



LIBRARY
Michigan State
University

This is to certify that the

dissertation entitled

STRUCTURAL CHANGE IN THE HOG/PORK SUBSECTOR:
COORDINATING ROLES OF LIVESTOCK FARMER COOPERATIVES

presented by

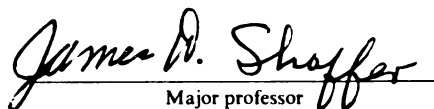
Lisa Chloe Abeles-Allison

has been accepted towards fulfillment

of the requirements for

Agricultural

Ph.D. degree in Economics


Major professor

Date September, 1992

PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

DATE DUE	DATE DUE	DATE DUE
FEB 06 1995	_____	_____
JAN 23 1995 2122138	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

MSU Is An Affirmative Action/Equal Opportunity Institution

c:\circ\datedue.pm3-p.1

**STRUCTURAL CHANGE IN THE HOG/PORK SUBSECTOR:
COORDINATING ROLES OF LIVESTOCK FARMER COOPERATIVES**

By

Lisa Chloie Abeles-Allison

Volume I

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1992

ABSTRACT

STRUCTURAL CHANGE IN THE HOG/PORK SUBSECTOR: COORDINATING ROLES OF LIVESTOCK FARMER COOPERATIVES

By

Lisa Chloie Abeles-Allison

The hog/pork subsector is undergoing structural change driven by new technologies and consumer demands for lean pork and convenient food products. The number of hog farmers continues to decrease while the average size of hog farms continues to increase. The number of hog slaughter plants is decreasing while the average plant size is increasing. Fresh pork has begun to be differentiated by branding. Assets are becoming more specialized in the subsector. Confinement facilities for farrowing and finishing, hybrid hog breeds, specialized feeds and skilled hog farm managers are examples of specialized assets.

The hog/pork subsector is characterized by quantity and price instability which leads to profit instability. Increasing asset specialization means greater losses are sustained when participants in the subsector exit or cut

back production. Start up costs are also higher. As a result, subsector participants are taking actions to improve coordination and reduce the uncertainty of prices and profits.

The research used a case-study approach and transactions cost analysis to determine roles livestock farmer cooperatives can take to improve coordination in the hog/pork subsector. Coordination problems at each transaction level of the subsector were determined. Alternative institutions and coordination mechanisms were analyzed that reduced the coordination problems. Specifically, hog farmer cooperatives were analyzed as an alternative institution to improve coordination.

A model of vertical coordination by hog farmer cooperatives was developed that incorporated the institutions and coordination mechanisms the analysis concluded were most likely to dominate the hog/pork subsector. Analysis of advantages and disadvantages of farmer cooperatives distinguished the costs and benefits to subsector participants of farmer cooperatives versus investor-owned firms as coordinating institutions.

The research showed that hog farmer cooperatives have the capacity to improve vertical coordination and benefit hog farmers. Farmer cooperatives maintain hog farmers' decision making power and can be more efficient at reducing transactions costs than investor-owned firms.

Copyright by
LISA CHLOIE ABELES-ALLISON
1992

To Mark and Elizabeth Abeles-Allison

ACKNOWLEDGEMENTS

I would like to thank James Shaffer, my major professor, who continued to challenge and encourage me throughout my graduate coursework and dissertation, as well as John Staatz, James Bonnen, Thomas Pierson and Gerald Schwab, the other members of my guidance committee. Rose Lilly and Donna Rogers warmly provided secretarial support.

Agricultural Cooperative Service of the USDA provided funding for this research. Many thanks to Julie Hogeland, who helped me get my feet wet, as well as Jim Haskell and Randall Torgerson.

Livestock cooperative participants provided the "meat" of this dissertation. I would like to thank those people who took the time to answer my questions and share their own insights.

I would like to thank my friends who have made this long journey one with many pleasures: Carla Henry, Lucy Winchester, Ellen Fitzpatrick, John Mykrantz, Pablo de la Torre, Meg Brown, Tom Land, Jan and Steve Galitzer, Jennifer Kassebaum and the "econ prelim study group"; Abdoul Barry, Laura Geis and Joan Parker.

I would also like to thank my family who accepted my immersion into academia without asking "when will you be

done?" once I'd completed my master's degree and begun a PhD, which they astutely realized could have taken forever: Susan Meyer, Robin Hartnett, Garth Allison, Norman and Jeanette Abeles. My daughter, Elizabeth, unwittingly entered in the midst of this project. Her smiles and hugs brightened up many a grey day.

Most of all, my love and thanks go out to Mark, who bore with me through my comprehensive exams, offered his support and shared my frustrations throughout my dissertation and will travel the road ahead with me.

TABLE OF CONTENTS

CHAPTER ONE

RESEARCH PROBLEM

	<u>Page</u>
1.1 Introduction	1
1.2 Price Instability and Hog Cycles	2
1.3 Definition of Structural Change	4
1.4 Changes in a Basic Condition of Supply: Technology	7
1.5 Change in a Basic Condition of Demand: Growth Rate of Demand	10
1.6 Structural Change	11
1.6.1 Number and Size of Packers	11
1.6.2 Cost Structures of Packing Plants	13
1.6.3 Barriers to Entry and Exit for Packing Plants	16
1.6.4 Number and Size of Producers	17
1.6.5 Cost Structures of Hog Farms	20
1.6.6 Barriers to Entry and Exit for Hog Farmers	21
1.6.7 Product Differentiation	22
1.6.8 Conglomerateness	24
1.6.9 Contract Farming	24
1.7 Vertical Coordination	25
1.8 Potential for Improved Coordination	27
1.9 Organization of the Dissertation	27

CHAPTER TWO

CONCEPTUAL APPROACH

2.1 Introduction	29
2.2 Research Methods	29

	<u>Page</u>
2.3 Conceptual Approach	33
2.3.1 Asset Fixity Principle	35
2.3.1.1 Transaction-Specific Assets	36
2.3.1.2 Commodity-Specific Assets	37
2.3.1.3 Immobile Assets	37
2.3.1.4 Cooperatives and Asset Specificity	38
2.3.2 Uncertainty Principle	38
2.3.3 Externality Principle	39
2.3.4 Hierarchical Decomposition Principle	40
2.4 Cooperative Problems Relevant to the Hog/Pork Subsector	41
2.4.1 Member Loyalty and Commitment	42
2.4.2 Free Riders	43
2.4.3 Serving Small Versus Large Farmers	43
2.4.4 Forward Planning Problems	44
2.5 Summary	46

CHAPTER THREE

STRUCTURE OF THE HOG/PORK SUBSECTOR AND THE ROLE OF COOPERATIVES

3.1 Introduction	47
3.2 Breeding Stock Farmers	51
3.2.1 Purebred Breeders	53
3.2.1.1 Purebred Breeder Hog Price Determination	53
3.2.1.2 Purebred Breeder Research and Development	54
3.2.1.3 Cooperative Involvement in Purebred Hog Breed Multiplying	55
3.2.2 Corporate Breeders	56
3.2.2.1 Corporate Breeders' Price Determination	56
3.2.2.2 Corporate Breeders' Progressiveness	57
3.2.2.3 Cooperative Involvement in Hybrid Hog Breed Multiplying	58
3.3 Hog Farming	60
3.3.1 Stages of Hog Production	61
3.3.2 Cooperative Involvement in Pig and Hog Production	63
3.3.2.1 Cooperative Feeder Pig Certification Programs	63
3.3.2.2 Farrowing Corporations	64
3.3.3 Marketing of Pigs and Hogs	66

	<u>Page</u>
3.3.3.1 Market Channels/Price Mechanisms for Feeder Pigs	67
3.3.3.2 Market Channels and Price Mechanisms for Slaughter Hogs	68
3.3.3.3 Public and Private Sources of Price Information	70
3.3.3.4 Cooperative Auctions and Daily Markets	71
3.3.3.5 Order Buyers	73
3.3.3.6 Teleauctions	74
3.3.3.6.1 Slaughter Hog Teleauction . .	74
3.3.3.6.1.1 Serving Large Farmers via Teleauctions . . .	76
3.3.3.6.2 Feeder Pig Teleauctions . . .	77
3.3.3.7 Direct Sales Pricing	78
3.3.3.7.1 Forward Contracts with Packers	79
3.3.3.7.2 Formula Pricing with Packers	80
3.3.3.8 Liveweight Pricing versus Carcass Grade and Yield	80
3.3.4 Returns to Pig and Hog Production	83
3.3.4.1 Returns to Feeder Pig Production . .	83
3.3.4.2 Returns to Finishing	85
3.3.4.3 Returns to Farrow-to-Finish	85
3.4 Slaughter/Processors	86
3.4.1 Farmer Cooperative Meatpacking	87
3.4.2 Processors	88
3.4.2.1 Cooperative Processing and Branded Pork	89
3.4.3 Slaughter/Processor Profitability and Progressiveness	89
3.5 Wholesalers, Retailers and Food-Service	90
3.5.1 Wholesalers	90
3.5.2 Food-Service Sector	91
3.5.3 Price Determination	91
3.5.4 Progressiveness and Profitability	92
3.6 Inputs Sector Influence	93
3.6.1 Input-Supply Cooperatives	95
3.7 Financing	97
3.7.1 Loans	97
3.7.2 Gilt Purchase Loans	98
3.8 Government Intervention	99
3.9 Summary	100

CHAPTER FOUR

CONTRACTING AS A COORDINATION MECHANISM: COMPARISONS BETWEEN THE HOG/PORK AND BROILER SUBSECTORS

	<u>Page</u>
4.1 Introduction	103
4.2 Overview of the Broiler Subsector	103
4.3 Levels of the Broiler Subsector	105
4.4 Structural Change in the Broiler Subsector	106
4.4.1 Basic Conditions	108
4.4.2 Number and Size of Firms	109
4.4.3 Product Differentiation	110
4.4.3.1 Branded Product	111
4.5 Performance of the Broiler Subsector	112
4.6 Broiler Production Contracts	113
4.6.1 Terms and Conditions of Broiler Production Contracts	114
4.6.2 Contracts for Suppliers of Poults and Hatching Eggs	115
4.7 Contract Production of Hogs	116
4.7.1 How Much Contracting is Occurring?	116
4.7.2 Hog Production Contractors	117
4.7.3 Reasons for Offering Contracts	117
4.7.4 Contract Growers	119
4.7.5 Why Do Growers Contract?	120
4.7.6 Types and Terms of Contracts	120
4.7.7 Responsibilities	121
4.7.8 Terminating Contracts	122
4.7.9 Payments	123
4.7.10 Financial Returns to Contracting as Opposed to Market Transactions	123
4.8 Use of Contracts by Livestock-Farmer Cooperatives	125
4.8.1 Forward Market Contracts	125
4.8.1.1 Market Outlet Contracts	127
4.8.2 Cooperative Marketing and Production of Broilers	128
4.8.3 Fed Cattle and Hog Programs	130
4.8.4 Feeder Pig and Slaughter Hog Production .	134
4.8.4.1 Regional Differences	136
4.8.4.2 Midwestern Cooperatives' Production Contracts	137
4.8.4.3 Differences between IOF and Cooperative Contracting	139

	<u>Page</u>
4.9 Lessons Learned from the Broiler Subsector	140
4.9.1 Macro Level of Coordination	140
4.9.2 Micro Level of Coordination	141
4.9.3 Micro-Micro Level of Coordination	145
4.9.3.1 Terms of Payment	145
4.9.3.2 Length of Contracts and Capacity Utilization	148
4.9.3.3 Division of Responsibilities	150
4.10 Summary	151

CHAPTER FIVE

IMPORTANT FACTORS INFLUENCING THE FUTURE EVOLUTION AND COORDINATION PERFORMANCE OF THE HOG/PORK SUBSECTOR

5.1 Introduction	153
5.2 Critical Factors	153
5.3 Implications of Changes in Production Technology and Marketing Innovations	154
5.3.1 Widespread Adoption of Pork Growth Promotants	155
5.3.1.1 Food and Drug Administration Approval	156
5.3.1.2 Pricing of Pork Growth Promotants .	157
5.3.1.3 Challenges of Adopting Pork Growth Promotants	157
5.3.1.4 Rate of Adoption	158
5.3.1.5 Accelerated Trends Towards Fewer, Larger Hog Farms and Packers	159
5.3.1.6 Specialized Assets for Production .	160
5.3.1.7 Management Intensive	161
5.3.1.8 Training in the Use of New Technologies: Human Asset Specificity	162
5.3.1.9 Increased Off-Farm Inputs	162
5.3.1.10 Feed Types	163
5.3.1.11 Genetics	164
5.3.1.12 Public Acceptance and Health Concerns	164
5.3.2 Widespread Introduction of Branded Fresh Pork	165
5.3.2.1 Challenges of Introducing Branded Fresh Pork	168
5.3.2.2 Adequate Supplies of Consistent Quality Pork	168
5.3.2.3 Challenges in Common with Pork Growth Promotants	169

	<u>Page</u>
5.3.2.4 Grading	169
5.3.2.5 Genetics	170
5.3.2.6 Management Techniques	170
5.3.2.7 Market Share	170
5.3.2.8 Advertising	171
5.4 Implications of Changes in Market Structure and Economies of Size	172
5.4.1 Increasing Concentration of Packers	173
5.4.1.1 Challenges of Increased Packer Concentration	175
5.4.1.2 Access to Markets	175
5.4.1.3 Reduced Market Competition	176
5.4.1.4 Potential for Opportunistic Behavior	177
5.4.2 Concentration of Wholesalers and Retailers	178
5.4.3 Concentration of Food-Service Firms	178
5.4.4 Economies of Size	179
5.4.4.1 Economies of Size in Hog Production	180
5.4.4.2 Economies of Size in Adoption of Pork Growth Promotants	182
5.4.4.3 Economies of Size in Fed Hog Programs	183
5.4.4.4 Economies of Size in Input Costs	183
5.4.4.5 Economies of Size in Hog Slaughtering and Processing Plants	184
5.4.4.6 Each Level in the Hog/Pork Subsector Experiences Economies of Size that Appear to Influence "Upstream" and "Downstream" Coordination	185
5.5 Implications of Coordination Problems and Opportunities for Improving Coordination	187
5.5.1 Problems Coordinating Quantities and Qualities	188
5.5.2 Opportunities for Improved Coordination	190
5.5.2.1 Implications for Coordination of Who Offers Production Contracts	191
5.5.2.2 Production Contracts Offered by Input Suppliers	191
5.5.2.3 Production Contracts with Other Farmers	193
5.5.2.4 Production Contracts Offered by Packers	194
5.5.3 Coordination by Slaughter/Processors	194
5.5.3.1 Coordination of Quality Control from Farm to Final Consumer	195
5.5.3.2 Evidence of Further Processing by Slaughter Plants	196
5.5.3.3 Implications for Production Contracting	197

	<u>Page</u>
5.5.4 Coordination by Conglomerates	198
5.5.5 Progressiveness of Contractors	199
5.6 Conclusions	200

CHAPTER SIX

POTENTIAL COORDINATING ROLES AND ORGANIZATION OF LIVESTOCK FARMER COOPERATIVES

6.1 Introduction	202
6.2 Coordination Problems	202
6.3 Coordination Wholesale/Retail and Slaughter/Processing	205
6.4 Coordination of Hog Processing and Slaughter . . .	205
6.4.1 Coordination Alternatives	206
6.4.1.1 Advantages of Cooperative Ownership	206
6.5 Coordination of Hog Slaughter and Finishing . . .	206
6.5.1 Coordination Alternatives	209
6.5.1.1 Integration of Hog Slaughter and Finishing	209
6.5.1.2 Cooperative Ownership of Packing Plants	210
6.5.1.3 Production Contracts	213
6.5.1.3.1 Production Contracts Now Offered by Cooperatives . . .	214
6.5.1.4 Forward Contracts Prior to Production Decisions	217
6.5.1.4.1 Use of Forward Contracts by Cooperatives	221
6.5.1.5 Bargaining Associations	222
6.5.1.5.1 Bargain for Hog Prices . . .	223
6.5.1.5.2 Bargain for Non-Price Terms .	223
6.5.1.5.3 Bargain for Terms of Production Contracts	224
6.5.1.5.4 Problems in Organizing and Maintaining Bargaining Associations	224
6.5.1.6 Carcass Merit Pricing	225
6.5.1.6.1 Packers' Objections to Using Carcass Merit Pricing	228
6.5.1.6.2 Hog Farmers' Objections to Using Carcass Merit Pricing	230
6.5.1.6.3 National Pork Producers' Council Committee on	231
Carcass Merit Pricing	231

	<u>Page</u>
6.5.1.6.4 Cooperatives' Roles in Carcass Merit Pricing	233
6.6 Coordination of Hog Finishing and Feeder Pig Production	235
6.6.1 Coordination Alternatives	236
6.6.2 Production Contracts for Feeder Pigs	238
6.6.3 Forward Contracts for Feeder Pigs	238
6.7 Coordination of Feeder Pig Production and Hog Breeding	239
6.7.1 Coordination Alternatives	240
6.8 Coordination of Hog Farmers and Input Suppliers	242
6.9 Vertical Coordination of the Subsector	244
6.9.1 Cooperatives Coordinating by Contracts	245
6.9.1.1 Membership of Growers in Cooperatives Offering Contracts	246
6.9.1.1.1 Conflicts of Interest	248
6.9.1.1.2 Lifecycle of Cooperative Services	251
6.9.1.2 Pooling Arrangements	253
6.9.1.3 Recommended Production Contract Terms for Payment	259
6.9.1.4 Contract Lengths	266
6.9.2 A Model of Vertical Coordination by Cooperatives	271
6.9.2.1 Model Hog Farms	273
6.9.2.2 Model Slaughter/Processing	274
6.9.2.3 Model Production Contracts	274
6.9.2.4 Model Breed-Stock Multiplying	275
6.9.2.5 Model Profit Centers	275
6.9.2.6 Model Grain Farmer Cooperatives and Forward Contracts	276
6.9.2.7 Model Hog Breeders	276
6.9.2.8 Model Wholesale, Retail and Eating Establishments	277
6.10 Advantages of Cooperatives Coordinating the Hog/Pork Subsector	277
6.11 Challenges for Coordination by Cooperatives	283
6.12 Macro Coordination of the Hog/Pork Subsector	285
6.12.1 Open Markets in Contracts	286
6.13 Summary	287

CHAPTER SEVEN

CONCLUSIONS

	<u>Page</u>
7.1 Introduction	289
7.2 Summary and Conclusions	289
7.2.1 Improving Coordination	291
7.2.2 Transaction Costs	292
7.2.3 Vertical Coordination	293
7.2.4 Advantages of Farmer Cooperatives Coordinating the Hog/Pork Subsector	296
7.2.5 Challenges for Hog Farmer Cooperatives as Coordinators	299
7.3 Suggestions for Future Research	301
7.3.1 Macro Coordination	301
7.3.2 Applied Research on Cooperatives	303
 APPENDIX A: TOPICS OF INTERVIEWS AND TITLES OF INDIVIDUALS INTERVIEWED	 304
 REFERENCES.	 305

LIST OF TABLES

<u>Tables</u>	<u>Page</u>
1 U.S. Four-Firm Concentration Ratios for Slaughter, 1978 - 1987 (percent)	12
2 Four Firm Concentration Ratios for Hog Slaughter, 14 Major Producing States, 1969, 1975 and 1979 (percent)	14
3 Number of Hog Operations, Key Production States, Selected Years 1980 - 1988	18
4 Proportion of Operations and Percentage of Total Hog Inventory by Size of Inventory - 10 Hog Producing States, 1981 and 1988.	19
5 List of Livestock-Farmer Cooperatives Participating in the Study	48

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 Changes in Hog Prices and Pork Production, 1970-1983	.3
2 Average Annual Returns in Hog Production, 1972-1978	.5
3 Receipts Less Cash and Capital Replacement Costs for Farrow-to-Finish Hog Production	.6
4 A Model of Industrial Organization Analysis.	.8
5 The Pork Subsector Production and Marketing System	52
6 Biological Lags in Hog Production	62
7 Returns to U.S. Hog Production for Farrow-to- Finish, Feeder Pig Production and Finishing.	84
8 Functions of a Typical Integrated Broiler Firm	.107
9 Model of the Hog/Pork Subsector Coordinated by Cooperatives	.272

CHAPTER ONE

RESEARCH PROBLEM

1.1 Introduction

The research problem is to analyze alternative ways of coordinating supply with the demand for pork, under the conditions of structural change and price instability in the hog/pork subsector, by utilizing the unique characteristics of livestock-farmer cooperatives. Structural changes are increasing specialization of assets in the subsector. Increased specialization is indicated by increased costs of moving assets into alternative uses. Specialization affects three types of assets. First, facilities for producing hogs are more specialized. Second, specialized characteristics are demanded of the hogs themselves. Third, specialized human assets are needed to raise hogs with specialized characteristics in specialized facilities. Problems arise with specialized assets in an uncertain environment where partners to transactions may behave opportunistically¹.

A transactions cost approach, described in Chapter 2, is used to analyze the research problem and roles of

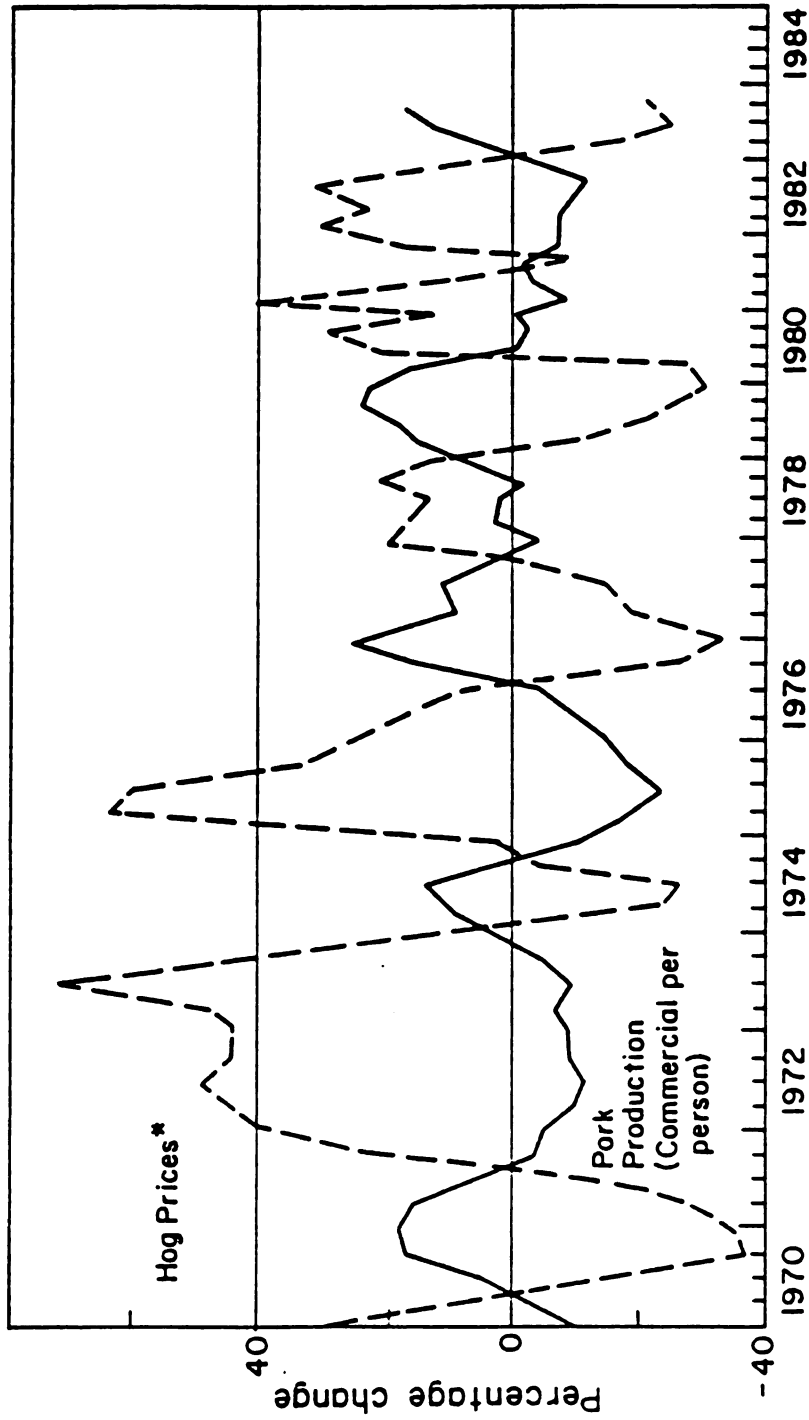
¹Opportunistic behavior is defined as "self-interest seeking with guile" (Williamson 1987).

livestock-farmer cooperatives. The rest of this chapter introduces the problems of instability and structural change in the hog/pork subsector which indicates a need for improved coordination. The thesis of this study is that livestock-farmer cooperatives can have an important role in improving coordination. The chapter concludes with a section on the organization of the dissertation.

1.2 Price Instability and Hog Cycles

The hog/pork subsector has long been characterized by price instability (Figure 1). Dalziell found the livestock sector experienced a much higher level of instability than most other commodity sectors in the period 1972-1983. The grain sector experienced an even higher level of instability during that time period. Grain price instability contributes to livestock price instability since grains are a major input into livestock production (Dalziell 1985).

Price instability can be attributed, in part, to what is commonly referred to as the hog cycle. Talpaz concluded the hog cycle is composed of six cycles explained by a multi-frequency cobweb model (Talpaz). Cobweb models are generated because consumers' demand decisions are based on known current market prices while producers' farrowing (supply) decisions are based on expected market prices at slaughter (Nicholson). If producers incorrectly anticipate prices because of imperfect information and bounded rationality, quantities supplied may not match quantities



*Percentage change from previous year

*Barrows and gilts at 7 markets

Figure 1. Changes In Hog Prices and Pork Production, 1970-1983

Source: Hayenga, Marvin, et al., 1985

demanded at the expected price. Producers will then readjust their price expectations and the quantity supplied in the next production period. This continuous adjustment in supply to expected prices which do not come to pass leads to disequilibrium in the market and instability of prices.

Price instability creates profit instability. Average annual returns in hog production were variable but positive throughout the 1970s (Figure 2). However, from 1980 to 1988 there was increased volatility in profits with only three years of positive profits while in the remaining six years there were losses (Farmland Foods, p. 4). A profile of profitability for producers in different-sized operation ranges reveals that large producers were able to maintain positive profits, covering fixed and variable costs and realizing a return to ownership. During the same time period, small producers suffered negative profits and were unable to cover variable costs (Figure 3). Price and profit instability, in addition to changes in basic conditions, have led to structural change in the hog/pork subsector and is discussed below.

1.3 Definition of Structural Change

Structural change can be defined as changes in the structure of industries in a subsector. Caves defines market structure as "the economically significant features of a market which affect the behavior of firms in the industry supplying that market." His list of those features

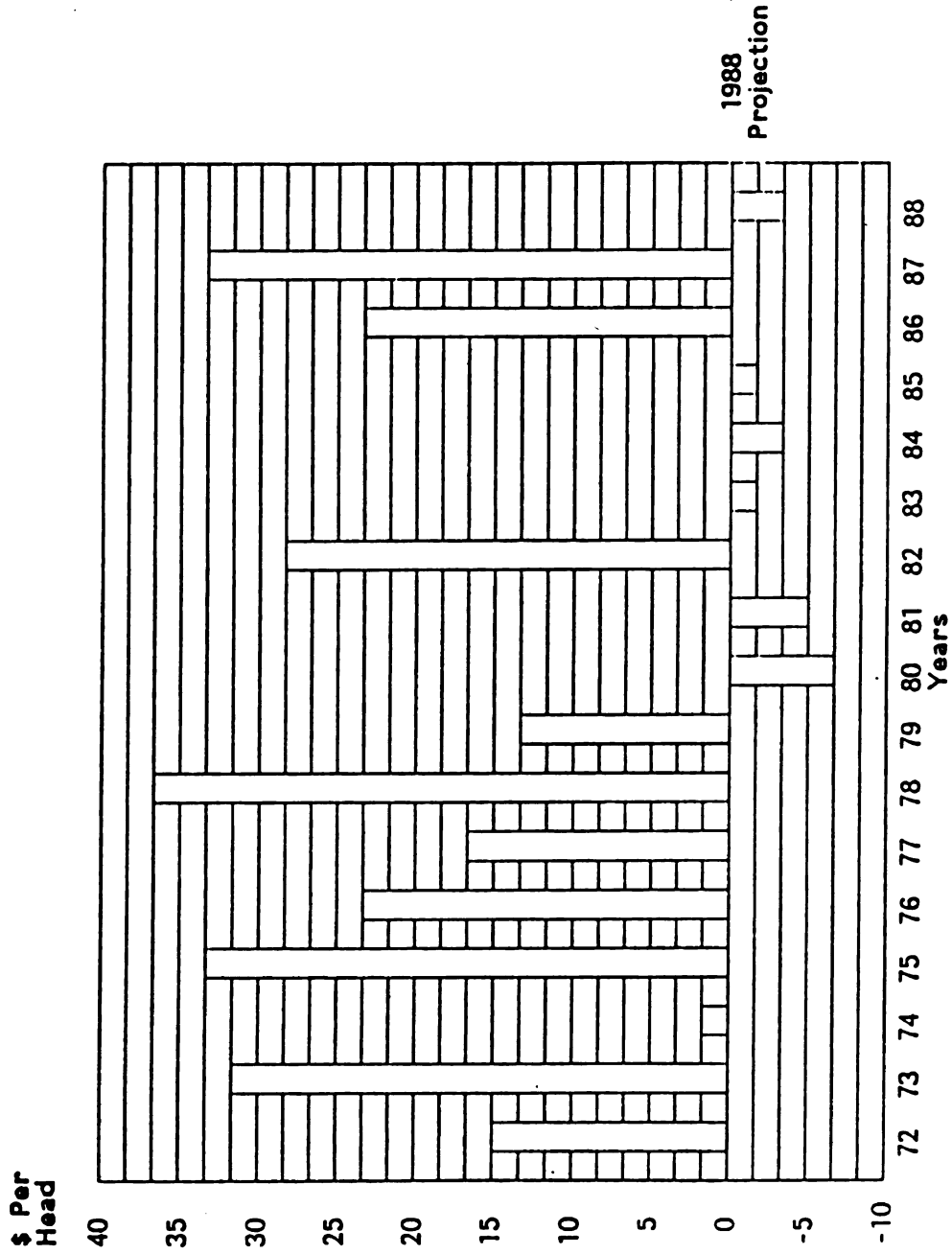


Figure 2. Average Annual Returns In Hog Production, 1972 - 1988

Source: Farmland Foods, 1989

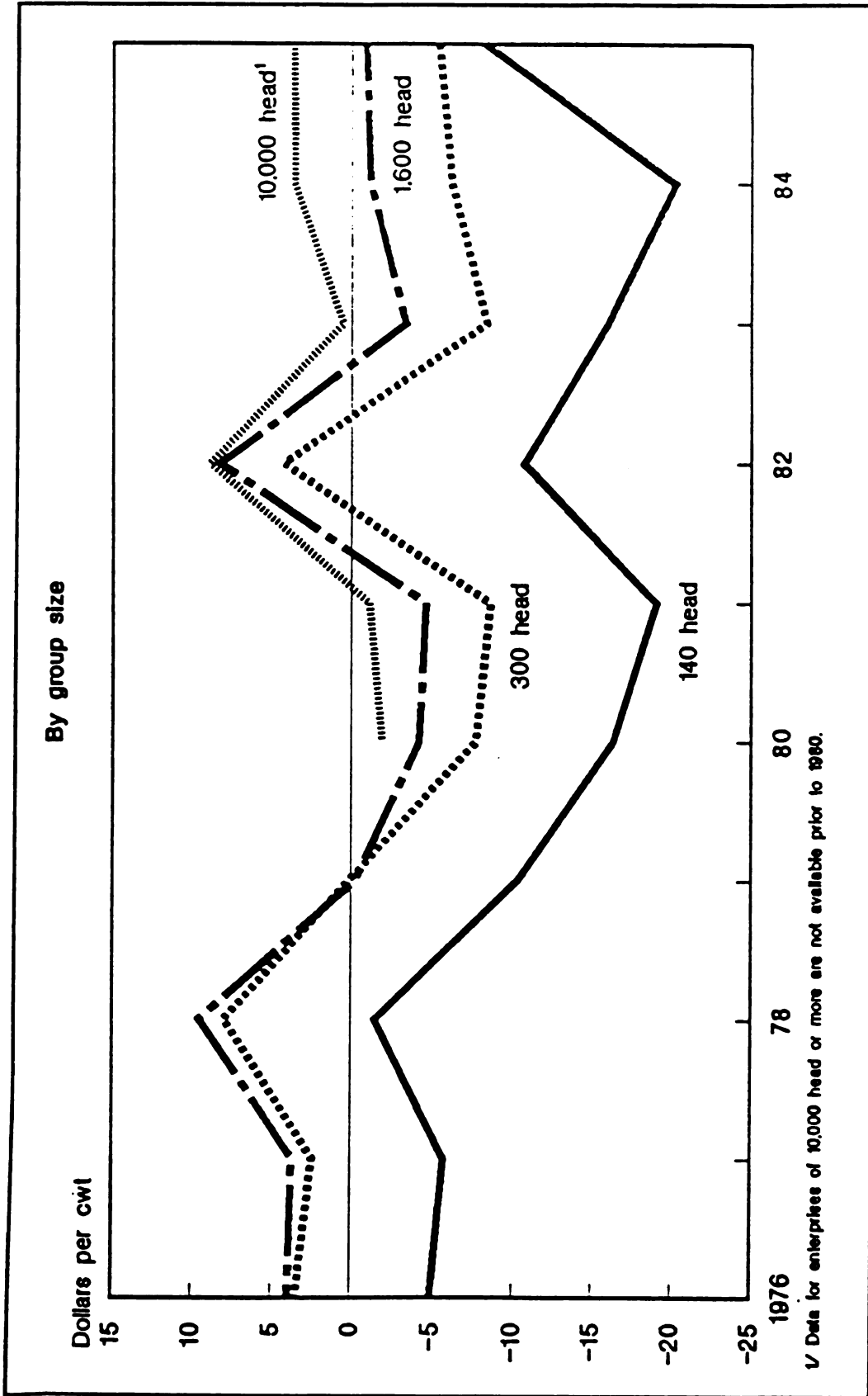


Figure 3. Receipts Less Cash and Capital Replacement Costs for Farrow-to-Finish Hog Production

Source: Crom, 1988

includes: 1) buyer concentration; 2) seller concentration; 3) barriers of entry to new firms; 4) height of fixed costs and barriers to exit; 5) product differentiation; and 6) growth rate of market demand. Scherer distinguishes between basic conditions and market structure. Basic conditions are the characteristics of supply and demand in the subsector. Basic conditions of supply include raw materials and technology. Basic conditions of demand include the rate of growth of demand and purchase method (Figure 4). Market structure is defined by: 1) number of sellers and buyers; 2) product differentiation; 3) barriers to entry; 4) cost structures; 5) vertical integration; and 6) conglomerateness. This study uses Scherer's model of industrial organization analysis as a basis in examining structural change in the hog/pork subsector.

1.4 Changes in a Basic Condition of Supply: Technology

Technology is one of the most rapidly changing basic conditions of supply in the hog/pork subsector. Pork growth promotants and genetic technology are two areas where new developments are promising improved productivity in hogs. Pork growth promotants speed up the rate of growth of hogs. Treated animals require less feed but gain weight more quickly than untreated animals. Growth promotants also increase the percentage of lean meat in hogs. Treated animals develop more muscle and less fat for each pound of weight gained.

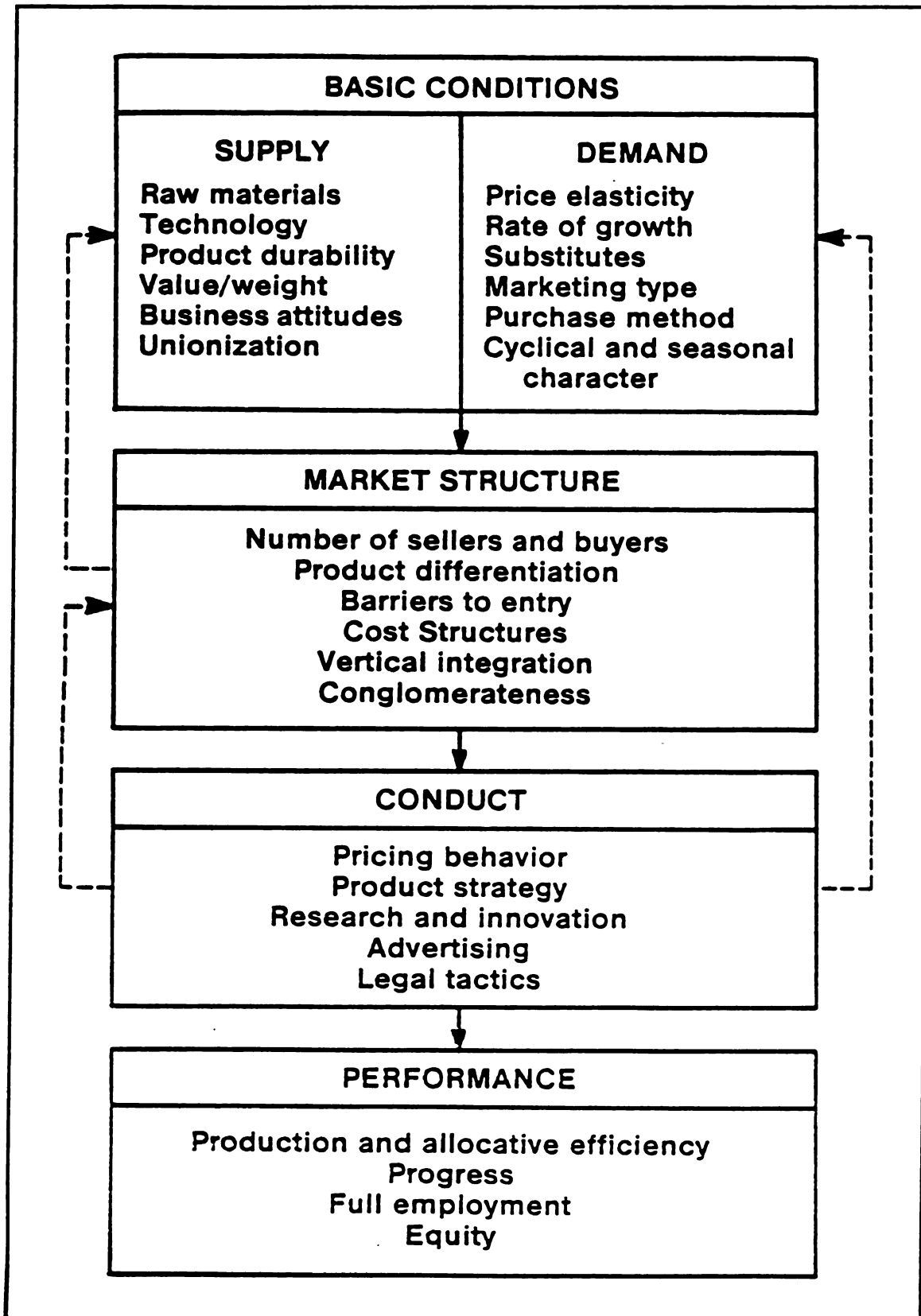


Figure 4. A Model of Industrial Organization Analysis

Source: McBride, 1986

Changes in genetic technology are also taking place. Newly developed hybrid hogs exhibit high performance measures. However, heritability of some of the important economic traits, such as litter size and feed efficiency, is still not consistent. Leanness traits are more likely to be inherited (Warwick 1979).

Artificial insemination allows relatively inexpensive improvement of genetic traits. Relatively few sows are artificially inseminated as swine insemination is not economical. This is in contrast to beef and dairy cattle where artificial insemination is more profitable. Cattle have a longer gestation period than swine and have single births, as opposed to litters of swine. Therefore, fewer offspring can be produced per year from a heifer using "natural breeding" than from a sow. In cattle, invitro fertilization and implantation of embryos is practiced. Embryos may be split before implantation to create clones which are borne by different heifers. The potential for affecting the genetic pool for cattle via these techniques is tremendous. Since the profitability for swine lags that of cattle in this area, it may be some time before such control will be exerted over the swine gene pool, but the potential clearly exists. Despite continuing challenges, genetic similarity is still the best way to achieve uniformity in hog carcasses.

