
Meat Packer Vertical Integration And Contract Linkages in the Beef and Pork Industries: An Economic Perspective

by

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Executive Summary

The livestock and meat industry's increasing use of production contract, marketing agreement, or ownership linkages between beef and pork producers and meat packers has provoked controversy and legislation to abolish many of these market linkages. In this report, we analyze the transition away from cash markets in the beef and pork industries. We explore its character and extent, underlying driving forces, problems and issues. The research team has completed an extensive review of prior research and data relevant to the policy issues currently being raised, conducted surveys of beef and pork packers and their leading customers, and summarized information useful to those involved in the policy analysis and debate. The summary below highlights the main points of the full report.

Overview of Agriculture

Vertical integration is not extensive in agriculture.

- Less than 8 percent of farm production is from vertically integrated businesses.
- The poultry industry (eggs, turkeys) and some crops (sugar beets, sugar cane, potatoes, fresh market vegetables, and some fruits and nuts) have the greatest shares of production involved in vertically integrated operations.
- Farmer cooperatives handle or process 30 percent of farm output.

Contracting is common among all types of farms, accounting for 35 percent of total production.

- Over two-thirds of contract volume were marketing contracts, one-third was production contracts. Over 11 percent of all farms were involved in contracts, with the largest involvement by the large family farms.
- During the 1990s, marketing contract use increased from 16 to 22 percent, while production contract use was stable at 10 to 15 percent of volume.
- Production contracts are used in producing almost all broilers, with significant use also in egg and hog production.
- Marketing contracts are extensively used in many commodity sectors, with more use in sugar beets, fruits, canola, potatoes, peanuts, cotton, rice, and vegetables.

The reasons given for vertical integration and contracts include the following points.

- Vertical integration reduces quantity and/or quality risk, generates efficiencies in moving product through the system, and captures the profits from both levels of the production and marketing process. Integration assures raw materials

or customers, and may help avoid market power that might exist in supply or customer markets.

- Marketing contracts typically offer farmers more independence, more financial risk and less capital than production contracts, and less independence, less financial risk and easier access to capital than cash market arrangements. Contracts convey clear signals and incentives to producers, and may result in faster response to changing consumer demands.
- New driving forces likely to stimulate more contract linkages include increasing quality demands from customers, the GMO labeling and certification needs in some major markets, food safety concerns becoming more prevalent here and abroad, identity preservation becoming essential to capture and insure benefits of new specialty products from agriculture, and financial stress among farmers.

There are some disadvantages attributed to vertical integration and contracts.

- A large amount of capital is required. Payoffs from acquiring suppliers or customers may not be great. Customer or raw material market foreclosures for competitors are potential concerns when the share of the markets involved is high.
- Contract disadvantages and concerns for contract participants include loss of independence to the farmer involved in a contract, potential inequities in risk and return sharing, contract complexity, the risk of the contractor's financial failure, and potential bargaining position inequities especially at time of contract renewal.
- Other contract concerns for farmers include their ability to compete with vertically linked operations. Thinner cash markets, the potential for cash market manipulation by processors, less price transparency and price reporting problems, and lower cash market prices are concerns expressed.

The long contract history in many agricultural industries suggests that advantages outweigh disadvantages for those continuing to engage in vertical integration and contracts. Yet, many industries have several co-existing systems of vertical linkages, suggesting that contracts or vertical integration seldom result in the demise of other effective systems.

Pork Sector

The pork sector has dramatically changed its size structure and vertical linkages in the last 15 years, according to prior studies.

- Vertical integration by packers into hog production has been small until recent acquisitions occurred. Presently, about 18 percent of industry volume is represented by vertically-integrated suppliers. Packers building plants outside typical production regions had to build hog production or encourage expanded production through contract arrangements. Production contracts have primarily been offered by large-scale producers, not packers.
- Pork packer marketing contract volume has risen dramatically in the last decade, now reaching over 50 percent of industry volume. Very large production units, especially those outside major hog production regions, found long term arrangements with packers essential for financial security. Packers have had significant incentives to utilize capacity fully and keep costs down, and they found marketing contracts to be a low cost way of securing a stable supply of hogs.
- Recently, the increasingly stringent quality demands by export customers and their own brand product managers have been a more important incentive to assure consistent high quality supplies of hogs.
- The financial crisis in pork production in 1998-99 probably stimulated more pork producers to seek contracts to stabilize their financial situation. Consequently, less than 30 percent of hogs are purchased via the cash market in 2000. Producer satisfaction with hog production and marketing contracts is high.

There are issues and concerns about vertical integration and contracts in the pork industry.

- Cash market volume is dropping sharply, and price reporting will become more problematic. Concerns have arisen about possible price or price report manipulation, but mandatory reporting legislation should reduce those concerns.
- Independent producers are concerned whether they can compete effectively against vertically-linked operations. Access to markets for independent producers is limited, especially outside the Midwest. Producers face the decision of becoming linked with packers or being residual suppliers inherently bearing more risk.
- Perceived inequities among contract and non-contract producers' prices or unfairness in contract relationships are sometimes alleged, but unlawful price differences not explained by timing of contracts, or differences in hog value and services provided have not been shown to date.

Beef Sector

Approximately one-fourth of slaughter cattle comes from long-term contracts and marketing agreements, and 5 percent of slaughter cattle are fed by beef packers.

- Most packer feeding has been a result of cattle producers (including producer cooperatives) vertically integrating and buying beef packing firms. Improved market coordination between cattle feeders and beef packers has been demonstrated to result in significant cost savings for beef slaughtering and processing. These cost savings have been at least in part passed on to cattle feeders and consumers.
- Value-based pricing in fed cattle marketing agreements between beef packers and cattle producers are beginning to improve cattle quality.

The impacts of packer-fed and contract cattle are controversial.

- Packers are accused of undue favoritism for contract suppliers, or manipulating cash market prices to their advantage. Several studies found lower cash market prices occurred when contract cattle deliveries were high. Although precise reasons for these negative relationships have not been determined, they are probably partly attributable to cattle quality differences and contract cattle feeders (not packers) adjusting contract deliveries to benefit from short term price changes.
- The concerns regarding undue preference for contract suppliers spurred the USDA to file suit against one beef packer-cattle feeding group contract arrangement. The courts found the agreement was not in violation of the law – that the higher prices paid to the contract suppliers were reasonable and justified.

Poultry Sector

The poultry industry is a significant competitor for the pork and beef industries, rapidly gaining market share over the last 30 years.

- The broiler industry is entirely vertically coordinated through ownership or contract. Breeding flocks, hatcheries to feed mills, transportation divisions, and processing plants have a single owner. The integrator has production contracts with growers to feed the chicks to market weight. The significant economies of scale in poultry processing and the large proportion of value added in processing are major drivers toward the processor being the coordinator of the industry.
- The table egg industry is highly vertically integrated. The large egg producers deal directly with breeders to obtain parent stock and then produce their own

hatching eggs, chicks, and pullets. Most of them also maintain their own egg marketing operations. The extensive use of production contracts for egg production is in decline.

- Turkey production is organized through contract production. Farmers now specialize either in brooding or in finishing of turkeys, covered by separate contracts.

There are possible advantages and disadvantages to contract production in the poultry industry.

- The extensive use of contracts with independent farmers in the poultry industry has resulted in lower financial risk for farmers, rapid technology adoption, quicker response to changing consumer demand, and improved grower access to capital.
- While a majority of contract broiler growers surveyed recently express satisfaction with their contract arrangements, including their income from them, substantial numbers of growers (sometimes majorities) express dissatisfaction with bonus determination, communication, and a number of other operational issues with their contractor.
- The broiler industry has dramatically improved its competitive position in the last 30 years, improving efficiency, developing innovative products, keeping consumer prices low, and greatly increasing its market share.

International Competitors

The leading beef and pork competitors in the world market extensively use contract or ownership links between producers and processors.

- Denmark's farmer cooperatives dominate that country's entire pork packing industry, with long term one or two-year marketing contracts for each producer.
- Canada's pork sector is rapidly breaking away from the marketing boards' auction mechanism, shifting to contract arrangements with packers.
- Canada's beef industry has over 30 percent of volume under vertical integration, production or marketing contracts with packers.
- Australia's beef sector (mostly grass fed beef) has retailers contracting directly with producers or indirectly through processors paid a processing fee; the small feedlot sector is either packer-owned or dominated by marketing contracts with packers, retailers or exporters.

Pork Packer Survey Results

Leading pork packers were surveyed to better understand the types of procurement practices used by packers and motivations for evolving away from cash market transactions. Eleven responding firms accounted for 77 percent of 1999 U.S. slaughter volume.

- These firms report purchasing 27 percent of the hogs they acquired for processing in the cash market (individually negotiated prices on loads delivered within 14 days) in 1999, down sharply from levels in 1993.
- Marketing contracts that were formula-priced based on cash market prices represented 32 percent of slaughter hogs. Agreements with fixed prices based on futures, or some type of risk sharing or cash flow smoothing feature accounted for approximately 23 percent of packers' supply, an increase in the 1990s.
- Production contracts (over 40 percent of production) have primarily been offered by large hog producers; there has been little packer involvement in production contracts until recently.
- Packer-feeding of hogs has been small until recent acquisitions occurred. The volume of survey respondents' hogs going through their own slaughter plants was approximately 18 percent of their slaughter in early 2000.

Motivations for the use of long-term hog marketing agreements were packers' need for a consistent supply of quality hogs, and higher quality hogs to satisfy customer demands (with increasing branded and long-term contract sales), and the demand for contracts by producers.

- Packers responding to our survey sold 72 percent of their pork on the cash market, and 28 percent of sales via long term contracts.
- Leading reasons for self-production of hogs by packers were insuring pork quality and safety, improved plant efficiency, and long-run price risk management. Packers reported a higher level of quality and consistency from hogs under contract or self-produced compared to those purchased on the cash market.
- Packers reported that producers' leading reasons for wanting an ongoing contractual relationship were improved access to capital, reduced price risk, a secure market outlet, and a higher price.
- More packers have or are beginning to establish their own branded pork merchandising programs, or are forming exclusive supplier arrangements with retailers. They would have a difficult time enforcing their food safety and quality control measures without their own production or contract supply agreements.

Beef Packer Survey Results

Fifteen of the largest U.S. beef packers were surveyed to obtain information regarding beef packer cattle procurement and beef marketing practices, and perceptions of gains or losses from changes in vertical linkages with cattle producers. Ten responded, representing 72 percent of 1999 cattle slaughter.

- Only 5 percent of cattle slaughtered by survey respondents were packer-fed in 1999, little changed over the last 15 years.
- The dominant cash market purchasing arrangements (negotiated prices, with delivery within 14 days) are used for two-thirds of all cattle slaughtered and beef marketed, though their importance is slowly declining in fed cattle and wholesale beef markets.
- Formula-priced cattle purchase contracts based on cash market prices accounted for 20 percent of 1999 cattle supply. In addition, four percent of cattle were acquired using short-term fixed price or basis contracts based on the Chicago Mercantile Exchange futures prices.
- Cash market purchases based on carcass merit are increasing in the cash and contract markets—now at least 35 percent of cattle purchased.

The most important reasons cited by packers to enter into contracts and marketing agreements with cattle producers were to secure higher and more consistent quality cattle.

- Packers perceived producers' primary incentives to enter into contracts and marketing agreements were to secure a quality premium/discount matrix followed by enabling producers to obtain a higher price for cattle. Growth in branded merchandising programs is likely to result in more reliance on long term contracts with customers.
- Loss of packer-feeding and contract arrangements would result in higher risk and transactions costs for packers and cattle feeders losing contract assurances. The marketing chain would not capture the benefits from improved quality and efficiency, with corresponding lower payoffs to cattle producers or consumers. Packers in fringe production areas may have to close.

Meat Merchandiser and Processor Survey Results

Is the consumer or the immediate customer of meat packers and processors the driving force toward more tightly linked production and marketing systems for beef and pork? We asked a small group of the leading companies serving customers for beef and pork about the willingness of the consumer or the merchandiser serving the consumer to pay for some of the changing demands expected in the marketplace.

The results indicated willingness to pay for those demands.

- Taste and tenderness, product consistency, food safety, better inventory management, and lower price that might result from a more integrated system were ranked as very important.
- Coordination systems offering stable, timely shipments and lower price were highly ranked.
- A branded product with a minimum amount of exterior fat, a specified degree of marbling and a tenderness guarantee would be worth more than six cents per pound more than a commodity product, if individual attribute values are additive. Products with a guarantee against all food borne pathogens might be worth as much as seven cents per pound more than a commodity product in 2005.
- The payoff for traceback in an identity-preserved integrated system is perceived to be much greater for firms in the chain than for consumers, perhaps because of the increasingly important liability issues for branded product merchandisers.

Survey results indicate that the consumers of beef and pork are willing to pay an additional 20 to 30 cents per pound for meat from a system of production that results in a branded customized product, if these values are additive in many customers' views. That perceived value serves as an increasingly important driving force in the industry as it plans for the future. Innovative linkages in the meat chain are necessary to capture that added value.

Implications

Packers report more consistent and improved product quality, reduced financial risk, and lower costs due to improved plant utilization from hogs or cattle under contract or self-produced.

- Production contracts in the beef and pork industries, usually not with packers, offer producers low risk returns for facilities and services provided while feeding the contractors' hogs or cattle. The key concern is growers' bargaining position when contract renewal is negotiated, if there is insufficient competition for contract production services.
- Added values associated with lower purchasing and handling costs for contract hogs or cattle, early plant deliveries, lower supply and quality risk, better utilization of plant labor and equipment, etc., often are passed on to producers in the form of higher prices for value-received. Producers with contracts are generally satisfied.
- Customers of beef packers indicate that both consumers and the processors and merchandisers of beef and pork products place a reasonably high value on

product attributes that can be better achieved through closer coordination arrangements in the entire meat production and merchandising chain.

- Food safety concerns and extremely demanding quality specifications in the Japanese market make contractual assurances in the chain very important in serving our largest export customers.

There are some possible disadvantages.

- Some producers are concerned about the potential for market manipulation as more integration and contracting leads to thinner cash markets. Mandatory price reporting should help reduce these concerns.
- Some producers are concerned that packers use their own or contract cattle deliveries to drive down cash prices. USDA studies have not confirmed that. Feedlot operators with contracts who ship more cattle when prices are dropping are a likely cause.
- Market access for independent producers may be a problem in some regions with high packer-fed or contract livestock volumes; joining cooperative livestock marketing or packing plant efforts, or contracting with packers may become necessary.

How do these tradeoffs balance out? Those involved in contracts benefit, generally. The industries become more effective competitors, serving consumers more effectively. But concerns about the effects of these arrangements continue. The debate will focus on the comparative importance of these perceived problems, and their consequences, versus the benefits from these vertical linkages in the beef and pork industries. We hope the facts and economic analysis outlined in this report will be a useful contribution to participants in the debate of these issues.

Introduction

The livestock and meat industry's increasing use of production contract, marketing contract or ownership linkages between beef and pork producers and meat packers has provoked controversy in some farm or producer groups, as well as in state legislatures and Congress. We have been asked to analyze the transition away from cash markets in the beef and pork industries, its character and extent, underlying driving forces, problems, and issues. We hope that the information provided will assist Congress and Congressional staff, state legislators, industry groups, and others considering legislation regulating or restricting these market linkages.

Objectives

This report is intended to summarize the economic research available on the changing market organization in the beef and pork industries, focusing on the linkages between meat packers and livestock producers, and evaluate the relevant facts and issues. The research team is a group of well-known university economists, including several who have contributed much of the previously published economic analysis of the structure and behavior in these industries.

In this report, we will describe and analyze the:

- Current vertical integration, producer-processor or first handler contract and cash market linkages in agriculture, emphasizing the beef, pork, and poultry producer and processor vertical market structures, and how they compare to the vertical linkages in other important agricultural commodity systems;
- Driving forces for the changes observed in the food and agriculture market structure, and the economic incentives for tighter vertical coordination linkages in the beef, pork, and poultry industries;
- Benefits and costs of these coordination system changes in agriculture, emphasizing those in the beef, pork, and poultry industries for processors and merchandisers, independent and contract producers, other industry participants, and consumers; and
- Implications of packer vertical integration or contract linkages with cattle and hog producers for independent and contract livestock producers, packers, other industry participants, consumers, global market competitiveness, price discovery and reporting, policy makers, and regulators.

Procedures

The research team completed an extensive review of prior research and data available relevant to the policy issues currently being raised, conducted surveys of beef and

pork packers and their leading customers, and summarized the information which might be useful to those involved in the policy analysis and debate. The steps included:

- Reviewing statistics on the extent of use of vertical integration, production and marketing contract systems, and their perceived economic advantages and disadvantages, in major agricultural commodity marketing systems in the U.S.;
- Reviewing statistics on the extent of use of vertical integration, production and marketing contract systems, and their perceived economic advantages and disadvantages, in the U.S. beef and pork industries;
- Reviewing statistics on the extent of use of vertical integration, production and marketing contract systems of competing broiler and turkey industries in the U.S. that have long histories of vertically-linked production and marketing systems, and export market competitors in Denmark, Australia, and Canada;
- Surveying leading pork and beef packers regarding the extent of use and the specific advantages and disadvantages of vertical integration, production and marketing contracts with livestock producers;
- Surveying leading customers of beef and pork packers to determine what changes in their customers' demands or their own operations or merchandising systems may be driving forces contributing to current or future changes in vertical linkages between packers and livestock producers or production; and
- Using the information above, evaluating the likely implications of recent and future changes in beef and pork industry vertical linkages and related legislative initiatives for packers, independent and contract livestock producers, other industry participants, consumers, global market competitiveness, price discovery and reporting, policy makers, and regulators.

SECTION I:

Overview of Contracting And Vertical Integration in Agriculture

The issue of packer ownership and control of livestock should be examined in the context of other agricultural industries here in the U.S. and in competing countries. Are the current industry linkages among producers (or production) and processors aberrations, or are they similar to organizational structures in other industry production and marketing chains? Are there sound economic motivations for these forms of industry organization? Who are the beneficiaries of the changed vertical structures? What are their implications? Are there difficulties associated with them that warrant government intervention?

Our review of the vertical integration and contracting literature draws heavily from Economic Research Service, U. S. Department of Agriculture (USDA) statistics and publications, data and analysis from numerous other sources, and our own analysis and prior publications. Good overviews of vertical integration and contracting use and implications include USDA (1996); Hayenga, Harl and Lawrence (2000); and Boland, Barton and Domine (1999).

Terminology

To ensure that semantics are not an issue, we begin by briefly defining and illustrating the terms used throughout this report:

Vertical integration is defined as a person or business owning two adjacent stages in the production and marketing system. For example, a processor owning the crop and the land would be vertically integrated. Similarly, producer cooperatives owning and operating processing plants are vertically integrated.

Marketing contracts refer to oral or written agreements between a contractor and a grower that set a price (or pricing mechanism) and an outlet for the commodity before harvest or before the commodity is ready to be marketed. Most management decisions remain with the growers since they retain ownership while the commodity is being produced. The farmer or grower typically assumes all production risks, but may share price risk with the contractor. Marketing contracts can take many forms, such as:

- Forward sales of a growing crop, where the contract provides for later delivery and establishes a price or contains provisions for setting a price later;
- Price setting after delivery based on a formula that considers grade and yield;
or

- Pre-harvest pooling arrangements among a group of farmers, where the amount received is determined by the net pool receipts for the quantity sold by all farmers in the pool.

Production contracts for livestock, poultry, or crop commodities are either oral or written agreements that require a grower to perform certain tasks involved in producing a commodity in return for a fee for services and inputs provided to a contractor. The contractor typically owns the commodity being produced under contract. These contracts usually specify the quality and quantity of a particular commodity that is to be produced, and indicate who bears various costs and responsibilities. The contractual agreement spells out the production inputs to be provided by each party, the amount of payment to be received by the grower for services and inputs provided, and who bears what risks. The proportions in which costs, revenues, and risks are shared between growers, ranchers, and their contractors vary among commodities and generally depend on the amount of inputs and managerial oversight provided by the contractor. Contractors have varying degrees of control over a farmer's production decisions, depending on the type of contract. Many production contracts are between producers, not just producers and processors or producers and input suppliers. (Hamilton)

Extent of Vertical Integration and Contracting in Agriculture

Vertical integration

Vertical integration is not extensive in agriculture, with less than 8 percent of volume produced by farm operations owned by, or owning processors or input supply businesses in 1994 (USDA, 1994-95). See Table 1. The poultry industry (eggs, turkeys) and some crops (sugar beets, sugar cane, potatoes, fresh market vegetables, and some fruits and nuts) have the greatest shares of production involved in vertically integrated operations. A high proportion of those are farmer cooperatives involved in handling or processing farm output of their member-owners as shown in Table 2. USDA estimates that approximately 30 percent of farm marketing cash volume was handled by cooperatives in 1998, with extremely high farmer cooperative involvement in dairy handling and processing, nearly half of grain, oilseed and cotton, and smaller but still substantial volumes of a large number of other farm commodities.

Contracts in agriculture

The most recent 1998 USDA-ERS Agricultural Resource Management Study found contracting is common among all types of farms, accounting for 35 percent of total production. Over two-thirds of contract volume was marketing contracts, one-third was production contracts.

