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Agricultural Economics Report

REPORT NO. 462

DECEMBER 1984

AN EVALUATION OF THE POTENTIAL FOR A MARKET IN HOG CONTRACTS

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A PORK CONTRACT MARKET: AN INVESTIGATION INTO
ATTITUDES ABOUT AND POSSIBILITIES OF SUCH
A MARKET FOR SLAUGHTER HOGS

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Agricultural Economics Report No. 462
Michigan Agricultural Experiment Station No. 11521

FORWARD

This report is a condensation of a Ph.D. dissertation entitled: A Pork Contract Market: An Investigation Into Attitudes About and Possibilities of Such a Market For Slaughter Hogs. A copy of that more detailed work may be obtained from University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48106.

The United States Department of Agriculture's Agricultural Marketing Service provided the financial support necessary to do the research for the dissertation. Particular thanks is expressed to the late James Pearson, who was with AMS, and was particularly interested in improving agricultural marketing systems. Other institutional support for this report came from the Michigan State University Experiment Station and the Agricultural Economics Department of Virginia Polytechnic Institute and State University.

James Shaffer of MSU originated and helped nurture the ideas contained in this report. James Bonnen, John Ferris, Glenn Johnson, Norman Obst and Don Ricks of MSU and Wayne Purcell of VPI all attempted to disabuse me of mistaken notions. I appreciate their help.

Daniel Kauffman

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CHAPTER I

THE PROBLEM

Few people realize how much money is in hogs, how quickly and easily they can be raised with but little or no cash outlay.

George Washington Carver
Tuskegee Institute, 1916

Investment and Price Variation:

Farmers who started to sell hogs in the latter half of 1982 would agree with Carver's sentiments on money. In August of that year hogs sold for \$63.13 per 100 pounds in major midwestern markets. It was easy street. But forget the cash outlay part. A confinement facility can easily cost a million dollars.

Unfortunately for hog producers and to the good fortune of consumers, the high prices did not last. In November of 1983 the average price plummeted to \$38.79. In 1984 when hog prices again increased profits were wiped out by the drought induced high price of corn. Any hog producer with a little experience can tell first time sellers that the good times are a sometimes thing. Hog prices in the latter part of 1982 were at historical nominal highs, but as always occurs, prices inevitably tumbled. Any farmer that gets into the hog business on borrowed funds during that peak of the cycle will face difficulty in meeting the debt service charges when the income from hogs drops as the cycle turns down. For instance, a 5,000 head a year hog operation selling at the August 1982 price for a year would generate \$725,000. Selling at the November 1983 price for a year produces revenues of less than \$450,000.

Historically returns to hog production have been better, on average, than most other forms of agricultural production. In the corn belt, hogs were called the

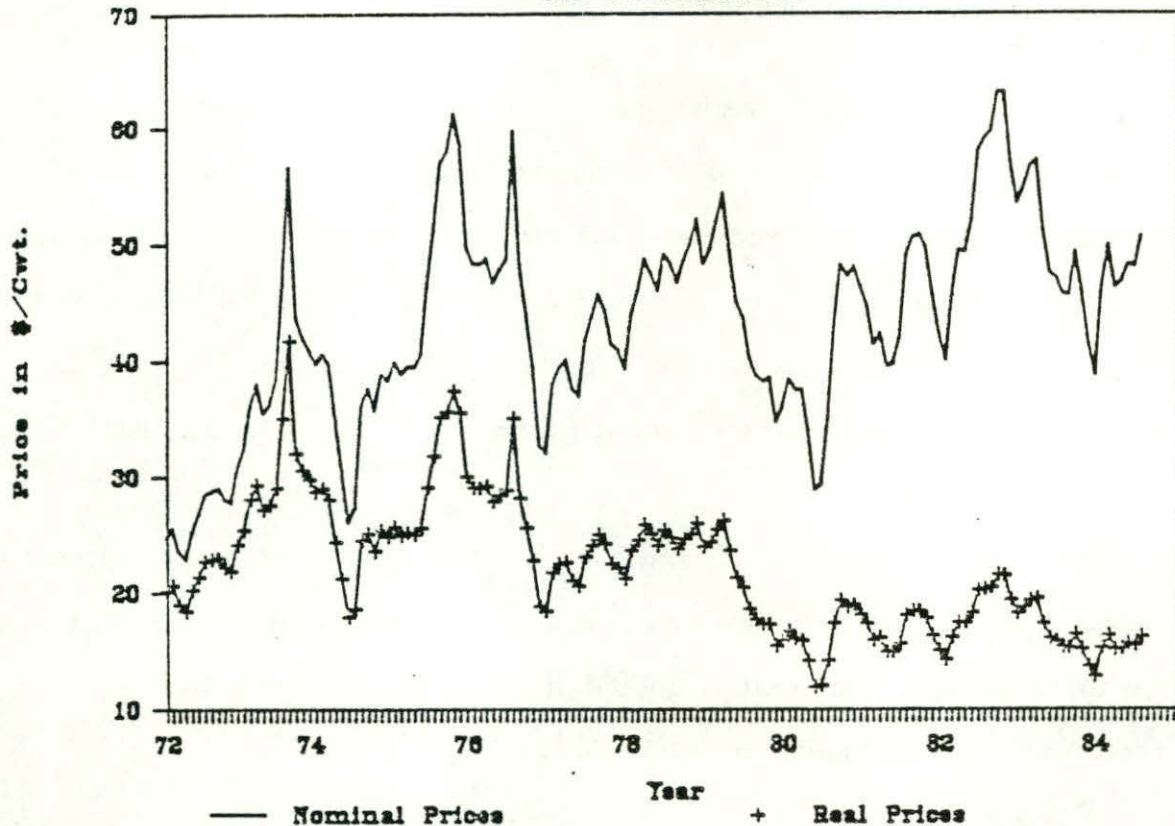
"mortgage lifter." They still are tremendously profitable when the hog cycle hits high price periods like the latter half of 1982. But production has changed significantly so that hogs are no longer easy to raise with little or no cash. The move to confinement production facilities, while cutting labor costs per unit of production, changed the way farmers can think about hogs. No longer are hogs the residual claimant of farm labor and no longer are they the orphan of a farmer's production plans. Hogs used to be turned in with the cows to clean up after them. And they were turned into the fields to "hog down" the corn. They were not the center of the farm's plans. Hogs were farrowed in spring and fall only. They were taken care of with time that would not have been employed to advantage otherwise. If prices got too bad, farmers could just shut down their hog operations because there was not a big capital investment in their field farrow operations.

But with the investment in confinement operations the balance between fixed and variable costs changed towards higher fixed costs. Those fixed assets require debt service that did not exist with the old field operations. Previously a farmer could just push the A-frame or small quonset hut shelters, feeders and waterers to the fence row and wait out the bottom of the cycle because of low fixed costs. A farmer shutting down confinement operations may well be forced into bankruptcy and not be able to come back when the cycle turns up again. And the amplitude of the hog cycle has gotten larger. Figure 1.1 shows the jag hog prices are on.

Starting in about 1971, hog prices began violent fluctuations that made earlier cycles look anemic. In some markets prices in September of 1982 briefly topped sixty-seven dollars. In the fall of 1982, hog producers who managed to survive 1981, were hauling money to the bank. Unfortunately, for many of them the money could not go into savings accounts, but rather had to pay off delinquent loans

Figure 1.1.

Monthly Ave Hog Price For Seven Markets



acquired during the previous two years of losses. Just two years earlier hog prices stood at twenty-eight dollars per cwt.

How profitable the business was at the 1982 peak can be judged by using figures from the National Hog Producers Association. If a top producer bought two dollar corn and financed the breeding stock and one fourth of the operating expenses at eighteen percent, the average cost of producing a hundred pounds of pork for a three thousand a year head operation is forty-four dollars, according to the Association. Thus, if that top producer could sell hogs for sixty-two dollars per cwt. for a year, a profit of \$54,000 would result. However, if the twenty-eight dollar price held for a year, a loss of \$48,000 would be produced.

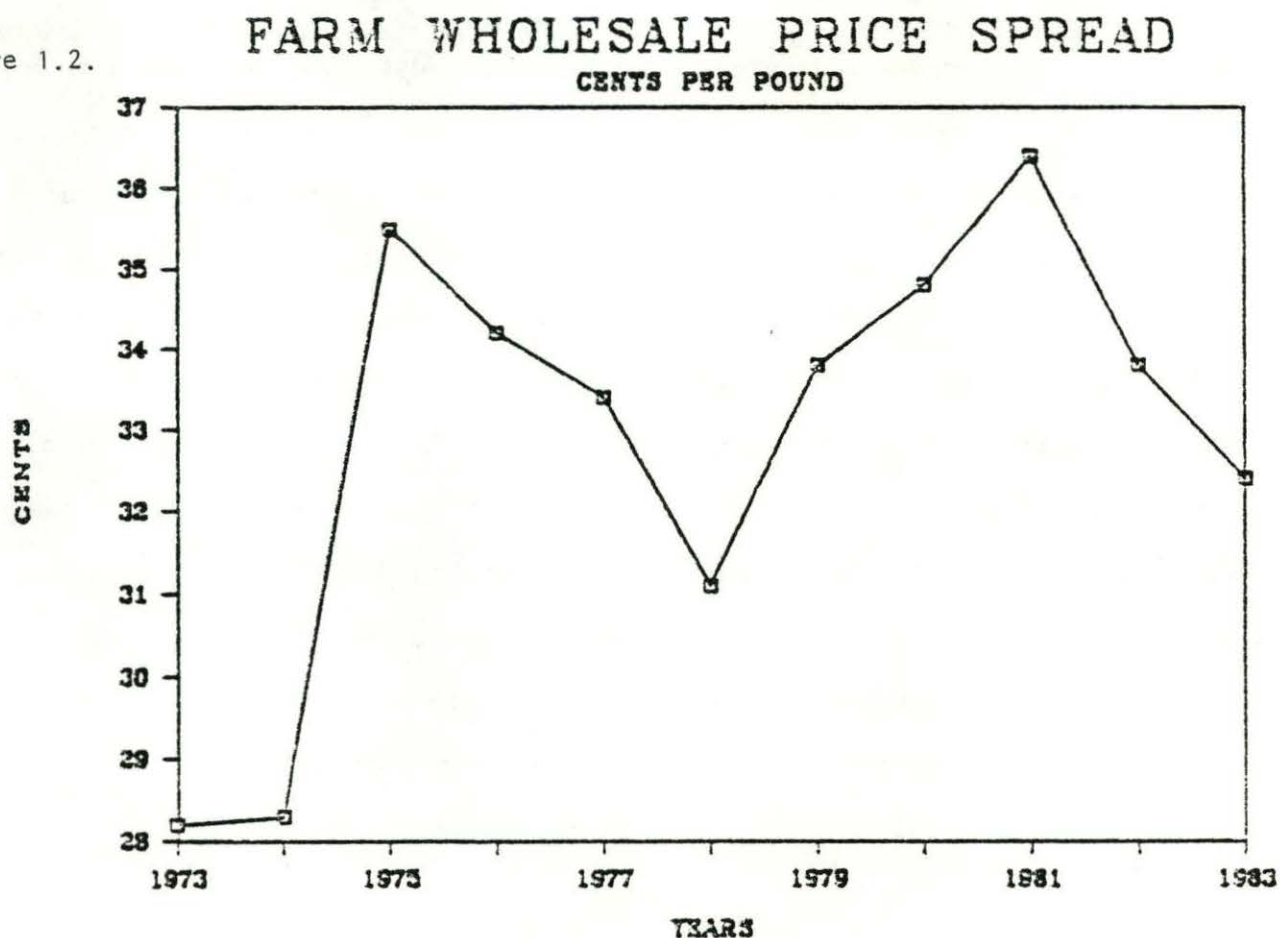
This extreme variability in prices produces much entry and exit from the business. Such moves, as noted, have become more costly as production has moved from field farrow operations to highly specialized confinement facilities.

Planning Difficulties:

Farmers faced with such dramatic price variation and uncertainty as exists in the hog subsector, find production planning extremely difficult. Ivan Top, a past president of the Michigan Pork Producers Association, planned a major expansion of his facilities prior to 1982. Plans were drawn and financing committed but he backed out at the last minute because of uncertainty about future prices. Top, of course, wished he had those facilities producing hogs during 1982. In 1983 and the fall of 1984 he was glad he didn't.

Uncertainty, of course, is also endemic for packers. A few will claim that they can adequately control their margins. But it is a claim that should at least be looked at with jaded eye. At least it should if one takes to heart the variation in margins shown by USDA numbers in Figure 1.2.

Figure 1.2.



Packers' margins in late 1982 were being severely squeezed because of the high prices. When the price was thirty dollars per cwt. packers were making money the way the farmers were in 1982. But when hog prices move up packer margins are again squeezed. Usually packers and farmers make profit on the opposite ends of the cycle.

This extreme price fluctuation has made planning difficult for packers. Explains Alan H. Beswick, vice president of Canada's largest meat packer, Gainers, said, "When I started in the business (in the early 1950's) I could write a book about what would happen for the next year. If the market moved 50 cents in a year people fell out of bed. It moved 60 cents this morning. Commodity prices are just so dynamic now. We often have a one day price movement that is larger than our margins."

This fluctuation helps neither the packer nor the farmer, according to Beswick. Beswick has tried to work on this problem with the industry by creating new marketing systems. He has not met much success.

Supply Changes Responsible for Cycle:

The price fluctuation is primarily due to variations in supply rather than changes in demand. By plotting the yearly average price per cwt. and the annual per capita pork consumption one can visually fit a demand curve to the coordinates. A similar plotting of spring farrowings, a very good indication of supply, on price leaves no clear picture. From that data one can not visually fit a supply curve (Ferris, 1982).

The reasons for the demand stability almost jump out at you if demand is specified as a function of the price of pork, price of substitutes, income, population and implied tastes and preferences. Only price of substitutes is likely to change rapidly. And of course, as with nearly all consumption goods, there is

no price uncertainty at the time of purchase. Consumers do not buy pork and months later find out how much it will cost.

Supply, on the other hand, is much more fickle for equally good reasons. If supply is primarily a function of price expectations, variable costs, and capital stock, one sees why the visual fit can not be performed. Corn and meal prices shift rapidly, particularly since the lessening of government grain support programs. Farmers, once committed to a confinement facility, will produce even though that capital is not carrying its own cost (Edwards, 1958; Johnson and Quance, 1972). Because it is about ten months from breeding decision until a slaughter hog is ready for market, production, unlike consumption, can not be quickly reduced in the face of significant price change. While this is not a problem totally unique to agriculture, it is more severe there than most other places and it causes enormous problems.

Demand is not always rock steady. Denis Gaydon, vice president of commodity procurement for Oscar Meyer, explained that it used to be if anyone could tell him the supply of hogs next year, with a great deal of accuracy he could tell you the price of hogs. This is not precisely the case any more but it is almost so (Chavas, 1982). In 1984, one possible reason for low hog prices was a surprising lack of demand. However, price fluctuations are still mostly controlled by supply side variation which can not be shown to be strictly rational from a marginal analysis view point if one assumes accurate information about future prices. Of course, such accurate information is not available.

This is the familiar micro-macro problem. The individual actions which make sense in isolation end up causing problems for everyone in the aggregate. A price of sixty-two dollars cwt. makes capital expansion an unbearable temptation and one that should be yielded to if the price rise was going to be permanent. In

aggregate all those temptation yielders cause an outward shift in supply, driving prices down. In the last five cycles the average amount of time from low price to high price has been just over two years. Prices then turn down rapidly. Those who, during the high prices, have only increased production by adding hogs without expanding facilities, will not be hurt too badly when the price falls. Those who have expanded to a new production function by adding capacity, will find their assets trapped in overproduction when the price falls (Johnson and Quance, 1972; Edwards, 1958). That is, they are covering their variable costs but not their fixed costs. However, they keep operating because they are unable to sell their fixed assets for anything close to book value.

That the cycle exists has long been known. More than one hundred years ago Samuel Brenner wrote that the rise and fall of hog prices is "for twenty years past . . . as alternately certain as the diurnal revolutions of the earth on its axis." (Breimyer, 1959).

Traditionally, agricultural economists have explained the up and down hog prices through a theoretical construct called the cobweb cycle (Ezekiel, 1938). According to the theory, farmers would look at current price, assume it was the price in the future, and make production plans accordingly. But while the cobweb cycle had a theoretical appeal, it did not really offer a satisfactory explanation of the cycle.

The cobweb cycle did not adequately capture the biological time periods involved in hog production and surely no farmer involved in hog production is naive enough to think current price will equal future price. There were a number of attempts to correct the cobweb model's deficiencies (Nerlove, 1958; Lerohl, 1965).

It is clear farmers aren't just backward looking when it comes to price expectations. A number of studies have shown that farmers incorporate future information into expectation formation. Partenheimer in the Interstate Farm Management Study pointed this out (Johnson, et al., 1961), as did Kaldor and Heady (1952).

In research done for this study, farmers cited the futures market as the single most important element in their formation of price expectations. Hog futures did not even exist when Partenheimer and Kaldor and Heady reported the results of their works.

Because farm level hog price is quite sensitive to quantity produced only slight production mistakes need be made to cause significant price changes. A rule of thumb is that a 10 percent increase in hog production will cause a 20 percent decrease in farm level price.

Other Attempts at Dealing with the Cycle:

There were early attempts to dampen the hog cycle that did not deal directly with expectation formation. Over and under production was not laid entirely at the feet of farmers' price expectations.

Another major contributor was corn price fluctuations. The hog corn ratio became one of the tools for analysis. The Agricultural Adjustment Act of 1938, among other things, attempted to stabilize the price of corn. One of the justifications for this was that a more stable corn price would lead to a dampening of the hog cycle. It did not happen. Dean and Heady (1958) found the intra and inter-seasonal price fluctuation somewhat larger after World War II than before. As recalled from Figure 1.1, it has become even more pronounced since.

Ideas about Stabilization:

Planning, which Galbraith (1967) says is the reason large firms are successful, is extremely difficult in the face of the price fluctuations detailed above.

Because of the major capital outlays the large technologically oriented firms make, they want to be assured of the price for which they can sell their product. Without this assurance effective planning can not be done, Galbraith claims.

Hog producers, because of the movement to confinement operations, now use capital much more intensively than formerly. If hog producers are to plan rationally they must also be able to have reliable estimates of future prices. For farmers the uncertainty about price is introduced into the system because of supply fluctuations.

An old coach's bromide, repeated in countless speeches on the rubber chicken dinner circuit, has it that: "Failure to plan is planning to fail." How can a hog producer plan effectively when price is all over the scale. The roller coaster ride that pork producers are on becomes clear by looking at some Michigan income statistics.

Large producers (more than two hundred litters annually) and medium producers (less than two hundred litters annually), who use the Michigan State University accounting system, have seen their profits vary as reported in Table 1.1. These numbers do not include payment for the farmer's labor, management or owned capital, and so overstate the profit.

Table 1.1.	Net Profit (Income - Variable Cost - Changes in Inventory - Depreciation)				
	1977	1978	1979	1980	1981
Large Hog Producers	\$16,573	\$112,819	\$53,121	\$38,919	\$-3,697
Medium Hog Producers	6,534	40,984	16,456	20,815	-7,325

As noted, the cycle causes similar planning problems for packers also. Packers' capital is often not better utilized than producers' capital. They often operate far below their processing capacity.