Technological change has implications for the structural characteristics of product differentiation, cost

structures and hog farm size. Because technological developments can also affect coordination in a subsector, the case of adoption of pork growth promotants is analyzed in Chapter 5.

1.5 Change in a Basic Condition of Demand: Growth Rate of Demand

One element of the basic conditions in demand for pork, the growth rate of demand, has become stagnant. Total meat consumption per person has steadily increased over past decades. In 1960 meat consumption was 178.1 pounds per person on a retail weight basis. By 1970 the amount was 212.8 pounds; by 1980, 221.1 pounds; and by 1985, 230.4 pounds. However, the increased meat consumption has largely been in the area of broilers, which have been steadily increasing. The market share of meat consumption held by pork has gradually declined over the decades from 34 percent in 1960 to 30 percent in 1970 to 27 percent in 1988. Beef market share rose and then declined to levels below 1960. Overall red meat market share has declined steadily while poultry meat shares increased (Crom 1988).

The hog/pork subsector has become what business marketers term a mature industry. Without increasing demand (either domestically or internationally) the size of the subsector will remain approximately constant. New entrants and participants wishing to expand will be able to do so only at the expense of loss of market share by other

participants. Lower margins will force out the least competitive.

1.6 Structural Change

Changes in basic conditions, including those described above, will continue to lead to changes in market structure. Structural changes in the hog/pork subsector are discussed next.

1.6.1 Number and Size of Packers

The number of slaughtering plants in the U.S. has been declining while plant size has increased due to economies of size (Ward 1988b, p. 3). Plants are also becoming more specialized with respect to species slaughtered and processing undertaken. More fabrication of fresh pork is taking place at the packer level. Cost savings can be realized by shipping fewer bones and less fat; utilizing, instead of disposing of, byproducts like hides; and employing lower cost rural labor. More direct shipments are being made from packers to retailers or food services. These factors indicate packers have an important role to play in brand identification of fresh pork.

The number of multi-plant firms has been increasing while the number of single plant firms declined by one-third from 1969-1980 (Hayenga et al. 1985, p. 45). Four-firm concentration ratios for hog slaughter varied between 29 percent and 37 percent during 1978-1987 (Table 1). Periods

Table 1. U.S. Four-Firm Concentration Ratio for Slaughter, 1978-1987 (percent)

Table 1. U.S. Four-Firm Concentration Ratios for Slaughter, 1978-1987 (percent)

Year	Steers and Heifers	Boxed Beef	Cows and Bulls	Hogs	Sheep and Lamb
1978	30	na	10	34	56
1979	35	51	10	34	64
1980	36	53	10	34	56
1981	40	57	10	33	52
1982	41	59	09	36	44
1983	47	61	10	29	44
1984	50	62	11	35	42
1985	50	62	17	32	51
1986	54	68	18	33	51
1987	67	80	20	37	75

Source: Packers and Stockyard Administration

of rapid increase in concentration between 1983 and 1984 and 1986 and 1987 were due to mergers and acquisitions (Jones 1988), an increasingly common phenomenon.

Although national concentration ratios for hog slaughter show relatively low concentration, regional and state concentration ratios are much higher. In 1982 the 156 hog slaughter plants located in the North Central states killed nearly 75 percent of U.S. hogs but accounted for only about 30 percent of the number of plants (Crom 1988, p. 33). More recently, concentration ratios of the largest four firms in each of the 14 major producing states reveal significantly higher numbers, often nearing 100 percent (Table 2). For states located close to other states with slaughter plants, these figures may understate competition as hogs move across state lines. In more isolated states the figures are a more accurate index (Hayenga et al. 1985, p. 47).

Table 1 also shows four-firm concentration ratios for beef slaughter. The ten-year period from 1978 to 1987 saw more than a doubling in concentration for beef animals from 30 percent to 67 percent (Packers and Stockyard Administration 1985). The situation in beef is an example of how rapidly slaughter concentration can increase.

1.6.2 Cost Structures of Packing Plants

All levels of the subsector have experienced changing cost structures in the past decades. The most dramatic

**Table 2. Four-Firm Concentration Ratios for Hog Slaughter,
14 Major Producing States, 1969, 1975, and 1979 (percent)**

State	1969	1975	1979
Illinois	71.8	80.2	84.9
Indiana	81.2	93.4	98.9
Iowa	45.9	50.5	53.7
Kansas	92.6	97.2	97.7
Kentucky	93.4	97.6	95.4
Minnesota	97.7	100.0	99.8
Missouri	95.1	95.3	96.2
Nebraska	99.2	99.9	97.9
North Carolina	79.6	87.5	93.2
Ohio	50.5	60.1	64.4
South Dakota	100.0	100.0	100.0
Texas	68.0	77.5	80.2
Wisconsin	97.8	100.0	99.8

Source: Annual reports of packers filed with USDA-P&SA-AMS.

Note: The concentration ratio is the total slaughter of the top four firms in a state divided by the total state slaughter for all firms filing annual reports with P&SA

Source: Hayenga et al. 1985

example is found in meatpacking. The shakeup in beef slaughter which has more than doubled concentration ratios of the top four firms was preceded by the entry of IBP into beef slaughter with new, modern technology plants, non-union labor, and the boxed beef concept. IBP operates on a high volume, low cost basis. Older, unionized plants were unable to compete in the environment ushered in by IBP. Many plants were closed. Others were sold and/or reorganized with newer equipment, management and labor contracts to lower costs. Most plants were multi-species slaughter plants so the slaughter of pork was also affected. In reorganizing, many plants chose to specialize in either beef or pork. Initially the competition was not as stiff in pork. But throughout the 1980s more and more pork plants have been closing as new plants have stiffened the competition. IBP entered into pork slaughter and began to expand. IBP built a large new pork slaughter plant in Iowa in 1988. An affiliate of Central Soya Company, Inc., Innovative Pork Concepts of Fort Wayne, Indiana, was solidifying plans in 1990 to build a new packing plant which will be able to slaughter 600-650 hogs per hour or as many as 4.2 million hogs per year working double shifts (Fetterman 1990). Presumably, cost structures will continue to change as these new modern packing plants of previously unknown sizes are being built. If they are successful, concentration ratios in pork slaughter may increase.

1.6.3 Barriers to Entry and Exit for Packing Plants

As meatpacking plants increase in size to capture economies of size and specialize to slaughter a single species, costs of building or acquiring a plant increase. This may pose a barrier to entry as the costs of existing operations may be lower than those of new operations. Specialized fixed assets may also pose a barrier to exit as their value in alternative uses are much lower than their value in the use for which they were designed. Finding a willing buyer in an industry with a history of low profit margins may be difficult. These barriers are more critical in a mature industry as the incentives to enter are less. Given the number of mergers and acquisitions, new packing plants constructed and older packing plants shutting down, these barriers are not insurmountable. However, most of the purchase activity is being carried out by large conglomerates or diversified corporations with considerable resources.

A larger barrier to entry may be posed by the need to take market share from another packer as the total level of production has remained stagnant. This would explain the prevalence of mergers and acquisitions to enter the market. New or expanded plants owned by conglomerates may be cross-subsidized initially. This can enable them to capture market share by offering more favorable prices which eventually forces the older competition out of business. The threat by conglomerate owners of being willing and able

to cross-subsidize in the face of competition may deter potential entrants into a region. It may also deter competitors from entering into price wars. Though not an important factor at present except, perhaps, in some areas in the southeast, if packers obtain captive supplies by integration or contracting, potential competitors may be shut out of the market due to inability to access adequate supplies.

1.6.4 Number and Size of Producers

The number of hog operations has been declining since the turn of the century. The rate of decline greatly accelerated in the 1960s. In the 1980s the number of operations in key producing states fell by nearly one-half (Table 3). At the same time, the types and sizes of production units have been changing. The types of production units are moving toward intensive confinement systems from pasture and semi-confinement. Larger production units are producing a greater percentage of total hogs (Table 4). Van Arsdall and Gilliam project that three-fourths of all hogs will be from farms with 1,000 head or more by the year 2000 as contrasted to a one-third share in 1978. Rhodes et al. (1981, p. 27) suggest this estimate may be conservative.

Dominance of hog farming by larger operations can be expected to result in changes in conduct and performance. For example, large farms have been shown to differ from

**Table 3. Number of Hog Operations, Key Production States,
Selected Years 1980 - 1988**

State	1988	1986	1984	1982	1980
Georgia	9,100	9,000	13,500	16,000	23,000
Illinois	17,200	16,000	23,000	25,000	30,000
Indiana	16,000	17,000	20,000	22,000	24,000
Iowa	41,000	38,000	45,000	51,000	64,000
Kansas	6,500	7,000	8,800	11,200	14,000
Minnesota	16,500	18,000	21,000	24,000	35,000
Missouri	17,000	19,000	26,000	27,000	40,000
Nebraska	12,500	13,000	14,000	16,000	22,000
N Carolina	14,000	15,000	21,000	26,000	41,000
Ohio	15,000	14,000	15,000	16,000	23,000
Total	164,000	166,000	207,300	234,200	316,000

Source: Hogs and Pigs, NASS-USDA, Selected years

Source: Moore, 1989

Table 4. Proportion of Operations and Percentage of Total Hog Inventory by Size of Inventory - 10 Hog Producing States, 1981 and 1988

SIZE OF OPERATION (HEAD)	PERCENT OF TOTAL OPERATIONS		PERCENT OF TOTAL INVENTORIES	
	1981	1988	1981	1988
1-99	60.5	50.2	9.9	6.1
100-499	31.0	35.6	40.9	32.6
500-999	8.5	9.4	49.2	25.0
1000+	NA	4.8	NA	36.3

Source: Moore, 1989

smaller farms in their use of marketing channels and technology. Large farms usually sell their hogs directly to packing plants, negotiating prices in a private treaty as opposed to using auction or terminal markets where prices are public. Larger farms are likely to adopt new technology sooner than small farms and may thus be more progressive. Ownership of the largest production units at this time is by corporate conglomerates which may have different performance goals than those of single enterprises.

Independent hog farmers are competing in a changing environment. These changes have implications for the competitive nature of hog farming. Van Arsdall and Nelson (1985, p. 43) predict hog farming will eventually become industrialized. Farmers' choices as they adapt to the changing environment will help determine the structure of hog farming in the future.

1.6.5 Cost Structures of Hog Farms

Cost structures for farming are undergoing change. Operations with new facilities that utilize advanced production techniques are experiencing lower per unit costs. However, owning new confinement units requires higher levels of debt than was common in hog farming before the mid 1970s when facilities were less specialized. New technologies, such as pork growth promotants, may lower hog farming costs in the future. Lower farming costs should lead to lower

pork prices. This would make pork more competitive with broilers.

1.6.6 Barriers to Entry and Exit for Hog Farmers

For independent hog producers the barriers to entry and exit posed by the cost of intensive confinement production systems may be significant. Agricultural lenders became more cautious after the financial troubles in farming of the early 1980s. Lack of access to credit may pose a barrier to entry for some farmers. Other farmers may consider alternatives with lower capital requirements, such as contracting, in the face of tight credit.

If farmers are able to secure loans for new facilities, repayment may require the facilities be utilized to capacity with continuous farrowing and/or feeding. Farmers with low fixed costs may exit hog farming when prices are low and reenter when prices are higher. Cash flow constraints imposed by loans may preclude cyclically exiting and entering hog farming as a business strategy. Hog farmers' facilities are usually located on multi-enterprise farms. It may be difficult or impossible to sell such facilities separately from the rest of the farm. The specialized nature of confinement facilities, especially those for farrowing, make their value in alternative uses low. The fact that farmers will need at least to recover the cost of outstanding loans, plus the problems associated with the

location of their facilities, pose barriers to exit for hog farmers.

1.6.7 Product Differentiation

Products can be differentiated in many ways including physical characteristics of the raw product, processing, packaging and branding. Differentiating products can help to distinguish distinct demand functions and allow price discrimination by sellers to take place.

Pork product differentiation can be noted at the wholesale and retail levels. At the wholesale level, boxed pork was introduced in the past decade. Packaging innovations have extended the shelf life of fresh pork. An example is cryovac packaging, a gas filled plastic packaging.

Branding of products, formerly considered commodities, can differentiate them. Typically, however, branding involves more than labeling a package with a name and logo. Product characteristics of quality and consistency also serve to differentiate branded products. At the retail level, processed pork products have long been nationally and regionally branded and advertised. This has increased returns to processors with popular brands.

Brand marketing is making its debut in fresh pork. Chain store branding has become evident. Krogers labels its pork with a "Silver Platter" medallion. In an extension of generic advertising for pork, a pork farmers' organization,

the National Pork Producer's Council, has been promoting "America's Cut." The cut is a boneless, thick, pork steak. The Council has agreements with retail store meat departments to cut pork loins to specifications set by the Council. They can then package these pork steaks with the "America's Cut" labels provided by the Council. The stores can also use the "America's Cut" name and logo in their advertising. Problems have arisen, however, since the Council cannot adequately control product quality through this system. Some retailers have used the "America's Cut" labels on cuts which do not meet the specifications. Inconsistent or poor quality tarnish the brand image quickly.

The largest broiler processor, Tyson Foods, has begun market tests in Arkansas with branded fresh pork. Presumably, they plan to utilize the name recognition, contacts with retailers and knowledge gained from marketing branded broilers to expand into fresh pork.

Although branding of fresh pork is relatively insignificant at this time, the implications of extensive branding of fresh pork could be significant. Slaughter/processors are at the best level in the subsector to orchestrate brand development. They would require assured supplies of consistently high quality hogs. The coordination mechanism chosen to obtain these supplies could have substantial effects on the characteristics of hog farming.

1.6.8 Conglomerateness

Meat slaughter and the more lucrative area of meat processing have been entered by national and international conglomerates. Some of these conglomerates have the bulk of their businesses in the food or grain industries. An example in the grain industry is Central Soya. Central Soya, recently purchased by Ferruzzi, an Italian conglomerate, has plans to build a hog slaughter facility in Indiana (Moore). Nonfood industry conglomerates, such as British Petroleum, entered meat packing in hopes of benefitting from diversity. British Petroleum purchased Purina Mills. In 1989, they purchased Mariah Packing Company of Columbus, Indiana (Moore). Hayenga et al. (1985, p. 49) state:

"While most pork slaughter/processing firms are small, single plant firms, the largest firms are multi-plant firms that are or have been in large diverse corporate or conglomerate structures."

1.6.9 Contract Farming

Contracts to raise pigs and/or hogs can take place between farmers or between farmers and packers, feed companies, cooperatives and/or food companies. Contract farming of hogs was minimal in 1980, accounting for about one percent of hogs raised in farrow-to-finish enterprises and two percent of pigs raised in feeder pig enterprises (Van Arsdall and Nelson 1984). In their study published in 1985, Hayenga et al. did not find economic efficiency

considerations driving contractual coordination in the hog industry. They state:

"To date, the noncontractual marketing system apparently has been offering adequate supplies and market outlets for the buyers and sellers of live hogs, resulting in insufficient incentives to become highly integrated by ownership or contract as in the broiler industry. Commercial hog producers have been able to equal or excel in productive efficiency the vertically or contractually integrated producers whereas that was not generally the case in broilers."

However, by 1988 contracting had risen to include about 10 percent of slaughter hogs (Rhodes 1990). Dave Watson of Farmland Foods anticipates contracting to increase to 20 percent in the coming decade (Pork '89). Contracting in the hog industry will be considered further in Chapters 5 and 6.

1.7 Vertical Coordination

Coordination can be defined as the match between characteristics of the product supplied and the characteristics of the product which are demanded. The match between supplied and demanded characteristics may be good or poor. Characteristics of products include those which are nonphysical, such as price, timing and location, as well as basic physical characteristics.

The term vertical integration has been used to describe a broad array of ways to achieve coordination between different levels of a subsector. For the purpose of this study vertical integration is defined narrowly as coordination between levels of the hog/pork subsector achieved by direct ownership. For example, if a feed

company owns hog production units and hires labor to run them, this would be considered a case of vertical integration of the input supply and hog production levels.

There are many other types of coordination between levels of a subsector which do not involve direct ownership. They include, but are not limited to, joint ventures, contracts and private treaty negotiations. They involve autonomous parties at different levels of the subsector.

The broad term which will be used in this study to include all the ways of achieving coordination between different levels of a subsector is vertical coordination. Vertical coordination includes direct ownership as one of the many possible forms of coordination. Vertical coordination is defined by Mighell and Jones as all the ways in which the succession of stages a commodity passes through from production to marketing are directed and fit together. Schneidau and Duewer define vertical coordination more specifically as "an agreement between two parties, one an input supplier to the other, resulting in the transfer from one party to the other, part or all, of management control, assets or functions." This definition is too narrow, as coordination takes place with or without agreements. Harris and Massey state "the four principal ways of achieving vertical coordination include open-market competition, farmer cooperatives, coordination within one firm and contract farming."

1.8 Potential for Improved Coordination

Having introduced the research problem of price instability and structural change in the hog/pork subsector, the benefits of improved coordination are addressed.

If price instability is largely a function of repeatedly incorrect price expectations by producers leading to levels of production which are inappropriate given demand at the time of sale to achieve desired profits, then improving coordination of supply with demand should result in increased price stability. If price stability is a desirable goal, then coordination mechanisms which result in more stable prices should be considered. This research examines the roles livestock-farmer cooperatives can take to improve coordination in the hog/pork subsector.

1.9 Organization of the Dissertation

The dissertation is organized in the following manner. Chapter 1 described the research problem and focus of the dissertation. Chapter 2 defines the conceptual approach taken for this study. Chapter 3 describes the levels of the hog/pork subsector in detail, the activities livestock-farmer cooperatives are currently undertaking in the hog/pork subsector and how they differ from those of investor owned firms (IOFs). Chapter 4 analyzes contracting as a coordination mechanism. Experiences in the broiler subsector are examined and compared with the situation in the hog/pork subsector. Chapter 5 examines important

factors influencing the future evolution and coordination performance of the hog/pork subsector. Chapter 6 presents potential coordinating roles and the organization of livestock-farmer cooperatives. Chapter 7 includes a summary and conclusions.

CHAPTER TWO

CONCEPTUAL APPROACH

2.1 Introduction

This chapter describes the research methods and the conceptual approach used in this study. Hypotheses on the roles of livestock-farmer cooperatives are developed. The problems and constraints facing livestock-farmer cooperatives are also addressed.

2.2 Research Methods

The U.S. hog/pork subsector is, in a sense, a moving target which is changing its shape. The purpose of this research is to describe the structure, conduct and performance of the hog/pork subsector, to investigate changes which are likely to occur in the near future, and to identify strategies by which cooperatives may maintain their traditional role as a countervailing force in the market place. An effort will also be made to develop prescriptions that the leadership of cooperatives may want to consider in their quest to strengthen cooperatives' presence in the market and/or to expand the hog/pork related services that these cooperatives offer.

The research methods needed to address these issues are essentially descriptive and theoretical. The topic is very broad and relatively little information is available on the roles of cooperatives in the hog/pork subsector. Therefore, it is not feasible, nor appropriate, to attempt to generate a formal quantitative model to describe and analyze the future structure of the subsector and potential roles of cooperatives. Instead, this research will develop an appropriate qualitative model based on the well-documented transformation of the U.S. poultry industry. This model will then be used to explore the consequences of a variety of possible structural changes in the hog/pork subsector. The object of this inquiry is to determine if, and how, these changes will affect hog farmers. Selected case studies of livestock-farmer cooperatives will be used to contribute to understanding consequences of different organizational forms. Following that, this research will employ appropriate theory to ascertain what, if anything, cooperatives may be able to do to protect or enhance the economic interests of hog farmers. A few of the most promising alternatives will be analyzed in depth and compared to IOF market alternatives.

The case study approach is appropriate for this research for several reasons. There is no database of the operations of livestock-farmer marketing cooperatives to utilize in modeling behavior and performance of the hog/pork subsector. Direct contact with livestock-farmer cooperative

representatives is necessary to gather information. The complex of macroeconomic structure and microeconomics which influence behavior and performance in a dynamic environment is revealed by case study analysis. In depth understanding of the subsector and particularly livestock-farmer marketing cooperatives is critical to analyzing future roles of cooperatives in subsector. Also, the pragmatic nature of this research requires an understanding of the operating environment as perceived by participants in the hog/pork subsector.

Herbert Simon, researcher of the decision-making process in economic organizations and the 1978 Nobel Laureate in Economics, finds understanding of the economic behavior of "rational" decision makers requires more than the neoclassical assumption of utility maximization and unsupported auxiliary assumptions. Simon states:

"All these investigations call for empirical inquiry at the micro level--detailed study of decision makers engaged in the task of choice. They are not questions that are easily answered by even the most sophisticated econometric analysis of aggregated data. To understand the processes that the economic actor employs in making decisions calls for observing these processes directly while they are going on, either in real world situations or in the laboratory, and/or interrogating the decision maker about beliefs, expectations and methods of calculation and reason."

Background information to develop the model was obtained from the literature and discussions with livestock subsector participants. An extensive literature search was conducted. First, literature was reviewed to examine the

structure, conduct and performance of the hog, broiler and beef subsectors. In particular, the literature was reviewed on: 1) the hog/pork subsector: inputs, hog farming, slaughter/processing, grading and marketing; 2) poultry subsector: broilers, eggs and turkeys; 3) beef subsector: slaughter/processing and marketing; and 4) contract production of livestock: broilers and hogs.

Literature was reviewed on cooperatives to examine how cooperatives coordinate economic activities. The literature reviewed was in the areas of: 1) cooperative theory; 2) cooperative principles and practices; and 3) livestock-farmer cooperatives.

Finally, literature on transactions cost theory, and how it has been applied to analysis of cooperative organization, was reviewed. Transactions cost analysis contributes to understanding structural change in subsectors.

The literature review¹ revealed substantial information from the animal sciences on the technical aspects of raising livestock. The structure, conduct and performance of the hog, beef and broiler subsectors have been documented. Cooperative theory is developing. Staatz (1987a, 1988) used transactions cost analysis in examining cooperative

¹Rather than having a separate literature review section, literature contributing to the analysis will be discussed in the chapters when the areas of analysis are discussed.

organization. Cooperative principles are well-documented. However, little has been written on practices of livestock-farmer cooperatives marketing and/or producing pigs and hogs.² Also, little has been written on contract production of hogs.

In order to obtain information lacking in the literature, participants in the livestock subsectors were interviewed. The purpose of the interviews was to collect information in a broad spectrum of areas. Therefore, use of a survey was inappropriate. Instead, individuals considered by other participants in the subsector to be experts in their field, were interviewed. Although the researcher had some specific questions in the areas of expertise of the individuals interviewed, the format of the interviews was an open-ended exchange of questions and answers. Questions addressed the development and current state of the hog/pork and broiler subsectors and future directions projected by those interviewed. Appendix A is a list of topics discussed and the job titles of people interviewed. Where available, actual production contracts offered by cooperative and noncooperative contractors were obtained.

2.3 Conceptual Approach

Given the problems of price instability and structural changes in the hog/pork subsector, there may be considerable

²Hogeland (1982a, 1982b, 1987, 1988a, 1988b) wrote most of the literature on livestock cooperative practices.

benefits if farmer cooperatives expand their roles to improve coordination within the subsector.

Economic organization of transactions can be viewed on a spectrum. On one end of the spectrum are "open market" transactions while the other end is represented by "complete vertical integration" within the firm. For the purpose of this research, cooperatives are viewed as an alternative form of organization which can be used to achieve coordination.

Coordination can be addressed at several levels: micro-micro, micro, macro, and macro-macro (Shaffer 1987). Micro-micro pertains to coordination within firms. Micro pertains to coordination between individual firms. Macro pertains to coordination of total supply and demand of a commodity at each step in the production/distribution process. Macro-macro pertains to coordination of aggregate supply with aggregate demand for an economy as a whole. This research focuses on micro and macro coordination with some attention to micro-micro coordination.

Transactions cost analysis is one method of analyzing the potential for expanding cooperatives' roles. Transactions costs are those costs incurred in making an exchange of a good or service. They include costs of seeking information, making decisions, negotiating contracts and enforcing those contracts.

Transactions cost theory originated with Coase's discussion of reasons for formation of firms (Coase 1937).

It has been expanded by Williamson (1985). Transactions cost theory is based on a simple premise: the form of organization which minimizes the combined costs of transportation and transactions costs is the one that will have a competitive advantage and thus will prevail in an industry. Frank and Henderson (1991, pp. 11-12) found that transactions costs are a primary motivation for vertical coordination. The transactions cost factors found to be most influential were those related to uncertainty, input supplier concentration, asset specificity and scale economies.

Four principles determine the organizational structure that will minimize transactions costs: the asset fixity principle, the uncertainty principle, the externality principle and the hierarchical decomposition principle. Most traditional justifications for farmer cooperatives can be subsumed under these four principles (Staatz 1987a, p. 88). The next sections define these principles and develop hypotheses concerning the coordinating roles of livestock-farmer cooperatives.

2.3.1 Asset Fixity Principle

The asset fixity principle states that autonomous market contracting will become progressively less efficient the more the market becomes specialized (Staatz 1987a; Williamson 1981, p. 1548). Production facilities, feed rations, human assets for hog farming and characteristics of

the hogs themselves are becoming more specialized in the hog/pork subsector. Specialization of assets is not a problem in and of itself. However, owners of specialized assets run a risk. The more specialized the asset, the higher the cost of moving the asset into alternative uses. Recognizing this, trading partners may seek to exploit the situation by opportunistic trading practices as described below. Assets can be specialized for several reasons: 1) transactional relationships; 2) the market for a commodity; and 3) asset immobility.

2.3.1.1 Transaction-Specific Assets

Transaction-specific assets are those assets whose value is based on a specific transactional relationship. For example, hog farmers engage in transactional relationships with meat packers, and increasingly, with contractors. These transactional relationships become specific when hog farmers are limited to selling hogs to a single meat packer or a single contractor. Generally, there are many buyers for hogs. However, for individual farmers, specific transactional relationships may exist. For example, farmers raising hogs of a specific genetic makeup desired by a packer may sign exclusive purchase agreements that packer.

Transactional specialization may arise due to geographical isolation. Geographical isolation may be the result of farm location relative to existing packing plants

or increased concentration in the packing industry via plant closings or mergers and acquisitions. Where transactions-specific assets exist, packers may behave opportunistically and reduce the prices that they offer to farmers.

2.3.1.2 Commodity-Specific Assets

The most common reason assets are specific in the hog/pork subsector is due to the characteristics of the market for hogs. Commodity-specific assets are those assets whose value is based on the market for a specific commodity. The value of specialized facilities, labor, and management skills which are only useful for raising hogs as well as the value of specialized hogs, themselves, are dependent on the market values for pigs and hogs. To the extent that trading partners of farmers have market power in their trading area, they may be able to affect the value of specialized assets by behaving opportunistically toward hog farmers. In a subsector with static or declining demand, as in the hog/pork subsector, meat packers or contractors may act opportunistically (Staatz 1987a, pp. 89-90).

2.3.1.3 Immobile Assets

Immobile assets are those assets whose value is determined by their use at a particular location. Examples include specialized farrowing and finishing buildings and waste storage facilities. If a farmer is unable to fully utilize hog facilities, per unit costs of production rise.

2.3.1.4 Cooperatives and Asset Specificity

The cooperative mode of coordination is particularly well suited to deal with problems created by asset specificity (Shaffer 1987, p. 77). Cooperative members/owners have different objectives than owners of IOFs. Farmer cooperatives may be able to offset the market power of IOF trading partners, and thus reduce the potential for opportunistic behavior in two ways. First, cooperatives can enhance farmers' market leverage and provide them with a stronger position from which to bargain with IOFs for prices and contract terms. There are several approaches by which cooperative organizations may be able to improve the market power of hog farmers. They include: 1) increase the information and training available to farmers; 2) broaden market access; and 3) become a bargaining agent for farmers. Second, cooperatives can replace IOFs in some functions.

2.3.2 Uncertainty Principle

The uncertainty principle states that autonomous market contracting is less likely to mediate transactions efficiently as the level of uncertainty surrounding them increases (Staatz 1987a, p. 94; Williamson 1979). Uncertainty increases the likelihood of unforeseen events arising, which may allow opportunistic behavior by one party to the transaction. Price instability and the resulting hog cycle are evidence of uncertainty in the hog/pork subsector.

Price instability presents the potential for greater

losses by hog farmers as assets in the hog/pork subsector become more specialized. High levels of risk may be reduced or shifted by coordination with other levels of the subsector. The combination of increased asset specificity and price instability is likely to lead to some type of increased coordination between levels of the hog/pork subsector. Contracts are one mechanism to reduce or shift risk. Livestock-farmer cooperatives may be able to coordinate the subsector using contracts. Cooperative contractors are less likely to behave opportunistically toward farmer/members than IOF contractors because cooperative members have control through voting over practices of a cooperative offering contracts.

2.3.3 Externality Principle

Externalities are costs (or benefits) arising from economic actions between two parties, which are imposed (bestowed) on third parties. Many "market" transactions frequently fail to take externalities into account. This failure to consider externalities may reduce the effectiveness of economic coordination (Shaffer 1987, p. 78). The externality principle states that when participants in adjacent market stages impose externalities on a firm, there is an incentive to integrate vertically (Staatz 1987a, p. 96; Williamson 1981, pp. 1549-50).

Quality control is an area where lack of coordination of adjacent market stages may reduce the value of pork.

This is very important when it comes to developing branded products. For successful entry of branded fresh pork products, slaughter/processors may need to have control over pork quality through all stages of production, processing and distribution to grocers' meat cases. Farmers/owners of cooperative meatpacking plants may benefit from development of successful brands. This could increase farmer participation in quality control programs. Since cooperatives could capture the benefits of training farmers in improved production techniques, cooperatives may be more willing to invest in education programs for farmers than an IOF might be.

Cooperative meatpacking firms, which can combine elements of vertical coordination and market transactions with direct involvement of producers, might be effective coordinators of a system controlling pork quality through all stages of production, processing and distribution to grocers' meat cases. Grade and yield pricing would improve price incentives for quality, lean hogs. Cooperatives marketing hogs and cooperative meatpackers should promote grade and yield pricing.

2.3.4 Hierarchical Decomposition Principle

Williamson's hierarchical decomposition principle states that in order for vertical integration to improve coordination above the level found in open market transactions, integrated firms must have an internal

organizational structure that allows them to handle transactions efficiently. Specifically, operating activities (high frequency) and strategic planning activities (low frequency) should be in relatively independent subunits to allow for effective management. An efficient hierarchy of management allows alignment of incentives within subunits, allows an orderly flow of information, and avoids swamping top management with day-to-day operational duties (Staatz 1987, p. 98, Williamson 1981, p. 1550).

A single, vertically-integrated firm is unlikely to be able to handle transactions efficiently because of relative economies of size of operations at different levels of the hog/pork subsector. Alternatively, an IOF could try to duplicate the benefits of vertical integration by extensive, detailed contracting with farmers. The enforcement of such contracts is likely to be more expensive for an IOF than for cooperatives because cooperatives, potentially, have more ways of punishing members who fail to live up to their contracts than do IOFs (Staatz 1987a, p. 97). Cooperatives may be more successful coordinators of the hog/pork subsector than IOFs because cooperatives can coordinate the actions of independent firms.

2.4 Cooperative Problems Relevant to the Hog/Pork Subsector

The previous section introduced a set of hypotheses regarding the potential role of cooperatives in overcoming

problems for hog farmers due to asset fixity and externalities. However, because of their organizational form, problems arise in forming and maintaining livestock producer cooperatives. These problems, unless overcome, may limit the ability of livestock producer cooperatives to improve coordination in the hog/pork subsector.

2.4.1 Member Loyalty and Commitment

Livestock producer marketing cooperatives typically accept as members all farmers who use the services of the cooperatives. Low entry costs to join a cooperative may make more farmers willing to use cooperatives' services. However, because the basic buying and selling services offered by cooperatives are identical to those offered by independently-owned auction markets and order buyers, livestock farmers may not view cooperatives any differently than IOFs. Cooperatives may have to compete for members against IOFs solely on the basis of offering the best price to farmers.

Price competition alone does not build loyalty to cooperatives. There are two ways that cooperatives can build loyalty. First, cooperatives create loyalty by educating farmers about the reasons cooperatives were formed and the influence they can have through use of voting rights. Farmers can also be educated about other functions cooperatives can perform that can benefit farmers. The

second way cooperatives can build loyalty is by offering services to distinguish themselves from IOFs.

2.4.2 Free Riders

If a cooperative has been established and has effectively increased competition in an area, all producers in that area will benefit whether they were instrumental in forming the cooperative or not. The free-rider problem may not be as significant in isolated areas where the cooperative is the only marketer or meat packer. The free-rider problem might be overcome by legislation making membership mandatory. However, mandatory membership creates the problem of unwilling riders and the loss of exit as a means to discipline management (Hirschman 1970).

Offering additional services designed specifically for members is one approach to overcoming the general free-rider problem, but it will not eliminate the problem (Olson).

2.4.3 Serving Small Versus Large Farmers

Problems in maintaining membership or keeping the cooperative together as a coalition may occur when members have different needs and costs associated with serving them differ. Large farmers using cooperative services may have different needs than small farmers. If cooperatives adhere to a one-member, one-vote rule, large farmers may not be able to exercise their voice effectively and may exit instead (Hirschman 1970).

Structural change in the hog/pork subsector has led to a decline in the use of terminal and auction markets, accompanied by an increase in direct sales to packers. Large farmers sell directly to packers more often than small farmers. Since cooperatives historically offered marketing services via auction markets, most large farmers are now bypassing them. Cooperatives may need to expand their roles to meet diverse needs of a heterogeneous membership.

2.4.4 Forward Planning Problems

Cooperatives encounter problems in matching supply with demand when they lack adequate forward planning mechanisms. Farmers independently make decisions as to size of herd, timing of production and sale of pigs and/or hogs. This presents problems to cooperatives trying to coordinate the quantity supplied with the quantity of hogs demanded.

Cooperatives also encounter problems in trying to match the quality of hogs supplied with the quality of hogs demanded. Cooperatives can only influence the quality of hogs insofar as packers offer appropriate premiums and discounts for different qualities of hogs. Roles cooperatives could take in developing and implementing a grade and yield pricing system are discussed in Chapter 6.

Cooperatives can address quantity problems planning in several ways. One way is to require farmers to commit to selling a certain percentage of their hogs through the cooperative. Another planning mechanism is forward

contracts with farmers. Cooperatives hedge these contracts on the futures market. Forward contracts are addressed in Chapters 4 and 6.

Feeder pig and finishing contracts, wherein cooperatives purchase breeding stock or feeder pigs and place them on member farms, affords a longer planning horizon. There are incentives for contractors to control genetics and management practices, which influence quality of hogs. The incentives are that cooperatives may be able to command premium prices for higher quality hogs. Since breeding stock and feed are two major inputs provided by contractors, cooperatives must have the capability to supply both at a competitive cost. Contract production of hogs is addressed in Chapters 4 and 6.

Cooperatives may also seek to influence demand for pork and slaughter hogs via advertising and branding programs. Branding and advertising pork products may expand demand. If supply increases to meet the expanded demand, prices for hogs will not be increased. Branding requires partnership with or ownership of meatpacking and processing facilities. If branding of fresh pork gains momentum, higher quality and more uniform hogs may be required of farmers. How this might affect the hog/pork subsector and roles livestock-farmer cooperatives could take is addressed in Chapter 6.

2.5 Summary

This chapter described the research methods of this study. The conceptual approach was outlined. Within the broad structure-conduct performance model, transactions cost analysis was introduced. Hypotheses were developed regarding the problems facing hog farmers with respect to fixed assets, uncertainty, externalities and economies of size. Potential benefits of farmer cooperatives in facing these transactions cost problems were identified. The final section of the chapter reviewed a number of problems that face livestock-farmer cooperatives, and potential solutions were cataloged. The conceptual background introduced in this chapter is utilized throughout the dissertation. The hypothesis and the potential solutions will be developed and tested in the succeeding chapters. Chapter 3 describes the structure, conduct and performance of the hog/pork subsector and the role of cooperatives.

CHAPTER THREE
STRUCTURE OF THE HOG/PORK SUBSECTOR
AND THE ROLE OF COOPERATIVES

3.1 Introduction

It is necessary to understand the evolution of the hog/pork subsector and the current roles of subsector participants in order to predict the future direction of the subsector and potential coordinating roles of cooperatives. This chapter describes the hog/pork subsector participants' structure, conduct and performance, including the roles of livestock-farmer cooperatives. Structural characteristics examined include numbers, types and ownership of firms. Conduct is examined with respect to pricing practices. Performance is examined with respect to progressiveness and profitability.

Discussions were conducted with representatives of nine livestock-farmer cooperatives, to determine roles cooperatives are currently taking in the subsector and their plans for the future. Table 5 lists the names, headquarters location, and states served of the cooperatives interviewed.

**Table 5. List of Livestock-Farmer Cooperatives
Participating in the Study¹**

Central Livestock Exchange

South St. Paul, Minnesota
Minnesota, Wisconsin, North Dakota, South Dakota,
Iowa

Equity Cooperative Livestock Sales Association

Baraboo, Wisconsin
Wisconsin, Minnesota

Farmland Foods, Inc.

Kansas City, Missouri
Missouri, Kansas, Iowa, Illinois, Minnesota,
Oklahoma, Colorado, Nebraska, South Dakota, Texas

Gold Kist, Inc.

Atlanta, Georgia
Northeast Georgia, Northern Alabama, South
Carolina

Indiana Farm Bureau Cooperative Association

Indianapolis, Indiana
Indiana, Kentucky

Interstate Livestock Producers Association

Peoria, Illinois
Illinois, Eastern Iowa, Eastern Missouri, Western
Tennessee

Land O' Lakes/Cenex

Fort Dodge, Iowa
15 Midwestern and Western States including Iowa,
Minnesota, Wisconsin, North Dakota, South Dakota,
Nebraska

Michigan Live Stock Exchange

Lansing, Michigan
Michigan, Ohio, Indiana

MFA Incorporated

Marshall, Missouri
Missouri, Arkansas

Producers Livestock Association

Columbus, Ohio
Ohio

¹In 1991, after interviews were completed, Michigan Live Stock Exchange bought the facilities of Producers Livestock Association of Ohio and entered into a two-year management contract to run the marketing operations of Indiana Farm Bureau Cooperative Association.

All marketing and meatpacking cooperatives combined handled only 16 percent of hogs and pigs in 1975 (Haas 1978). Although this figure indicates relatively small control by cooperatives of overall supply, it understates the influence of cooperatives in the hog/pork subsector in several ways. First, a much larger percentage of all hogs may be marketed through cooperatives in several states or regions. In Michigan, approximately 80 percent of hogs are marketed through a cooperative. In Wisconsin, the figure is closer to 30 percent according to industry sources. Second, input-supply cooperatives also affect the hog subsector as suppliers of feed, fuel and veterinary supplies in addition to cooperatives whose primary services are livestock marketing and meatpacking. Including these cooperatives greatly expands the potential influence of cooperatives on the hog/pork subsector. This is especially true in the Midwest where most hogs are not marketed through cooperatives, but most farmers are members of input-supply cooperatives.

Livestock-farmer cooperatives can be arbitrarily divided into three groups for the purpose of discussion. They include: 1) those that are organized to perform primarily a single function at one level of the subsector; 2) those that perform several functions at more than one level of the subsector; and 3) large diversified cooperatives operating at multiple levels in the hog/pork subsector.

Farmer cooperatives that perform primarily a single function tend to be smaller cooperatives in the sense of having either relatively few members or dealing with small numbers of hogs. The most common function is that of marketing at the interface between hog farmers and slaughter plants. Other functions for which cooperatives may be established include: breed-stock production; feeder pig production; and buying inputs such as feed. Central Livestock Exchange of South St. Paul, Minnesota is an example of a participant in this study that directs its efforts almost exclusively toward marketing livestock. Its members number between 30,000-40,000 individuals in all areas of livestock, so it cannot be considered a small cooperative.

