Studies of the Organization and Control of the U.S. Food System

N. C. Project 117
Monograph 2

Jan. 1976

COORDINATION AND EXCHANGE IN AGRICULTURAL SUBSECTORS

Agricultural Experiment Stations of Alaska, California, Cornell, Illinois, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, Nebraska, New Mexico, North Dakota, Ohio, South Dakota and Wisconsin.

Published by the Research Division, College of Agricultural and Life Sciences, University of Wisconsin-Madison.

NORTH CENTRAL REGIONAL
RESEARCH PUBLICATION 228

PRODUCER-FIRST HANDLER EXCHANGE MECHANISMS FOR LIVESTOCK WITH SPECIAL EMPHASIS ON HOGS

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Several exchange mechanisms are currently used in the livestock-meat subsectors to coordinate activities of livestock producers and packers. Some exchange mechanisms have been used for several years such as the terminal, auction and direct and country buying. Other mechanisms such as the county commission agency, teleauction, teletype auction, telecomputer exchange, contracts and vertical integration have not been widely used but are currently in experimental stages. An economic comparison of alternative exchange mechanisms is needed to guide producers, packers, and others who will make decisions to implement future exchange mechanisms.

HISTORICAL PERSPECTIVE

The three major livestock exchange mechanisms of the 1900's have been the terminal, auction and direct and country buying. In the last twenty-five years (since 1950), use of terminals has declined rapidly, especially for cattle. Auctions began in 1930's and 1940's and have maintained a fairly stable share of the market, while use of direct and country dealers has steadily increased (Table 1).

"Direct, country dealers, etc." is a "catch-all" category in the Packers and Stockyards Administration's data that includes several local exchange mechanisms in which the first handlers are packers, order buyers, or dealers who complete their transactions at buying stations, at the farm, at the packing plant, or over the telephone. This category also includes contractual purchases and custom feeding by or for packers.

This paper will use "country buying" to include all of the above exchange mechanisms *except* those involving contracts and custom feeding which will be handled separately. "Direct" mechanisms will be a subset of country buying mechanisms involving direct negotiations between producers and packers and direct shipment of livestock from the farm or feedlot to the packing plant.

EXCHANGE MECHANISMS FOR THE FUTURE

The choice of exchange mechanisms for the future will be heavily influenced by the desire to improve efficiency. Efficiency improvements bring benefits to the innovators even though in the food and fiber sector these benefits are often shared eventually with consumers. Other innovations will come about by changes in the relative bargaining strengths of producers and packers.

Table 1—Distribution of packer livestock purchases by market outlet, selected years, 1923-1972

Year	Terminal			Auctions			Direct or country dealers[1]		
	Cattle	Hogs	Sheep and lambs	Cattle	Hogs	Sheep and lambs	Cattle	Hogs	Sheep and lambs
	Percent								
FI series									
1923	89.6	76.0	85.4				10.4	24.0	14.0
1930	88.2	59.9	84.7				11.8	40.1	15.3
1940	75.8	46.7	63.8				24.2	53.3	36.2
1950	74.9	39.9	57.4				25.1	60.1	42.6
P&SA series:									
1960	45.8	30.3	35.4	15.6	8.7	10.6	38.6	61.0	54.0
1961	42.3	29.2	36.8	19.7	11.2	10.9	38.0	59.6	52.3
1962	42.6	29.3	35.4	18.8	11.1	15.2	38.6	59.6	49.4
1963	39.1	26.6	30.0	17.8	12.7	14.0	43.1	60.7	56.0
1964	36.5	23.8	28.6	18.9	13.1	13.7	44.6	63.1	57.7
1965	34.0	23.4	25.5	20.9	13.7	12.1	45.1	62.9	62.4
1966	31.0	22.1	21.9	19.8	15.2	13.5	49.2	62.7	64.6
1967	28.7	18.8	19.0	18.2	15.5	16.2	53.1	62.7	64.8
1968	24.7	19.3	18.6	18.3	14.1	15.0	57.0	66.6	66.4
1969	21.2	18.9	16.1	17.0	13.7	13.1	61.8	67.4	70.8
1970	18.4	17.1	15.1	16.4	14.3	12.4	65.3	68.5	72.5
1971	15.9	16.9	13.6	15.5	13.8	12.3	68.6	69.3	74.0
1972	13.2	16.3	13.7	14.6	13.3	12.0	72.2	70.4	74.3

[1] Includes auctions, direct or country dealers, and other outlets for 1923-50. Auction market purchases were not significant until about 1940.