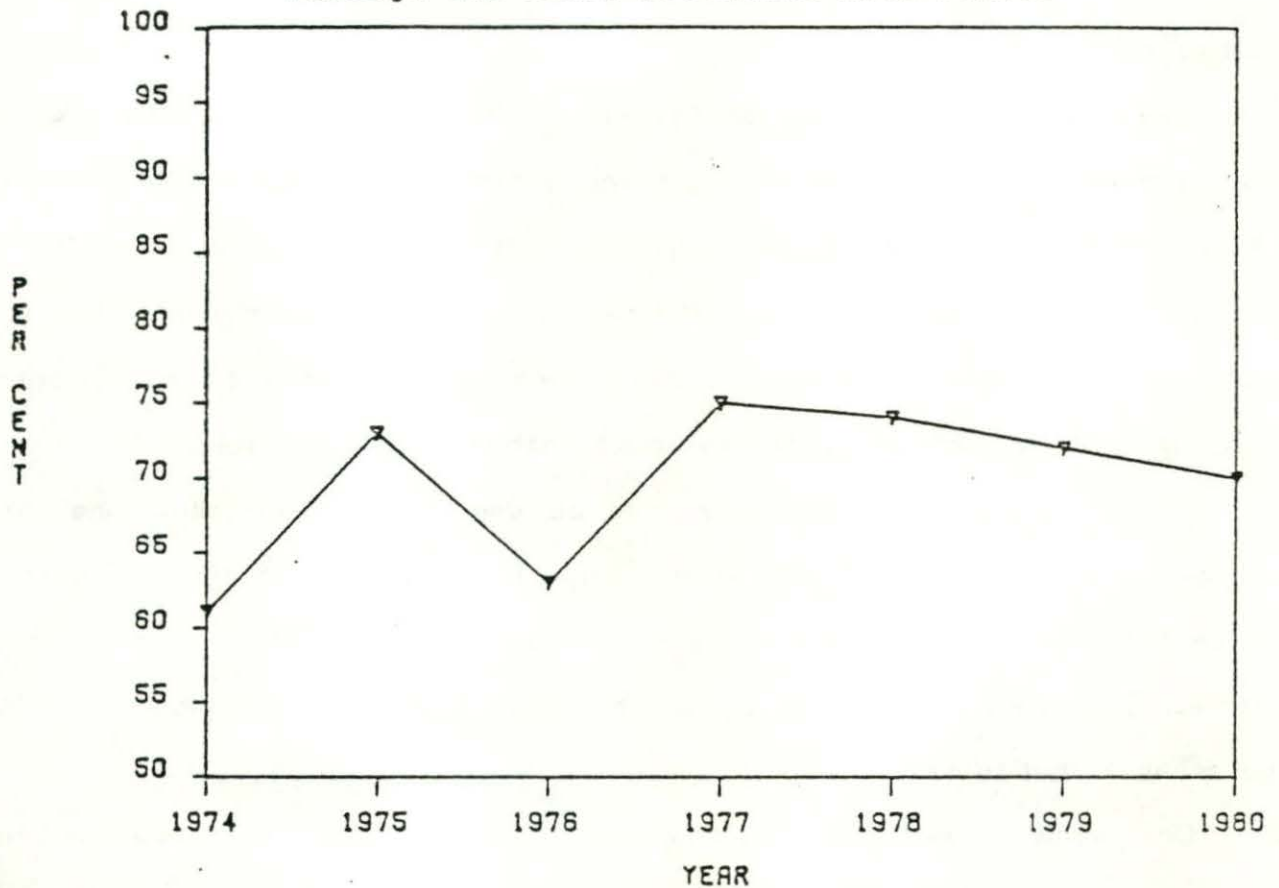
When few hogs are produced at the top of the price cycle, packers find their margins squeezed. And, generally, their average total costs are up since they are forced to charge fixed costs to fewer hogs processed.

Unfortunately government statistics on packing plant utilization are too aggregate to see what happens to pork packers specifically. But, statistics from the Bureau of Census' Current Industrial Reports "Survey of Plant Capacity", give an indication of how utilization varies for pork packers (Figure 1.3). The "Sausage and Other Processed Meats Plants" was selected as the closest proxy for the pork packing industry. Since in a normal year, seventy percent of a hog carcass is processed, much of the processed meat in this country is pork. One should not, however, read too much into these numbers. Much of unutilized plant is obsolete.

Another idea of utilized plant capacity can be gotten by looking at the number of hogs going through the system in the summer and fall of 1984.

There is a hog slaughter capacity in this country of better than 2 million head a week. In the 12 week period June 23-September 8 an average of 13.9 million hogs or less than 70 percent of capacity, were being slaughtered.

Figure 1.3. Per Cent of Practical Plant Capacity Used by Sausage and Other Processed Meat Plants



What this does to return on investment can be seen by looking at the following formula:

$$\frac{\text{Sales}}{\text{Total Investment}} \times \frac{\text{Net}}{\text{Sales}} = \text{Return on Investment (ROI)}$$

This formula says that ROI is equal to turnover of assets times net margin. When turnover falls ROI falls in like manner. Thus, when a hog plant operates at 70 percent of capacity, ROI will fall unless margins increase.

In the fall of 1984 neither packers nor hog farmers were unprofitable. It seems clear that, at least for hog industry participants, the wild fluctuation in hog

numbers, resulting from poor price expectations, do no good. However, the desirability of the dampening cycle is not accepted by everyone.

Coordination:

The lack of coordination and the pervasive uncertainty in the hog subsector has been shown. As both hog farmers and packers have become more specialized in their operations, the need for coordination is obvious. Because of increasing capitalization for both packers and farmers, the risks are higher. Break even points have increased, which means the importance of effective plant utilization has gone up. Why have not mechanisms arisen that reduce these problems?

Highly specialized investments can be used to produce only one kind of product. Efficient use of capital can only be assured if there are contractual agreements between the parties. The transaction costs of relying on classical markets in such circumstances are much higher than those produced by alternate governance structures.

One would expect more vertical coordination in the hog subsector than is occurring. Several reasons can be put forward for this. While both processors and producers have moved to much more specialized investments, the hog is still a generic product. Although different packers prefer different weights and lengths of hogs, for the most part a 230 pound slaughter hog can be utilized by any packer.

Pork packers are not quite similar to General Motors where there may be only one set of production equipment in the country to produce a specialized diesel fuel pump that will go on only one General Motors' engine. Such a diesel pump can obviously not be purchased in the open market. In fact, according to a director of purchasing for a GM division, the company decided that it could get an outside supplier to furnish the pump more cheaply than with the internal manufacturer.

GM then had to provide the supplier with twenty-three million dollars in capital and a guarantee that it would buy at least ninety percent of the capacity of that capital for five years.

In addition to the generic product reason for lack of coordination in the pork subsector, one can also posit that the administration cost of such contracted coordination will be high in a system where there are many contracts. For instance, GM likes to have at least two contractors for any one item so that both suppliers know they must keep costs in line. But they never have more than four or five contractors for one item because the cost of administering the contracts becomes too burdensome. The costs of contract administration become too high.

A packer usually buys pigs from many farmers, dealers and other assemblers. The transaction costs for total contracts covering all these entities would be large. But most packers have special relationships with farmers they have found to be suppliers of the type of hog they need. And most packers do engage in some form of contracting. Now there is no formal mechanism to facilitate contracts for delivery product. Production contracts, the kind which provide input and control methods of production may be spreading more rapidly than previously thought. A recent survey (Mundy 1983) showed that about 20 percent of the hogs in North Carolina are raised under production contracts. Virginia, Maryland, and Pennsylvania, however, were marketing less than one percent under contract, according to that same survey.

Improving Coordination and Decreasing Price Fluctuation:

Might there be a coordination structure that could cut down on the crap shoot nature of participation in the hog subsector? One is needed that would force more information into the system so that the portion of the cycle which reflects neither

changes in demand nor changes in input costs is eliminated. Since demand for hogs is relatively constant, any institution that could decrease supply variation because of poor price expectations could have a dramatic effect on price fluctuation. Not only is demand quite constant but also the quantity demanded of food does not vary as much as for mechanically manufactured products.

This can best be understood by comparing the difference in demand for cars and food. When it comes to food we want what we want. Consumers may not like when the price of meat is high but they just cut back on consumption as opposed to not buying. With cars, however, sticker shock has been strong enough that it has induced many not to buy new cars. Although recently consumers have been getting over that shock.

If we can't satisfy our food desires, we grow desperate and are willing to pay a very high price for food. This, of course, works to farmers' advantage when crops are short. However, this desire is a two edged sword that cuts back ways as far as farmers are concerned.

We may wish for a chicken in every pot but most of us would not buy 10 chickens just because of a drop in price. It is different for cars. We want a car in every garage and, in fact, maybe three or four if the price is right. The quantity demanded of cars is pretty well unlimited if the price is low enough. Price could also probably get high enough to make us get along without cars. The price of food could get high enough that major political unrest could result but it could never get so high that we would decide to do without it.

The point of all this is that just a small change in quantity of agricultural products produces a large change in price. A similar quantity change will not produce nearly so great a price change for mechanically manufactured products.

Estimates of this sensitivity have been devised. Taking only a few liberties we can say that a 20 percent increase in the volume of hogs produced would necessitate a 40 percent or larger drop in the farm level price in order to get rid of all the hogs produced, if all other things remained the same. By way of comparison, if manufacturers produced 20 percent more full sized cars, they would have to cut prices by only 6.4 percent, according to one study (Irwin, 1983), to clear the market. The nature of demand for agricultural products is dramatically different from mechanically manufactured products.

It is clear that because of the biological nature of agricultural production, quantity supplied often misses the mark as far as the amount consumers want at a price which allows a normal profit. Given the nature of consumer demand for food these quantity changes cause price to fluctuate more wildly for agricultural products than mechanically manufactured ones. It seems clear there is a need for improved coordination in agriculture. Yet, at this point, the mechanisms which allow people at one stage in the marketing channel to inform those at another stage what their future needs will be, are not well developed.

Various government agricultural programs have attempted to deal with the supply fluctuation problems. Success has been distinctly limited.

But now, by combining new technology with old institutions, it may be possible to create a new institution that maintains free market advantages while producing supplies that are predictable enough so that rationale planning can occur.

Using computers to sell hog contracts that require delivery could result in quantities of hogs which more nearly meet consumers demands at prices which do not cause outrageous gain or loss to farmers.

Such an institution could be a national electronic market in forward contracts between producers and packers. This market would capture the futures market

advantage of price availability to all and would also be readily understandable to participants. It would also produce information about production intentions that the futures market never will because the number of contracts in the futures market rarely reflects actual production.

Electronic or computer connected agricultural cash markets already exist. These markets are growing but their success is not yet assured. In these markets buyers and sellers are connected to each other by computer terminal. From their office, farm, or stock assembly point, they buy and sell products on a computer network. If these markets became well developed then it would be possible to take what is currently happening in the private treaty agricultural contracting market and wed it with these agricultural electronic markets to produce a public contract market.

Electronic trading of stocks has been very successful in both Canada and the U.S. The U.S. computer system, called National Association of Securities Dealers Automated Quotations (NASDAQ), has grown rapidly in the last 10 years. Its listings have gone from about 2,500 to 3,600 stocks. The New York Stock Exchange has remained static at about 1,500.

It used to be that whenever a company grew large enough to be listed on the NYSE it almost always chose to be listed. However, some companies are now so pleased with the competitive electronic marketing environment of NASDAQ that they are not making the switch to NYSE, even though they are big enough to do so.

Many find the NASDAQ system to be more desirable because there are many more market makers to keep the market liquid.

There is no apparent reason why sale of agricultural products couldn't be equally successful. This is not to say that it isn't more difficult to sell a hog than a stock by description. However, this description problem is being surmounted.

Once it is fully solved, it will be possible to take what is happening in the private treaty contract market and wed it with the electronic market. When this happens a truly public contract market with open price discovery will have been created.

If participation in this market became significant then both packers and farmers would have information with which to plan. There would be more accurate information about future supply and demand.

This system would not, however, be like centralized planning from government with production amounts mandated. Supply and demand would still be free to shift in response to changing technologies or costs and tastes and preferences. Production could not get very far away from levels dictated by the market because of a bureaucratic mistake.

In this study such a market will be called a Pork Contract Market (PCM). A PCM would:

- (1) *Commit farmers to delivery of slaughter hogs prior to hog maturity. As the system itself matures, more contracts would be let prior to breeding.*
- (2) *Create a forward price readily observable to all. The price would be created by interaction of those with intimate knowledge of costs of production and the demand for pork.*
- (3) *Be open to all qualified producers and processors with no unnecessary barriers to entry. (This will be spelled out in more detail later.)*
- (4) *Have relatively low transaction costs if it were done on an electronic market. The electronic market appears to be the only realistic alternative.*
- (5) *Eventually be national in coverage. While it is unlikely that packers in California would contract with Ohio producers, it is possible that this could be done. The market must be national in scope so as to get broad participation. The market itself will determine price differentials among areas.*

Such a market could improve both coordination in the subsector and dampen the amplitude of the hog cycle. Both of these effects are desirable attributes. A

PCM appears to be a way to force enough long run price information into the system so that chronic mistakes in long run production plans might be reduced.

The cycle seems primarily to be a manifestation of lack of information. There is certainly no technological or biological based theory that can explain all of the jiggling hog numbers in Figure 1.3.

If information about prices ten to twelve months hence actually became reliable, then production levels might be stabilized so that the cycle would dampen. But we know that people respond primarily to immediate rewards (Skinner, 1974). Thus, in order for such a market to be created with voluntary participation, it must be designed so that people can obtain benefits from it immediately.

The possibility that contracts might some day force enough information into the system to dampen the cycle can hardly be held out as a reason for participation to someone who is worried that s/he might be forced into bankruptcy next month. For that person the question has to be: "What can you do for me today?"

Industry participants often view those selling the long range benefits of dampening the cycle with extreme skepticism. The ear of subsector participants can be had, for good reason, only by stressing the immediate benefits of the PCM. "Big picture" sellers are selling a product without effective demand.

Some will contend that if a PCM had such systemic benefits, the market would be created on its own power. This idea will be more fully disposed of in the next chapter, but for now it is sufficient to observe that: 1) Such a market is slowly starting to evolve, and; 2) It has not grown faster because of the conflict between short run micro-motives and long run macro-good. That is, the immediate costs of creating a PCM with transparent prices are such that they stop the long run obtaining of the macro good. It is for this reason that a look at the immediate or attachable benefits would be worthwhile. These benefits all result from better coordination. Some of them would not be unique to a PCM. They are:

- (1) *Less uncertainty about farmer income possibly reducing farmers borrowing costs.*
- (2) *A smoother flow of product to processor resulting in a more efficient operation of production plants.*
- (3) *A higher expected sales over time because of more price stability.*
- (4) *A more competitive market.*
- (5) *Improved transportation with less cross hauling and shrink of animals. Production and processing located more rationally.*
- (6) *Somewhat reduced acquisition costs because of efficiencies and reduction in personnel required to sell a hog.*
- (7) *Improved information flows about the quality of slaughter hog the market wants and improved premiums to induce such production.*
- (8) *Increased rate of technology adoption because of faster diffusion of information on successful farmers.*
- (9) *Better information on when hogs should be produced and how their weight should vary during the year.*

Summary:

The pervasive uncertainty in the hog subsector makes planning extremely difficult. It also means less capital is available to it than otherwise would be. The fluctuations result largely because of periodic over and under production and not because of changes in demand. A Pork Contract Market (PCM) could reduce the uncertainty by producing a more reliably anticipatory price. In addition to dampening the cycle, a PCM could improve coordination in the system by reducing transaction costs. A PCM would transmit clearer signals than current spot markets about the kind of product needed and when and where it is desired.

CHAPTER II

THE EVOLUTION OF THE HOG SUBSECTOR

But we all recognize that history has little relevancy to the future, except possibly in the mental block it establishes in our minds.

Max Brunk
Agricultural Economist
1972

Inexorable but Controlled Change:

Any observer of markets knows the one constant about them is change. They also know that new market structures are shaped by the old market and therefore history is important.

For instance, in Ontario, Canada, an entirely new marketing system for hogs was created during the 50's and 60's. The system apparently works to most participants' satisfaction but it has been a failure when tried in other provinces. According to Ontario Pork Producer's Marketing Board sales manager, J. A. Rollings, it is successful because "we had a hog evangelist" who sold the system.

It was not easy to create this new market. Because truckers' and drovers', packers' and farmers' interests were different, they battled each other. The nature of the threats varied with the station of the participant. But sometimes things became heated enough that conflict moved beyond threats to property destruction (Bishop, 1977). Furthermore, interests were not the same within a group. So farmers were fighting farmers and packers were at each others throats. The creation of the market included an ill-advised attempt by a splinter group to set up their own packing plant; a decision that involved the loss of more than two million dollars and probably included some fraud.

But the centralized marketing system did get off the ground in 1960. Now, all hogs marketed in Ontario are sold on a teletype system under a uniform grading system. C. W. McInnis, by all accounts, was the man who made that system possible. This "hog evangelist," apparently by force of personality, created it. But before the system was up and running, he had become so dissatisfied with some of the compromises that were necessary that he resigned from the marketing board.

It was McInnis who led the ill-advised splinter attempt and in doing so he and others apparently got taken. It is doubtful that the well trained bureaucrats who run the board today would ever be taken in the way the splinter group was. However, it may be likely that today's bureaucrats do not have the color and fire necessary to create the coalition that forged the current marketing system in Ontario. That is, the marketing system in Ontario was not the result of an inexorable process. It came into existence because the teletype was invented, which allowed remote sellers and buyers to be connected, and because those buyers and sellers agreed to new institutional rules. The most important rules were new grading standards and sales by description, which allowed the creation of a new market. It exists because one person spent years on the road building the coalition that could mold the technology and institutions together so that a new market could be created.

When one reads contemporary accounts of the changes that the rash upstart Iowa Beef has forced into the meat system, one would think that it was the first time there was ever radical change within the meat subsector. It is true that Iowa Beef, which was formed in 1960 with a \$300,000 loan from S.B.A., has taken some of the most venerable companies in the industry to the mat. Swift, for instance, decided that their packing operations could never meet their long term profit objectives either in terms of size or dependability. So the packing operations were sold.

Iowa Beef probably did pin Swift to the mat with their innovations and lower labor costs. But 100 years ago Swift was forcing changes into the system of a larger magnitude than anything Iowa Beef ever did.

When G. F. Swift started shipping Western dressed beef in refrigerator cars that kept the meat fresh, he revolutionized the packing industry. Until that time only live animals were taken into the Eastern market. His approach made a lot of investments in human and physical capital worth less. Butchers and others tried to stop the innovation by burning refrigerated cars.

The point of all this is that marketing and production systems grow out of a complicated weave of technical and institutional factors. Schmid (1978) rightly contends that it leads to poor analysis to think of markets and government separately. But equally important are non-governmental institutions and technology. A market will exist once the interplay of those variables is established. But as the coefficients of the variables and even the variables themselves change, the market will change and prices will change.

Thus, whatever the current market is, it exists because somebody tampered with institutions or technology so that the antecedent market was replaced or altered. The well-schooled analyst must be careful not to fall into the trap of thinking the market is a divinely ordained mechanism that exists in response to natural law. The market is whatever people create through their technology and institutions. Once those are in place, prices and income streams will emerge. But the performance outcomes are a result of a weave of technology and institutions. The income distributions that emerge from this are inevitable. But since the distributions are not from holy writ, it requires thinking about the kind of institutional structure we want.

The careful analyst refrains from taking the sanguine view that a current market is correct just because it's there. Likewise, change must be recommended only with extreme care. This is for several reasons. First what is there got there because the community or at least a segment of it decided that such an organization elicited behavior that led to desirable performance, or performance that benefits them.

Secondly, a change may be undertaken without resulting in improved performance. This error obviously should be avoided because it needlessly visits costs on subsector participants without giving any benefits.

Finally, nearly all change damages someone. Economics offers help in determining the direction of these changes. That is, who will gain and who will lose. But economics does not offer much help in deciding which distribution is best. Such recommendations for change nearly always require value judgements.