The second group of cooperatives that perform several functions at more than one level of the subsector developed from cooperatives such as Central Livestock Exchange, which have diversified into more functions as they grew. The majority of participants in this study, listed in Table 5, are in this category. They are middle-sized livestock-farmer cooperatives, that have been innovative in addressing changing hog farmers' needs.

The third group of cooperatives are large, diversified cooperatives with hog farmers being only one of the commodity groups they serve. The participants in this study in this group include Gold Kist, Cenex/Land O' Lakes and Farmland.

This chapter is organized by the functions performed by participants in the subsector¹. Hog/pork subsector participants include: 1) breed-stock farmers; 2) feeder pig farmers; 3) hog finishers; and 4) farrow-to-finish farmers; 5) slaughterers and/or; 6) processors; 7) wholesalers; 8) retailers; and 9) food-service (Figure 5).

3.2 Breed-Stock Farmers

Breed stock is of two major types, purebred and crossbred or hybrid. Hybrid stock is the offspring of herds developed from specific crosses of traditional breeds (Hayenga et al. 1985, p. 31). The purebred market share is comprised of eight major breeds, each known for its performance traits. Yorkshire and Duroc are the leading purebreds (Hayenga et al. 1985, p. 16). Crossbreeds and hybrids are the result of purebred crosses and are noted for their vigor and performance traits.

Breed stock is produced by purebred breeders and corporate breeders. Breeders sell both boars and gilts; however, only about 15 percent of all gilts are purchased. The other 85 percent of replacement gilts are selected from hog farmers' own herds.

¹Cooperatives' roles, as well, are discussed by their functions as subsector participants. Therefore, there is no attempt to describe the all functions of individual cooperatives by name.

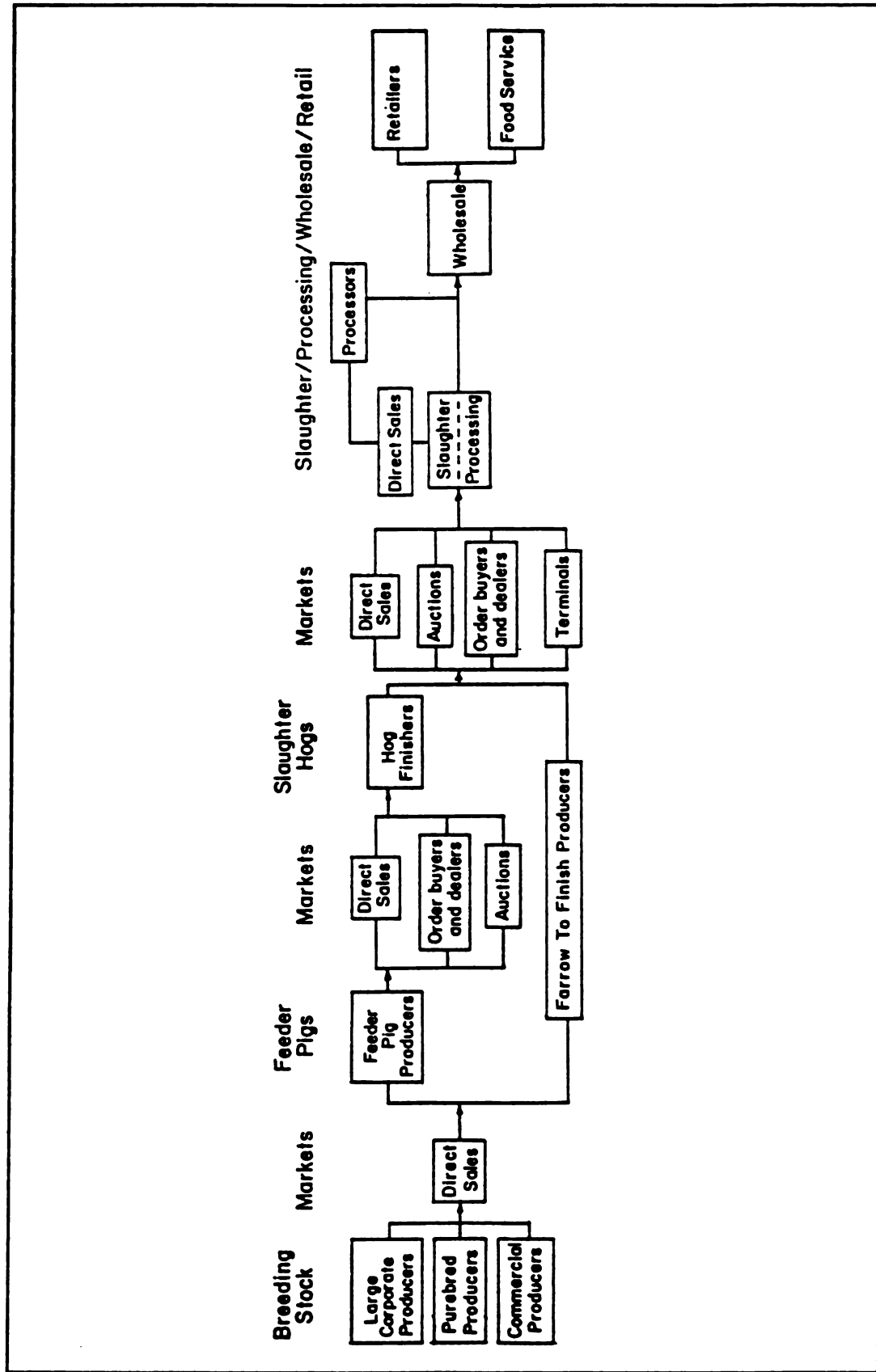


Figure 5. The Pork Subsector Production and Marketing System

Source: Hayenga, Marvin, et al., 1985

3.2.1 Purebred Breeders

Purebred breeders are the dominant suppliers of boars. Purebred breeders supplied an estimated 80 percent of the boar market in 1981. Purebred breeders are the traditional gilt suppliers and dominated with 98 percent of the gilt market in 1981 (Hayenga et al. 1985, pp. 13-14). Throughout the 1980s and continuing into the 1990s, purebred breeders lost market share to corporate breeders selling hybrid hogs with high performance characteristics.

Purebred breeders range in size from those producing only a few head a year to those selling more than 1,000 head. They are located throughout the U.S. but are concentrated in the Corn Belt states. Their sales radius is typically within 50-100 miles of their farm. Some well-known purebred breeders will travel and sell nationally (Hayenga et al. 1985, p. 17).

3.2.1.1 Purebred Breeder Hog Price Determination

Hayenga et al. (1985, p. 33) found individual negotiation was the primary method (40-95 percent of sales of individual associations) of price setting among the breed associations they interviewed. Other methods include a firm asking price, auctions and long term contracts.

The National Association of Swine Records, an association of purebred breeders, provides national all-breed advertising to compete with corporate breeders. This is financed by a collection of \$1.00 per litter from all

purebred breeders. Local and area advertising is still prevalent for individual breeds.

3.2.1.2 Purebred Breeder Research and Development

Little research and development is performed by individual purebred farmers. Farmer cooperatives, likewise, have not been involved in hog breeding research. Research and development requires a large financial commitment with an uncertain pay back after a relatively long time period. Research results have high-exclusion-cost characteristics, making it difficult for research organizations to capture sufficient benefits to pay back investments in research. It is more difficult to capture benefits when purebred genetic lines are improved than when crossbreeds lines are developed. Unless research organizations have the ability to police farmers adequately, farmers may reproduce improved purebred lines and sell them as breed stock in competition with research firms but without incurring the costs of performing the research. On the other hand, if a hybrid line is developed by breeders and the formula of genetic crosses is kept secret, farmers cannot replicate breed-stock genetics and will be forced to purchase breed stock from research firms, facilitating the capture of benefits from their investments. Corporate breed stock companies have, perhaps, focused their efforts on hybrids for that reason.

3.2.1.3 Cooperative Involvement in Purebred Hog Breed Multiplying

Cooperatives multiply purebred breed stock, both by working with purebred breeder members and maintaining cooperatively-owned breed multiplying herds. Two cooperatives, Farmland and Genetics Unlimited, coordinate the supplies of purebred breeder members. Cooperatives establish minimum health and physical standards, then help members in selecting, evaluating and pricing of breed stock. Cooperative marketing allows the large volume and quality control to meet the requirements of large farmers. In addition, Genetics Unlimited offers management, genetic and health services to farmers similar to those offered by corporate suppliers (Hayenga et al. 1985, pp. 34-35).

Land O' Lakes is directly involved in multiplying breed stock by maintaining cooperatively-owned purebred herds. The cooperative, as a corporation, owns these herds and the facilities in which they are raised. Labor is hired to perform necessary functions. Breed animals are sold to farmer/members who produce purebred breed stock. The cooperative purchases at least one boar per litter and the top 40 percent of gilts. These animals are then sold by the cooperative to large farmers (Hayenga et al. 1985, p. 35).

Livestock-farmer cooperatives' involvement in the area of purebred breed stock has helped coordinate the supplies of many independent breeders. These cooperatives add value to the stock by certifying that they meet specific criteria.

Value is also added by combining members' stock in lots of sufficient size to meet the demands of large farmers.

Like IOFs, cooperatively-owned facilities may be able to realize economies of size in raising and marketing breed stock which individual farms cannot. However, unlike purchasing breed stock from IOFs, cooperative farmer member/owners gain profits from the cooperatively-owned facilities in addition to profits from their individual farms.

3.2.2 Corporate Breeders

There are five major corporate breeders. They sell hybrid breeds selected for superior performance traits. They have a national market served by large centrally-located operations, with sales representatives located in outlying states. Corporate breeders acquired 15-20 percent of the boar market and 2 percent of the gilt market in 1981 (Hayenga et al. 1985, pp. 13-14). The market share of corporate breeders is likely to have increased in the 1980s as reflected by the overall improvement in production efficiency during the decade of the 1980s.

3.2.2.1 Corporate Breeders' Price Determination

Gilts and boars are priced using different systems. Gilts are priced by formulas, based on a market price series, such as the weekly average for U.S. 1 and 2 grade market hogs. When market prices vary outside a set range,

gilt prices are adjusted upward or downward to reflect the change.

Boars are priced using a classified pricing system, which reflects the performance characteristics of the individual boars. These prices are adjusted at irregular intervals. Some volume discounts and special prices on boar/gilt groups are also offered (Hayenga et al. 1985, p. 30). Corporate breed stock are viewed as highly differentiated products. As such, prices may be set high to project an "upscale" or superior image to attract buyers.

3.2.2.2 Corporate Breeders' Progressiveness

Corporate breed stock are nationally advertised. Advertisements emphasize the scientific approach used in developing hybrid stock and their resulting superior performance traits. Research and development by corporate breeders resulted in hybrids that contributed to improved overall performance efficiency in hog production in the 1980s. Corporate breeders also influenced the way breed stock are evaluated, by using population genetic selection techniques and performance testing. Performance indexes are valuable tools for large farmers purchasing breed stock. Purebred breeders will have to provide similar testing and information to remain effective competitors (Hayenga et al. 1985, p. 32).

3.2.2.3 Cooperative Involvement in Hybrid Hog Breed Multiplying

Farmers have grown more interested in raising hybrid hogs as impressive performance results are reported for some hybrid crosses. Raising hybrid slaughter hogs with uniform genetics alters the standard practices of farrow-to-finish operations of renewing the gilt pool by saving gilts from feeder pig litters. Continuing this practice would weaken the gene pool. The offspring of the daughters of hybrid hogs will have different characteristics than additional offspring of the parents. New sows must be purchased from hybrid breeders, as opposed to farm raised, to maintain uniformity in the gene pool and, presumably, the desired hybrid characteristics in slaughter hogs. The additional expense of purchasing 100 percent of replacement gilts has led farmers to question whether the characteristics of hybrid hogs are sufficiently better to justify changing practices and adding expenses².

If hybrid hogs are indeed better, how can hybrid breed stock be obtained in sufficient quantities and as cheaply as possible? Farmers have turned to their cooperatives to help

²Profitability of raising hybrid hogs depends on the costs of purchasing breeding stock or feeder pigs and prices received from packers for leaner hogs. New feeding practices may need to be adopted to get the best performance of hybrid hogs. Comparisons with farmers' current profits need to be made to determine if a farmer should switch to hybrid hogs. The October 1991 issue of Pork 91¹ found farmers with the poorest performance with current hogs have the potential to gain the most from switching to hybrid hogs.

answer these questions. Farmland, Land O' Lakes and MFA are operating research farms where hybrid hogs are raised and tested. Indiana Farm Bureau Cooperative Association is organizing a research project wherein eight model production units will test the performance traits of four different types of genetically superior hybrid hogs. Each hybrid would be raised on two different units so comparisons could be made across units as well as across hybrids. The units would be learning tools for cooperative members to become familiar with hybrid performance and management techniques. Feeder pigs and breed stock from these units will be sold to farmers. Education of members is the primary function of these research farms.

Cooperatives offering production contracts may integrate backward into multiplying hybrid breed stock to supply growers. Gold Kist is an example. Gold Kist owns and manages, with hired labor, five "pork centers." At each pork center, 300 DeKalb hybrid sows are bred with DeKalb boars. Offspring are raised to weights of 230-250 pounds. The gilts are placed on 14 contract farms as breed stock. The boars are sent to slaughter. Performing an intermediate cross at their own facilities allows Gold Kist to reduce breed stock costs but maintain DeKalb hybrid characteristics in slaughter hogs sold from pork centers and contract farms.

Farmland Foods plans to build a 700-sow hybrid gilt multiplier unit. The facility will produce about 14,000

pigs per year. Barrows will be sold through Farmland's feeder pig programs. Gilts will be the start of Farmland's program to provide quality, uniform, lean hogs for Farmland Foods' slaughter/processing plants (Farmland News, April 1990d).

Cooperative research farms for hybrid hogs aid coordination by disseminating information to farmers. Hybrid hog research farms that train farmers are examples of services cooperatives offer farmer/members which IOFs are unlikely to offer. IOFs seldom train farmers, unless there is some type of contract involved, because IOFs cannot be assured they will capture the benefits of training. Cooperative members may be more loyal to cooperatives, as explained in Chapter 2, allowing cooperatives to capture the benefits of training farmers.

Raising breed stock in cooperatively-owned facilities may reduce input costs for farmers. Cooperative facilities act as a countervailing power to IOF hybrid breed stock facilities.

3.3 Hog Farming

This section examines how hogs are raised. Hog farming is becoming more specialized. The average-sized hog farm is increasing, as noted in Chapter 1. Environmentally-controlled confinement facilities are replacing semi-confinement and pastures. Genetically-lean, hybrid hogs are replacing hogs with diverse genetics. Lifecycle feed

rations are specialized for age, gestation and sex of hogs. Highly-skilled management is becoming critical to success. Fewer marketing channels are available to most farmers.

3.3.1 Stages of Hog Production

Hog production is composed of two stages. The first, feeder pig production, involves maintaining a breed herd, farrowing, weaning and raising piglets to a weight of 40-50 pounds, until they may be sold as feeder pigs. The gestation period is 3.75 months (Figure 6). Piglets are weaned between 3.5 and 7 weeks of age, with larger operations weaning younger. Raising feeder pigs takes 9-10 weeks. Feeder pigs are often produced on marginal land. Feed requirements for farrowing are less than those for finishing hogs.

The second phase, finishing, requires purchasing feeder pigs and raising them to slaughter weight of about 230-250 pounds. Finishing takes about 18 weeks. Farmers living in grain-surplus areas with multiple enterprises and without the time or inclination to farrow sows, may choose to finish hogs. If corn prices are relatively low and hog prices are relatively high, farmers have greater incentive to "market their corn through hogs."

The majority of hog farmers combine the feeder-pig and finishing phases into farrow-to-finish production. In 1980, 59 percent of hog enterprises were farrow-to-finish while 20 percent were feeder pig and 21 percent were finishing

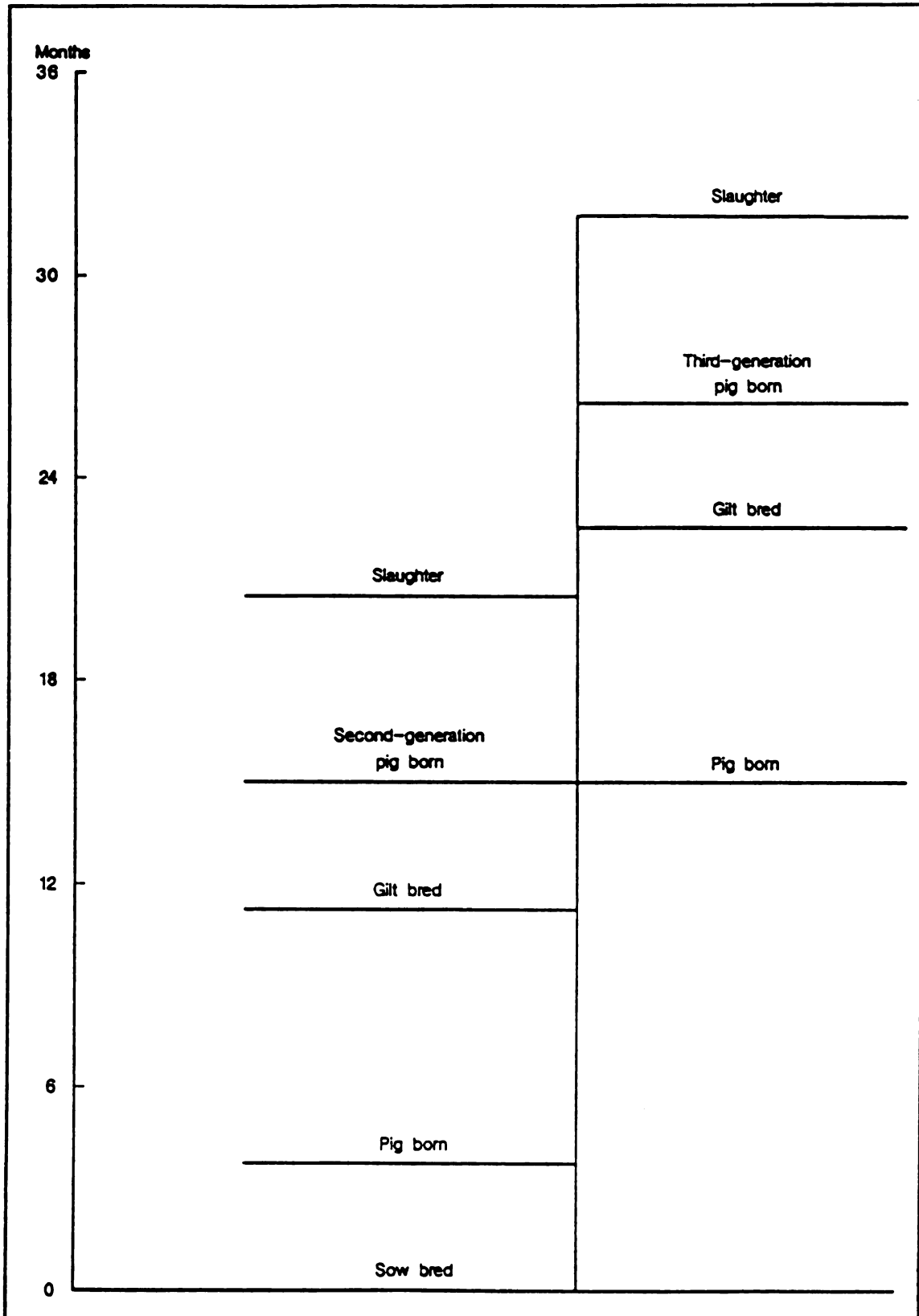


Figure 6. Biological Lags in Hog Production

Source: Crom, 1988

operations. It takes 25 weeks to raise hogs to slaughter weight in a combined system (Crom 1988, pp. 63-65). This saves 2-3 weeks time as compared to separate operations. Moving piglets stresses them and reduces their rate of weight gain.

3.3.2 Cooperative Involvement in Pig and Hog Production

Livestock-farmer cooperatives are involved to varying degrees in pig and hog production throughout the U.S. Involvement ranges from feeder pig certification programs and farrowing corporations to fed hog programs and production contracting. Feeder pig certification programs and farrowing corporations are discussed below. Fed hog programs and production contracting are discussed in Chapter 4.

3.3.2.1 Cooperative Feeder Pig Certification Programs

MFA of Missouri and Interstate Producers Livestock Association of Indiana have feeder pig certification programs. Farmers enter into contracts with these cooperatives to produce feeder pigs which meet specified minimum standards with respect to breed characteristics, vaccination and/or freedom from diseases. Ownership of breed stock and feeder pigs remain with farmers, but farmers agree to market their certified feeder pigs through a teleauction organized by these cooperatives. The contracts allow the cooperatives to estimate the number of feeder pigs

they can offer on the teleauction as well as assuring a minimum standard to buyers who utilize the teleauction. Feeder pig teleauctions are discussed below in the section on marketing pigs and hogs.

3.3.2.2 Farrowing Corporations

Farrowing corporations are an alternative organization to obtain an assured supply of feeder pigs. Single sources of feeder pigs are desirable because commingling of feeder pig lots increases disease. Also divergent genetic backgrounds of multiple sources can lead to variable growth rates, which makes it difficult to sell all slaughter hogs of the same age as a lot with uniform weights.

Farrowing corporations may be organized as Subchapter S corporations or cooperatives. Several finishers may jointly own a large farrowing unit, using hired management and labor. Feeder pigs are purchased from the corporation and finished on individual farms. Non-farmers, such as feed salesmen and veterinarians, may organize a farrowing corporation as an investment (Paulson and Rahm 1978). Farrowing corporations are also promoted by construction firms specializing in confinement facilities, breed-stock firms and large farmer cooperatives (Rhodes and Grimes 1976).

Farrowing corporations began in areas of surplus feed grain production. Their numbers grew during the 1970s. Surveys in 1978 revealed a range of 2 to 22 owners, with an

average of 8.6 owners per firm (Paulson and Rahm 1978). Firms were more likely to be organized as cooperatives when there were larger numbers of owners. The operations were usually of substantial size, with 440-660 sows.

Prices were established in advance of production by three-fourths of farrowing cooperatives, based on estimated costs of production (Paulson and Rahm 1978). About one-fourth of the firms surveyed used formula pricing based on current market prices for feeder pigs or slaughter hogs as the transfer price.

Objectives of non-farmer owners of farrowing corporations may differ from those of farmer owners. Farmers, who will be buying the feeder pigs produced by the corporation, may have a greater concern over the quality of pigs produced than would non-farmer investors, especially if payments in feeder pig markets do not adequately reflect quality differences in pigs. Feeder pigs are not graded. Pigs may be certified to meet minimum standards of breed characteristics and freedom from disease. Minimum standards, however, do not fully reflect quality differences. Without additional information, buyers may not be willing to pay higher prices for pigs of purported higher quality.

Owners who provide and receive additional payments for inputs, such as feed or veterinary services, may have less interest in minimizing costs of these inputs than farmers who benefit only from the final product.

One of Farmland's proposals for developing a uniform supply of quality hogs involved joint ownership of farrowing units by farmers, who would finish hogs on their independent units. Presumably, the farrowing cooperatives would be organized as local cooperatives or distinct operating units within the Farmland federation of cooperatives. Hybrid gilts and boars from Farmland's breed-multiplying farms would be purchased by the farrowing cooperatives. Farmers would be required to market hogs through Farmland's slaughter/processing plants.

3.3.3 Marketing of Pigs and Hogs

Pigs and hogs are marketed through several channels. The sections below describe the market channels and the extent to which they are used. Marketing functions performed by cooperatives are described in detail. Most livestock-farmer cooperatives were organized to provide marketing services. Nearly all livestock-farmer cooperatives market several species of livestock for their members including cattle, hogs, sheep and lambs and, in some cases, goats. Cooperatives market both slaughter hogs and feeder pigs or market only feeder pigs. Marketing continues to be one of livestock-farmer cooperatives' primary functions. Mechanisms to establish price include auction markets and teleauctions as well as direct purchases by cooperatives at daily markets and teleauctions, which are

discussed below. Forward contracts, production contracts and other pricing mechanisms are described in Chapter 4.

3.3.3.1 Market Channels/Price Mechanisms for Feeder Pigs

Feeder pigs are marketed through three main channels. In order of volume handled they are: organized auction markets; direct farmer to finisher sales; and professional dealers who buy and sell feeder pigs. In 1980, Crom and Duewer found 47 percent of feeder pigs were sold through organized markets: 25 percent in proprietary auctions, 20 percent in cooperative auctions and 2 percent in terminals. About three-fourths of those sold through cooperative auctions were sold by teleauction. Of the remaining 53 percent of feeder pigs, 33 percent were sold direct to finishers and 20 percent were sold to dealers (Crom and Duewer 1980). The marketing channels used varied in different regions of the country depending on how markets were organized.

Cooperative teleauctions have grown in importance, and direct sales and proprietary auction sales have declined since the 1960s (Hayenga et al. 1985, pp. 37-38). Finishers require larger, more uniform lots of feeder pigs than provided by most individual farmers. Auctions and dealers perform the functions of sorting and commingling lots to meet finisher specifications. Teleauctions provide the advantages over on-the-spot auctions of reduced transportation costs and lowered health risks. Feeder pigs

are shipped direct from the farmers to the finishers and not through a central auction site. They are not commingled with other pigs until arrival at the finishers, reducing the likelihood of disease transfer. The teleauction thus captures the advantages of direct sales without the disadvantage of lack of price information. Teleauctions draw from a broad region of buyers and sellers. Their success requires that pigs be accurately described and large enough volumes be traded to provide liquidity and low per unit transactions costs (Hayenga et al. 1985, pp. 38-41).

3.3.3.2 Market Channels and Price Mechanisms for Slaughter Hogs

Slaughter hogs are marketed via three main channels: direct sales, auctions and terminal markets. Use of auctions and terminal markets has declined. Terminal markets handled 50 percent of hogs in 1940, but that market share declined to 13.5 percent by 1980. Auction market share declined from 10-15 percent in the 1960s to less than 10 percent in 1980. Auction markets are still an important source of hogs for packers in the Mountain States, Southern Plains and the North Atlantic region (Crom 1988, p. 39). Electronic telemarketing is a form of auction, mentioned above for feeder pigs, which has been used also for slaughter hogs. The success and details of its use are discussed below. Direct sales to packers had increased to 76.6 percent by 1980 (Hayenga et al. 1985, pp. 54-55).

Farrow-to-finish operators are more likely to ship direct than finishers, who use terminal markets more often (Van Arsdall and Nelson 1984).

The larger an operation is, the greater the percentage of hogs that will be shipped direct to packers. Gonzales et al. found the percentage increased from 65 percent of annual marketings for operations selling 7,000-14,999 hogs to 94 percent of operations selling 15,000 and more hogs in 1980 (Gonzales et al. 1983). Larger operations can ship in truckload-sized lots and gain sufficient market knowledge to deal with packers. Larger farmers are more likely than smaller farmers to use more market outlets. However, 75 percent of the largest farmers use only one or two market outlets and 42 percent of them obtained only one price bid before selling each lot of hogs (Hayenga et al. 1985, p. 55).

The smaller an operation is, the more likely it is to use a buying station³. Farmers marketing 100-2,499 head used buying stations 53 percent of the time, while those marketing 5,000-6,999 head only used them 32 percent of the time (Gonzales et al. 1983). Buying stations are established in local markets. While they may be packer-

³A buying station is a location where hog farmers deliver hogs for sale and negotiate price directly with a packer's representative. Buying stations differ from auction markets because there is no public bidding by several buyers. Instead a private treaty transaction takes place between the farmer and the packer's representative.

owned, independent dealers and cooperatives often purchase hogs at buying stations and resell them to packers.

The majority of farmers sell their hogs when they reach a certain weight. Others either sell at set times, such as the day of the local auction, or when they think they will get the highest price (Hayenga et al. 1985, p. 55). When market prices are low, some farmers will hold onto hogs till prices improve. This strategy often backfires, however, as heavy hogs are discounted by packers.

3.3.3.3 Public and Private Sources of Price Information

With three-fourths of hogs sold direct to packers, how is price information obtained? Terminal and auction markets are one source of price information. Terminal and auction markets have 23 percent of the market. However, the hogs traded on these markets may not be representative of the majority of hogs sold. Hogs entering terminal and auction markets are more likely to be produced by small- and medium-sized farmers and exhibit greater variability in weight and quality. Hogs entering these markets from larger farmers are likely to be residual hogs not fitting into truckload lots due to quantity or quality problems. Lots offered for sale will usually be a commingling of several smaller lots. Few buyers may be present on a given day or time. If packers are able to meet the majority of their needs by direct purchases, they enter auctions and terminal markets only to fill out their killing line. The fact that auction

and terminal markets trade may be for overall lower quality hogs with fewer than optimal number of buyers may lead to lower prices than would prevail if the majority of hogs entered these markets.

To increase market transparency and provide more information to farmers, U.S.D.A.'s Agricultural Marketing Service collects information daily from cooperating packers and other market operators. While obtaining price information, U.S.D.A. reporters also give other information to packers and market operators, making price reporters part of the price discovery process (Hayenga et al. 1985, p. 90). Private price sources include the Yellow Sheet and the Meat Sheet.

3.3.3.4 Cooperative Auctions and Daily Markets

Cooperatives maintain buying stations, called daily markets, strategically located at several locations in their region. At these stations, auctions may be run as well if there is sufficient volume. Auctions may be held only once a week if volume is low. Farmers have the option of selling their animals in the auction or directly to buyers. In addition to cooperative buyers, order buyers representing slaughter plants may be present, purchasing both through the auctions and directly.

Cooperatives help farmer/members sort lots for auctions or direct sales. A sales commission is charged for each animal sold. For example, Central Livestock Exchange of

Minnesota charges a commission of \$1.50 per head. Use of the market makes a farmer a voting member of Central Livestock and eligible for patronage refunds based on the number of head sold through the cooperative. Use of auction markets has declined with the increase of direct purchases by packers. Fewer hogs enter the auctions and fewer bidders bid on hogs. Cooperatives have increased their direct purchases to help their farmer members compete in this environment. With direct purchases, farmers are paid immediately after the sale. Cooperatives sort the hogs purchased and offer them as lots to packers, either directly, via teleauction, or in larger auction or terminal markets. Sorting lots, increasing lot size and offering lots to a greater number of packers adds value to hogs. Cooperative sales managers know the qualities considered important by different packers and can help to better coordinate supply with demand.

Packers and IOFs may also establish buying stations in hog producing regions. IOF-owned buying stations offer many services of cooperative stations, but farmers using these stations do not gain the advantages of cooperative membership. Those advantages include access to other services of cooperatives and patronage refunds. Value-added when cooperatives directly purchase and resell hogs is returned, minus expenses incurred, to members as patronage refunds. A portion of the patronage refund is payable in cash. In 1988, Michigan Live Stock Exchange returned

\$313,546 in cash patronage refunds to livestock farmers
(Annual Report MLSE 1989)

3.3.3.5 Order Buyers

Cooperative employees may also be order buyers for packers. Order buyers contact packers to determine the quantities and types of hogs they wish to buy, and the prices they are offering to pay that day. Order buyers then go into auction markets and bid for lots meeting the packers' specifications. They may also purchase hogs directly from farmers at daily markets. Cooperative employees acting as packers' order buyers would seem to present a conflict of interest, as packers desire the lowest price for a lot of hogs while farmers desire the highest price. However, in auctions where few bidders are present, cooperatives' order buyers can offer bids from packers who do not already have representatives present at the auctions. Since order buyers may represent several packers, the number of bidders in the auction increases, which may bring farmers more representative prices than might be offered by just one or two packers.

Cooperatives also provide price protection measures as operators of auctions. Packers and Stockyards Act regulations allow auction operators to buy livestock, if the highest "bid price" is judged noncompetitive. This is known as "market support" (Sarhan and Kunda, p. 6).

3.3.3.6 Teleauctions

Teleauctions are electronic auctions where prospective buyers and sellers communicate across telephone lines. Sellers present descriptions of the livestock to be sold on teletype machines or computer monitors. At a specified time a high bid for the lot is presented. The bid drops unit by unit until a buyer indicates it is willing to pay that price for the lot. If the price drops too low, the seller may refuse to accept the offer and withdraw the lot from the auction. Separate teleauctions are run for slaughter hogs and feeder pigs. They are discussed below.

3.3.3.6.1 Slaughter Hog Teleauction

Several midwestern cooperatives joined together to reestablish a teleauction for slaughter hogs in the late 1980s. A teleauction had been organized in the early 1980s but closed due to insufficient volume. Hogeland reported positive effects on prices received by farmers during the time it was in operation (Hogeland, April 1982, pp. 8-9). However, packers, wishing to maintain direct purchases offered farmers premiums exceeding the prices offered by the teleauction. The teleauction was closed after only seven months in operation. Once the teleauction was closed, prices fell back to the levels prior to the teleauction.

In 1988, a group of marketing cooperatives decided to reestablish a teleauction. They included Michigan Live Stock Exchange, Equity in Wisconsin and Interstate Producers

Livestock Association of Illinois. Cooperatives offer lots of hogs by description to packers over the teleauction. Lots meet or exceed minimum standards of the descriptions. Lots may be offered "on-the-hoof" or grade-and-yield, as specified by the seller. If the bid price drops too low, the seller can refuse to accept the bid. As many as 60-75 percent of the hogs which are offered for sale over the teleauction are being sold via the teleauction. As many as 13 packers are bidding at a given time (Jenks).

Lots of slaughter hogs offered on the teleauction are procured in two ways: by combining smaller lots and by selecting from large farmers' herds. Smaller lots are purchased by the cooperatives directly from farmers in the daily markets. These smaller lots are then resorted and combined into larger lots to be offered on the teleauction. Cooperatives also purchase entire lots from large farmers. Representatives of the cooperatives visit farms and offer to purchase hogs. This saves farmers the expense of delivering the hogs to a central buying point. These lots may be offered for sale to packers on the teleauction. Once cooperatives sell the hogs they can be shipped directly from the farmer to the packer.

Individual farmers have not been using the teleauction directly. For the majority of farmers this is because they do not have enough hogs to offer a uniform lot for sale. This is not the case for larger farmers, but they may wish to utilize the expertise of cooperative personnel in using

the teleauction system. Cooperatives guarantee immediate payment to farmers. They deduct a service charge for marketing farmers' hogs.

3.3.3.6.1.1 Serving Large Farmers via Teleauctions

Increased numbers of large hog farmers led to an increase in direct sales from farm gates to packers. Rather than lose these farmers as members, cooperatives are offering their services as marketing agents. Field personnel assist farmers in sorting uniform lots of slaughter hogs. A truckload contains 200-230 hogs. Cooperatives then accept bids from several packers for the lots. Lots may be offered for bidding on the teleauction or by direct phone contacts with packers. Once bids are accepted, lots are shipped directly to packers from farms.

There are several advantages for farmers in this situation. An individual farmer may be limited by transactions costs to accepting the bids of nearby packers or those he or she has dealt with in the past. As discussed earlier, bids are often received from only one or two packers even by large farmers. Cooperatives are in the market with large volumes and take bids from many packers. They may be better able to coordinate supply with demand and obtain the highest price for farmers. Cooperatives pay farmers immediately and take any risk of delayed payment or nonpayment by packers. Cooperative field personnel have information as to packers' specifications. They can assist

in sorting lots so as to get the highest return. Hogs which do not meet the specifications for uniform lots are separated out. They can be purchased by cooperatives directly, which reassemble hogs in lots for resale, or sold through cooperative auction markets.

3.3.3.6.2 Feeder Pig Teleauctions

Feeder pig teleauctions operate in a manner similar to slaughter hog teleauctions. About one-fifth of the pigs produced in the U.S. are sold as feeder pigs to be finished by other farmers. The remaining four-fifths are produced and finished on farrow-to-finish farms (Hayenga et al 1985, p. 26). Farmers that specialize in feeder pig production are located mainly in the Corn Belt or in states surrounding the Corn Belt where marginal conditions exist for raising feed grains. Farrowing requires less feed per animal than finishing hogs, but it is more labor intensive. Areas with lower labor costs can compete with areas with lower feed costs in feeder pig production. Buyers of feeder pigs are other farmers and large commercial farms, typically in grain-surplus regions.

MFA of Missouri and Interstate Producers Livestock Association of Indiana operate feeder pig teleauctions. They certify the feeder pigs will meet minimum standards. The number of pigs offered through these teleauctions declined in the 1980s. MFA sold 700,000 pigs in the early 1980s, but for several reasons, that number had declined to

40

wh

bu

fr

19

de

in

op

be

te

se

ef

in

te

3.3

mos

the

bon

pac

pub

slau

hogs

regu

offe

400,000 by 1989. Many cooperative members were small farmers who went out of business in the hard economic times for all but the largest hog farmers in 1980s. Membership dropped from 3,500 farmers in the early 1980s to 1,400 farmers by 1989. Another contributing factor was a decline in the demand for feeder pigs, as large and very large hog farmers increasingly began farrowing in their own operations as opposed to concentrating on finishing hogs. This trend became noticeable in the 1970s (Hayenga et al. 1985, p. 25).

As they have been organized, cooperative feeder pig teleauctions have served not only to match buyers and sellers but to set minimum standards. Cooperatives effectively utilize the non-price mechanism of contracting in conjunction with the pricing mechanism of the teleauctions to enhance coordination.

3.3.3.7 Direct Sales Pricing

Prices for direct sales to packers are determined in most cases by individual negotiation. The packer informs the seller of the base price being offered that day, plus bonuses and discounts for specific characteristics. The packer sets this price based on market information from public and private price sources and on their own demand for slaughter hogs. Packers are often familiar with the type of hogs they will receive from a farmer they deal with on a regular basis. This knowledge also enters into the price offer. The farmer may accept the offer or negotiate for a

different price. These negotiations may take place over the phone or after the lot of hogs has been unloaded and inspected.

3.3.3.7.1 Forward Contracts with Packers

Other pricing mechanisms for direct sales to packers include forward contracts, formula-based pricing, fixed-price contracts and cost-of-production contracts. In the case of forward contracts, farmers and packers (or marketing cooperatives where this service is offered) sign contracts establishing the price, quantity and delivery period for hogs. The price may not be fixed but tied to the futures price in the month of delivery minus the basis⁴ plus a service charge to cover hedging costs. The packer then hedges the contract on the futures market. Forward contracting usually takes place only a month or two before delivery. To be useful devices for planning production, prices would need to be established prior to farrowing. Only in the case of ongoing contract deliveries between a farmer and a packer are prices likely to be established prior to farrowing. Then prices are most likely set by formulas as discussed below. The advantage to the farmer of forward contracting with a packer as opposed to hedging directly on the futures market is two-fold. Often the quantity of hogs needed for forward contracting is less than

⁴The basis is the usual difference between cash and futures prices during the delivery month.

a full futures contract quantity. Also, farmers do not have to meet margin calls, pay commissions or follow the futures market closely. The disadvantage is that price uncertainty is not reduced for farmers entering into forward contracts that set price by formula, whereas farmers hedging directly on the futures market are able to reduce price uncertainty.

3.3.3.7.2 Formula Pricing with Packers

Formula pricing involves establishing price based on an agreed upon formula, often the Yellow Sheet price for the day of delivery or an average price for the week. The agreement may be verbal or written. The quantity and delivery period may or may not be specified. Formula pricing is also most likely to be used in the case of ongoing transactions between farmers and packers. Fixed-price and cost-of-production pricing are usually used only in the cases of contract production.

3.3.3.8 Liveweight Pricing versus Carcass Grade and Yield

The value of a hog carcass is determined by the quantity and quality of cuts it can produce. Characteristics of hogs which determine their carcass grade include carcass weight, inches of backfat, area of loin eye and percentage of carcass muscle. Degree of marbling and color, firmness and wateriness or dryness of lean determines carcass quality. There are four U.S.D.A. grades: No. 1,

No. 2, No. 3 and No. 4. Grades are based on expected carcass yield of lean cuts with no consideration for superior quality, above the minimum required for each grade (Boggs and Merkel, pp. 41-51). U.S.D.A. grades are not precise enough measures of carcass value to a packer, because superior quality is not considered; and the fact that over 90 percent of hogs produced today are grade No. 2 and above. In addition, grading by U.S.D.A. standards is not mandatory for packers. Pricing of hogs, therefore, is based to a large extent on the characteristics deemed most important by the market and individual packers' needs.