Table 1. Ownership Integration

Year	1960	1980	1993-94
	<i>Percent of volume</i>		
Crops:			
Feed grains	0.4	0.5	0.5
Hay	0	0	0
Food grains	0.3	.5	0.5
Vegetables for fresh market	25.0	35.0	40.0
Vegetables for processing	8.0	10.0	6.0
Dry beans and peas	1.0	1.0	1.0
Potatoes	30.0	35.0	40.0
Citrus fruits	8.9	11.2	6.9
Other fruits and nuts	15.0	25.0	25.0
Sugar beets	1.0	1.0	1.0
Sugar cane	75.6	70.7	72.7
Cotton	3.0	1.0	1.0
Tobacco	2.0	2.0	1.5
Soybeans	0.4	.5	.4
Seed crops	0.3	10.0	10.0
Livestock:			
Fed cattle	6.7	3.6	4.5
Calves, slaughter	1.5	1.8	10.0
Other cattle and calves	—	—	—
Sheep and lambs	5.1	9.2	29.0
Market hogs	0.7	1.5	8.0
Fluid grade milk	0	0	0
Manufacturing grade milk	2.0	1.0	1.0
Market eggs	5.5	45.0	70.0
Hatching eggs	30.0	30.0	30.0
Broilers	5.4	8.0	8.0
Market turkeys	4.0	28.0	28.0
Total Farm Output	4.4	6.2	7.6

Sources: Compiled by ERS/USDA. Food Marketing Review, 1994-95

Table 2. Cooperatives' Shares of U.S. Farm Sales Volume, by Selected Commodity Group

Commodity Group	1998
	<i>Percent of U.S. Cash Receipts</i>
Milk and dairy products	86
Grains and oilseeds	40
Cotton and cottonseed	43
Fruits and vegetables	19
Livestock and wool	14
All other	12
Total	30

Source: Rural Business-Cooperative Service, USDA

Over 11 percent of all farms were involved in contracts, with the largest involvement by the large family farms. Poultry and dairy contracts were 45 percent of total contract value, but each commodity sector had contract volume ranging from 12-13 percent for corn and soybeans to 94 percent for broilers, with several near half of their volume (cotton, fruit, vegetables, hogs and dairy). See Tables 3 and 4. Input suppliers (e.g. feed companies or cow-calf operations), farmers themselves (e.g. Iowa Select Farms), processors of farm commodities (e.g. Del Monte), or non-farm investors may offer contracts to farm operators.

Table 3. Use of Contracting by Type of Farm, 1998

Item	Small Family Farms	Large Family Farms	Non-family Farms	All
Farms:				
		<i>Number</i>		
All farms	1,869,201	153,212	42,296	2,064,709
		<i>Percent</i>		
All farms	90.5	7.4	2.0	100.0
Farms with contracts	61.0	34.1	4.9	100.0
Value of production		<i>Million dollars</i>		
Total	64,191	102,325	25,973	192,488
Contract value	14,130	44,035	10,144	68,309
Production contracts	4,175	17,624	5,413	27,212
Marketing contracts	9,955	26,410	4,731	41,097
		<i>Percent</i>		
Share of contract value	20.7	64.5	14.9	100.0
Share of Farms' Type with:		<i>Percent</i>		
Contracts	7.8	53.0	27.5	11.5
Production contracts	1.3	19.2	2.6	2.6
Marketing contracts	6.7	37.1	26.3	9.4
Value of production under contract	22.0	43.0	39.1	35.5

Source: 1998 USDA Agricultural Resource Management Study, summarized in Rural Conditions and Trends, USDA-ERS, Vol. 10, No. 2, 2000 (forthcoming)

The 1998 contracting data does not break down the type of contract used in each industry as was done in some earlier USDA studies. In farmer surveys in 1993, marketing contracts for livestock commodities were much less common than production contracts; they accounted for 20 percent of farms and 42 percent of the total value of production under marketing contracts. In contrast, about 80 percent of the farms with marketing contracts were for crop commodities and they accounted for about 58 percent of the value of production under marketing contracts.

Between 1991 and 1997, marketing contract use increased from 16 to 22 percent of farm production. Production contract use showed no clear trend, ranging in the 10-15 percent of volume during that period (USDA, Agricultural Outlook, 1999).

Table 4. Share of Contract Value of Production for Selected Commodities, 1998

Commodity	Commodity Share of All Contract Production	Share of Commodity Produced under Contract
	<i>Percent</i>	
Corn	3.1	13.1
Soybean	3.2	12.2
Cotton	2.9	50.6
Vegetables	7.4	45.4
Fruit	8.5	56.7
Cattle	11.5	25.3
Hogs	5.4	42.9
Poultry	23.8	94.9
Dairy	24.1	56.7
All other commodities	10.1	22.5
All commodities	100.0	35.5

Source: 1998 USDA Agricultural Resource Management Study. Summarized in Rural Conditions and Trends USDA-ERS, Vol. 10 No. 2, 2000 (forthcoming)

Production contracts

In 1994 (when production contracts were defined to include any marketing contracts prior to beginning production), the commodities where production contracts were most frequently used included eggs, turkeys and broilers, and crops for seed, sugar cane and beets, vegetables and potatoes. More recent 1997 data (Table 5) from USDA (1998) cover fewer commodity sectors, with definitions consistent with those earlier in this report. The dominance of production contracts in the broiler sector is especially noteworthy, with significant use also in eggs and hogs. The diversity of production contract arrangements is illustrated in Hayenga, Harl and Lawrence; Hamilton; and the USDA (1996) study of production and marketing contracts.

Table 5. Value of Selected Commodities Produced under Production Contracts, 1997

Commodity	Value of Production
	<i>Percent</i>
Broilers	99
Cattle	14
Eggs	37
Hogs	33
Vegetables	8
Total value of production under production contracts, all commodities	12

Source: USDA, Economic Research Service, 1997 Agricultural Resource Management Study, special analysis

Marketing contracts

In 1997, marketing contracts accounted for 22 percent of market volume of agricultural commodities (see Table 6.)

Table 6. Value of Selected Commodities Produced under Marketing Contracts, 1997

Commodity	Value of Production under
	Marketing Contracts
	<i>Percent</i>
Barley	19
Canola	46
Cattle	9
Corn	8
Cotton	33
Dry edible beans	3
Eggs	6
Fruits	59
Oats	3
Peanuts	41
Peas	9
Potatoes	43
Rice	3
Sorghum for grain	6
Soybeans	9
Sugar beets	82
Sunflowers	8
Vegetables	24
Total value of production under marketing contracts, all commodities	22

Source: USDA, Economic Research Service, 1997 Agricultural Resource Management Study, special analysis.

The commodities most heavily involved in contracting were crops like sugar beets, fruits, canola, potatoes, peanuts, cotton, rice and vegetables. But there was a substantial volume involved in marketing contracts in many commodity sectors.

Cooperative marketing agreements involve farmers contracting with their own farmer cooperative. Under marketing agreements, members are required to market their output to their cooperative, which in turn provides marketing services.

A 1997 USDA survey of marketing cooperatives (Wissman) with total sales of \$15 million or more provides an indication of market agreement use. Considering all cooperatives, those with marketing agreements acquired 19 percent of their volume through long-term contracts. These were primarily in dairy, with lower percentages elsewhere, espe-

cially in grain marketing cooperatives. Grain cooperatives used short-term contracts extensively or cash market transactions.

A recent California wine grape industry study found 90 percent of wine grape acreage was under a long-term marketing contract to mitigate the effects of uncertainty and imperfect information. Fifty percent of grape acreage involved contracts more than one year in length. Thirty percent of acreage involved “evergreen contracts” which perpetually renew unless one party chooses not to, and contracts for 10 percent of acreage were entered into before the vines were planted, several years before the first harvest. (Goodhue, Heien and Lee)

Rationale for Vertical Integration and Contracting

The motivations for vertical integration (ownership) or contractual vertical linkages have been summarized in many publications (see Hayenga, Rhodes, Grimes and Lawrence for a brief summary). The motivations for shifting away from cash market links between two stages of the supply chain are similar for vertical integration and contracting, though there are some strategic differences.

Ownership of two adjacent production and processing or merchandising businesses in a commodity supply or value chain provides the most control over crucial supplies or markets. Reducing quantity or quality risk, generating efficiencies in moving product through the system, and capturing the profits from both levels of the production and marketing process are potential benefits. The efficiencies might be lower transaction costs, technical production process efficiencies, spreading market research costs over more businesses, improved management information, etc. Risks may be shifted to primary raw material markets (e.g. corn and soybean meal instead of turkeys), or risks at one stage of the system may be offset by risks at the next stage.

Vertical linkages may allow a firm to avoid market power that might exist in supply or customer markets, and capture the profits at a more profitable stage of the production-marketing system. Farmers often aspire to the higher profits expected from processing or merchandising (adding value to) their raw products. Input suppliers like feed companies develop markets for surplus processing facilities by investing in expanding livestock production, sometimes under their ownership. Processors seldom invest in farming operations with volatile, often low returns, though there are exceptions to the rule.

Vertical integration may tie up raw materials or customers (from competitors), or allow linking sales of one set of products to others in demand by their customers. In some industries, vertical integration may be necessary to keep up with other competitors buying into their supplier or customer industries.

The amount of capital required varies significantly in integration by ownership (very high for the buyer), production contracts (high for contractors), and marketing contracts

(low for contractors). In many cases, the financial risk transfer or reduction may make it significantly easier to acquire loans or investment capital to begin a business or expand.

Contracting involves some degree of control, but the extent varies significantly by type of arrangement, as do the risk and returns to both parties to the contract. Further, a contract involves two parties voluntarily linking together in the production and marketing chain, and the extent of control, risk, profit, and volume involved in contractual links depends upon the willingness of both parties to provide what the other is willing to accept.

Contracts and contractors are both a source of capital or shifters of risk that often can facilitate acquisition of capital from other sources. Typically, the owner of the commodity will bear more risk and a higher share of the profits (or losses), e.g. vertical integration and production contracts. Marketing contracts may shift price risks from producers by a lot, or very little, depending on contract terms.

Contracting farmers' incomes tend to be more stable over time. To the extent that management decisions are transferred to the contractor, producers without substantial expertise can benefit from technical advice or access to technological advances (such as high-quality breeding or new seed varieties) sometimes not otherwise available.

Farmer-farmer production contracts for a specific crop or livestock production service are numerous, especially in livestock operations. Feeder pig cooperatives by hog finishers and retained ownership of cattle by cow-calf producers in custom feedlots are examples. The principal motivations for this practice include economic advantages of specialization in one or more production stages, facility limitations, or other types of capital constraints.

Sometimes lenders may strongly encourage production or marketing contracts for beginning farmers without much capital, and for financially stressed farmers. These incentives are most relevant in the production of livestock commodities, which, unlike crops, are portable between farm operations and can have longer and more clearly delineated stages of production.

Processors are more likely to engage in production contracts to assure closer control of the timing, quality, and quantity of inputs into their specialized processing plants. Sometimes, capturing the profits from cattle feeding, hog or poultry production, or multiplying and protecting proprietary germ plasm in breeding or seed businesses can be the primary motivating force for other growers, processors or input supply companies entering into crop or livestock production contracts with growers. In others, innovative contracts with preferred suppliers may be an insurance strategy, just in case contract links being established by competitors are more effective than spot market or other vertical linkages, putting the independent business at a competitive disadvantage.

Because some crop processors or seed companies often need to control the amount and variety planted and the production practices used, they tend to direct the terms of the

contracts, with the fees for services and quantity to be produced being the primary negotiation with individual growers. Exceptions also arise, such as cattle feeding, where the contracts are often standard practice and fee contracts prepared by the custom feedlots, not the cattle investor. One advantage of production contracts is that the grower and contractor often share risks of both production and marketing of the commodity, though the extent of transferring risk varies from contract to contract. Another advantage is that financing is available either directly from the contractor or indirectly through other lenders who are more assured of loan repayment.

Marketing contract motivations are similar to those for production contracts, though they are employed where greater control over the production process is not essential. When product specifications on the delivered product are adequate, and the ownership of the product throughout the production process is not essential, marketing contracts can suffice. Marketing contracts are a middle-ground for producers who don't want to rely solely upon volatile cash markets, and who need some assurance of market access, prices, and related financial stability and access to loans. Yet, the control of their daily operations is less affected than under most production contracts. Contracts typically convey clear signals and incentives to the producer regarding grades and standards that best meet consumer demands, and may result in faster response to customer demands than cash market signals.

Processors use marketing contracts to insure supply and quality, but with lower capital requirements compared to production contracts or vertical integration. The control of a substantial volume of their supply needs in advance reduces the likelihood of bidding wars to keep plants running. Costs in some cases are negotiated in advance; in others they may be based on the cash market, futures market, or other pricing mechanisms.

Disadvantages of Vertical Integration and Contracts

Most advantages noted above will be captured by the contract participants, or farmers or processors acquiring their customers or suppliers. The disadvantages which follow are those which integrators or contract participants sometimes face. The concerns discussed in the broader industry issues section are those more likely to be perceived by other industry members.

Most processors want higher and more stable returns than are typically available from farming operations. The payoffs to acquiring your supplier or customer may not be as good as contemplated, as market or competitive conditions change, or when the management expertise of the acquiring firm is not transferable to the acquired business. The stock market may not value the different types of businesses as highly as they would be valued separately. Using ownership or contracts to foreclose customers or strategic raw materials from competitors are potential antitrust concerns if the share of the volume or markets controlled involved is high.

The loss of independence is perhaps the largest disadvantage to the farmer involved in a contract, along with the potential inequities in risk and return sharing. The farmer must evaluate whether the income stability, greater access to operating or facility loans, and/or access to a confirmed market are a fair exchange for the loss of independence involved in the contract.

There can also be practical issues associated with contract complexity, information and grower education, and potential bargaining position inequities associated with contract negotiation. Attorney fees are an additional cost to help insure equitable terms in the agreements.

In addition, the possibility of the contractor delaying placement or not providing livestock or poultry under the contract, providing low quality inputs, and the costs associated with non-renewal of a contract which requires specialized assets are potential disadvantages. The lack of adequate local market competition in the spot market or for new contract arrangements when contracts expire may put growers of specialty commodities (using specialized facilities or equipment) at a significant bargaining disadvantage. Growers are also subject to the risk of the contractor's financial failure, with payment for services or products at risk, especially if there is no enforceable security interest in the crops or livestock grown under contract (some states have enacted laws protecting contract growers).

Broader Industry Issues

The evolutionary or revolutionary changes in vertical linkages described in this report are responses to changing economic demands both on the industry and within the industry. The competitive system forces improvements in quality and efficiency for growth or survival. The demands by Japanese export customers, Wal-Mart's logistical innovations and rapid expansion in food marketing, the food safety issues here and abroad are a few examples of the driving forces affecting the organizational linkages for many players in the food production and marketing system.

The issues typically voiced by other industry members are consequences of the stresses involved in agricultural industries in the state of transition. The concern often voiced by some producers and processors not involved in contracts is their potential inability to compete with vertically integrated or contractually linked operations, due to their perceived greater efficiencies or market power. Sometimes concerns about market concentration and power are lumped together inappropriately with issues associated with vertical market linkages in the production-marketing system. The economic benefits from tighter coordination, if substantial, may be difficult to compensate for by independent operations. But the economic benefits will vary in each situation, so it is difficult to argue that independence is seriously threatened in all cases. If there are substantial benefits, then producers and processors must determine whether enhancing their ability to compete and improving financial viability through contracting is worth any loss of independence.

Contracts or acquisitions move product out of the cash markets, making the cash markets thinner, making price discovery more likely to be problematic. One concern expressed regarding marketing contracts focuses on the potential for market manipulation by processors, especially if they have a high proportion of their purchases under contracts based upon reported spot market prices (and they are cash market buyers too). If there are only a few competitors in the cash market, the potential for cash market manipulation may exist. It has been alleged that cash market prices might be lower than “competitive” market prices for independent livestock producers (and for contract suppliers with prices based on reported prices).

In addition, some concerns have been raised regarding the lack of transparency in markets dominated by contract supplies, with reduced or less reliable price information to guide production and marketing decisions. Concerns about inequities among contract and non-contract producers, and inequities in the terms of marketing contracts offered to different producers have been raised. Such concerns have prompted calls for mandatory price reporting, including contract prices; a mandatory price reporting law recently was enacted in Congress for cattle, hogs, and lambs, and some states enacted similar laws earlier.

New Driving Forces

The European Union’s failure to approve import of some GMO products, and the announced labeling requirements for GMO products by Japan and several other countries fostered a major logistics crisis in grain and oilseed marketing in fall, 1999. The consequence is likely to include identification and separation of various types of GMO commodities from conventionally bred crops, with certification and testing at each stage of the marketing process to assure no mixing of types. This is very expensive. Future contracts that provide incentives for particular genetics and the paper trail to assure its purity are likely to become common in the grain market, with penalty provisions to make up for losses if noncompliance is traced back to a particular supplier.

Food safety concerns are becoming more prevalent in the food and agricultural sector here and abroad. Food processing and merchandising firms are likely to be imposing sharply higher standards on process and product security, with corresponding contract links with suppliers becoming more necessary.

Closely linked with food safety issues, at least in some consumers’ minds, are the labeling requirements being imposed on genetically modified grains and oilseeds (GMO) or their processed products in world markets, and the demands for GMO product segregation by some customers. These developments are creating a greater demand for contract links with farmers. Further, the emergence of genetically modified grains and oilseeds with added value traits like improved oil and protein, and improved phosphorus absorption in animals, is likely to lead to an increase in contracting in Midwest grain and oilseeds in the next few years. This presumes that the current GMO policy issues are re-

solved, and significant markets remain for new and improved GMOs. Identity preservation will be essential to capture and insure the benefits of the new specialty traits tailored for particular feed or food uses. Contracts will be necessary to insure producers with a market outlet that will offer a premium for the value-added commodity, and provide customers with an assured supply of specialty products.

The current level of financial stress in agriculture could induce farmers to more aggressively enter into long term contracts to balance out financial risks in the spot market, and accept terms in new or renewed contracts that would not have been accepted in more prosperous times. Yet, contracting may also save a farmer teetering on the financial edge, though at some loss of independence in farm decision-making.

Summary and Overview

Vertical integration or contracting may facilitate a faster response to changing consumer preferences. The consumer may be able to buy higher, consistent quality chicken or vegetables at a few cents per pound less because risks and costs of more closely coordinated systems can be lower. Food safety and GMO concerns are likely to spawn contractually linked production and marketing systems (food chains) which can assure customers of best practices, no improper chemicals or additives, and offer trace-back to the source of any problem that does arise. The growth of specialty products will foster more reliance on contracts in the food and agricultural sector.

Benefits of contracting

Processors desire uniformity and predictability to suit consumers, but they also benefit from lower costs in processing, packing, and grading. Because many agricultural processing facilities involve extensive investments in buildings, equipment, and labor, processors must establish an orderly flow of a large volume of uniform products to control operating costs, and be sure to have the right type of raw material available to handle increasingly stringent customer requirements. Processors may vertically integrate into farm production or employ production contracts to exercise greater control over the quality and timing of deliveries and the quality of inputs used in the production process. Again, reduced risk or greater profits may result. The shifts in risk and associated benefits associated with vertical integration or production contracts depend to a great extent on the nature of the contract and the industry structure. Typically, the benefits associated with integration or contractual control increase as production and marketing interrelationships become more complex and when breakdowns in marketplace competition are most likely (such as opportunistic behavior by contracting parties). For perfectly competitive industries, all firms are subject to price fluctuations caused by supply and demand shifts whether or not they are vertically integrated. Integration or contracting cannot provide protection from such risks, though they may shift the risks into other commodity markets (e.g. corn and soybean meal rather than market hog price risk).

Farmers contract with other growers to leverage their capital, and capture economies of scale and efficiency gains from specialization (Rhodes). Farmers benefit by having a guaranteed market outlet, sometimes a guaranteed price, and access to a wider range of production inputs, and they can concentrate their management efforts on a particular part of the production process. How other benefits and costs are distributed to the industry and the rural community has not been quantified well; these include the impacts of consolidation, inputs supplied by contractors rather than local retailers, and marketing channel control distributed away from cash markets.

Disadvantages of contracting

While vertical integration and contracting can reduce risks and/or enhance profits for some firms or growers (Knoeber; Whitson, Barry, and Lacewell), others may find such a strategy unattractive. Depending on the size of the firm and the extent of the proposed integration, the benefits associated with specialization and scale economies can be greatly reduced or lost, particularly in perfectly competitive markets. For growers in such markets who choose to vertically integrate, the gain may be primarily through enterprise (or business) diversification. Lower risk can result if there are negative or weakly positive price, yield, or profit correlations between the different stages of the production process, different crop or livestock enterprises, and different locations when weather-related risks are important, as they often are in agricultural crops.

The long history of contracting in many agricultural industries suggests that the advantages outweigh the disadvantages for those continuing to engage in contracts. Some forms of contract production might actually be viewed as granting farmers some degree of market power, if one defines “market power” as the ability to influence price or other contract terms, or walk away from the contract if terms are not acceptable. Contract agriculture sometimes provides opportunities for alternative production enterprises which otherwise would not be feasible for producers. As biotechnology becomes more accepted worldwide and innovative new products are developed, the contracts likely to be involved will offer expanded opportunities for producers for more enterprise diversification. However, after the first adopters of the new technology capture some improved returns in early contracts (with higher risk), subsequent growers under marketing or production contracts are likely to be paid only competitive market returns to produce the higher-value commodities (Hayenga and Kalaitzandonakes).