Source: Gerald Engleman, et. al., *The Lamb Industry: An Economic Study of Marketing Structure, Practices, and Problems,* U.S.D.A., P&SA Research Report No. 2, May 1973. p. 17; U.S.D.A., Packers and Stockyards Administration, *Resume,* December 14, 1973, p.8.

In comparing relative efficiencies of alternative exchange mechanisms for the future, it is helpful to look at the different functions performed in the exchange process. These functions include:

(1) Bringing buyers and sellers together
(2) Buyer and seller decision-making (pricing)
(3) Physical handling of the product
(4) Handling of other matters such as invoices, transfer of funds, record keeping, etc.

In addition one must look at the effect of the exchange mechanism on the production efficiency of the buyer and seller. For example, a supply contract could not only reduce a packer's procurement cost, but also reduce his in-plant slaughtering cost by enabling the packer to operate at a more constant rate of kill.

Johnson (8) has demonstrated the relative efficiency of several exchange mechanisms for cattle. The cost of using each exchange mechanism is shown in the first three columns of Table 2. The effects of each exchange mechanism on packers' costs are shown in the next two columns ("yield difference" and "killing efficiency"). The result is that total costs for direct, telephone direct, teleauction and teletype auction methods are all about the same and almost four times less costly than terminal and auction methods. The consignment method is the least-cost method, but it requires the producer to maintain title to his cattle while the packer performs his usual slaughtering and wholesaling function on a fee basis for the producer.

One would not expect the relative efficiency of the above exchange mechanisms for cattle to be much different for hogs. The major difference is that the cattle were all shipped direct (except for the terminal and the auction methods) whereas many hogs could not be shipped from the farm in truckload lots and would require assembly prior to shipping. If the cattle were all assembled prior to shipping, the direct through teletype auction methods in table 2 would incur at $1.50 per head yardage charge and an additional $1.90 per head transportation cost, adding a total of $3.40 to these mechanisms. These methods would then cost about $7.50 per head, which is still twice as efficient as the terminal and auction methods.

Increases in efficiency from new producer-packer exchange mechanisms adopted during the next 25 years are expected to come from the following changes:

(1) Trading on the basis of description to facilitate the meeting of buyers and sellers by telephone instead of in person. Description is likely to be in carcass terms.
(2) Improvements in market information, methods of analysis, and decision making capabilities of buyers and sellers for faster and more accurate decisions.
(3) More direct movement of livestock from farm to slaughtering plant in efficient truckload lots.

Table 2—Estimated per head total marketing cost of alternative marketing methods for fed cattle, 1970

	Marketing costs (dollars)							
Marketing method	*Commission and yardage*	*Buying*	*Transportation*	*Yield difference*	*Killing efficiency*	*Total cost*	*Least cost rank*	*Percent of least cost method*
Terminal	3.14	1.42	4.05	3.72	1.35	14.28	8	523
Auction	3.12	1.00	4.67	4.00	1.35	14.23	7	521
Direct	0	1.00	2.73	0	0	3.73	4 & 5	137
Country commission	1.00	1.00	2.73	0	0	4.73	6	173
Consignment	0	0	2.73	0	0	2.73	1	100
Telephone auction	.43	.30	2.73	0	0	3.46	3	126
Telephone direct	0	1.00	2.73	0	0	3.73	4 & 5	137
Teletype auction	.38	.27	2.73	0	0	3.38	2	124

[1] Source: Ralph D. Johnson, *An Economic Evaluation of Alternative Marketing Methods for Fed Cattle,* SB 520, Nebraska Ag. Exp. Sta., Lincoln, Nebraska, June 1972, p.40.

(4) Larger numbers of livestock per transaction among sellers (or groups of sellers) and buyers to reduce selling time, recordkeeping, and other costs.

(5) More control over quantity and quality of livestock arriving at each slaughtering plant.

COUNTRY BUYING

Country buying (including direct buying) is the most widely used set of exchange mechanisms (Table 1) and is relatively efficient (Table 2). Producers like country buying because they usually receive a price for their livestock before it leaves the farm. The price may be specifically for their livestock, or it may be in terms of some standard weight and grade of livestock with appropriate adjustments made after delivery. Producers also like country buying because it is convenient, minimizing their out-of-pocket transportation costs and other expenses. Packers like country buying because of the choice of livestock available for sale; the known reputation of the sellers they deal with on a regular basis; and perhaps the opportunity to take advantage of some less skillful farmer traders.