There are two main types of pricing: liveweight and carcass grade-and-yield. Liveweight pricing is based on weight and appearance of hogs. Typically live hogs are bid on by the lot. Each lot may be composed of hogs of variable value. Bids are made on an estimated average value for the lot per hundredweight. In other words, high value hogs are underpriced and low value hogs are overpriced. Inaccurate pricing is a problem with liveweight pricing of hogs. Prices which are inaccurate cannot send accurate messages to farmers as to the most valuable characteristics of hogs.

Farmers or auctioneers may sort lots to achieve more uniformity when possible, but farmers are likely to be reluctant to commingle their hogs with someone else's unless absolutely necessary. Order buyers may overcome the problem by directly purchasing hogs from farmers and sorting them into lots that will be most desired by packers. Packers

evaluate each carcass purchased and give the information back to their order buyers so buyers can adjust their judgement over time to reflect actual value as closely as visual inspection and weight will allow. In repeated transactions with the same farmer, the value of his or her hogs becomes known to packers. However, since carcass evaluations are not shared with farmers, packers have more information than farmers when negotiating prices. Packers may use carcass information and market power for their own advantage when offering prices to farmers.

Carcass grade-and-yield, as the name implies, involves pricing each carcass on an individual basis. After the hog has been slaughtered, it is weighed, and measurements are taken on backfat, loin eye area, etc. Bruised and diseased sections, if any, are removed, and a price is determined based on the packer's formulas. Issues arise for farmers because each packer has its own specifications; the graders are hired by the packer; the hog is already in the packer's cooler; and the farmer is not paid until a few days after delivery. The farmer, therefore, has little recourse in the case of disagreement on price, except when it comes to selling his or her next lot. Farmers also may have difficulty determining how different packers would value their hogs.

Carcass grade-and-yield pricing has the advantage over liveweight pricing of price incentives for specific desired characteristics per hog that the farmer can evaluate and

respond to over time. As such, it has the capacity to coordinate packers' demands to farmers directly via the price mechanism. Some countries use carcass grade-and-yield pricing almost exclusively. These include: Denmark, where the subsector is coordinated by cooperatives; Canada, where the subsector is coordinated by the government; and Australia.

3.3.4 Returns to Pig and Hog Production

Returns to separate stages of pig and hog production differ year to year. Potential returns influence farmers' and corporations' decisions as to the stage(s) of hog production to enter or exit.

3.3.4.1 Returns to Feeder Pig Production

Feeder pig production is labor and management intensive. Specialized facilities are required for farrowing sows and weaning piglets. Boars must also be maintained. Feeder pig farmers are the most exposed to production and price risks. Death loss is highest immediately after birth and during weaning. The market for feeder pigs is both seasonal and highly variable. Returns to feeder pig production are more highly variable than returns to finishers or farrow-to-finish production (Figure 7).

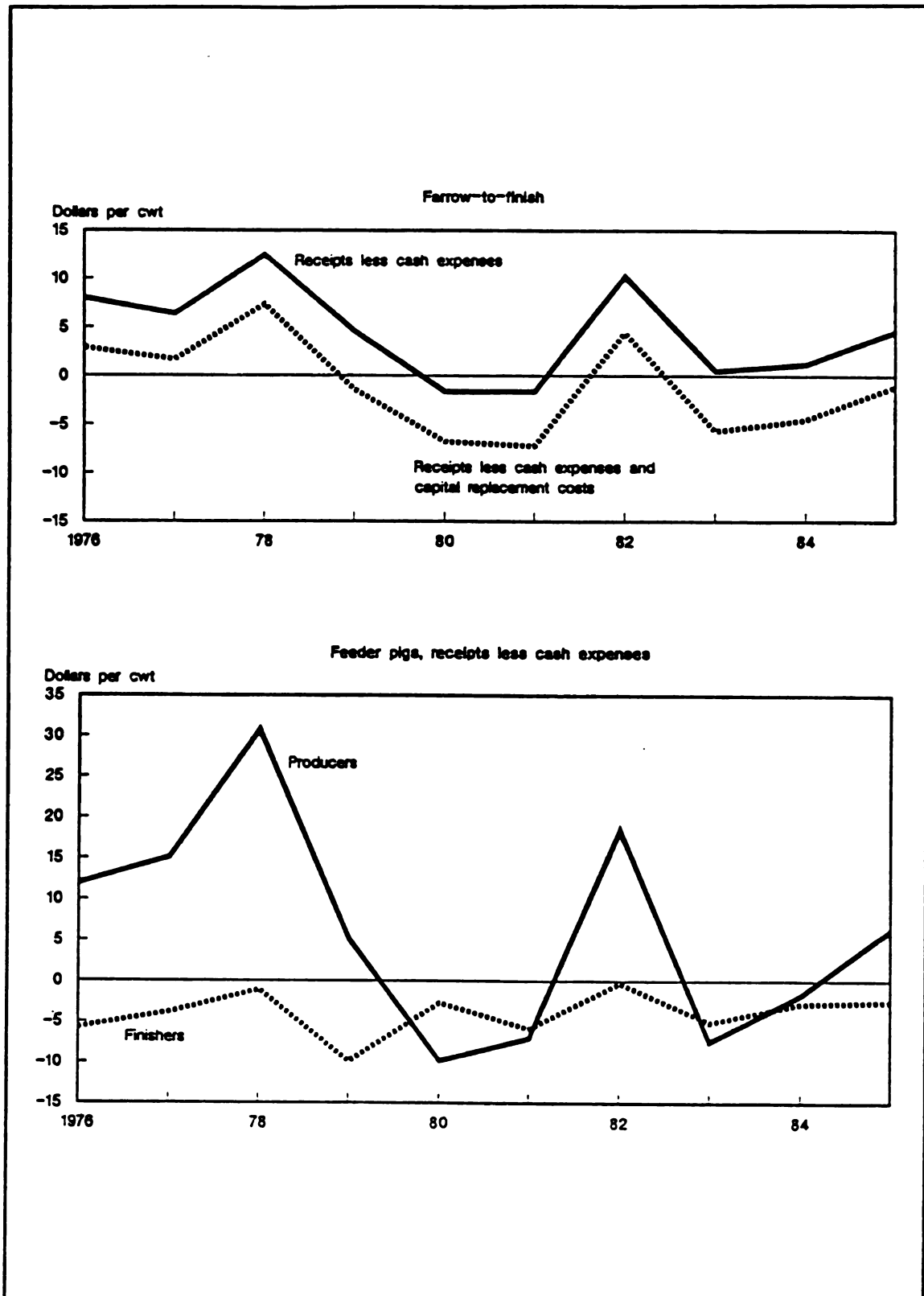


Figure 7. Returns to U.S. Hog Production for Farrow-to-Finish, Feeder Pig Production and Finishing.

Source: Crom, 1988

3

f.

st

s.

in

fa

st

fa

co

3.

pa

th

se.

lar

198

cos

fle

dep

pou

Far.

ope

Comp

that

fini

3.3.4.2 Returns to Finishing

Large operations affiliated with feed and/or processing firms were primarily finishing units in 1970. It is the stage requiring the most feed and the final stage before slaughter. Labor and management for finishing are not as intensive as for feeder pig production. Likewise, facilities are less specialized. Returns to finishing are still cyclical but are much less variable than feeder pig or farrow-to-finish production. However, receipts did not cover cash expenses from 1976-1985 (Figure 7).

3.3.4.3 Returns to Farrow-to-Finish

In the 1970s, enterprises affiliated with feed and/or packing firms began farrowing their own hogs. By the end of the 1970s, the large volume hog operations were still selling more hogs than they were farrowing, but some of the largest units were farrow-to-finish units (Hayenga et al. 1985, pp. 23-25). The reasons for this may have to do with costs and profitability. Farrow-to-finish farmers have flexibility either to sell or finish feeder pigs. This depends on the market at the time the piglets reach 40-50 pounds, and the anticipated market at the time of slaughter. Farrowing is the stage of the most cost savings as size of operation increases (Hayenga et al. 1985, p. 20). Comparisons of returns to hog production from 1976-1985 show that farrow-to-finish enterprises have fared better than finishers and feeder pig enterprises, respectively.

En

to

at

for

pl

me

d

wh

Sp

ha

s.

su

He

fr

wh

pl

Ap

be

so

fr

pe

p.

fa

Enterprises producing over 10,000 head were the only group to cover cash and capital replacement costs consistently after 1981 (Crom 1988, pp. 76-78). In other words, large farrow-to-finish enterprises have maintained the best profitability record in times of overall low returns. This may explain corporate hog enterprise movement in this direction.

3.4 Slaughter/Processors

The majority of hogs are slaughtered, cut into fresh wholesale cuts and further processed by the same firm. Specialized processors purchase fresh pork cuts, such as hams or meat for sausage, which are in excess of the slaughter/processors needs. In addition, meat byproducts, such as hides and lard, may also be sold by slaughterers. Hogs enter a "kill and cut" line where they are cut into fresh wholesale cuts. High value fresh cuts are sold to wholesalers. They may be packaged in gas-flushed heavy plastic wrap, known as cryovac, to extend case-life. Approximately 40 percent of pork cuts are further processed before leaving the slaughter firm. Processed products are sold to retailers and food-service industries. Remaining fresh cuts are sold to specialized processors. Over 60 percent of all pork is processed (Hayenga et al. 1985, p. 42).

IBP, which invested heavily in pork slaughter facilities in the 1980s, slaughters hogs but does not

further process pork. It focuses on high volume slaughter, supplying fresh pork to wholesalers and retailers, while letting others process the remaining cuts. IBP's "processing" is directed toward convenience for retailers. They focus on boxed pork. Instead of shipping a whole carcass, carcasses are cut into subprimals at slaughter plants, cryovac packaged to lengthen case-life, and shipped in boxes to wholesalers or directly to retailers. Wholesalers or retailers are able to purchase only those parts which are in demand--ribs, tenderloins, etc.

3.4.1 Farmer Cooperative Meatpacking

Currently only one U.S. cooperative, Farmland, owns meatpacking plants. Gold Kist owned pork packing plants in the early 1970s but sold them because they were inefficient and unprofitable. Van Arsdall and Nelson (1984) found two percent of hogs in the Southeastern states and three percent of hogs in the North Central states were sold to cooperative slaughterers in 1980.

Farmland purchased its first meat packing plant in 1959. By 1980, it owned three pork packing plants and was slaughtering four percent of U.S. federally inspected slaughter (Farmer Cooperatives, April 1980a). It ranked as the eighth largest hog packer in the U.S. It also owned a pork canning plant and a pork processing plant. By 1988, Farmland ranked as the seventh largest hog slaughterer in the U.S. It slaughtered 13 percent of hogs in Iowa and

Nebraska (Meat Processing, pp. 46-54) and 5 percent of hogs nationally (Watson). Farmland Foods has maintained a relatively steady share of a market where ownership and/or ranking of the 10 largest firms changed entirely in an eight-year period (Ward, November 1989).

3.4.2 Processors

Processors produce consumer products such as sausage links and patties, hot dogs, smoked hams and pork chops, luncheon meats and preformed meat (such as is found in McDonald's McRib barbecue sandwich). Oscar Mayer has the largest market share in branded hot dogs and sliced cold meats at 10-20 percent and over 25 percent, respectively. The top four firms have approximately 30 percent of national hot dog sales. Retail chain private-label products account for about 20 percent of the hot dog market and 25 percent of cold cuts. Oscar Mayer also is the leader in the bacon market at 5-10 percent. Regional brands typically have market shares of 20-30 percent for their regions, while private label and generic products account for over 25 percent of retail sales volume. Canned and smoked hams are produced largely by packers who may have significant regional market share. Bluebird, the largest specialized processor of hams, Wilson, Hormel and Rath have strong national market shares. Imports have had a market share ranging from 10-15 percent in the 1980s (Hayenga et al. 1985, pp. 48-49). Most processors with national brands also

ma

son

sl

3.4

pro

etc

pro

Con

fac

stu

me

Ma

3.4

pro

sta

the

equ

les

pri

maintain slaughter plants although they may still acquire some of their supplies for processing from other slaughterers.

3.4.2.1 Cooperative Processing and Branded Pork

Farmland's pork processing plants make traditional processed pork products: hams, sausages, luncheon meats, etc. They also were a leader in selling boxed pork. These products carry brand names that are regionally promoted. Consumer demographics, packaging innovations and other facets of the changing marketplace for meats are being studied. New lower-fat, lower-salt hot dogs and luncheon meats are in their product lines (Farmland Food Futures, March/April 1990).

3.4.3 Slaughter/Processor Profitability and Progressiveness

Through the 1970s and the 1980s hog slaughter/processing performed competitively. Crom (1988, p. 47) states:

"The past record of meatpacking shows good performance in the areas of technical efficiency, product development, decreasing real-dollar price spreads and overall low profit rates."

The industry was forced to modernize and restructure by the entry of non-union, low wage, large firms with modern equipment. Old packing plants with high union wages and less efficient cutting lines could not compete with the low prices of the new entrants. They were forced to close or

sell inefficient plants, renegotiate wages and modernize to compete. Restructuring and changing ownership led to continual changes in the ranks of the companies owning the largest packing operations (Hayenga et al. 1985).

3.5 Wholesalers, Retailers and Food-Service

Retail sales accounted for about 85 percent of the volume of pork sales in 1980 (Crom and Duewer 1980). Meat department sales were about 21 percent of all grocery store sales from the mid 1970s to the mid 1980s. Fresh pork averaged 9 percent of meat department sales while provisions, cured meats and sausages, which are largely pork, make up 30-35 percent of meat sales. Processed and fresh pork combined were approximately equivalent to fresh beef, ranging between 40-45 percent. Poultry accounted for 12 percent (Crom 1988, p. 21).

3.5.1 Wholesalers

Wholesalers are associated most directly with their largest buyers. Most grocery chains have their own wholesale units as do large food-service chains. The wholesaler acts as an agent between retail and food-service customers and packers.

With the advent of boxed pork and cryovac-packed loins and tenderloins, some food-service and retailers may deal directly with packers to obtain the cuts they desire. However, wholesalers still perform an important function in

off

lik

ret.

spe

off

met.

rest

hist

sect

menu

perc

comp

cons

on p

perc

outl

forks

One v

buyer

bid f

offer

offering a variety of meats, since packers are becoming more likely to slaughter only one species of animal, while retailers and food-services generally offer a variety of species to consumers. Wholesalers, including packer sales offices, handled 85 percent of pork in six Southern metropolitan areas in 1979 (Baker and Duewer 1983).

3.5.2 Food-Service Sector

The food-service sector is comprised of institutions, restaurants and fast-food outlets. The food-service sector, historically, purchased a small share of pork, but the sector has both grown in size and increased the number of menu items made of pork. In 1960, Americans spent only 27 percent of their food dollar on meals and snacks eaten out, compared to 42 percent in 1984. In 1967, 23 percent of consumers' meat dollars in food-service outlets were spent on pork, compared to 32 percent in 1982. In 1982, 20 percent of pork consumed was bought from food-service outlets (Crom 1988, p. 19).

3.5.3 Price Determination

Three pricing systems are used for fresh and processed pork: formula prices, negotiated prices and price lists. One variation of the negotiated price, used by some large buyers, is the offer-and-acceptance system, whereby the best bid from potential suppliers is accepted without counter offering any bids. The prevalent pricing system used

depends on the degree of fabrication and/or processing and the functions of the parties to the transaction. Fresh cuts, which do not require any processing, are sold most often via negotiated prices. Negotiated prices account for 50 percent of fresh pork pricing. Fresh cuts sold to other firms for further processing are formula priced. Formula pricing accounts for 40 percent of fresh pork pricing. Packers' sales force or brokers use price lists to handle accounts. Price lists account for 10 percent of fresh pork pricing. Processed product sales, on the other hand, are made via price lists over 90 percent of the time. Formula prices account for over 5 percent and negotiated prices only 1-4 percent of processed pork pricing (Hayenga et al. 1985, pp. 80-81). Suppliers have more control over the prices of branded products. They establish weekly price lists, which may be adjusted if product moves too slowly (Crom 1988, p. 10).

3.5.4 Progressiveness and Profitability

A physical efficiency measure of the number of times meat change hands between slaughter and consumption found pork changed hands 1.3 times, although processed meats changed hands more frequently than did fresh meats. A turnover of less than two times is considered reasonably efficient (Baker and Duewer 1983).

A productivity index for food stores, measured by output per unit of labor (1977=100), was 98 in 1967.

It rose to 110 in the early 1970s and fell back to the high 90s after 1980. The pattern was similar for restaurants (Crom 1988, p. 25). This is in contrast to the increased productivity in slaughter/processing, which is in part due to the increasing fabrication of case-ready product at the slaughter/processor level and slaughter/processors' integration into wholesaling. However, measuring output per unit of labor may not be a very useful measure of efficiency, because it says nothing about how the services incorporated into the product may have changed over time.

Crom (1988, pp. 24-25) attributes the failure to increase productivity as contributing to the stability in returns to retailers and food manufacturers. The food distribution system has had higher gross returns, but little increase in profits, due to cost increases from inflation. Profits as a percentage of sales remained about one percent for retailers and three percent for food manufacturers. Returns to assets were 4-5 percent for retailers and 6-7 percent for food manufacturers, levels below many other industries.

3.6 Inputs Sector Influence

An important component of a market system involves the inputs into production and marketing. The most important input component into the hog subsector is feed grain. Feed is the largest cost item in hog production. It was 58 percent of total cash expenses plus capital replacement

co

en

hoc

esp

ra

soy

Nor

sta

liv

cat

the

pro

gra

gro

Fir

the

hog

com

hog

slat

vent

gra

impo

inve

peri

costs for farrow-to-finish and 36 percent for finishing enterprises in 1984 (Crom 1988, p. 71). Primary feed for hogs includes corn and soybean meal. Most hog farmers, especially those with farrow-to-finish enterprises, also raise feed grains. In 1980, the average acreage of corn and soybeans for farrow-to-finish farmers was 295 acres in the North Central states and 244 acres in the Southeastern states. One-third of hog production units also had other livestock enterprises, principally cow-calf enterprises and cattle feeding (Van Arsdall and Nelson 1984).

Small hog farmers in the Midwest are likely to meet all their corn needs from on-farm production, but larger production units usually purchase a large percentage of feed grain. In the southeast and southwest, where corn is not grown, farmers must purchase all their feed grain needs.

The importance of discussing feed grains is twofold. First, some feed-sector participants are also involved in the hog subsector. Second, government programs affect the hog subsector through grain price supports. Feed grain companies and input-supply cooperatives are involved in the hog subsector via direct investment in production units and slaughter/processing facilities, as well as through joint-ventures and production contracts with hog farmers. Feed grain companies' role and influence on the subsector is important, because their broad capital base allows them to invest on a large scale and, if necessary, ride through a period of losses in establishing a market presence.

The largest hog production units are owned by feed grain and other food companies.

3.6.1 Input-supply Cooperatives

Although input-supply cooperatives serve a broad membership, only a percentage of which may be hog farmers, they are an important access for cooperatives into the hog/pork subsector. Input-supply cooperatives may expand into hog production and/or marketing. Examples are Land O' Lakes, Farmland, Gold Kist and Indiana Farm Bureau Cooperative Association. Inputs into hog production include bulk feed, feed supplements and premixed formula feeds for different life stages of swine. As mentioned above, feed costs can amount to almost 60 percent of the cost of production. Other inputs include veterinary supplies; medicines and tools; recordkeeping forms; and housing supplies, such as farrowing pens, waste treatment systems and fuel. Although cooperatives providing these inputs may not be considered primarily livestock-farmer cooperatives, they can play an important role, especially as the amount of off-farm inputs increases.

Input-supply cooperatives have focused most heavily on feed, fuel and veterinary supplies for hog farmers. Smaller farmers may purchase all specialized feeds while the averaged-sized farmer has some capacity to mix feeds. They may purchase specific nutrients or antibiotics to be added to feed and mix it themselves for the bulk of the feed they

use. However, they may still purchase some specialty feeds. In the Midwest, most hog farmers grow most or all of the feed corn needed and possibly soybeans as well. In the Southeast, hog farmers must purchase most or all of their feed. Thus location will influence the role of cooperatives in supplying inputs.

Indiana Farm Bureau Cooperative Association offers its Life Cycle Feeding Program, which includes specially formulated feeds for each stage of hogs' lives. It also offers animal health supplies. Sales of feed to hog farmers is a significant part of Land O' Lakes' business. The "seed" money to start their contract production program came from the feed division. Input-supply cooperatives are established organizations that hog farmers can use to provide more services as the need arises. In contrast, farmers purchasing inputs from IOFs may find it difficult to influence those organizations to provide more services, especially services which benefit farmers more than input suppliers.

Cooperatives established primarily as livestock marketing cooperatives are diversifying into supplying inputs. Animal health products and feed are two such areas. Michigan Live Stock Exchange offers animal health products, which farmers can conveniently purchase at the same time they deliver hogs. The cost of supplies can be deducted from farmers' livestock checks, if they desire. Equity, in Wisconsin, has entered into joint-ventures with feed

manufacturers to supply feed to members. In one case, Archer Daniels Midland has an agreement with Equity to loan money for feed purchases to cooperative members at subsidized interest rates. In the other case, DeKalb Feeds contracted with Equity to sell feed to members at better prices than farmers can obtain purchasing directly from DeKalb. By integrating into supplying inputs through their cooperative, farmer members may be able to obtain supplies at lower costs or with greater convenience than is available to them otherwise.

3.7 Financing

Cooperatives offer financial services directly to members. The farm credit crisis of the 1980s made banks more cautious in lending to livestock farmers (Hanson). As a result, some livestock farmers did not have access to sufficient funds to purchase inputs, livestock, etc., in quantities to run their operations at full capacity. Livestock-farmer cooperatives fill their members' credit needs in several ways. They include offering loans similar to those offered by banks, co-purchasing breed stock with farmers and livestock feeding programs, called fed hog programs (discussed in Chapter 4).

3.7.1 Loans

Farmland has two types of loan programs. In the first, it offers loans directly to farmers to purchase inputs or

li

a

Fi

th

Ne

of

is

Le

th

fa

co

lo

ne

th

bor

ext

Pec

far

per

loa

pas

fee

plus

prog

livestock. The cooperative is selective. Farmers must have a 50 percent debt-to-equity ratio and meet other criteria. Field-based loan officers work directly with farmers on their farms, which is very convenient for farmers (Farmland News, April 1990). In the second program, farmers are offered a line of credit through local cooperatives, which is used for purchases at that local cooperative. (Coop Leadership, Summer 1989, pp. 6-8). This arrangement assures the cooperative of a certain amount of business and prevents farmers from borrowing beyond their needs from the cooperative. Both of these types of loans fill niches of loans not offered by banks. Farmers may have financial needs in excess of what local banks can offer but smaller than regional banks care to deal with. Cooperatives can borrow large amounts from the Bank for Cooperatives when extra financing is needed to cover smaller loans to members.

3.7.2 Gilt Purchase Loans

Interstate Producers Livestock Association (IPLA) of Peoria, Illinois tailored loan programs to small hog farmers' needs with an "80-20 Program." Farmers put up 20 percent of the cost of purchasing gilts and the cooperative loans them the remaining 80 percent. Titles to gilts are passed to farmers, but they must agree to market their feeder pigs through the cooperative, paying back the loan plus any fees for buying gilts and selling pigs. This program is most often utilized by small or new hog farmers,

who

li

on

of

su

in

in

ad

pr

ad

es

he

pr

br

Ad

pa

pr

Tr

fe

Th

ca

as

go

who have difficulty getting loans from banks for raising livestock. It is a relatively small program for IPLA with only \$50,000-200,000 tied up in the program at any one time.

3.8 Government Intervention

The hog/pork subsector boasts of the independent nature of its businesses and non-reliance on government price supports. However, government intervenes directly and indirectly in every level of the subsector. Direct intervention includes regulations controlling feed additives, medications, environmental pollution, meat preservation practices and retail product labelling, in addition to import/export restrictions. U.S.D.A. has established hog and pork grades and standards. It provides health, sanitation and animal welfare inspectors. It also provides market price and quantity reporting services. A branch of the U.S.D.A., the Packers and Stockyards Administration, is concerned with competitive practices of packers including: structure, marketing, pricing and payment practices, and vertical integration. The Commodity Futures Trading Commission regulates live hog, frozen pork belly and feed-grain futures contract terms and trading practices. The Internal Revenue Service regulates tax incentives for capital investments and different business structures, such as corporations, partnerships and proprietorships. Indirect government involvement includes, but is not limited to,

fee

int

bar

par

con

pro

per

coo

sub

pro

org

dir

buy

auc

suc

and

pro

to

sou

hog

coop

feed-grain policies and dietary recommendations for nutrient intake (Hayenga et al. 1985, pp. 95-106).

These regulations affect the incentives, costs, bargaining power and profitability of subsector participants. They offer protection to trading partners, consumers and neighbors of farmers and slaughter/processors.

3.9 Summary

This chapter described structure, conduct and performance of the hog/pork subsector. Livestock-farmer cooperatives are involved in the levels of the hog/pork subsector from breed multiplying to selling fresh and processed pork. Most livestock-farmer cooperatives were organized to provide marketing services. Cooperatives directly purchase hogs at daily markets and act as order buyers for packers, in addition to maintaining traditional auction-markets. A group of midwestern cooperatives successfully began teleauction marketing.

Cooperatives coordinate pig production through purebred and hybrid breed stock multiplying, feeder pig certification programs and farrowing corporations. Farmland is planning to produce feeder pigs on a large scale to provide single source lots for members to finish. Forward contracting, fed hog programs and production contracts offered by cooperatives coordinate hog finishing. They are discussed

in C

mech

proc

proc

man

for

the

pr

pr

po

ta

Ex

by

re

g

p

d

c

s

v

in Chapter 4, which examines contracting as a coordination mechanism, comparing the hog/pork and broiler subsectors.

Other cooperatives are trying to influence member production and educate members. They plan to develop model production units with controlled genetics and intensive management practices. Advisory services would be available for farmer members to incorporate what has been learned in their own operations.

One U.S. cooperative, Farmland, owns slaughter and processing facilities. They sell branded processed pork products nationally and were innovators in marketing boxed pork. Farmland sells byproducts of slaughter, such as tallow and hides, and exports pork. Michigan Live Stock Exchange has hogs custom slaughtered, offers prime pork cuts by mail-order and supplies prime cuts directly to restaurants and institutions. Farmland also has mail-order gift selections. Land O' Lakes is considering entering pork processing in the future.

There has been a strong trend, especially in the last decade, for cooperatives to diversify the services they offer members. Some marketing cooperatives expanded into selling veterinary supplies and joint-ventures with feed companies. Financing is offered to cooperative members through extension of credit on input purchases until sale of hogs or pigs and financing of gilt and feeder pig purchases. Input-supply companies with excess feed-milling capacity are

diversifying by offering hog production contracts in addition to their traditional role as hog feed suppliers.

Roles of farmer cooperatives in the hog/pork subsector differ from one region of the U.S. to another. Regional differences, such as packer concentration, corn production, alternative farm enterprises and alternative employment options, influence the coordinating roles livestock-farmer cooperatives can perform.

me

Ap

co

wi

br

in

in

1)

co

pr

su

en

ho

su

hoo

CHAPTER FOUR

CONTRACTING AS A COORDINATION MECHANISM: COMPARISONS BETWEEN THE HOG/PORK AND BROILER SUBSECTORS

4.1 Introduction

This chapter examines contracting as a coordination mechanism within the broiler and hog/pork subsectors. Approximately 92 percent of U.S. broilers are produced under contract (Lasley et al. 1988, p. 17). This is contrasted with 9-12 percent of U.S. hogs (Rhodes 1990). Examining the broiler subsector experience may shed light on the importance contracting may play as a coordination mechanism in the hog/pork subsector. The following sections will:

- 1) describe the broiler subsector and broiler-farmer cooperatives;
- 2) examine the role of contracting for broiler production;
- 3) describe contracting in the hog/pork subsector by livestock-farmer cooperatives and other entities; and
- 4) analyze what lessons participants in the hog/pork subsector can learn from the broiler subsector.

4.2 Overview of the Broiler Subsector

Since integrated firms gained control of the broiler subsector in the 1950s there has been debate as to whether hog production would go the way of broilers. There are a

ni

co

st

ad

st

br

th

st

a

s

e

L

st

a

o

we

th

qu

br

an

th

fo

in

de

br

number of interesting structural elements that can be compared and contrasted between the hog/pork and broiler subsectors. It is beyond the purview of this research to address them all. Accepting the constraints of time and space, this research will focus on those features of the broiler subsector that have the most immediate applicability to the hog/pork subsector.

Broiler production shifted from a large number of small, supplemental enterprises on multi-enterprise farms to a small number of large production units controlled by slaughter/processors or feed dealers. Control was exercised either through production contracts or direct ownership. Location of production shifted as well, away from grain surplus areas of the midwest to grain deficit, labor surplus areas of the south. Technological improvements in the areas of feed conversion, growth rates and disease prevention, as well as changes in rail charges for grain transport, allowed the shifts in production unit size and location to occur.

Through the 1940s broilers were produced in small quantities on farms throughout the U.S. Levels of the broiler subsector operated independently. During the 1950s and 1960s, new technology was developed which gave producers the ability to control many poultry diseases. Feed was formulated and environmental controls were designed to increase the growth rates of broilers. Genetic lines were developed which increased broilers weight gain and amount of breast meat. Economies of size were associated with use of

th

po

sl

in

br

gr

fr

co

of

an

pr

ef

cor

it

a w

inc

oth

sub

bro

eggs

weig
v).

the new technologies. Feed companies were in the best position to formulate the required feeds at the least cost. Slaughter offal and waste were found to be inexpensive feed ingredients after rendering.

These and other factors led to the integration of broiler feed, slaughter and chick hatching operations. The grow-out of broilers and the production of hatching eggs from breed stock were two phases of production that were contracted out to farmers. Integrators maintained ownership of breeders, eggs and broilers and provided feed, medication and technical advice to growers. Large production units proved the most cost effective. Integrators required efficient large-sized production units of growers as a condition to granting a contract.

4.3 Levels of the Broiler Subsector

Before describing the levels in the broiler subsector, it is important to distinguish between the poultry sector as a whole and the broiler¹ subsector. The poultry sector includes turkeys, eggs, broilers, hens and roosters and other minor poultry, such as cornish game hens. The subsectors are interactive. For example, production of broilers depends on production of hens, roosters and broiler eggs. The focus of this chapter will be on the broiler

¹Broilers are young chickens produced for meat. They weigh 3-5 pounds and are 6-8 weeks old (Lasley et al. 1988, p. v).

sub

thu

bre

sla

and

est

are

fee

mil

fur

int

con

par

The

liv

act

suc

29)
evi
pro
hea
bre
raw

subsector as it is the major producer of poultry meat and thus most comparable to the hog/pork subsector.

Levels in the broiler subsector include egg laying by breeder hens, hatching chicks, growing-out broilers, slaughtering, cutup, further processing², meat wholesaling and sales in retail, institutional and away-from-home eating establishments. Offal and waste from slaughter and cutup are sent to rendering plants where offal is converted to feed ingredients to be mixed with grain in feed mills. Feed mills provide breeder and broiler feed. Figure 8 shows the functions of a typical integrated broiler firm.

4.4 Structural Change in the Broiler Subsector

Although the broiler subsector has been viewed as fully integrated and highly concentrated for over 25 years, it continues to experience structural change. The trends parallel structural change in other livestock subsectors. The "simultaneity" of structural change throughout the livestock sector brings home the dynamic nature of economic activity and the importance of looking beyond a broad label such as "integrated" in analyzing a subsector.

²Further processing is defined by Lasley et al. (1988, p. 29) as "a level of processing which extends beyond the eviscerated carcass or cutup stage. It involves a change of product form in which the raw carcass or meat is frozen, heated, boned, sliced, smoked, formed into patties and breaded, or otherwise altered in flavor or texture from the raw state."

Fig

Sour

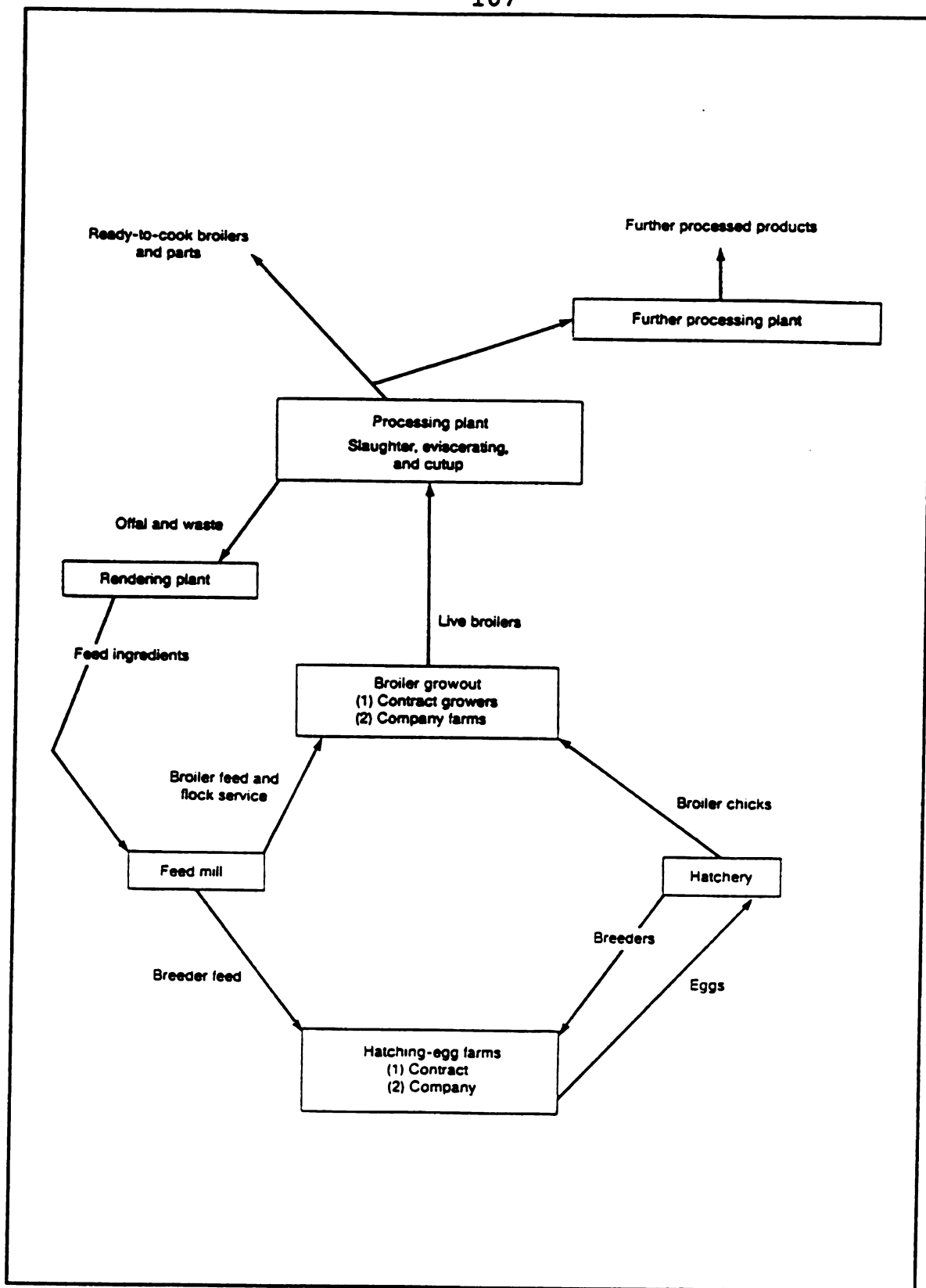


Figure 8. Functions of a Typical Integrated Broiler Firm

Source: Lasley, et al., 1988

a

C

c

1

a

c

f

r

y

c

t

5

p

I

p

p

b

no

an

re

po

po

By

4.4.1 Basic Conditions

Per capita purchases of broilers have been increasing and are predicted to continue to do so for some time. Consumption of broiler meat has risen since the 1950s. Per capita consumption was 23.4 pounds in 1960, 36.5 pounds in 1970, 46.7 pounds in 1980 and 60.3 pounds in 1987 (Lasley et al. 1988, p. 6). Industry analysts estimate that per capita consumption could reach 75 to 95 pounds by the year 2000. A four percent annual increase in per capita consumption would require a 70 percent expansion in broiler production by the year 2000 (Lasley et al., 1988, pp. 63-64).

The rapid growth of broiler consumption is in sharp contrast to the stagnant consumption of beef and pork since the mid-1970s. By 1985, per capita broiler consumption was 55.5 pounds, just shy of consumption per capita of pork, 62 pounds, while beef consumption per capita was 79.1 pounds. In 1960, per capita broiler consumption was just 23.4 pounds, pork consumption was 60.4 pounds and beef was 64.2 pounds (Bunch; Crom 1988).

Relative retail prices for broilers versus pork and beef indicate one reason for the differences. In 1960, nominal prices for broilers, pork and beef were 42.4, 55.9 and 80.2 cents per pound, respectively. The ratios of the relative prices were about 1:1.5:2, i.e., the price of a pound of pork was about one and one half times that of a pound of broiler. Beef was about twice the price per pound. By 1985, prices were 76.3, 162 and 233 cents per pound,

respectively. The ratio of relative prices was 1:2+:3 (Blazer; Crom, 1988). Thus, over the decades, broilers have become a cheaper protein source relative to pork and beef. Coupling lower prices with concerns over higher cholesterol levels in red meats gives an indication of why the quantity of broilers purchased has increased.

4.4.2 Number and Size of Firms

As stated above, approximately 92 percent of broilers are produced under contract, while the remaining 8 percent are produced on integrator-owned farms (Lasley et al. 1988, p. 17). The number of integrated broiler firms has declined as the size of units has increased. The number of multi-plant firms has increased. The number of poultry integrators exceeds 50 firms. In 1984, the four largest firms (CR4) slaughtered 34 percent of total broilers. CR4 was 17 percent in 1974 and approximately the same in 1964. The eight largest firms (CR8) slaughtered 51 percent in 1984. CR8 was 28 percent in 1974 and 1964 (Lasley et al. 1988, p. 24). The 10 largest firms grew under contract and slaughtered 70 percent of broilers by 1990 (Rahn).

There has been much turnover in ownership of top firms due largely to buy-outs by other firms to achieve higher market share (Lasley et al. 1988, p. 24) This merger activity parallels that in beef and hog slaughter plants. The number of farms producing broilers has also declined, while the average size of production units has increased.

In 1959, 42,185 farms produced broilers and meat-type chickens. By 1982, the number had dropped to 30,100 farms. Broilers raised per farm increased from an average of 33,657 in 1959 to 116,844 in 1982. In 1982, 13,214 farms selling over 100,000 birds produced 89 percent of broilers sold, averaging 237,000 birds per farm.

Location of broiler production has shifted to the southern states and east coast. In 1987, 66 percent of production was in the South, 14 percent was in the Delmarva Peninsula and the Shenandoah Valley, 4 percent in California and 16 percent in other regions. The top ten states in the country produce 85 percent of broilers. California is the ninth largest and only non-southern state in the top 10 (Lasley et al. 1988, p. 10).

4.4.3 Product Differentiation

The broiler subsector is adopting product differentiation as the industry standard. The forms of product differentiation discussed will include cutup, further processing and branding of broilers. Cutup volume tripled between 1975 and 1985 (Lasley et al. 1988, p. 31). More than 60 percent of processors' volume was cutup in 1987 (Broiler Industry 1988a, p. 13) up from 53.4 percent in 1985 (Lasley et al. 1988, p. 31).

There is movement toward further fabrication and processing by integrators and meat processors. Large integrators have multiple plants, including specialized

plai

plai

bro

fur

pp.

pro

and

pro

et

bet

4.4

con

mor

abo

lab

p.

near

ind.

with

from

food

incr

1983

rema

plants which further process broilers. Further-processing plants are located close to slaughter plants. Integrated broiler firms further process over half the total volume of further-processed broiler meat (Lasley et al. 1988, pp. 31-33). In addition to broiler integrator firms, meat processors further process broilers as well as other poultry and red meats. The volume of further-processed broiler products more than doubled between 1979 and 1985 (Lasley et al. 1988, p. 33) but then leveled off at about 18 percent between 1985 and 1987 (Broiler Industry 1988a, p. 12).