Even if the judgment is made that the change will lead to an improved performance, there is still a problem in deciding whether to proceed. The question then is will those effected negatively by the change be able to resist the change so the improved performance does not occur?

Since no market has a divine imprimatur, the careful analyst is always left with a delimma when making policy recommendations. S/he must carefully weigh who wins and who loses under the present or alternative set of rules or institutions. The question is always what will performance be, given this situation of institutions and technology? Who will win and who will lose?

Development of New Systems of Exchange:

As noted, as packing plants started to move into the country, the terminal markets started to decline because farmers no longer needed to move their hogs

through the markets in order to make connections with packers. Auction markets started to make a comeback in the country when the terminal markets started to decline. By 1920 auctions had all but died out. But, from 1920 until 1950 their numbers grew from almost none to nearly twenty-five hundred. The numbers have been declining since but there were recently about two thousand auction markets (McCoy, 1979). They are an extremely important market outlet for hog farmers. The volume that moves through them is geographically dependent. They are used extensively for hog marketing in the South and also in the Rocky Mountain area. Records on total number of hogs moving through the auction system are not kept. But in 1980, packers acquired 9.9 percent of their hogs through auction markets (Packers and Stockyards Resume, 1982).

Auctions were one of the first price discovery methods used in this country at fairs and other regular events. But, at these events in the early 1800's, information on other markets was nearly non-existent. Now at any auction buyers and sellers are keenly aware of what the price has been at competing markets. The telephone auction has been or is being used to sell hogs in Virginia, Missouri and Wisconsin.

But even though country auctions are well used, terminal markets have remained the primary price discovery mechanism. Economists have lamented that with the decline of the terminal markets there was no longer an adequate price discovery method (Hayenga, et al., 1978).

Contracting:

Contracting has never been very successful in the pork subsector. A contracting program of sorts was tried in the 1920's, in an attempt to give midwestern producers access to eastern processors. But it was not really a forward deliverable contract in the sense that there was a substantial delay in delivery from the date the contract was agreed upon.

In Columbus, Ohio, the Eastern States Co. moved as many as one hundred thousand hogs a year through what was called the guaranteed yield program, but it eventually failed (Dowell, 1941).

In the 1950's, there was some production contracting similar to what exists in the broiler industry. It was basically a southern phenomenon. In this study, production contracting is defined as a contract that includes control of inputs used in producing the product. A pork contract market would most likely not include production contracts.

In 1972, the president of Gold Kist, the large southern cooperative that supplies chicken to much of the U.S., said it planned to enter the hog market in the same way it had entered the chicken subsector. It started an ambitious training program at a center where farmers were brought to learn proper methods of production. And it had its own production center to produce just the type of brood stock wanted to run through the processing plants (Scheidau and Duewer, 1972).

But instead of making the same progress it did in the broiler industry, Gold Kist spent the next decade making no progress at all. According to Gold Kist Vice President, Ralph Mobley, by 1981 it was trying desperately to get out of the hog business. Gold Kist was closing down all its plants and selling most of the hogs under contract to a competitor, Swift.

"We felt we could go out and just do like we did with chicken. But we found it took too much money. We could put in twenty-five thousand chickens for a hundred thousand dollars. A 250 sow operation was costing us four hundred thousand dollars. And our farmers just could not get that kind of financing. The banker would not float it. We'd get out of it altogether if we could find a buyer for our production center," said Mobley.

In the Midwest, apparently never more than six percent of the hogs were raised under production contracts (Phillips, 1961). When Bloomer (1975) surveyed the Michigan industry he found contracting virtually non-existent. Between 1960 and 1970, Mighell and Hoofnagle (1972) found that hog contracting in the U. S. increased from .7 percent of the production to one percent.

As recently as 1982, the large Michigan packer Frederick and Herrud tried to enter into production contracts with farmers. It was a new departure for Frederick's, because they normally get most of the 14,000 or so hogs they need daily from livestock dealers. They get almost none of their hogs from famers and have had little direct dealing with farmers.

The Frederick and Herrud contract was supposed to cover five years. It had similarities to broiler contracts. The contract would basically guarantee that if the farmer met the contract conditions s/he would be paid the cost of producing hogs regardless of the market price. But the farmer had to meet some fairly stringent feed conversion ratios, pigs saved per farrowing crate, etc. If the market price was above the farmer's cost of the production, then Frederick and Herrud and the farmer split the excess 40/60.

Allen Scotch, the manager of a Frederick and Herrud subsidiary that managed the contract sales, pitched the contract to farmers as a way of evening out the cycle. In meetings with farmers, Scotch drew a graph of the cycle and circled the high point saying when that point is reached packers do not make any money because they can not move the product at rates necessary to cover their fixed costs. He then circled the low points and told farmers that they are not making any money there either.

"We can't live with this cycle as meat packers and processors, and producers can't live with it either," Scotch told a not particularly receptive audience of

farmers in Grand Rapids, Michigan in the Spring of 1982. Scotch said that the wide price variation means that the Company sells less pork than it could with a more consistent price. The Company's goal, according to Scotch, was to "take the humps out of the cycle."

That may have been a rather lofty goal for one company, but the F&H definitely could have reduced its transportation costs with a contracting program. Many of the Company's hogs come out of Missouri and Iowa. Scotch said the Company estimated additional costs of five to fifteen dollars a head, when shrink costs are included, to transport an animal from Missouri and Iowa to the slaughter floor in Detroit above those animals purchased locally in Michigan. Another Company officer later disputed this, saying that there was really very little difference in shrink of the animals when you compare "meat on the hook; the difference is all just (excrement)".

Whatever the case, no Michigan farmers were apparently interested in the contracts. So Frederick and Herrud quit the effort to get about fifteen percent of its production under contract.

In other states this type of production contracting has apparently gained a foothold. The North Carolina Crop Reporting Service estimates 20 percent of hog production there is under contract. However, a recent survey (Mundy, 1984) of Pennsylvania, Maryland, Virginia, and North Carolina indicates that less than one percent of the hogs in the region are produced under contract.

Direct Marketing:

With the decline of the terminal market and the movement of packers into the country, marketing direct to the packer became popular. (Traditionally direct marketing has meant any selling that did not go through the terminal markets. It has now been expanded to include anything which does not go through auctions or terminal markets.)

Farmers now deliver direct several ways to packers. They can haul their hogs right to the packing plant if their operations are nearby. Packers have also set up what they call salaried stations or concentration yards away from their plants to which farmers may deliver. And packers in some parts of the country have what they call car buyers. These are just buyers who go direct to the farmers operations to make arrangements to buy hogs.

Figure 2.1 shows the current marketing channels and the percentages of hogs that are moving through them. There are no specific percentages kept on the direct channels.

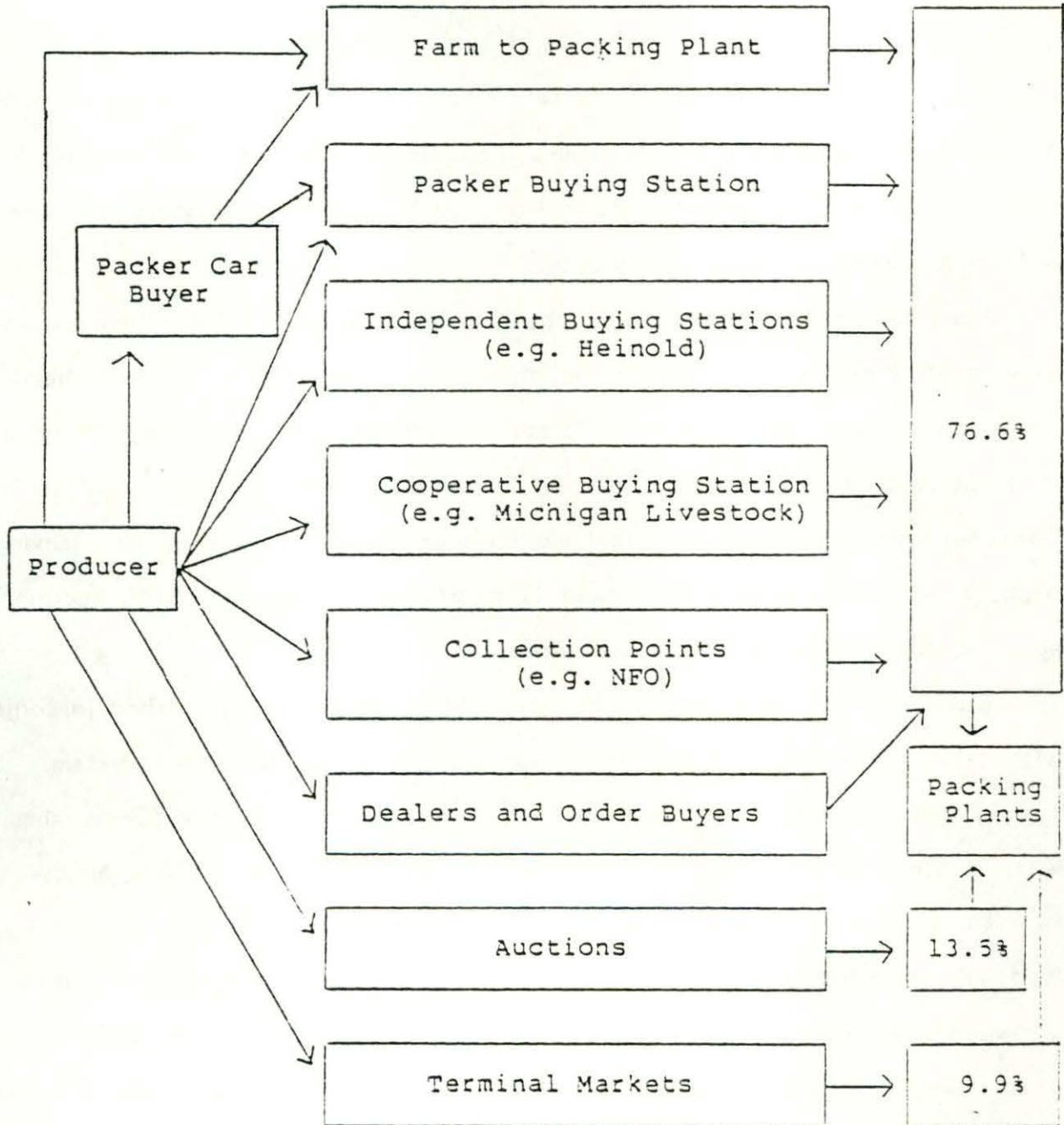
With the direct arrangements, prices are driven by some formula, usually plus or minus terminal market price or some other announced price. For instance, Oscar Mayer, which gets a substantial portion of its hogs direct from farmers, pays on the basis of the price which is broadcast by the radio station, WAMES, which is run by Iowa State University. The radio station is right in the heart of Oscar's procurement area.

If, at times, a packer is not able to get the hogs at the formula price, the price is moved up to induce more farmers to bring in hogs. Formula pricing has evolved at both farmer-packer and packer-retailer exchange levels because it reduces transaction costs.

In the 1930's, critics charged that direct marketing (nonterminal) was causing a decline in prices. Bjorka (1935) concluded that direct marketing had not "impaired" the pricing function of the public markets or caused prices to decline.

However, recent experience with the Ohio State electronic spot market for hogs, indicates that is no longer the case (Henderson and Holder, 1982). During the time the Ohio State market was running, there was a statistically significant price increase of about one dollar per cwt. over the price when there was less

Figure 2.1. Marketing Channels and Percentages Moving Through Them, 1980.*



*Packers and Stockyard Resume, 1982, Table 3.

competition in the market. This was done by comparing the normal Peoria basis with the one that existed during the time the electronic market was operating.

Dealers and cooperative livestock marketers are an extremely important part of the marketing system in some parts of the country. For instance, Michigan Livestock Exchange markets about 60% of the hogs sold in Michigan.

Michigan Livestock uses no set formula to reach price agreements with packers, according to their manager, Tom Reed. "We set our own market," he said. They look at what the competitive cash markets are doing and then start talking to buyers from packing plants.

Reed thinks his sellers can tell by the "tone of voice" of the buyers how badly they need hogs. Based on these different kinds of information, the Michigan Livestock sellers see if they can "bump up" the price or, if the demand is soft, they let it slide. The sellers make sure all buyers agree to pay the same price. Then Michigan Livestock personnel must divide up the hogs they have amongst the packers who want them. The object is to provide each packer with enough volume so slaughter operations will be maintained.

But Reed dislikes deciding who gets what. He originally pushed in conjunction with other midwestern cooperatives, for an electronic marketing system. Such a system will eliminate "playing God," which the current system forces them to do when it comes to dividing the hogs which farmers have sold to Michigan Livestock.

Under the electronic system, whoever pays the highest price would get the load, Reed noted. Thus Michigan Livestock personnel would be spared making decisions about who gets what. Under the current system, such individual pricing of lots would be too time consuming and complicated. It should be noted that Reed later became less enthusiastic about the system because of competitive problems. In fact Michigan Livestock eventually decided not to participate in the system after its

archrival Heinhold bought stock in the system which is now up and running. It is operated by National Electronic Marketing Association, Christiansburg, Virginia.

Futures Markets:

Another marketing tool that hog farmers have acquired in the last 20 years is the futures market. Since 1966 live hog contracts of 30,000 pounds have been sold on the Chicago Mercantile Exchange.

The futures market is used by some farmers to approximately lock in a price for their agricultural production. However, farmers are not using the futures markets directly. For these non-using farmers future markets influence production decisions only to the extent that breeding or planting decisions are made on that far distance futures price. However, tests show that economic models do a better job than hog futures contracts when it comes to predicting prices a year or more in advance (Just and Rausser, 1984). It is only as the hog futures contract gets within several months of delivery that it starts to outperform the models of the economists.

Those long term problems aside, futures have use to both processors and farmers. Farmers do not use the futures market as a temporary substitute for a cash forward contract or hold their futures contract until they are about ready to sell their product in the cash market. Futures contracts have not been successful unless they are used by handlers of the commodity, according to those who studied these markets. For a long time it was felt that it was primarily speculators who used the futures market. This led to charges that futures were organized gambling and as late as 1956 to the outlawing of an onion contract on the grounds that it was destabilizing price. Subsequent study showed that onion futures had a stabilizing effect.

Attacks on the futures markets have not quieted, and those of a populist bent still often charge that it is a fount of farmers troubles. Currently several groups of cattle producers are trying to get cattle contracts outlawed.

Futures markets do give public information about what speculators and hedgers think the price will be as long as 16 months in advance of delivery of the hogs. But these distant contracts are so thinly traded that they don't reflect a consensus on price and they give no indication of farmers production intentions. Of course, it is precisely in these distant contracts that the information is most needed. Unless distant futures are traded in volume by hedgers they have limited ability to effect production decisions.

Reliable information about price and quantity must be produced by the time a farmer makes his production decision. Otherwise the production decision is made without adequate feedback about whether it was the right one. Solid information the number of pigs coming to market three months from now is definitely helpful to some parties but does very little to alter production. Those hogs will come to market almost regardless. Other commodities require information about price even further in advance if production is to be influenced.

Grain futures have long been traded, livestock contracts are of more recent vintage. Hog futures have only been traded since 1966, but a survey of farmers in 1982 showed that they are already the most relied upon source of information farmers use for future price information when making production decisions. However, the futures has apparently not dampened the cycle.

While futures are widely used as a source of future price information, most farmers don't actually use them for hedging. Although the number of outstanding contracts in any commodity is always available, there is not information, except when special studies are done, about who holds the contracts. The percentage of

contracts held by speculators as opposed to producers or buyers is unknown. Both speculators and hedgers play important roles in the market but, the way the market is structured, little information about production intentions is created. The number of contracts outstanding is usually a fairly small portion of actual production. It is this lack of information about supply that makes price so unpredictable. This, of course, makes processors reluctant to contract directly with farmers unless there is assurance that their competitors will acquire their product at similar prices.

Thus while futures do offer both processors and packers a useful management tool they are not producing information that dampens the cycle as much as it might because it doesn't really produce information in time to effect breeding decisions.

Current Production Trends:

Pork producers, like pork packers, have specialized. Most of this specialization has meant a move to more confinement facilities, which has also meant a move to large facilities.

The ease of operation and the ability to produce pork on a continuous basis first made centralized farrowing housing popular in the 1930's. But farmers who went to such a system soon found themselves wishing they had not. The technology was not yet developed for adequate control of disease and parasites. Disease problems became worse in their confinement buildings each year that they operated them. Farmers with the confinement facilities soon had to go back to portable housing rotated on clean pastures.

But, increasing land prices increased the cost of field farrow operations. So from the middle 1950's until about 1965, production moved back from the fields onto paved barnyard lots (Van Arsdall, 1978). From 1965 on, the move was from lots to slotted floor confinement farrowing houses with farrowing crates which helped protect the piglets from being crushed by the sow.

Disease control advances permitted this move. Slotted floor nurseries and finishing buildings also came into use. In many of these buildings, heating and ventilation could be controlled. Some farmers found that air conditioning pays for itself by keeping rate of gain up during the heat of summer.

With the move to confinement farrowing houses, farmers increased their capacity from fall and spring litters to almost eight litters a year in a farrowing unit, if they weaned in six weeks. In practice, those following such procedures usually managed to get out only six litters because of irregularity in sow heat and the time required to clean the facility. But now, some of the larger operations have cut weaning time to three or four weeks and are getting twelve litters a year out of each farrowing space.

No long term data on production methods exist, but a 1978 study (Van Arsdale, 1978) showed the following percentages of hogs born in the different types of production facilities in farrow to finish enterprises (Table 2.1).

Table 2.1. Distribution of Farrowing Facilities in Farrow to Finish Enterprises by Region, 1975.

Region	Percentage of Hogs in Each Type of Farrow Facility				
	No Facilities	Portable Housing	Solid Floor	Slotted Floor	Mixed Housing
North Central	5.2	14.0	40.1	16.8	23.9
Southeast	7.1	1.7	48.1	29.5	13.6
South-west	1.9	1.5	45.7	42.6	8.3
All Regions	5.3	12.1	41.3	19.1	22.2

Table 2.2 shows how larger production facilities are producing more and more of the hogs. The thousand and up head per year category in the right hand column of the table does not adequately describe the really large operations. Even in Michigan, where capacities tend to be smaller than in some parts of the South, a hog farm with a capacity of two thousand head is not considered very large.

One of the farms which showed up in the survey on contracting, which will be discussed in the next chapter produces seventy-two thousand hogs a year. The trend to larger operations, as is illustrated in Table 2.2 is expected to continue.

Table 2.2. Number and Percentage of Hogs and Pigs Sold Yearly by Farm Size Classes*

Year	Number of Hogs and Pigs Sold in 1,000's	Per Cent of Hogs Sold by Farm Size				
		1-99	100-199	200-499	500-999	1,000 and Over
1964	80,391	23.0	23.1	33.2	13.2	7.3
1969	85,903	15.6	17.7	34.9	19.2	12.6
1974	76,422	11.4	13.0	29.0	21.7	24.9
1978	90,723	8.4	10.5	24.8	22.0	34.0

*Census of Agriculture, 1964, 1969, 1974, 1978.

Summary:

The case for constant but evolutionary change within the hog subsector was examined in this chapter. Examples cited of how change entered the system

included: 1) Swift's use of refrigerated railroad cars so dressed meat could be shipped into the Eastern markets; 2) The changeover to an electronic marketing system in Ontario, Canada which changed the structure of the hog subsector there.

The concept of market structure was looked at and it was claimed that no "correct" price exists, but only one that is in response to a particular structure and technology. The structure, given human behavior or conduct, leads to performance outcomes.

