advantage. The second development is the dramatic growth in knowledge of the chemical, biological and physical processes involved in agricultural production. This vast expansion in knowledge and understanding means that those who can sort through that knowledge and put it to work in a practical context have a further comparative advantage. Thus, the role of knowledge and information in achieving success in the agricultural industry is more important today than ever before.

Access to Information—The logical question then for individuals in the food and industrial product manufacturing chain is how to obtain access to this knowledge and information. Historically, particularly for the independent producers in the farm sector, this knowledge and information has been obtained from public sources, as well as from external sources such as genetics and chemical companies, feed companies, machinery and equipment manufacturers, packers and processors, etc. In contrast, ownership or contract coordinated production and distribution systems have sourced their knowledge and information from a combination of internal and external sources. Many of these firms or alliances of firms have internal research and development staffs to enhance their knowledge and information base. And the knowledge they obtain is obviously proprietary and not shared outside the firm or alliance; it is a source of strategic competitive advantage.

Integrated Systems—The research and development activities in coordinated systems are more focused on total system efficiency and effectiveness rather than on only individual components of that system; they are focused on integrating the nutrition, genetics, building and equipment design, health and disease control programs, marketing strategy, etc., rather than on these areas or topics separately. And in addition to more effective research and development, such alliances or integrated firms have the capacity to implement technological breakthroughs more rapidly over a larger volume of output to obtain larger innovator's profits. In the case of a defective new technology, ownership/contract coordinated systems generally have more monitoring and control procedures in place, and can consequently detect deteriorating performance earlier and make adjustments more quickly, compared to a system with impersonal market coordination.

The expanded capacity of integrated systems to generate proprietary knowledge and technology and adapt it rapidly enables the participants in that system to more regularly *capture* and *create* innovator's profits, while simultaneously increasing control and reducing risk. This provides a formidable advantage to the ownership/contract coordinated production system compared to the system of independent stages and decision making.

Value of Information—Because of the increased value of information and the expanding role of the private sector in providing it, the issue of the proprietary nature of, and access to, data and information becomes more important. With the increasing value of information and its use as a strategic competitive advantage, there is less free exchange of data and information. If coordinated production systems have the potential to obtain superior information, how can a producer that is not part of that system obtain access to similar information to remain competitive? Will you need to become part of the system—"in the loop"—to obtain access to the latest information to be competitive?

The Policy Issues

Farm Programs

An industrialized agriculture provides yet another challenge to the rhetoric, if not the substance, of traditional farm programs. The rhetoric of farm commodity programs has long emphasized maintaining family farms and a smaller scale, family-based agriculture. In spite of this rhetoric, most of the farm program payments have been received by larger scale commercial farms, particularly in the cotton and rice sectors, as well as in feed and food grains. A second justification of farm programs has been to provide a safety net for farmers—to reduce the financial risk that they encounter because of both price and yield volatility.

Industrialization of agriculture may significantly undermine both of these traditional arguments for farm commodity programs. An industrialized agriculture will likely involve fewer family-based businesses, and those family-based businesses that remain will likely be operated and managed like many other family-based businesses in other economic sectors that do not benefit from price and income support programs. And the increased use of contract production may reduce or substantially mitigate the price and yield risk faced by industrialized producers, although contract production will likely introduce additional risk such as relationship risk (i.e. the potential for unexpected contract termination or nonrenewal), which is more difficult to manage or transfer to others through formalized exchanges.

An industrialized agriculture will likely be expected to respond and adjust to changes in market conditions in similar fashion as any other industrialized sector of the economy. It will be expected to use private sector risk management strategies to transfer and/or reduce price risk. It would be expected to more readily and effectively adjust to changing market conditions with less support and assistance from the public sector. The public might even expect and accept a higher financial failure rate as is currently exhibited by and politically acceptable for the non-farm, small business sector. At a minimum, industrialization of agriculture will likely undermine the political rhetoric for traditional farm price and income support programs, and may provide further support for payment limitations and other targeting provisions that would focus benefits on family-based rather than industrialized agriculture.