4.4.3.1 Branded Product

The number of broiler processors with consumer brands continues to increase. Firms marketing three million or more broilers a week have consumer brand programs. In 1987, about 52 percent of all broilers were sold under a brand label, up from 39 percent in 1983 (Broiler Industry 1988a, p. 13). Of the total volume of broilers carrying a brand, nearly all carried the processors' own brands. This would indicate a predominance of regional brands. The few firms with national brands purchase little, if any, broiler meat from other processors to carry their brand label.

Direct shipments by processors to retailers and fast-food outlets are increasing. This could be due to the increasing volume of prepackaged broilers (Broiler Industry 1988a, pp. 12-13). The primary market outlet for broilers remains retail grocery stores, with 47 percent of the volume

in 1987. Public eating places received 43 percent. Fast food is the most rapidly growing segment in this category, with one-third of total marketings in 1987. Export sales were less than one percent. Reshipment to other distributors was five percent (Broiler Industry 1988a, pp. 13-14).

4.5 Performance of the Broiler Subsector

The broiler subsector has performed well with respect to economic efficiency and progressiveness. The increased quantity of broiler meat consumed per capita can be attributed to the lower cost of broilers relative to other meats coupled with rising consumer incomes³ and shifts in preferences away from red meat towards poultry due to health concerns.

The integrated organization of the subsector allowed rapid widespread adoption of new technology. Broilers reach market weight 1-2 days earlier each year. In the decade of the 1980s, grow-out time for each brood has declined by about two weeks. In combination with reduced average time between broods this has permitted growers to raise one more brood per year. Broilers are also being fed to heavier weights. These factors contributed to growers increasing

³Broiler consumption was discussed above. As consumer incomes rise, the total quantity of meat consumed per person also rises. Total meat consumption rose from 178.1 pounds in 1960 to 212.8 pounds in 1970, 221.1 pounds in 1980 and 230.4 pounds in 1985 (Bunch).

their output by one-third between the mid-1970s and mid-1980s (Lasley et al. 1988, p. 20).

One area where the broiler subsector has not performed as well is in price stability. Wholesale prices and total costs have been highly variable since 1955. Net returns for whole broilers varied relatively more than either costs or wholesale prices, since net returns are determined by product prices as well as costs. For 22 of the past 33 years, net returns were within two cents per pound of the estimated breakeven point. Thus, small changes in either costs or prices can result in large relative changes in returns. Net returns averaged 1.1 cents per pound over the 33-year period 1955-1988. Lasley et al. (1988) cite fluctuating feed prices as the major cause of change in net returns for broiler companies since 1973.

Broiler integrators adopted product differentiation as a risk-reduction strategy. Integrators found that cutting and further processing adds more profit per unit, expands their market volume and contributes to volume and price stability (Lasley et al. 1988, p. 16).

4.6 Broiler Production Contracts

The next section describes the typical terms and conditions of broiler production contracts. The extent of contracting in the hog/pork subsector is discussed. A section on the use of contracts by livestock cooperatives follows.

4.

(f

co

gr

ho

li

co

et

ex

fe

li

gr

pra

ear

thu

fac

con

pay

gro

gro

gro

also

cert

4.6.1 Terms and Conditions of Broiler Production Contracts

Contracts specify the responsibilities of the growers (farmers) and contractors (integrated broiler firms or cooperatives) and methods of payment. In typical broiler grow-out contracts, growers are responsible for providing housing, equipment, labor, water and all or part of fuel and litter. Facilities must meet or exceed standards set by contractors as to size, climate control, waste disposal, etc. This may require new investment by growers to build, expand and/or update facilities.

Contractors provide and maintain ownership of chicks, feed, medication, transportation and part of the fuel and litter. They provides field agents who visit all the growers at least weekly to train new growers in management practices, maintain contacts and spot potential problems early.

Contractors set the delivery and pickup schedules and thus determine the percentage capacity usage of growers' facilities based on anticipated supply and demand conditions. Once contracts have been signed establishing payment terms, contractors exert the most control over grower returns by placement decisions. This concerns growers because in lean times, inefficient or distant growers may be dropped at the end of the contract. It would also appear to allow favoritism by contractors towards certain growers.

di

pe

pe

sal

fe

(b

un

Po

po

th

wo

pp

4

eg

pa

sc

un

f

e

t

t

s

s

r

However, tournament payment terms of the contracts discourage favoritism. Payment terms and their effect on performance are discussed below. Briefly, the average performance of a group of growers marketing broilers in the same week is determined with respect to total weight and feed-conversion ratios. Each grower performing above (below) average is paid a set amount more (less) for each unit of performance above (below) the average of the group. For example, a typical incentive awarded is 0.1 cent per pound for each 0.1 point advantage in feed conversion over the average for the group of growers. Growers below average would be penalized at the same rate (Lasley et al. 1988, pp. 19-20).

4.6.2 Contracts for Suppliers of Poults and Hatching Eggs

Contract terms for suppliers of poults and hatching eggs are similar to those for broiler growers; however, the payment method differs. Instead of a tournament payment scheme, suppliers are paid an established flat fee for each unit of product plus (minus) an incentive (penalty) for feed-conversion ratios above (below) a standard level established in the contracts. This differs from the tournament payment because suppliers are not grouped and their performance averaged. Rather, the performance standards they are expected to meet are established prior to signing the contracts. Therefore, suppliers, whose performances are not judged on the basis of tournaments,

bear more of the risk of variable returns due to bad weather, poor quality chicks and feed, etc. than do contract broiler growers.

4.7 Contract Production of Hogs

This section addresses the current state of contract production of hogs: the contractors, contractor motivations, the growers, grower motivations, common terms of contracts, and grower returns to contracting.

4.7.1 How Much Contracting is Occurring?

Rhodes estimated about 10 percent of domestic slaughter hogs in 1988 were produced under contract. Many contractors produce their own feeder pigs and/or hogs, in addition to contracted hogs. Large contractors were less likely to produce their own feeder pigs or market hogs than were small contractors⁴. Small contractors produced and marketed two percent of total U.S. slaughter in 1988 on their own, in addition to the hogs they produced under contract. If own production by contractors is included, 12 percent of slaughter hogs in 1988 can be said to be produced under contract (Rhodes 1990, pp. 18-19).

⁴Large contractors are defined as those with over 50,000 head.

be

ho

co

fi

co

ti

co

Tr

me

a

co

r

p

f

c

O

t

r

o

4.7.2 Hog Production Contractors

Vertical integration and contracting can take place between farmers producing feeder pigs and those finishing hogs or between farmers and packers, feed companies, cooperatives and/or food corporations. In this study the firm offering the farmer a contract is referred to as the contractor and the farmer producing swine is referred to as the grower. In Rhodes' survey (1990), 68 percent of the contractors surveyed identified themselves as farmers. Twenty-one percent said they were feed dealers and/or feed manufacturers. Eight percent identified themselves as other agribusinesses. Three percent said they were big contractors.⁵

Big contractors in the Rhodes' survey (1990) were responsible for 51 percent of contracted market hogs and 63 percent of feeder pigs. Feed-related businesses contracted for 27 percent of hogs and 9 percent of pigs. Farmers contracted for 18 percent of hogs and 25 percent of pigs. Other agribusinesses contracted for four percent of hogs and three percent of pigs.

4.7.3 Reasons for Offering Contracts

Contractors choose to offer contracts for three main reasons: 1) to assure supplies of breed stock, feeder pigs or slaughter hogs; 2) to assure demand for commodities or

⁵The categories are not mutually exclusive.

services supplied by contractors; and 3) to diversify an investment portfolio.

Crom (p. 39) points out that actions to improve coordination such as contracting and integration have taken place in livestock subsectors when the "market failed to yield a dependable supply or when quality control needed improvement." To assure supplies and/or quality, feeder pig and farrow-to-finish farmers may contract with breed-stock farmers. Finishers may contract with feeder pig farmers. Packers may contract with finishers or farrow-to-finish farmers.

To assure an outlet for their feeder pigs, feeder pig farmers may contract with other farmers to finish their pigs. Having an assured outlet for feed may motivate many contractors. Rhodes (1990, p. 47) found 89 percent of big contractors and 17 percent of farmers who offered contracts had feed dealer or feed manufacturer connections. Veterinarians, professional farm managers or others with specialized skills that can be utilized in raising hogs may offer contracts. Farmers may wish to expand their operations without assuming much risk (McDaniel et al., p. 2).

Investors wishing to diversify their investment portfolio into livestock, but unwilling or unable to provide the necessary labor, facilities and equipment, may offer contracts (McDaniel et al., p. 2). Participants at one level of the hog/pork subsector may want to capture benefits

a

p

e

h

m

l

r

f

c

c

p

h

s

pe

co

gr

in

ab

wi

ne

co

inc

at an additional level in the subsector. Another level may profit when the primary level is suffering losses. For example, when feed prices are low, hog finishers may make a higher than normal profit. When hog prices are low, packers may receive higher profits. Involvement at more than one level in the subsector may modify fluctuations in net returns.

4.7.4 Contract Growers

The average grower is male, in his 40s, was a hog farmer prior to contracting and has contracted with the same contractor for about three years. About 39 percent began contracting recently, in 1987 or 1988 (Rhodes 1990, pp. 48-49). Approximately 21 percent of growers were not hog farmers prior to contracting, but this varied significantly by region. Southern regions had the highest percentages of growers new to hog farming entering into contracts. Fifty-three percent of South Atlantic region growers and 69 percent of South Central growers were not independent prior to contracting. Big contractors were about twice as likely as farmers to contract with growers with no prior experience. Big contractors usually require new growers to set up large operations.

Growers derived about one-third of family income from contracting. The percentage increased as size of operation increased. Those who began contracting in the 1980s derived

Q
S
R
R
i
b
w
C
t
u
u
a
C
M
Y
st
19

br

a larger percentage of family income from contracting than those beginning in the 1970s and earlier (Rhodes 1990, p. 60).

4.7.5 Why Do Growers Contract?

The most common reasons given for becoming a contract grower are financial, listed by 25 percent of growers surveyed, and to reduce market price risk, listed by 18 percent of growers surveyed. Other reasons listed in the Rhodes' survey (1990, p. 38) in declining order of mention, included: better and/or more steady income, assured market, better cash flow, a way to get started, less burden to work with someone and better livestock. Growers in the North Central region mentioned financial reasons more than did those in other regions. Other reasons include: 1) to use under-utilized facilities (McDaniel et al.); 2) to expand or update facilities with an assured income to pay off loans; and 3) to learn new management techniques and skills from a contractor's program. Large contractors were rated as being more helpful in improving grower production efficiency. Younger growers, growers with larger operations and breed-stock producers found contractors the most helpful (Rhodes 1990, p. 39).

4.7.6 Types and Terms of Contracts

Four types of contracts were offered. Farrow-to-finish breed-stock production accounted for four percent of all

col

Fa

Fe

ac

ty

pr

co

ge

an

sy

p

in

o

t

a

o

r

l

r

a

contracts included in the Rhodes' survey (1990, p. 27). Farrow-to-finish market hogs accounted for nine percent. Feeder pig production accounted for 37 percent. Finishing accounted for 62 percent. Most growers specialize in one type, but a combination of the four types may also be practiced.⁶

4.7.7 Responsibilities

The most common division of responsibilities between contractors and growers is discussed below. Contractors generally provide breed stock or feeder pigs, feed, medicine and veterinary care, and transportation. They may require specific management practices be used. They may also provide field people to train new growers or expand management capabilities of growers. Contractors maintain ownership of and usually provide insurance for hogs and their offspring. They have the right to inspect the herd at any time. Contractors determine when and where feeder pigs or hogs shall be marketed.

Growers usually provide facilities, utilities, access roads and loading chutes for trucks. They also provide labor and day-to-day management. For example, they keep records as well as performing minor medical procedures, such as clipping eye teeth of piglets. They may be required to

⁶ This explains why the total exceeds 100 percent.

hav

mus

sp

ho

th

it

wh

te

we

gr

gr

gr

co

co

mo

li

s:

ex

th

ha

have liability and casualty insurance. In some cases, they must also insure the contractors' hogs and pigs.

4.7.8 Terminating Contracts

Contracts can be terminated by either party with a specified amount of notice. Growers are obliged to keep hogs on the premises until they reach market weight even if the contract is terminated prior to that time. This makes it inconvenient to end a contract at any time other than when pigs or hogs reach market weights. If the contractor terminates the contract at some time other than at market weight of pigs or hogs because of dissatisfaction with the grower, they may send in personnel to care for hogs on the growers' premises. Contracts are binding on heirs of growers.

Rhodes found evidence that growers do switch contractors. Midwest growers switched the most, where contractors are more numerous and contracting tends to be more transitory. Contractors also dropped growers. The likelihood of having done so was positively related to the size of the contractor and the length of their contracting experience (Rhodes 1990, pp. 34-35). Larger contractors and those with more contracting experience were more likely to have dropped growers.

4.7.9 Payments

The most common payment for all types of contracts is a fixed payment per head when pigs or hogs are marketed. The percentage of growers receiving fixed payments ranged from 50-73 percent. The next most common for finishers, at 33 percent, was payment on arrival of pigs plus final payment after marketing. A daily fee was paid to 20 percent of finishers. Payment of cents per pound was second most common according to 12 percent of the feeder pig growers. Formula pricing related to current market prices for feeder pigs was a close third at 11 percent. Profit sharing was the least common for both finishing and feeder pig production at 1-3 percent.

About 52 percent of growers reported receiving incentive payments in addition to fixed payments. For finishers, the incentives were based on daily weight gain, feed efficiency and low death losses. For feeder pig growers, the incentives were based on pigs saved per year, pigs weaned per litter, low sow death loss and whole herd feed efficiency, among others. They may also receive a monthly payment for each sow and/or boar maintained (Rhodes 1990, pp. 53-59).

4.7.10 Financial Returns to Contracting as Opposed to Market Transactions

A question of interest to most hog producers is whether returns to contract production are lower than, equal to or

g

p

t

d

t

b

h

s

t

i

(

d

c

c

t

p

r

g

s

p

ac

greater than returns made by independent producers in the past. Also of interest is the projection for returns over the next 5-10 years. Obviously, the answer will vary depending on the situation of each producer and the specific terms of the many contracts. Rhodes found payments reported by those growers surveyed in 1987-1988 to average \$12.67 per head for feeder pigs and about \$7-\$9 per head for finished slaughter hogs. Broad ranges of payments were reported due to the diversity of contract terms and the use of incentive/penalty plans for performance in most contracts (Rhodes 1990, pp. 53-61).

Knowledge of returns per hog without cost information does not indicate profitability or address long-run considerations of returns sufficient to cover replacement costs of facilities and equipment. Rhodes tried to address the long-run consideration of whether contracting was profitable enough that farmers could maintain and eventually replace their facilities. The answers he received were growers' opinions only since their actual financial situations were not disclosed in the survey. Rhodes (1990, p. 7) found:

"Eighty-nine percent of growers said their contract income was enough to maintain adequately their hog buildings but only 36 percent thought it adequate to replace them. However, 47 percent of the strictly pig producers and 46 percent of the farrow-to-finishers thought they could replace compared to 24 percent of the finishers."

The situation for contract growers would need to be accurately measured and then compared to the situation for

inde
whet
unfa
and
yet
1979
cate
cos
wer

coo
wit
men
cha
for
Coo
in

co
an
fa
se

independent farmers before any statement can be made as to whether contract grower returns compared favorably or unfavorably with independent farmers running the same types and sizes of operations. This type of information is not yet available. Crom did find that in the period of 1979-1981, farrow-to-finish independent farmers in all size categories were unable to cover cash and capital replacement costs from receipts. Only those farms with over 10,000 head were able to do so between 1983 and 1985 (Crom 1988, p. 78).

4.8 Use of Contracts by Livestock-farmer Cooperatives

Livestock-farmer cooperatives are using contracts as a coordination mechanism in several ways. Equity's contracts with feed companies to provide a major input to hog farmer members at lower costs were discussed in the previous chapter. Contracts to be discussed in this section include forward market contracts and production contracts. Cooperatives' use of contracts for production are examined in the broiler subsector as well as the hog/pork subsector.

4.8.1 Forward Market Contracts

Forward contracts can be made between farmers and their cooperatives, cooperatives and packers, or between farmers and packers. The current use of forward contracts by farmers and their cooperatives is discussed in the next sections. A criticism with respect to the usefulness for

improving coordination of forward contracts as they are currently used follows.

Cooperatives may offer forward market contracts to livestock farmer members. Contracts specify the quantity, quality, time of delivery and price. Prices received are discounted by the cost to the cooperatives of providing the forward contracts. The quantity contracted is typically a fraction of the size of a futures market contract for the livestock. Cooperatives hedge in the futures market to reduce their risk in offering the forward contracts. Forward contracts have the advantage of allowing farmers to hedge against market price risk without the expense and constant attendance to price fluctuations and margin calls required by futures market trading. Cooperatives take delivery of the hogs and market them where they think they will receive the highest returns.

Forward market contracts are offered to farmers by all the livestock-farmer cooperatives participating in this study. Farmers, however, do not use these forward market contracts as advance planning mechanisms prior to making decisions to breed sows or purchase feeder pigs. Instead, they are usually entered into a month or so before the hogs go to market when farmers believe the price may drop below that currently offered in the contract.

f)

of

pr

co

we

\$:

su

de

de

kr

fa

Co

ri

li

Co

im

li

de

co

de

pa

in

su

to

4.8.1.1 Market Outlet Contracts

Livestock-farmer marketing cooperatives may take bids from several packers, then forward contract to deliver loads of hogs to the packers with the highest bids. The actual price received is determined by formula. For example, the cooperative contracts to deliver 10 loads of 200 hogs each week for six months. The price is a set premium, such as \$3 per head, above the spot price in a large auction market, such as St. Louis, Missouri, the week the hogs are delivered. The cooperative is assured a market.

If they contract with farmers, cooperatives can make decisions as to how many hogs to contract for after they know the terms they will receive from packers. They still face the uncertainty of spot market price fluctuations. Cooperatives may hedge on the futures markets to reduce this risk. Forward contracts as they are currently used play little role in price determination (Shaffer 1989, p. 18). Contracts entered into after production decisions are implemented serve only to coordinate location and, to a very limited extent, timing of delivery. Contracts ending with delivery of hogs to cooperatives which have not forward contracted with packers do not serve to match supply with demand. A system of forward contracting from farmers to packers would serve to reduce the macro problem of price instability. Shaffer (1989) has addressed the components of such a system in his paper entitled, "A Market Alternative to Farm Price Support Programs: Full Participation

Contracts for Future Delivery." Use of forward contracts by livestock-farmer cooperatives as coordination mechanisms is discussed further in Chapter 5.

4.8.2 Cooperative Marketing and Production of Broilers

Cooperatives have been involved in the marketing of broilers since the 1940s. Broiler-farmer cooperatives that survived the 1970s and 1980s adapted their business to the most modern methods. Thus they were able to meet their IOF competition head on. Broiler-farmer cooperatives organized their operations similar to that of the typical integrated broiler firm described above. The cooperatives own hatching, slaughter, processing, offal-rendering and feed milling facilities. Production of laying poults (breed-stock multiplication) and hatching eggs are contracted out to farmers who are not cooperative members. Growing out chicks to broilers is contracted out to farmers who are cooperative members. As in the case of the integrated broiler firm, the cooperative provides chicks, feed, medication, transportation and technical support to contract growers.

There is one curious difference between producers of poults and eggs and producers of broilers. Producers of "inputs", poults and eggs, are not cooperative members. Producers of "outputs", broilers, are cooperative members. One explanation for this may be due to problems associated with pooling the contributions of all cooperative members.

Purchasing inputs outside the cooperative avoids the problem of valuing the contribution of input suppliers. Just as the cooperative manager and staff, suppliers of human resources, are paid a "market wage" for their services, suppliers of poults and hatching eggs, despite the fact that they are also farmers, are paid the market rate for their inputs. Contracting for these inputs, as opposed to open market purchases, is necessary because of their specialized nature in form and timeliness.

Typically, cooperatives marketing broilers are engaged in diversified services: egg and fowl marketing, livestock feed manufacture, crop marketing and possibly other livestock production and marketing, such as hogs. Thus broiler-farmer members often constitute a minority of farmer members. Broiler operations are viewed as risky due to widely fluctuating returns. For this reason, broiler operations are operated as a separate division of the cooperative. Patronage refunds of broiler-farmer members are tied to the success of the broiler division alone. In some cooperatives, broiler-farmer members are not eligible to receive any patronage refunds because other farmer members perceive a disproportionate amount of resources and risks are involved in broiler operations (Mather and Drewniak 1984, p. 43).

Gold Kist, a diversified cooperative, is the third largest broiler producer in the United States. Its broiler operations are run in the manner described above. The

c

h

c

a

h

(

n

P

P

i

s

c

r

w

f

h

L

t

S

p

f

ar

cooperative was originally formed by cotton producers. They began selling poultry feed in the early 1940s. By the end of the decade, the cooperative began acquiring facilities and providing financing for members wanting to produce broilers to supplement declining returns to growing cotton (Mather and Drewniak 1984, p. 43). In 1988, Gold Kist had nine slaughter/processing plants, one of which also further processed broiler meat (Broiler Industry 1988b, p. 48).

The next two sections discuss contracts involving production of feeder pigs and/or slaughter hogs. The first is a financial arrangement for production of hogs. The second requires more direct involvement in production.

4.8.3 Fed Cattle and Hog Programs

Fed cattle and hog programs evolved from the financial crisis in agriculture in the early 1980s. Due to the relatively high risk of loans to livestock feeders, banks were unwilling to loan livestock farmers sufficient funds to fill their feed lots. Livestock owners were faced with higher unit costs due to excess feed lot capacity. Livestock-farmer marketing cooperatives were, however, able to borrow from the Bank for Cooperatives. Michigan Live Stock Exchange began a program wherein it purchased feeder pigs and cattle with bank loans and placed them on member farms to utilize the excess capacity.

The Michigan cooperative maintains ownership of the animals, but the member feeds them to market weight. They

are then sold by the cooperative at market prices. The cooperative collects for the expenses on the loan needed to purchase the animals plus other expenses and service charges associated with buying and selling the animals. It returns the rest of the money to the producer members. Farmers bear production and market price risk but lower their per-unit production costs by fully utilizing facility capacity.

When Michigan Live Stock Exchange's program proved successful, other medium-sized Midwestern cooperatives designed feeding programs of their own. They include Equity of Wisconsin, Interstate Producers Livestock Association of Illinois, Indiana Farm Bureau Cooperative Association and Producers Livestock Association of Ohio⁷.

Livestock-farmer cooperatives have several advantages over commercial banks in managing the risks of livestock feeding. Cooperatives have personnel with the knowledge to monitor the care of the hogs. They have the facilities to sell the animals in the event a farmer does an unsatisfactory job. It is more difficult to sell hogs in the event of problems than it is to sell feeder cattle. There is no well defined market for hogs between feeder pig and slaughter weight due to disease problems when mixing

⁷As noted in Chapter 3, Table 5, in 1991 Michigan Live Stock Exchange bought the facilities of Producers Livestock Association of Ohio and entered into a two-year management contract to run the livestock marketing operations of Indiana Farm Bureau Cooperative Association.

1
t
S
a
S
h
d
m
h
a
t
re

lots of hogs. The problem is less likely to arise with cattle, as they can be sold at any weight.

Hog farmers interested in contracts for feeding hogs need to be carefully screened prior to entering into contracts. Cooperative personnel may be in a better position than bank personnel to judge farmers' finishing capabilities. Cooperatives are likely to have purchased from or sold hogs for farmers interested in contracts and have seen the quality of their hogs."

To date, cooperatives have focused on careful screening of producers rather than on monitoring of management practices of producers on contracts. Fed hog programs have been viewed as finance programs with relatively little attempt to influence hog production management decisions. If the demand for contracts increases, cooperatives may need to take a more active role in production decisions. Since the cooperatives purchase the animals, they could prescribe genetic makeup. They could also require specific facilities and production practices if they had the capacity to monitor growers. Banks or other IOFs financing hog finishing don't have an incentive to influence management production decisions, because the return they receive from loaning money is set in advance and not dependent on the quality of hogs sold. Livestock-farmer cooperatives that market hogs are in a position to capture some of the benefits of training hog farmers in better management techniques and requiring hogs with specific genetics. Hogs that better

m

o

c

l

a

h

b

t

c

c

a

e

w

b

C

i

t

can

far

pig

in

of

coop

the

buyi

meet packer demands bring premium prices. Cooperatives' ongoing relationship with trained farmers allows them to continue to capture benefits of offering training.

Cooperatives may be better able to deal with many small loan amounts for a short period of time. Hog feeding loans are for about four months. Transactions costs for banks are high for small, short-term loans. If instead, commercial banks can make one large, long-term loan to a cooperative, transactions costs for the banks are reduced. Transactions costs of many small loans to cooperative members by the cooperative still exist. However, if cooperative personnel are able to make fewer "bad" loans because of their expertise in hog production and marketing and familiarity with farmers, overall costs of making hog-feeding loans may be less through the cooperatives than through the banks. Cooperatives also obtain marketing fees in addition to interest repayment. Extra hogs help the cooperatives use their facilities and staff to higher capacity.

There are added advantages to farmers. Cooperatives can assist farmers' cash flow by purchasing feeder pigs from farmers and allowing farmers to finish those same feeder pigs under the cooperatives' hog feeding program. Producers in need of cash after feeder pigs have reached market weight of about 42 pounds can turn ownership of pigs over to the cooperative. If they have access to feed, they can finish the pigs to slaughter weight and repay the cooperative for buying and selling commissions, in addition to the cost of

ser

"of

pro

oth

4

coo

pro

of

pr

fe

br

af

fa

ch

co

pr

de

pr

(G

pr

gr

fac

cor

De

servicing the loan. The "loan" from the cooperative is an "off-the-books" transaction and does not affect the producers' balance sheet in obtaining loans for inputs or other enterprises.

4.8.4 Feeder Pig and Slaughter Hog Production Contracts

Gold Kist, Cenex/Land O' Lakes and Farmland, large cooperatives with feed milling facilities, offer hog production contracts. Since the early 1970s Gold Kist, one of the largest broiler producers discussed above, has also produced hogs under contract with farmer members. Its feeder pig and slaughter hog contracts are modeled after its broiler contracts. Gold Kist began contracting for hogs after purchasing two hog slaughter facilities. As the facilities became outdated and unprofitable, the cooperative chose to sell them. However, it continued to honor its commitment to hog farmer members by continuing its production contracts. Gold Kist now forward contracts for delivery of slaughter hogs with packers in the region.

As of 1989, Gold Kist had 14 contract hog growers producing .12 percent of the nation's total slaughter hogs (Glover). Contract growers are required to build new production facilities to Gold Kist's specifications. The grower is responsible for obtaining a loan for the facilities. Gold Kist will help by explaining their contract program and its success to the bank, if necessary. DeKalb breed stock is drawn from Gold Kist's pork centers,

1
r
s
b
b
r
t
to

discussed in the previous chapter. Gold Kist maintains ownership of breed stock and their offspring. Growers are trained in Gold Kist's management plan. Field people visit contract farms weekly to offer suggestions and answer questions.

Feeder pig production contracts are distinct from finishing contracts even if the same grower produces both. This provides the cooperative more flexibility to reallocate or sell feeder pigs. Payment terms differ between feeder-pig and finisher contracts. Feeder-pig farmers are paid a flat fee per pig. The payment is based on a base price originally derived from market prices for feeder pigs minus the cost of inputs provided by the cooperative. Incentive bonuses and discounts for performance with respect to factors such as feed efficiency and number of pigs/sow/year are added to the base payment. Growers must meet minimum standards set forth in the contract with respect to such factors as culling rate, feed efficiency and number of pigs/sow/year.

Payments for hog finishing contracts are based on a fixed amount, entitled an "advance", upon delivery of slaughter hogs for marketing. The amount of the advance is based on the total pounds of weight gain times an amount based on feed efficiency. The lower the feed-conversion ratio the higher the advance payment per pound of gain. At the end of the fiscal year a patronage refund is distributed to growers if the hog division is profitable. Market price

risk is thus pooled among producers. Those selling in low priced weeks will not be penalized relative to those selling in high priced weeks. The amount of the patronage refund is based on the number of slaughter hogs sold through the cooperative in that year.

Gold Kist's personnel decides when to market hogs and/or feeder pigs. Hogs are sold under the terms of forward contracts Gold Kist has entered into with packers prior to making production plans. The Gold Kist contract production plan requires growers to meet strict standards. As a result, their farmers have high performance results compared with industry averages and with performance results of contracting programs in the Midwest (Glover; Peterson).

Gold Kist's plans for the future do not include a push for expansion of hog production contracts, but it will remain open to farmers interested in contracting and able to raise the capital, about \$500,000, to build the hog production facilities Gold Kist requires of its growers.

4.8.4.1 Regional Differences

Midwestern cooperatives and corporations considering production contracting face a different environment than southeastern businesses. There is a different political and economic climate in the Midwest. The Midwest has been the traditional hog raising area and has established institutions in the hog/pork subsector. In the southeast, traditional institutions did not have to be usurped to

c
t
m
s
we
sk

establish contract operations. Instead the institutions developed within the contracting framework.

The political environment in the Midwest is to protect the investment in specific assets made by actors in the hog/pork subsector. Specific assets include: 1) physical assets; buildings and equipment; 2) physical assets in businesses in the hog/pork subsector and profits from those businesses, and 3) human assets; labor and management abilities. Protection of specific assets takes place in the political arena via various laws restricting "corporate" farming, but the political impetus arises from a grassroots level of resistance to change from individual farmers. Thus, a company wishing to contract must persuade potential contract farmers and be subject to criticism from other farmers who object to contracting. This resistance has particular importance for cooperatives, whose membership base likely includes a broad spectrum of opinions on contracting.

4.8.4.2 Midwestern Cooperatives' Production Contracts

Cenex/Land O' Lakes offers feeder pig and finishing contracts to farmers. Its program is less stringent than that of Gold Kist. It has a purebred breed-stock multiplying program as opposed to the DeKalb hybrid breed-stock multiplying program used by Gold Kist. Land O' Lakes works with farmers' existing facilities and management skills. It does offer better incentives to farmers who

upgrade their facilities. As a result of less stringent requirements, more variability and lower average performance is seen in Land O' Lakes' program than in Gold Kist's. However, Land O' Lakes' growers maintain greater autonomy and are not necessarily burdened with large loan payments for new facilities.

Farmland, which owns meatpacking plants and feed milling facilities, is interested in developing a comprehensive contracting program to supply lean, uniform, quality hogs to its packing plants. As discussed in the previous chapter, Farmland Foods is building a 700-sow hybrid gilt multiplier unit in Missouri. It is also proposing joint-ownership of large scale farrowing units by farmers who would finish hogs on their own farms. Breed stock would come from Farmland's hybrid gilt multiplier units. Hogs would be sold to Farmland Foods.

Farmland is also considering several types of price-risk-reducing production contracts it could offer farmers. One type would remove all price risk for farmers by offering a flat fee payment. Farmers would still bear production loss risks. An alternative is to offer a market-price based contract with a guaranteed minimum price based on cost of production figures coupled with a price ceiling of, for example, \$10.00 over the minimum guaranteed price. Farmers would get some of the benefits of high prices and be assured of covering production costs for the term of the contract. Farmland Foods would have a reasonably priced supply of hogs

when market prices rise above the ceiling price in the contract. Farmland figured that it would have had lower overall procurement costs for hogs under such guaranteed minimum price contracts in the 10-year period from 1979-1988 than it actually experienced (Davis). Hog farmers would be assured of being able to remain in business through lean times. Farmland is involved in all levels of the hog/pork subsector and may be in a good position to help coordinate supplies of lean, uniform quality pork. If Farmland and Land O' Lakes are ever successful at merging, they would have access to a large proportion of hog farmers in the Midwest who utilize their cooperatives not only for hog-related services, but also for farm input supplies, grain marketing services, etc.

4.8.4.3 Differences between IOF and Cooperative Contracting

Cooperatives' hog production contracts are similar to those of other contractors, except with respect to growers' input into the organization and payment terms. Contract grower members of cooperatives have a vote to influence the bylaws of the hog division. Members with concerns about the practices of the hog division or terms of contracts can voice their concerns to managers of the hog division and in individual negotiations of contracts. If they are still dissatisfied, they can consult with elected board members who offer guidance to division managers. If they remain dissatisfied they can nominate someone sympathetic to their

cause or run for election to the Board of Directors. They can lobby other members of the cooperative to help support their concerns. Although a single cooperative member does not have the power to control the entire hog division of the cooperative, that member does have a democratic means to be heard in the cooperative. Growers for investor owned firms do not have this power of influence.

4.9 Lessons Learned from the Broiler Subsector

There is much to be learned about contracting as a coordination mechanism from the broiler subsector. Coordination of supply and demand can be analyzed at several levels. This discussion will focus on the macro, micro and micro-micro levels. The macro level encompasses all firms in the broiler subsector. The micro level encompasses coordination between firms at different levels in the subsector. The micro-micro level encompasses coordination within firms. By definition there is interaction between the three levels of analysis, making the distinction between them less important than the insights gained into coordination by examining it at several levels.

4.9.1 Macro Level of Coordination

Although the broiler subsector is highly concentrated and coordinated by a system of contracts and integration, it still experiences significant price and profit instability. Integrators are unable to control either feed prices or

wholesale broiler prices (Lasley et al. 1988, p. 15).

Contracts, as they exist today, do not provide an institutional means for coordinating industry supply with industry demand (Shaffer 1989, p. 18).

4.9.2 Micro Level of Coordination

Micro-level coordination involves coordination between firms at different levels of the subsector. This section discusses institutions and strategies developed in the broiler subsector to reduce profit variability or redistribute risk.

Highly variable returns have direct consequences for investment and risk bearing in a subsector. Institutions and strategies, which reduce profit variability or redistribute risk, have developed in the broiler subsector. These institutions and strategies are only effective in the short run. They enable certain groups to benefit over others. For example, redistributing price risk does not eliminate it from the system. This does not imply that short-run measures are unnecessary or somehow undesirable. In the example of redistributing price risk, one level of the subsector may be better able to absorb or be in a better position to minimize short-run losses due to price variability than another level.

Lessons from the broiler subsector with respect to the use of contracting as a coordination mechanism have applications in the hog/pork subsector. Four of the largest

hog operations are owned by broiler integrators (Farm Journal, February 1987). Tyson in Arkansas, Murphys, Prestage and Carrolls in North Carolina, and Gold Kist in Georgia are examples of broiler integrators that entered hog production in the 1970s (Moore, pp. 3-4).

Integrated broiler firms were able to utilize technological developments and reduce costs of broiler production significantly. The broiler subsector has stressed efficiency and progressiveness.

The broiler subsector serves as an example of developing different types of governance and terms of trade for each stage of production⁸. A range of governance from open market to contracts to integration is evident in the broiler subsector. Breeder chicks, coarse feed grains and labor for management and operation of facilities are purchased in open market transactions. Poults, hatching eggs and broilers are obtained via production contracts. Feed mills, hatching, slaughter, processing and rendering facilities are integrated by ownership.

⁸It should be noted that the broiler subsector continues to experience structural change. Rahn, a poultry economist at Michigan State University, predicts a move toward more vertically-integrated complete ownership versus the contracting arrangements now common in the grow-out phase. He argues that capital investment in grow-out operations is large, which explains the present contracting situation. However, contracts don't offer as much control over production as implementation of some technologies would require. Full ownership could allow more efficient production by separate feeding of hens and roosters and closer quality controls, leading to more uniform product and thus lower processing costs.

Cooperatives and IOFs compete head to head. They use similar coordinating mechanisms, but cooperatives distinguish contracts for inputs, such as poults and hatching eggs, from contracts for output, such as broilers. As explained previously, farmers contracting for inputs are not cooperative members while farmers contracting for outputs are cooperative members.

Transaction-cost analysis can lead us toward understanding the different institutional arrangements which develop. One problem is that transaction-cost variables which determine institutional arrangements cannot be converted into a formula. For example, there is no formula which states \$x of specific assets + y number of transactions in an environment of z percent of uncertainty will lead to the formation of cooperatives as coordinating institutions while a, b and c levels those variables will lead to vertical integration as coordinating institutions. Transaction-cost analysis alone cannot determine which governance form, from open markets to integrated firms, is best suited given information about key variables. Combining transaction-cost analysis with case studies from the broiler subsector should improve understanding of the use of contracts as coordination mechanisms.

Relative economies of size between different levels of the subsector influence whether a level will be coordinated by integration through ownership or contracting. Levels with large economies of size and a high degree of

transaction-specific assets are coordinated via ownership. Feed mills, rendering, slaughter, processing and hatching facilities are examples. The fact that feed mills rely on renderings of offal from slaughter plants as a feed ingredient explains the high degree of transaction specificity for these operations.

Levels, where economies of size are relatively lower but where product specifications are stringent, are coordinated via contracts. Production of poults (multiplying breed stock), eggs for hatching and broilers are examples. Stringent product specifications with respect to genetics, weight, age and timing and frequency of delivery are factors which are highly transaction specific.

Open market transactions are used when transactions are infrequent and/or inputs are not highly specific. Breeder chicks, coarse feed grains and labor for operation of facilities are examples. Coarse feed grains and labor are not highly specific. Management labor is more highly specific, but some managers are trained within the operation. Hiring managers is a relatively infrequent transaction. Purchasing breeder chicks to improve the genetic lines of breed multiplying units may also be relatively infrequent transactions.

Marion found contracting and vertical integration to be unimportant in livestock subsectors where transaction specific capital is relatively unimportant. The importance of production contracts as a coordinating mechanism in the

hog/pork subsector depends on whether trends in structural change toward larger production units, fewer large packers and increased demand for branded (differentiated) fresh meat continue. If these trends continue, the evolution of the broiler subsector suggests that contract production of hogs will become more important as a coordination mechanism.

4.9.3 Micro-Micro Level of Coordination

Micro-micro coordination encompasses behavior within firms. A lesson from the broiler subsector is that specific terms of contracts influence the behavior of parties to the contract. Contract terms also affect coordination of supply and demand at the micro level and ultimately the macro level. This section examines specific terms within production contracts and assesses how these terms affect coordination. The first area to be discussed is terms of payment as analyzed by Knoeber; next will follow length of contracts, capacity utilization and division of responsibilities.

4.9.3.1 Terms of Payment

Knoeber found that Williamson's (1985) transaction-cost theory correctly predicted broiler production to be a non-spot market transaction. However, Knoeber was unable to distinguish between contract production and integrated production using transaction-cost theory. Transaction-specific investment, by both growers in broiler housing and

integrators in slaughter and milling facilities, implies non-spot market transactions. But the high degree of uncertainty and rapid technological change in broilers would seem to indicate integrated production would dominate as opposed to contract production. Knoeber found it necessary to go beyond transaction-cost analysis. He expanded his analysis and examined payment terms and obligations of contract growers in an effort to explain the nearly exclusive use of contract production.

Knoeber attributes the successful use of contract production of broilers to the use of "tournaments" as a payment method for growers coupled with the required large capital investment in broiler housing. The large capital investment in broiler housing on a grower's land has multiple effects of leading to self-selection of better growers and committing the grower to achieving at least a minimum level of competence in production lest he/she lose the option to contract produce. Additionally, growers are committed to long-term relationships with integrators and thus gain skills at growing broilers on which the integrators can rely⁹.

⁹Growers' commitments to integrators may be due in many cases to growers' lack of alternative markets for broilers. This creates a situation wherein integrators can opportunistically capture the value of growers' assets. Farmer cooperative contractors as an institution to reduce the potential for opportunism with contracting is analyzed in Chapter 6.

Clustering growers by time of broiler marketing removes variability in production due to weather, genetic makeup of chicks, disease (to some extent), feed mixture and other components controlled largely by the integrators from the competition between the growers. Growers compete among themselves largely on the factors they control, such as management skill and labor input. Integrators control and bear the risks of new technology and innovations.

The use of tournament payment methods, in combination with grower investment, was found to reduce the cost of contract broiler production to less than that of fully integrated production (Knoeber). In addition, this arrangement still maintains the integrators' flexibility to implement and benefit from technological developments. This is a critical factor because it appears that technological adaptability may account, in part, for the progressiveness of the broiler industry.