Largely for reasons of transportation efficiency, the pricing process for most finished cattle takes place at the farm and cattle are shipped directly to the plant. A cattle feedlot does not have to be very large to have 40 head of cattle, a truckload lot, ready to go at one time. On the other hand, it takes about 180 butcher hogs and 300 lambs to make a truckload. Because most farms cannot ship that many hogs or lambs at one time, some assembly function must be performed prior to the sale.

One evidence of the need for the assembly function for hogs is found in a western cornbelt study. The study [8] shows in 1967, 46 percent of the hogs were traded through buying stations, 32 percent through terminals, 11 percent through auctions and only 12 percent went directly to the packing plant. Many of these direct hogs probably came in farm trucks from small farms located near packing plants. In contrast, a study [12] of large farms marketing over 4,000 hogs a year showed that 39 percent of the farms made only direct sales to packers and another 33 percent made at least some direct sales.

The pricing process for large farmers dealing direct with packers is usually one of private negotiation that takes place on the telephone prior to shipment. For small producers, whether delivering to a packer buying station or to the plant itself, the price is usually administered to them by the buyer.

Sheep and lambs are sold by a variety of country buying mechanisms. Most eastern sheep are produced in small farm flocks, hence, the buying station approach prevails. Auctions are also used. In the western range areas, and in areas where there are large lamb feeding

operations, exchange mechanisms with on-farm and telephone selling are used.

The future of country buyers will probably include less reliance on buying stations. Farm operations will be larger, permitting more truckload lots from single farms. There will also be some new operating procedures to get around the usual buying station assembly function. Teleauctions for lambs, for example, grade on the farm and assemble lambs "on paper" for sale over the telephone in truckload lots. While the lambs sold by teleauction currently go to an assembly facility prior to shipment, many could be assembled on the truck which would stop at 2, 3 or 4 farms to complete a load. Such an assembly procedure could require producer identification on each animal and prices based on carcass grade and weight. A similar procedure could also be adopted for hogs.

Another type of country buying exchange mechanism (not teleauction) that could assemble livestock "on paper" prior to a sale and "on truck" after the sale would be a "country commission agency." The agency would coordinate the assembly process and merchandise livestock to prospective buyers.

A country commission agency is already being tried to sell finished cattle by Farm Bureau affiliated cooperatives in several states. The agency provides marketing intelligence for the farmer and accompanies several buyers, one at a time, to each feedlot. However, there is little reason why the commission agency cannot adequately describe the cattle to several buyers and sell them over the telephone by bid-acceptance pricing or negotiated pricing. A truckload lot from a single hog operation or a single sheep operation could be sold the same way.

The economic feasibility of a country commission agency still needs to be tested. It is being used to sell cattle, but little is known about the feasibility of using it to sell hogs and lambs both from large farms with full truckload lots and from small farms requiring assembly "on paper" and perhaps "on truck."

A modification of the country commission agency concept to include auction pricing brings us to the teleauction and teletype auction concepts. Auction pricing may have a greater appeal to producers if they have more confidence in a public pricing process than a private pricing process. Except for the pricing process, many of the procedures and results discussed under the teleauction concept can be applied to the potential country commission agency concept just discussed.

TELEAUCTION

The teleauction, or telephone auction, is in some ways very similar to a conventional auction with an auctioneer calling out successively higher prices as long as buyers continue to bid. But, in most other ways a teleauction is different. The auction itself is conducted over a con-

ference telephone call. The auctioneer, each buyer, and each load of livestock can all be at different locations for a teleauction, whereas all are usually at the same location for a conventional auction.

At this time, teleauctions are being used to sell feeder pigs in Missouri, Wisconsin, Illinois, Ohio and Virginia. Just recently the Iowa Farm Bureau, cooperating with two commission firms at Webster City, Iowa, has begun to sell slaughter hogs by teleauction. A pilot project for hogs has also been started in North Carolina. Teleauctions have been tried and discontinued for hogs in Missouri and Wisconsin. Teleauctions are being used to sell slaughter sheep and lambs in the Virginia-West Virginia area and in the Oregon-Idaho area; Virginia is also selling finished cattle on a carcass basis by teleauction. A teleauction for yearling cattle was tested in Virginia in the fall of 1974 and will probably be expanded in 1975.