If a production or marketing contracting system shifts risk and facilitates bringing more capital into production of any commodity, there should be a shift in the industry supply curve that can lead to lower market prices and producer margins, at least temporarily. While no studies have documented that impact, lower market prices (and incomes) in response to lower risk for producers should not be a surprising result. Further, long-term contracts with assured volumes and prices may reduce the responsiveness of growers to cyclical prices. More volume stability can have positive effects on industry efficiency and consumer acceptance. While thinner cash markets may exhibit more price

volatility in the short run, it seems likely that dampened production fluctuations in cyclical commodity markets may result in dampened price cycles.

For some growers, the issue associated with increased contracting is reduced access to markets. For many years, virtually the only access to markets in many industries has been through a contract—e.g. processing vegetables, turkeys, and broilers. In others, like hogs, the spot market is rapidly declining, and producers may have little alternative than to become contractually or cooperatively linked to processors, or become a residual supplier (which bears potentially big risks or rewards).

Conclusions

The impacts of contracting vary among producers and processors in each agricultural commodity sector. Certainly, there is a possibility that independent producers could be harmed by increased levels of contracting, but there is little research showing evidence of significant harm to date. Vertical integration into farming is not significant, while vertical integration of farmers into processing is more significant. As a higher percent of an industry's volume is vertically integrated or contractually linked, more independent producers are unable to be in the business without a contract, with more restricted market outlets and potentially greater risk with specialty crops, or less competition, especially when production levels approach processing capacity. At the same time, the increasing demand for “production services” by other farmers and processors and the increased demand for the contractual quantity and quality assurance from marketing contracts by processors and merchandisers could offer new market opportunities for farmers.

Processors are often unwilling to invest in new facilities, processing technologies, merchandising innovations or branded product development unless their essential raw material supplies and quality are assured. For example, experience in the poultry sector strongly suggests that the great success of that industry in new product introductions, cost reductions, and competing successfully in domestic and export markets would have been much different if they would not have installed the systems that dramatically reduced those risks. Consumers here and abroad benefit from the changes that come faster when control by vertical integration and/or by contracts allows a quicker response to a changing consumer than would be accomplished by the cash market systems.

Will independent producers and processors be driven out of business by the integrated or contractually-linked competitors? Not necessarily. But the economies involved in vertical linkages combined with good management certainly can increase the height of the competitive hurdles necessary to stay and prosper in agricultural production, processing and merchandising businesses. Increasing demands for tighter food product specifications, source and process assurances and verification are likely to chip away at “independence” in any and all food chain organization arrangements.

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Section II: Pork Sector Contracting and Vertical Integration

In this section, we summarize the economic literature dealing with the vertical integration and contract links in the pork production and marketing chain, the evolution, motivations, consequences, problems and issues. This may assist in evaluating the potential consequences of various policy proposals to restrict packer ownership and control of livestock, or similar future initiatives.

1945-1993 Pork Industry Coordination Overview

Hayenga, Rhodes, Grimes and Lawrence (1996) summarized the post-WW II changes in the pork industry organization. In the 1950s and 1960s, the broiler industry began to adopt new technologies, increasing size and sophistication of production units, and embarked on an economic restructuring that has been characterized as the prototype of the industrialization of agriculture. Various pork industry participants, including feed companies and meat packers, began to experiment with production contracts, and concerns began to be raised during the late 1960s whether the pork industry was going to emulate the broiler industry. A 1973 North Carolina study found contracting was being used by feedmills to develop or maintain a dependable market for feed and by packing plants to keep their plants running near capacity and to upgrade the quality of hogs processed. In 1982, over 20 percent of the North Carolina hogs were produced under production contracts with feedmills. The contracts provided for a payment per head plus a premium for feed efficiency. Packers were not widely involved in contract production with producers (Kenyon and Purcell).

Generally the feed company and pork packer trials of production contracts were unprofitable and, as a consequence, largely subsidized. Although some economists, on the basis of a vaguely understood broiler model, projected extensive vertical integration of packing and hog production, such integration has been minor until the 1990s when several packers built plants and hog production facilities (e.g. Seaboard and Premium Standard Farms), developed hog production joint ventures or acquired large scale producers (e.g. Smithfield).

Contract production of hogs is considered by most observers to be vertical coordination. That is correct when feed companies or packers engage in contract production. However, a majority of contract hog production is horizontal contracting among producers. A producer with more assets, management skills, and/or a willingness to take risks provides the hogs (breeding stock or pigs) and the feed to another producer who raises them. The producer/grower has incentives that generally arise from a lack of capital, management skills, or being unwilling to take large risks. This significant and growing share

of contract hog production, which interests—and even disturbs—many farmers, needs to be distinguished from other contract production that involves vertical coordination.

Various studies have looked at the extent and type of vertical coordination in the hog industry. Hayenga et al., 1985, summarized many studies prior to 1985. They conclude that (1) vertical integration in the pork industry was relatively uncommon, (2) that production contracts had gone nowhere in the Midwest, but had received greater use in the Southeast, and (3) the noncontractual marketing system was offering adequate supplies and market outlets, resulting in insufficient incentives for the pork industry to become highly integrated by ownership or contract as in the broiler industry.

However, a 1992 Hayenga and Kimle survey of the 22 largest packers led to a different conclusion—that packers' production and marketing contracts with hog producers would expand dramatically in the next decade, triggered more by quality concerns than supply uncertainty. Hayenga, Rhodes, Grimes and Lawrence surveyed the largest pork packers, hog producers and feed companies in early 1994. They reported that the largest packers obtained 87 percent of their hogs through spot market arrangements, 11 percent through long term marketing contracts and 2 percent through direct and contract production in 1993. However, long term marketing contracts and production contracts were expected to double or triple in importance in the next five years. The largest hog producers accounted for much of the production contracting with other hog producers. Their sales to packers constituted most of the long term marketing contract volume with the largest packers in 1993. A few of the largest feed companies were involved in large scale hog production, and a few other large feed companies did some financing of feed sales.

The survey found that the motivations for the use and expected growth of longer term linkages between packers and producers were different for each party to the relationship. Cyclical and seasonal variation in hog supplies for the packing industry have frequently resulted in unutilized capacity in packing plants, and highly variable prices for hog producers. The packers using marketing contracts often cited more consistent supplies and improved quality as the most important advantages. In contrast, reduced market price risk was most frequently cited as the most important advantage of forward contracts in the North Central Region by producers. However, an assured market outlet (plant shackle space) was more frequently mentioned by producers in the rest of the nation. Beginning production of many thousand market hogs without having an assured market for them was viewed as risky, especially in areas where there were few large packers.

Nearly all of the 1.8 million hogs produced under packer control in 1993—through contract production, joint ventures, or own production—were produced by six large producers that were wholly or partially owned by packers. Two packer-producers were major producers before they acquired a packing plant. Two other large producers opened packing plants soon after 1993 (Premium Standard Farms and Seaboard) as they began hog production (one in a fringe production area). Some packers initiated production because of the large profits obtainable from large scale hog production, or to reduce

transaction costs, supply and quality risk. Case studies showed that transaction cost minimization is helpful but quite incomplete in explaining the coordination changes underway in the pork sector by 1993.

Hayenga, Rhodes, Grimes and Lawrence concluded that a more rapid shift to producing higher quality pork was beginning; high quality was required in many long term coordination arrangements, and independent producers were becoming more sensitized to the need for high, consistent quality in order to be competitive. It seemed likely that these arrangements facilitated additional capital inflow into pork production, resulting in increased pork supply and/or tighter margins for hog producers. These arrangements may have been essential for the entry of packers into new hog production areas such as Oklahoma and may have facilitated the expansion of packers outside the North Central Region.

Long term marketing contracts with packers usually involved formula pricing with little control of production methods. Those contracts do not shift price risk to packers. A few contracts with risk sharing mechanisms do redistribute price risk between packer and producer. This practice may facilitate expanded pork production, but may also create periods (like late 1994 and late 1998) of lower profits for packers offering those contracts. This risk probably will limit the volume of hogs which individual packers will be willing to buy under such arrangements.

Since hog production usually is one of the better profit generators for farmers, production contracts and self-production by packers generally should be profitable, but the cyclical nature of pork production and the significant recent expansion by large producers can contribute to periods of low or negative returns in pork production. That may result in more stable overall returns for packers involved in pork production or in risk sharing contracts, as packer margins typically improve when the production cycle peaks.

Hayenga, Rhodes, Grimes and Lawrence concluded the more tightly linked pork sector would still be dominated by cash market arrangements in the mid-1990s or longer, but issues might begin to arise associated with these expected changes, especially in areas outside the Corn Belt. If long term arrangements become dominant, the probable impacts would include: (1) quicker responsiveness to consumer demands, including higher quality products; (2) possibly more branded and differentiated products; (3) more stable production levels seasonally and cyclically; (4) less spot market volume, with associated problems of more limited market access for small producers and increased short term volatility for their hogs; and (5) reduced transaction costs for participants in the long term arrangements.

They concluded that long term arrangements which enhance product quality may allow differentiated, possibly branded products to be more successfully developed. Differentiated products may allow some limited exercise of market power, and enhance profitability. But higher prices for higher quality may be justifiable, and entry is unlikely to be restricted effectively. Product differentiation also might offer market niches for new entrants to exploit.

They noted that cash markets for the residual supply and demand would become more thinly traded, and probably more volatile as the “shock absorber” for unanticipated changes in supply and demand. Price reporting would become more difficult, and concern about price manipulation would escalate as relatively small changes in the behavior of large market participants more likely could have an impact on reported market prices. Government agencies would have to consider whether reporting contract terms in a market for differentiated contracts would be feasible and a contribution to improved or more equitable market performance, enough to justify using public funds for the service. But Hayenga, Rhodes, Grimes and Lawrence concluded the 1993 situation did not suggest any significant regulatory issues were imminent.

1997-2000 Pork Industry Coordination Studies

Lawrence, Grimes and Hayenga’s 1998 survey of pork producers and Grimes and Meyer’s January, 2000 survey of leading pork packers provide a recent picture of the changing vertical linkages among packers and producers, and the types of contracts employed, reasons for using them, and their degree of acceptance. Buhr and Kunkel and Lawrence evaluated the incentives for and the financial performance of several types of contracts being used.

Vertical integration

Lawrence, Grimes and Hayenga’s survey of pork producers found 9.4 percent of pigs marketed were owned by packers, and less than 5 percent were owned by companies that also were feed producers in 1997. Thus, vertical integration was relatively small in the pork industry. Smithfield’s recent acquisitions of two very large hog producers will increase packer ownership to 15-17 percent of national hog production. These hogs were mostly contracted to Smithfield before, so this is primarily a shift from marketing contracts to packer-owned.

Production contracts

In 1997, 40 percent of the hogs farrowed and 44 percent of the hogs finished were by producers involved in production contracts. This number was up sharply from 29 percent in 1994. Most of the growth was in the over 50,000 head size class. Half or more of the contract production came from the 18 largest hog producers. While only a small proportion of that contract production involved packers, the producer response to production contracts generally may be an important consideration in evaluating some current policy initiatives. Obviously, contractors perceived higher benefits than costs, or they wouldn’t be continuing to offer contracts. The primary benefits to medium-size farmers offering contracts to other growers were greater access to capital, ability to expand, and reduced risk. Larger operators offering contracts cited financial leverage, dealing with environmental constraints and accessing labor as the principal advantages.

The Lawrence, Grimes and Lawrence survey asked producers raising pigs under contract about their degree of satisfaction with being a contract producer. Only 13 percent of the 240 respondents indicated any degree of dissatisfaction (only 2 percent were not at all satisfied), while 87 percent indicated being more satisfied than dissatisfied, with 64 percent saying they were very or extremely satisfied with their contract arrangements.

Types of Marketing Contracts

Buhr and Kunkel summarize types of long term marketing contracts available, and succinctly summarize the motivations for both packers and producers.

Formula Prices are used as a mechanism to establish prices over extended time periods where multiple sales of hogs are forward contracted with a packer or another producer and there is some concern about the ability to establish a price. The formula price is based off a “price determining market” (one where, at least in the minds of the parties to the market agreement, there are enough buyers and sellers to effectively establish a price). Formula prices, for example, may be calculated using the Iowa-Southern Minnesota weighted average price of 49-51 percent lean hogs which are plant delivered, plus or minus a price differential or premium based on factors such as length of commitment, location or overall quality of hogs.

In this context, formula prices will generally not provide price risk protection. The formula price will move with the price-determining market. However, the formula price will likely assure short-term or long-term access to slaughter capacity. One of the difficulties with formula prices has been the need for frequent re-evaluation or adjustment as industry marketing systems and government price reports change.

Cost Plus involves a formula price often based on feed costs. Such agreements usually set a minimum price level, so they usually are risk protection contracts in addition to quantity assurance and slaughter space access contracts. Provisions also may include splitting the difference between the contracted **base price** and an observed market price. Basing the contract on costs essentially provides for a margin above some “standard” costs of production. These contracts may have a balancing clause (commonly known as a **ledger**) where payments made to producers when market prices are below the contract floor price must be paid back when the contract base price exceeds the cost-plus formula price of the contract. These contracts typically range from 4 to 7 years in length.

One of the greatest risks in these contracts is that technology or other external market conditions may change which alters the performance of the contract relative to the market, again placing one of the contracting parties at an economic disadvantage relative to their competitors. In general, the risk of unexpected or detrimental price behavior increases as the length of time the contract is in effect increases. This risk goes both ways, however. New production technology could leave packers paying more for hogs under a cost plus contract than their competitors have to pay in the open market or on formula contracts. New packing technology could leave producers under cost plus contracts get-

ting less than their competitors selling on the cash market or under formula-priced contracts. Furthermore, both could be reversed if policy decisions cause some currently used technology to no longer be available.

Note that cost plus contracts are “production driven.” Packers agree to pay based on costs but, in turn, get any demand-driven rewards in the future. Producers, in effect, give up any rights to demand-driven rewards in return for the assurance that costs will be met and that some margin above these costs will be paid.

Price Window contracts are very similar to the cost-plus contract other than the pricing mechanism. In general a ceiling and floor price are pre-specified. When a market hog price in a pre-determined market falls within the ceiling and the floor, the hogs are exchanged at the market price. When the market price in the base market is above the ceiling or below the floor price, the packer and producer split the difference between the two prices according to a pre-specified percentage (i.e. 50:50, 60:40, etc). Other terms are fairly similar to the cost-plus contract. A key determinant of the performance of the contract is correctly setting the levels of the floor and ceiling price. Some window contracts will also utilize moving averages of prices to further smooth the payout of the contracts.

Price Floor contracts set a minimum price. To compensate the packer for this protection, the producer places a portion of the hog price above predetermined ceiling levels in an account to subsidize the floor price during the low price periods. A loose analogy can be drawn between these price floor contracts and a futures option contract. As with other mechanisms, changes in underlying fundamental market conditions can place one of the parties at an economic disadvantage over time.

Packer Motivations

The following are motivating factors for packers to use contracts:

- **Supply Assurance.** The hog industry exhibits large supply variability as evidenced by cyclical and seasonal patterns of swine production. Large scale U.S. packing plants face high short term fixed costs. These can include labor costs as well as traditional overhead costs of facilities, depreciation, and interest. In an attempt to reduce exposure to the risk of hog supply shortages or capacity constraints, packers have an incentive to modulate supply variation by forward scheduling hogs for slaughter.
- **Quality Assurance.** A factor related to supply assurance is the narrowing of quality standards for hogs. So far, this quality distribution has been defined only by the lean/fat characteristics of hogs, but it will increasingly focus on meat quality attributes such as pH, color, water holding capacity, taste, tenderness, and food safety attributes. Particular quality specifications have the effect of narrowing the effective supply of hogs (i.e. those meeting the particular standard) so packers try to “capture” this particular supply through forward contracts. Quantity and quality incentives are closely related as the relevant

market is defined by the quantity of hogs within a specific quality type. Investments in new consumer products and a willingness by processors to brand fresh pork and stand behind its performance were linked to the increased demand for consistent high quality in the 1990s.

- **Price Risk Shifting.** Price variation corresponding to supply variation has adverse effects on packer profitability just as it does producer profitability. Price variation can disrupt cash flows, affect credit acquisition, and increase costs. To the extent market contracts have a price mechanism as well as a quantity component, they also may reduce price variation.
- **Regional Supply Change.** Historically, the Midwest has had the greatest share of packing capacity. However, since the late 1980s hog supplies in the Midwest have declined while they have increased in the Southeast and Southwest regions – far outside the procurement range of most Midwest packers. Midwestern meat packers have often cited their desire to help producers in their region remain viable as a major reason for offering risk-protecting market contracts which reduce short term cash flow risk exposure and help stimulate investment. This strategy addresses the self-interest of packers to maintain supplies in regions where they have large fixed investments.
- **Risk Protection.** A similar situation arises in “new” hog production areas. Producers won’t invest without a relatively nearby market and most packers won’t invest without a relatively nearby supply of hogs, so market/supply contracts are common in newly developing hog production areas. Both parties must be assured that the other will be there and, in some cases, that some kind of risk protection is available. In the absence of market contracts, vertical integration through ownership may be the only recourse for either the producer or the packer.

Grower Motivations

The following are motivations for growers to use contracts:

- **Price Risk Shifting.** Compared with traditional marketing alternatives, market contracts tend to reduce price variation, so producers’ incomes tend to be more stable over time. Of course, in return for this income stability, the producer may have to give up some market flexibility and potential for increased income. Reduced market risk may also allow the producer greater access to capital. Often the mitigation of price risk will come at the expense of lower average contract prices relative to the market—this is essentially a premium for price risk protection and may be an equitable tradeoff, depending on a particular producer’s attitudes towards and preferences about risk. Price risk shifting does not and is not intended to reduce the need to use other factors (such as vaccines and insurance) which mitigate production risk that can also affect profitability.

- **Market Assurance.** Producers may face the risk of not having a buyer when needed or, more likely, problems in scheduling delivery times consistent with their production system. The latter can be particularly risky for producers with all-in-all-out production systems where delivery is dictated by time rather than market weights. A market contract provides assurance that a specified quality and quantity of hogs have the right to be delivered at scheduled times.
- **Reduced Marketing Management.** With multi-year marketing contracts, it is likely that time contributed to marketing management will be reduced as compared to cash marketing and using other market risk management strategies such as the futures market or short term forward contracts. This can free time for production or financial management activities for which the producer may be better suited and may enjoy more, or may have higher returns.

GAO Perspective

The reasons for packer and producer use of contracts are recognized by the General Accounting Office (GAO) in its recent report on the pork sector structure and price reporting issues. Through vertical coordination, hog farmers can lower their risks of investing in large, specialized operations by ensuring a buyer for their hogs. Also, in some contractual arrangements, price risks are shared by both the farmer and packer.

To maximize the operating efficiencies of modern plants, packers in recent years have increased their control over the quantity and quality of hogs coming into their plants. High capital costs and competitive pressures have forced packers to reduce idle capacity. By contracting or vertically integrating, packers ensure a large, stable flow of hogs into their plants, thereby maximizing the utilization of their facilities and reducing risks and costs. In addition, packers can reduce their costs by improving the quality of hogs slaughtered. Quality affects processing time and labor costs as well as the quantity of high-value fresh meat cuts per hog. For example, each hog with excessive fat requires more trimming and produces less lean meat. Conversely, a lean hog takes less time to process and produces a larger quantity of lean pork. Through marketing contracts, packers specify the quality characteristics wanted in the hogs it purchases from producers. Packers are sometimes able to control the choice of genetic stock, feeding program, and management decisions on the production of their contracted hogs. This control ensures a consistent supply of lean, high-quality hogs that meet their stringent quality specifications, which are dictated by consumers.

Marketing Contract Use

The use of marketing contracts between producers and packers has increased sharply in recent years. Nearly 57 percent of the 1997 market volume were under some type of prearranged agreement with the packer. This compares with 37 percent in 1994 and 11 percent in

1993. The above 50,000 size classes and those operations outside the Corn Belt had 75 percent or more of their hogs under contract with a packer. Because market access is a big issue for large-scale operations and producers not in areas with many competing packers, the demand for long term arrangements with packers should not be surprising.

In 1998, producers selling market hogs under marketing contracts reported that advantages (like higher market prices, allowing them to be in the hog business, and increased access to capita) were more important than disadvantages (e.g. sometimes locked out of higher prices). In the Southeast, prior surveys had found access to shackle space in plants was most important for large hog producers there (Lawrence, Grimes and Hayenga).

Producers without marketing contracts rated the disadvantages relatively higher. Their perceptions were that the performance of the marketing system deteriorated in many respects—reduced number of buyers, reduced market access, more expansion, and lower open market prices. In their views, the advantages associated with contracting were slightly less important—better product quality, more efficiency in marketing system, better communication, and better consumer service. Yet, 22 percent of those producers were interested in getting involved in a marketing contract.