Knoeber briefly discussed why contracting is a much smaller percentage of total egg and turkey production. He concludes that economies of size dictate fewer egg and turkey production units relative to the number of processing and slaughter facilities. A large number of contract growers must enter each tournament to be effective. Smaller numbers of growers increases the opportunity for collusive behavior. Tournaments reduce the cost of contracting because they reduce the need to specify contingencies. Where tournaments are infeasible, contracting may be less

widely used than vertical integration, as in the case of eggs and turkeys.

4.9.3.2 Length of Contracts and Capacity Utilization

The length of contracts, requirements for specialized facilities and capacity utilization of facilities have implications for coordination. Growers provide facilities which are durable fixed assets. Contractors may require specialized facilities to meet their management plan. About one-third of growers in the Rhodes' survey (1990, p. 7) were required to build or modify facilities in order to obtain a contract. It was required more often for farrow-to-finish and feeder pig operations and for larger contractors and for East Coast contractors.

The length of contracts is important. Once growers have made investments in facilities, they are obliged to pay back the loan whether they utilize the facilities or not. Investment in a 300-sow farrow-to-finish facility is approximately \$500,000. A loan at 12 percent amortized over 10 years requires yearly payments of nearly \$80,000.

Growers are subject to opportunism on the part of the contractors if the contract length is shorter than the time required to pay off the loan. For example, a contractor might offer favorable terms on an initial short term contract. The terms of this contract would be sufficient to pay off yearly loan payments as well as provide a reasonable return to growers. After the growers made the investments

and the initial contract expired, the contractor might change the terms of the contracts which would make them less favorable to the grower. Unless growers have alternative contractors to turn to, or unless they can cover operating costs and sell hogs elsewhere, they may be forced to accept the less favorable contracts just to service their debt¹⁰.

Capacity utilization is another area where contractors can act opportunistically. Most production contracts state that contractors decide when to place and when to remove livestock. If contractors place hogs less frequently or in smaller quantities than required to utilize growers' facilities to full capacity, growers' returns fall and costs per unit rise.

Very few hog production contracts are for periods long enough to depreciate fixed assets. Instead, contracts generally range in length from lot to lot to several years. Contract lengths ranged from 3 months to 20 years with the overall mean at 26.5 months according to Rhodes (1990, pp. 40-50). Farrow-to-finish producers had a mean of 49 months; pig producers, 30 months; breed-stock producers, 26 months; and finishers, 15 months. Producers with longer contracts were more satisfied overall and also felt contractors were more helpful. The advantage of shorter contracts for coordination is that they provide more

¹⁰This kind of duplicity is not just of hypothetical interest. Broiler growers have complained of being subject to this type of opportunism by contractors (Wall Street Journal 1990).

flexibility to adapt to changing economic conditions. A disadvantage of shorter contracts, besides that of opportunism, is that producers entering and leaving the market may cause supply shifts which may exacerbate price instability.

Overall, relationships between contractors and growers usually span several contract lengths (Glover; Rhodes 1990). Growers in areas with more contractors switch contractors more often than those in isolated regions. A reason for contractors to renew contracts with reasonable terms is that contractors also have fixed assets to be utilized as near full capacity as possible. Recruiting new growers may be difficult if contractors have poor records with previous growers. As discussed above, when both parties to a contract have expensive fixed assets to support, there is a greater incentive to abstain from opportunistic behavior.

Contractors and growers may be caught in an over production trap due to their high levels of fixed assets. (Johnson and Quance) High levels of fixed assets reduce flexibility to respond to changing economic conditions. This is likely to be a more serious problem in the hog/pork subsector than in the broiler subsector, because pork demand is stagnant while chicken demand continues to grow.

4.9.3.3 Division of Responsibilities

Contract terms divide responsibilities and attendant risks between growers and contractors. A well-designed

contract assigns risk to the party most able to bear responsibility for it. Knoeber referred to this when he pointed out that tournament payment schemes do not penalize growers for poor quality chicks provided by contractors. Another example lies in bonuses paid to growers who have more favorable feed-conversion ratios. Contractors provide feed, but growers have control over how much wastage there is. Prior to incorporating such terms into contracts, contractors often endured high feed-conversion ratios as well as the diversion of some feed to growers' own livestock. Growers are in the best position to see that hogs receive proper care and are thus best able to bear death loss risk. Some contractors will share death loss by accepting responsibility for all death loss up to a certain percentage and then part or none beyond that percentage. Risks and responsibilities misplaced by terms of contracts result in less efficient coordination.

4.10 Summary

This chapter examined contracting as a coordination mechanism. The organization of the broiler subsector was described. Use and terms of production contracts for broilers and hogs were examined. Uses of contracts by livestock-farmer cooperatives and how they differ from the use of contracts by IOFs were analyzed. Lessons from the broiler subsector with respect to the use of contracts and

integration for macro, micro and micro-micro coordination were analyzed.

Many of the structural factors which transformed the broiler sector are at work in the hog/pork subsector. Among the most significant commonalities are: 1) new technologies allowing confinement production, improved disease control and higher feed-conversion ratios; 2) increased management intensiveness to utilize new technologies in confinement facilities; 3) economies of size in hog production and slaughter/processing, which allow only large operations to be consistently profitable; 4) more single-enterprise farm operations raising only hogs versus both livestock and crops; 5) genetic improvements increasing pigs per sow, leanness, speed of growth and uniformity of hogs; 6) increase in production contracting to capture economies of size and train growers in intensive production techniques to gain benefits of new technologies; 7) involvement of largest broiler contractors in hog production contracting and developing fresh branded pork products; 8) use of similar contract terms for broiler and hog production contracts; and 9) introduction of branded fresh pork products, prepackaged with extended shelf-life by hog slaughter/processors.

Conversely, several noteworthy structural dissimilarities between the two sectors were noted. The contrasts identified include: 1) the required grower investment for hog production contracting is more than five

times greater than the grower investment for broiler production contracting, leading to a greater magnitude of problems associated with asset fixity; 2) longer production cycle for hogs than for broilers limiting timely responses to changes in demand and supply; 3) industry-wide less uniformity of genetics and animal characteristics for hogs than for broilers, which means less ability to meet stringent specifications for hogs; 4) farrowing and raising pigs is more labor intensive than laying eggs, hatching and raising chicks; 5) slaughter renderings are not used in feed for hogs as they are for broilers, indicating tight slaughter to feed-milling coordination is not necessary for hogs as it is for broilers; 6) waste generated from hog farming and slaughter is a greater volume than for broiler farming and slaughter, indicating environmental concerns and waste disposal is more of a problem for hogs than for broilers, especially if production is concentrated in an area; and 7) overall higher production costs per pound of pork than per pound of chicken reducing pork's competitiveness as a protein source compared with chicken.

The hog/pork subsector is becoming more like the highly concentrated, integrated broiler subsector due to structural changes and increased contracting. However, significant dissimilarities between the two subsectors indicate the structure of the hog/pork subsector is unlikely to duplicate the structure of the broiler subsector. Integration by ownership of all levels of the subsector is less likely to

occur for hogs than is the case for broilers since assets are not as transactions-specific between subsector levels for hogs as for broilers. Higher concentration by ownership within levels of the hog/pork subsector is not precluded, however, nor is increased coordination between levels by institutions other than ownership.

Chapter 5 discusses important factors influencing the future evolution and coordination performance of the hog/pork subsector.

CHAPTER FIVE

IMPORTANT FACTORS INFLUENCING THE FUTURE EVOLUTION AND COORDINATION PERFORMANCE OF THE HOG/PORK SUBSECTOR

5.1 Introduction

Chapters 3 and 4 described the genesis and current condition of the hog/pork subsector. This chapter will explore the implications of several alternative scenarios which are likely to develop in the near future. Each of these scenarios poses a different set of problems/challenges for all subsector participants.

The hog/pork subsector is undergoing dramatic and continuous change. There is no clear consensus among industry analysts as to exactly how the subsector will evolve in the coming decade. Some alternative scenarios can be identified based in part on new technology, long-term trends and developments in other livestock subsectors. The critical factors chosen for examination in this chapter are those that are currently being discussed and studied by subsector participants and analysts.

5.2 Critical Factors

The critical factors chosen are: 1) changes in production technology, represented by pork growth

promotants; 2) changes in marketing innovations, represented by fresh branded pork; and 3) economies of size and changes in market structure, represented by increasing concentration of hog packers. Competing scenarios could have been selected but these three meet several important criteria. First, each factor illustrates structural change originating at one of each of three levels of the hog/pork subsector: farm, retail and slaughter/processor.

Second, some of these innovations are actively being investigated by other meat industry researchers (pork growth promotants and branded fresh meats). In addition, a number of researchers from academia, producer groups and governmental organizations are studying the effects of increased packer concentration on livestock prices.

Third, each of these cases raises interesting questions regarding the opportunities for increased coordination at the micro-micro, micro and macro levels. The response of livestock cooperatives to these challenges will be addressed in the following chapter.

5.3 Implications of Changes in Production Technology and Marketing Innovations

Changes in production technology and marketing innovations present challenges for subsector participants. The implications of widespread adoption of pork growth promotants and introduction of fresh branded pork are examined below.

5.3.1 Widespread Adoption of Pork Growth Promotants

Two types of pork growth promotants are awaiting Food and Drug Administration (FDA) approval: ractopamine and porcine somatotropin. Ractopamine is administered as a feed additive. Somatotropin is administered by daily injections. Both promotants produce similar results and are dispensed in the final stages of the "finishing" process, just before the animals go to slaughter.

The results of seven studies on the effects of ractopamine and six studies on the effects of somatotropin were summarized by Thulin (1990). The studies found that pork growth promotants produce leaner, meatier hogs in a shorter time period on less feed. On average, somatotropins have stronger effects than ractopamine, though there was a wide range of results for both promotants in the different tests.

Average daily weight gain increased by 16 percent for the hogs treated with somatotropin and their daily feed intake fell 15 percent. With ractopamine, the average daily weight gain and daily feed intake reduction were both seven percent. Feed efficiency improved an average of 28 percent with somatotropin and 15 percent with ractopamine. Tenth rib back fat decreased an average of 24 percent for both growth promotants. Loin eye area increased an average of 17 percent with somatotropin and 14 percent with ractopamine. Because they operate by different modes of action, additive

effects have been found when both growth promotants were used together (Jones et al. 1989).

To obtain peak performance, finishing rations must be modified to support the faster rates of growth associated with the use of growth promotants. The diet needs to be high in protein, particularly lysine. Thulin (1990) states "It is realistic to expect to use four or more different finishing diets with varying protein and other nutrient levels to achieve optimum performance with the use of new growth promoting products."

Another factor influencing the effectiveness of growth promotants is genetic makeup of hogs. Hogs that are genetically lean and fast-growing realize the biggest performance gains compared to hogs that are genetically fatter and slower-growing (Thulin 1990).

5.3.1.1 Food and Drug Administration Approval

To date (August 1992), the FDA has not granted approval for the commercial sale of ractopamine and porcine somatotropin. Manufacturers of both types of growth promotants are running trial tests. Approval of ractopamine may come within the next year. Approval of porcine somatotropin may be at least 2-3 years in the future (Thulin, February 1991). Even if FDA approval were granted, there are some additional problems with the delivery system of somatotropin. The promotant must be injected daily. More practical delivery systems are being researched.

5.3.1.2 Pricing of Pork Growth Promotants

Since neither ractopamine or porcine somatotropin are commercially available at this time, no actual price information is available. Manufacturers have not been willing to disclose anticipated prices. However, they anticipate rapid, widespread adoption of ractopamine once it gains FDA approval. Manufacturers project that, within six months of approval, the majority of large hog operations will have adopted ractopamine.

Test trials of ractopamine have already been conducted with several large hog operations and feed companies. These firms will have a clear advantage due to their experience in use of growth promotants. Exceptional management will be needed to use ractopamine profitably since lifestage, sex of hog, feed nutrients and dosage, in addition to animal genetics, influence results. Management skill will be a limiting factor in adoption. Farms that are unable to obtain satisfactory results, due to inadequate management and/or poor genetic stock, are likely to quit using the products due to their cost.

5.3.1.3 Challenges of Adopting Pork Growth Promotants

The development of pork growth promotants is an unequivocal example of technological change. Scherer's structure-conduct-performance model, described in Chapter 1, lists technology as a basic condition of supply. Changes in basic conditions can set off a chain reaction which affect

further changes in the structure, conduct and performance of the subsector. Feedback effects are also found on basic conditions of supply. Changes in the system present challenges to subsector participants.

Challenges arise in the areas of: 1) rate of adoption; 2) acceleration of trends towards fewer and larger hog farmers and packers; 3) genetic requirements; 4) an expansion in off-farm purchases; 5) increased production intensiveness; 6) grading; and 7) consumer acceptance.

5.3.1.4 Rate of Adoption

The economic benefits of pork growth promotants are correlated with the rate of adoption. The decision to adopt or not is made by managers within each farm. Making such a decision requires information. Acquiring such information can entail high transactions costs with respect to management time and training, as well as cash costs.

Trade publications describe new techniques and developments in the industry. However, the articles often lack sufficient detail for producers to actually implement the new techniques or understand how developments will affect them.

The Federal and State Cooperative Extension Services play an important role in "translating" research, developing management prescriptions and disseminating this information to agricultural producers. However, given the constraints of personnel, financial support and time, extension

specialists do not have the resources to meet the information needs of all farmers.

Sales representatives of companies which produce products for agriculture are additional sources of information for farmers. The information that these companies provide may, however, be limited to their own products. To get a balanced view farmers should seek information from several companies and interpret it in terms of their own situation. Collecting such information and evaluating all the relevant information about these products requires considerable technical skills (in animal physiology, genetics, nutrition, statistics, pharmacology, etc.). Even when the producer possesses the requisite technical skills, the time needed to collect and process the information may be prohibitive.

5.3.1.5 Accelerated Trends Towards Fewer, Larger Hog Farms and Packers

If pork growth promotants are widely adopted, this is likely to result in significant alterations in the structure of the hog/pork subsector. Growth promotants produce hogs which can either be: 1) raised to a finished weight of 240 pounds faster; or 2) be fed to a heavier weight without suffering from excess fat.

Faster turnover rates implies more hogs can be finished in existing facilities in the same time period. However, it is not likely that this is the way the industry will go.

Packers would prefer to slaughter a high portion of heavier, lean hogs (Thulin 1991). The costs per hog of slaughtering and processing heavier, lean hogs is essentially the same as for lighter, lean hogs.

If growth promotants are used, fewer farms and packers will be needed to produce hogs and slaughter the same quantity of pork. If demand for pork remains stable, the introduction of growth promotants will accelerate the preexisting trend towards fewer hog farmers and packers.

5.3.1.6 Specialized Assets for Production

Assets for hog production are becoming more specialized. Facilities to house sows, pigs and hogs and accompanying waste disposal systems are becoming more specialized. Facilities for raising hogs range from pasture to total confinement systems. Total confinement systems are environmentally-controlled units specialized for the life stage of the hogs housed therein. In 1980, over 60 percent of feeder pig and farrow-to-finish operations had central farrowing houses, while about 20 percent had mixed housing, 10 percent had portable houses and less than 10 percent had no facilities (Van Arsdall and Nelson 1984). Larger operations and those in the Southeast, as opposed to the North Central U.S., were more likely to have central farrowing housing. The trend continues toward use of intensive-confinement systems away from pasture and semi-confinement.

5.3.1.7 Management Intensive

Administering pork growth promotants is management and labor intensive. Recordkeeping must be precise with respect to determining dosage levels, feed rations and time for each group of hogs. In the case of somatotropins, daily shots must be given to each hog. The recordkeeping system must be detailed enough to keep track of each group of hogs' rate of gain and feed consumed. The record system must also be able to correlate these variables with the hogs' genetic history. Improvements can be made in the herd by replicating the genetics of hogs with good performance.

Due to the intensiveness of administering pork growth promotants, confinement facilities are a virtual necessity. Total confinement facilities affect farmers' competitive position in several ways. First, they are costly to build and maintain. Most farmers must take on considerable debt to build a confinement facility. This debt must be repaid on a regular basis. Year-to-year variability in hog prices and feed costs makes orderly and prompt debt servicing difficult.

Second, total confinement hog facilities do not have good alternative uses and tend to make hog farming more asset specific. They cannot be sold without the land they are built on, which may be part of a multi-enterprise farm. Rental of the units is possible, but finding a willing renter is difficult in a low-population rural area.

5.3.1.8 Training in the Use of New Technologies: Human Asset Specificity

Historical evidence has shown that early adopters of new technology gain the biggest benefits. A new technology reduces the marginal cost of production for adopters. New technologies are seldom neutral with respect to farm size. The unequal distribution of benefits associated with the adoption of new technologies (and the negative consequences for those that fail to adopt useful technologies) are a powerful incentive for hog farmers to become trained in the use of pork growth promotants as early as possible. However, learning new skills associated with new technologies increases the human asset specificity of farmers. Specialized human assets are another factor leading to larger production units that operate year-round in order to fully utilize the specialized asset.

5.3.1.9 Increased Off-Farm Inputs

Growth promotants and their complements, including specialized feed additives and lean, hybrid hogs, increase the percentage of production inputs which must be purchased off-farm. The greater farmers' use of off-farm purchases, the greater their financial vulnerability. The need for additional feed ingredients and purchase of hybrid gilts will make some farmers less self-sufficient in providing hog feed and gilts than they have been in the past.

Increasing the percentage of purchased inputs ties farmers more directly to the dangers of the hog sector's unique cyclical economy. Uncertainty about input costs increases uncertainty at the time production decisions are being made. Therefore, as growth promotants increase farmers' use of purchased inputs, so might it increase farmers' vulnerability to price instability. This in turn would create more incentives to seek protection from such instability.

5.3.1.10 Feed Types

In addition to different housing for different life stages, different feed types are formulated for different life stages. Gestating and nursing sows receive special feed, as do newly-weaned piglets. Depending upon the management practices of an operation, the feed rations can be changed up to 3-4 times during the hog's life cycle. Gilts and barrows have been shown to gain weight most efficiently with different feed rations. Most farmers provide special rations for gestating and nursing sows and newly-weaned piglets, but the majority have not adopted additional ration changes or feeding gilts and barrows separately (Thulin 1990). Genetically lean hogs are more responsive to specialized feed rations (Pork '91). As more farmers invest in genetically lean sows and boars, the use of specialized feed rations is likely to increase as specialized feed becomes more profitable to use.

5.3.1.11 Genetics

As discussed above, genetic factors play a large role in leanness and responsiveness to pork growth promotants. Farmers will need to raise a different breed of hogs to gain the maximum benefits offered by this new technology. Gathering the necessary information and obtaining breeding stock or feeder pigs of the desired genetics poses a significant hurdle for many farmers.

5.3.1.12 Public Acceptance and Health Concerns

Adoption of pork growth promotants is dependent upon public acceptance, as well as FDA approval. Scientific studies to date have not found measurable residues of growth promotants in treated pork. Such evidence may not fully assure a skeptical public. DES hormone, used as a growth promotant in beef for 25 years, was shown to accumulate in meat tissues by more accurate testing methods developed years after DES began to be used. DES was suspected as a carcinogen and was removed from use in beef (Kuchler and McClelland 1989).

Pork growth promotants produce leaner pork and larger cuts. Leaner pork helps consumers reduce their saturated fat intake. Consumers will have to weigh the benefits of leaner pork against any as yet unknown risks associated with the possible presence of the growth promotants in the pork they consume. Studies have not shown health risks to either humans consuming pork from hogs treated with pork growth

promotants or to the animals treated (Etherton). In experiments to treat dwarfism in humans, pork growth promotants were administered to humans but had no effect. The effects of growth hormones appear to be species specific (Harlander).

5.3.2 Widespread Introduction of Branded Fresh Pork

Branded fresh pork seems likely to become widespread in the decades ahead. The reasons for this are related to the changing demand and supply conditions for pork. On the demand side, consumers want convenient, "healthy" food. Pork's share of the total spent on meat dropped from 32 percent in 1965 to 29 percent in 1984 (Bunch 1984). Pork must compete with boned, skinless, fat removed, "low cholesterol" chicken.

All fresh meats (beef, poultry, pork and fish) must compete for the consumer's dollar with complete, ready-to-microwave meals, packaged in single servings. Pork must compete with beef, chicken, fish and vegetarian entrees on the menus of fast food and away-from-home eating establishments. To maintain its share of the consumer's meat dollar, fresh pork must change to meet changing consumer demand.

The introduction of branded products is likely to help fresh pork maintain or even increase its market share. Branded products are characterized by uniform size, consistent quality, informative packaging, continuous

availability and satisfaction guarantees. Branded meats have made their most visible showing in broilers. Pre-packaged and branded Holly Farms and Perdue broilers fill the entire self-serve poultry cooler at many retail stores. Brand-name broilers usually have exclusive rights for fresh broiler sales with retailers. Retail outlets occasionally offer "generic" chicken in the cooler for a wider selection, but most often the customer has only the branded product cuts to choose from.

Supply factors will also influence the effectiveness of branded pork products. The fresh meat counter at retail food stores has undergone dramatic change. In the past, retail butchers housed in-store prepared cuts of meat at customer request. Today, many of these butchers are gone and customers select meats from self-serve pre-packaged meat coolers.

However, during the 1980s, the cycle came full circle, and some food chains began to offer greater and more diverse services. These include offering more customer service in the meat department. In some stores, self-serve coolers have been supplemented by the traditional-looking meat counter with a butcher. But what goes on behind that traditional-looking counter has changed.

The store's meat locker is no longer filled with whole sides of beef and hogs. Instead the meat manager orders subprimal cuts which can be sliced into the cuts most demanded by the customers of that store. For example, if

boneless pork loin chops are desired, the meat manager orders boneless pork tenderloins, vacuum-packaged or gas flushed for long shelf life. The bones and excess fat layers have already been removed at the processing plant. Packaged tenderloins are branded for consumers or at least carry the processors' labels. Some retail outlets sell the tenderloin as packaged but will slice pork chops of desired thickness if the customer requests it.

The shift in the cutting and trimming functions upstream from retail butchers to processors results in lower total labor costs. Processor-plant labor can be more efficient as it is more specialized. Wages are likely to be lower in rural areas where processors locate than in urban areas where retailers locate. Transportation and byproduct disposal costs are reduced by removing hides, excess fat and bones at the processors. Boxed subprimals are also less costly to transport than whole or partial carcasses.

Processors are in a unique position to design and promote branded fresh pork products. Processors have direct linkages to both farmers and retailers. They can influence the quality of hogs going into the products as well as product packaging and care at the retail level. This type of quality control is necessary in developing a branded product.

If processors decide to market branded fresh pork products, it would have implications for the organization of the hog/pork subsector. Functions of fresh meat packaging,

labeling, advertising and quality guarantee would be shifted upstream to processors. Hog farmers would face increased requirements for hogs with specific characteristics. If processors cannot achieve the quality and uniformity of hogs they need through the current market system, they will have incentives to change the system to achieve desired inputs. They will choose to do this with price incentives, through contracts with farmers or some other method of control.

5.3.2.1 Challenges of Introducing Branded Fresh Pork

There are several challenges presented by the introduction of branded fresh pork. The first is developing adequate supplies of consistent quality pork. In order to produce quality pork, the subsector must address many of the same problems that apply for adopting pork growth promotants (grading, genetics and management techniques). Additional challenges include: 1) quality control beyond the farm level in transportation and packaging; 2) gaining access to retail cooler space; and 3) increasing demand via advertising.

5.3.2.2 Adequate Supplies of Consistent Quality Pork

To launch new branded fresh pork products, a supply of pork of consistent quality must be continuously available. Lack of consistent quality in meats was one of the major

complaints of retail store meat managers.¹ Consumer Reports, likewise, found inconsistent quality in branded broilers. Lack of consistent quality comparable to non-branded broilers led that consumer magazine to not recommend branded over non-branded broilers. Inconsistent quality in branded broilers has not hindered branding of poultry, indicating the perception of consistent quality seems to be the important factor. However, the degree of variability in quality actually is greater for pork than for broilers. There is greater diversity in breeds of hogs and hog producers when compared with broilers raised in a highly concentrated industry.

5.3.2.3 Challenges in Common with Pork Growth Promotants

At the farm and slaughter levels, the challenges for branded fresh pork have much in common with those for adoption of pork growth promotants. These will be discussed only briefly below since the issues as they related to pork growth promotants were previously discussed.

5.3.2.4 Grading

If processors require consistent quality and nearly uniform-sized pork cuts to produce branded fresh pork products, they will need to convey these specifications to

¹Informal survey done by the author in the Lansing, Michigan area of supermarket meat managers.

hog farmers. A grade-and-yield system would allow processors to communicate their needs to farmers and reward desirable carcass characteristics by paying relatively higher prices.

5.3.2.5 Genetics

Similar genetic makeup most strongly influences uniformity in carcass characteristics. Changing the genetic makeup of herds is likely to be the most direct way for farmers to comply with processor demands for consistent quality. A significant challenge for farmers associated with the development of branded fresh pork will be adapting herd genetics.

5.3.2.6 Management Techniques

Management techniques, such as feeding barrows and gilts separately on feed rations that maximize the growth of each, are additional ways to achieve consistency in slaughter hogs. Learning and adopting new techniques is another challenge to hog farmers if branded fresh pork products are developed.

5.3.2.7 Market Share

As branded fresh pork products are developed, they will need to take over cooler space previously occupied by pork packaged by retail store personnel. To be accepted by retail meat managers, branded pork must provide either

higher margins, increased sales or lower costs than store-packaged pork. In the case of branded chicken, processors pay a flat fee to retailers to have exclusive rights to cooler space (Glover). Barriers to entry to the branded fresh pork market are likely to rise substantially as more processors offer branded products and compete for limited cooler space. In a market with stagnant demand, increased market share would come at the expense of other processors.

5.3.2.8 Advertising

Once fresh pork moves from a generic commodity to a branded product, processors who advertise directly to final consumers are likely to realize benefits in the form of increased demand and premium prices for their brand. Price premiums must exceed the added costs of producing a branded versus non-branded product and advertising for branding to be profitable for processors.

The free-rider problem is likely to be slight with brand-name advertising. The free-rider problem still exists to the extent that advertising for a particular brand of pork encourages consumers to purchase more pork, regardless of brand or lack thereof.

Although advertising is effective for branded fresh pork products, it is costly. This increased cost must be added to the costs of branded products. Consumers must perceive an added value to branded products before they are willing to pay more for them than for generic products. If

a store carries only one brand of pork and no generic pork, consumers are likely to be willing to pay more just for the convenience of purchasing pork in the same store as their other groceries.

5.4 Implications of Changes in Market Structure and Economies of Size

New technologies and changing consumer demands, as in the cases of pork growth promotants and fresh branded pork described above, are variables that lead to structural change in a subsector. Changes in the structure of a subsector affects the relative market power or bargaining power between participants at different levels of the subsector. Examining the relative degrees of concentration of firms at every level of the subsector sheds light on the potential market power of firms at one level over firms at another level. Chapter 3 described a relatively high degree of concentration by corporations developing hybrid breeding stock. Purebred breeding stock development has a relatively low degree of concentration. Feeder pig production, finishing and farrow-to-finish production of slaughter hogs have low degrees of concentration, although the largest farms are producing a greater percentage of all hogs. The degree of concentration in hog slaughter has been relatively low nationally but high regionally and is expected to increase. The following sections discuss the degree of concentration of packers, wholesalers, retailers and food-

service firms and relative market power between levels of the hog/pork subsector.

5.4.1 Increasing Concentration of Packers

There are indications that concentration of hog packers will increase. National four-firm concentration ratios have been relatively low, while state-level concentration ratios in major production states have been very high. National figures for four-firm concentration ratios for hog slaughter shifted slightly down then up again, ranging between 29 and 37 percent, from 1979-1987 (Packers and Stockyards Administration). Four-firm concentration ratios for 9 of 14 major hog producing states were already above 90 percent by 1979. Only Iowa and Ohio had much lower ratios, at 53.7 percent and 64.4 percent, respectively (Hayenga et al. 1985). Several developments are likely to contribute to a further increase in packer concentration. The number of hog slaughter plants is declining. Ward (1988) attributes this trend to economies of size in slaughter and fabricating. These factors, plus mergers, acquisitions and building plans by large hog packers, have led several analysts to expect an increase in hog slaughter concentration over the next few years (Ward 1990). The percentage of total slaughter by the largest plants slaughtering 1,000,000 or more head per year increased from 35.9 to 75.4 percent (Packers and Stockyards Administration). It's not clear whether the decline in slaughtering plants is a cause or symptom of increased

packer concentration. Detailed knowledge is not available on the costs of operating different-sized hog slaughtering plants in the various regions of the country. Without this data, it can not be determined why some plants were closed while others were expanded, or why new larger plants were built. Obviously, in addition to increasing concentration, changes in the relative supplies of hogs, transportation and labor costs all played a role.

In 1973, 564 plants reported to the Packers and Stockyards Administration. By 1988, this number had declined to 349 plants. The biggest decline was for plants slaughtering fewer than 300,000 head. Only plants slaughtering more than 1,000,000 head grew in number, from 19 to 33, over the period 1973-1988.

Packing plants of all sizes seek to reduce transactions costs. However, the sizes of packing plants and number of plants under single ownership are related to the efficiency with which transaction cost-reducing activities can be carried out. Multi-plant firms gain benefits from specialization.

The number of multi-plant packing firms is increasing. More mergers and acquisitions in the 1980s are evidence of this trend (Ward 1990). With multiple plants, each operation is able to further specialize. For example, one plant specializes in further processing cured meats while another specializes in fresh pork cuts. Hog buyers for the firm can send the most desired types of hogs to each plant.

Carcasses or subprimal cuts can be shipped between plants if needed. Byproducts, such as hides, can be utilized to increase returns. Multi-plant firms can reduce transactions costs by removing certain transactions from the open market system.

Regular supplies of hogs are very important to packers (Ward 1990). At the beginning of the week buyers are able to obtain plenty of hogs to keep the slaughter line running. By the end of the week, this may not be the case. Unionized employees must be paid even if the work load slacks off. This increases slaughter costs per hog.

5.4.1.1 Challenges of Increased Packer Concentration

Challenges of increased packer concentration include: 1) access to markets; and 2) reduced market competition; which leads to 3) the potential for opportunistic behavior.

5.4.1.2 Access to Markets

Many small and medium-sized plants have closed. Large plants² had their numbers reduced by more than one-half from 1973-1988 (Packers and Stockyards Administration). In areas where packing plants have closed and the numbers of hogs in the region have not been sufficient to attract giant

²Small plants are those slaughtering less than 10,000 head; medium plants slaughter between 10,000-299,999 head; large plants slaughter between 300,000-999,000 head; and giant plants slaughter 1,000,000 or more head per year.

packing plants, increased concentration means fewer packers to sell to and longer distances to ship hogs once they are sold.

5.4.1.3 Reduced Market Competition

Increased packer concentration can reduce the number of bids hog farmers receive. Hogeland (1988) found a higher percentage of slaughter hogs were sold with just one or two bids in 1987-88 than in 1982. In a study of beef sales in four regions, 84.3 percent of cattle sold received bids from just one or two packers in 1989, compared with 66 percent in 1979 (Ward 1990, p. 83). Fewer bids can be expected to result in lower prices for livestock. However, econometric analysis of cattle prices in 1979 and 1989 failed to show that number of bids significantly affect fed cattle prices. At first glance, these two statements appear to be contradictory. However, the structure of the hog and cattle markets are sufficiently different that it is conceivable both authors' findings are valid.

Based on his own studies and those of others, Ward concludes:

"There is no clear empirical evidence that suggest the reduced number of buyers and related reductions in buying activity cause fed cattle prices to be lower. More extensive analysis is needed, and there is a need to focus on the overall level of prices rather than just the day-to-day or sale-to-sale variability in prices."

If packers exert monopsony power, profit rates are expected to increase. There is no clear evidence that large

meatpackers are earning excessive profits. The reason for this is likely to be that substantial excess slaughter capacity is causing packers to compete for available cattle (Ward 1990, pp. 89-90).

5.4.1.4 Potential for Opportunistic Behavior

Reduced market competition does not necessarily lead to "opportunistic" behavior. However, reduced competition probably increases the ability of some market participants to exert increased market power. It is likely that other market participants, if unable to counter this increased market power, would then label such behavior as "opportunistic."

In cases where transaction-specific assets are involved, as when there is only one packer in a region that farmers can sell to or when farmers are producing hogs with specialized characteristics for a single packer, the potential for opportunistic behavior on the part of the packer still exists. As packer concentration escalates, the number of such cases is likely to increase.

Small numbers of packers could potentially collude and reduce returns to farmers. Koontz et al. (1989) found evidence that meatpackers behaved "cooperatively" during two 2-year time periods in the early 1980s. Cooperative behavior was associated with relative price stability. Ward (1990) responds that other factors are likely to have been responsible for the observed behavior.

5.4.2 Concentration of Wholesalers and Retailers

There are large numbers of wholesalers and retailers. National market shares of grocery stores do not indicate market power in the wholesale procurement of meats. However, the four-firm concentration ratios of supermarkets in large metropolitan areas were over 70 percent in 1972 (Connor 1980). Marion found concentration ratios have increased since then (Marion 1983). The wholesalers of supermarket chains are likely to have some bargaining leverage with packers through the volume of their purchases (Hayenga et al. 1985, pp. 70-71).

5.4.3 Concentration of Food-Service Firms

National concentration ratios for food-service firms are insignificant, with the top 50 firms at approximately 13 percent of the market. However, the largest four fast-food outlets had 41 percent market share in 1980, up from 6 percent in 1972. Restaurant franchise chains also have grown in the past two decades (Hayenga et al. 1985, p. 74). They require meats to be prepared to specification. Purveyors, some of which are fast-food company-owned, service this market, but slaughter/processors are performing more of the fabrication (Crom 1988, p. 23). Fast-food and franchise chains' need specialized products and make large volume purchases. Slaughter/processors with excess capacity are likely to offer very low prices in order to more fully utilize the packing plants (Hayenga et al. 1985, p. 72).

With

incr

cons

of

the

one

198

198

int

on

onl

ser

cou

et

san

par

alo

to

an

mark

numb

numb

stru

With the exception of fast-food and franchise chains, the increasing number of food-service outlets meeting increasing consumer demand indicates low concentration in the purchase of pork.

Nine of the 10 largest, 24 of the 50 largest and 32 of the 100 largest food-service firms were involved in at least one merger or acquisition between 1976 and 1980 (Schmelzer 1981, p. 106). Mergers and acquisitions continued in the 1980s, which increased the likelihood of vertical integration of food-service into wholesaling. The effects on pork were minimal so long as fast-food restaurants served only beef and chicken. However, decisions by large food-service firms to add (or remove) pork items to their menu could have important impacts on the pork sector (Hayenga et al. 1985, pp. 74-75). McDonald's promoted McRib sandwiches in 1990. The National Pork Producers Council participated in promoting McRib in exchange for their logo alongside the McRib logo. McDonald's decisions to continue to offer McRib or to feature other pork products will have an impact on the pork industry.

5.4.4 Economies of Size

Economies of size is one factor driving changes in market structure. Economies of size directly influence the number of viable firms at each level of a subsector. The number and size of firms is one of the components of market structure. Economies of size of firms at different levels

of

re

de

ho

5.

to

pr

ec

th

av

he

e

m

f

f

f

s

of the hog/pork subsector are examined below, because relative economies of size is an important factor in determining the types of institutions which provide horizontal and vertical coordination.

5.4.4.1 Economies of Size in Hog Production

Improved genetics, controlled environment production techniques and new animal health products have increased productivity in hog production. Through the mid 1960s, few economies of size were found for hog operations. Studies in the latter 1970s, however, found economies of size, with average costs reaching a minimum between 5,000 and 16,000 head. Hayenga et al. (1985, p. 19) state:

"The shift in optimum size is due primarily to significant improvement in disease control of large concentrated groups of hogs (sows and pigs, especially) and the gradual development of specialized equipment and management skills adapted to large units. The success of numerous units much larger than 16,000 head suggests that those operators may have developed the management skills to avoid cost increases as their size increases."

Farrowing is the stage with the most significant economies of size (Hayenga et al. 1985). Facilities are more specialized for farrowing and nursing piglets than for finishing hogs. There is higher risk due to price fluctuations for producing feeder pigs, as compared to finishing hogs (Van Arsdall and Nelson 1985).

Larger operations proved significantly better than smaller operations on physical performance measures: pigs

f

w

r

p

pr

he

di

no

we

pr

hi

lo

hun

fee

lay

Per

for

the

son

Ars

ent

and

farrowed and weaned per litter; litters farrowed and pigs weaned per female year; and death losses and feed conversion rates (Van Arsdall and Nelson 1985, pp. 32-36). Crom (1988, p. 63) attributes better management as the key to this production efficiency. Smaller operations marketed hogs at heavier weights. Thus, total pounds of hogs sold per litter did not differ much from large operations, which produced more pigs per litter but marketed the hogs at lighter weights. Size of operation did not affect the length of the production period.

Crom (1988, pp. 36-38) reported large farmers received higher prices for hogs, paid lower prices for feeds and had lower labor costs. Large farmers had lower feed costs per hundredweight of hog produced, higher returns per \$100 of feed fed and higher returns above feed costs. However, large size of enterprise was no assurance of success. Performance varied widely for farmers of similar size and for all farmers on total returns, but the variability was the greatest among small farmers. In physical performance some small farmers did as well as large farmers, but Van Arsdall and Nelson (1985, p. iii) predict that:

"Competition will likely keep them from earning sufficient margins of returns per unit of production to make continued production attractive."

As operations get larger, they are involved in fewer enterprises. Typical large Midwest enterprises grow grain and purchase additional grain to feed hogs. The largest

operations are likely to be single-enterprise operations that purchase all their feed.

5.4.4.2 Economies of Size in Adoption of Pork Growth Promotants

Historically, larger farms gained the most from technological advances. This is because large operations are usually the first to adopt new technology. Large farms are more likely than small farms to have the information and management skills necessary to successfully adopt new technology. Early adoption often gave the large operations a temporary, but important, competitive advantage, allowing them to reap the biggest gains. Large operations are also likely to be the first to adopt pork growth promotants.'

Generally speaking, larger hog farms already have confinement facilities, precise feed-mixing equipment, accurate recordkeeping systems, lean hogs and other capabilities. Using growth promotants will require only relatively minor adjustments in production and management practices of large farms.

Smaller hog operations are less likely to have existing facilities and management capabilities necessary to successfully utilize pork growth promotants. Adopting pork growth promotants would require small operators to introduce, simultaneously, a wide variety of technologies and management practices that are needed complements in the production function. Adoption and successful integration of these new technologies will be costly and could even (in the

short-run) increase production costs per pound. Economies of size associated with confinement facilities, feed mills, etc. is likely to cause per unit costs of small farmers to be higher than those of large farmers. Relatively high complementary costs associated with adopting growth promotants offset higher payments for leaner hogs raised with growth promotants. If some of these smaller hog operations are already marginal, adoption of pork growth promotants could be unprofitable.

5.4.4.3 Economies of Size in Fed Hog Programs

Large hog feeding operations realize economies of size in purchasing large numbers of feeder pigs and other supplies for fed hog programs. Loan rates that larger operations receive borrowing large sums of money is likely to be lower than rates which small operators receive (if they borrow smaller amounts).

Larger operations can afford to hire skilled managers to run fed hog programs and train workers. Skilled management expertise and training might not be available to or economical for small hog operators.

5.4.4.4 Economies of Size in Input Costs

Large livestock input firms offering production contracts achieve economies of size which lower costs of production. Contractors make large quantity purchases of input supplies such as feed and veterinary supplies.

I

h

E

c

f

by

re

fo

in

wh

un

si

Ass

to

fac

5.4

cont

exce

Contractors realize economies in purchasing large numbers of breeding stock. Quality of breeding stock influences quality of slaughter hogs. Contractors can establish large farrowing units with high quality breeding stock. Hogs should be chosen that are lean and fast-growing and thus particularly responsive to pork growth promotants. Lean hogs also meet consumer desires for leaner pork. Establishing single sources for lots of feeder pigs reduces costs of disease and death losses relative to commingling feeder pigs from many separate sources.