The teleauction as an exchange mechanism is more than just a method of pricing. All of the above mentioned teleauctions are controlled by producer associations which organized them for the purpose of meeting their particular needs. Most of these teleauctions were primarily designed to:

(1) Increase competition for livestock by making it easier for more buyers to bid on livestock.
(2) Price livestock according to quality to provide appropriate rewards and incentives for quality production.
(3) Build a reputation for quality of product and for service to buyers.

Teleauctions have been most successful in areas where there has been relatively little competition for livestock. Producers in these areas have felt as if they were not getting a "fair" price for their livestock, especially quality livestock.

Operating efficiency is also a part of the teleauction method. Teleauctions are more efficient than conventional auctions and some country buying mechanisms because buyers and sellers complete their exchange by telephone. The teleauction saves travel time and related expenses for buyers. It also makes it possible to sell from several locations in the same sale. The teleauction gives some packers access to livestock they would otherwise have to forego.

Before the operating efficiency of teleauctions can be discussed further, it is necessary to distinguish between two different assembly procedures. Some teleauctions require physical assembly prior to the sale while others do not assemble livestock until after the sale. Prior assembly appears to be necessary for feeder pigs and calves because buyers prefer to have fairly uniformly graded truckload lots of livestock which cannot be obtained from any one farm. Slaughter livestock on the other hand do not have to be segregated as carefully because most packers can readily process and merchandise a variety of grades of animals. Consequently, the quality of slaughter livestock can be determined by on-the-farm grading, and the livestock can be assembled on

paper in truckload lots prior to the sale. If sold on a carcass basis, the animals can be shipped directly from the farm to the slaughter plant where final weight and grade of the carcass will be determined.

When on-the-farm grading is part of the teleauction instead of assembly and grading just prior to the sale, operating efficiency is improved by the following:

(1) There is less stress and shrink on the livestock than in buying stations, conventional auctions or teleauctions requiring prior assembly
(2) One sale per week is sufficient for a multi-state area.
(3) Packers can plan their kill schedules by having livestock assembled and delivered in any of the next seven days after the sale.
(4) Market facilities and personnel can be used daily rather than weekly as packers are likely to space their delivery demands.
(5) Livestock sold on a carcass weight and grade can move directly from the farms to the packing plant. The livestock may come from one farm or be assembled "on-truck" from 2-4 farms.
(6) A given lot of livestock can be "no-saled" if bids are "unreasonably" low.

Efficiency is decreased by the added cost of:

(1) Grading on the farm.
(2) Office work to coordinate grading, making of truckload lots, scheduling deliveries, etc.
(3) Conference telephone calls.

On-the-farm grading is used for both of the sheep and lamb teleauctions and the slaughter-cattle teleauction. A technical problem relating to disease control currently makes on-the-farm grading less practical for hogs. The same problem also works against the use of a on-truck assembly of hogs for direct shipment to the packer.

A study [6] of the prices of slaughter lambs in Virginia-West Virginia, comparing prices in the area to a nationwide base before and after the beginning of the teleauction in 1971, shows a net gain to teleauction farmers of about $2.50 per hundredweight and a net gain to farmers in conventional auctions of about $2.00 per hundredweight. Since the selling charges to farmers are about the same in both systems, it can be said that the benefits are net increases. Further, it can be said that the $2.00 per hundredweight price increase to all farmers is largely due to increased competition for lambs and that the additional $.50 for teleauction farmers is due to increased operating efficiency for packers using the teleauction.

The current location of teleauctions and the fact that they have been established by producers seems to indicate that they are beneficial to producers in areas of limited competition. Limited competition is common in most lamb producing areas [4, pp. 107-120]. It is com-

mon for feeder pigs. It is also common for finished livestock in fringe producing areas. Limited competition is probably present in most areas where cull cows, cull ewes and cull sows are sold. The teleauction exchange mechanism would probably be most beneficial to producers in these areas.

Nevertheless, there is reason to believe that teleauctions could also benefit producers in major cattle and hog feeding states. The concentration of buying power is not really that much different. In most of these states the top four firms purchase at least 65 percent of the cattle and 80 percent of the hogs (Table 3). The teleauction could probably improve competition if a sufficient number of producers supported it. In addition to increased competition there would be some operating efficiencies which the teleauction exhibits when compared with conventional auctions, direct, telephone direct and the counry commission agency (Table 2).