Grimes and Meyer's January 2000 survey of the 12 largest pork packers showed a continuing increase in contract marketing and an increase in the variety of contracts in place. See Table 1. If all packers were similar to the top 12 who have over 90 percent of the volume, over 60 percent of hogs marketed were under contract. Packer-owned hogs were only 1.7 percent of the volume, though some packer-producer joint venture hogs were not included in that figure.

Most large and medium-size hog producers now sell their hogs under a long-term marketing contract. In addition to the dominant formula pricing contracts used by most very large producers, a small volume under contract have prices based on reported market prices, but with upper and lower price limits. Others are based on estimated production costs that vary with feed prices, or futures prices. Where "ledgers" are included in contracts, differences in prices paid versus current market prices are added up, and considered a credit or debit on the packer's books (essentially a loan from packer to producer or vice versa). This allows cash flow to producers to be stable, but doesn't allow the ultimate cost to be out of line with long-term market price or cost averages. Unfortunately, extremely low market prices in 1998-99 created significant debts to be paid by producers under these contracts, sometimes more than can be repaid.

Table 1. Twelve largest U.S. Pork Packers' Procurement Methods, January, 2000

Pricing Method	Percent
Formula (reported price plus some amount)	47.2
Fixed price tied to futures (i.e., a cash contract)	8.5
Fixed tied to feed prices, no ledger	3.3
Fixed tied to feed prices, with ledger maintained	9.0
Window risk sharing, no ledger	3.8
Window risk sharing, ledger maintained	.8
Other (packer-owned)	1.7
Spot market purchases	25.7

Source: Glenn Grimes and Steve Meyer

Implications

Cost structure impact

Hayenga's study of pork plant cost structure found approximately 60-70 percent of variable costs are essentially fixed within the first 32-36 hours of operations in a week, so there is a strong incentive to acquire more hogs to fully use an already-paid-for labor force in times of short supply. Both variable and fixed costs per unit decline significantly as capacity utilization reaches 100 percent for 5 days, then overtime wages on the sixth day of operation increase plant operating costs, but average fixed costs per unit produced continue to decline. This is confirmed by a recent USDA study finding small but important economies of scale in slaughter plants, based on older Census data (MacDonald, et al.). Plants frequently are underutilized during a high proportion of the 4-5 year hog production cycle. This prompts packers to consider contracts or self-production to insure a high percentage capacity utilization and lower costs per unit produced.

When hog supplies are low, firms have to choose among bidding higher prices for a larger share of the hogs, closing one shift at double shift plants, or closing an entire plant and shipping some hogs longer distances to their other plants. The plants and firms with the most variable sources of hog supplies are most vulnerable in the low volume stage of the hog cycle, especially in fringe areas of hog production. The growth in production contracts, self production, or long term contracts has been much faster in areas like North Carolina and Oklahoma, where short hog supplies have a much greater opportunity cost than in the Midwest. Long term marketing contracts with producers also are rapidly increasing in the Midwest. This is partly a competitive response to some packers locking up high quality hogs and high volume producers via marketing contracts. This forces other packers to bear more of the brunt of cyclical and seasonal supply downturns if they do not follow similar purchasing strategies.

Price/return volatility

Packers involved in hog production typically expect that high hog prices typically coincide with low packer processing margins, and vice versa. Experience has shown this to be true, though no studies document this. Thus, packers involved in hog production via ownership or production contracts will have lower profits than competitors when hog prices are below cost of production, higher when hog prices are high, and more stable returns in the long run. Their long run payoffs depend upon their relative efficiency in producing hogs versus the rest of the industry, and the benefits that accrue to their improved quality control and plant utilization economies.

Producers raising hogs under production contracts are assured of payments per pig space or payments per pig produced (perhaps with some uncertain bonuses). They continue to have risks associated with production, like disease risk, but their returns typically are not affected by the volatile cash market.

Producer returns from marketing contracts vary. Formula-priced contracts based upon the current market price may not reduce price volatility or increase price at all versus the cash market. Others that limit price moves (e.g. window contracts) or tie prices paid to feed costs, etc., may significantly reduce price risk and assure more stable cash flows (e.g. Figure 1, from Buhr and Kunkel). For example, note the sharp price drop in late 1998 during which the window contract portrayed in Figure 1 paid producers \$40 per cwt. while market prices dropped to \$10 per cwt.

Lawrence reports that marketing contracts with packers have varying strengths and weaknesses depending on the needs of the producer. If the objective of the producer is to receive the highest long run price, then the cash market or a formula tied to the cash market is “best.” If protection from low prices is more important than high prices another contract may be “best.” Given the recent extremely low hog prices in late 1998 and 1999, packers paid over the market price for hogs under some contracts, though the accrued debt by producers under the contracts with ledgers¹ grew quickly.

¹ In general these contracts loan producers the difference between the market price and floor price when prices are low and the producer pays back the loan when the open market price is high. The contract may also require that the producer pay into an account that the packer holds when prices are high to build a reserve for the next downturn in the market. Contracts often are 4-10 years in length.



Figure 1. Window Contract Payout, 1995 – March 1999

Lawrence developed an economic model simulating the cash market, hog production cost and eight different packer contracts over a 10-year period, July 1989 – June 1999. Six of the contracts paid an average price higher than the cash market and five of the six had a ledger balance that must be paid back because the producer received a higher than market price at the time of sale. The contracts greatly reduced the percent of time the producer experienced red ink on a week-to-week basis, but the debt accumulated under the severe low price period of 1998-99 created unanticipated problems.

Buhr did a similar analysis, and concluded that although each of the long term contracts is different in its mechanism, they all essentially reduce price risk for producers. With the ledger accounts, it's clear that the intention is to achieve a long-term price level near the market average. However, in the short run there can be significant risk shifting and balances accrued. All market contracts closely track market prices which means the main advantage is that they will amount to cash flow assistance—smoothing out the highs and the lows of hog prices.

Lawrence expects the next generation of packer contracts and risk management will change from the current agreements. Packers, for the most part, are uncomfortable being a lender to producers, but the ledger contract has made them an unsecured lender. Corporate offices, lenders to packers, stockholders, and stock market regulators are asking questions about the collectability of some of the large debts. Contracts that were designed to function as if history will repeat itself may have to be re-evaluated as we move into a new lower price world. Existing contracts may be revised and/or written down, but will require agreement on both sides, and will be handled on a case-by-case basis.

Cash market quality composition

When the USDA Grain Inspection, Packers and Stockyards Administration released the results of its January, 1996 Western Cornbelt Hog Procurement Investigation in several Midwest states, comparison of hot carcass yields and lean measures indicated significant differences in hog quality sourced from contracts or cash market transactions. Smaller sellers and cash market acquisitions had more of the lower quality hogs. This result should not be surprising, as most packers preferred to sign contracts with the producers of high quality hogs, and offered significant incentives for producers interested in a contract to improve their lean carcass performance.

Issues and Concerns

Lawrence, Grimes and Hayenga, and Hayenga et al. expected that packers and producers currently relying on the spot market may have to become linked to maintain access to supplies and markets. This would involve a continuing shift away from spot markets, as long-term contracts or vertical integration (to a lesser degree) grow even more in importance. With less spot market volume, there may be associated problems of more limited market access for small producers and increased short term volatility for their hogs. Spot markets for the residual supply and demand would become more thinly traded, and probably more volatile as the “shock absorber” for unanticipated changes in supply and demand. Price reporting would become more difficult, and concern about price manipulation would escalate as relatively small changes in the behavior of large market participants more likely could have an impact on reported market prices. That would make government price reporting in the more thinly traded markets more problematic, and reliance on a pricing formula based on spot market price reports may not be practical. Those contracts using formula pricing may need to include a clause that would trigger a renegotiated pricing base if spot markets get too thin.

Packers are motivated to coordinate their supply of live animals by the large fixed costs associated with a slaughter plant, and the large transactions cost of purchasing thousands of animals on a daily basis. In order to reduce their cost per unit of wholesale meat, packers need to slaughter as many animals as possible. The risk of “coming up short” motivates the use of company owned animals and contracted purchases to ensure the appropriate quantity and quality of animals arrive as needed. Transaction costs are reduced by not having to haggle over the price of each load of animals - an added attraction to contracting with pre-set prices and quality standards. As the number of hog suppliers used declines, the packer’s transactions costs also decline. (Paarlberg, et al.)

Logically, packers attempt to capture the highest quality animals via contracts and vertical alliances. This can leave the lower quality animals to establish prices in the open market. Because payments for most packer contracted animals are based on a reported cash market price, moving more high quality pigs out of the cash market may create a downward bias in the prices received by producers with marketing contracts if the price basis used in the contract is not for specific quality animals.

The USDA summarized its view of the situation in its proposed mandatory price reporting rules in March, 2000. Private marketing arrangements or otherwise coordinated agreements between hog producers and slaughter plants are increasingly the norm. As a result, spot-market demand for slaughter hogs is greatly influenced by slaughter capacity utilization. When the available supply of slaughter hogs exceeds the designed plant capacity, slaughter costs rise as packers turn to overtime labor. To compensate for sharply higher labor costs, slaughter plants lower their bids for slaughter hogs on the public cash markets. This reduces demand for the uncontracted supply of slaughter hogs and is reflected in sharply lower spot market cash prices. This was the situation in late 1998. Many market participants were no longer able to obtain the actual purchase prices of hogs on which to base their marketing decisions. Even the large farm producers were unable to evaluate contracts because of the unknown premium/discount schedules, which may be different in each marketing agreement. These circumstances helped to galvanize support for mandatory reporting.

During the same time period, the General Accounting Office (GAO) was requested by members of Congress to conduct a study on USDA's pork price reporting system. The study found that USDA's current methods for reporting farm and retail prices did not accurately reflect actual prices for all methods of purchase. During periods of plentiful hog supplies, packers frequently pay a lower price for hogs procured through the spot market than those procured by contract. However, the study did point out spot market hogs are of generally lower quality and more variable in weight and availability which may explain why packers are willing to pay a premium for a stable flow of hogs with consistent quality and weights.

Overview

The pork sector has dramatically changed its size structure and vertical linkages in the last 15 years. Very large production units, especially those outside major hog production regions, found long term arrangements with packers essential for financial security. Packers building plants outside typical production regions had to build hog production or encourage expanded production through contract arrangements. Packers have had significant incentives to utilize capacity fully and keep costs down for a long time, and found marketing contracts to be a low cost way of buying a stable supply of hogs. Recently, the increasing stringent quality demands by export customers and their own brand product managers have made improved quality of their raw material a more important incentive to assure consistent high quality supplies. The financial crisis in pork production in 1998-99 probably stimulated more pork producers to seek contracts to stabilize their financial situation. Consequently, less than 30 percent of hogs are purchased via the spot market in 2000.

Cash market volume is dropping sharply, and price reporting will become more problematic if the spot market volume gets substantially thinner. Concerns arise about possible price or price report manipulation as the spot market becomes thinner, but man-

datory reporting legislation should minimize those concerns and help regulators spot manipulation if it would occur. Independent producers are concerned whether they can compete effectively against vertically-linked operations. Access to markets for independent producers is limited, especially outside the Midwest. They face the decision of becoming linked with packers individually or via cooperative processing or marketing initiatives, or becoming residual suppliers inherently bearing more risk. Perceived inequities among contract and non-contract producers' prices or unfairness in contract relationships are sometimes alleged, but no significant widespread problems have surfaced to date that could not be addressed by existing law.

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Section III: Beef Sector Contracting and Vertical Integration

This section summarizes prior research on the type and extent of vertical relationships in fed cattle marketing and packer procurement, the motivations for these linkages, their benefits and disadvantages, and related issues and concerns.

Extent of Beef Packer Feeding, Contracts and Marketing Agreements

Packer feeding and contract arrangements with feedlot operators in the beef industry have been common for a long time. In the mid-1950s, packer feeding of cattle accounted for 4-7 percent of slaughter, according to USDA Grain Inspection Packers and Stockyards Administration (GIPSA) data. Beef packers continue to feed small amounts of cattle -- 4.2 percent of the steer and heifer slaughter over the 1988-1997 period (Table 1).¹

In recent years, forward contracts and marketing agreements have represented from 14 to 19.4 percent of the four largest beef packers' annual slaughter and 12.7 to 18.8 percent of the 15 largest beef packers' annual slaughter from 1988 to 1997.² The USDA Agricultural Marketing Service (AMS) collects and reports the number of cattle delivered weekly to beef packers that were marketed on a non-cash basis. Non-cash deliveries include fed cattle sold using forward contracts, marketing agreements, cattle priced using formulas (not necessarily under a formal long term marketing agreement), packer fed cattle, and cattle delivered against futures contract positions (which is generally a very small component of the total).

Non-cash fed cattle deliveries as a percentage of total weekly market volume have increased over the last decade in major cattle feeding states. For example, in Colorado, Kansas, and Texas, non-cash fed cattle deliveries represented typically less than 30 percent of fed cattle weekly volume during the early 1990s and often exceeded 60 percent in the late 1990s (AMS). Most of this increase is a result of an increase in the number of fed cattle marketed on a formula basis (i.e., the price paid for cattle by the packer is based on

¹ Packer-fed cattle are defined by GIPSA as cattle packers owned for two or more weeks prior to slaughter that were fed in the packer's own facility or fed for the packer in an operation owned by another firm (i.e., custom fed).

² GIPSA defines forward contracts as contracts entered into two or more weeks prior to slaughter. A marketing agreement is defined by GIPSA as "an oral or written agreement between a packer and a seller in which the seller agrees to ship all or part of its slaughter cattle to the packer when the cattle are ready for slaughter, with price determined at or after slaughter."

Table 1. Annual Beef Packer Feeding, Forward Contracts and Marketing Agreements, 15 Largest Packers, 1988-1997.

Year	Forward Contracts and Marketing Agreements	Packer Feeding	Total
		<i>Percent of steer and heifer slaughter</i>	
1988	14.3	5.0	19.3
1989	17.2	5.2	22.4
1990	13.9	5.0	18.9
1991	12.7	4.5	17.2
1992	15.3	4.1	19.5
1993	13.3	4.1	17.4
1994	16.5	4.0	20.5
1995	17.8	3.3	21.1
1996	18.8	3.3	22.2
1997	14.9	3.7	18.6
Average	15.5	4.2	19.7

Source: GIPSA, USDA

some other market price or packing plant average price). Figure 1 illustrates the pattern and trend in weekly AMS non-cash market deliveries as a percent of total sales over the 1991-1998 period. Other states show similar trends, although the southern plains states tend to have higher percentages of non-cash deliveries relative to northern plains states like Nebraska.³

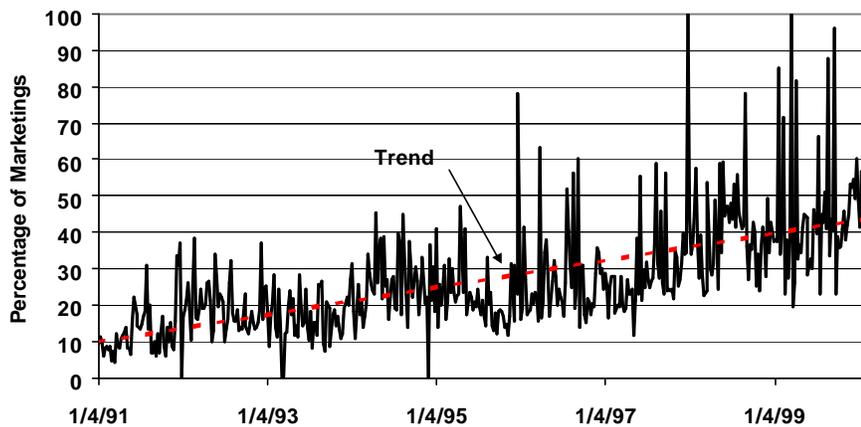


Figure 1. Kansas Weekly Non-Cash Feed Cattle Deliveries as a Percentage of Marketings, 1991-March 2000⁴

³ The GIPSA data represents cattle sold either under forward contracts, long term marketing agreements, or packer fed cattle. Whereas, the AMS data include all cattle delivered under any non-cash means including cattle sold to packers using a formula price.

⁴ Source: USDA and Kansas State Extension.

Packer Feeding of Cattle

As noted earlier, packer feeding of cattle has represented a relatively small and stable portion of total cattle slaughter (generally less than 5 percent - Table 1). Packer feeding has often been the result of cattle producers buying beef packers. For example, National Beef Packing, the fourth largest beef packer with two plants located in Kansas, is jointly owned by Farmland, a farmer-owned cooperative, and U.S. Premium Beef, a closed cooperative comprised primarily of cow-calf producers and cattle feeders. Farmland also owns Supreme Feeders, a large commercial feedlot. Harris Ranch, originally a cattle producer located in California, owns a beef slaughtering plant. Monfort, the third largest beef packer headquartered in Colorado, was started by a cattle feeder.

The primary reasons producers integrated into beef packing historically were to capture packing margins to help offset low cattle feeding margins during times when beef packing margins were high and vice versa. More recently firms like U.S. Premium Beef and others have acquired beef plants to increase beef producer vertical integration, to improve value signals to producers and, ultimately in some instances, to develop branded beef products and capture increased margins associated with higher wholesale prices for branded and further processed products.

Some packer feeding is in their own feedlots (e.g. Monfort/ConAgra), some in other feedlots where packer-owned cattle are fed for a fee. Schroeder and Blair surveyed cattle feeding operations in Kansas and found a variety of services offered by feedlot operators to investors. Feedlot operators provided labor, facilities, utilities, nutritional and veterinary services, financing of part or all of the cattle, feed and services provided (or would feed cattle on a partnership basis). Payments for feedlot services were built into yardage fees for use of pen space, included in feed cost surcharges, or both. Feedlot operators often feed some of their own cattle, but they try to assure an income stream at low risk by custom feeding cattle for (or in partnership with) others to more fully utilize facilities and labor, and achieve greater economies of size in their purchasing and feedlot operations. Most custom feeding contracts have been developed by the feedlot operator, not the packer or other cattle investors. This is in contrast to contractors typically developing the contracts in many other industries.

Packer-Feedlot Contracts and Marketing Agreements

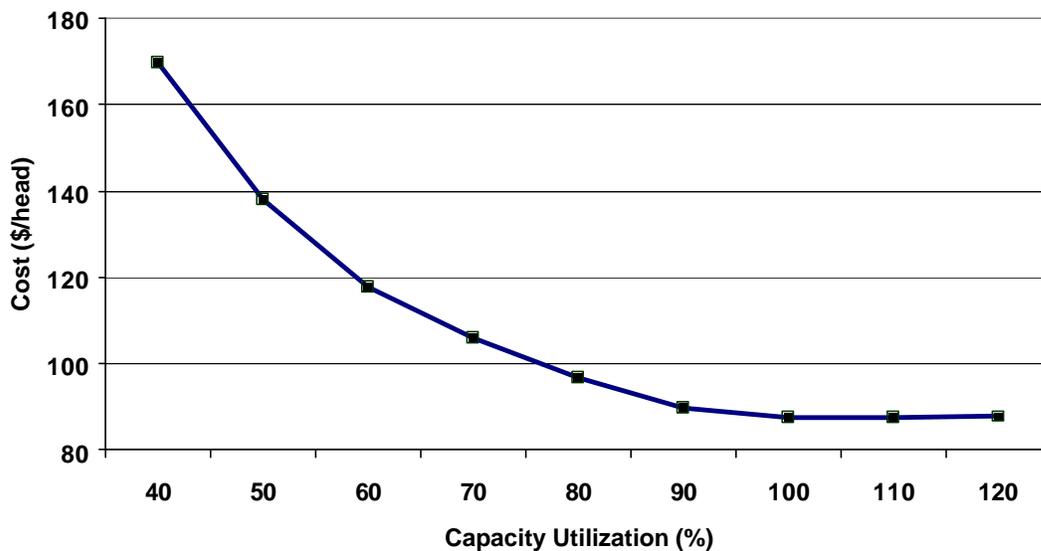
Several motivations exist for cattle producers and beef packers to become involved in contracts and marketing agreements. The incentives can be categorized into three broad areas: 1) reduced costs, 2) enhanced risk management, and 3) cattle and beef quality.

Reduced costs

Use of fed cattle contracting and marketing agreements reduces costs for both beef packers and cattle producers. Beef packers strive to operate plants near designed capacity. However, fed cattle supplies and plant utilization rates vary considerably over time. Ward

found that large (10,000 head or more weekly slaughter) steer and heifer slaughter plants had average weekly plant capacity utilization rates of 73 percent. Anderson and Trapp (using GIPSA data for the largest 15 beef packers) estimated average daily slaughter capacity utilization rates of 85 percent for all operating days during April 5, 1992 to April 3, 1993.

Packers realize significant cost savings when operating beef slaughter and processing plants near designed capacity. Anderson and Trapp (1999) estimated combined killing and fabrication costs for alternative slaughter rates for steers and heifers based on work by Duewer and Nelson (figure 2). Increasing plant capacity utilization from 70 percent to 90 percent reduced plant killing and fabrication cost by an estimated \$16.20/head.