Marketing economies are also realized by selling hogs by the semi-truck load. Transportation costs per hog are reduced. Prices received for hogs are likely to be higher for contractors than for small farmers as they can sort hogs into uniform lots in each semi-truck. Contractors determine when hogs will be marketed, which also enables more uniformity per lot to be achieved.

Contracting enables farmers to capture economies of size by enlarging and modernizing production facilities. Assured income from production contracts are used by farmers to secure loans needed to expand and/or modernize facilities.

5.4.4.5 Economies of Size in Hog Slaughtering and Processing Plants

Economies of size exist for hog slaughter plants and continue to be found for slaughter plants with a volume exceeding one million hogs annually (Ward 1988, p. 24). One

problem associated with the question of economies of size is that there is little data on very large slaughtering operations. Only recently have categories for operations slaughtering 1,000,000 or more head per year been added to surveys conducted in the hog/pork subsector.

Economies of size appear to be less for processing than for slaughter. In Chapter 3, it was noted that, on average, only forty percent of the volume of hog slaughtering plants is processed by the same firm. Another twenty percent is sold to other processors. The remainder is sold in the fresh market. It's possible that since only forty percent of the total slaughter volume is retained for processing, there are limited economies of size in processing. Due to a lack of data, it is not possible to determine the validity of this hypothesis.

5.4.4.6 Each Level in the Hog/Pork Subsector Experiences Economies of Size that Appear to Influence "Upstream" and "Downstream" Coordination

Economies of size is one variable that influences the number of firms at each level in a subsector and how the numbers of firms change over time. Relative economies of size influences upstream and downstream coordination, because the number and volume of transactions and relative market power of parties to transactions is influenced by the relative sizes of firms. The number of hog farms needed to supply one slaughter plant can be estimated from the economies of size information presented above. If hog

slaughter plants realize most economies of size slaughtering 1,000,000 hogs, while farrow-to-finish hog farms realize most economies of size raising 10,000 hogs, approximately 100 hog farms would be needed to supply one slaughter plant. Each hog farm producing 10,000 hogs requires approximately 550 sows and 30 boars of breeding stock. If breed-stock multiplying farms have approximately the same economies of size as farrow-to-finish farms, a breed-stock multiplying farm producing 10,000 head (including both female and male pigs) would supply about 5,000 gilts. Farms replace about one-third of their breeding stock each year or about 180 gilts. One breed-multiplying farm producing 5000 gilts can supply about 27 farms needing 180 gilts. Therefore approximately three breed-multiplying farms will be needed to supply 100 farrow-to-finish farms. Downstream, if one processing plant processes approximately 40 percent of the volume of a slaughter plant and a remaining 20 percent of the volume is sold to other processors, one slaughter plant can supply approximately one and a half processing plants.

The slaughter industry is characterized by persistent overcapacity due to the cyclical nature of hog production (Crom 1988, p. 38). Slaughtering is a low margin, low profit enterprise. Processing lower value cuts and preparing byproducts in the vicinity of hog slaughter reduces refrigeration and transportation costs and reduces waste of byproducts. Processing holds higher margins and higher returns. Relative economies of size indicate one

1
r
t
t
i
a
o

5

d
t
e
f
ma

slaughter plant can supply all the needs of one processing plant. Perishability of meat exposes slaughterers to problems with holdups if meat is not sold or processed soon after slaughter (Masten 1991). The above factors explain why slaughter and processing are often combined. However, processing also continues to be done by firms which do not own slaughter plants.

On the other hand, large numbers of hog farms are required to supply one slaughter plant. Skills to manage hog farms are significantly different from skills required to manage slaughter plants. Live hogs are not immediately perishable but do reach an optimum weight for slaughter. The above factors explain why slaughter plants are unlikely to vertically integrate and supply all of the slaughter hogs to operate a plant. At the same time, there is a need for improved coordination due to problems of price instability and increasing specificity of facilities, management and hog characteristics.

5.5 Implications of Coordination Problems and Opportunities for Improving Coordination

The development of new technologies, changing consumer demands for pork and structural changes pose challenges for the hog/pork subsector. The challenges share common elements in that they present coordination problems for subsector participants. The basic problems are: 1) matching the quantity of hogs produced with the demand for

pork; 2) matching the quality characteristics of hogs produced with characteristics demanded, consistent with cost possibilities; and 3) dealing with the possibility of holdups due to increasing specialization of production assets and widening divergence of economies of size between adjacent stages of the subsector.

5.5.1 Problems Coordinating Quantities and Qualities

Evidence that there are problems matching the quantity of hogs produced with the demand for pork is that the hog cycle and price instability continue. Production decisions are made in an uncertain environment. Resources must be committed months before prices received for feeder pigs and slaughter hogs are determined. The risk of losses associated with unstable prices becomes greater as more specialized assets are required to produce hogs; the amount of off-farm inputs increases; and concentration increases the market power of trading partners.

Evidence that there are problems matching the quality of hogs produced with the quality demanded is in the pricing system for pigs and hogs. As discussed in Chapter 3, most hogs are sold by visual inspection on a liveweight basis. Existing U.S.D.A. grades are very broad. Farmers are paid an average price per pound for all hogs sold together. Clear incentives to produce higher quality hogs are lacking.

Holdups are a transactions cost problem with the timely transfer of pigs, hogs and/or pork from one adjacent level

of the subsector to the next. Holdups affect the quality, and thereby the value, of perishable products. The complexity increases of coordinating transactions between levels of the subsector as the divergence widens between economies of size of operations at adjacent levels of the subsector. Increased complexity of transactions increases the probability of holdups occurring. The potential for losses due to holdups increases as assets are more specialized in the hog/pork subsector, because alternative activities cannot be undertaken in the event of a holdup.

Coordination mechanisms to improve forward planning, prevent holdups, deal effectively with contingencies which arise and specify hog quality are likely to be adopted by subsector participants to reduce the degree of risk associated with specialized assets and changing market structure in an uncertain environment characterized by price instability.

Analysis of relative economies of size in the hog/pork subsector indicated that vertical integration of all levels of the subsector is unlikely. Production contracts³ are one mechanism to reduce holdups and uncertainty about quantity and quality of hogs. Production contracts are discussed in the remainder of this chapter. Additional coordination

³Other types of contracts can also specify quantity and quality characteristics. Feeder pig certification contracts offered by cooperatives were discussed in an earlier chapter. Forward market contracts, also discussed earlier, are examined further in Chapter 6.

mechanisms, specifically as they can be used by cooperatives, are addressed in Chapter 6.

5.5.2 Opportunities for Improved Coordination

Production contracts are one mechanism to improve coordination. Vertical coordination by contracts avoids the problems of managing dissimilar types of operations encountered with integration while improving forward planning and addressing contingencies which can be described in the contracts. Production contracts facilitate vertical (and at some levels horizontal) coordination of the subsector's: 1) input supplies; 2) breeding and multiplying stock; 3) feeder pig and slaughter hog production; and 4) pig and hog marketing, while maintaining ownership of production facilities by farmers. Production contracts enable farmers/growers to capture economies of size in input purchases and production facilities. Price and production risks and profits are shared via production contracts. The potential for holdups by buyers or sellers is reduced. Challenges of structural change are also addressed by production contracts. For example, production contracts respond to the need for tailored inputs such as specialized hogs, as needed in the cases of pork growth promotants and branded fresh pork. Externalities associated with controlling product quality are minimized through production contracts. Free-rider problems, such as those associated with sharing expertise and training, are reduced through

production contracts if the term of the contract is long enough to amortize these investments. The following sections address these ideas in more detail. The degree of coordination actually achieved by production contracts depends upon who offers production contracts, discussed below, and the specific terms of the contracts, discussed in Chapter 6.

5.5.2.1 Implications for Coordination of Who Offers Production Contracts

Chapter 4 stated that Rhodes' survey (1990) found the majority of respondents offering contracts were farmers. Feed dealers and other agribusinesses accounted for one-third of respondents offering contracts. Big contractors were only three percent of respondents. However, big contractors accounted for more than one-half of the number of hogs and pigs produced under contracts. Feed dealers and other agribusinesses accounted for one-third of hogs and just over one-tenth of pigs. Farmers accounted for one-fifth of hogs and one-fourth of pigs produced under contract.

5.5.2.2 Production Contracts Offered by Input Suppliers

Feed dealers and other agribusinesses give their reasons for offering production contracts as assuring demand for feed and inputs and/or diversifying investments, but they also serve a coordination function. Dalziell's (p. 143)

study of instability showed corn and, to a greater degree, soybean prices were among the most unstable of more than 100 commodities, when comparing price instability between two periods, 1961-1971 and 1972-1982. Feed companies offering production contracts are able to reduce variability of returns, if pig and/or hog prices are less variable than feed prices. In addition, in years of relatively low feed prices, but high hog prices, a higher return may be realized by "marketing corn through hogs."

Feed costs are about 60 percent of production costs for raising hogs, as stated in Chapter 3. Clearly, highly fluctuating feed input costs lead to fluctuations in the costs of raising hogs, especially as more feed was purchased off-farm by hog farmers in recent years.⁴ Production contracts, wherein contractors provide all feed and most other supplies, shift input price instability away from farmers/growers to contractors. Contractors are in a better position to absorb feed price fluctuations, for instance, if their investments are diversified. Feed companies realize economies of size in milling feed. Growers capture these

⁴The contribution of input prices to price variation of hogs should not be overstated. The price variation of hogs due to variation in feed cost is not as much a problem as the instability due to the number of hogs marketed (Dalziel). The central problem is not price instability per se but the need for stability and predictability of returns to large amounts of fixed and increasingly specialized assets. Predictability of returns entails predictability of prices.

ec

gr

5.

ut

co

su

Ec

fi

fe

st

se

cou

up

the

Pro

bre

whe

buy

rat

cou

spec

may

comp

economies of size, if contractors provide feed at cost to growers.⁵

5.5.2.3 Production Contracts with Other Farmers

Farmers offer production contracts to other farmers to utilize feedgrain crops and/or diversify investments. If contractors are also hog farmers, contracts can assure supplies of, or demand for, breeding stock or feeder pigs. Economies of size are greater for farrowing than for finishing hogs. This implies large breed-multiplying (or feeder pig operations) could assure demand for breeding stock (or pigs ready for finishing) by contracting with several growers.

Conversely, several feeder pig producers or finishers could assure supplies of breeding stock or pigs by setting up farrowing corporations, as discussed in Chapter 3, thereby capturing economies of size in farrowing. Production contracts could coordinate the timing of lots of breeding stock or pigs. Holdup problems could be avoided, wherein feeder pigs are at the right weight for sale but a buyer cannot be found. Health problems and divergent growth rates from commingling lots of pigs from several sources could be avoided. Desired genetics and other quality specifications could also be coordinated via the contracts.

⁵However, gains from economies of size in feed milling may not be passed on to growers if there is insufficient competition in the feed industry.

5.5.2.4 Production Contracts Offered by Packers

Contracting for hogs can assure supplies when they are needed the most. Packer feeding of hogs amounted to just two-tenths of one percent of commercial hog slaughter in 1988 (Packers and Stockyards Administration). In the cases of both broilers and beef, as packer concentration increased, so did the amount of contract production by packers. Many analysts predict production contracts involving packers will increase (Ward 1990, p. 74).

To date (August 1992), slaughter plants have been more likely to enter into exclusive purchase agreements with large hog farmers than to offer production contracts. Excel has exclusive purchase agreements with several large hog farmers in Iowa. The farmers raise hogs with PIC hybrid genetics for Excel. Farmers are paid current market prices based on the grade and yield cutout value of these hogs (Schroeder 1992).

5.5.3 Coordination by Slaughter/Processors

Slaughter/processers have an important role to play in the marketing of pork. Processed products typically are branded. Fresh pork has not been branded in the past, but there is movement toward branded fresh pork products as well. Slaughter/processers are the key players in this movement. As packer concentration increases, packers can influence product grade and quality at the farm level by the slaughter hogs they purchase. Grade-and-yield pricing that

pays significantly more for desirable characteristics uses the price mechanism to convey packer preferences to farmers. Packers can influence product grade and quality at the retail/consumer level by providing case-ready packages of fresh pork. In an effort to reduce labor costs and increase efficiency, retailers are likely to be receptive to case-ready products of high quality. Consumer preferences for convenience and lean meat are well-documented. The impetus to move forward in the area of branded fresh pork lies with slaughter/processors, where the most efficiencies can be gained. However, making the transition from offering subprimals to case-ready branded fresh pork is more difficult than it appears.

5.5.3.1 Coordination of Quality Control from Farm to Final Consumer

The need for quality control of branded fresh pork extends beyond the farm level all the way to the final retail level. Product quality can be compromised in transporting live hogs and meat products. Handling and packaging can likewise affect product quality. The implication is that there must be coordination between the different levels of the subsector in order for quality control of branded products to be achieved.

If processors establish brand names, they must provide guarantees of product quality, either explicitly on the label or implicitly. Retailers are willing to share some of

the risks of quality control. These include those brought about by in-store refrigeration equipment failures or disposal of outdated products if they ordered more than they could sell. But retailers will be unwilling to accept branded products that arrive out of condition due to transportation problems or that fail to stay in condition until the marked final sale date due to packaging problems.

In the past, processor participation in quality control ended once retailers or food-service buyers agreed upon the purchase price and the goods were accepted. With branded fresh pork products, the processor maintains a direct interest until the final consumer is satisfied.

5.5.3.2 Evidence of Further Processing by Slaughter Plants

There is evidence that slaughter/processors are further processing and fabricating⁶ fresh meat. The number of meat wholesalers declined about 19 percent between 1963 and 1982 (Duewer, 1989). Slaughter/processors are performing more of the fabrication of cuts for fast-food chains. The productivity index per employee in the red meats sector, including slaughter/processing employees, increased from 75 in 1967 to 108 in 1982 (1977=100). The productivity increases and cost efficiencies of boxed and tray-ready meat products are sizeable. This is leading to the changing

⁶As defined by Crom (1988), fabrication is the breaking and cutting of carcasses or primals into retail cuts. Primals are major divisions of the carcass.

structure of the meat distribution sector and a smaller number of specialized firms (Crom 1988, pp. 21-27).

5.5.3.3 Implications for Production Contracting

Slaughter/processors branding fresh pork products, or planning to brand fresh pork in the future, have incentives to offer production contracts to meet specifications for uniform hogs to be used to produce uniform fresh pork cuts. Widespread use of production contracts by packers would represent a significant change in coordination in the hog/pork subsector. Packers could have assured supplies of hogs with designated genetics, raised under designated production practices, such as using pork growth hormones or avoiding using hormones. Coordination by contracts could reduce price instability of hogs for growers and packers.

Growers contracting with packers might reduce price instability, capture economies of size and gain the other coordination benefits of contracting described in the above sections. However, growers' assets in production facilities, hog characteristics and human assets are likely to become more specific. Having more specific assets increases the potential for loss from opportunistic behavior on the part of packers. This is discussed further in Chapter 6.

5.5.4 Coordination by Conglomerates

Many of the self-identified "big contractors" from Rhodes' survey (1990) which contract for more than one-half of all hogs and pigs, are likely to be owned by firms which could be called conglomerates⁷. Rhodes (1990) discovered that, in addition to the nine percent of hogs in the U.S. produced under contract, the contractors, themselves, produced another three percent of the hogs in the U.S.

Acquisitions by conglomerates, in conjunction with the increasing size of plants (the largest plant slaughters over three million head a year), has led to speculation as to what the situation in the future will be (Hayenga et al. 1985, p. 42). Evidence on the actions of conglomerate firms owning operations in the hog/pork subsector has not revealed actions to control all levels of the subsector through vertical integration. For example, as stated in Chapter 4, the four largest hog operations are owned by broiler integrators, which also offer production contracts for hogs. Ownership of meatpacking by conglomerates has been increasing. One major packer's lawsuit to block acquisition of several large plants was unsuccessful (Crom 1988, p. 47), which reflects the lax anti-trust regulatory attitude in the 1980s. Increasing concentration in the slaughter industry is of particular concern, because some of the same firms gaining market share in slaughtering also are present in

⁷Conglomerates can be defined as firms owning businesses in several commodity areas.

other subsector levels and could potentially act in an integrated fashion exerting control over the entire subsector. Ginder (1989, pp. 15-16) states this concern:

"Concerns about an increasingly concentrated slaughter sector are compounded by the fact that some of the same firms have significant positions in the processing sector. Specifically, high levels of horizontal concentration have developed in the feed ingredient industries (oilseed processing, corn refining and corn processing). A few firms involved in pork (and beef) slaughter have... established a presence (through mergers, acquisitions or new investment) at all levels [in the subsector]--including the actual production of livestock. There is little evidence that such firms are (at present) using vertical coordination to orchestrate the activities of their subsidiary operations at various levels in the pork channel. Nevertheless, the fact that these firms now occupy positions at all levels in the channel would permit them to operate in an integrated fashion given the proper set of conditions, including the production of hogs either internally or control of the production process through production contracts with farmers."

5.5.5 Progressiveness of Contractors

Large contractors directly influence the production practices of several farmers and large quantities of hogs. Progressiveness of contractors with respect to new technologies will have an impact on the rate of adoption of pork growth promotants, if approved. Contractors could train growers in the management skills needed to successfully use pork growth promotants. Training also helps growers face the challenges presented by increased production intensiveness in hog farming. Training farmers increases human asset specificity. Contractors are willing

to train growers, because the free-rider problem associated with training⁸ can be overcome, at least during the period of the contract.

5.6 Conclusions

The problems of the hog/pork subsector and problems which will arise in the future as new technologies are adopted, consumer demands change and concentration increases most levels of the subsector indicate the potential, if not the essential need, for a new system of coordination. Future developments will accelerate the trend of increased specialization of physical, human and hog assets. Large investments in more specific assets creates a need to change institutions to reduce the level of uncertainty associated with returns to large specialized investments. New institutions must reduce the potential for opportunistic behavior by trading partners. The potential for opportunistic behavior arises, in part, because of diverse relative economies of size between trading partners, which was examined in this chapter. Increasing concentration, and thus bargaining power, of slaughter/processors coupled with specialized assets, which reduce or eliminate alternative uses of investments by subsector participants, increases the potential for opportunistic behavior. Opportunistic

⁸There is an externality problem with training, because trained farmers can take their new skills and use them to produce hogs for themselves or someone other than the company who paid for the training.

behavior can take many forms which directly or indirectly⁹ reduce returns, as well as create uncertainty about the level of returns to specialized investments.

Technological developments and changing consumer demands affect the quality characteristics and quantities supplied and demanded at all levels of the subsector. Technological developments, such as pork growth promotants, affect both production practices and quality characteristics of hogs. Changes throughout the subsector are required to meet consumer demands for consistent quality pork. A new system of coordination is needed to create the incentives to match supply and demand with respect to both quality and quantity. Slaughter/processors are in a unique position to coordinate upstream supplies of hogs and downstream demands for fresh pork and pork products.

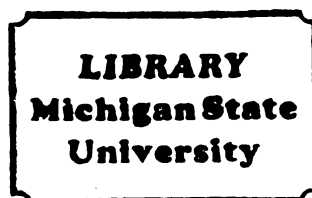
Contracting is one institution to improve coordination. The degree of coordination achieved, however, depends upon the level of the contractor in the subsector, whether the contractor is organized as a cooperative or an IOF and the specific terms of the contracts.

Chapter 6 examines potential coordinating roles and organization of livestock-farmer cooperatives. Production contracts offered by livestock-farmer cooperatives and utilization of grade-and-yield pricing are analyzed, in addition to other roles.

⁹Holdups are an example of an indirect form of opportunistic behavior.

THESIS

v. 2



PLACE IN RETURN BOX to remove this checkout from your record.
TO AVOID FINES return on or before date due.

DATE DUE	DATE DUE	DATE DUE
06 1994		
JAN 03 1995		
2737108		
SP 28		

MSU Is An Affirmative Action/Equal Opportunity Institution

c:\circ\datedue.pm3-p.1

**STRUCTURAL CHANGE IN THE HOG/PORK SUBSECTOR:
COORDINATING ROLES OF LIVESTOCK FARMER COOPERATIVES**

By

Lisa Chloie Abeles-Allison

Volume II

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1992

CHAPTER SIX
POTENTIAL COORDINATING ROLES AND ORGANIZATION
OF LIVESTOCK FARMER COOPERATIVES

6.1 Introduction

This chapter is organized as follows. The general causes and evidence of coordination problems between levels of the hog/pork subsector are examined. Then, each transaction interface is analyzed in three areas:

1) specific coordination problems; 2) alternative governance structures that reduce coordination problems; and 3) roles farmer cooperatives can take to improve coordination. After analyzing each transaction interface separately, vertical coordination of the subsector by cooperatives is analyzed. Advantages and disadvantages of cooperatives over IOFs are examined. Finally, macro coordination problems are discussed.

6.2 Coordination Problems

As discussed in previous chapters, the driving forces for structural change in the hog/pork subsector are changes in the basic conditions of supply and demand (for example, consumer preference for leaner pork). Structural changes in the subsector present coordination problems to participants.

Causes of structural change and coordination problems are:

1) increased specialized assets; 2) increased concentration; and 3) divergent relative economies of size between firms at adjacent levels in the subsector. Evidence of coordination problems are: 1) mismatch of quantities supplied and demanded; and 2) mismatch of qualities of hogs and pork supplied and demanded.

Specialized assets in combination with increased concentration and divergent relative economies of size create the potential for opportunistic behavior. The mismatch of quantities and qualities of hogs supplied and demanded creates price instability and thus revenue instability, forcing subsector participants to make decisions in an uncertain environment. Large investments in specific assets create a need for stable returns. Spot market transactions have not eliminated these coordination problems. Instead, structural changes in the subsector are increasing the severity of coordination problems.

Theory suggests that firms that enjoy significant economies of size and concentration (relative to firms operating at different levels of the subsector) have market or negotiating power over firms that operate at adjacent levels. Highly concentrated levels in the hog/pork subsector include hybrid breeders, feed suppliers and packers. Hog farming is the least concentrated level of the U.S. hog subsector. As a consequence, hog farmers have the

least market power, thus placing them at a disadvantage when purchasing inputs and/or selling hogs.

In a subsector where trading partners are IOFs, hog farmers are subject to the potential for opportunistic behavior by their trading partners. However, opportunistic behavior can be inhibited if one of two circumstances exist. First, there may be sufficient competition, even in highly concentrated subsectors, if firms behaving opportunistically would lose their farmer-customers to competing firms. Second, some firms, that operate at highly concentrated levels, may have such large investments in specialized fixed assets that they are enjoined from following strategies which might force hog farmers out of business and thus threaten their own existence as well (Williamson). Since hog farmers are only one of the livestock subsectors purchasing feed, the second argument is not likely to apply to the feed supply sector. However, hog breeders clearly depend on hog farmers. As slaughter plants specialize to slaughter only one species, hog slaughter plants cannot risk running hog farmers out of business.

The question is also one of degree. Trading partners with market power might reduce returns to hog farming below the level that would prevail if hog farmers had equal market power. However, it would be illogical for firms to intentionally reduce returns so low that all farmers exit hog farming. The formation of effective hog farmer

cooperatives is one way hog farmers can equalize market power with trading partners.

6.3 Coordination Wholesale/Retail and Slaughter/Processing

Slaughter\processors are unlikely to integrate into wholesale or retail meat sales. Anti-trust regulations prohibit ownership of all three levels. However, purchase agreements may be negotiated between slaughter\processors and wholesale\retailers, especially for branded fresh pork. Fresh pork is perishable. Branded products rely on consistent quality to attract repeat purchases. It is in the interest of packers branding fresh pork to assure timely delivery under proper refrigeration, as well as timely turnover in grocer's meat cases. Purchase agreements help ensure product quality maintenance. As a strategy to capture market share, successful branded pork packers might follow the example of broiler integrators who forced some retail chains to carry only their brands. Significant branded product development would have to precede exclusive sale agreements between packers and retailers.

6.4 Coordination of Hog Processing and Slaughter

Coordination problems between hog slaughter and processing include perishability of pork and thus the potential for holdups, matching supplies with demands for specific cuts, byproduct and waste disposal and transportation costs.

6.4.1 Coordination Alternatives

Integration of hog slaughter and processing is the most likely system of coordination to develop between hog slaughter and processing for the reasons given in section 5.4.4.6. In addition to integrated slaughter/processing plants, independent processing plants will produce specialty pork products for niche markets. Integrated slaughter/processing plants can be either IOFs or cooperatively-owned.

6.4.1.1 Advantages of Cooperative Ownership

Slaughter/processing facilities are pivotal for coordination of the subsector as described in section 5.5.3. As described below, collective ownership of slaughter and processing plants by hog farmers gives hog farmers a strong mechanism to influence the direction of the subsector. Cooperative ownership improves coordination between hog farmers and slaughter plants. If slaughter facilities are cooperatively-owned, processing facilities should be cooperatively-owned as well since integration of hog slaughter and processing is most economical.

6.5 Coordination of Hog Slaughter and Finishing

Coordination between hog slaughter and finishing requires matching the quantities and qualities of hogs supplied with the quantities and qualities of hogs demanded. Historically, coordination between hog finishers

and packers has been achieved by private treaty or spot market transaction. The foremost problem associated with matching quantities is the uncertainty about future hog prices at the time when farmers must plan the quantities of hogs to produce. The result is characterized by the cobweb model described in Chapter 1. The implication is that various types of forward pricing contracts are needed.

The problem of matching qualities of hogs in open market exchange exists because price differentials are not clearly signaling desirable versus undesirable hog qualities to farmers. The implication is that carcass merit pricing systems sending clear signals to farmers are needed for open market exchange and/or institutions that allow exact specification of quality standards, such as marketing and production contracts, as alternatives to open market pricing. In addition, institutions that allow exact specification of quality standards, such as marketing and production contracts, are needed as alternatives to spot market pricing.

Coordination is complex because of widely divergent relative economies of size between hog slaughter and finishing. If known economies of size, examined in Chapter 5, are taken to their logical extreme, approximately 8,000-10,000 hog farmers would sell to approximately 50 packing

plants owned by approximately a dozen firms.¹ Packer concentration is likely to give packers market power² over independent hog farmers. Market power enables packers to behave opportunistically toward hog farmers.³ The implication is organization by independent farmers is needed to balance information and bargaining power between packers and farmers.

As assets become more specialized for both hog farming and slaughter, unstable prices and revenues increase the risks associated with investments in the hog/pork subsector. Subsector participants seek to reduce these risks by seeking alternative coordinating institutions and mechanisms for coordination within those institutions. The next sections analyze alternative coordinating institutions and coordination mechanisms.

¹Approximately 80 million hogs are produced annually in the U.S. Economies of size exist for farms finishing 10,000 head of hogs (Crom). If each farm produced 10,000 head, approximately 8,000 farms would be needed. Economies of size exist for plants slaughtering more than one million head. The average packing plant in that size category slaughtered 1.6 million hogs in 1985 (Packers and Stockyards Administration). Approximately 50 packing plants would be needed to slaughter 80 million hogs. There are economies of owning multiple plants. The four largest packers each slaughtered approximately 6 million hogs. Approximately a dozen firms could own all the slaughter capacity in the U.S.

²A component of market power is asymmetric information, wherein packers have much more information about hog markets than independent farmers.

³Whether or not concentrated packers actually use market power to behave opportunistically is an empirical question which studies by Hogeland, Ward and Schroeder addressed with differing results. Further research is needed.

6.5.1 Coordination Alternatives

Alternatives for coordination range the spectrum from improved open market pricing to contracts to cooperatives to integration. The subsector is most likely to be composed of some combination of alternatives, but the question is which alternatives will dominate.

6.5.1.1 Integration of Hog Slaughter and Finishing

Integration by slaughter plants into hog farming would allow plants to reduce quantity and quality instability. However, coordination by integration is unlikely for several reasons. One reason is divergent economies of size. Integration would require ownership of several hundred farms or giant production units by slaughter/processors. Ownership of production facilities and the attendant requirements for waste disposal would require investments of several hundred million dollars by slaughter plants.⁴

Anti-corporate farming laws in some states and local zoning and planning laws are likely to present barriers to the purchase of land and the development of large production facilities.

Integration entails intensive management of hog farrowing and finishing. Management skills are required which are dissimilar to management of slaughter facilities,

⁴If facilities to produce 10,000 hogs cost \$750,000, the cost of facilities to produce nearly 1000 times as many hogs would exceed \$500,000,000. Operating costs would be in addition to facilities costs.

increasing the difficulty of achieving effective management. The above difficulties imply integration of packing and hog finishing for the majority of hog supplies is unlikely.

6.5.1.2 Cooperative Ownership of Packing Plants

Cooperative ownership of slaughter/processing plants by hog finishers is an alternative for coordination. Cooperative ownership has several advantages. Within a cooperatively-owned packing plant, hog farmer ownership and control of the Board of Directors is likely to prevent opportunistic behavior by the packer/processor management towards farmers. As owners, farmers capture any profits generated at the slaughter and processing levels.

Cooperatively-owned packing plants serve as a countervailing power to IOF packing plants. Returns to all hog farmers are improved if packers are unable to behave opportunistically. The need for hog farmers to have countervailing power becomes more critical as packer concentration increases and market competition declines. As fewer firms control the slaughter/processing industry, cooperatively-owned slaughter/processing plants are likely to be more effective as countervailing powers than in less concentrated markets. In an oligopolistic market each firm considers the actions of the other firms when making strategic decisions (Scherer).

The problems associated with vertical integration of managing diverse types of operations, both large plants and

multiple farms, are uniquely addressed by cooperative ownership. Management skills are matched to the type of operation managed. Hog production is intensively managed by farmers with proprietary interests. Slaughter/processing operations are managed by professional staff carrying out policies set by a Board of Directors composed of hog farmers.

Coordination of supply and demand is likely to be improved because the needs of packers and processors effectively become the needs of hog farmers. Farmers are in a position to make the necessary changes in supply.

Cooperative ownership presents challenges. First is organization of hog farmers in sufficient numbers in a cooperative to finance purchasing or building slaughter/processing facilities. Farmers return on investment in slaughter/processing facilities must equal or exceed returns on alternative investments. Slaughter plants have had relatively low rates of return, but processing plants have been more profitable (Chapter 3). Non-monetary returns, such as farmer control of the direction of change in the hog/pork subsector, need to be included in the investment decision.

Conflicts of interest exist between management of slaughter/processing plants and hog farmers. For example, hog farmers are concerned with production characteristics of hogs, such as number of pigs per litter. Plant management is concerned with carcass quality characteristics. A breed

of hogs which excels in one of those criteria may perform poorly in the other. Pricing of hogs is another area of potential conflict. Plant managers seek low-cost hogs. Farmers seek high prices for hogs. How are payments to hog farmers/plant owners determined? Paying farmers based on wholesale pork prices would create a common incentive for slaughter/processors and farmers to produce products with the highest wholesale value. The need would still exist for a method to calculate each farmer's contribution to the final products in order to determine payment with appropriate incentives for farmers to produce high-value carcasses. Carcass identification and a carcass merit system, such as the system discussed below, are necessary.

Cooperative ownership of slaughter/processing plants does not solve the forward planning problem which causes quantity and price instability. A system of forward contracts to match hog supplies with slaughter/processor needs would need to be implemented to improve coordination. Forward delivery contracts would specify quantities, prices paid for specific carcass grades and yields and delivery dates. Hog farmers would know the future prices to be received for their hogs before production begins. Decisions about the quantities of hogs to produce would still be made independently by farmers, but a contract for future delivery and slaughter would be signed when the decision was made, locking in the price and quantity. In addition to forward delivery contracts, production contracts, as discussed in

Chapter 4, should be offered to hog farmer/owners. Production contracts improve coordination of quality characteristics, as well as quantities, because the packers/contractors decide hog breeds in addition to production practices to be followed. Use of forward contracts and production contracts within cooperatives are analyzed below.

6.5.1.3 Production Contracts

Although not likely to integrate by ownership into hog finishing, slaughter/processors are likely to offer production contracts to hog farmers. Historically, packers accounted for a very small percent of contractors. In the future, packers are likely to account for a large percent of contractors. Widespread introduction of fresh branded pork is probable in the next few years.⁵ Slaughter/processors selling fresh branded pork need consistent supplies of uniform quality hogs. Production contracts improve coordination by allowing slaughter/processors, as contractors, to require the genetics, feed rations and

⁵Tyson Foods, the largest hog production contractor in the U.S., is producing fresh branded pork. Tyson owns pork processing facilities, but not hog slaughter plants. In the summer of 1992, Tyson broke off negotiations to purchase Mariah Packing in Illinois (Feedstuffs, 1992). Most of Tyson's contract growers are in the Southern states. Tyson has discussed the possibility of building slaughter facilities once contract production expands enough to supply a plant. Tyson has not yet vertically coordinated all levels of the hog/pork subsector, but it is poised to do so in the near future.

management practices that produce hogs with characteristics that match slaughter/processors needs. Coordination problems relating to quality, quantity, timing of deliveries and price instability are reduced or eliminated. Production contracts allow close coordination of packers' demands with supplies without requiring packer investment in the specialized fixed assets of production facilities and skilled labor. More about how production contracts improve coordination was discussed in section 5.5.2. Production contracts now offered by cooperatives are described next. In a later section on vertical coordination of the subsector specific terms of production contracts are analyzed and recommendations made for improving coordination.

6.5.1.3.1 Production Contracts Now Offered by Cooperatives

The three farmer cooperatives now offering production contracts are large diversified cooperatives: Gold Kist, Cenex/Land O' Lakes and Farmland. Each cooperative has a unique history and philosophy. Though several of the services they offer hog farmers are similar, the breadth and depth of their involvement in the hog/pork subsector differs.

Gold Kist has the narrowest focus of the three. Gold Kist's operations were discussed in detail in Chapter 4.

Cenex/Land O' Lakes (LOL) entered the hog/pork subsector via feed sales, which remain important. Over the years, LOL has become further involved in the livestock

industry. This includes dairy (where it has a long history), turkey contracting and integration, and red meat slaughter plants. Turkey contracting proved unsuccessful due to overly optimistic profit projections. Turkey farmers who contracted with LOL did very well, but LOL's turkey division eventually went broke and defaulted on all its contracts. Similarly, LOL's red meat slaughter plant was unprofitable because it was unable to adapt to lower costs forced on the industry by the entry of IBP (with its high technology plants and non-union labor).

As a consequence of these failures, LOL is proceeding cautiously in its ventures in the hog/pork subsector. LOL's philosophy is rooted in farmer control of the cooperative. Unlike Gold Kist, which dictates a single standard that all its hog farmers must meet, LOL has implemented a variety of programs to help Midwestern hog farmers adapt to changes in the hog subsector. Programs include development of new feed mixes, research farms, marketing services and contract production programs.

LOL's contract production programs are more flexible than those of Gold Kist in that it will work with farmers' existing facilities if the farmer desires, instead of requiring them to build facilities to meet a prototype. LOL's acknowledges the importance of developing high-quality, uniform hogs and consumer meat products. It does not plan to enter into hog slaughter, but may enter into pork processing in the future.

Farmland Industries and its subsidiary, Farmland Foods, are involved in all levels in the hog/pork subsector. Its operations include: 1) feed and other input supplies; 2) breed testing at research stations and on-farm; 3) a scientifically-designed crossbreeding program called the Quality Pork Program; 4) hybrid sow and feeder pig production facilities; 5) contract production programs for feeder pigs and slaughter hogs; 6) pig and hog marketing; 7) hog slaughter; 8) pork processing; 9) sale of branded products; and 10) exports.

As stated in the April 1990 Farmland News:

"Farmland officials say closer coordination between producer and packer is needed to respond to raising expectations of the consumer and to keep the Midwestern hog industry healthy and competitive with growers' factory-type pork production in the Southeast."

To realize these goals, Farmland Foods believes a supply of quality, uniform and lean hogs needs to be produced through closer coordination between farmers and processors. More specifically, Farmland Foods is planning to supply its own packing plants⁶ with as many as 2 million uniform-quality hogs produced under contract with farmers. Its goal is to produce half a million hogs under contract in the first five years. The program involves hybrid breed-stock multiplication, farrowing, feeder pig production and

⁶Farmland Foods total slaughter capacity is about 4 million hogs per year (Davis 1992).

hog finishing, with Farmland Foods performing both slaughtering and processing.

Plans are being implemented to supply uniform-quality hogs to Farmland Foods. The Quality Pork Program (part of the output division), and Farmland Foods (the division which owns slaughter/processing plants), each offer separate programs. The Pork Program owns several breed multiplying units. Each unit has between 600 and 2400 sows and utilizes DeKalb stock. The hybrid breeding stock is used by growers who produce feeder pigs under contract. Those feeder pigs are also finished under contract. Growers (who must bear production risk but not price risk), must meet minimum production standards and are rewarded with incentive bonuses (discounts) based on feed efficiency and sow productivity.

6.5.1.4 Forward Contracts Prior to Production Decisions

Forward contracts prior to production decisions are a coordination mechanism which can eliminate the planning problems due to making production decisions before the price of hogs is known. Forward contracts do not require any investment by packers in hog production, unlike production contracts. However, forward contracts also do not allow as tight of coordination as production contracts allow between

packer demands and hog finishers' supplies.⁷ Forward contracts can specify breeds, feeding regimen (for example, use of Company Z Feeds), delivery dates and minimum carcass specifications, as well as bonuses or discounts.

Forward contracts can be arranged several ways:

1) directly by packers to hog farmers; 2) by livestock-farmer cooperatives with packers; 3) by livestock-farmer cooperatives with hog farmers; or 4) by livestock-farmer cooperatives forward contracting with both packers and hog farmers.

Packers forward contracting directly with hog farmers presents two main problems. The first is information asymmetry between packers and hog farmers. Forward contracts are private treaties between the two parties, thus information on price and contract terms is not publicly available. Packers have more resources with which to gain information, as well as information already gained directly from contracts with many farmers. The asymmetry in negotiating power can allow packers opportunistically to set contract terms to the packers' advantage. Second, Kauffman found that farmers and packers differed with respect to the size of the contracts to which they would commit. Packers preferred to trade contracts at least as large as hog

⁷It is hard to enforce forward contracts with terms as strict as the terms can be in production contracts. Also, most production contracts allow contractors to determine management practices. Production contractors often have the flexibility to incorporate new techniques or technology without rewriting production contracts.

futures contracts and, ideally, the size of a semi-trailer of hogs, an even larger quantity. Farmers, on the other hand, preferred to trade in contracts the size of an average truckload of hogs. Smaller farmers desired even smaller contract sizes (Kauffman 1983).

Forward contracts offered by packers are likely to be available only to large farmers. Evidence from the industry indicates that, in fact, exclusive marketing agreements (which are a form of forward contract) are between packers and large farmers (Schroeder). These results, while not surprising, indicate a need to coordinate farm-sized with packer-sized contracts. Kauffman suggested this be done at collection points, but did not go into detail as to how or by whom this was to be done.

Cooperatives provide one of the missing links for coordination that Kauffman did not elaborate on. Livestock-farmer cooperatives are composed of farmers operating different sized hog operations. Cooperatives could perform the function of commingling forward contracted lots of hogs. Contracts could be offered to farmers in lot sizes they could meet. The cooperative has two options after forward contracting with hog farmers for hogs. The cooperative can hedge the price risk on the futures market. The viability of the forward contract program then depends upon the success and cost of hedging. Alternatively, cooperatives could then forward contract with packers in larger lot sizes. The packer is left to hedge in the futures market.

An alternative is for livestock-farmer cooperatives to serve as a broker between packers and hog farmers. The cooperative would find out the amount hog farmer/members would offer for different prices and the amount packers would offer to buy at different prices, thus arriving at acceptable terms. The cooperative would create a market in contracts.

Using the livestock-farmer marketing cooperative as an intermediary has several advantages over farmers contracting directly with packers. The potential for opportunistic behavior on the part of packers is reduced as cooperatives have more information gathering resources than individual farmers and can be a stronger negotiating partner. Price and contract terms information can be made public by cooperatives or at least available to cooperative members. Cooperatives can offer high exclusion cost goods in addition to contracting services to encourage participation by farmers in forward contracts.