TABLE 3. Concentration of Livestock Purchases by Four Largest Meat Packing Firms, Selected States, 1970.

State	*Percentage of livestock bought by four firms*		
	Steers and Heifers	*Hogs*	*Sheep and Lambs*
Michigan	47.5	87.2	100.0
Ohio	42.8	49.8	78.0
Indiana	66.3	83.8	92.3
Wisconsin	85.6	97.5	100.0*
Illinois	58.1	71.1	99.5
Minnesota	71.5	98.4	100.0*
North Dakota	100.0*	100.0*	----
South Dakota	93.5	100.0*	100.0*
Iowa	47.1	45.6	100.0*
Missouri	65.9	93.7	100.0*
Kansas	69.5	94.1	----
Nebraska	49.2	99.5	100.0*
Oklahoma	72.6	83.6	----
Texas	39.1	65:9	97.3

* Less than 4 firms included in percentage.

Source: Arnold Aspelin and Gerald Engelman, "National Oligopoly and Local Oligopsony in the Meat Packing Industry", USDA, P&SA, 1972, pp. 9-10.

TELETYPE AUCTION

The teletype auction is currently used to trade slaughter hogs in several Canadian provinces. In the United States, it is only in the discussion stages among various university and government personnel and some producer organizations such as the American Farm Bureau.

The teletype auction is very similar to the teleauction except for differences in the telecommunication equipment used. The operating procedures that are suitable to one are generally suitable to the other. Even though, for example, the Canadian teletype auctions physically assemble hogs at concentration yards prior to the sale, use the Dutch (regressive) type auction, and sell strictly on a carcass basis, a teletype system in the United States could operate differently.

In fact, some modification of the Canadian system would seem desirable in adapting it for use in the United States [14]:

(1) Make participation by producers and packers voluntary. Competition among alternative exchange mechanisms would encourage efficiency in the exchange process.

(2) Place quality and weight range limits on at least some loads in order to give the buyer some assurance of minimum variability. Some price improvement could probably be captured to offset increased costs.

(3) Make the premium and discount schedule responsive to changes in relative wholesale value of primary cuts. (The Ontario schedule is largely fixed over time.)

In addition:

(4) Make provisions for selling animals directly off individual farms or groups of 2 to 4 farms.

(5) Sell at least some loads two to seven days in advance of delivery to enable packers to plan their kill schedules.

Some of the advantages of the teletype over the teleauction are that the teletype:

(1) Handles a larger number of buyers. (The teleauction technology limits trading to a maximum of 15 participants.)

(2) Produces a written record of bids, offers and sale confirmations.

(3) Is faster than a teleauction, especially when a regressive auction is used.

The efficiencies created by the Canadian teletype auctions, as a replacement for direct and country buying in Ontario, resulted in a net increase to producers of $.40 per hundredweight of carcass [11, p.33].

TELECOMPUTER EXCHANGE

The telecomputer exchange is a third alternative using modern telecommunications technology to coordinate livestock producers and

packers. It was initially designed for hogs by Holder [5] following a prototype for eggs by Schrader [15].

The equipment for the exchange consists of a central computer processor accessed by producers using touchtone telephones and by packers using touchtone telephones or teletypewriters. Pricing is done on a bid-acceptance and offer-acceptance basis. The producer offers his hogs for sale at a specified price which is matched with a same or higher price already placed by a packer. Or a packer bids for hogs at a specified price that is matched by a same or lower price already placed by a producer. If the computer cannot match a new bid or offer when it is placed, the order is stored until a match is obtained. Prices in the exchange are in dollars per hundredweight for a standardized carcass having specified backfat thickness, weight, and carcass length measurements. Carcasses differing from the standard are priced by a premium-discount schedule that is allowed to fluctuate with wholesale market conditions.

The operating cost of such a system, to be paid by producers and/or packers, was $.32 per head for a system handling 5,000,000 head per year, and $.14 for a system handling 50,000,000 [5, p. 48]. Those costs included all equipment and rental of all telephone lines, but excluded buyers' salaries and overhead costs for packers. Somewhat comparable figures for the teleauction and the teletype auction were $.43 and $.39 per head [8, p. 24, 29-30]. (All of the above costs were for 1969.)

The opportunity for sellers and buyers to enter price orders is psychologically appealing to producers who are often price-takers. But there is also some research to support the idea that a market with simultaneous bids and offers determines prices more quickly and more accurately than a market where only buyers or sellers place the orders [16].