The case was made that an understanding of evolutionary history was necessary to understand the structure of the hog subsector. And it was emphasized that the structure-conduct-performance paradigm will be used as the framework of analysis for this research.

The history of the pork subsector was examined with emphasis on marketing methods. It was seen that the pork subsector has constantly undergone change, but in an evolutionary fashion. Every time technology or institutions have changed, performance has changed. Current problems of the marketing system were highlighted.

CHAPTER III

FARMER AND PACKER ATTITUDES TOWARDS A
PORK CONTRACT MARKET

His education had had the curious effect of making things he read and wrote more real to him than things he saw. Statistics about agricultural labourers were the substance; any real ditcher, ploughman, or farmer's boy, was shadow. Though he had never noticed it himself, he had a great reluctance, in his work, ever to use such words as "man" or "woman." He preferred to write about "vocational groups," "elements," "classes," and "populations" for, in his own way, he believed as firmly as any mystic in the superior reality of the things that are not seen.

C.S. Lewis
That Hideous Strength

The Survey:

The theoretical underpinnings of a Pork Contract Market (PCM) have been established. But, if subsector participants' attitudes about a PCM are unknown, it is impossible to judge whether, or how to operationalize a PCM. To acquire this knowledge, surveys of both farmers and packers were done in the Spring and Summer of 1982. The survey of farmers was a formal random mail survey with follow-up telephone solicitation of nonrespondents. The packer survey was purposive and more openended.

Farmers were surveyed in Iowa, Michigan and North Carolina to discover their attitudes about a (PCM). In addition to the hog farmers, eight packers were interviewed. The packers interviewed were non-randomly selected by talking to knowledgeable industry personnel and by reviewing trade publications such as National Provisioner and other sources of information like Grocery Register.

The Response:

Fifty-one of the seventy-five farmer surveys were completed either by return mail or telephone interview. Twenty surveys were completed by Michigan farmers, eighteen by Iowa farmers and thirteen by farmers in North Carolina. Six farmers in the sample were found to be no longer in the hog raising business or were only members of the associations because of their connections with the industry.

Sample Population Characteristics:

About sixty-seven percent of the producers were farrow finish operators, twelve percent sold both feeder pigs and slaughter hogs; fourteen percent bought feeder pigs and sold slaughter hogs and about eight percent operated feeder pig facilities.

Fifty-three percent of the respondents had total confinement operations. Thirty-five percent had semi-confinement facilities and twelve percent of the farmers raised their hogs in either open lots or in the field.

The number of slaughter hogs produced annually ranged from less than 100 to 80,000 with a mean of 4,500 and a standard error of a little better than 2,000. The median number of hogs marketed annually was about 1,200. Farmers in the sample marketed on the average of once every two weeks but the range was from twice a year to every day, with the standard sample error in the number of yearly marketings being three.

About fifty-seven percent of the farmers in the sample relied on their hog operation for more than fifty percent of their income, with the standard error here being less than nine percent. However, this income question was not carefully enough constructed to determine whether the farmers considered corn crops as part of the hog operation. The packers interviewed had a daily kill capacity ranging from 1,600 to 40,000. All the packers' hog facilities slaughtered only pork, a situation that would not have existed twenty years ago.

The Survey Results:

Information about Time Limitations on Delivery for Contracted Hogs: In order for contracting to work smoothly, farmers need to know prior to breeding when their hogs will be ready. By putting operations in a more controlled environment, confinement production has reduced uncertainty in production somewhat. Unfortunately there is still a lot of biological uncertainty. About seventy-five percent of the farmers said that prior to breeding they would need at least a range of a month in order to be sure they would have the pigs ready for market. About twenty percent believed they could tell within a week of when the hogs would be ready for market and four percent said they could estimate within two days.

Even after the litter was weaned, farmers still remained relatively unsure when the hogs would be ready for market. Fifty-eight percent of those answering the question still said they needed at least a month to tell when the hogs would be ready. About thirty-six percent felt they could tell within a week and seven percent said they could tell within two days.

This is not as big a problem as initially hypothesized. It was thought that because of the coordination advantages, packers would want to know exactly when they were getting the hogs at the time of contract. But packers using contracting nearly universally said that since they never expected to have all their production under contract, they could easily work with a range of days for delivery at contract time.

Price Expectation: A relatively new institution has apparently changed the way farmers form price expectations. The futures market for live hogs, which has only been in existence since 1966, is the most important of the various sources of information available in helping to form the price expectations of the farmers in the

survey. Of those who answered the question about how they form price expectations, fifty-nine percent said they paid more attention to the futures price than any other factor when making forecasts of future prices. Only eighteen percent said they do not pay attention to the futures price. The remaining thirteen percent of the farmers gave it secondary weighting in their expectations formation procedures.

All the other methods of price formation fell far behind the value of futures in the farmers' estimations.

The price formation question gave farmers six choices about how they form price expectations. The choices were: 1) A weighted average of past prices; 2) Futures market; 3) USDA pig crop forecasts; 4) Extension Service price forecast; 5) Own computer or calculator model, and; 6) another method. Farmers were instructed to rank their choices in order of the importance they attached to the methods. A chart of the absolute frequencies of the farmers' responses is in Table 3.1:

Table 3.1. Absolute Frequencies of Relative Importance of Information Sources Used in Formation of Price Expectations

Information Sources	Relative Importance		
	First	Second	Third
A Weighted Average of Past Prices	2	5	9
Futures Market	26	6	2
USDA Pig Crop Forecasts	6	11	8
Extension Service Price Forecast	0	1	3
Own Computer or Calculator Model	3	2	0
Another Method	6	1	2

Price Forecasting Ability: Most farmers admitted to a great deal of difficulty in predicting prices ten months from now. Of those answering, a total of forty percent said their price predictions were sometimes off by twenty-five percent or more in that time period. About seven percent said they sometimes missed by forty percent or more. But forty-four percent reported they usually catch it between ten and twenty-five per cent. About seventeen percent of the farmers felt they missed their guess by less than ten percent.

Output Response to Price Changes: Neoclassical economic theory suggests that as price varies, production adjusts. But many farmers in the survey offered confirmation of the over production trap theory (Johnson and Quance, 1972). An astounding seventy-four percent of the farmers said they do not alter production in response to price variation. This may mean the variation in supply comes from

marginal operators going in and out of the business or it may mean that these flat out farmers do not consider a five to fifteen percent change in hogs produced to be a significant change.

Several times during the course of this research remarks were made on the order of: "We just can never out guess the market so we run at capacity regardless."

Attitudes about the Cycle: Even with some rough years immediately behind them, forty-one percent of those answering still felt that they were better off with the cycle than without it. This was a sentiment that was sometimes expressed in personal interviews with Michigan farmers.

Reg Cridler, a Rockford, Michigan producer of about two thousand slaughter hogs a year, explained that the really good times allow him to get enough capital ahead to improve his operations. His wife, Diane, added that the low end of the cycle forces inefficient producers out of business.

Ivan Top, president of the Michigan Pork Producers Association, has also long felt positively about the cycle. "I used to say we could not live without the peaks so we had to take the valleys. But I've been raising hogs for fifteen years and this is the longest I've been losing," said Top, referring to the two years of red ink entries his ledger books acquired in 1980 and 1981.

"If anyone would have talked to me about contracting a couple of years ago I would not have paid any attention. But now I am at least willing to listen because I do not want to go through another two years like I have just gone through," Top said early in 1982.

Top, from Hamilton, Michigan, almost committed himself to a major expansion of his facilities in 1981. He had the building contracts in hand and the financing committed but at the last minute canceled the construction because of uncertainty about future prices.

But, although it was surprising that so many of the surveyed farmers felt positively about the cycle, it should be emphasized that 58.3 percent of the respondents did feel that the cycle was a hinderance in running their businesses.

Ability to Always Cover Variable Costs: About sixty percent of the farmers felt that at the low end of the cycle they could not cover their variable cost of production. How closely all farmers monitor their costs of production is a matter of some debate. Several of the packers interviewed believed a sizable number of farmers often do not know their cost of production.

Packers' views gain credence when one observes that price has been as low as thirty dollars in the last two years and forty of the farmers in the survey said they always cover variable costs. Surely not all of that group were covering variable costs all of the time. During some of that time gross margin per cwt. over feed cost was not much above three dollars. Some farmers may cover their non-feed variable costs with three dollars per cwt., but certainly not all can do it. For instance, 1982 Michigan State Telfarm records show non-feed average variable costs to be \$9.10.

If a farmer believes that variable production costs are always covered, then the flat-out operation rule is economically defensible.

Changes in Production Based on Price Predictions: While an overall total of only twenty-six percent of the farmers said they change production levels based on price predictions, eleven of the thirteen farmers who said they did not always cover variable cost said they would change production levels based on price prediction. The cross tabulation Table 3.2 with row percentages is shown below:

Table 3.2. Effects of Variable Cost Coverage on Willingness to Change Production Based on Price Prediction by Percentage

	Sometimes Unable to Cover Production Cost	
	Yes	No
	83%	17%
Change Production Based on Price Predictions	53%	47%

One can see why the high degree of uncertainty about future prices means that farmers may not pay as much attention to what costs are. If you are unsure about returns you can not really decide about incremental shifts in production because you have only cost data and no revenue data upon which to make the decision. Therefore it may be rational just to concentrate on making production as efficient as possible and then, if in the long run average you find yourself making money, expand your operations.

Ken Norton, a Michigan producer of about 1,700 hogs a year explained that it is easy just to shove the hog accounting reports in the drawer rather than spend the evening studying them because right now he does not alter production. Norton, who uses the Michigan State sponsored accounting system for farmers, noted that since he runs his operation flat out, it does not really make any difference what the costs are going to be once the hogs are in the barn. Hogs weaned are basically hogs sold because there would rarely be a situation that marginal returns do not exceed marginal costs from that point on. Norton said if

he became involved in contracting he would spend much more time analyzing costs because it would pay him dividends. At present he sometimes thinks extra effort spent acquiring information on costs is not worthwhile because he is always uncertain about output price. Because of the uncertainty about output price and high fixed costs resulting from confinement operations, he thinks his "flat out" rule is best.

First Awareness of Not Covering Costs: Of those who said they were sometimes unable to cover total costs, fifty percent said they only became certain of this shortly before marketing. Only eighteen percent said they had an inkling of this situation prior to breeding.

But the loss situation apparently did not too often cause real financial difficulties for most of those in the survey. Only thirty-three percent of all farmers surveyed reported they were ever forced to ask to refinance a loan when such refinancing was not originally planned.

Effect of Leverage on Refinancing: Farmers who needed to borrow most of their operating capital did have more trouble with financing. Fifty-six percent of all the farmers who had more than seventy-five percent of their operating capital borrowed reported that they had to ask for refinancing of loans when they had not originally planned on it. Only nineteen percent of those not so heavily levered reported ever asking for refinancing when it was not planned. The correlation ratio (the portion of variance in the dependent variable explained by independent variable) is .81 with percentage borrowed being the independent variable. The percentage cross tabulations (Table 3.3) are reproduced below.

 Table 3.3. Effect of High Leverage on Unplanned Refinancing by Percentage

		More than 75% of Operating Capital Borrowed	
		Yes	No
Unplanned Refinancing of Loan	Yes	56%	44%
	No	19%	81%

Use of Contracting or Futures Market: The majority of those surveyed did not ordinarily use futures or cash contracting as a marketing tool. About forty-one percent of the sample had experience in the area, but only about twenty percent of the farmers were currently either hedging or cash contracting.

Farmers were about evenly split among the eight choices offered to explain why they did not contract. A summary of the absolute frequencies of the farmers who did not hedge or cash contract and their reasons for not doing so are in Table 3.4.

Table 3.4. Reasons for Rejecting Contracting

Reason	Absolute Frequencies
Contracts too Large	10
Untimely Contracts	2
Capital Position Large Enough to Absorb Unhedged Loss	10
Too Time Consuming or Complicated	12
Temptation to Speculate too Great	1
Dishonesty in Those Markets	4
Transaction Costs too High	8
Other	10

Twelve of the nineteen farmers who said they sometimes hedge said they have no rules for doing so. Most of the rules of thumb for hedging were not well defined, like "half of production when futures are relatively high." Some of the replies indicated that the query, which was supposed to elicit the rules of thumb used for future or cash contracting, was not well specified.

But Dale Warsco, the president of the large White Cross Farms in Windsor, North Carolina defined very specific rules. Warsco, who produces about 72,000 hogs a year, indicated they do not pay much attention to price expectations but watch the futures prices compared to their costs carefully to determine what they should hedge. White Cross is always run at capacity.

Although he sells hogs five days a week, he lumps production into weekly groups. Each Tuesday he uses his computer to print out his costs of production

for each group based on a hedged soybean meal and corn price. If he can net \$2.50 cwt. on any of his groups, he hedges five percent of that production. At a profit of ten dollars cwt. he is fifty percent hedged. And if profit ever reached a dreamed twenty dollars cwt. he'd be one hundred percent hedged.

Market Channels: Only thirteen of the fifty-one farmers used auction markets to sell any of their hogs. Four farmers used that channel exclusively. Nineteen, twelve exclusively, sold their hogs through non-packer buying stations. Twenty-one, sixteen exclusively, sold direct to packer buying station or gate. Two sold to an order buyer. And, reflective of the demise of the terminal market, only four buyers utilized this channel.

Table 3.5. Absolute Frequency of Farmers Checking Reasons for Selling in a Marketing Channel

Closest Outlet	24
Best Price	24
Honestly Treated	10
Convenient Hours	18
Other	6

Price and convenience, as one would expect, were most important reasons for selecting a marketing channel. As one would also expect, this should mean that if a contract market is able to enhance prices through a more competitive market, farmers would use it. As has been noted, when Ohio State ran its electronic market, there was a price enhancement of about one dollar per hundred pounds when compared to the normal basis between Ohio and Peoria. Even then the big

volume growers did not get on the system, allegedly because packers sweetened their private treaty deals with these large farmers. When the market collapsed, the larger basis reappeared.

Attitudes about a PCM: Farmers were asked to compare the Electronic Contract Market to their present marketing channels. Unfortunately, not all the farmers answered these questions, but of those who did, sixty-three percent felt that an electronic contract market would produce superior prices to their present system. Eighty percent felt they could do a better planning job with a contract market. Enthusiasm for this answer should, however, be tempered with the observation that a somewhat lower percentage, fifty-two percent, of those who had actual contracting experience felt it improved their ability to make management decisions.

About eighty percent of those surveyed felt that the PCM would give them access to more buyers than are presently interested in their products. But only forty-eight percent believed that the contract market could better reward them for producing a superior product.

As evidenced by their previous answers, farmers in the survey were mostly favorably impressed by the idea of a PCM. But, they did not think their fellow farmers would be similarly impressed. About seventy-one percent of those answering believed that most pork producers would favor the present system to a PCM. Likewise, fifty-three percent believed that buyers would find the present system more to their liking.

Packers surveyed, for the most part, were lukewarm towards the idea of a PCM. All but one said they would look at a PCM to see if it could help them with their procurement problems. But, it was said more in the spirit of "we will look at everything that comes along, on the outside chance that it can help us," rather than with enthusiasm.

Packer representatives like Leonard Haverkamp, Vice President of Wilson Foods, felt a PCM would be redundant with the current marketing. Haverkamp, an economist, felt the only justification for a PCM would give them wider exposure to farmers interested in contracting, thus increasing the coordination in the system.

Haverkamp said the whole subsector, in his estimation, would be better off without the cycle. But, he held out little hope that this could be done, because he did not think it possible to get significant numbers of farmers to sign contracts prior to breeding.

Size was apparently not a significantly related to how favorably farmers are disposed toward the PCM idea. A slightly larger nominal percentage of large farmers said they would be willing to contract, as can be seen from Table 3.6. While the numbers are statistically different, the spread is not large enough so as to cause educational programs to be differentiated on size alone.

Table 3.6. Effects of Producer Size on Contracting Attitudes by Percentage

Producer Size	Favorable Towards Contracting	
	Yes	No
Small	71%	29%
Medium	73%	27%
Large	78%	22%

Range of Time for Allowable Deliveries for Contracts: Prior to undertaking the research it was hypothesized that contracts would be more valuable to packers if they had very tight delivery schedules. But the surveyed farmers, for the most part, reported that they would be unwilling to contract for a specific delivery date if a nine month contract was being considered. If a contract called for delivery to be within one day, only fourteen percent of the farmers would be willing to contract as much as twenty percent of their anticipated production. So, a contract that called for delivery to the day nine months hence would not be very successful.

This is even more true if the amount under contract increases. For instance, if the amount of production under contract was sixty percent, only six percent of the farmers would contract deliveries to within one day. If contracts, however, allowed delivery within a seven day period of time, a cumulative total of thirty percent of the farmers would be willing to contract sixty percent of their production. All farmers who were willing to contract would be willing to contract sixty percent of their production nine months ahead if they were allowed a leadway of a month in delivery time.

Subsequent interviewing also made it clear that packers would pay no more for such a tight delivery feature as long as the farmer could give them a firm indication of when delivery would be made a week or so in advance. Thus, farmers' reluctance to tightly specify delivery dates does not appear, at least initially, to be a serious impediment to long term contracting. Several packers discounted the idea that significant advantages could be gained from contracting to smooth daily delivery.

This discounting is not supported by studies of advantages gained from smooth flow of product (Schneidau and Duewer, 1972; Holtman, et al., 1974; Daellenbach

and Fletcher, 1971). Nor does packer discounting fit with the long run idea that if plants had a dependable low variance supply of products they could be designed with lower average cost curves (Purcell, 1979).

Bernard Ebbing, retired procurement manager for Rath Packing in Iowa, said that managers are less than forthright if they claim that hog delivery is not a real concern. Ebbing further noted: "Watch what happens when it looks like the procurement manager will only be able to fill a five hour kill when the schedule calls for eight. I guarantee you he will be out of the box with one dollar tacked onto market price so that he can fill his kill."

Percent of Production Contracted: Even if the contract was suitably specified, only one farmer initially was willing to contract one hundred percent of production. A cumulative total of nineteen percent were willing to initially contract seventy-five percent of their production; fifty-eight percent fifty percent, and eighty-five percent would be willing to contract twenty-five percent. All of the forty-eight farmers answering the question said they would be willing to contract at least ten percent of their production if they did contract.

Despite the fact that early questions showed that confinement raising has reduced uncertainty, farmers were still, for the most part, afraid to contract before breeding. Asked when they would prefer to contract, most farmers said they would only contract after weaning. Sixteen percent said they would contract before breeding and a cumulative total of forty percent said they would contract after birth but before weaning. A cumulative total of ninety percent said they would contract after weaning. Apparently it is only after weaning that uncertainty about production is fully reduced for most farmers.

The biological uncertainty in hog production makes farmers wary. Harold Trimble, of Dexter, Michigan, said: "I'm always afraid of not having the hogs ready when I need them."

Size did seem to have some effect on willingness to contract before breeding. Only three of twenty-two small producers were willing to contract then; none of the medium sized producers, and five of the seventeen large producers would contract then.

The cross tabulation (Table 3.7) shows the row percentages by size on how long a contract farmers would be willing to take.

Table 3.7. Effects of Producer Size on Length of Contract by Percentage

		Length of Contract			
		Prior to Breeding	Only After Birth	Only After Weaning	Month Before Marketing
Producer Size	Small	14%	23%	41%	22%
	Medium	0	27%	73%	0
	Large	29%	24%	47%	0

Obviously, if the PCM is ever to do anything about the problem of cycling, it must cause a behavioral change in the way farmers use prices to make breeding decisions. And the only way to do that is to structure the PCM so that it can get at the breeding decision. A contract taken three months ahead of delivery may offer some coordination or pricing advantages to either party, but it does not affect the amount of pork coming onto the market.