Environmental Policy

An industrialized agriculture is likely to be increasingly treated like manufacturing or any other industry when it comes to environmental regulation. Agriculture has been exempt in many instances from the environmental regulation faced by much of industry, in part because of the difficulty of regulating and monitoring non-point compared to point sources of pollution, and in part because of the small scale of many farm firms compared to the manufacturing complex. But as farming and agriculture become more industrialized, the rationale for exemption from regulation becomes less persuasive. This does not suggest that the agricultural sector will be subjected to more regulations than those encountered by non-agricultural industries; only that farming will be increasingly brought into the main stream of environmental regulation and have fewer exceptions from the environmental law of the land.

The environmental consequences of the industrialization process are not straight forward. As noted above, a larger proportion of agricultural production and resources might be subject to increasingly stringent environmental regulation, resulting in less potential environmental degradation. But with larger scale units, if there is an environmental accident, the consequences are more severe because of the increased concentration of pollutants as evidenced by the recent lagoon accidents in North Carolina and other states (*National Hog Farmer*, p. 17).

Labor Regulation

Similar to environmental regulation, an industrialized agriculture would be expected to be less exempt from current labor regulations that impact most other industries. Production agriculture is one of the more hazardous

occupations in terms of worker safety, yet much of the industry is not regulated by the Occupational Safety and Health Administration (OSHA) and/or under more recent Worker Protection Standards legislation. Largely as a function of increased scale as one moves to an industrialized agriculture, but also because of more complexity in the workplace, an industrialized agriculture would be expected to encounter increased regulation concerning the work environment and working conditions of its employees. Furthermore, industrialized agriculture may include more employees (both skilled and unskilled) and fewer self-employed individuals. An interesting policy dilemma will be how the self-employed and their family members will be treated under worker protection and other labor regulations as they become increasingly applicable to the agricultural sector.

Food Safety

Industrialization of agriculture is in part a response to increasing concerns by food processors and retailers, as well as institutional food service companies, concerning issues of food safety and health as well as nutrition. And as a consequence of the industrialization process, food safety regulations may become easier to enforce and lower cost to implement. One of the significant implications of the negotiated linkages, which are part of the industrialization process, is the ability to more accurately and easily document the processes used in producing agricultural products, including chemical and feed additive use. Such information is increasingly valuable to comply with nutritional labeling requirements, as well as to document compliance with food safety and health regulations that are increasingly imposed along the entire food chain. Although industrialization of agriculture may not suggest policy changes in this area, it is expected that the industry will be more responsive to these regulations, and some segments of the industry might view changes in policy and legislation in the food safety and nutrition arena as providing opportunities to differentiate products and obtain a sustainable competitive advantage.

Information/Technology Transfer

The public policy issue of the role of the public sector in making information a public good that is broadly available to all potential users, and the more general issue of intellectual property rights, become critical with industrialization of agriculture. The intellectual property rights debate has historically focused more on research and development and new innovations protectable under patent or copyright law. Particularly in agriculture, the public sector has played a major role in the research and development activity, and thus provided broad access to new technology and ideas. In this context, part of the public purpose was developing and disseminating new

ideas in a sufficiently broad fashion that a wide spectrum of users benefited, and so that individual firms could not restrict access and capture the value associated with the new idea. The public sector role was that of leveling the playing field so that all participants competed on the same grounds vis-a-vis access to new ideas and information.

But as more and more of the research and development and thus new ideas come from private sector firms compared to the public sector, and more of the information dissemination system becomes privatized, individual firms have more potential to capture value at the expense of end users. They have the potential to restrict access to new ideas and information to particular users, thus favoring some producers and excluding others from the ideas, technology or information necessary for them to be competitive. The concepts of intellectual property rights, including patent and copyright law as applied to agriculture, were developed in an era of domestic markets and national firms; a relatively large public sector research, development and information dissemination system, and a limited role of information as a critical resource. These concepts should be reevaluated in the current context of global markets and multi-national business firms; the shrinking role of the public sector in research and development and disseminating information; and the increasing importance of information compared to other resources as a source of strategic competitive advantage.