The use of a computer facilitates:

(1) Placing new orders or changing old ones (if the old ones are still unmatched) throughout the day.
(2) Adjusting bids and offers to account for transportation differences among traders.
(3) Accounting and record keeping.
(4) Assembly of market reports.

A basic goal in developing the telecomputer exchange was to use modern electronic technology to interface producers and packers directly. While the exchange firm represented a third party, the system was extremely automated so as to minimize its visibility and its costs. However, it may be more practical to use country commission men or dealers to solicit producer participation, estimate the grade and weight of the hogs, and enter the offers to sell. These additional participants are not simply an additional cost. They perform a very legitimate function of concentrating livestock from smaller producers and of helping to specify the quality of livestock prior to the sale. In ad-

dition, while almost every farmer could have a touchtone phone installed in his home, the commission men or dealers could operate with sufficient volume to justify teletypewriters which give the advantages of instantaneous written records and more automation.

A system similar to the telecomputer exchange was put into commercial operation in the fall of 1973. The Hog Exchange, as it is called, is headquartered in Illinois and coordinates transactions among dealers and packers in several states. The matching of bids and offers continues to be done manually because the Exchange does not handle a large enough volume to justify a computerized match. Nevertheless, the firm is operating in the "black," charging $.10 per hundred pounds of live weight. Just recently it began to match bids and offers for finished cattle, charging $.25 per hundredweight of carcass.

CONTRACTS

Some livestock producers and packers have turned to contractual arrangements as a means of coordinating their activities. In order to organize a discussion of the wide variety of contracts that can be used, the contracts will be segregated into four different categories: (1) marketing service contracts, (2) market-specification contracts, (3) resource-providing contracts, and (4) production-management contracts [11, pp. 40-46].

Marketing Service Contracts

"This type of contract involves an agreement between a producer and a marketing agency under which the marketing agency provides certain marketing services in return for a fee [11, p. 40]." The "country commission agency" would fit this class of market mechanisms. The contract is a means of formalizing the arrangements.

Farm Bureau affiliated organizations are offering marketing service contracts for finished cattle in Illinois, Indiana, Ohio, Iowa and Missouri. The contracts specify all the services to be offered by the agency and the responsibilities of the producers. A similar program to sell hogs directly from the farm to the packer, has recently been started by Interstate Livestock Producers Association (IPLA) in Illinois.

Market-Specification Contracts

A market-specification contract is an agreement between a producer and a packer or a group of producers and a packer whereby the producers promise to deliver a specified number and quality of livestock to the packer at specified intervals. There are usually a few additional provisions. Production practices, for example, are usually left to the discretion of the producer.

A former agreement between Interstate Producers Livestock Association and the Krey Packing Company in St. Louis is a well known example of a market specification contract. Producers Livestock Asso-

ciation in Ohio had one with Sugardale Packing Company for a short period of time, and the NFO has also had similar contracts from time to time.

When a group of producers is involved, a producer cooperative usually represents the producers. The cooperative negotiates the terms of the contract with the packer to establish mutually acceptable operating procedures and prices. It almost goes without saying that a cooperative with the backing of several producers can negotiate more favorable terms with the packer than any single producer acting on his own. The cooperative assumes the responsibility of coordinating the flow of livestock from the producers to the packer and the flow of funds back to the producers. If carcass trading procedures are used, the ccoperative has the added responsibility of assuring adequate grading and weighing for its members.

Pricing usually involves some type of formula based on one or more live market quotations on the day or week of delivery. Prices based on a weekly average, or even a moving average of several days, smooth out some variability of income among producers who may be asked to deliver on specified days. In many ways, the averaged price reflects a more accurate price signal to producers.

Some variations from a pricing formula based strictly on market quotations include the addition of a maximum price and/or a minimum price. The NFO has tried to build cost of production floors into their hog supply contracts. At least one hog packer has offered individual producers a four-year contract with both a floor and a ceiling designed to benefit farmers in very low price periods and the packer in very high price period [2, p. 4].

Most individual producer-packer contracts have been priced in advance in relationship to the live hogs futures contract. By using a formula, the purchaser determines his expected cash-futures basis for livestock at the time of delivery, adds in his hedging and other expenses and administers the contract price. Group supply contracts could also be based on the futures, but the adjustments to the base could be negotiated.