Thus, if the goal of cycle dampening is to be reached, farmers must be willing to contract nine or ten months ahead of delivery. Contracts taken that far ahead affect breeding decisions. That is, farmers taking contracts that far out should contract to the point only so long as they make a reasonable profit. Other farmers would make plans according to that price if they saw that it was reliably anticipatory.

If one of the goals of a PCM is to reduce the cycle, farmers' ideas that nine or ten month contracts are too risky because of biological uncertainty must be dealt with. Otherwise, information can not be forced into the system which will alter farmer behavioral patterns enough to dampen the cycle. Some way must be found to ameliorate this fear.

Operating Details of the Contract Market:

Ownership: Fifty-four percent of the farmers thought the contract market should be owned and operated by farmers. But thirty-one percent wanted a third party to do it. When they did specify which third party, it was usually a joint organization of packers and farmers.

Participation Requirements: Under some conditions it might be necessary to require farmers to participate at low levels in order to make the contracting market successful. It would be extremely difficult at this time to get a mandatory system in the U.S. Eighty-four percent of the farmers said they would vote against such required participation. Attitudes could, of course, change substantially with experience or information showing significant benefits to participants.

Other Operating Details: Fifty-two percent of the farmers thought the pre-set penalties could handle cases of non-contract compliance. Other ways of handling non-compliance generated little enthusiasm.

Farmers felt strongly that contracts should be inviolate except for acts of God or an uncontrollable disease outbreak. Seventy-eight percent thought acts of God and sixty-seven percent thought disease outbreak were acceptable reasons for not meeting a contract.

Such requirements would be fine with Dale Warsco, Windsor, North Carolina. He wrote: "They should not be allowed to cancel any contract. They can always sell out of their position. There should never be any other way out!!!"

Since the purpose of this market is to get participants in the system who face actual market demands and costs of supply, a secondary market that did not require delivery would negate the PCM's purpose. If pure speculators were involved, the market might end up being somewhat redundant with the futures market. The PCM market, of course, would be intended to facilitate the delivery of actual products and not the holding of contracts which is what the futures market is designed to do (Working, 1954).

But farmers overwhelmingly wanted to be able to sell their contracts. About eight-five percent thought it was a good idea to be allowed to sell their contracts. Upon reflection, there is no important reason why others could not be allowed to create an ad hoc secondary market in these contracts so long as they intended to actually take delivery or deliver the product. This presence in the market would add liquidity and make both farmers and packers less reluctant to take a contract initially if they knew that they might sell it if some unforeseen event occurred.

Contract Size: At this point the scale of most hog farms is not large enough to make the standard Chicago Mercantile Exchange contract attractive to most farmers. The mercantile contract is for 30,000 pounds or 130 to 135 slaughter hogs. Some packers offer 15,000 pound contracts which they hedge on the Mid-American Exchange or else just comingle their smaller contracts so as to meet the 30,000 Mercantile Exchange requirements.

Farmers in the survey showed a marked preference for contracts of 15,000 or 5,000 pounds. Thirty-five percent of the farmers wanted 15,000 pound contracts or about sixty-eight market weight hogs. Forty-four percent wanted 5,000 pound contracts or about twenty-three market weight hogs. Twelve percent wanted contracts of 1,000 pounds. Only eight percent found the standard 30,000 pound contract acceptable. Thus, a cumulative total of ninety-two percent of the farmers wanted a contract that is smaller than the Chicago Mercantile Exchange offers. While it was earlier learned that farm size does not make a dramatic difference in contracting attitudes, it is, as you would suspect, crucially important in determining attitudes about contract size. No small producers were interested in 30,000 pound contracts and no medium or large producers felt contracts of 1,000 pound increments would serve their purposes. The table (Table 3.8) showing responses with respect to farm size and contract size preference is as follows:

Table 3.8. Effects of Producer Size on Contract Size Preference by Percentage

		Size of Contract in Pounds			
		30,000	15,000	5,000	1,000
Producer Size	Small	0	19%	52%	29%

	Medium	10%	40%	40%	50%

	Large	18%	53%	30%	0

The survey revealed a major difference between packers and farmers as far as contract size is concerned. All packers preferred to deal only in contracts of 30,000 pounds and seventy-five percent of the small producers preferred contracts of 5,000 pounds or less.

Because a large number of contract size variations complicates the system and increases per unit cost, the decision could be made to eliminate the smaller size contracts. This could be done particularly on the grounds that it is the large producers who can produce the volume sufficient to cover the overhead costs of running the PCM.

The Ohio State HAMS system did not succeed in part because it failed to induce the large producers to use the system consistently.

Four of the packers interviewed expressed reluctance to deal with contracts smaller than 30,000 pounds. Design features to overcome this mismatch in packer and farmer contract size preference will be discussed later.

Grading: Grading is also a critical question. If unseen animals are sold by contract, grading must offer assurances of the quality of animals to be delivered. All livestock varies widely in amount of usable meat as well as the quality of the meat. Because of this variation it was long thought that livestock could not be traded on the futures. That carnard has been laid to rest, but it is an article of faith among traders in livestock that the buyer wants to be able to "eyeball" the stock being purchased or else know and place confidence in the seller. This is one of the reasons personal relationships are important in the livestock industry. But electronic markets have shown that livestock can be traded by description.

USDA, of course, has Number's One, Two and Three grades for hogs. And the Mercantile Exchange uses those standards. The USDA grades are based on a sliding scale relationship between backfat and weight. An experienced grader can do an adequate job of grading hogs to USDA standards simply by eyeballing them.

At this point about 96 percent of the hogs produced in the U.S. grade No. 1 (Van Arsdale, 1984). This fact alone is indicative that grading could be on a more discriminating scale to facilitate a PCM.

There are several other problems with the system. First there can still be tremendous variation within the Number One category. Some hog carcasses will cut out as high as seventy percent or better in the four best cuts and they are paid at the same price as a fifty-three percent hog because both are defined as Number One hogs. Cutout is defined as the portion of a carcass that is ham, loin, picnic and Boston butt. At today's prices such a difference in cutout can make a real difference in profit to the packer.

Secondly, graders do not always grade accurately. Because of these problems some companies use their own live grading standards which are usually a variation of USDA grades. For instance, some companies split the USDA Number One category into three categories. Most industry experts agree that the preferred way to grade a hog is after it has been killed and while the carcass is still warm.

This method of rail grading is used in Canada but it is only beginning to catch on here. Packers who have gone to such a system report good eventual acceptance by farmers.

But even if carcass grading is the better method for determining carcass value, it is not a method that has gained wide acceptance. Farmers sometimes mistrust such schemes because they usually will not be able to watch their animals being graded. They can at least usually know immediately how their live animals are graded. This mistrust is reflected in the fact that forty-nine percent of the farmers wanted the current USDA live standard used in the contract market grade requirements. But thirty-seven percent did opt for carcass grading.

The experience at Kahn's in Cincinnati shows that farmers do come to trust a grade and yield program. When Kahn's started its contracting program in 1981, only ten percent of the contracts were under grade and yield specification -- the rest being live graded. By the end of 1982, virtually all of the contracts were on grade and yield. All the packers interviewed agreed that there would be some universal grading standard that they could use. The subsector now has a hodgepodge of grading standards with some companies having their own. Packers seemed fairly indifferent to whether grading was live or carcass. But if they had their choice, most would opt for carcass grading.

An electronic market would have the possibility of negotiating the discount for hogs that don't make the grade with every contract settlement. However, this temptation to exploit the limitless possibilities of the computer is probably best avoided. Users of some of the failed electronic systems have complained that the systems were made too complicated.

For whatever the reason, most farmers wished that the grading discount factor be set beforehand and periodically reevaluated. Only twelve percent thought it should be part of the negotiation process. About sixty-eight percent of the farmers felt that a joint-committee of packers and producers should negotiate the discount and periodically meet to decide if it should be changed.

Summary:

Farmers were willing to use a PCM, but they, for the most part, did not see it as producing information which could be used to plan production. Packers were lukewarm to the idea of a PCM, but only one of the eight surveyed was openly hostile to the idea. The overall evaluation produced from the interviews was that packers felt such an idea could not really improve upon their current procurement procedures.

Farmers were reluctant to contract prior to breeding decisions if the contract called for delivery within a range of a few days. But they were more willing to contract if the nine month contract called for delivery anytime within a month.

Packers said that such loose delivery dates would pose no problem for them in as much as that is the way the current contracting system works. But the question does arise whether packers are not too heavily discounting the coordination advantages that could accrue from a system that has substantial amount of contracting in it.

The majority of farmers felt the PCM should be farmer controlled. But they were overwhelmingly against required farmer participation. There was a mismatch between the size of contract the farmers wanted to sell and the size packers wanted to buy. Farmers wanted contracts of 5,000 to 15,000 pounds; packers wanted 30,000 pounds or more. The simple majority of farmers preferred that contracts be sold on live grade basis, although large producers did prefer carcass grading. Packers did agree that it would be possible to set up one grading standard that would suit all of their purposes. They said they could use either a live or carcass grading system, but if there was a preference specified it was usually for the carcass system.

In Chapter IV the findings from the survey, in conjunction with the work done in the first two chapters, will be used to design the rules for a PCM.

CHAPTER IV

THE RULES FOR A PORK CONTRACT MARKET

Steps Necessary to Institute a PCM:

The ways a Pork Contract Market (PCM) could improve coordination and dampen the cycle have been specified. Knowing that a PCM could do these things obviously is not enough to make it happen. An idea for institutional change that improves performances may be theoretically correct. But, it may never be instituted successfully if the rules for operation do not produce incentives to make the system work and if the social movement, which supports the institutional change, has not taken place. Usually this means that the changes produce added income streams for system participants. Thus, they will support the new institution.

In chapter two this research examined the evolutionary path of institutional change in the pork subsector. There is no reason to believe that future changes will not come in similar evolutionary fashion. The emphasis of this chapter will be on creating the evolutionary path that leads to a workable new institution that can sustain itself.

Purcell (1983) lists the following steps as necessary to make an electronic market successful:

1. *The people and institutions who will use the system must be involved in its development.*
2. *The system must be kept simple. Temptations to exploit all the capabilities of the computer should be resisted.*
3. *Strong educational effort must be made to make sure the system is understood. Understanding will reduce uncertainty and, in most cases, resistance to the institutional change.*
4. *Institutions that are part of the current marketing structure must be involved. These institutions can in turn guarantee performance.*

5. *If existing institutions can not or will not guarantee performance, then a separate system of performance guarantees must be created.*
6. *If an existing institution will not fill the role, then a new selling agency must be created to handle the transactions between buyers and sellers.*
7. *The system must be fully tested before the actual market use of it is made. At the first attempt a few parties must be committed to giving it a try.*
8. *The creator must be patient and make sure of financial staying power to withstand some setbacks because "institutions change slowly."*

Many of Purcell's steps apply equally to the creation of a PCM. Since it is likely that a PCM would be instituted in conjunction with an already existing electronic market, at least a few of the problems Purcell mentions will already be solved. But in some of the problem areas it will be necessary to start over again. For instance, the people who use a PCM must be involved in creating it. The primary task of those creating it will be to design the rules for the PCM.

The "rules of the game" are surely just as important as the basic concepts in determining institutional success. Rules for the PCM will need to determine: 1) Whether hog farmers and packers would be required to participate to some degree. (This rule will affect other rules also. If voluntary participation is chosen, other rules will have to be designed with free rider problems in mind.); 2) Ownership of the PCM; 3) Who should be allowed to buy and sell contracts; 4) The size of contract; 5) How hogs contracted should be described and graded; 6) Under what conditions contracts can be cancelled; 7) Whether a secondary market in the PCM should exist; 8) The kind of information generated by the PCM and who should have access to it; 9) The discounts and premiums for hogs that are not of the exact quality the contract specifies; 10) The method of price negotiation used to sell the contract; 11) Whether transportation for the contracted hogs should be arranged by the system; 12) How far ahead contracts should be let and how

variable in length they should be; 13) Over how wide a geographical area contracts should be sold; 14) How tight, in terms of days, delivery of a contract must be, and; 15) The devices used to put buyers and sellers of contracts in contact with each other. Cost of these devices is also an important consideration. This chapter will recommend appropriate rules in these fifteen areas.

1) Mandatory Participation:

Mandatory anything is repugnant for most Americans. Hog farmers showed themselves to be overwhelmingly against such requirements for the PCM. In fact, since eighty-five percent of the farmers in this study were against such a requirement, it might be impossible to get them to vote for it even if it was shown that that would be the only circumstance under which it would be possible to set up a PCM.

Of course, many things are mandatory because it is not practical to have it otherwise. These rules are used to eliminate free riders which make operationalization impossible or else to capture economies of scale.

Initially it was thought that it might be necessary to spread a high fixed-cost PCM over a large volume in order to get a unit cost that is competitive with other forms of marketing. Fortunately, as will soon be illustrated, as long as a time share computer system is used, there are not tremendous cost economies beyond a certain minimal volume.

While economies might not require mandatory participation, it should be noted that the higher the volume offered on the PCM, the higher the packer interest. Further, there will need to be concerted action on the part of producers. They must decide to use the system or else private treaty contracts might be prevalent enough to break the system apart. It was for this reason that the spot electronic market in Ontario, Canada was made mandatory. In Canada, even if a packer owns

a production facility, the hogs must be offered for sale to all bidders and can not be moved directly to the packer's plant.

Because 85 percent of the farmers were against mandatory contracting does not mean absolutely that a PCM should not go in this direction.

It has been established that freedom is a relative concept, gaining freedom in one area usually entails giving it up somewhere else. Making contracts mandatory would not limit packer or farmer ability to produce or process. It would only change when those intentions must be revealed. Now it is at marketing time, for all practical purposes. Under a mandatory provision, intentions would be revealed instead at production decision time. The forces of supply and demand would still be operative, but planning advantages of the big industrial firms would then be available to farmers, packers and processors. Such an approach to planning could well be preferable to government attempts to set prices.

An alternative to total mandatory participation would be to require only that farmers contract at least a portion of their production. This would allow them to gain experience with the institution and also create a minimum volume that a PCM would have to have to survive.

Although it can be established that large volume is not necessary to make a PCM feasible from a cost point, a low volume will not dampen the cycle as much as larger volumes. In the U.S., if the system is not made mandatory, there would be free riders. This is a case where free riders would not be the total anathema they normally are. It is hoped that those not using the PCM would still use the PCM price generated information to make production plans. However, the higher the participation, the higher the quality of the information generated.

Further, since many packers' volumes do not vary by more than fifteen to twenty percent on a yearly basis, coordination advantages from contracting start to

occur at fairly low levels of participation. Contracting levels of twenty percent should be adequate to produce some coordination advantages between packers and farmers. If a voluntary system could be gotten to this level of contracting, then the ever increasing advantages from contracting might be enough to encourage even more contracting on the PCM.

Recommendation: There are strong reasons why a PCM participation should be mandatory. However, since 85 percent of the farmers said they were against mandatory requirements, the system should at first be voluntary. The information about prices would be available to participants and non-participants alike. Therefore, there should be concerted efforts to give participants advantages non-participants couldn't get. Of course, participants would have planning and marketing advantages over non-participants. In addition, the PCM should give them such advantages as accounting systems, electronic transfer of funds, fuller market information, arrangements for transportation services, etc. The additional advantages would encourage participation. If experience showed that a PCM couldn't operate successfully on a voluntary basis then a farmer vote on mandatory participation should be considered.

2) Ownership of the PCM:

Fifty-one percent of the farmers surveyed responded that farmer organizations should own the PCM. But, significantly, thirty-one percent checked the "other" category box and usually indicated that they meant a joint organization of packers and farmers. But none of the packers expressed a desire to help organize the market by expending funds towards such efforts.

Discussion of ownership of the PCM may be a moot point since it is most likely that a PCM would be done in conjunction with an already existing electronic market. If that happens, the ownership of the PCM, by default, would almost certainly be the ownership of the electronic market.

Because of costs, the practical alternative would be if a separate PCM organization rented time on the electronic market association's network. Only if all electronic marketing organizations rejected the idea of putting a PCM on their networks would investigation of a unique system for the PCM be worthwhile.

It will need to be emphasized that the contracts would be continuously let on a daily basis in a transparent market. This competitive price determination should overcome many of the objections to current contracts. Prices would be determined as they are in any well functioning market. Showing that, even with contracts, there will still be assembly functions should decrease organization's objections to a PCM. It is undeniable, however, that some operators may be eliminated. But, the nimble dealer would be able to find a niche to fill in the new system.

The National Electronic Marketing Association (NEMA) in Christiansburg, Virginia, probably has the best chance of any currently existing organization to operationalize an electronic spot market for hogs successfully. It will, therefore, pay to look at their emerging structure. If they are successful with a slaughter hog auction system, that would be the logical place to piggyback a PCM.

NEMA was started in conjunction with Virginia Tech and USDA. It is being turned into a farmer and agri-business controlled organization with transfer of ownership to a jointly held stock corporation.

If their electronic spot market for slaughter hogs works, and if the farmer organizations then buy the idea of a PCM, it would mean the PCM could start with very strong institutional support. Some of the owners of NEMA are large enough to be strong factors in the market. But NEMA's emerging structure has pitfalls also. Although NEMA's charter states that it must offer its services to anyone who wants them, NEMA's owners are not likely to push that idea. In fact, who should participate has already caused bickering amongst the owners of NEMA.

An organization like NEMA would be the logical place to try and start a PCM. The electronic markets that have been successful are producer owned and it is unlikely that packers would be willing to support such a market with their money, particularly if they feel they have some market power with the present system. However, if the PCM can provide contract hogs to packers in a reliable easy-to-use manner and, if past history is a reliable indicator, packers will use the system.

Recommendation: A producer organization should own the PCM. The form of producer control may be predetermined if the PCM is set up in conjunction with an already existing electronic market. NEMA, for instance, is no longer exclusively controlled by farmer cooperatives.

3) Certification:

Who should be allowed to contract? Obviously the PCM's integrity depends on the ability of system participants to meet contractual obligations. In most contracting there is an institutional arrangement that insures this integrity. In construction contracts, builders are often required to post a performance bond. With futures, margin calls account basically serve this purpose.

Recall that farmers surveyed felt that the best way to enforce the contract was with agreed upon non-performance penalties. But farmers were of mixed opinions about who should contract. Thirty-one percent thought anyone who wanted to contract should be allowed to do so and a like percentage thought it should be limited to only those who have been certified by the PCM board. The remainder were split among variations on those choices.

Perhaps a compromise between complete certification or no one being excluded from contracting would be best. If a farmer desired to do contracting directly from the farm, then an agency of the PCM could certify the farmer as being able to meet contractual obligations.

It is assumed, at least in the beginning, that most farmers would not be contracting directly from their farms, but rather have a local assembly point offer their contracts. Farmers who have already purchased micro-computers with modems and the right communications package could get on the system without much additional expense. If their operations were big enough, these farmers could become independent contractors themselves.

It could be the assembly firm's responsibility to screen all of the farmers wishing to contract through them. If the assembly firm was convinced that the farmer was a reliable producer then the farmer's contracts should be offered for sale through the assembly point. If the farmer did not meet the contract, both the farmer and the assembler could be made legally responsible. The farmer and the assembler could work out the considerations necessary to induce this transfer of risk. Assembly firms would have the incentive to bear this risk since a contract signed through them guarantees volume moving through their yards and hence commissions.

Recommendation: If an assembly firm judged a farmer responsible to contract, then the farmer could contract. In case of non-contract compliance from the farmers' side, the assembly point would bear a secondary responsibility. That is, if the farmer did not make the deal good, both the farmer and the assembly point could be sued. But, prestated penalties would avoid court action in most cases.