Source: Anderson and Trapp (1999)

Figure 2. Combined Killing and Fabrication costs per Head by Rate of Capacity Utilization

The cost changes came from operating below average capacity over time, and from fluctuations in supply around the average operating level. They concluded that added costs of up to \$5 per head (up to a range of \$150 to \$200 million per year) are incurred with the level of slaughter variation present in the industry. Such sizeable cost savings serve as a major motivation for beef packers to develop non-price means such as contracts and marketing agreements to better coordinate cattle flows into beef packing plants. Gottschalk, from LFG, Inc. estimates that beef processing profits averaged \$5.23 per head during 1990-1999, so cost savings of that magnitude could have a significant short run impact on packer profitability. In the long run, part of these cost savings are passed on to cattle producers through higher prices paid for fed cattle, and to consumers as lower prices for beef.

Cattle producers also realize reduced costs (in addition to those passed down by beef packers) through entering into contracts and marketing agreements with packers. One significant cost benefit of formula pricing is that it reduces costs associated with daily price discovery for feedlot managers (Schroeder et al. 1998). These costs include considerable time collecting, analyzing, and monitoring short-term fed cattle market conditions as well as on-going time spent negotiating prices with packers.

Risk management

Marketing agreements and contracts between beef packers and cattle feeders also can serve as a risk management tool. Some forward contracts that establish price reduce price risk for both cattle feeders and beef packers. Contracts enable cattle feeders to obtain more favorable financing terms (Ward and Bliss). Having a buyer identified in advance also assures cattle feeders of a timely market outlet. Feedlots have about a two-week period over which they can most effectively market fed cattle. During this time frame, with steady market prices and typical quality and yield grade discounts, profits tend not to change by more than \$1/head. However, selling cattle one-week prior to this period reduces profit by about \$6/head, and holding them one week past the optimal period reduces profit by about \$2/head (Anderson and Trapp). Therefore, risk of lost profit for cattle feeders from not selling cattle at the optimum time is reduced if a buyer is lined up well in advance.

Securing cattle well in advance of slaughter reduces the risk of not being able to acquire cattle needed to efficiently utilize plants and keep costs low. Because of their relatively high ratio of fixed to variable costs, packers have strong incentives to operate plants near capacity to minimize per unit costs (Koontz and Purcell). Barkley and Schroeder determined that larger beef packers use contracts, marketing agreements, and packer feeding to help keep plant utilization high.

Quality issues

Traditionally fed cattle have been sold on a live weight basis. However, live cattle pricing has been inadequate at sending appropriate pricing signals to producers regarding cattle quality attributes (Schroeder et al. 1998). Problems associated with beef product quality and consistency have been thoroughly documented (Smith et al. 1992 and 1995). Much of the beef product quality problem has resulted from poor coordination of the vertical beef production and marketing system (Lamb and Beshear; Schroeder and Mark). Schroeder et al. (1998) concluded that a considerable amount of beef system coordination problems rest in poor information transmission between cattle feeders and beef packers. They argued that live-weight average pricing of fed cattle inhibits information flow from beef consumers to cattle producers. This poor information flow, resulting in poor beef quality, contributed to beef demand declining by nearly 50 percent from 1980 to 1998 (Purcell 1998; Schroeder, Marsh, and Mintert).

Several analysts have argued that for the beef industry to revitalize consumer demand, it must improve information flow and increase value-based price discovery of fed cattle (Fausti, Feuz, and Wagner; Lamb and Beshear; Schroeder et al. 1998). Schroeder and Graff estimated that high-quality cattle subsidize low-quality cattle by an average of \$30/head when fed cattle are marketed using traditional live-weight or dressed-weight pricing methods compared to quality-based grid pricing. Therefore, there are sizeable incentives for both producers of better cattle and beef packers to move away from average live (or dressed) weight cattle pricing and move towards value-based grid (or grade and yield) pricing.

Value-based pricing of fed cattle leads to increased vertical alliances and contracts between beef producers and packers for several reasons. First, to enable beef packers to supply their customers with the specific qualities of beef products they demand, packers need to make certain they have access to cattle possessing the desired attributes. The way packers do this is by entering into marketing agreements with producers to supply the quality of beef in the volume the packer needs to meet specific customer demand. Second, Hennessy demonstrated that when it is difficult to discern quality differences of raw farm products, as is the case for live cattle (Jones et al. 1992), the processor has increased incentive to vertically integrate in some fashion with producers. Third, beef producers have recognized the \$30/head average pricing errors (and in excess of \$150/head value range) present when they sell cattle on a live basis (Schroeder and Graff), and the related incentives to sell high quality cattle using a value-based pricing system. Value-based pricing systems pay premiums and discounts for varying quality attributes (e.g., USDA quality and yield grades and carcass weight) of cattle. Ward and Lee collected cattle price premium and discount schedules for seven different packers. Packer premiums and discounts for various traits differed across packers. Thus, cattle producers who adjust cattle management and genetics have an incentive to enter into a long-term marketing agreement with the beef processor with the most advantageous value-based pricing system.

In summary, beef quality concerns together with more customers desiring specific beef quality attributes increased the need for beef packers to secure cattle possessing certain quality traits. At the same time, cattle producers realized there were sizeable economic incentives to price cattle based on individual carcass merit. Together these evolutions have created incentives for beef producers and packers to increasingly enter into various forms of alliances, partnerships, marketing agreements, and other contracts to the benefit of both parties and to consumers.

Issues and Concerns

When cattle producers and beef packers become vertically linked through means other than direct cash market negotiations, concerns arise regarding remaining cash markets. These include the following concerns which have been voiced by industry members or analysts: 1) cash market prices could be lowered because packers may bid more conservatively for cattle if they already have a portion of plant slaughter needs secured

through contracts and agreements (this would reduce both cash market fed cattle prices as well as formula prices based on cash prices);⁵ 2) short term cash market price variability could increase because of thin markets; and 3) reported cash prices may become less representative of market conditions at times when they represent only a small part of overall trade; and 4) cattle sold under marketing agreements might receive higher quality-adjusted prices than cattle purchased on the cash market.

Cash price—contract delivery relationships

Considerable research has been conducted exploring impacts of non-cash cattle trade on the cash market. The most recently completed USDA study (Schroeter and Azzam, 1999) examined detailed transactions data for every lot of cattle over 35 head purchased by the four largest beef packing plants in the Texas panhandle region during February 1995 through May 1996. While that situation may not be typical, Schroeter and Azzam found a statistically significant negative correlation between weekly cash market fed cattle prices and use of captive supply. For the four plants included in the USDA study, a contract supply increase of about 8 percent (e.g. 29 to 37 percent) was associated with a 0.54 \$/cwt. drop in the spot price on a live-weight basis.

Schroeter and Azzam's results are generally consistent with those from earlier studies. The most comprehensive study in terms of the number of plants and detailed transactions data was by Ward, Koontz, and Schroeder. They analyzed transactions from the 43 largest steer and heifer slaughter plants owned by 25 companies during April 5, 1992 through April 3, 1993. They concluded that packers may rely on contract and marketing agreement cattle when cash prices are high and rely more on cash cattle when cash prices decline. Thus, existence of contract and marketing agreement relationships might serve to smooth out week-to-week price variability. The study found fed cattle transaction prices declined by at most 0.003 percent for each 1 percent increase in contract, marketing agreement, or packer fed cattle deliveries.

The small negative correlation observed between contract deliveries and short-run cash fed cattle market price may also be due to a number of forces. Beef packers could use non-cash market fed cattle agreements for their slaughter needs enabling them to bid less aggressively for fed cattle in the cash market. With a small number of large beef packers, removing one from the cash market potentially reduces competition to the detriment of sellers remaining in the cash market (Sexton).

Cattle feeders under marketing agreements generally make the decisions when these supplies are delivered. As a result, cattle feeders likely elect to make more deliveries when they anticipate lower prices next week. As beef and cattle prices drop during the

⁵ Since beef packing activity is concentrated in a small number of firms if one or two firms are not actively bidding in the cash market this might adversely affect the level of competition for fed cattle in the cash market, especially in fringe production areas.

week, and decisions regarding deliveries are made late in the week, more pens of contract cattle are likely to be delivered. That is because delivery commitments announced this week for next week's slaughter are generally priced based on the current week's "higher" cash price (Schroeter and Azzam 1999). This would result in the observed negative correlation between deliveries of marketing agreement cattle and cash prices.

If higher quality cattle are more likely to be priced on the basis of carcass merit, the cash market quality composition will represent the remaining lower quality cattle, whether done on the cash market as more are every year, or by contract arrangements with merit or "grid" pricing. Schroeter and Azzam found cattle sold under marketing agreements had higher yield grades than cash market cattle. Higher quality cattle have increasingly been sold under marketing agreement relationships. Schroeder and Mintert (1999) found evidence of this by determining that the cash market price has declined relative to live cattle futures and wholesale boxed beef prices over time because lower quality cattle were being marketed in the cash market.

It is critical to understand that there are several possible explanations for the linkage of higher levels of captive supplies with lower cash market prices that have not been proven or refuted in existing literature. Schroeter and Azzam concluded, "In light of our results, we recommend that the agency (USDA-GIPSA) should not rely on the statistical finding of a negative correlation between deliveries of cattle procured by non-cash methods and spot market prices as evidence of intent by packers to depress cattle prices through the use of non-cash supply sources, or as evidence of the unintentional consequence of lower prices as a result of non-cash supply use" (p. 72).

Cash Market Price Versus Contract and Marketing Agreement Prices

Schroeter and Azzam (1999) and Ward, Koontz, and Schroeder (1996) both found that packers tend to pay higher prices for cattle delivered under marketing agreements than for cash market delivered cattle even after adjusting for cattle quality differences which can be quantified. Some have questioned whether this suggests price discrimination on the part of the packer. The fact that marketing agreement cattle receive higher prices could be a result of cost savings and reduced risk these arrangements offer beef packers. Marketing agreements offer packers numerous potential benefits including securing cattle to operate plants near-optimal slaughter capacity utilization, reduced costs of searching for cattle to procure, and reduced costs associated with having more homogeneous cattle and carcasses. In addition, quality factors affecting value not considered (due to data inadequacy) in prior studies, like branded versus unbranded hides, and breed differences in value (like humped breeds which often grade poorly versus Certified Angus for marketing programs that receive premiums) may be found in contract versus cash market cattle. In addition, the fact that many cash market cattle are purchased on a live basis (where quality and yield grades are not known in advance, but are estimated with inaccuracy), may be a contributor to lower cash market prices, as cattle buyers discount their bids slightly to reflect that risk (Fausti and Feuz).

The USDA filed the only recent case alleging undue preference in a cattle purchase contract in 1995 against IBP. In the case involving IBP's contract with a Kansas cattle feeding group, the Administrative Law Judge for the USDA found that price differences between contract and spot market cattle (arguably 0.43 \$/cwt.) were economically justifiable and supported by valid business reasons. IBP claimed that lower shipment costs and lower operating costs from more fully utilizing their plant contributed at least 0.37 \$/cwt. to added profits, quite close to the USDA's estimate of the price difference, plus other intangible benefits. (Hausmann) The judge cited the added value associated with selective pen-by-pen bidding rather than one bid for all pens, IBP's right of first refusal on pens when others bid higher, the option value of being able to extend delivery a few days beyond usual practice, and improved cattle quality attributable to shared carcass information. He found that the small size of the price difference in a volatile market would be unlikely to significantly affect producer profit or cattle feeding decisions.

Thus, the USDA Administrative Law Judge found no unreasonable preference was provided these feedlots under this marketing contract. He stated that price differences are not illegal if there is no anti-competitive intent, and actual or likely injury to competition, as in this case. "So long as the methods of transaction used are not anti-competitive in nature, there is no reason for the government to stifle such innovation by interfering with respondents' (IBP's) business judgment and freedom to contract." (p. 29)

Overview

The extent of contracting and marketing agreements in the beef industry has historically represented less than 20 percent of the leading beef packer's slaughter on an annual basis. Further, cattle feeding by beef packers has represented less than 5 percent of slaughter, and much of the packer feeding that has occurred has been a result of cattle producers vertically integrating and buying beef packing firms. Several independent research studies have found negative relationships between cash market prices and deliveries of formerly contracted fed cattle. Although precise reasons for these negative relationships have not been determined, they are probably partly attributable to quality differences and contract cattle feeders' adjusting deliveries in response to short term price changes and their expectations regarding next week's price.

Notwithstanding, some industry observers and participants have voiced concerns regarding beef packer – cattle feeder market agreements, particularly in some regions when contract cattle supplies temporarily made up a large share of the packer supplies. Actually, a large part of what has fueled concerns may be related more to formula pricing than to long term beef packer – cattle feeder marketing agreements. Nonetheless, these concerns spurred the USDA to file suit against one beef packer – cattle feeding group marketing arrangement. The courts found the agreement was not in violation of the law. Concerns regarding marketing agreements have also motivated several state and federal statute proposals designed to eliminate various forms of beef packer – cattle feeder marketing arrangements.

Improved market coordination between cattle feeders and beef packers has been demonstrated to result in significant cost savings for beef slaughtering and processing. This cost savings have been at least in part passed on to cattle feeders in the form of higher prices paid for fed cattle, especially cattle that are sold under agreements that help directly reduce processor costs. The beef industry has recently started to make strides toward improving its long run consumer product offering problems. An important part of this improvement has resulted from value-based fed cattle marketing agreements between beef packers and cattle producers. There continues to be debate over concentration and contract arrangements in the beef industry. However, the vertical links in the beef sector are only gradually changing. The relationships between contract cattle volume and producer prices are becoming better understood, along with the closer vertical linkages' contributions to more efficient system coordination.

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Section IV: Poultry Sector Contracting and Vertical Integration

The poultry industry is a significant competitor for the pork and beef industries, rapidly gaining market share over the last 30 years. In addition, the poultry sector has been the forerunner in tighter vertical coordination systems linking suppliers of basic raw materials and all intermediate stages of production and processing, almost to the final consumer. The reasons for this very important competitor moving away from the spot market may be useful in understanding the corresponding evolution being observed more recently in the livestock industry, especially in the pork sector.

Evolution of Vertical Organization in the Poultry Industry

After World War II, the U.S. poultry industry grew into one of the most integrated agricultural industries. Despite some important differences, this is true for broilers, turkeys, and table eggs. The broiler industry is entirely vertically coordinated through ownership or contract from breeding flocks and hatcheries to feed mills, transportation divisions, and processing plants. The finishing stage of production is organized almost entirely through processor contracts with independent growers. The significant economies of scale in poultry processing and the large proportion of value added in processing are major drivers toward the processor being the coordinator of the industry.

The pattern of vertical coordination is less uniform in the turkey industry than in the broiler industry. A turkey industry member is less likely to own its own hatchery but is more likely to have company-owned production farms. There is also more variation among production contracts with respect to division of risks and profits from growing turkeys than in the broiler industry. The processing plant is the center of control of placement. A processor may contract the turkey production directly with farmers or indirectly with feed supplier who, in turn, would then contract the production of company-owned turkeys with farmers. There is still room for an independent producer to have a formal marketing contract with a turkey processor. This marketing contract in some cases does not provide any price or margin guarantee to turkey producers (Martin et al.).

The table egg industry is highly vertically integrated as well. The large egg producers deal directly with breeders to obtain parent stock and then produce their own hatching eggs, chicks, and pullets. Most of them also maintain their own egg marketing operations. Medium size producers contract with others for marketing services, i.e. they pack and deliver as directed by a marketing firm who may also be an egg producing firm. Only the small producers sell to independent packing stations. The use of production contracts for egg production is in decline (Martin et al.).

The evolution of contracting in poultry industry can be chronologically followed through several steps (Martin). The industry started with *open account contracts* where growers were provided with loans from a bank, production credit association, or a feed mill owner in return for interest payment. In order to reduce risks of losses to growers some integrators started offering an *open account - no loss contracts* which carried a clause ensuring that any deficit incurred by the grower after broilers had been marketed was absorbed by the contractor. This arrangement resulted from competition among integrators for growers and the threat by growers to discontinue broiler production. The next stage was the *guaranteed price contract* that was quite similar to their predecessors except for an additional clause guaranteeing the grower a certain price per bird delivered. Whereas the guaranteed price contracts were popular in the broiler industry in the 1950s and 1960s, its use was limited in the turkey industry. The holiday-dominated consumption pattern and the long grow-out period for turkeys made output price unpredictable at the beginning of the production process. The next generation of contracts involved *flat fee contracts* under which growers were compensated for their husbandry and inputs by payment per pound, per bird or per week. The contractor retained ownership of birds, provided feed, medicine, and chicks and coordinated production and marketing decisions. Due to little incentive for good grower performance in the contract, flat fee contracts had the problem of growers shirking responsibility. Both broiler and turkey companies started including feed conversion bonuses in their flat fee contracts as well as introducing profit sharing to provide greater incentives for good performance. The *share contracts* stipulated profit-sharing percentages, with the responsibilities of the two parties remaining similar to the flat fee contract. The *basic feed conversion contract* compensated growers according to a specified schedule of feed conversion (pounds of feed/pound of live weight). Such contracts were often used together with a flat fee payment that made those contracts very similar to the contracts we observe today.

The Design of Modern Poultry Contracts¹

A modern production contract is an agreement between an integrator company and a farmer (grower) that binds the farmer to manage the company's animals until they reach market weight by following specific production practices in exchange for payment for services and productive inputs provided by the grower². Broiler contracts have two main components: the division of responsibility for providing inputs, and the method used to determine grower's compensation. The grower provides land, housing, utilities (electricity and water), and labor. Operating expenses such as repairs and maintenance, clean up

¹ The specific information on poultry contracts design is representative of the contracts offered to growers in North Carolina. The information gathered is considered to be representative of the entire industry. North Carolina ranks first in turkey production and fourth in broiler production nationally.

² We focus our discussion on the so-called finishing contracts where a certain age group of animals, say one-day old chicks, are brought to the farm and then grown to market weight. Other types of production contracts include, for example, breeder and hatching egg contracts in the broiler industry and brooding contracts in the turkey industry.

cost, manure, and dead poultry disposal are also the responsibility of the grower. The contractor provides birds to be grown to processing weight, feed, medication, and services of field men. Items like fuel or litter can be the responsibility of either the integrator or the grower, or they can be shared. The decision about the timing and volume of birds placed on a given farm is made by the contractor, and so is the size (capacity) of the housing unit built by the grower. Most contractors require that houses be built according to strict specifications regarding construction and equipment. New houses are typically well-insulated units, with highly automated feeders, drinkers, and heating and cooling devices.

Broiler contracts

All modern broiler contracts have a fairly similar payment structure consisting of a fixed base payment per pound of live meat produced and the variable bonus payment based on the grower's relative performance. The bonus payment is determined as a percentage (bonus factor) of the difference between group average settlement costs and producer's individual settlement costs. The calculation of the group average performance includes growers whose flocks were harvested at approximately the same time.

Most of the broiler production contracts also have two auxiliary payment mechanisms: the minimum guaranteed payment and the disaster payment. If the producer's revenue based on the performance payment is smaller than some minimum guaranteed revenue, the minimum payment formula will be applied. In the event of a disaster such as fire, flood, or hailstorm involving a loss of the entire or fraction of a flock, the grower will be compensated based on the disaster payment. Minimum guaranteed payment and the disaster payment schemes differ substantially among different integrators. Both are designed to pay enough to prevent a grower from defaulting on the chicken house mortgage.

A more recent development in broiler contracts has been the introduction of the market price clause. This payment mechanism was added to the performance payment scheme (i.e., base plus bonus) to partially tie growers' payments to the difference (only when positive) between the broiler market price and the contractors' average variable production and processing cost. In that way, growers share in profits in profitable times, but not in loss situations.

Turkey contracts

During the last two decades turkey production was mainly organized through contract production with a standard production unit consisting of one brooder house and two finishing houses covered by one contract. In recent years, mainly as a result of the outbreak of disease and biosecurity reasons, the production unit organization is gradually changing towards brooding and finishing operations that are separated geographically (to avoid having more than one generation of turkeys on the same farm at any given time).

The farmer specializes either in brooding or in finishing of turkeys, and these stages of the production process are covered by separate contracts.

Turkey contracts are very similar to broiler contracts in their division of responsibility for providing inputs. Both broiler and turkey contracts exhibit some combination of a flat fee and a feed conversion bonus paid per pound of the USDA approved meat produced. However, unlike broiler contracts where the use of relative performance bonuses is pervasive, most of the turkey contracts use some type of a fixed performance standard as a basis for awarding bonuses. A critical difference between a relative performance and a fixed standard scheme lies in the computation of the benchmark against which the performance of an individual grower is compared. Whereas in the first case the benchmark is determined by the contest among growers (tournaments), in the second case it represents a predetermined technological constant.

Contract Production Rationale

The explanations for vertical integration and the extensive use of contracts with independent farmers in the poultry industry include: (a) risk sharing, (b) technology, (c) changing consumer demand, and (d) access to capital.

Risk sharing

The first important benefit of contracting is risk shifting from the grower to the contractor. The magnitude of risk shifting from growers to integrators have been investigated by Knoeber and Thurman. They found that price risk accounts for 84 percent of total financial risk. The form of contracting used in broiler industry shifts not only the entire price risk but also a significant proportion of the production risk to large, sometimes publicly owned, companies which can more efficiently handle those risks.