Regardless of how market-specification contracts are used, the packer gains a certain degree of control over the number and quality of livestock delivered to his plant that he did not have before the contracts were put into effect. "Net profitability and return on funds invested are very sensitive to sales volume, product branding, hog quality and volume variability in the hog run" [17, p. 43]. Market-specification contracts, as well as vertical integration, are a means of controlling the volume and quality of a hog run. Although the magnitude of the effects vary among several completed studies, they all show benefits do exist [3, 7, 17]. Under the assumptions of one study [17], a packer receiving better yielding hogs of a given grade and weight increased his return on investment from 10.4 percent to 32.7 percentA an increase in value of about $2.55 per hog. If the packer used his

plant at 100 percent of capacity instead of at 80 percent, he increased his return on investment from -4.7 percent to 10.4 percent—an increase of about $1.85 per hog.

Contracted hogs may give the packer some added flexibility and leverage when he buys other hogs on the open market because he does not have to buy as many there as he did before he contracted. On the other hand, contracting reduces a packer's flexibility to adjust production to meet changes in product demand. Contracting also reduces his flexibility to "shop" for hogs in several different areas. A producer who makes a forward contract also acquires a new risk of being able to fulfill his contract without penalty.

If the packer is a net gainer from contracting, and it appears that this is the case, the question is: What will the producer receive? Considering the balancing of bargaining power between individual producers and packers, producers will not gain much of the packer's newly created surplus unless they act as a group with control over a sizable number of hogs.

Another option for pricing livestock on contract is to create an open market for standardized contracts that would meet the needs of several packers. This is part of Holder's proposal [5] for the telecomputer market. Competition among packers to obtain enough contracts for each week's kill would help give producers more of the packer's surplus without the expense and operating problems of a bargaining association.

Resource-Providing Contracts

"In these contracts the 'contractor' (i.e., party contracting with the producer) provides some of the resources needed in producing hogs" [11, p. 45] or other livestock. The contractor makes many of the production decisions, especially those closely associated with the inputs he is providing. These inputs may be feed, breeding stock or feeder animals, credit or a number of other items. The producer usually provides inputs plus labor, equipment and buildings.

Resource-providing contracts have generally been used to help the contractor move a greater volume of supplies, such as feed or breeding stock. Consequently, attention given to the marketing of finished hogs is often lacking. If the contractor actually has superior inputs, especially breeding stock, it may be to his advantage to have a marketing system established whereby he can obtain premium prices for the output of his producers [2, p. 6]. The contractor's method of selling could be by contact with a local dealer teleauction or contract with a packer, just to name a few possibilities.

Producers Livestock Marketing Association in Ohio is piloting a new program in cooperation with the Landmark feed division to provide producers with a package of feed and feeder pigs, and then to market the slaughter hogs to packers. The advantages to the individual pro-

ducers are quality inputs, a line of credit, and "expert" purchasing and marketing services. While most producers would choose to perform a number of these functions themselves, there are other producers, especially those with full-time, off-farm jobs, that demand the services. Such a program could provide Producers Livestock Association with a sizable supply of quality hogs to merchandise. Moreover, the Association would know when the hogs would be ready to slaughter. Indiana Farm Bureau Co-op and Indiana Producers Marketing Association are engaged in a similar type of program. In the Indiana experiment the producer bears only some of the price risks and is protected against a total loss, whereas in Ohio the individual producer bears all of the price risks.

It is surprising that packers have not taken more initiative in this area, either to contract with firms that are supplying resources to producers or to provide resources themselves.

Production-Management Contracts

A production-management contract is one step beyond the resource-providing contract, and the contractor provides the management decision-making function along with the resources. In the production-management contract the producer provides labor, buildings and equipment and is paid on a piece-work basis, usually related to efficiency of gain. The contractor owns the livestock and makes almost all decisions about which types of resources to use, when to begin production, and when to sell. The contractor could be a feeder pig producer, packer, or other party interested in having hogs (or other livestock) custom fed for him by someone else.

Two packers who have tried production-management contracts with individual producers have decided to discontinue the program. Both firms were dissatisfied with the "management performance" of their contract producers, and both firms concluded that "ownership vested with the manager produced better hogs at lower cost." This has led both of the firms to shift toward marketing contracts" [2, p. 4].