A related policy issue is the funding of public information services. The tradition has been to provide most extension programs on a free or nominal charge basis, premised on the argument that public funds have been used to support the information development and dissemination system; and that charging for services would require users to pay again, and would also discriminate against those who do not have the ability to pay. In recent years, many extension services have faced tighter budgets and are implementing fee schedules for some information programs. Most of these fee schedules are based on partial or total cost recovery. Thus, in the context of economic principles, these pricing decisions are supply or cost-driven.

But information, like any resource, has a supply and demand function. And consideration of the demand or value function can be useful in resource allocation decisions. Market-driven pricing based on the demand function provides information on the value of information, and is thus useful in making decisions about how to allocate scarce extension resources to various forms of information programming. Markets provide signals and incentives to do the right thing, so pricing for services may not only assist in recovering cost, it may provide significant information that can be used to allocate resources to the highest payoff extension program. In that context, pricing extension programs might make a significant contribution

to a demand/consumer driven public sector information system, as contrasted with the current supply/provider/cost- driven system of determining the proper types of programs.

Clearly, one must always be concerned about issues of market failure that would allow firms to capture excessive profits or exercise monopoly power in the information markets, and an important role of the public information system is to mitigate the impacts of those market failures. But one cannot ignore the potential failure of non-market allocation systems that do not recognize relative value in providing their product or service—in this case information services. Markets and prices do provide extremely valuable data that can be used in making socially optimal resource allocation decisions, and this data should not be summarily ignored.

Regulation of Structure

Finally, probably one of the most contentious policy issues precipitated by the industrialization of agriculture is that of the appropriate regulation of the structure of the industry. The public policy issues here are far-reaching and complex, including the implementation of anti-trust policy to an increasingly concentrated and integrated food industry; the regulation of the ownership of farm land, livestock facilities, and other resources used in production agriculture; state and/or federal legislation and regulations on the appropriate form of business organization (corporate farming, contract production, limited partnerships, etc.) and who are appropriate participants in such business arrangements; contract protection provisions which specify the rules and the protections available to various contracting parties; and even local county and township zoning regulations which influence the ability of individual producers to construct new facilities or implement various farming practices. Concerns about market power and concentration in the agricultural industry might result in increased scrutiny under anti-trust laws and regulations, although the current posture of limited enforcement under these rules makes that unlikely. More likely, state legislators, concerned about the future of family farmers and threat of corporate farming, may constrain forms of coordination arrangements such as contract farming or integrated ownership of various stages of agricultural production. Note, however, that such limitations are more likely to influence the geographic location of various activities in the food production and distribution chain, rather than the method of coordination, unless such legislation is national in scope.

Several broad policy options are available to deal with the structural change that is occurring in the agricultural industry. One option would be to do nothing—to let the changes take their course within the state and federal

laws already in existence. A second option is, as suggested earlier, to prohibit various types of activity that are deemed socially undesirable. This option precludes institutional innovations that may have significant economic and social costs and benefits in favor of the status quo. A third option is to impose better "rules of the game" that would level the "playing field" or maybe even give some participants an advantage; or to define the relative "rights" of various parties in contracting, ownership and other negotiated linkages, where the potential for unfair treatment or exploitation is a concern. Prompt payment and custodial account provisions under current legislation for livestock buyers and grain merchandisers are examples. Other "rules" might relate to contract length, compensation if a contract is terminated early or without cause, and escape clauses for both the contractor and contractee, for example. A public policy response of providing educational programs, legal advice and mediation or negotiation services to help parties evaluate and resolve contractual or other business linkage conflicts might also be appropriate.

In attempting to regulate the structure of agriculture, particularly as it relates to the production sector, public policy makers should obtain satisfactory answers to the following questions:

1. Do we want to prohibit contracting, vertical integration or similar activities by any and all parties, or do we only want to prohibit firms over a certain size or with other characteristics from engaging in these activities? One way for the public to favor smaller agricultural enterprises over larger ones would be to enact some sort of progressive tax, where the rate increases with size of the enterprise. Perhaps a progressive tax on volume of production could be used.