Technology adoption

Faster adoption of new production technology is another very important benefit of contracting in the broiler industry. This has generated tremendous productivity gains that have resulted in a significant reduction in the cost of production, largely passed on to consumers as lower consumer prices. While it is difficult to isolate the impact of contracting alone on productivity, it seems likely that contracting and vertical integration facilitated the rapid improvements in productivity prior to 1980 when the beef and pork sectors had few contract linkages. Over the 25-year period from 1955-1980, the broiler feed conversion ratio dropped nearly 30 percent, the days required to grow out a broiler to market weight fell from 73 to 52, while the average market weight actually increased from 3.1 to 4 pounds (Lasley). This increased productivity came about through disease control, development of genetically superior breeding stock and innovations in animal nutrition.

The evidence that the pace of technological change in broiler production is exceptional is found by comparing the 54 percent drop in broiler meat prices with the 18 percent increase for beef and veal and a 14 percent drop in pork prices, adjusted for inflation, during 1955-1980. The per capita consumption of broiler meat increased four-fold in the same period. (Lasley et al.).

Changing consumer demand

The expansion of broiler production and consumption and decline in real broiler prices continued into the 1990s. Martinez offers additional evidence of the magnitude of the broiler industry's production and marketing efficiency gains. He showed that if higher input prices had been passed on to consumers, average retail broiler prices over the 1992-1996 period would have been \$1.58 per pound instead of the actual average of \$0.91 per pound. From 1976 to 1997, per capita broiler consumption nearly doubled, compared with a 5 percent increase for pork and a 30 percent reduction for beef. In 1986, per capita consumption of broiler meat exceeded pork for the first time and, in 1993, it surpassed beef consumption as well. Increasing per capita consumption at relatively constant prices suggests the possibility of a demand shift caused by the combination of lower relative prices for broilers and, possibly, changing consumer preferences due to health concerns.

The poultry industry organization allows more rapid response to changes in consumer preferences. The poultry industry has significantly increased its new product introductions. The shift to cut-up and further processed chicken from whole birds has been dramatic--by 1995, 63 percent of broiler volume was cut up and sold as parts, and 11 percent was sold as further processed products. The poultry industry leads the other meat industries in prepackaged, consumer ready meat products. According to its 1996 listings, one major supermarket chain offered its consumers 70 prepacked, consumer-ready poultry products, 58 pork products and less than 10 each of veal, lamb and beef products (Martinez).

Contracting and vertical integration have also given the poultry industry greater control over both the volume and quality of its products, which turned out to be especially important in meeting the needs of large food-away-from-home establishments and supermarket chains. In the 1980s approximately 25,000 fast-food outlets added chicken items to their menus (Lasley et al., 1988). Poultry producers are increasingly associating their brand name with uniform high quality product. According to Bugos, brand names accounted for half of all supermarket sales of chickens and shoppers were willing to pay 14 percent more for brand-name broilers than for supermarket brands.

Access to capital

Another benefit of production contracts in the poultry industry is the ability to share the cost of capital expansion between integrators and growers. The rapid expansion of the broiler industry was facilitated by relatively easy and inexpensive access to capital through federally insured loans that farmers were eligible to obtain for the construction of the

housing facilities. Growers supplying capital leveraged contractors' ability to finance expansion, and provided significant added employment for growers and their families. Productive growers typically enjoy a long-term relationship with an integrator. Grower provision of capital is the fee for entering a long-term relationship with an integrator, and an important device for screening out low ability growers.

Issues and Concerns

While the majority of poultry contract growers probably are satisfied with most aspects of their contractual arrangements, many are dissatisfied with at least one aspect of their contractual arrangements. Their complaints focus primarily on the bonus systems based on their productivity compared to other growers. Poultry growers have repeatedly expressed concern about the fairness of comparing their performance with particular flocks with those of other growers in determining payments. Some growers have argued that contractors have sole control over the initial quality of production inputs. Consecutive flocks grown by the same grower, while having similar production costs, can receive substantially different bonus payments, depending on the performance of other growers in the settlement group. Growers have expressed exasperation over this form of remuneration since they have no way of anticipating how large their payments will be.

Growers have also raised complaints about the quality of chicks, the way that live birds and feed are weighed, and the length of time between flock placements. They also complain about contract non-renewal, contract terminations, requirements that facilities be modified or upgraded (excessively), their limited choice of integrators or their inability to change integrators, and about alleged integrator reprisals for joining grower associations and for seeking redress of grievances. The magnitude of the degree of satisfaction or mistrust can best be illustrated by the results of several grower surveys conducted in 1993 by Tyson, the largest broiler processor company in the U.S., of its own growers. The survey revealed that more than 50 percent of growers did not trust the company scale weights, 44 percent did not trust feed weights, 62 percent were unhappy with the quality of chicks provided by the company, and 40 percent did not fully understand how their payments are determined (Bjerklie).

In a 1998 study of Delmarva Peninsula poultry growers by Ilvento and Watson, contract growers expressed relatively high satisfaction with their poultry business, their contractor and their flock supervisor or fieldman. Nearly half felt communication was not adequate, and feared retaliation if they raised concerns. Most felt that income was adequate, or that they were getting a fair return on their investment.

Earlier Alabama grower surveys in 1994 (Kennedy) and 1998 (AP&EA) found substantial differences in overall grower perceptions of the fairness of the arrangements with contracting companies, ranging from 20-73 percent satisfaction with individual companies. The 1998 survey results generally were more positive toward integrators'

performance, with 50-90 percent generally favorable, but a substantial minority often was not favorable toward some aspect(s) of the contractual relationship.

Out of concern for such grower discontent, a number of states have considered legislation to protect growers. In southern states such legislative proposals generally have failed as the poultry companies voiced strong opposition. For example, in 1993, the North Carolina Legislature introduced a bill that would have restricted the types of contracts that growers and integrators could sign. The bill specifically prohibited payments to a grower based on his performance relative to other growers (Vukina). Bills with provisions that protected the rights of growers to organize and create associations were also defeated in Alabama and Louisiana. However, various forms of legislation aimed at regulating contracts without explicitly targeting the relative performance bonus issue were passed in Minnesota, Wisconsin, and Kansas in the early 1990s (Lewin).

On the federal level, a regulatory initiative came from the Grain Inspection, Packers and Stockyards Administration of the USDA in 1997. In an advanced notice of proposed rulemaking, the agency announced that it was considering “the need for issuing substantive regulations to address concerns in the poultry industry with respect to contract payment provisions tied to the performance of other growers” (GIPSA). In 1998, the National Commission on Small Farms recommended that the Secretary of Agriculture evaluate the need for federal legislation to provide uniform contract regulations for all growers engaged in agricultural production contracts. In reference to poultry contracts, the recommendation specifically focused on the factors used in ranking growers and determining performance payments. No concrete regulatory actions have been taken so far, but the pressure from the growers’ circles to do something continues.

The literature on the economic impact of contractor practices and procedures, and consequently the need for government regulation of poultry contracts, is minimal. The theoretical literature on franchising (essentially poultry contract growers can be thought of as franchises like McDonalds’ franchises) has generally been very critical of government regulation, on the grounds that any regulation will interfere with the ability of economic parties to negotiate efficient agreements (Beales and Muris; Brickley, Dark and Weisbach). More recently, Levin argues that, theoretically, requiring growers to make large, perhaps unnecessarily specific, investments in the chicken houses increases the risk of larger potential losses if contracts aren’t renewed, and provides increased motivation to perform well under the contract (especially in areas with few alternative contractors).

Analyzing the welfare implications of the contemplated government regulation of poultry contracts, Tsoulouhas and Vukina find that government prohibition of the controversial comparative performance-based bonus system potentially could increase grower risk without sufficiently increasing his expected revenue with almost certain reduction in integrators’ profits. A much more complicated regulatory scheme is required to guarantee that the growers are unambiguously better off with fixed performance than with the relative performance bonus schemes.

Overview

The broiler industry is often considered the poster child for the industrialization of agriculture. It is a vertically integrated production, processing, and distribution system, though the actual production of the birds is done by contract growers.

Overall, contract growers express more satisfaction than dissatisfaction with contract arrangements, but there is a large minority expressing dissatisfaction with one or more aspects of contract arrangements. There have been concerns expressed by contract growers regarding the fairness of the payment systems. When growers are negotiating renewal of an expiring contract, there is a risk of inadequate competition for contract services, especially in areas with few processors. Some policies have been enacted to deal with some of these concerns.

The broiler industry has dominated the competitive scene in the meat complex over the last 30 years, expanding market share dramatically as it improved efficiency, kept prices low versus competitors, and improved its product offerings and variety. Overall, the poultry industry's vertical integration and reliance on production contracts with growers undoubtedly facilitated the industry's efficiency and responsiveness to consumers, making them more formidable competitors in the global and red meat and poultry markets.

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Section V: International Competitors Contracting and Vertical Integration

Contracting and vertical integration are widely used tools by leading international competitors in the global beef and pork markets. The Danish model of producer cooperatives handling almost all of the pigs produced under a combination of farmer ownership of plants and contractual supply commitments with those plants is the most extreme. Canada's cattle marketing system mirrors the U.S. in many ways, while the Canadian hog marketing system is switching to contract arrangements with packers after deep dissatisfaction by producers and processors with the highly restrictive provincial marketing boards and their auction systems. Australia's system is dominated by retail chains that often contract with producers directly.

Danish Pork Sector

For many years, Denmark has been the world's leading exporter of pork until the United States and Canada surpassed it in 1999. Danish pork exports typically constitute at least 75 percent of Danish production.

Pig production doubled from 1975 to 1995, and much of this increase could be attributed to improved breeding and production technology during this period. A small percentage of all pigs are now produced and processed under an ISO 9000 process quality certification program, but most packers are waiting to see whether the market will pay for the additional effort involved. All hogs are traced back to their source for quality assurance.

Farm cooperatives dominate the entire breeding, feed, slaughter, and distribution system, accounting for nearly all of the volume of breeding stock and slaughter. Privately owned companies disappeared from the scene starting in the early 1990s, and only three companies remain in the slaughtering business, compared with 54 in 1970. Membership in the cooperatives depends solely on a producer's contractual commitment to be a member and market all pigs through the cooperative for at least one year. All activities of the cooperatives are coordinated by Danske Slagterier, the umbrella organization of pig producers and processing firms, which operates breeding, veterinary, pig research, meat research, and marketing programs. Research is funded mainly from producer and slaughter levies, and by the government. Pig producers primarily comprise the boards that control and direct the operations of the cooperatives. ESS-Food is a major exporting firm owned by three of the largest cooperatives which use ESS-Food to sell to large export customers collectively, but also use their own sales departments to sell directly.

Over 95 percent of all pigs were slaughtered by farmer co-ops in 1999, with the remainder exported live or slaughtered in privately owned slaughterhouses. Individual cooperative members have contracts to supply specific plants. There are now only three

major cooperatives in Denmark, with a recent merger bringing the Danish Crown cooperative to over 80 percent market share. Eighty four percent of the pigs are supplied by producers who annually sign one year full supply contracts; sixteen percent are supplied under two year contracts.

Canadian Pork Sector

Canada's pork industry is in a period of great change. The industry is the second largest net exporter of pork in the world, behind the United States and ahead of Denmark.

Canadian marketing boards used to dominate the live hog marketing system, with electronic auctions and price premium-discount grids giving significant premiums for lean carcasses for 30 years. Marketing of high-grade pork products in Canada is partly controlled by provincial pig marketing boards, such as the Ontario Pork Producers Marketing Board. The Board was developed to protect eastern Canada's industry from vertical integration and to enable market access for smaller-scale producers. Pig producers generally have been obligated to trade their pigs through such boards, though this is changing. These boards often have central selling desks, such that each province has its own system for organizing the centralized purchase and sale of pigs. These "single-desk selling" agencies collect pigs, participate in delivery of pigs to packers, price and settle deals, collect stabilization payments, and conduct lobbying, fund research and industry promotion. Pig pricing is based on each province's carcass premium/discount matrix.

Western Canada pork production

More direct sales and contracting with packers is occurring in many provinces, especially in western Canada. Canada's marketing boards have been criticized as less than appropriate for current conditions. "Dual marketing" for pigs has been introduced, and many producers now have their choice between marketing their pigs through a provincial marketing board or through private contracts with processors. Given that Western Canada represents most of Canada's growth potential, it is interesting to note that marketing boards in Western Canada have much less influence on hog marketing than Eastern boards.

For example, Alberta began an "open marketing system" for slaughter pigs in December 1996 to replace the compulsory marketing system operated by the Alberta Pork Producers Development Corporation. A producer vote in July, 1998 determined this system will continue. The open system allows for other marketing agencies to compete with the Western Hog Exchange, and for producers to sell directly to packers. The Western Hog Exchange assembles, schedules and sells pigs destined for slaughter on behalf of producers. Other agencies involved in the marketing of pigs in Alberta include other private dealers and agents, Alberta packer buyers and buyers in markets outside Alberta. The Alberta Pork Producers Development Corporation provides "universal" services for all producers, supporting industry research and conducting pork advertising and promotion to consumers via a compulsory levy on hogs marketed for slaughter.

Québec pork production

Québec, the province with the largest hog production volume in Canada, has had a series of significant changes in its marketing system, according to LaRue. Prior to the establishment of the electronic auction in 1989, hog prices were determined by bilateral negotiations between individual producers and processors. As in Western Canada, the processing sector was sufficiently concentrated to cause price distortions. It is common knowledge that larger producers were getting higher prices. Smaller producers located farther away from processing firms were clearly disadvantaged and lobbied hard for changes. A marketing board plan was imposed in 1977, but subsequent legal battles kept the marketing board from becoming operational. Producers, millers, and processors finally fine-tuned the proposal of a single desk selling agency that would operate an electronic auction. After years of struggle, producers and processors participated in the first auction in March of 1989.

Since 1989 to the present, all hogs produced in Québec must be sold through the selling desk, even hogs produced in facilities owned by processors. Auctions are conducted every day of the week. Producers call the selling desk prior to 9:00 A.M. to indicate how many hogs they want to market on any given day. They must also state to which slaughterhouse they intend to deliver, and provide the time and size of their deliveries.

Between March of 1989 and June of 1995, the auction was of the Dutch type. Asking price bids were descending until a bidder signaled an intention to buy. In 1995, the descending/Dutch auction was replaced by a descending/ascending auction. In this system, as in the previous one, the asking price goes down every three seconds by \$0.20/100 kg. until a buyer signals an intention to buy. The difference is that other buyers then have 3 seconds to bid up by \$0.10/100 kg. The minimum bid to remain unchallenged is the winning bid.

After complaints by producers that they were not getting fair prices from the auction and by some processors who were not satisfied with the uncertainty surrounding their supply of hogs, the selling desk and the processors decided to change the marketing system. They now have a hybrid system in which part of the hogs are pre-arranged to be delivered to slaughterhouses at a negotiated price, while the remainder is sold on the auction. From January 1996 to until very recently, 72 percent of the hog deliveries were pre-arranged, with prices linked to the weighted average of four U.S. prices (i.e., Illinois, Indiana, Iowa-Southern Minnesota, and Ohio).

The processing sector got even more concentrated in March of 1991 with the merger of the two largest firms to form a giant with 75-80 percent of Québec's hog slaughter. Its share of the business recently tumbled to 58 percent, and is now totally under the control of producer cooperative *Coopérative Fédérée*.

On the production side, the sector remains fairly vertically integrated since ten feed mills control about 50 percent of the production. The Québec hog marketing system is entering a new phase in which pre-arranged contract deliveries are to be reduced from 72

to 60 percent and from 60 to 55 percent starting in January of 2001. The share sold on the auction is to drop from 28 to 25 percent (of the total supply of hogs to be marketed in a given week). The novelty is that 15 percent (20 percent starting in January of 2001) of the average weekly number of hogs slaughtered during the last three months will be sold through contracts awarded through an auction. Initially, the contracts will offer guaranteed one-month supplies but this might change in the near future.

Canadian Beef Sector

Canadian beef cattle procurement trends have followed those in the U.S., though more slowly. The acquisition of major plants in Western Canada by U.S. packers in the last 10 years may have played a role in those changes. Ten years ago, little volume was handled outside the spot market, as no futures market existed in Canada to facilitate some forms of contracting. Over three-fourths of Canadian cattle are produced in Alberta. In 1999, 68 percent of Alberta cattle were purchased on the spot market, 6 percent by forward contract, 11 percent by formula price arrangements involving grade and yield grid pricing. Fifteen percent were packer owned, partly in packer feed lots, partly in custom feedlots (CanFax survey). Thus, Canada's vertical market linkages are similar to the U.S., though with slightly more packer feeding.

Australian Beef Sector

The Australian beef sector is a major competitor in international markets, marketing 63 percent of its beef abroad. Australia is the primary competitor for the U.S. in Asian markets, and is a significant supplier of boneless beef in the United States. While most of their beef is grass fed, 15 to 20 percent of the cattle is grain fed, supplying 25 percent of all beef produced.

While there are no comprehensive studies available, industry organization representatives estimate that 50 to 60 percent of feedlot cattle is contracted in advance. A number of packers also offer contracts 90 to 120 days in advance for grain fed cattle. In some cases these contracts are minimum price, but with sharing of higher prices, i.e. if cash prices go up by 10 cents, the cattle supplier will receive an additional 5 cents.

Another 25 percent of grain fed cattle is fed in packer-owned facilities, especially to serve Japanese markets. A small percentage is retained ownership by cattle producers, custom slaughtered and sold directly to retailers or sold under the producer's brand.

Approximately 80 percent of Australian beef marketed through retail stores, which is half domestic consumption, is contracted in advance by cattle producers or feedlots directly with the retail chains (or indirectly through custom processors). The retail chains have the greatest market power in the Australian meat industry. Many packers are primarily slaughter only, often small multi-species operations, with custom-kill contracts with retail chains.

Some supermarkets have formal relationships with feedlot operators, who in turn have relationship with producers. The feedlots feed on a custom basis and the cattle are supplied directly to the supermarket (retailer) as part of the feedlot's supply contract. The feedlots will buy cattle themselves to fill supply if they cannot draw enough numbers from their regular producer base. The supermarkets use the lot feeders as supply managers, but they also acquire additional cattle on the cash market.

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Section VI: Pork Packer Survey Results

Dramatic changes are taking place in the way pork packers procure hogs from producers. In 1993, 87 percent of slaughter hogs were purchased in the cash market (Rhodes, Grimes, Hayenga, and Lawrence). By early 2000, it was estimated that this number has fallen to 25 percent (Grimes and Meyer). Leading pork packers were surveyed to better understand the types of procurement practices used by packers and the motivations for evolving away from cash market transactions. Thirteen of the nation's largest pork processors were surveyed in April, 2000 regarding their procurement and merchandising activity for 1999. These processors were telephoned, asked to participate in the study, and were faxed a survey form. Eleven of the 13 processors completed the survey and returned it. Processors answered the questions based either on calendar year 1999 actual results or with adjustments reflecting recent acquisitions and practices. Drawing upon the survey results and other public information, future trends are also considered.

Packer Purchasing Arrangements

Collectively, the 11 responding firms accounted for 77 percent of the 101 million hogs processed in 1999. These firms report purchasing 27 percent of the hogs they bought for processing in the cash market in 1999¹ (Table 1). Formula agreements based on the cash market represented 32 percent of the purchases. Agreements with some type of risk management or cash flow smoothing feature accounted for approximately 22 percent of the purchases. While modest changes in procurement methods are expected by 2004, recent trends are expected to continue. In 1996 these packers bought 59 percent of their hogs on the open market. This figure fell to below 30 percent in 1999 and is expected to decline more by 2004 resulting in a smaller cash market as more hogs will be purchased on formula-priced contracts.

The packers surveyed also produced hogs for their own plants, and in some cases for competitors. The survey respondents produced the equivalent of approximately 17 percent of 1999 U.S. hog slaughter, and 22 percent of their slaughter volume. But, 21 percent of the hogs produced by a packer or its subsidiary were processed by a competing packer. So the volume of their own hogs going through their slaughter plants was

¹ Grimes and Meyer reported slightly lower cash market reliance, based on a smaller set of respondents, adding their estimates of three non-respondents' purchasing practices, and including some transfer price systems from hog-producing subsidiaries in their calculations. In our survey, some packers also may have reported the transfer price method for hogs produced within the company or by a subsidiary, and reported them as self-produced.

Table 1. Hog Procurement Methods, 1999

Procurement Method	Percent
Cash market purchase, live basis	8.0
Cash market purchase, carcass basis	18.8
Formula-priced contract based on cash market	32.3
Fixed price contract based on futures	8.3
Fixed agreement based on feed price	5.7
Formula contract with window	7.9
Other purchase methods	1.4
Self production	17.7
Total	100.1

approximately 18 percent of their slaughter (as of Spring 2000). Some production units are not located near a company owned packing plant, or are operated as separate profit centers making their independent marketing decisions, or are operating under pre-existing contracts with others. The smaller number of packers responding to questions about the future expected to produce over 10 percent more hogs in 2004 than they do currently and process a higher percentage of their hogs in their plants.

Motivations

Motivations for the use of long-term marketing agreements were driven primarily by their need for a consistent supply of quality hogs and higher quality hogs (Table 2). The ability to assure food safety was rated next most important receiving a ranking of 3.8 on a 5-point scale. Reducing plant operating expenses, search cost for hogs, and week-to-week supply/price risk all rated 3.5. Long run price risk management (3.0) and the ability to purchase hogs at lower prices (2.3) rated considerably below quality issues. All motivations for contracting (except buying hogs at lower prices) are expected to become more important by 2004.