Gold Kist, Inc., a farmer cooperative with headquarters in Atlanta, Georgia, is currently working out the details of a hog-pork complex which in many respects will resemble Gold Kist's broiler production-processing system. Gold Kist is developing the foundation herds, placing sows and boars on farms to produce feeder pigs, placing feeder pigs with finishers, providing feed, slaughtering and processing the hogs and merchandising the pork products under their own brand label.

Other cooperatives such as Farmland and Landmark own slaughter plants, but they lack any coordinated production-processing system. For the most part, they act as any private packer procuring hogs on a competitive basis through variety of country buying methods.

VERTICAL INTEGRATION

Vertical integration is "the kind of vertical coordination that goes on within one firm. The production stages that are coordinated are all inside that firm." Vertical integration can also be described as "the situation in which two or more stages that were formerly handled by separate firms are merged into one firm" [10, p. 2].

Examples of vertical integration in livestock production and processing are relatively rare, especially in the hog-pork sub-sector. One attempt that received considerable notoriety was that of Charles McQuoid who planned to farrow, feed, and process 2,500,000 hogs per year in Kahoka, Missouri [9]. McQuoid's venture has failed, but the idea of producing pork in a large integrated firm is still generating considerable interest.

First Colony Farms in North Carolina is currently constructing five breeding through finishing units that will each turn out 10,000 hogs per year. Five more units are planned for next year and each succeeding year until they have an annual capacity of 1,000,000 head. In due time a slaughter plant will be added. First Colony Farms also has a parallel system underway for cattle [13].

Little is known about the relative advantages and disadvantages of a completely integrated system like First Colony, or even a cooperative approach like Gold Kist's, but some people are convinced that it will work. We have some evidence concerning the value of supplying a packing plant with a known quantity of top quality of hogs. But what is the value of being able to develop your own foundation herd, farrow pigs, finish them, control the flow of the hogs to your packing plant, put the product in your own label and wholesale it? What will it cost? In addition, will the firm be able to translate desirable product characteristics into future foundation herd characteristics? Will it be able to translate seasonal differences in demand to breeding plans? If so, what is it worth and what will it cost? Similar questions can be asked about several contracting alternatives which involve not only the finisher and packer but one or more additional stages.

SUMMARY AND CONCLUSIONS

This paper has compared several alternative exchange mechanisms for coordinating hog producers and packers. The comparison was primarily based upon the relative operating efficiencies of the selected mechanisms. Changes in the competitive environment brought about by some mechanisms were also evaluated.

For reasons of operating efficiency there has been a dramatic move away from terminal markets to direct and country buying. For similar reasons the future role of conventional auction markets is also likely to decline.

A comparison of direct, telephone direct, country commission

agency, teleauction, teletype auction and telecomputer exchange, shows little difference in operating efficiencies. However, the telecommunication systems (the last three mechanisms) provide some increase in prices paid to producers by increasing competition among packers. Documented cases of the effect of increased competition include the use of a teleauction for lambs in the Virginia-West Virginia area [6] and teletype auctions for hogs in Canada [11].

Contracting is another means of coordinating hog producers and packers. While many of the benefits to packers have been estimated, many of costs have been ignored, especially the cost of increased risks borne by packers who contract for most or all of their needs. At the present time we can only hypothesize that the net benefits to contracting are positive and that the largest gains are made in the packing plant. Individual producers will not be able to capture many of these benefits. Hence, group action by producer cooperatives will be necessary to negotiate prices and other contract terms. A cooperative could also operate a teletype auction for standardized contracts in order to distribute the contract gains.

Coordination by integration of hog production and packing is another alternative that is being tried, but the benefits and costs are not very well understood at the current time. Hence, the future of giant hog production-processing complexes is still largely unknown. It is unlikely that established packers will integrate backward. Attempts so far have been by new firms entering both stages for the first time.

Existing producers could also integrate forward by acquiring a cooperative packing firm. To be truly integrated, however, the cooperative plant must have control over the quantity, quality, and timing of production. Control can be accomplished by contracts between individual producers and their cooperative. While the cooperative controls the actions of individual producers, all producer members collectively control their cooperative.

One of the major issues to be reckoned in the development of all future exchange mechanisms is: Who will control agriculture? Producers have the power to make decisions in this regard. They have the choice of: (1) being passive and letting packers and others continue to make the bulk of the marketing decisions and to reap the bulk of the benefits; (2) establishing a new telecommunication "open market" system to gain some operating efficiency, but largely to improve competition; (3) forming bargaining associations to negotiate prices and to control the industry; and (4) owning and controlling their own packing plants.

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