In the case of a farmer wishing to contract directly, an agency of the board would have to certify the ability of the farmer to meet commitments. The same agency of the PCM would also need to certify the credit worthiness and performance of all those wishing to buy contracts.

4) Size of Contract:

From the survey, it is known that the smaller farms prefer smaller contracts, five thousand pounds or less. Packers prefer to deal with thirty thousand pound contracts because hedging on the Mercantile Exchange is facilitated. Nearly all packers will hedge their contracts. This is because one of their greatest fears is paying a cash price substantially different from their competitors. Of course, they would love to pay a lower price. But, they will not take the risk of paying a higher price than their competitors because of low margins in the packing business. Nearly all the packers said that they were margin killers and not price risk takers. By hedging their farmer contracts with the sale of a futures contract, price will vary approximately the same as their uncontracted competitors. Thus, at the time the contracts are delivered, they end up paying approximately the same price as they would have in the spot market.

Even producers of more than two thousand head annually had a preference for contracts of fifteen thousand pounds. However, about eight percent of this group had no objections to dealing with thirty thousand pound contracts.

There is an obvious mismatch here between packers' and farmers' desires as far as contract size is concerned. The mismatch would be even greater if packers had their preferences. The packers' preference for thirty thousand pound contracts is only because that is the way the contracts on the Chicago Mercantile Exchange are specified. Some packers would prefer that the contracts were actually in the neighborhood of 42,000 to 44,000 pounds. That way contracts would nearly match the net weight of a semi-trailer loaded with hogs. But packers, of course, will not move to that size contract unless the Mercantile Exchange also offers such a contract. Some packers are trying to get the Exchange to move contracts to a size that more nearly matches a semi-load.

In order for a PCM to overcome this mismatch in desires, smaller contracts than what packers are interested in will have to be offered. Offering these smaller contracts will increase the cost of operating the system somewhat, but the more important concern is that the small contracts be put on the system in such a way so as not to kill the packer's interest in the PCM. If packers have to sit through the auctioning of many six thousand pound contracts they might lose interest in the system. The best way to surmount this problem would be to allow contracts of a certain size to be traded each day at a certain time.

Assuming the contracts would operate in conjunction with an electronic spot market, the PCM could start after the close of the cash markets for the day. For instance, the pattern could be that for the first half hour only contracts of five thousand pounds are traded, the second half hour only contracts of fifteen thousand pounds and during the final half hour contracts of thirty thousand pounds are let.

If such a system were set up, then most likely assembly agents or cooperative livestock exchanges would be the contract buyers of the smaller contracts. This differential is what would induce buyers to take the contracts and assemble them into thirty thousand pound lots which they could in turn sell to the packers.

Recommendation: Specific size contracts should be traded at specific times of the day. The first contract might be about 30 to 45 hogs that farmers can get into their farm trucks or goose neck type trailers. Succeeding contracts could be fifteen thousand pounds and thirty thousand pounds. If the futures market moves to a larger contract than thirty thousand pounds, then the PCM should move with it. Variations from the specified weight should be allowed only in a limited upwards direction with the excess paid at current cash price at time of delivery.

5) Description and Grading of Contracted Hogs:

Electronic trading and the futures market showed that livestock can be traded by description. So, the question is, what kind of product description and grading should be established for the PCM?

The Ontario system of electronic trading has been running since 1961. It has been modified through the years to meet changing market conditions and non-random samples indicate that packers and farmers are satisfied with the system. By law, all hogs there must be sold on the teletype system. There are practically no exceptions. Even totally integrated operations must pay marketing charges to the system.

The Canadian market apparently wants a slightly lighter hog, about two hundred pounds, than is produced in the U.S. Further, the market there apparently wants a uniform hog rather than the varying types of hogs produced in the U.S. system. In Canada, all hogs are sold on a carcass, rather than liveweight, basis and assigned a quality index based on the relationship between carcass weight and backfat. For instance, a carcass weighing between 140 and 149 pounds with 2.8 to 2.9 total inches of back fat measured at the shoulder and loin, is a 100 index hog.

Packers bid on lots of hogs on the assumption that all hogs will grade to be one hundred. The auction works on a descending bid principle with the first packer to punch the bid button getting the lot. The packer does not know the actual quality of the hogs purchased until they're delivered to the plant. If the hogs that are purchased grade higher than one hundred, the packer pays a premium to the farmer. Likewise, if they grade less than one hundred the bid price is discounted.

In the Canadian system each hog is tattooed at the assembly point so both packer and farmer get a full report on how each animal grades. Thus, farmers will know which of their sow and boar lines are producing superior products. This feedback would seem to be quite important in making sure that farmers get information on what kind of hog is really wanted to meet retail demands.

Canadian farmers interviewed in cursory fashion in 1981 at the Kitchener-Waterloo stockyard and at a meeting of producers held by the Hog Producers Marketing Board in Arthur, Ontario, nearly all liked the system.

But even though there seems to be universal approval of the system in Canada, it probably would not work here in the same form because packers apparently want a more varied product here than the Canadian system provides. For instance, Frederick and Herrud's contract now specifies that its premium hogs have a live weight between 210 and 250. Swift Independent wants its contract hogs to weigh between 200 and 230 pounds. Several of the U.S. packers interviewed stressed that the Canadian system was not flexible enough for them because it gave no information on the lot as far as grade or weight but rather assumed that the hogs would be of average weight and grade.

The grading issue, while somewhat outside the purview of this research, is extremely critical. In fact, grading problems must really be solved before it is possible to institute a PCM. Obviously, some universally agreed upon standard must be accepted if hogs are to be sold strictly by description. Further the system must adequately differentiate a hog's quality. The system is slowly moving in that direction now.

Most of the U.S. packers interviewed did feel that one grading system would work so long as they knew what the approximate grade and weight of the lot of hogs offered for sale is and could thus appropriately adjust their bid price relative to their needs.

The HAMS system, the short-lived Ohio electronic market, had a more flexible grading system letting the market set prices for different weight and grade hogs. And if market tests are valued, the HAMS grading system met the needs of some subsector participants. Even though the HAMS system has long since collapsed, the grading system was effective enough to still be utilized by some participants.

The HAMS grading system was effective because it split the current USDA grades into more discriminating categories. B.D. Van Staven of Ohio State University did a study using February 16, 1981 prices. He found the carcass value for a one plus hog to be \$53.29; for a one average to be \$51.30; a one minus \$49.67; and; a two minus \$48.23. The average USDA one, two and three hog was \$52.20, \$50.03, and \$47.94, respectively (Baldwin, 1981).

In a similar study at the University of Illinois, researchers in cooperation with Successful Farming, slaughtered five hogs on July 30, 1980. The hogs were numbers one, two or three's but all were purchased at the same price per cwt. The live weight value of the animals to the packer, derived from the wholesale value of the broken carcass varied by more than twenty dollars per animal when the lowest quality and the highest quality hog were compared (Johnston and Houghton, 1980).

Farmers are now producing better quality hogs. In 1980, ninety-six percent of the hogs marketed were grades one or two. In 1968, the figure was only fifty percent.

Van Staven and the University of Illinois researchers indicated farmers are probably not being fully rewarded for producing better quality hogs. If farmers were capturing more of the returns from this improvement, the system would move more quickly towards the kind of pig that retail demand wants. The HAMS system could better reward the superior producer and take away from poor producers some

undeserved rewards because it discerns quality differentials better than the current USDA system does.

It is a live grading system which was the most preferred way to grade by producers in the survey. Forty-nine percent of the producers in the farmer survey selected live grading as their preferred method. But this preference for live grading may be just because that is what producers are used to. Recall the experience at Kahn's in Cincinnati where farmers initially resisted, but after a year's experience, switched to a preference for carcass grading. Producers apparently started seeing that they could get paid more by producing quality hogs and having them carcass graded.

Live grading is highly dependent on the skill of the grader and if some live graders are better than others then the name of the grader becomes useful economic information. A carcass grading system, because it is more mechanical, does not put the same burden on the grader.

However, exactly which grading system would be better may be a moot point if one assumes that a PCM would be tied to an electronic marketing system with an already existing spot market for hogs. Under that situation the PCM grading system would probably be like the spot market grading system.

NEMA, in Christiansburg, Virginia, started selling hogs September 22, 1983. There, a live grading system, designed with help from USDA, is being used. There are A, B, C, and D hogs in the system, which is based on estimated cut out in the four lean cuts. A and B categories are basically a split of the USDA one category. So far the system seems to be working well with initial evidence suggesting that A hogs are obtaining a premium over USDA one hogs.

Recommendation: The ideal system is a carcass grading system that might be a variation on the Canadian system or any one of the packers' grading systems

currently in use. (Whatever the carcass grading system, it should use only one back fat measurement since the single measurement has been shown to be as good a predictor as the two measurements.) Since farmers apparently prefer live grading, it might be wise to start with a system that allows either live or carcass grading. If farmers saw that by producing a quality product and having it carcass graded they could be paid more, the system would surely move towards carcass grading.

6) Canceling Contracts:

Are there ever extraordinary situations that would justify either party not honoring a contract negotiated? Seventy-eight percent of the farmers thought contracts would not need to be honored if "acts of God" prevented delivery.

Some current contracts specify that there is no way out of the contract except to pay any difference between the contract and cash price. Other contracts like Swift's have clauses that could be interpreted in a number of ways. The Swift Company's escape clause reads:

" . . . neither party shall be liable in any respect for failure or delay in the fulfillment or performance of this contract, if hindered or prevented, directly or indirectly, by war; condition of war; acts of enemies; national emergency; sabotage; revolution or other disorders; strikes, lockouts or other labor disturbances; orders or acts of government or governmental agency or authority; interference by civil or military authority; or any cause like or different kinds beyond either party's control."

Conceivably Swift's contractual clause could be interpreted to cover outbreaks of disease since these are sometimes random events. But while even the best producers get disease, they get less of it than those who do not watch details as carefully as they might. Determining if a disease outbreak is induced because of poor management practices or uncontrollable events is difficult.

Likewise, a strike may be unavoidable if demands are unreasonable. But strikes are also sometimes management induced. Usually a strike results from a

complex weave of failings on both sides. Asking an agency of the PCM to sort this weave seems unnecessary. Besides, any competent management that faces a strong probability of a strike, but yet continues to buy contracts without heed, is behaving irresponsibly.

Asking an agent of the PCM to decide whether failure to fulfill a contract is the fault of the party involved or the result of a stochastic event seems unwarranted. Besides it would be possible to purchase insurance against most of these events.

Recommendation: The contract should be honored under all circumstances or else the non-performing party should be required to reimburse the other party to the contract for damages. The only exception to this would be for the standard insurance contract escape clauses which cover acts of war or God. This clause would not cover strikes, lockouts or disease, etc. If this strict requirement was unsatisfactory to packers or farmers, events like strikes and disease could be handled by impartial arbitration.

7) Secondary Market for the PCM:

Farmers overwhelmingly want the freedom to sell their contracts. There is no reason not to allow them to do this so long as they can sell it to a buyer who is capable of fulfilling the contract. Similarly, packers should be allowed to sell their side of the contract to bonafide buyers so long as the sales do not inflict extra costs on the sellers.

The sale of contracts to parties not capable of producing or having use for hogs would negate the purpose of the PCM since the coordination and cycle dampening effects would be lost and the PCM would then become redundant with the futures market.

Recommendation: Selling of already negotiated contracts should be allowed so long as they are sold to someone capable of living up to the terms of the contract. The person selling a contract would need to obtain the buyer's permission.

8) Confidentiality and Information:

Should the identity of buyers and sellers be known? Emerging electronic spot markets can again be a guide here. Most of them divulge the identity of the seller but not the buyer. But, it should be noted that the information given off by contracts and spot markets is different. Knowing the number of hogs one's competitor buys today, as well as the price, is useful to the extent that one can respond based on that knowledge. But because of the shortness of time to alter one's own actions, this information is of limited value. Contract information is different. If one has an inkling of the competitor's plans six months hence, then one's own plans can be altered. Thus, information about plans from contracting would be of higher value than that given off by the spot market.

On the supply side, the large number of sellers means that knowledge about the amount of contracting being done by your neighbor will not help you gain any advantage, at least no advantage that can be taken at the expense of the neighbor.

But, recall that fifty-one percent of the farmers felt the relationships with their buyers was important enough that they would continue it even though they might be slightly better off elsewhere. This indicates, although the inference can not be made directly from the questionnaire, that farmers like to have the buyer know whose hogs they are purchasing. Farmers in conversation confirmed this hypothesis. Packers also said they like to know from whom they are buying hogs because it is an additional source of information about the quality of the hogs. That is, given current grading standards, packers might be willing to pay more for lot A than lot B of slaughter hogs because lot A comes from a producer known to

raise high percentage cut out hogs. This premium payment is made even though both lots A and B graded number one. If grading standards were more precise, information about who is raising the hogs would be less valuable.

Of course, once sales were consummated, there should be as wide as possible dissemination of the contracted price. At the end of the trading day, there could be reports summarizing prices, by month, total sales, and direction of price movements.

Recommendation: At least initially, farmers raising the hogs should be identified, unless they ask not to be. Packers buying the hogs on contract should not be identified, unless they ask to be identified. Most packers said they didn't want to be identified. If grading standards get precise enough so that the name of the farmer carries no information, the listing of names could be dropped. Of course, the delivery point for the hogs must be known.

A concerted effort should be made to publicize the price information generated by the PCM. Only if the information is widely available can farmers use it to make production plans.

9) Discount and Premium Adjustments:

Farmers with experience know the approximate quality of hogs they can raise. Farmers who are contracting fifty percent of their hogs or less would have no trouble meeting stringent quality standards. That is, a large farmer in the fifty percent contracted position would rarely be unable to deliver contracts that called for all number one plus hogs. But a farmer one hundred percent contracted would have trouble meeting such stringent quality requirements.

Unfortunately there is still quite a bit of uncertainty in production. Even first class farmers can not consistently deliver the same type of hog. Genetic science at this point does not yet always produce exactly the hog that is wanted. Because of this, assembly points have to constantly sort lots to get uniformity.

"You just can not hand make a hog", said Tom Reed, manager of Michigan Livestock Exchange (MLE), in noting that farmers often have trouble bringing the same kind of animal to the MLE yards. Because of this inconsistency, it would be difficult to contract one hundred percent of your production to a certain grade, if it is too tightly drawn. The current contracting system recognizes all these vagaries by allowing loose specifications of grade requirements for contracts.

Dinner Bell, for instance, specifies that the barrows and gilts for which it contracts be only USDA Number One's, Two's, or Three's with average lot weight between 200 and 220 pounds. Dinner Bell discounts for individual hogs over 230 and under 190 pounds.

In effect Dinner Bell has committed to pay farmers the same amount for a hog that cuts out upwards to seventy percent in the four lean cuts as they will for a hog that cuts out forty-seven percent. As previously noted, there is a rather large difference in the retail value of the two animals. These kinds of contracts discourage the production of superior hogs because high quality animals are underpaid and low priced animals are overpaid. Quality hogs are somewhat more expensive to produce.

The effect of these grade standards can be seen by looking at the cut out value data for February 16, 1981 (Baldwin, 1981). Using those values, one 30,000 pound contract should have a cut out value of \$15,660 if the carcasses turned out to be all Number One. If, however, they were all Number Three the value would be \$14,382. The difference in value between the two cut outs is \$1,270, but both would meet the terms of the Dinner Bell contract.

It is highly unlikely that farmers could deliver loads of all Number Three's even if they chose to do so, but the fact is that a contract so loosely specified has less value to the packer than those more tightly drawn.

Some contracts from other companies are more tightly drawn. Whether companies pay more for those contracts is difficult to tell since there are no public price data on private treaty contracting.

Both Michigan Livestock Exchange and Wilson Packing, for instance, only allow ten percent of the hogs in their contracts to be Number Three's. Swift sets the Number Three limit at twenty-five percent. Frederick and Herrud and Land of Lake take only One's and Two's. Kahn's specifies a base price on twelve different weights in ten pound increments, and then pays a premium or discount on each one of those bases depending how the hog yields. The point is, the industry recognizes the need to allow a variance in the quality of contracted product.

The PCM will need to recognize this also so that farmers can not be found in non-compliance of the contract just because they do not quite raise the quality hog for which they had contracted. This can be handled by a premium and discount schedule.

Eight-eight percent of the farmers surveyed said they preferred to work with a preset premium and discount schedule that was periodically readjusted. The Canadian system uses this periodic readjustment process. A computer system that included the discount and premium schedule as part of the negotiation process would be more complicated and require a greater programming effort.

Recommendation: The premium or discount schedule should be preset but adjusted once a year by the PCM in consultation with the packers. A discount schedule similar to Kahn's would be best because it would better reward the superior producer and allow the clearest signal about the specific kind of product that the market wants.

10) Price Negotiation Methods for the PCM's:

The underlying assumption in this work has been that contracts would be sold through a descending or ascending auction system. This assumption was made because contracts offered on the CATTLEX system using the bid-offer techniques were never very successful. Possibly, according to system organizers, this is because those offering and selling the contracts had unrealistic expectations. Often those offering the contracts placed unrealistically high reservation prices on their contracts. Possibly this was done with the idea that they would take a contract if they got such a good price, but otherwise they would take their chances on the spot market.

TELCOT, which sells both spot and contract cotton, has had more success with the bid-offer system. But the uncertainty involved in raising cotton is much higher than for hogs. Therefore the TELCOT contracts specify only the amount of acreage contracted and makes no promises as to amount or grade delivered. For those reasons a cotton contract is not really comparable to a livestock contract. TELCOT tried several methods before it finally hit on the procedure that works best in its system. Farmers, however, can offer their cotton using several different price discovery methods.

There is no reason why the PCM could not try both bid-offer and auction techniques to determine which works best. The computer could be programmed for several different bid-offer procedures.

The program could use a "sealed" bid approach. Here packers would offer bids on a lot of slaughter hogs without knowing that competitors are bidding. At the deadline for bid acceptance the high bidder would get the lot so long as the bid was above the reservation price of the person offering the lot. The transaction price would then be reported on the system.

Alternately the contract could be sold by firm offer. Here the offer would be made at a set price and the first party to meet the price would get the lot.

Programming efforts for either of these methods would not be extremely difficult or costly. For instance, in 1981 NEMA estimated it could develop a bid offer system for Producers Livestock Association in Ohio for \$13,200.

Or the system could be made flexible enough so that it corresponds to the higgling and jiggling that goes on at a terminal market. Packers could make bids on farmers' offers and farmers could counter the bids. Packers could counter the counters and so forth. But this last method, while having desirable properties, would be difficult to program and would also require a lot of computer and participant time.

The price discovery method selected will affect the price level. Experiments show that English Auctions result in a higher and more efficient price than do Dutch auctions (Smith, 1982). In that same article Smith said the literature supports the view that a bid-offer (double auction) system quickly converges to a competitive market equilibrium. He said this convergence occurs rapidly when there are as few as two sellers and six buyers. But he does not compare results of the bid-offer (double auction) and regular auction systems. Although it can be inferred from his work that bid offer systems with sufficient buyers and sellers are about as efficient as an auction system past experience shows English auctions work best for livestock (Purcell, 1983).

Recommendation: Initially the PCM should sell contracts using the English ascending price auction system, but hold in reserve the possibility of going to some sort of bid-offer system. Packers may prefer a bid offer system because it will take less of their time. System designers need to be flexible on exactly which approach is best. If, as the system is built, it appears there is more interest in

the bid-offer procedure, designers should move to that method. Both of these methods could be tried to see which is the most effective.

11) Transportation:

Much of the early work on a contract market for hogs (Holder, 1970) and other electronic spot markets assumed that transportation should be part of the bundle of services provided by the market and hence included in the product price. But the only way to include transportation costs as a direct part of the PCM is to fix them, since transportation providers are not direct participants in the market itself. Such administered prices would make the system less flexible than need be.