Self-production of hogs by packers had slightly different motivations. In general, ensuring pork quality and safety, plant efficiency, and long run price risk management were higher-ranked reasons for self-production than for marketing contracts. Producing hogs was rated lower on both week-to-week supply management and on lower price of hogs. Packers admit that they do not lower the cost of hogs processed by producing them, and place only moderate importance on profits that can be captured by producing hogs. The ability to secure consistently safe, high quality hogs is more important to packers than are efficiency and price considerations.

In an open-ended question about the driving forces toward tighter coordination, packers added another important element to the quality, consistency, and food safety list. Over half of the packers identified the demand by producers as the driving force for packers offering and entering into more long-term contracts. Producers' reasons for

Table 2. Motivation for Increased Coordination of the Pork Supply Chain, 1999^a

	Marketing Agreement	Hog Production
Reduce plant operating costs by improving plant scheduling	3.5	4.0
Secure higher quality hogs	4.0	4.4
Secure more consistent quality of hogs	4.3	4.6
Assure food safety	3.8	4.3
Long run price risk management	3.0	3.3
Week-to-week supply/price management	3.5	3.1
Reduce costs of searching for hogs to procure	3.5	3.6
Able to purchase hogs for lower price	2.3	1.9
Capture profits from hog production		3.2

^aScale of 1 to 5, 1=not important to 5=very important

wanting an ongoing relationship were reportedly to assure market access, share information about consumer concerns and to secure financing for their operations. Packers also noted that knowing where their supplies were coming from and their likely quality allowed them to enter into agreements with customers that were requesting longer term arrangements for higher quality products. They asserted that they could not rely on suppliers in the cash market to change fast enough to meet their needs.

Packers also identified the perceived benefits of marketing and production contracts for producers, based upon their interaction with them. Access to capital was seen as the greatest benefit to producers of marketing agreements (rating 4.6 out of 5). Reduced price risk (3.9), securing a market outlet (3.8), ability to sell hogs at a higher price (3.6), and the ability to secure a quality matrix (3.4) were the next most important benefits to producer. While the higher price rationale was clearly evident based on experience under contracts, especially risk sharing contracts in 1998 and 1999 when cash market prices were lower than some contract prices, new marketing contract offerings reflecting recent experience will likely have lower prices in 2000. Benefits to producers of production contracts were identified as increasing access to capital and reducing financial risk (both received 4.7 out of a 5-point scale) followed by increased producer income at 4.5.

Pork merchandising

In 1999, the packers responding (with less than half of U.S. slaughter²) sold 72 percent of their pork on the cash market for delivery within 21 days (Table 3). Approximately 22.5 percent of sales was sold on a forward or formula price contract for delivery in the future, and 6 percent was sold on a long term agreement not tied to the cash market. These relative shares are expected to change dramatically by 2004 given the changes in pork merchandising. Several packers either have or are beginning to establish their own branded pork programs, or are forming exclusive supplier arrangements with retailers. Cash market sales are expected to fall by more than half and forward pricing will grow to

² Fewer packers (7) responded to questions regarding current and future merchandising methods and motivations.

a larger share of the market. Long term agreements not tied to the cash market are expected to double as well.

Table 3. Pork Marketing Methods, Share of Total Sales, 1999

	Percent
Cash market delivery within 21 days	71.6
Forward fixed price agreement for delivery beyond 21 days	9.9
Forward formula price agreement based on current cash market	12.5
Long run agreement basis not on cash market	6.1

The largest single market for pork today is pork for further processing, representing 37.5 percent of 1999 sales (Table 4). These products may become branded lunch meats, further processed products under the processor or retail label, or further processed products going into food service or export markets. Branded programs by packers, a rapidly growing market segment, make up 18 percent of the current market volume.

By 2004 branded programs will represent an even larger share of pork sold. These pork products must carry a higher degree of brand reputation and liability and demand higher standards to consistently satisfy end-user expectations. Within the branded products there is expected to be a switch from further processing by other companies to one of branded retail and food service pork items by packers.

Table 4. Percent of pork sales by category, 1999

	Percent
Retail grocery non-branded commodity sales	14.2
Retail grocery branded value-added products	14.2
Food service non-branded commodity sales	7.8
Food service branded value added products	2.3
Sold to domestic processor for further processing	37.5
Export non-branded commodity sales	6.3
Export branded value added sales	1.7
Wholesaler or broker	11.7
Other	4.5

Thus, the motivation for increased coordination of the pork supply chain has been driven primarily by the need for increased quality control and consistency in the hogs procured to meet rising demands from pork buyers and ultimately the final consumers. Packers report a higher level of quality and consistency from hogs under contract or self-produced compared to those purchased on the cash market.

Coordination advantages

Packers had a difficult time quantifying the cost and returns advantages from hog production or marketing contracts. However, half of the packers responding noted that they reduced the number of buying stations and procurement staff as they increased the

level of coordination. In some cases, the associated cost savings have been dramatic, reducing the number of buyers 10-20 percent and the number of buying stations by as much as half. At the same time the quality of the hogs increased. Several noted that the lean percentage of the hogs increased (in the range of 1.8 to 2.6 percent on average) and cutting and processing yields improved significantly. These answers are consistent with their earlier responses that the value of coordination was in product quality, consistency and safety more so than plant efficiency or lower priced hogs.

Packers were asked what they thought the impact would be if packer ownership and/or agreements offering packer control of hogs are abolished. They indicated that customers and producers would not be able to get the benefits described earlier. Packers would have a difficult time enforcing the food safety and quality control measures that they have implemented via managing their own production or by contract supply agreements. One packer responded that coordinated systems that have evolved in the U.S. in response to consumer requests would emerge offshore if banned in this country. Some commented that slaughter capacity would decline because packers are not willing to maintain their large investments without a predictable supply of hogs. A couple of firms said they would not exist without their current arrangements and would go out of business. Most were uncertain about the price impact of ending such practices, but added that revoking existing agreements would penalize progressive producers who have aligned themselves with a processor.

Conclusions

Hog procurement practices are expected to continue to evolve toward tighter coordination systems in order to satisfy pork retailers and final consumers for consistently high quality, safe pork products. More demanding consumers are encouraging more branded retail and food service products that entail both brand loyalty and product liability. Packers report success in acquiring leaner, higher yielding hogs through coordinated systems than are generally available through traditional cash market channels. Packers report that hogs they produce themselves address the concerns of quality, consistency and safety as well or better than market contract hogs produced by others. While capturing the profits in the production sector, packers admit that their own hogs are not lower cost than hogs from producers. It appears that the increased quality control afforded the integrated packer is sufficient to offset possible higher costs of producing their own hogs.

From the other end of the pork chain, producers are asking for marketing agreements in order to secure financing to continue in hog production or to expand, and for purchasing programs that reward leaner higher yielding hogs. Many producers are reluctant to adopt new technologies and invest in new facilities and genetics without a formal arrangement to market output. In an increasingly risky agricultural market place, long-term marketing agreements are a private sector response to a particular wide-spread problem – producing without a place to sell.

Section VII: Beef Packer Survey Results

Fifteen of the largest U.S. beef packers were surveyed during April 2000. The purpose of the survey was to obtain information regarding beef packer cattle procurement and beef marketing practices, and perceptions of gains or losses from changes in vertical linkages with cattle producers.

Firms were initially contacted via telephone to request their cooperation in completing the surveys. Survey forms were sent to firms via fax, followed by telephone calls and/or follow-up faxes to encourage completion. Ten of the 15 beef packing firms provided completed survey responses. The survey respondents collectively represented approximately 72 percent of 1999 cattle slaughter, though some respondents did not answer some questions.

Cattle Procurement

Cattle procurement practices are evolving from live cattle cash market purchases to more long term contractual and/or value based grid purchase, yet negotiated cash market pricing arrangements are dominant. Only 5 percent of cattle slaughtered by survey respondents were owned by them and fed in their own lots or by other cattle feeders, little changed over the last 15 years.

In 1999, survey respondents reported 36 percent of cattle were purchased on the cash market on a live weight basis, and 29 percent on a carcass weight or grid (carcass merit) basis (Table 1). Thus, approximately two-thirds of cattle slaughtered were cash market acquisitions.

Long term (more than 14 days) formula-priced contracts linked to cash market (live cattle or wholesale beef prices reported by USDA, plant cost averages, or retail beef prices) or futures market prices accounted for 20 percent of 1999 purchases. Four percent of cattle purchased were via short-term contract arrangements based on the Chicago Mercantile Exchange (basis contracts, or fixed price based on futures market prices, with deliveries typically several months in the future). Three percent of the cattle were acquired under risk and profit-sharing marketing contract arrangements with cattle feeders (but were not owned by packers while in the feedlot).

Grid or carcass merit pricing is clearly increasing in the fed cattle market. Cash market purchases by packer buyers are based on their expectations of likely carcass quality. However, there are still a large number of cattle feeders who sell their entire group of pens (perhaps with several owners in custom feedlots) at the same live or carcass price, allowing little distinction for quality on a lot-by-lot let alone carcass-by-carcass basis. Cash market purchases based on carcass merit are increasing in the cash and contract

markets. In 1999, at least 35 percent of cattle purchased on contract or in the cash market were priced based on carcass merit (some packers did not break that out in their responses). Most cattle fed by packers were also transferred to their packing operations based on carcass merit.

Table 1. Percentage of Cattle Procured via Various Methods, 1999

Purchase method	Percentage
Cash market purchases on live weight basis	36
Cash market purchases on a carcass-weight or grid basis	29
Formula-priced contract purchases based on a reported live cash market, reported dressed price, plant average, CME cattle futures price, quoted boxed beef or retail beef price	20
Packer-fed cattle	5
Fixed price or basis contract purchases based on CME futures	4
Risk-sharing contract purchases	3
Other purchases	4

Packers were queried regarding the importance of specific reasons they and cattle producers enter into contracts and marketing agreements. The two most important reasons cited by packers to enter into contracts and marketing agreements with cattle producers were to “secure higher quality cattle,” and to “secure more consistent quality cattle” (Table 2). Both of these responses had an average score of 4.0 with 1 being *not important* to 5 being *very important*. Interestingly, these were the most important both in 1999 and expected to be most important (and even more important at 4.2) in 2004. Improving risk management, reducing plant operating costs by improving slaughter plant capacity utilization rates, and assuring food safety were the next most important reasons (average scores of 2.8 to 3.0 in 1999). All three also are becoming increasingly more important, with food safety at 3.7 and plant operating efficiency at 3.5 ratings in 2004 by packers. The low importance (average score of 1.8) attached to the assertion that contracts enabled packers to purchase cattle for a lower price may be because contracts and agreements do not enable packers to lower prices paid for cattle, as shown in recent USDA-sponsored studies described earlier. Securing cattle quality and quantity needs are the primary factors motivating beef packer use of contracts and marketing agreements with cattle producers.¹

Packers perceived producers’ primary incentives to enter into contracts and marketing agreements were to secure a quality premium/discount matrix followed by enabling producers to obtain a higher price for cattle (Table 3). Packers felt that in the next five

¹ In an open-ended question, survey respondents indicated important forces causing a reduction over time in the percentage of cattle being purchased in the cash market included: efficiencies gained by aligning producers and packers; increased needs for consistent supplies necessary for branded beef programs and operational efficiency; to better meet changing beef customer demands; and concerns over losing cattle to competitors.

years producers would benefit from marketing agreements primarily because of these same reasons and to enable producers to obtain detailed carcass data.

Table 2. Packer Survey Responses of Importance of Contract and Marketing Agreement Incentives to Beef Packers^a

Importance to Packers	1999 Average	2004 Expected Average
Reduce plant operating costs due to improved slaughter plant capacity utilization	2.9	3.5
Secure higher quality cattle	4.0	4.2
Secure more consistent quality of cattle	4.0	4.2
Assure food safety	3.0	3.7
Improve long run price risk management	2.8	3.1
Improve week-to-week supply/price management	2.2	2.9
Reduce costs of searching for cattle to procure	2.3	2.4
Able to purchase cattle for lower price	1.8	1.8

^a Scale of 1 to 5, 1=not important to 5=very important.

Table 3. Packer Survey Responses of Importance of Contract and Marketing Agreement Incentives to Cattle Producers^a

Importance for Producers	1999 Average	2004 expected Average
Secure a buyer for cattle	2.6	2.8
Secure a quality premium/discount	4.0	4.0
Reduce price risk	3.3	3.3
Reduce costs of searching for a cattle buyer	2.4	2.8
Able to sell cattle for higher price	3.8	3.8
Easy to get loans	3.1	3.4
Provide detailed carcass data	3.4	3.6

^a Scale of 1 to 5, 1=not important to 5=very important.

Beef Merchandising

The largest customers for beef from packers are retail grocery chains, wholesalers and domestic processors that account for 71 percent of survey respondents' 1999 beef sales. Export and food service customers each accounted for approximately 10 percent of sales (Table 4). Only four percent of packer sales were branded beef products, well below their pork and poultry competitors. Cash marketing dominated beef sales with 70 percent marketed in the cash market (Table 5). Forward contracting and marketing agreements represented 20 percent of respondent beef sales in 1999.

Not all survey responses were complete regarding future trends in merchandising. Nonetheless, available responses combined with other public information suggest there will be substantial growth in branded merchandising programs in all major market seg-

ments, with much more reliance on long term contracts with customers. We expect that price list, formula and fixed price arrangements will grow, while cash market links will decline substantially in importance.

Table 4. Beef Marketing Practices in 1999, Volume -Weighted Responses

Representative Sales Percentage to:	Percentage
Retail grocery non-branded commodity sales	28
Retail grocery branded value-added products	2
Food service non-branded commodity sales	8
Food service branded value added products	1
Sold to domestic processor for further processing	19
Export non-branded commodity sales	9
Export branded value added sales	1
Wholesaler or broker	22
Other	11

Table 5. Beef Sales Methods in 1999, Volume -Weighted Average Responses

Sales Method Percentage	Percentage
Cash market sales with delivery within 21 days	70
Forward fixed price contract for delivery beyond 21 days	9
Forward formula price contract priced off current cash market	8
Long run agreement basis not on cash market	3
Packer sets price and takes orders	7
Packer bids for sales (bid-acceptance)	3

Summary and Implications

The beef packer survey found that cash market arrangements are declining in the fed cattle and the wholesale beef markets. The longer term arrangements necessary to satisfy branded merchandising programs and more demanding customers are likely to shift purchasing arrangements to more value-based pricing arrangements with cattle feeders.

Packers indicate contracting and marketing agreements are important for them to secure consistent high quality cattle. They also expect increasing importance over time of such marketing arrangements to help assure food safety and continue to run packing plants at efficient capacity utilization levels. Beef packers indicate the most important reason for cattle producers to contract and participate in marketing agreements is to sell their cattle based on quality premium/discount selling grids, and increase prices received for cattle.

Value-added, branded grocery and food service beef products will likely represent an increasing percentage of volume. Packers are likely to reduce cash marketing and increase long term contracting and marketing agreements with customers. Packers will

have increased incentive to secure quality beef from producers in advance of slaughter to supply product for value-added branded product marketing agreements.

What would the loss of packer-feeding and contract arrangements do? In the extreme, packers in fringe production areas may close. They indicate costs of operation would increase substantially without supply assurances. Most others would be unable to capture the benefits from improved quality and efficiency, which are sometimes intangible benefits that are difficult to quantify. Cattle producers who now appear to be capturing part of those benefits in the form of higher prices for contract cattle, based on studies reported earlier, would lose the reduced risk and higher payoffs for value received from contracts. Customers would be unable to capture any benefits from improved quality, new products, and merchandising innovations that require lower supply or quality risk. Cash markets would be larger in volume, value-added pricing would probably grow (but at a slower pace) to compensate for contract loss, and higher risks would be prevalent in the industry. With little packer-feeding now or likely in the future, and only a moderate volume of cattle under long-term contracts, eliminating these arrangements would be unlikely to significantly improve the ability of independent cattle feeders to be competitive in the beef industry.

Section VIII: Meat Merchandiser and Processor Survey Results

This section examines whether the consumer or the immediate customer of meat packers and processors is or will be the driving force toward more tightly linked production and marketing system for beef and pork. To address this issue, we designed a survey asking the leading companies who serve customers for beef and pork about the willingness of the consumer or the merchandiser serving the consumer to pay for some of the changing demands expected in the marketplace. We faxed surveys to 18 leading importers, meat processors, food retailers, and food service companies. We received a 50 percent response rate (nine usable responses, 2 or 3 from each type of customer). Some of the questions asked these experts to represent their consumers and some treated the firms themselves as consumers.

The Framework of the Survey

The questions we pose in the survey are based on two extreme versions of the U.S. meat chain. One version is a pure commodity market where packers and processors commingle product from many suppliers. In this world, it is difficult for the chain to create differentiated products, and little branding is done. The anonymity of the commodity system also allows some producers to skimp on product quality, and signals about consumer tastes are passed to producers using the very blunt instrument of commodity prices. Each individual in this system faces both input and output price risk. The commodity system puts enormous pressures on costs and takes advantage of economies of scale in packing and processing.

The alternative system is one where "integration" (by contract or ownership linkages) has occurred and full traceback of product and process is possible. This allows creation of branded, differentiated products. The direct link between consumers and producers in this system allows signals about quality and tastes to be transferred to producers and allows some firms to create valuable brand names. The lack of anonymity in this system encourages all participants to behave responsibly because the consumers (and their lawyers) can identify and punish those who behave irresponsibly. This system can be coordinated so that plants run at optimal capacity, but the scale of each facility is necessarily smaller because of the multitude of branded products. Firms in this system face additional costs as they attempt to market branded products, and the costs of coordinating all parties can be relatively high because they have to serve more functions more effectively than if they were solely linked by markets.

The basic question we ask in the survey is this: Is the consumer willing to bear the additional costs associated with the integrated system, in return for the benefits such a system would bring?

Results of the Survey

We asked whether the merchandising firm itself would be willing to pay all of the costs of integration even if the ultimate consumer would not contribute. Of the firms responding, about half said they would not be capable of bearing all of these costs, while almost as many said that they would. The logic behind the latter response was provided by manager of a valuable processed meat brand who was prepared to bear all costs associated with identity preservation--they need to identify those farmers who left broken needles in the live animal and created a food safety and brand image problem for the company.

Importance of product quality

One set of questions asked for measures of importance for some of the attributes that might be improved under a more integrated system. We asked that they answer these questions under today's market conditions and under those that they anticipated in 2005.

The average answers from all nine responses are presented in Table 1 below.

Table 1. Product Quality Importance Measures

Consumer Issues	During 2000					Expect in 2005				
<i>Please rate the importance of the following as an inducement to your firm to participate in marketing arrangements with your suppliers (circle appropriate rating)</i>	<i>1=Not important to 5=very important</i>					<i>1=Not important to 5=very important</i>				
Reduced fat	1	2	3	4	5	1	2	3	4	5
Improved taste/tenderness	1	2	3	4	5	1	2	3	4	5
More consistent quality	1	2	3	4	5	1	2	3	4	5
Food safety guarantees	1	2	3	4	5	1	2	3	4	5
More uniform portion sizes	1	2	3	4	5	1	2	3	4	5
Maintaining a lower price	1	2	3	4	5	1	2	3	4	5
Avoiding out of stock, or zero inventory situations	1	2	3	4	5	1	2	3	4	5
Improved packaging/marketing appearance	1	2	3	4	5	1	2	3	4	5

The results emphasize the importance of quality to these respondents. All of the quality criteria were deemed of average or great importance. Taste and tenderness, consistency, food safety, and inventory management were ranked as highly as price under current market conditions. In general most of the respondents increased the ranking for most of the quality measures by one full point as they anticipated market conditions in 2005. Note that the rankings for consistency and safety in 2005 were greater than those for price.

Importance of marketing arrangements

Another set of questions asked about the importance of marketing arrangements to the firm itself. These questions touched on issues of coordination, risk management, and pricing, and are presented in Table 2 below.

Table 2. Firm Coordination Importance Measures

Organizational Issues	During 2000					Expect in 2005				
<i>Please rate the importance of the following as an inducement to your firm to participate in marketing arrangements with your suppliers (circle appropriate rating)</i>	<i>1=not important to 5=very important</i>					<i>1=not important to 5=very important</i>				
Improve scheduling/operational efficiency	1	2	3	4	5	1	2	3	4	5
Long run price risk management	1	2	3	4	5	1	2	3	4	5
Inventory management	1	2	3	4	5	1	2	3	4	5
Reduced costs of searching for meat to procure	1	2	3	4	5	1	2	3	4	5
Able to purchase meat for a lower price	1	2	3	4	5	1	2	3	4	5
Timely shipment patterns, stable flows and just in time deliveries	1	2	3	4	5	1	2	3	4	5
Tighter more stringent specifications	1	2	3	4	5	1	2	3	4	5

The results suggest that organizational issues are of great importance with most of the responses equal to 4 or 5 on a five-point scale. The results suggest that price continues to be of great importance, but that coordination, particularly as it influences inventory management, is of equal importance.

Consumer willingness to pay

The importance measures described above are difficult to aggregate in a meaningful way. To some respondents the term ‘very important’ means that the issue is critical to business success, but to others all variables of some importance are of great importance. To pin down these differences in a way that can be directly compared across respondents and questions, we asked for the dollar values they would place on some of the attributes. These responses are summarized in Tables 3 to 7 below.