The impact of restrictions on existing firms may turn out to be less than first thought. Firms already engaged in activities covered by the restrictions may be able to restructure in ways that circumvent the restrictions. The $50,000 limit on federal crop subsidies and the 160-acre limit on subsidized irrigation water in the western states are two examples of restrictions that some farms are reported to be circumventing through such techniques as setting up multiple business entities.

2. Are there ways to protect market access for independent producers, other than restricting vertical integration or vertical linkages? One way might be to require processors to purchase some minimum percentage of their daily kill on the cash-spot market.

3. Is the important question whether the alternatives available to a producer are cash-spot markets or contract alternatives, or is it the number of alternatives available and the market power of each? In other words, is

there really any fundamental difference between a producer choosing among two or three packers to sell to, or signing a contract with one of two or three contractors? One obvious difference is that the choice of packers is made every week or two, while the choice of contractors is only made once a year or once every few years, depending on the length of the contract.

4. Is it more desirable for cooperatives to engage in contracting with producers or to vertically integrate than other corporations or large privately held firms? One apparent concern with allowing existing cooperatives to contract or integrate is that they might use equity capital built up from independent producer members' contributions to help other contractee producers start or expand, such that they compete with the independents. Would it be more desirable to allow new cooperatives to form, which would take advantage of economies of size, but using only contractee capital? If there are efficiency advantages of larger operations, would it be more desirable for groups of farmers to own and operate the operations than others? Do farmers "wear whiter hats" than others, in some sense?

5. What activities are to be restricted or prohibited? It appears that a major concern is who will be in control of strategic decisions in the agricultural production and distribution industry. Specific activities should be evaluated in relation to their roles as instruments of control. How do owning livestock or buildings, financing, providing feed and other inputs, or marketing relate to control?

6. What is a "contract?" How is "ownership" of livestock to be defined and rules about it to be enforced? Could a contractor circumvent a prohibition on ownership by selling the animals and feed to the producer with an agreement to buy back the market animals under some preset terms? Are "profit sharing" or financing arrangements to be prohibited or restricted? Market access is a key and legitimate concern.

7. Many producers are concerned about risk, and contract production is one method to manage risk. What other strategies might producers adopt to manage risk? Marketing contracts, futures and options trading, and contracts that simply guarantee access to a slaughter facility are possibilities.

8. What are the constitutional limits on regulatory activities of this type? It is clear that state and federal governments may impose restrictions that limit activity contrary to the "public good." But what is "good" and for whom in this situation? How will agriculture commerce be affected?

A Final Comment

The structural changes that will impact agriculture over the next decade will be profound. These changes will include both technological and institutional innovations. Production agriculture has been very accepting of technological innovations—farmers have generally been eager to try new hybrids, new chemicals, new tillage practices, new feeding regimes, new equipment, etc. Institutional innovations or new ways of doing business have been accepted with more resistance, possibly in part because they change relationships and frequently substitute interdependence for independence in the decision making process.

But the economic benefits of the dual dimensions of industrialization of agriculture—implementation of a manufacturing approach to the food and industrial product production and distribution chain, and negotiated coordination among the stages in that chain—are expected to dominate the economic and social cost, resulting in a rapid movement of the livestock sectors (particularly pork) followed chronologically by the grain sectors to an industrial model of production and distribution. The implications of this industrialization process for agricultural policy are profound. In essence, the underlying policy questions can be stated simply: (1) Should the industrialization of agriculture be allowed, or should public policy limit or shape this process so that the end result is more compatible with what is perceived by some to be a more acceptable structure of the industry; and (2) if industrialization of the agricultural sector does occur, can one justify unique policies, like price and income supports, and exemption from other policies such as worker safety and environmental regulation, for an industry that is no longer different than other manufacturing and industrial sectors of the economy.

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