Transportation costs in the hog subsector fluctuate depending on how large the demands for hog hauling services are and what the opportunities are for alternative use of tractor and driver time. In the late 1982 phase of the cycle with hog production off about nine percent from the previous year, truckers were looking for work. Because of this, some cut prices. A system that adds some fixed charge based on distance could not adequately keep up with these changes in transportation costs.

Transportation charges in the U.S. spot electronic markets are not included in the bid price.

Similarly, products for most regular agricultural marketing channels purchased FOB the assembly point. If a farmer is selling hogs directly to the packer, the agreed upon price usually includes farmer provided transportation unless there is a substantial distance involved.

It can be seen that the current system allows increased efficiency by allowing the parties to work out their own transportation arrangements.

Recommendation: Adding transportation arrangements needlessly clutters the PCM and makes it more inflexible. Transportation contracts should usually be FOB

the assembly point. If in a particular instance the farmer or assembly yard prefers to provide transportation, it can be so noted on a comment line of the screen which describes the lot for sale. Bids would then be adjusted to reflect the provided transportation. It may well be that the system could offer a transportation market also. However, that system should be a separate market from the PCM.

12) How Far Ahead Contracts Should be Let:

Ideally, contracts should be let every day, but only for a period nine and one-half or ten months in length. And, everybody should contract so the price generated is reliable and production plans can be made accordingly.

Most of the contracts being let now are for durations too short to affect the breeding decision. The farmers surveyed showed a general reluctance to contract prior to breeding. Therefore, a PCM that just offered nine or ten month contracts is unlikely to attract much attention or use. And, in any case, since all contracts do offer coordination advantages, any length of contract would improve coordination in the system.

Recommendation: In order to attract immediate interest, the PCM should mimic the current contracting system as far as length of contract is concerned. Contracts should be let on a regular basis and the contracts should be approximately two to fifteen months in length. Efforts should be undertaken to encourage farmers to do long term contracting on the system whenever they can meet their profit objectives.

13) Geographical Area:

If a PCM went with NEMA, it would be confined to the Midwest initially, as far as producers are concerned. Packers outside the Midwest could still get on the NEMA system if they desired. Initially, however, there will not be enough

exposure to make it a national PCM. The goal would be, of course, to have a national PCM in order to get input into the system from all parts of the country.

A national system would not mean that an Illinois farmer would be contracting with a Los Angeles packer. In fact, because of transportation costs, contracting will most likely remain a regional occurrence. But, if the PCM were national, it would reduce spatial problems. For instance, a Virginia packer might know that every July it is difficult to fill the kill schedule with just Virginia and North Carolina hogs. The rest of the year the region can satisfy the packer's demand. In that situation, the packer would have strong incentives to buy July PCM contracts in Ohio.

Recommendation: The incipient PCM would most likely be regional. This is particularly true if it were piggybacked on a regional electronic spot market. But, the long range goal should be to make the PCM national.

14) Length of Delivery of Contracts:

The tightest delivery that contracts now call for is within a range of twenty days. Most of them allow delivery within a month's period. Nearly all farmers in the survey resisted the idea of nine month contracts which specified delivery to the day. However, thirty percent were willing to contract to within a week's delivery if they were contracting only about sixty percent of their production.

Packers, however, said significant coordination advantages would not accrue to them if contracts, at the letting, specified a tight delivery schedule. Given this information, the simplest thing would be to abandon any effort to tighten current contract delivery specifications. However, there are significant advantages from a contract which specifies a delivery date within a week or so. This must certainly be true if the studies on the economics gained from smooth flow of product are correct. Packers may well be underestimating the benefits of predictable delivery.

Recommendation: The first contracts let on a PCM should follow current contracts as far as tightness of delivery is concerned. Consistent efforts should be made to experiment with a narrower or tighter range for allowable number of delivery days. Of course, even at the inception of a PCM, a system should be set up so that as the contract approaches delivery, farmers inform packers of their delivery intentions.

15) Physical Devices Needed to Implement the Market and Their Costs

A pork contract market would not really be feasible without the computer. Just as the advent of computers hooked into a network made possible electronic spot markets, so too they make possible the PCM.

The effort to develop computerized electronic spot markets has been costly. Millions of dollars have been spent by both government and the private sector in order to develop the software necessary to run these specialized programs.

Among the efforts have been the HAMS project in Ohio for slaughter hogs, TELCOT for cotton in Lubbock, Texas, CATTLEX for feeder cattle in in College Station, Texas, CATS for dressed beef in Chicago, and NEMA for a number of agricultural products in Christiansburg, Virginia.

Only TELCOT and NEMA have experienced real success. This is not totally unexpected since institutional change usually only takes place after a couple of unsuccessful starts.

Something was learned from each of these attempts. For instance, HAMS opted to go with its own computer and dedicated phone lines because employees thought they would have a less expensive and higher quality system if volume developed. But the volume never developed and HAMS was saddled with high fixed costs which they could not shed.

Other problems that have existed for some of these systems include not fully testing the software before starting the market. Both NEMA and HAMS harmed themselves in this fashion.

These new systems must also make sure that conflicts of interest are minimized as much as possible. One of the systems was severely hurt when farmer representatives figured out how to run up the price in the spot market beyond what it would have normally been supported at.

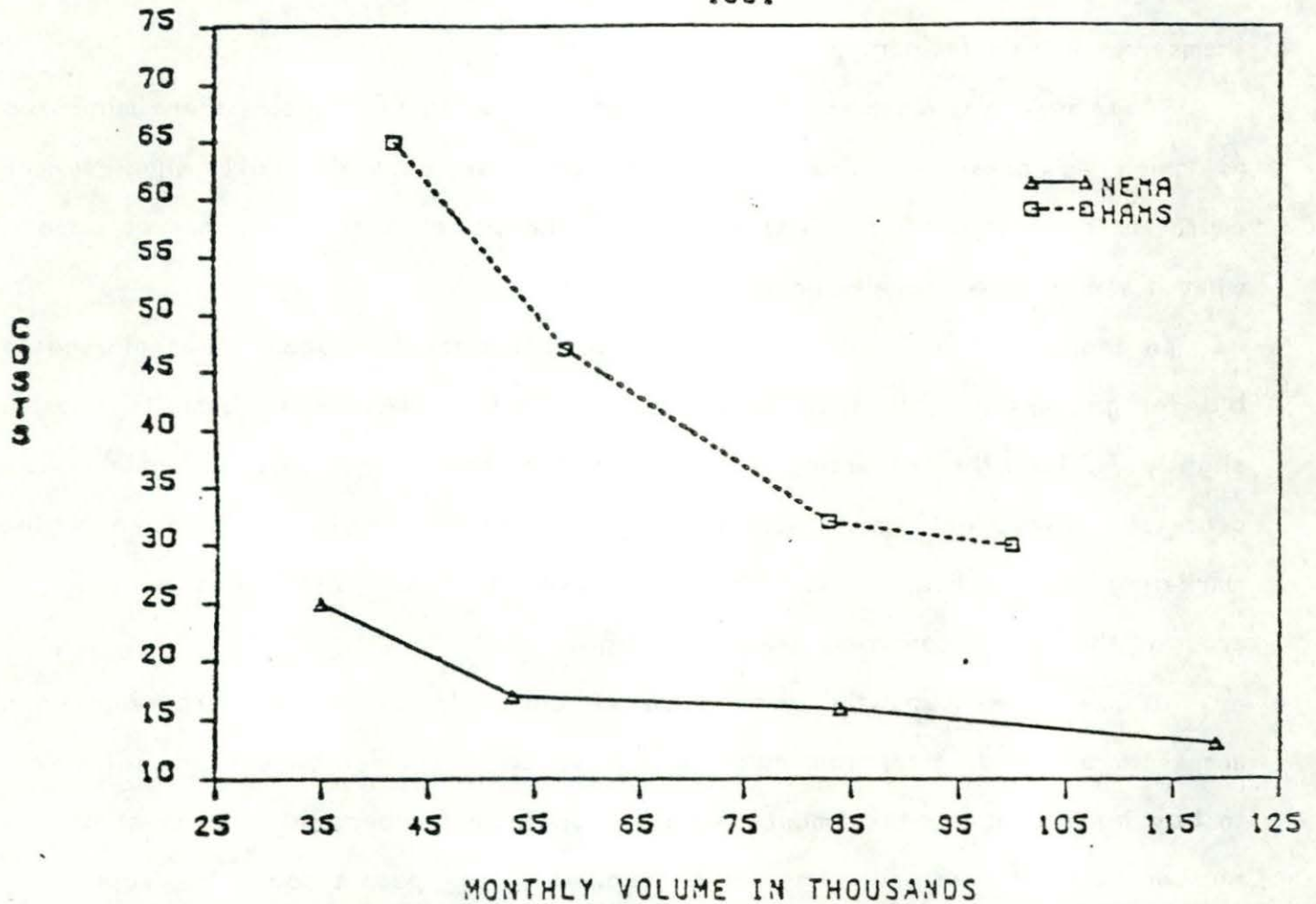
In the electronic market case in question, a marketing agency was allowed to bid for processors. It then used its own bidding machine to bump the price slightly. Then the marketing agency bid the processor's machine again. The processor always got stuck with just an incrementally higher price than if the marketing agency had access only to its own machine. When word of this got around, the system collapsed nearly overnight.

In future systems the importance of only allowing proper representatives access to the bidding terminal must be emphasized. If order buyers are authorized to buy for a company they must only do it on their number and not the company's number, etc. Market support can be allowed if the people doing the supporting face the possibility of buying a contract or load of hogs they do not really want.

NEMA has survived apparently because they went with a time share computer system from the INFONENT Division of Computer Sciences Corporation and used ordinary phone lines. HAMS, on the other hand, had its own Hewlett-Packard mini-computer and leased phone lines which provided a much higher quality signal than ordinary phone lines. While this system was of higher quality it was much more expensive than NEMA's.

A look at Figure 4.1 shows that while the HAMS system did exhibit economies of scale, at all reasonable volumes NEMA could provide the computer services

Figure 4.1.

CENTS PER HEAD COMPUTER COSTS FOR PLA SPOT MARKET
1981

cheaper. The per head costs on a monthly basis are estimates for providing computer services for electronic marketing for the Producers Livestock Association in Ohio.

The numbers in Figure 4.1 were taken from studies by Baldwin (1981) and Russell (1981). Every attempt was made to make them include only the same costs, but since only the secondary data was examined, they might not be finitely comparable. However, the orders of magnitude of the graph are certainly correct. Holder and Henderson (1982) have also concluded that time share systems are much cheaper to operate.

HAMS was stuck with fixed computer charges of about \$25,000 a month and NEMA's fixed costs are close to zero. With NEMA's high initial software costs of development out of the way, the system can be extended for nominal amounts.

It is critical that the operators of the system be well trained and work on a dummy system for a while. That way, human and software problems can be identified before the system is actually used to sell hogs.

Recommendation: The PCM can only be successful in a computerized system. Since NEMA already has such a system it may be the logical organization to approach about the possibilities of a PCM but it is not the only organization capable of running a PCM.

Summary:

The following rules for the PCM have been recommended:

- (1) Since mandatory participation requirements were thought vexatious by the overwhelming majority of farmers, such a rule probably would be strongly resisted. Therefore, participation should be voluntary initially. Fairly low levels of contracting are needed to produce coordination advantages. Higher levels are needed if the cycle is to be dampened. Education programs and tying other benefits to the PCM must be used to overcome free rider problems.
- (2) Producers should own the PCM. Packers did not express any interest in putting up funds to help organize a market. Furthermore, the electronic spot markets that seem to have the best long run chance of success are producer owned.
- (3) Any producer who is capable of raising quality hogs should be allowed to contract on the PCM. If the producer wants to contract through an assembly point, the decision whether s/he is a dependable producer

should be left to the assembly point personnel. If the producers want to contract directly from the farm, the PCM should certify their dependability to perform.

- (4) Contracts of variable size should be let in order to attract maximum interest to the market. Intermediaries can match these different contracts by assembling the smaller ones into larger ones. They, of course, should be financially rewarded for this service. The different sized contracts should only be let at certain times of the day so buyers and sellers can decide how much time they want to spend on the system.
- (5) Grading should probably start with live standards, but the standard must be more discriminating than current USDA standards. Possibly the HAM's live grading system would work. The system should be designed so as to encourage eventual movement to carcass grading.
- (6) Contracts should be honored by both parties and only under acts of God or war should parties to the contract have no liability.
- (7) Buying and selling of contracts in secondary markets should be allowed, or even encouraged, so long as all buyers and sellers intend to fulfill the terms of the contract.
- (8) The identity of buyers should not be revealed unless they desire to be. Sellers should be identified unless they wish not to be. The price information generated by the PCM should be given as wide a dissemination as possible.
- (9) Discounts and premiums for superior or inferior quality hogs should be preset and not made part of the negotiating process. The schedule should be periodically readjusted to reflect changing market conditions.

- (10) Contracts should be sold by auction, but PCM designers should not be wedded to that concept. If bid-offer techniques appear to have possibilities, that method should also be tried. However, it should be kept in mind that so far bid-offer techniques have not been successful for sale of livestock on electronic markets.
- (11) Transportation should not be bundled with the PCM price. Contracts should be FOB the assembly points. It would be possible to run a separate transportation market on the system.
- (12) Contract length should follow the current contract system which allows for contracts anywhere up to fifteen months in length. But, most contracts are now let only after breeding. Therefore, a concerted effort should be made to encourage farmers to contract prior to breeding.
- (13) The PCM, if operationalized, would need to start on a regional basis. But the goal should be to make it a national market.
- (14) A range of approximately a month of delivery days will be needed to start the PCM. But efforts should be made immediately to restrict this range so more coordination advantages from the contracts can be gained.
- (15) If a PCM is to be successful, it must be instituted on a computer market. NEMA seems the logical market to first explore possibilities of creating a PCM.

CHAPTER V

SUMMARY AND CONCLUSIONS

The number of hogs slaughtered in this country every year ranges from sixty-five to ninety-five million. This study and countless others, have established that such fluctuation is not because of rapid changes in consumer demand. But rather, it is primarily because of supply cycles related to breeding decisions made with inaccurate information about what the price will be when the hogs from that breeding decision are ready for market. One can decry a farmer's foolishness for periodic over and under production which means the system is only rarely in equilibrium. But, such decrying is foolish, since the information that could lead to better decisions is not readily available.

Production decisions will always be fraught with uncertainty, but in this study, a Pork Contracting Market (PCM) was analyzed as a way to reduce this uncertainty by improving the market information available to farmers and improving supply coordination between buyer and seller. A PCM would connect, by computer, those wishing to sell and those wishing to buy contracts for delivery of hogs at some future date. The contract would deal with delivery of a specified quality and quantity of hogs at a specified time and place. The contract would not deal with production methods or provide feed or any of the other items associated with production contracting.

A PCM could reduce uncertainty about future price and improve supply coordination by getting participants involved in these decisions earlier in the production processes. Hudson and Purcell (1984) have shown that prices often get discovered in the futures market. A PCM would bring more knowledgeable

participants into this discovery process. It could do this without requiring all of the participants to learn about the arcane world of futures. Knowledge of futures terminology would not be necessary for farmer participants. It would not really make any difference if "spreads, straddles, exhaustion gaps, duplex horizontals, open interest, or margin calls" all remained a mystery. What would be necessary for farmers is a firm knowledge of production costs. Packers and those further up the marketing channel would have to be able to approximately estimate the demand they would face at the time the contract was delivered. Packers and retailers being close to final demand are in much better position to estimate it than farmers. However, if packers and others lacked confidence in their demand estimates they could always hedge their price risk in the futures market. What would result from a high volume PCM would be better quality information sooner in the production cycle than is generated by the current market. A transparent negotiated future price would be developed, upon which farmer production plans could be better made. If packers signed contracts to reduce volume fluctuations into their plants, market flow coordination advantages would accrue. Exactly how these advantages would be distributed depends on the shape of supply and demand at the different levels in the subsector. Potentially, consumers, producers, and packers could all gain from such a system. The market would be open to all and, because of its straightforward simplicity, it should be useful to all in the subsector.

Chapter two showed that evolutionary change is constantly occurring in the pork subsector and that a PCM could well be part of the continuum. In fact, a rudimentary PCM has already started to emerge, with packers and others offering contracts at a set discount off futures. But these contracts are not easily comparable under the current system. And, there is no way for buyers and sellers to indicate to each other their wishes as far as contracting is concerned. This is

because there is not an organized market where many buyers and sellers can easily get together. Contracts that are signed now are mostly between buyers and sellers who are in normal contact with each other. But what about those who do not regularly do business together? A packer in a nearby state who regularly experiences a shortage of hogs in July might be willing to pay a premium for out of state July contracts. But, currently farmers in those adjoining states have no good way of finding that out.

It is only with diligent effort that knowledge of the various contracts available can now be obtained. And, comparing them is very difficult. There is no price negotiation on them. The only negotiation is that done indirectly in the futures market. The current contracts are, in essence, formula priced.

Neither are current contracts greatly useful in helping the packer plan the flow of hogs into the abattoir. Furthermore, there is no currently readily available mechanism that coordinates the desires of those wishing to buy large contracts and those wishing to sell small contracts. A PCM could be designed to meet these problems.

The survey for this research showed farmers quite willing to give a PCM a try and packers, for the most part, said they would give it a look. But, none of the packers reacted enthusiastically to the idea.

As judged by their answers to the survey, many farmers would probably not initially sign PCM contracts prior to breeding. Larger farmers were more willing to sign contracts prior to breeding. But smaller farmers, for the most part, felt safe contracting only after weaning.

Using the results of the survey and the background in the first three chapters, some suggested rules for effective operation of a PCM were put forward in Chapter IV. The rules covered fifteen critical areas that the analysis indicates are important to make a PCM successful.

The movement to a PCM would be evolutionary. For the most part, a PCM would utilize already existing institutions but combined somewhat differently because of possibilities afforded by new computer technology. This evolutionary approach is suggested by the cursory look at the history of the pork subsector outlined in Chapter Two.

This approach seems to be suggested by a look at the history of the pork subsector. Adjustments are always more painful and not always accomplished as well when the change is discreet or revolutionary rather than evolutionary. This is not to imply that evolutionary change is accomplished painlessly. But, whenever possible this method of change would seem preferable to discreet kinds of change. This is because evolutionary change allows gradual economic adjustment rather than causing immediate economic dislocation.

It is recognized that a PCM might not become successful, in the sense that it could dampen the cycle, without some form of mandatory participation. But, since hog farmers are so clearly against a mandatory provision, and since a PCM should be able to cover operating costs at low volume, it seems that the logical approach is to start with voluntary participation. If such a voluntary approach does not work, a mandatory approach can be considered.