How much might the ultimate consumer be willing to pay (in cents per pound) for some selected quality attributes? The results are presented for today’s marketplace and for the anticipated marketplace in 2005 in Table 3.

Table 3. Monetary Value of Some Quality Attributes

Quality Attributes	During 2000	Expect in 2005
<i>A more integrated system might allow the meat chain to deliver a wider range of quality attributes to customers provided that they are willing to pay a premium for customized quality traits. Listed below are some quality traits that might be influenced by integration. Please provide your estimate of the willingness of your average customer to pay a premium for each of these traits</i>	<i>Please provide your best estimate as to the maximum amount your typical consumer would pay for each of the following attributes on a cents per pound basis</i>	<i>Please provide your best estimate as to the maximum amount your typical consumer would pay for each of the following attributes on a cents per pound basis</i>
Current research shows that about 20 percent of meat is too tough to enjoy. What do you think your customers would pay for a branded range of products that was guaranteed to have less than 2 percent tough meat?	1.44	2.24
A branded range of products with consistent muscle size and predictable portions.	1.94	2.81
A branded range with a specified degree of intramuscular fat (marbling).	2.20	3.1
A branded range of products that is guaranteed to have a minimum amount of exterior fat.	1.39	2.10
Please list other quality attributes and the value of each to your typical consumer.	.50	.50

These responses suggest that by 2005 the average consumer will be willing to pay two to three cents per pound for a range of quality traits. A branded product with a minimum amount of exterior fat, a specified degree of marbling and a tenderness guarantee would be worth more than six cents per pound more than a commodity product.¹

Food safety issues

The next set of questions focused on food safety. Table 4 shows the monetary values for meat that is guaranteed to be free of some of the most troublesome food borne pathogens, an increasingly important issue in the meat industry.

¹ Respondents were asked to value each attribute individually. We summarize the results simply assuming that the values for two or more attributes are additive, though we realize that there may be added value for customers where attributes are synergistic, and reduced value where there is some degree of substitutability among two or more attributes.

Table 4. Monetary Value of Food Safety

Food Safety Attributes	During 2000 Cents per pound	Expected 2004 Cents per pound
<i>The next three questions ask you to put a monetary value on improvements to the safety of the meat you sell.</i>		
A branded range of products guaranteed to be free of E Coli	2.61	4.0
A branded range of products guaranteed to be free of Trichina	.72	1.06
A branded range of products guaranteed to be free of Salmonella	1.75	2.13

These results indicate that E Coli is important today, and that it will continue to be important in the future. A range of products with a guarantee against all food borne pathogens might be worth as much as seven cents per pound more than a commodity product in 2005.

Marketing issues

Some of the premiums that exist in branded markets are due more to successful advertising and marketing than to true differences in product quality. The next set of questions explores whether the meat chain might ever reward advertising that was based on subjective characteristics such as packaging and color.

Table 5. Monetary Value of Subjective Attributes

Marketing Issues	During 2000 Cents per pound	Expected 2004 Cents per pound
<i>Certain product features are not measurable, yet may add value to meat products for some consumers. Please let us know how much more your average consumer would be willing to pay for the following attributes.</i>		
A colorful label supported by nationwide advertising	.81	1.28
A picture of the actual farm that grew the animal	.22	.44
A picture of the individual farmer (farm family) that grew the animal	.22	.39
An attractive package designed to compliment the product	.64	1.31
A package designed for gift giving	3.09	3.75

The results suggest that the meat chain has an immediate and future need for attractive packaging. A well-packaged product could command as much a seven-cents-per-pound in premium. This type of package is unlikely to evolve at the meat counter of indi-

vidual stores because the set up costs and marketing required for a successful product launch are high. It also seems less likely that attractive packaging will evolve so long as meat is co-mingled and undifferentiated.

Legal issues

As mentioned above, an integrated meat system would remove the anonymity that exists in the current system. If this anonymity were removed, then firms at all segments of the chain would realize that problems caused by poor quality control could eventually be traced back to the offending party. This might in turn create an incentive for these firms to improve. The next set of questions is designed to measure the potential importance of a traceback mechanism that moved product liability to the party responsible for the problem.

Table 6. Monetary Value of Traceback Mechanism

Legal Issues	During 2000 Cents per pound	Expected 2004 Cents per pound
In your opinion how much would it be worth today to the US beef and pork chains to be able to trace-back food safety incidents to the firm that created the problem? Please take into account the incentive that each person in the system would have to minimize these legal problems.	2.33	3.0
How much would consumers be willing to pay to buy a product that could be traced back through each step of the system?	.97	1.36

The payoff for traceback is perceived to be much greater for firms in the chain than for consumers, perhaps because of the liability issues that have proven to be extremely expensive for some firms in the meat industry, and the expanded use of costly-to-introduce branded product merchandising programs. More importance is expected in the future.

Niche market opportunities

The final set of questions asks about niche market opportunities. We ask for an estimate of the size of the market segment and the willingness of customers in that segment to pay for certain attributes. The results suggest that sizable market niches exist for hormone free animals and for animal friendly production practices. These responses do not reflect the views of customers in the European Union but that they do include responses from individuals with expertise in Japan and South Korea.

It is unclear whether the premiums that are presented in Table 7 are enough to cover the costs associated with each system. Hormone-free and animal rights-related product claims gather the largest potential consumer groups from this small sample of domestic

and international customers. However, it is clear that these markets cannot be satisfied by product from a commodity system with continued anonymity.

Table 7. Niche Market Potential

Niche Markets	Size of Market Segment (Percent)	Willingness to Pay (Cents per pound)
<i>Some product attributes are of value to a subgroup of consumers. Please let us know the size of the likely subgroup and the willingness of the typical member of the subgroup to pay for each of the following characteristics.</i>		
Animal friendly production practices	15	3.14
Hormone free production practices	20	3.94
Animals produced without feed grade antibiotics	6	1.25
Animals produced in a way that is viewed as being friendly to the environment	17	1.17

Conclusions

The results presented above are from a small set of well-regarded experts. These results indicate that the consumers of beef and pork are willing to pay an additional 20 to 30 cents per pound for meat from a system of production that results in a branded, customized product. The results also suggest that this premium will grow over the next five years. Evident, too, from the results is the value consumers place on food safety and the ability to trace product to the point of origin. A potential market for attractively packaged products is also suggested here. The results also indicate that a group of consumers is willing to pay more for products from hormone-free and other animal-friendly environments. This added value to beef and pork products cannot be captured without innovative vertical linkages throughout the beef and pork production, processing, and merchandising system. That perceived value, as it increases in the future, serves as an increasingly important driving force in the industry reorganization which is now underway and very likely to continue.

Section IX: Overview and Implications of Changes in Beef and Pork Sector Vertical Linkages

The issue of packer ownership and control of livestock should be examined in the context of other agricultural industries here in the U.S. and in competing countries. Current industry linkages among meat packers and livestock producers (or production) are similar to the linkages found in most other commodity sectors in the United States.

The Extent of Contracting and Vertical Integration

With the exception of farmer cooperatives, vertical integration is not widespread in agriculture, or in the beef and pork sectors. The largest part of vertical integration in the beef and pork sectors involves livestock producers or producer cooperatives that have entered into processing operations. The Farmland cooperative has large beef and pork operations. Two producer group or producer-packer joint venture plans for beef packing plants have been announced recently.

Recent packer acquisitions of pork producers result in vertical integration and packer production contract volume contributing approximately 20 percent of total pork volume, as long term contracts were converted to ownership links. Some packer involvement in pork production involved building packing and production facilities at the same time in areas outside of typical hog production areas.

Production contracts are widely used in the broiler, egg, pork, and vegetable industries. The bulk of beef and hog production contracts have been between producers in the pork sector, or producers and investors in cattle feeding, with packers seldom involved. Recent packer acquisitions of large-scale hog producers-contractors will increase packer involvement.

Marketing contracts are widely used in agriculture in many commodity sectors. Their use has been dramatically increasing in importance in the last 10 to 15 years to over 50 percent of pork volume, but has only slightly increased in fed cattle sales, now over 20 percent of fed cattle volume.

International competitors have varying degrees of reliance on vertical linkages outside the spot market. In Denmark, farmer cooperatives have dominated the entire packing industry, along with long term one- or two-year marketing contracts for each producer. Canada's pork sector is rapidly breaking away from the marketing boards' auction mechanism, shifting to contract arrangements with packers. Canada's beef industry has over 30 percent of volume under vertical integration, production or marketing contracts with packers. Australia's beef sector (mostly grass-fed beef) has retailers contracting di-

rectly or indirectly with producers; the small feedlot sector is either packer-owned or dominated by marketing contracts with packers, retailers, or exporters.

Implications

There have been some interest groups decrying the shift away from cash markets toward more tightly-linked contract or ownership linkages of livestock production and processing. We consider the economic implications for these forms of industry organization, their benefits and disadvantages, pulling together relevant prior research and the new information from our industry surveys.

Industry perspective

Contract and ownership linkages with agricultural producers and productions have been used for years in many agricultural industries. Contract production is the norm in the broiler industry, the chief competitor for the beef and pork sectors. In that industry, the ownership of several stages of the production and processing system by poultry companies, combined with production contract links to producers, has clearly facilitated improved competitiveness of their products in the meat case, restaurants and export markets. The rapid introduction of new technology, increased process efficiency, reduced risks for processors and producers, rapid new product innovation, and lower consumer prices have been facilitated by the more tightly coordinated vertical industry organization.

The pork industry has dramatically increased contract linkages in the last decade, so the full impacts are still forthcoming. The growth and, sometimes, survival of many moderate and large-scale hog production operations have been aided by the lower risks from their contract arrangements. New plants built in a few locations outside the Corn Belt had to have hog production rapidly increase to make a new plant feasible; contracts or self-production were considered essential. More stringent customer requirements are being added to the usual cyclical needs for better capacity utilization and efficiency, and creating greater demands for the consistent quality and supply offered by contract arrangements.

The beef sector is still dominated by cash market arrangements at all levels of the production sector, which has not been well coordinated. Demand for beef products has declined for most of the last 20 years, as competitors made more progress in efficiency and improved products. Contract links with producers are gradually increasing, and are offering some improvements in plant efficiency in an industry faced with cyclical production. The shift toward more value-based pricing in the cash and contract markets is beginning to sharpen the signals to producers and help solve some of the quality shortcomings in the beef sector. Producer cooperatives have recently become an important competitive factor in the beef packing industry, and producer alliances developing branded products or other affiliations (including joint ventures in packing plants) with packers are growing rapidly.

Packers

Packers are initiating many of these changes in vertical linkages, though they, in turn, are responding to changing customer demands for consistent supply and quality improvements. Poor financial conditions recently in the pork sector have increased the demand for risk-reducing arrangements by many producers and their lenders. To temper the cyclical fluctuations in hog and cattle supplies, self-production or long term contracts by processors do contribute to more consistent and improved product quality, reduced financial risk, and lower costs due to improved plant utilization.

Packers report a higher level of quality and consistency from hogs under contract or self-produced compared to those purchased on the cash market. Some packers noted cost savings, sometimes dramatic, as they increased the level of coordination.

Packers would have a difficult time enforcing their food safety and quality control measures without their own production or contract supply agreements. Slaughter capacity and investments in new product innovations probably would decline because packers are not willing to maintain their large investments without predictable hog supply and quality. A couple of firms said they would not exist without their current supply arrangements and would go out of business.

Contract livestock producers

Most production contracts in the beef and pork industries are not with packers. These contracts offer producers low risk returns for facilities and services provided while feeding the contractors' hogs or cattle. The producer's independence is constrained by the contract, but the tradeoffs must be sufficient for both parties to voluntarily join in the arrangement. When the contract is up for renewal in the pork sector, one issue may be the potential competition available for these contract services, especially in areas where there are few contractors. Since packers and large-scale producers (who do most of the contracting for hogs) both compete for contract producers in many states where packer feeding is not prohibited, this may not become a significant problem. Producer satisfaction with production contracts (usually not with packers) has been quite high in the pork industry. Very little packer feeding in someone else's feedlot is done in the beef industry.

Marketing contracts with packers have grown very rapidly as large and moderate scale producers wanted assured packing plant capacity and the (sometimes) lower risk or better returns offered by the contract. Lenders often are more willing to provide capital for expansion, new facilities or operating loans when producers have a contract. Hog producers with marketing contracts are highly satisfied.

Contracts do provide another market opportunity for the independent producer, especially the young or highly leveraged farmers who might not otherwise be able to be livestock producers.

Independent livestock producers

Some independent producers in the beef and pork sectors voice concerns about their ability to compete with vertically-linked producers or integrated packer-producer operations. The potential efficiencies from these linkages, along with the large size and efficiency of many of the firms involved, may make it tougher for independent producers to remain competitive. Yet, the demands for capital required in integrated operations and in production contracts suggest that many of the packers' operational needs and customers' needs can be met more efficiently with marketing contracts, without the volatile cyclical returns from hog production or cattle feeding. In the beef sector, most commercial feedlot operators are still independent.

Access to markets is an issue for independent hog producers in the Southeast and in fringe production areas where there are very few plants and high contract volumes. Access to markets for cattle feeders may be an issue in fringe production areas where there are few plants. As hog contract volume increases in the Midwest, access could become a problem for independent producers in periods of peak cyclical production if plant capacity limits are reached. Independent producers can continue to be residual suppliers to packers, facing greater risks, especially in times of peak production, but able to capitalize when hogs are in short supply. Or they may have to ensure access to plant capacity by becoming linked to packers by contract (individually or through cooperative efforts), or by buying or building a plant, perhaps as a cooperative or coop-private firm joint venture like the beef plant being organized in Iowa.

As the cash market becomes thinner, economists expect that cash market price volatility might increase due to fewer packers in the cash market when supplies get large or small, and long term contracts keep production from adjusting as quickly to changes in demand and price. Thus, prices might be expected to stay at either high or low levels for a longer period of time. Lower risk for producers under contract may stimulate increased production and lower prices for producers (and consumers) in the long run. The dramatic drop in hog prices in 1998 may have been slightly influenced by contracts in the pork industry. However, the primary reason for the price drop was the poor coordination between production decisions made by producers of all sizes, contract or otherwise, in 1996 and 1997, and packer decisions regarding slaughter plant capacity, which proved to be inadequate during late 1998.

Some independent producers are concerned that their prices are not on a par with marketing contract prices. Cash market hogs and cattle are lower in quality, on average, so there may be legitimate price differences attributable to quality and related value. Beyond that, the few studies available suggest that added values associated with lower purchasing and handling costs for contract hogs or cattle, early plant deliveries, lower supply and quality risk, better utilization of plant labor and equipment, etc., often are passed on to producers in the form of higher prices for the higher value livestock being received.

Customers and consumers

More tightly coordinated systems—offering lower transactions costs, lower risk and increased operating efficiency, and improved access to capital to facilitate industry expansion—should be expected to result in benefits for processors, producers, and consumers. Consumers might be expected to have a higher quality more consistent supply, perhaps at lower cost, as processors are more apt to develop value-added products if raw material supply risk is minimal.

The beef and pork industry is shifting toward a branded, identity-preserved merchandising system, which values product quality, consistency of supply, and food safety. The beef industry has been much slower in this transition than the poultry and pork industries, but rapid growth is expected.

Customers of beef packers indicate that both consumers and the processors and merchandisers of beef and pork products place a reasonably high value on product attributes that can be better achieved through closer coordination arrangements in the entire meat production and merchandising chain. Taste and tenderness, product consistency, food safety, better inventory management, and lower price that might result from a more integrated system were perceived as very important by packers' customers, along with stable, timely shipments and lower price. The introduction of Wal-Mart's logistical demands in the meat and grocery industry may also be fueling the demand for improved coordination systems throughout the meat chain. Products with a guarantee against all food-borne pathogens were perceived as valuable for merchandisers and consumers, and increasing in importance for both. The payoff for traceback in an identity-preserved integrated system is perceived to be much greater for firms in the chain than for consumers, perhaps because of the increasingly important liability issues for branded product merchandisers.

The added value possible from consumers of beef and pork and merchandisers of branded customized product with quality and safety assurances serves as an increasingly important driving force in the industry reorganization now underway. Innovative linkages in the meat chain are necessary for the assurances, the incentive structure, and traceback necessary to capture that added value.

Global market competitiveness of the United States

Contracting and self-production facilitate supply consistency and quality in the United States. These are necessary to keep up with Denmark's tightly linked pork system in international market competition. Canada has low cost feed and substantial and/or growing dependence on contract links in beef and pork, and an excellent pork product reputation in international markets.

Food safety concerns and extremely demanding quality specifications in the Japanese market make contractual assurances in the chain very important in serving our largest export customers. Foregoing the advantages of improved coordination is likely to erode the U.S. competitiveness in international markets.

Price discovery and reporting

As cash markets become thinner due to increased contracting or self-production by packers, fewer hogs and cattle are available for cash market price reporting. These prices probably will still be representative prices reflecting supply and demand, though more care may be necessary in their use or interpretation. For example, the quality composition of those hogs and cattle is likely to gradually change as the higher quality livestock get tied up in contracts, or value-based pricing takes the higher quality livestock out of today's reported cash price. Producers will need to focus on prices for specific quality classes to avoid being misled.

Some producers are concerned about the potential for market manipulation in thinner cash markets. Packers engaging in both contract purchases based on the cash market price might have the incentive to adjust their purchasing behavior in the cash market. Of course, that would require enough market power to achieve success, and little excess capacity among competitors who might not be inclined to let a competitor get lower purchase prices. USDA regulatory agencies have had a number of studies related to this or related issues, and more are ongoing. Nothing illegal has been found to date in these studies or in the courts.

Producers' concerns about packers' use of contract supplies to force cash price down were addressed in several studies that found higher contract cattle deliveries were associated with slightly lower cash prices. Higher quality cattle are involved in contracts, partially explaining some price differences between contract and cash market cattle. Further, feedlot operators with marketing agreements probably are capitalizing on their contract pricing system (where the deliveries next week are priced using this week's price). They see prices dropping this week, and elect to deliver more cattle next week when prices are expected to be lower, but they receive this week's higher price. So feedlot operator decisions may contribute to the observed relationship. Evidence to date has not shown that packers are using their own or contract supplies as a lever to force cash market prices down.

The tradeoffs

These industries and markets are in a state of transition, which creates many stresses on industry members as they begin to feel the consequences of change, try to understand their underlying driving forces, and search for their best response to these economic forces. Cash markets (involving very short-term contracts for immediate delivery) are declining in volume as there is a shift to markets for longer-term contractual linkages that cover many deliveries with one transaction, and provide more guidance to producers to meet changing consumer demands. The demise of terminal and auction markets for market hogs and fed cattle occurred in the last 40 years, accompanied by the rise of more efficient direct purchasing arrangements. The growth of contract linkages (and limited amounts of vertical integration) we are observing in the beef and pork sectors are another stage in the continuing industry organization evolution.

Are the benefits observed from tighter coordination arrangements greater than the potential costs discussed above? Vertical integration by meat packers into pork production has grown recently after a long period of little involvement, and has sparked some controversy. Recent changes have simply replaced one packer's long term contract arrangements with two large hog producers with an ownership link, with little effect otherwise. Beef packers have had a consistently small involvement in cattle feeding. Is vertical integration likely to expand dramatically? We consider it unlikely. While producer and packer profit margins usually have opposite patterns, making a producer-packer combination more stable in profitability, the extremely large capital requirements (and some state laws against corporate farming) and volatile hog and cattle production profits make it unlikely that vertical integration will take over either sector.

Contracting is slowly growing in the beef sector, and is likely to increase as branded merchandising programs, export customer demands, and food safety issues push packers into more closely aligned relationships with customers and suppliers. The dramatic increase in contract relationships in the pork sector is a product of similar forces, plus the increasing demand for contract assurances, sometimes risk sharing, from producers needing financing, plant access, and higher prices or more assured cash flow. Both beef and pork contract relationships seem likely to expand, though probably much more slowly than the dramatic increase in the pork sector during the last decade.

Thinner cash markets are a clear consequence, though not necessarily problematic if a sufficient number of trades continue, and increased reporting will occur as a consequence of recent mandatory reporting legislation. Regulatory authorities monitoring market behavior have subpoena power to follow up any perceived irregularities. Packers' use of contract supplies has not been shown to push prices down, as alleged; feedlot operators' contract delivery behavior may be contributing to the low price-high captive supply relationships observed in a few studies.

Market access for independent growers or processors may become more difficult as contract linkages increase, primarily in the pork sector. Access may be more risky in times of cyclically high production for producers, and low production for packers. When contracting reaches very high levels, independent growers may need to forge alliances with other growers or independently link with packers to remain competitive. In the extreme, contracts may become necessary to remain in business.

How do these tradeoffs balance out? Those involved in contracts benefit, generally. The industries become more effective competitors, serving consumers more effectively. Still concerns continue about the consequences or byproducts of contracting and vertical integration on other industry participants. The policy debate will focus on the current or potential perceived problems, and whether they are sufficiently real and consequential that they outweigh the benefits from these vertical linkages found in the beef and pork industries. Hopefully, the facts and economic analysis outlined in this report will be a useful contribution to participants in the debate of these issues.