How Policy Makers Might Proceed:

USDA sponsored this research, presumably because their policy makers thought the negotiated contract markets had merit. How should they now proceed? As a result of this research, there are at least three policy decisions concerning a PCM that could conceivably be made. They are presented briefly below:

1. *Do nothing on the grounds that an incipient PCM already exists and it may develop most of the properties that economists believe are desirable in a market.*

2. *Start educational programs about contracting and begin to work with an agency that might create a computer driven PCM. Do further research on the exact nature of the currently existing contract market. Consider collecting and publishing price series data on current contract prices. (Refco contract prices are already being distributed by some of the wire services.) But, hold off on an actual attempt to create a PCM on the grounds that subsector participants consider both electronic spot markets and contracts new and untested marketing channels. Subsector participants should first gain more experience with the electronic spot markets before what is perceived as a new marketing channel is added to the electronic market.*
3. *Take the fifteen recommendations for rules of operation made in Chapter V, evaluate them, and then try to implement a PCM based on that evaluation.*

BIBLIOGRAPHY

- Almond, Shirley. "The Distributed Lag Between Capital Appropriations and Expenditures." Econometrica 33 (January 1965): 178-196.
- Bain, Joe S. Industrial Organization. New York: Wiley and Sons, 1959.
- Baker, C. B. "Instability in Capital Markets of U. S. Agriculture." American Journal of Agricultural Economics 59 (February 1977): 170-177.
- Bakken, Henry. Futures Trading in Livestock: Origins and Concepts. Madison, Wisconsin: Mimis Publishers, Inc., 1970.
- Baldwin, E. Dean. "Electronic Marketing of Agricultural Products." Paper delivered to the American Pork Congress, Kansas City, Missouri, March 12, 1981.
- Baumol, William J. "Contestable Markets: An Uprising in the Theory of Industry Structure." The American Economic Review 72 (March 1982): 1-15.
- Berry, Thomas. Western Prices before 1861. Cambridge: Harvard University Press, 1966.
- Bishop, W. L. Men and Pork Chops: A History of the Ontario Pork Producers Marketing Board. London, Ontario: Phelp Publishing Co., 1977.
- Bjorka, Knute. The Direct Marketing of Hogs. USDA Bureau of Agricultural Economics, Miscellaneous Publication No. 222, 1935.
- Bloomer, Tom. "Hog Marketing Channels in Michigan: Structure and Performance Implications." M.S. Thesis, Michigan State University, 1975.
- Breimyer, Harold F. "Emerging Phenomenon, A Cycle in Hogs." Journal of Farm Economics 41 (November 1959): 70.
- Bronowski, Jacob. The Ascent of Man. Boston: Little, Brown and Co., 1973.
- Bronowski, Jacob. The Origins of Knowledge and Imagination. New Haven: Yale University Press, 1978.
- Brunner, G. Allen and Carroll Jr., Stephen J. "The Effect of Prior Notification on the Refusal Rate in Fixed Address Surveys." Journal of Advertising Research 9 (March 1969): 42-44.
- Burns, Joseph M. A Treatise on Markets: Spot Futures and Options. Washington, D.C.: American Enterprise Institute for Public Policy Research, 1979.
- Butler, Leslie J. "Some Aspects of Agricultural Price Instability." Ph.D. Dissertation, Michigan State University, 1979.

- Chavas, Jean Paul. "Structural Changes in Demand for Meat." American Journal of Agricultural Economics, 65 (1983): 148-153.
- Clark, J. M. Studies in the Economics of Overhead Costs. Chicago: University of Chicago Press, 1923.
- Clark, J. M. Competition as a Dynamic Process. Washington: Brookings, 1961.
- Clemen, R. A. The American Livestock and Meat Industry. New York: Ronald Press, 1923.
- Congressional Record. 59th Congress, 1st session, 1906, Document No. 873, Vol. 40, Part 8, Washington, D.C.: Government Printing Office, 1906.
- Daellenbach, Lawrence A. and Fletcher, Lehman B. "Effects of Supply Variations on Costs and Profits of Slaughter Plants." American Journal of Agricultural Economics 53 (1971): 600-607.
- Darcovich, William and Heady, Earl. Application of Expectation Models to Livestock and Crop Prices and Products. Iowa Agricultural Experiment Station Research Bulletin No. 438, 1956.
- Dean, Gerald and Collins, Norman. World Trade in Fresh Oranges: An Analysis of the Effect of European Economic Tariff Policies. Giannini Foundation Monograph 18, January 1967.
- Dean, G. W. and Heady, Earl. "Changes in Supply Response and Elasticity for Hogs." Journal of Farm Economics 40 (November 1958): 854-860.
- Dewbre, Joe. "Interrelationships between Spot and Futures Markets: Some Implications of Rational Expectations." Invited Paper, American Agricultural Economics Association, Urbana, Illinois, 1981.
- Dowell, Austin and Bjorka, Knute. Livestock Marketing. New York: McGraw-Hill, 1941.
- Edwards, Clark. "Resource Fixity, Credit Availability and Agricultural Organization." Ph.D. Dissertation, Michigan State University, 1958.
- Ezekiel, Mordecai. "The Cobweb Theorem." Quarterly Journal of Economics 52 (February 1938): 262-272.
- Ferris, John N. "Selected Statistics on Hogs." Michigan State University Department of Agricultural Economics, February 1982. (Mimeographed.)
- Fowler, Stewart H. The Marketing of Meat and Livestock. Danville, Illinois: Interstate Printers and Publishers, 1961.
- Frich, Robert. "Sources of Commodity Market Instability in U. S. Agriculture." American Journal of Agricultural Economics 59 (February 1977): 164-169.
- Galbraith, John K. The New Industrial State. Boston: Houghton Mifflin, 1967.

- Girca, J. A.; Tomeck, W. G.; Mount, T. D. "The Effect of Income Instability of Farmer Consumption and Investment." Review of Economics and Statistics 56 (May 1974): 141-149.
- Gray, Roger. "The Futures Market for Maine Potatoes: An Appraisal." Food Research Institute Studies 11 (1966): 313-341.
- Grossman, S. J., and Stiglitz, J. E. "On the Impossibility of Informationally Efficient Markets." American Economics Review 70 (1976): 393-409.
- Gustafson, R. L. Carryover Levels for Grain. U. S. Department of Agriculture Technical Bulletin No. 1178 (1958).
- Hamm, Larry. "Food Distributor Procurement Practices: Their Implications for Food System Structure and Coordination." Ph.D. Dissertation, Michigan State University, 1981.
- Hayenga, Marvin; Johnson Aaron C.; and Marion, Bruce W.; eds. Market Information and Price Reporting in the Food and Agricultural Sector, N. C. 117 Monograph 9, 1980.
- Helmberger, Peter; Campbell, Gerald; and Dobson, William. "Organization and Performance of Agricultural Markets." In A Survey of Agricultural Economics Literature Volume 3, pp. 503-653. Edited by Lee R. Martin. Minneapolis: University of Minnesota Press, 1981.
- Henderson, Dennis and Holder, David. Lesson Learned in Electronic Marketing. Ohio State University Agricultural Economics Report No. ESO-934, July 1982.
- Holder, David L. "The Economic Feasibility of a Computerized Forward Contract Market for Slaughter Hogs." Ph.D. Dissertation, Michigan State University, 1970.
- Holder, David L. and Sporleder, Thomas. Marketing Alternatives for Agriculture. Paper No. 4, Cornell University, Ithaca, New York, (no date given).
- Holtman, J. B.; Sullivan, J. P.; Barreto, H. F. Supply Control Savings for Hog Slaughtering Plants-Processing Plants. USDA ERS Agricultural Economic Report No. 258, May 1974.
- Houck, James P.; Hayenga, Marvin L.; Gardner, Bruce L.; Paul, Allen B. "The Concept of a Thin Market" in Pricing Problems in the Food Industry edited by Marvin L. Hayenga. North Central Regional Research Project NC-117, Monograph No. 7, 1978.
- Hutchinson, T. Q. Consumers' Knowledge and Use of Government Grades for Selected Food Items. USDA Marketing Research Report No. 876, 1970.
- Ikerd, J. E. The Consumer Image of Pork. Missouri Agricultural Experiment Station Research Bulletin No. 978, 1971.
- Irwin, H. S. The Evolution of Futures Trading. Madison, Wisconsin: Mimir Publishers, Inc., 1954.

- Iwine, F. Owen. "Demand Equations for Individual New Car Models Estimated Using Transaction Prices with Implications for Regulatory Issues," Southern Economics Journal, 49 (1983): 764-782.
- Johnson, D. Gale. Forward Prices in Agriculture. Chicago: University of Chicago Press, 1947.
- Johnson, D. Gale. World Food Problems and Prospects. Washington D.C.: American Enterprise Institute for Public Policy Research, 1972.
- Johnson, Glenn L. "Book Review of Marc Nerlove's Dynamics of Supply: Estimation of Farmers' Response to Price." Agricultural Economics Research 12 (January 1960): 25-28.
- Johnson, Glenn L.; Halter, Albert; Jensen, Harold; Thomas, D. W. The Managerial Processes of Midwestern Farmers. Ames: The Iowa State University Press, 1961.
- Johnson, Glenn L. and Quance, C. Leroy. The Overproduction Trap in U. S. Agriculture, Resources for the Future. Baltimore, John Hopkins Press, 1972.
- Johnston, Gene and Houghton, Dean. "Let's Get Paid for Quality Hogs." Successful Farming 78 (December 1980): H5-H16.
- Jones, John. Farm Real Estate Market Developments Supplement No. 1. USDA Economic Research Service, 1982.
- Just, Richard and Rauser, Gordon. "Commodity Price Forecasting with Large-Scale Econometric Models and the Futures Market." American Journal of Agricultural Economics 63 (May 1981): 197-208.
- Kaldor, D. R. and Heady, Earl O. An Exploratory Study of Expectations Uncertainty and Farm Plans in Southern Iowa Agriculture. Iowa State University, Agricultural Experiment Research Station Research Bulletin No. 408, 1952.
- Kanu, Leslie and Berenson, Conrad. "Mail Surveys and Response Rate: A Literature Review." Journal of Marketing Research 62 (November 1975).
- Kemeny, John. A Philosopher Looks at Science. Princeton, New Jersey: Princeton University Press, 1959.
- Kish, Leslie. Survey Sampling. New York: John Wiley & Sons, 1965.
- Knight, Frank H. Risk, Uncertainty, and Profit. New York: Houghton Mifflin Co., 1921.
- Kuhn, Thomas. The Structure of Scientific Revolutions. Chicago: University of Chicago Press, 1970.
- Lansing, John B. and Morgan, James N. Economic Survey Methods. Ann Arbor: The University of Michigan Press, 1971.

- Leavitt, Charles T. "Transportation and Livestock of the Middle West." Agricultural History 8 (1934): 20-33.
- Lerohl, M. L. "Expected Prices for U. S. Agricultural Commodities 1917-1962." Ph.D. Dissertation, Michigan State University, 1965.
- Leuthold, Raymond M. "The Price Performance on the Futures Markets of a Nonstorable Commodity: Live Beef Cattle." American Journal of Agricultural Economics 56 (May 1974): 271-279.
- Leuthold, Raymond and Hartman, Peter. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market." American Journal of Agricultural Economics 63 (1979): 482-88.
- Leuthold, Raymond and Hartman, Peter. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market: Reply." American Journal of Agricultural Economics 62 (August 1980): 585-87.
- Love, Harold and Shuffet, D. Milton. "Short-Run Price Effects on Structural Changes in a Terminal Market for Hogs." American Journal of Agricultural Economics 47 (August 1966): 803-812.
- Marion, Bruce and Handy, Charles. Market Performance: Concepts and Measures. USDA Agricultural Economic Report No. 244, 1973.
- Martin, Larry and Garcia, Philip. "The Price-Forecasting Performance of Futures Markets for Live Cattle and Hogs: A Disaggregated Analysis." American Journal of Agricultural Economics 63 (May 1981): 209-15.
- Mason, Edward S. "Price and Production Policies of Large-Scale Enterprise." American Economic Review. Supplement (March 1939).
- Massell, B. F. "Price Stabilization and Welfare." Quarterly Journal of Economics 83 (May 1969): 284-298.
- McCoy, John H. Livestock and Meat Marketing. Westport, Connecticut: Avi Publishing Co., 1979.
- Meadows, Dennis L. Dynamics of Commodity Production Cycles. Cambridge, Massachusetts: Wright-Allen Press, Inc., 1970.
- Mighell, R. L. and Hoffnagle, W. S. Contract Production and Vertical Integration in Farming 1960 and 1970. USDA Economic Research Service Series No. 479, 1972.
- Mighell, R. L. and Jones, L. A. Vertical Coordination in Agriculture. USDA Agricultural Economics Report No. 19, 1963.
- Mitroff, Ian and Pondy, Louis. "On the Organization of Inquiry: A Comparison of Some Radically Different Approaches to Policy Analysis." Public Administration Review 34 (September/October 1974): 471-79.

- Nerlove, Marc. The Dynamics of Supply: Estimation of Farmers' Response to Price. Baltimore: John Hopkins Press, 1958.
- Neuman, Mark and Stephens, John. "Agribusiness Survey on Nonresponse Bias: The Case of Financial Performance and Equity Redemption Practices of Kansas Cooperatives. Kansas State University, July 1982.
- Oi, W. "The Desirability of Price Instability Under Perfect Competition." Econometrica 29 (January 1961): 58-64.
- Packers and Stockyards Resume USDA Packers Stockyards Association, Vol. 19, March 1982.
- Panton, Don B. "A Semi-Strong Form Evaluation of the Efficiency of the Hog Futures Market: Comment" Journal of Agricultural Economics 62 (August 1980): 584.
- Pasour, E. C., Jr. "A Semi-Strong Evaluation of the Efficiency of the Hog Futures Market: Comment." American Journal of Agricultural Economics 62 (August 1980) 581-583.
- Paul, Allen. "The Past and Future of the Commodities Exchanges." Agricultural History 56 (January 1982): 287-300.
- Peston, M. H. and Yamey, B. S. "Inter-Temporal Price Relationships with Forward Markets: A Method of Analysis." Economica 27 (November 1960): 355-67.
- Petit, Michel Jean. "Econometric Analysis of the Feed-Grain Livestock Economy." Ph.D. Dissertation, Michigan State University, 1964.
- Phillips, Richard. Contract Programs in the Middle West. Iowa Agricultural Experiment Station Special Report No. 28, April 1961.
- Popper, Karl. The Logic of Scientific Discovery. New York: Harper Torch Books, 1959.
- Powers, Mark J. "Does Futures Trading Reduce Price Fluctuations in the Cash Markets?" American Economic Review 60 (June 1970): 460-64.
- Purcell, Wayne. "An Approach to Research on Vertical Coordination: The Beef System in Oklahoma." American Journal of Agricultural Economics 55 (1973): 65-68.
- Purcell, Wayne. Systems, Coordination, Cash and Futures Prices. Reston, Virginia: Reston Publishing Co., 1979.
- Purcell, Wayne. "Do's and Don't's in Electronic Marketing." Proceedings from Electronic Marketing Conference, Virginia Cooperative Extension Service, Virginia Tech, Publication No. 448-003, January 1983.
- Rizek, R. L.; Judge, G. G.; and Havlicek, Joseph. Joint Spatial Analysis of Regional Slaughter and Flows and Pricing of Livestock Meat. North Central Research Bulletin No. 163, 1965.

- Robinson, W. L. "Unstable Farm Prices: Economic Consequences and Policy Options." American Journal of Agricultural Economics 57 (December 1975): 769-777.
- Rosenburg, Barr and Rudd, Andrew. "The Yield/Beta/Residual Risk Tradeoff." Research Program in Finance, Working Paper No. 68, Institute of Business and Economic Research, University of California-Berkeley, November 1977.
- Roy, E. P. Contract Farming, USA. Danville, Illinois: Interstate Printer and Publisher, 1963.
- Russell, James. "Electronic Marketing: Conceptual, Theoretical, and Empirical Considerations." Ph.D. Dissertation, Virginia Polytechnic Institute and State University, 1981.
- Samuelson, P. A. "The Consumer Does Benefit from Feasible Price Stability." Quarterly Journal of Economics 86 (1972): 476-93.
- Savage, L. J. and Friedman, Milton. "The Utility Analysis of Choices Involving Risks." Journal of Political Economy 56 (August 1948): 279-304.
- Scherer, F. M. Industrial Market Structures and Economic Performance. Chicago: Rand McNally, 1970.
- Schmid, A. A. Property, Power and Public Choice. New York: Praeger Publishers, 1978.
- Schneidau, Robert E. and Duewer, Lawrence. Symposium: Vertical Coordination in the Pork Industry. Bridgeport, Conn.: Avi Publishing Co., 1972.
- Schultz, T. "Capital Rationing, Uncertainty and Farm-Tenancy Reform." Journal of Political Economy 48 (June 1940): 309-324.
- Schumpeter, Joseph. Capitalism, Socialism, Democracy. 3rd edition, New York: Harper & Row, 1950.
- Scott, Christopher. "Research on Mail Survey." Journal of the Royal Statistical Society 124, Series A (1961).
- Shaffer, James. "On Institutional Obsolescence and Innovation." American Journal of Agricultural Economics 51 (May 1969): 245-267.
- Sharpe, William F. Portfolio Theory and Capital Markets. New York: McGraw Hill, 1970.
- Skinner, B. F. About Behaviorism. New York: Knopf Publishing Co., 1974.
- Smith, Vernon L. "Experimental Microeconomic Systems." American Economic Review 72 (December 1982): 923-955.
- Stewart, Paul and Dewhurst, J. Frederic. Does Distribution Cost Too Much? New York: Twentieth Century Fund, 1939.

- Stigler, George J. "The Economics of Information." Journal of Political Economy 69 (June 1961): 212-215.
- Stigler, George J. "Imperfections in the Capital Market." Journal of Political Economy 75 (1967): 287-92.
- Thomas Grocery Register. New York; Thomas Publishing Co.
- Thompson, J. W. A History of Livestock Raising in the United States, 1607-1860. Wilmington, Delaware: Scholarly Resource, 1942.
- Tintsman, Dale C. and Peterson, Robert L. Iowa Beef Processors, Inc. Newcomen Society. Princeton, New Jersey: Princeton University Press, 1981.
- Toffler, Alvin. Future Shock. New York: Random House, 1970.
- Tomek, W. G. and Gray, R. W. "Temporal Relationships among Prices on Commodity Futures Markets: Their Allocation and Stabilizing Roles." American Journal of Agricultural Economics 52 (August 1970): 372-380.
- Turnousky, Stephen O. "Price Expectations and Welfare Gains from Price Stabilization." American Journal of Agricultural Economics 56 (November 1974): 706-16.
- U. S. Congress. Subcommittee on Antitrust and Monopoly of the Committee on Judiciary. Unfair Trade Practice in the Meat Industry. 85th Congress, May 1957.
- U. S. House of Representatives. Hearings before the Subcommittee on SBA and SBIC Authority and General Small Business Problems. Small Business Problems in the Marketing of Meat. No. 95-1787, 13 October 1978.
- U. S. Federal Trade Commission. Report of the Federal Trade Commission on the Meat-Packing Industry. Washington, D. C.: Government Printing Office, 1918.
- Van Arsdall, Roy. Structural Characteristics of the U. S. Hog Production Industry. USDA Agricultural Economics Report No. 4151, December 1978.
- Van Sickle, Joe. "Iowan Emphasizes Marketing Leaner Hogs." National Hog Farmer 28 (February 15, 1983): 151-153.
- Von Neuman, John and Morgenstern, Oscar. Theory of Games and Economic Behavior. Princeton, New Jersey: Princeton University Press, 1944.
- Waugh, F. V. "Does the Consumer Benefit from Price Instability?" Quarterly Journal of Economics 58 (August 1944): 602-614.
- Welford, Harrison. Sowing the Wind. New York: Grossman Publishers, 1972.
- Williams, Willard and Stout, Thomas. Economics of the Livestock-Meat Economy. New York: Macmillian Publishing Co., 1964.

- Williamson, Oliver. "The Modern Corporation: Origins, Evaluation, Attributes." Journal of Economic Literature 19 (December 1981): 1537-1568.
- Williamson, Oliver. "Transaction Cost Economies: The Governanace of Contractual Relations." The Journal of Law and Economics 22 (October 1979): 233-261.
- Working, Holbrook. "Whose Markets? Evidence on Some Aspects of Futures Trading." Journal of Marketing 19 (July 1954): 1-11.
- Working, Holbrook. "A Theory of Anticipatory Prices." American Economic Review (May 1958): 188-199.