Forward contracts may be more widely used at the livestock-farmer cooperative level because farmers have more trust in their cooperatives than in packers. Farmers have a voice in how their cooperative runs the forward contract program. The ability to voice their concerns may make farmers more willing to forward contract with cooperatives despite the ups and downs of the hog cycle. Farmers have no voice and can only exit from forward contracting with IOF packers to convey dissatisfaction (Hirschman).

Livestock-farmer cooperatives may have difficulty policing forward contracts. Cooperatives may be hesitant to bring legal action against members, especially longstanding and larger members, who break forward contracts and sell their hogs elsewhere when prices are higher than those contracted.

Membership in cooperatives and use of forward contracts is voluntary. The free rider problem exists because farmers not using forward contracts still benefit from improved coordination from farmers using forward contracts. An incentive exists to let other farmers forward contract and not commit oneself to forward contracts.

Packers may lure large farmers to contract directly with them by offering slightly higher prices than cooperatives offer. It may not be feasible for cooperatives to offer forward contracts, if economies of scale are lost by large farmers contracting directly with packers.

6.5.1.4.1 Use of Forward Contracts by Cooperatives

Although Farmland Foods owns slaughter plants, the slaughter plant division does not enter into production contracts. Instead the slaughter plants offer exclusive buying contracts for 5-7 year periods, such as the "Cost Plus \$5" program. Under the program, Farmland Foods approves the genetics of hogs produced, but it does not own the hogs nor does it provide feed, supplies, or technical

advice⁸. Farmers participating in the program are paid a non-feed "cost", which is adjusted annually for inflation. The amount is not the farmers' actual costs but an amount calculated by Farmland to be representative of an efficient farmer's costs. Farmers are also paid a feed "cost" which is variable based on corn and meal prices. Finally, farmers are paid \$5.00 in addition to "costs".

Under the "Cost Plus \$5" program, farmers bear no market risk. A similar program allows farmers to bear some market risk and receive costs plus \$0-\$10, depending upon market prices. The program with some market risk, "Cost Plus \$0-\$10", has been less popular among farmers than the "Cost Plus \$5" program. Apparently, farmers usually enter such contracting because they are expanding or upgrading their operations and desire an assured income to meet loan payments (Davis 1992).

6.5.1.5 Bargaining Associations

Bargaining associations are an alternative when cooperative ownership of slaughter/processing facilities is not yet feasible. Bargaining associations enable farmers to reduce the disparity of market power where hog farmers face oligopsonistic markets. Bargaining associations that represent a large number of producers should be able to

⁸All feed, supplies, breeding stock or feeder pigs, technical advice and even financing can be purchased from Farmland in "one-stop shopping" (as Farmland promotes their range of services).

assert greater market power than an individual farmer. Bargaining associations also reduce transactions costs of bargaining for prices and negotiating contract terms, because one party negotiates for all farmers as opposed to separate negotiations with each farmer.

6.5.1.5.1 Bargain for Hog Prices

Most hogs are sold directly from farms to packers with only one or two price bids received by the farmer. Bargaining associations representing large numbers of farmers can contact several packers and negotiate prices for large numbers of hogs. Hogs can still be shipped directly from large farms to packers, but more competitive prices may be received. Bargaining associations could provide better access to markets to farmers in areas where auction, terminal markets and/or packing plants have closed down.

6.5.1.5.2 Bargain for Non-Price Terms

Bargaining associations also negotiate with packers on non-price terms. Control of non-price terms helps farmers overcome the externalities associated with lack of quality control beyond the farm gate. Non-price terms which affect hog quality include: delivery days and times, lot sizes, and grading. Hogs have higher values if they are delivered when packers have short supplies and packers' facilities and labor are under utilized. Hogs slaughtered soon after delivery avoid shrinkage and potential injuries. Value of

hogs is also increased if lot sizes are matched to the numbers farmers are able to deliver in uniform lots.

6.5.1.5.3 Bargain for Terms of Production Contracts

Bargaining associations can negotiate production contract terms on the behalf of members. Negotiating contract terms with bargaining associations makes the different contract terms offered by different contractors public information. The information allows growers to compare contracts prior to making a commitment to one or another. Typically, contracts are drawn up by attorneys representing contractors and contractors' interests. Bargaining associations could assure growers' interests are represented as well.

6.5.1.5.4 Problems in Organizing and Maintaining Bargaining Associations

The free rider problem makes it difficult for farmers to organize and maintain bargaining associations. Members bear the costs of organizing a bargaining association, while non-participating farmers still benefit from its existence. One way to reduce the transactions costs of organizing bargaining associations is for livestock-farmer cooperatives, which offer other services, to take on the functions of a bargaining association. Livestock-farmer cooperatives sell sufficient numbers of hogs to be able to negotiate with packers on price and non-price terms.

0

6

cc

Ca

Livestock-farmer cooperatives could effectively expand into bargaining functions to maintain a competitive selling environment for livestock farmers.

Even if bargaining associations are successfully organized, they may not be maintained. Heterogeneous members have different objectives and interests. For example, prices which are acceptable to low-cost producers may not be acceptable to higher-cost producers. These and other sources of conflict may lead to the dissolution of a bargaining association.

Bargaining associations, which have the power to act as the exclusive bargaining agent for a commodity, would have the most leverage in negotiating with packers and contractors. Federal legislation would be required. Exclusive agency legislation would deal with the free rider problem. Analysis of the political-economic issues of this type of legislation is beyond the scope of this report.

Due to the problems associated with bargaining associations, farmers might decide to integrate vertically by owning slaughter/processing facilities. This would be logical if it was less costly than bargaining and enforcing contracts (Staatz 1987a, p. 89).

6.5.1.6 Carcass Merit Pricing

Carcass merit pricing is a coordination mechanism that could improve the information generated in sales to packers. Carcass merit information is appropriate for use in

conjunction with the full range of transactions governance institutions from open markets to production contracts.

Carcass merit pricing (also referred to as grade-and-yield pricing) improves coordination of supply and demand by price incentives. Farmers are paid higher prices for hogs with characteristics valued by packers. Higher prices encourage farmers to adopt genetics and production practices that result in hogs with valued characteristics. However, sufficient price differentials must exist to make changing practices worthwhile for farmers.

Information on carcass characteristics is useful for packers, as well as farmers. Packers use carcass merit information to keep an inventory of pork supplies to be used for processing versus fresh pork sales. Prices packers receive for different pork cuts and qualities can be reflected back to the prices that are offered for hogs.

Carcass merit information can be used as a performance measure for production contractors. Contractors, such as slaughter/processors selling fresh branded pork, can determine if production contract programs are producing desired characteristics from carcass merit information. If the source of each carcass is identified, problems can be traced back to individual growers. Improvements can also be noted. In order to be most effective, price incentives for growers should be linked to specific carcass merit performance.

Farmers who are considering whether or not to use pork growth promotants, may concurrently decide whether or not to use carcass merit pricing. Heavy hogs are usually discounted with live weight pricing on the assumption that most of the extra weight is fat. If farmers are to be rewarded for producing heavy, lean hogs as a result of using pork growth promotants, the prices paid for hogs should be based on a carcass merit system. Carcass merit pricing accurately reflects the "true" final market values of heavy, lean hogs.

Carcass merit pricing of hogs has been increasing in the U.S. over the past three decades. In 1991, approximately 25 percent of hogs were priced on a carcass merit basis (Kauffman 1992). In 1982, 11 percent of all hogs were priced on a carcass merit basis. Regionally, 20-23 percent of hogs were priced on carcass merit in the North Atlantic, West North Central and Mountain states, while only 1 percent were in the South Atlantic and Pacific states and 8-9 percent were in the East North Central, South Central and Southern Plains states (Packers and Stockyards Administration 1985). In the early 1960s only 2-3 percent of hogs were priced on a carcass merit basis (Hayenga et al. 1985, p. 61).

The extent of the use of carcass merit pricing by packers and how packers use the information varies from packer to packer. Hormel purchases 65 percent of hogs on a carcass merit basis (Kauffman 1992). Excel purchases about

40 percent of its hogs on a carcass merit basis. All hogs bought under exclusive purchase agreements between Excel and farmers are purchased on carcass merit (Schroeder 1992).

IBP calculates carcass merit on every hog they buy, even if the farmer does not request carcass merit pricing. The information is used to offer farmers an indirect rolling average price based on the performance of each farmer's last few shipments. IBP prices each farmer's hogs based on average carcass merit performance of that farmer's last two or three loads of hogs (Kauffman 1992; Hayenga 1992).

Carcass merit pricing has not been more widespread for several reasons with objections coming both from packers and farmers.

6.5.1.6.1 Packers' Objections to Using Carcass Merit Pricing

Packers may object to carcass merit pricing because it increases the transactions costs of purchasing hogs as compared to live weight purchases. Carcass merit pricing requires identification of carcasses with sellers, which can be accomplished either by physical separation of lots or tagging hogs. More labor is required to take and record measurements and calculate prices. The identification and additional measurements may reduce the speed of hogs through the kill line and thus reduce the number of animals the packer can process in a given time period. An additional contact with the seller is required, although simply mailing

the evaluation results and payment may be all that is needed.

Specialized equipment is used for measuring and calculating results. There are several types of measurement instruments on the market, from hand-held probes to automated machines. The Danes developed a grading machine which measures over a dozen different points on the carcass (Pederson 1990). Purdue University is developing a grading machine called TOBEC (total body electrical conductivity). Another machine is being developed that uses ultrasound (Pork '91, June 1991). Installing machines may require redesigning the kill line. Machine prices range from about \$50,000 to over \$1,000,000. Packers may be dissatisfied with the options available either because of cost or the limited measurements made by the equipment.

The long run view of packers is that carcass merit pricing will improve the quality of hogs available. But in the short run, packers want to minimize the total cost of the raw product. There is also seasonal overcapacity in the slaughter industry when packers will take any hogs they can buy. If a packer were to unilaterally refuse to buy hogs except on a carcass merit basis, farmers unwilling to use carcass merit systems could effectively reduce the supply of hogs to that packer, which could exacerbate overcapacity problems when hog supplies were short.

6.5.1.6.2 Hog Farmers' Objections to Using Carcass Merit Pricing

Hog farmers may object to using carcass merit pricing systems for several reasons. They include uncertainty of the prices farmers will receive, distrust of packers' graders, lower returns for lower quality hogs, reduced payments for damaged hogs and no payment for hogs condemned after slaughter. Farmers find it difficult to compare prices offered by packers under carcass merit systems. Each packer has its own standards. Different packers take different carcass measurements, use different techniques or instruments to make measurements and/or use different formulas to calculate results and prices (Kauffman 1992). This makes it difficult for farmers to decipher which packer will pay the best price for their hogs. Pork '91 surveyed five large packers on the carcass merit prices they would pay for 42 hogs with the same weight and yield but different levels of back fat, loin eye area and percent lean. The results indicated that all five packers paid more for leaner hogs, but prices paid varied from \$3.00 to \$16.00 per hog from one packer to the next for identical hogs (Stahl). Different prices for identical hogs to some extent reflect different packers' preferences for different characteristics in hogs.

The original carcass merit system adopted by some packers was found not to reflect packers' preferences accurately and adjustments were made. Excel had a step-like

pricing system with relatively large range of carcass measurements receiving the same price. It recently adopted a more continuous pricing system (Schroeder 1992). Farmland Foods adjusted its carcass merit system to increase the price spread between fat and lean hogs. As a result, the number of farmers using carcass merit pricing at Farmland's packing plants increased significantly (Davis 1992). The carcass merit price spread for fat to lean hogs in the U.S. is about 80 cents per hundredweight which is less than half the price spread in Denmark, \$1.70 per hundredweight (Pork '91). Some industry analysts think a wider price spread will be necessary in the U.S. to attract more farmers to use carcass merit pricing (Kauffman 1992).

Farmers may be uncomfortable committing hogs for slaughter to packers before prices are known. Farmers may question the impartiality of graders who are hired by packers. Farmers also object to delayed payments for hogs. Carcass merit pricing will not improve returns to all hog farmers. Farmers producing lower quality hogs will receive less under a carcass merit system than under a live weight pricing system. These farmers can be expected to oppose using carcass merit price systems.

6.5.1.6.3 National Pork Producers' Council Committee on Carcass Merit Pricing

The National Pork Producers' Council, which represents 80 percent of U.S. hog farmers, has a committee studying how

to encourage all hog farmers to use carcass merit pricing. The consensus is that information is the first step to changing genetics to improve hog characteristics. The goal of the committee is to implement a nationwide Information Retrieval System by 1993-1994. The Information Retrieval System requests that all packers provide the same carcass merit information to hog farmers.

Farmers would get information on weight, wholesomeness, composition⁹ and quality¹⁰. NPPC committee members believe that price differentials are not wide enough yet to entice U.S. farmers to make necessary changes in production practices. The committee believes that price differentials will follow once carcass information is available.

The Information Retrieval System does not require packers to set common carcass merit standards. Anti-trust laws prevent packers from colluding on pricing systems. Different packers have different needs so they would not want to price the same. However, packers also may need different carcass measurements so they may resist participating in the Information Retrieval System.

The long run goal of improved pork quality would benefit consumers. There is evidence of severe quality problems in pork. NPPC conducted a quality survey at 14

⁹Composition is the proportion of skin to lean meat, fat and bone.

¹⁰Quality reflects how good the lean meat is with respect to color, firmness and moistness.

packing companies. Over 11,000 hams, 40 percent of total slaughter over 2 months, were measured for quality. One-fourth of the hams were not of good quality, either PSE (pale, soft, exudate) or dark and dry (Kauffman 1992).

6.5.1.6.4 Cooperatives' Roles in Carcass Merit Pricing

The information from carcass merit evaluation improves communication about desirable and undesirable hog characteristics, and thus improves coordination, between packers and hog farmers. What roles can farmer cooperatives take to overcome hog farmers' objections to using carcass merit pricing? Livestock-farmer marketing cooperatives, bargaining associations and cooperatively-owned packing plants could take initiative in three areas: 1) education; 2) graders; and 3) payments. One reason hog farmers hesitate to use carcass merit pricing is because carcass merit specifications may be unclear and vary from packer-to-packer. Representatives from farmer cooperatives could meet with packers to clarify carcass merit specifications. Specifications would then be explained to farmers by cooperatives' staff. Additional information as to how farmers could take advantage of breeding and production practices to get the highest prices should be presented at the same time. Packers do not have incentives to train farmers or point out unfavorable aspects of their own program as compared with those of other packers. Bringing

such information out into the open will force packers to compete more openly for farmers' hogs.

Second, farmers distrust packers to grade without bias. Cooperatives could ensure unbiased grading by hiring and placing their own graders in IOF packing plants. Cooperatives could also obtain copies of carcass merit specifications of hogs and prices paid to all their members. These records could be checked for consistency and with price information from other sources. Hog farmers are more likely to trust graders in cooperatively-owned packing plants. Management of cooperatively-owned packing plants are likely to share willingly carcass merit information with hog farmers.

Third, farmers find it difficult to turn over hogs for slaughter not knowing what price they will receive and then waiting to receive payment. Cooperatives may be able to address payment issues for hogs the way that some cooperatively-owned fruit and vegetable packers operate. Upon delivery of hogs, a minimum price could be paid. After slaughter, when carcass merit information is available, the remainder of the amount due would be paid. IOFs can also offer a two-part payment, as some fruit and vegetable IOF processors do. However, farmers are more likely to trust cooperatives to pay fairly because the books of the cooperative are open to members. The books of IOFs, on the other hand, are not open to hog farmers; so farmers cannot check to see if the IOF is paying fairly.

Services offered by cooperatively-owned packers, which are popular with hog farmers, could force IOF packers into offering similar services in order to compete effectively against cooperatively-owned packers.

6.6 Coordination of Hog Finishing and Feeder Pig Production

Coordination problems between hog finishing and feeder pig production are primarily due to the differences between the two production steps. Relative economies of size are greater for feeder pig production. Farrowing is more management intensive than finishing. More fixed assets are required for farrowing. Regions of the country with lower labor costs and lower grain output have a comparative advantage for farrowing, as opposed to finishing, due to the higher labor requirements (but relatively lower feed requirements) of farrowing.

The differences between farrowing and finishing, at first glance, would indicate the two production processes should be carried out by different groups of farmers and even in different regions of the country. However, other factors need to be considered. Regional price differences in labor and feed can be overcome by gaining economies of size in production and superior management. Competitiveness of large hog farmers in the Southeast states with Midwest hog farmers is evidence that factors other than labor and feed are important in determining comparative advantages of different regions. Separating farrowing and finishing

increases production time from birth to slaughter by several days. Transporting feeder pigs causes stress and reduces weight gain for a time period. Commingling groups of feeder pigs for finishing increases disease problems and death loss. Uniformity of hog lots for slaughter depends upon the genetics, age and health of feeder pigs. In other words, the quality of feeder pigs directly affects the quality of slaughter hogs. Improved coordination requires that feeder pig farmers supply pigs with the exact characteristics finishers demand.

6.6.1 Coordination Alternatives

Integration in the form of farrow-to-finish operations is likely to be the most common form of coordination. Farrow-to-finish operations already account for about 60 percent of hog production. The main reason is the effect of the genetics and quality of feeder pigs on the characteristics of slaughter hogs. As the demand for leaner and uniform cuts of pork increases, finishers need reliable sources of feeder pigs to meet the demands. Large farmers and production contractors require sufficient quantities of feeder pigs to capture most economies of size in pig production. A second reason is coordinating the timing of the availability of feeder pigs with the availability of finishing facilities. Large investments in specific assets require year-round production and year-round availability of inputs.

An alternative means of coordinating feeder pig production and hog finishing is for groups of hog finishers to invest in cooperatively-owned farrowing facilities. The different relative economies of size of farrowing and finishing could be attained. Hog finishers would control the genetics and management practices for feeder pigs. Litters could be timed to match openings in finishing facilities. Hog finishers are likely to have a good understanding of farrowing operations, so the farmers on the Board of Directors should be able to make sound decisions and not conflict with managers of farrowing facilities.¹¹

A plan of Farmland, which is being tried in Colorado, involves a group of hog finishers jointly-owning a large feeder pig production unit. However, it has been difficult to organize finishers to put up the initial investment to build and operate the unit. To overcome this obstacle, Farmland, through its Pork Program, is financing the start up of the feeder pig operation. Farmland is also supplying breeding stock and selling shares to hog finishers. Eventually, Farmland hopes the unit will be owned entirely by hog finishers. Farmland expects that once the operation

¹¹One of the problems that can occur when farmers cooperatively-own manufacturing facilities, such as hog slaughter plants, is that farmers on the Board of Directors are not knowledgeable about the industry or production processes. Lack of knowledge and different goals can lead to conflicts with facility management or poor policy decisions. If hog farmers cooperatively-own farrowing facilities, lack of knowledge of the industry should not be a problem.

becomes profitable, other hog finishers will organize and finance similar large feeder pig production units (Davis 1992).

6.6.2 Production Contracts for Feeder Pigs

Hog finishers organized in cooperatives could offer production contracts for feeder pigs, instead of cooperatively-owning farrowing facilities. Production contracts would not require investments in farrowing facilities. There are likely to be economies of size in offering production contracts. In other words, the transactions costs of offering several production contracts are less than proportional to the transactions costs of offering a single production contract. Large numbers of hog finishers would need to organize to make offering production contracts feasible. An alternative to a cooperative organized solely for the purpose of offering feeder pig production contracts is for a livestock-farmer marketing cooperative to offer feeder pig production contracts in addition to other services.

6.6.3 Forward Contracts for Feeder Pigs

Forward contracts for feeder pigs are another coordination mechanism. The contracts would be similar to forward contracts for slaughter hogs described above. One problem would be determining future prices for feeder pigs. Another problem would be determining appropriate hedges in the futures market to reduce the cooperatives' price risk.

Some type of teleauction in forward contracts for feeder pigs could overcome some of the coordination problems. Analysis of such a teleauction is beyond the scope of this study.

6.7 Coordination of Feeder Pig Production and Hog Breeding

Close coordination of hog breeding and feeder pig production is critical to the success of all genetic improvement programs whether undertaken by hog farmers or contractors. Coordination problems include divergent relative economies of size, different time horizons and risk of breeders. Breeding research is a relatively risky investment. Breeding research has a long time horizon. Relatively few breed research companies are able to supply all the genetic stock for U.S. hogs. Crossbreeds allow breeding companies to gain a payback for research. Crossbreeds have shown some of the best production results. More farmers and contractors are purchasing crossbreeds. More frequent purchases of gilts are necessary for crossbreed programs than for traditional farm-raised gilt programs. Increased numbers of transactions can be expected between breeding companies and feeder pig farmers. Increased numbers of transactions indicate a greater need for coordination.

Hog breeding involves two stages: 1) the research and development of new hog crossbreeds; and 2) breed-stock

multiplication for commercial sale. Breed-stock multiplication, in contrast to research and development, is similar to feeder pig production.

6.7.1 Coordination Alternatives

Integration into hog breeding research directly by individual feeder pig farmers is not likely due, primarily, to the widely divergent relative economies of size and the risky investment. Very large production contractors in the future may integrate into hog breeding research by purchasing the rights to the breeds of hogs that prove to be outstanding performers. Slaughter/processors producing branded pork are likely to be the first to integrate into breed research to obtain the necessary uniformity in hogs.

Large contractors are most likely to enter into purchasing arrangements with hog breeding firms. The agreements allow contractors to multiply breed stock. Several large production contractors, Gold Kist and Farmland cooperatives among them, already have purchasing agreements with corporate hog breeders. Smithfield, an IOF owning slaughter/processing facilities, and Carroll's Farms, an IOF hog producer, have a joint-venture owning exclusive franchise rights in the U.S. to genetic lines of specialized breeding stock from the National Pig Development Company in England (Feedstuffs, August 31, 1992).

Contractors are most likely to integrate into breed-stock multiplying by owning facilities and hiring labor.

Gilts and boars from these operations are placed on contract grower's farms. Economies of size figures indicate approximately one breed-stock multiplying farm is necessary for every 33 feeder pig growers.

Breed-stock multiplying could be contracted out like other feeder pig production. The reason contractors have not done so may be that the tighter control allowed by integration, as opposed to contracting, is desirable. For example, contractors may wish to experiment with different feeds or management techniques. Contract growers may not be willing to contract in such circumstances due to the uncertainty of experiment results which would affect growers' returns. In addition, breeding stock is an input contractors provide for feeder pig growers. Contract growers of breeding stock could not be placed in tournaments with slaughter hog growers because the value of the products are significantly different. There are not likely to be large enough numbers of breed-stock multiplying growers to form a separate tournament, because of economies of size. Contract production of breeding stock would require explicit pricing of an input the contractor is providing for itself. Determining the "right" price of intermediary inputs produced within a firm requires difficult decisions involving division of overhead costs. Therefore, breed-stock multiplying facilities are more likely to be owned by contractors than by farmers who produce breed-stock under production contracts.

6.8 Coordination of Hog Farmers and Input Suppliers

Large hog farms often find it more economical to purchase feed than to grow their own grain. Hog feed is also becoming more specialized. In the broiler subsector, the development of very specialized feeds was one of the keys to improved feed conversion ratios and lower production costs. Feed milling and broiler slaughter\processing were integrated because the waste from slaughter is a feed ingredient for broilers. Successful integration of inputs and slaughter enabled the formation of "broiler integrators" that dominate the broiler industry today. Similar uses of hog slaughter waste as an ingredient in hog feed have not been found to be successful. The lack of a direct production link plus excess capacity in the milling industry make integration of slaughter and hog feed milling less necessary for hog feed than for broiler feed. However, some form of coordination between feed millers and slaughter\processors is likely to develop if slaughter\processors are offering production contracts and are required to provide feed and other inputs to growers.

Historically, large hog production contractors have been feed companies or have had feed company connections. Cooperatives offering production contracts had established grain divisions first. Relative economies of size are greater for feed milling than for hog farming. Hog production contracting is likely to be a separate profit center from the feed division whether the corporation is a

cooperative or an IOF. Some transfer mechanism is necessary for feed. The transfer could be based on spot market prices. Grain prices tend to be highly unstable (Dalziel). If contractors offer fixed prices to growers, then contractors accept all the price risk for inputs as well as hogs. Since feed costs exceed half of the variable costs of hog production, contractors are likely to attempt to reduce feed price risk.

One coordination mechanism is use of the grain futures market. If hog feed prices move directly with grain prices for which futures contracts can be purchased, the degree of coordination achieved by using the futures markets and purchasing feed in spot markets may be satisfactory. However, as hog feed becomes more specialized, hog feed prices may not follow grain prices as closely. Contractors are likely to make some type of direct arrangement with feed suppliers to assure the quantities, qualities, timing of deliveries and the prices. Such contracts are likely to take the form of forward delivery contracts.

Hog production contractors are likely to consider joint ventures with feed millers, if contractors are progressive in adopting new technologies (for example, pork growth promotants), but find feed companies are slow to provide feed formulations required to get the best performance of hogs treated with growth promotants. Joint ventures would support research and development of the needed specialized feeds.

6.9 Vertical Coordination of the Subsector

The preceding sections analyzed alternative institutions and methods ways of coordinating transactions between different levels of the subsector. For analytical purposes, coordination of each transaction was examined separately, but in actual practice improved coordination depends upon better matching of supply and demand all the way from genetic development of hogs and feed improvement to pork on consumers' plates. In other words, the combination of institutions and methods vertically coordinating the subsector determines actual coordination. A weak link in the system reduces the potential for improved coordination at other levels in the system. Because of interdependence, subsector participants have incentives to control coordination at levels beyond the participants' primary level, in order to improve returns at participants' primary level.

Given the alternative means of coordination, how is the hog/pork subsector, as a whole, likely to be coordinated in the future? What role will cooperatives have? Can cooperatives compete as concentration levels in the

a
a
i

i
f
co
de
te

bro
the
bro
pro
Cha
how
bro
Gol
is a
high

subsector increase?¹² To answer these questions, a model of a vertically coordinated subsector will be described, based on the preceding analysis of the coordinating institutions and methods most likely to be used. The firms coordinating the subsector could be either IOFs or cooperatives. For the purposes of this study, it is assumed that farmer cooperatives coordinate the subsector. The advantages of and challenges for cooperatives coordinating the subsector, as opposed to IOFs coordinating the subsector, are analyzed in sections 6.10 and 6.11.

6.9.1 Cooperatives Coordinating by Contracts

Before describing the details of the model (which includes hog production contracts), some challenges for hog farmers coordinating the hog/pork subsector using production contracts are analyzed. Questions of membership of growers, determining profit-sharing pools and negotiating contract terms are analyzed.

¹²In the broiler subsector, the so-called "integrated broiler firms", as shown in Figure 8 (page 107), coordinate the subsector. "Integrated" is a misnomer because the broiler firms employ a combination of ownership, contract production and spot market purchases, as described in Chapter 4, to achieve coordination. Supply decisions, however, are made by less than a dozen firms for nearly all broiler production. One of the top firms is a cooperative, Gold Kist, while the rest are IOFs. The broiler subsector is an example where a cooperative is competitive even in a highly concentrated subsector.

6.9.1.1 Membership of Growers in Cooperatives Offering Contracts

Growers may or may not be members in cooperatives offering contracts. The question of membership is important. Cooperative membership gives a voice in determining cooperative policies and practices (including those affecting production contracts). Membership bestows the right to run for the cooperative's board of directors. Finally, membership gives a grower a share in patronage refunds, plus any other benefits or obligations of cooperative membership. Growers who are not cooperative members may find that contracting with a cooperative is not perceptively different from contracting with an IOF.

Several factors influence membership status of growers. One factor is whether growers are producing inputs purchased by the cooperative contractor or outputs sold by the cooperative contractor. The details of four hog finishing contracts (all offered by cooperatives), and six feeder pig contracts (two offered by cooperatives), were reviewed.

A broad range of terms were found, even among the finishing contracts offered by cooperatives. Only one of the four cooperatives' finishing contracts described the growers as cooperative members. This contract specified that at the end of the fiscal year net margins would be determined and the growers would receive a refund. Growers were not liable for any losses incurred in the marketing of

he

co

co

S.

or

wh

ma

ne

me

19

fi

su

gr

co

gr

me

ar

co

ri

—
hog

fin

gro

gro

pat

as

4 w

hogs.¹³ Neither of the two cooperative pig production contracts designated growers as cooperative members. The contracts state that growers are independent contractors. Since the contracts reviewed were only a sample of contracts offered, no inferences as to the number of cooperatives which do or do not admit contract growers as members can be made. However, it is apparent that cooperatives do not necessarily admit contract growers as members.

Gold Kist includes contract finishers as cooperative members, but feeder pig growers are not members (Glover, 1989).¹⁴ This distinction between feeder pig growers and finisher growers is similar to the situation in the poultry subsector. In the poultry subsector, breed-multiplying growers and growers of hens producing hatching eggs for cooperative broiler integrators are not members, while growers raising chicks into broilers are cooperative members.¹⁵ Feeder pigs, breeding stock and hatching eggs are inputs transferred at set prices, which are based on costs. Growers providing inputs do not bear market price risk and thus are not admitted as cooperative members.

¹³However, growers do bear production risk since any hogs condemned for disease are charged back to the grower.

¹⁴Most of Gold Kist's contract growers have farrow-to-finish operations. Separate contracts are signed for growing feeder pigs and finishing hogs. Farrow-to-finish growers are members of the cooperative, but receive patronage refunds based only on the finishing operations.

¹⁵The distinction between whether growers are admitted as cooperative members or not was analyzed in detail Chapter 4 with respect to broiler growers.

Growers of broilers and hogs that accept market price risk, as specified by the terms of the production contract, are admitted as cooperative members and are eligible for patronage refunds.

6.9.1.1.1. Conflicts of Interest

If cooperative membership includes both input suppliers and output producers, conflicts of interest may arise. For example, hog finishers wish to obtain feeder pigs at the least cost, but costs of feeder pigs include the returns to labor and investments in facilities of feeder pig farmers. Feeder pig farmers want to maximize the returns to their labor and investments. The goals of feeder pig farmers are in conflict with the goals of hog finishers. If both are cooperative members, setting transfer prices for feeder pigs could be difficult. Using market prices as transfer prices, removes price determination conflicts from within the cooperative. Transactions costs to transfer feeder pigs at market prices, even without actually offering feeder pigs for sale on the open market, include matching the quality characteristics of contracted feeder pigs with pigs actually sold on the market and accounting for each transaction, since market prices fluctuate daily. Transactions costs of obtaining inputs at market prices may be higher than transactions costs of transfer at a predetermined and seldom adjusted price. Increased transactions costs due to conflicts of interest are likely to preclude having both

feeder pig growers and hog finisher growers as cooperative members.

Similar conflicts of interest arise if feeder pig producers form cooperatives to offer production contracts to other farmers in order to multiply breeding stock. Membership of both feeder pig producers and contract growers of breeding stock in the cooperative is therefore unlikely.

Whether growers are producing inputs or outputs for the cooperative contractor is just one element influencing membership status of growers. A second element influencing membership status of growers is how, by whom, and why production contracting was organized initially.

If contract production is organized by cooperative members wanting to sell more feed, the feed division of a diversified cooperative finances the start up costs of hog contracting. Hog contracting remains under the management of the feed division. Feed division members generated the profits used to finance the start up of hog contracting and they bear the risk of losses (or potential for gain) from the investment. If the contracts offered to growers eliminate both input price and hog price risk, that risk is being borne by feed division members. Feed division members may decide that since contract growers did not finance the contract program and do not bear price risks associated with inputs or outputs, growers should not share in patronage

refunds generated by feed division members.¹⁶ Growers in Farmland's Pork Program, which began as part of the feed division, are not cooperative members under the terms of the production contracts, apparently for the reason described above (Davis 1992).

Membership of growers contracting with cooperatively-owned slaughter/processors is also dependent upon who the stockholders of the slaughter/processing are and what their goals are for offering production contracts. Hog finishers are likely to be cooperative members if slaughter/processing facilities are purchased cooperatively by hog farmers who then produce hogs under contract with the slaughter/processor. However, the admission of growers as members is likely to depend upon several factors if slaughter/processing facilities are cooperatively-owned by members of a diversified cooperative. One is the goals of cooperatives' stockholders. If the goal of contract production is a steady supply of uniform-quality hogs at market prices and contract production is a separate profit/loss center from other cooperative operations, contract growers may be admitted as cooperative members and

¹⁶The same hog farmers who are contract growers may be members of the cooperative if they use other cooperative services, such as purchasing supplies, etc. Any patronage refunds received by these contract growers would be tied to the use of those services and not to hog contracting. If the hog contracting division is in the same patronage pool as the other services used by the contract growers, profits or losses from hog contracting will be shared with contract growers indirectly.

accept market price risk. If the packing plant is using production contracting to supply only a portion of total slaughter, using market prices as transfer prices may be reasonable in production contracts. The plant is purchasing other hogs in the market every day and can price growers' hogs using the same criteria as non-growers' hogs.¹⁷ There may not be a conflict of interest between growers/members and contractors over pricing. However, if the goal of packing plant stockholders is to assure a steady supply of uniform-quality hogs at stable costs, contract growers may not be admitted as members. Non-member contract growers would be paid a fixed or cost-plus fee. Not admitting growers as members precludes conflict within cooperative membership over payment to growers.

6.9.1.1.2 Life Cycle of Cooperative Services

Cooperative ventures have a life cycle much like other businesses. Once a hog contracting program is well established, incentives may change for program managers, contract growers, and members of other divisions of the cooperative making the initial investments to start a production contracting program. Start up costs are a sunk cost for members of other cooperative divisions and a return

¹⁷Equal payment terms with non-growers raises a question. If membership in the cooperative does not provide any benefits beyond spot market prices available without the cooperative, what is the justification for cooperative-ownership of slaughter facilities?

on the initial investment may have been realized. Non-member growers may resent cooperative members, who are farmers like themselves, receiving patronage refunds generated, in part, from the hog contracting program (if it is profitable). Managers of hog contracting may want more autonomy from other cooperative divisions, especially if the interests of the contract program managers and the managers of the other divisions sometimes conflict. At this stage, there may be a push by managers to create a separate profit center for the hog contracting operations. Incentives for growers to improve production are likely to increase if they are admitted as cooperative members, which may lead management to support the change in grower status.¹⁸ Changes in incentives for all parties connected to production contracting may lead to a change in the membership status of growers as hog contracting programs mature.

Farmland reorganized its divisions into input and output divisions. In that process, the Pork Program was moved from the feed division, which is an input division, to become part of the output division, which also includes Farmland Foods and its slaughter and processing operations (Davis 1992). The membership status of Pork Program contract growers is allowed to change with the

¹⁸Hog contracting managers may relate more closely to the needs of growers that the managers work with day-in and day-out than with the needs of feed division members of the cooperative.

reorganization. Growers become cooperative members once equity accumulated from delivery of hogs to Farmland Foods under contract reaches \$1,000. Prior to that time, growers are non-member patrons of the cooperative (Lange 1992).

6.9.1.2 Pooling Arrangements

Patronage pools for contract production can be organized within cooperatives a number of ways: 1) as a separate cooperative; 2) as a separate profit/loss center within a division of a diversified cooperative; or 3) as part of a patronage pool that includes other operations of a diversified cooperative. Patronage pools determine:

1) sharing of price risk; 2) division of patronage refunds; 3) the potential for cross-subsidization; and 4) the degree of coordination achieved.

Within diversified cooperatives many pooling arrangements are possible. Pooling allows cooperative members to share the risk and profits while maintaining independent farming operations. One consideration influencing pooling arrangements is differences in the relative risk associated with production contracting, compared to the operations of cooperative members. If production contracting is viewed as more risky than other operations of the cooperative, then production contract operations may be placed in a separate pool so as not to adversely affect the patronage refunds of members with less risky operations.

A second consideration influencing pool assignment is related to investment portfolio theory. Returns from most agricultural commodities fluctuate significantly over time. If returns from hog contracting are expected to be positive at the time when returns from members' other operations are expected to be negative, including production contract operations in the same pool with members' commodities might even out returns over time. An example may be feed grains. Low feed prices should improve the profitability of hog contracting. Empirical tests would be needed to determine if a hypothesized relationship between returns from production contracting and another commodity has been complementary.

Pooling arrangements affect coordination by changing the returns to operations. Changing returns will alter incentives for cooperative members. For example, one element contributing to the hog cycle is farmers entering (exiting) hog production as hog prices rise (fall). If returns from hog farming were pooled with returns from other commodities through a cooperative, farmers might experience less (more) variability in returns to hog farming and be less (more) likely to enter or exit hog farming. Stabilizing (variable) supplies of hogs could further reduce (increase) price variability, which could help dampen (exacerbate) the hog cycle.

If the feed division of a cooperative offered production contracts, production contracting could be part

of the feed division pool or in a separate pool. If production contracting is a part of the feed division pool, pooling returns from hog production contracting with returns from other cooperative operations may help growers reduce market price risk and achieve better and/or more steady income.¹⁹

Rhodes' study (1990) found that hog farmers listed "reducing market price risk" as the second most common reason, after "financial reasons", for wanting to become contract growers. The third most common reason was to obtain "better and/or more steady income". Even if production contracting is in a separate patronage pool, there is still the potential for better and/or more steady income as compared to independent hog farming. Independent hog farmers may only market hogs a few times a year. Due to price variability in hog markets, returns to independent hog farmers who market infrequently may be volatile. Several contract growers, each marketing hogs at different periods, may join a cooperative production contracting pool. Growers could then choose to pool returns on an annual or semi-annual basis. Growers could receive an initial payment when hogs were marketed and a final payment at the end of the pooling period (after all marketing returns have been pooled). Final payment would reflect an average market

¹⁹However, if production contracting is part of the feed division pool the conflicts of interest problem, discussed earlier, would have to be addressed.

pr

co

gr

pr

re

pc

pr

pe

ti

ti

h

s

s

r

d

t

o

h

s

p

i

i

a

s

n

a

o

price paid for hogs throughout the pooling period, which could lead to better and/or more steady income for contract growers, as compared to: 1) independent hog farming; or 2) production contract payment terms which do not pool growers' returns.

There is a tradeoff between steadier income over longer pooling periods and addressing the temporal coordination problems due to periodic overcapacity in hog slaughter. Pool periods need to be short enough to encourage members to time production so as to supply more hogs during times when the quantities of hogs demanded can be anticipated to be higher than the quantities of hogs supplied with traditional seasonal farrowing. In other words, the tradeoff is between steadier incomes with longer pooling periods and responsiveness to market price signals about quantities demanded with shorter pooling periods.

Pooling of returns of contract growers, wherein payment to growers reflects average market prices, is unlikely to occur with IOF contractors.²⁰ Contract growers for IOFs have no input as to who are other growers or when hogs are sold. If a grower feels he/she has better than average performance, then that grower may not wish to enter a pool

²⁰Pooling of returns could occur with an IOF contractor, if growers agree to such an arrangement. The author interviewed an IOF contractor for fresh potatoes, a self-described "dictator", who controlled the timing of potato sales and the type of pack of all contract growers' potatoes. The returns were then averaged over time and across packs and growers were paid the average price based on the quantity and grade of potatoes delivered.

ov

ot

gr

cc

ac

cc

pr

ba

cc

tl

bu

tl

c

m

p

u

i

h

o

w

m

p

i

t

over which they have no control over the qualifications of other pool participants. In fact, the majority of contract growers do not accept any market price risk (Rhodes, 1990).

Cooperative member contract growers have a voice in cooperative affairs and thus may be able to agree to an acceptable pooling arrangement. Contract growers cannot control market prices for hogs, but they can control production practices. If part of a growers' payment is based on incentives for superior performance, growers can compete amongst themselves over production factors which they can control (such as practices influencing quality), but be willing to accept average returns over factors which they cannot control (such as market prices).

If cooperatively-owned packing plants offer production contracts and contract finishing growers are cooperative members, should the patronage pool include both packing plant returns and contracting returns? The answer depends upon the degree of price risk accepted and the extent of investment in packing operations by contract growers. If hog farmers were the primary investors in packing plant operations, investing hog farmers might choose to contract with the packing plant for a fixed price per hog and accept market price risk on wholesale pork sold by slaughter and processing operations. Production contracting would then be in the same patronage pool as packing operations.

Grower/members might experience more stable returns if the patronage pool included packing operations as well as

contract production. However, packing plants are typically low profit margin businesses with cyclical returns that depend upon supplies of hogs. Unless a large percentage of hog supplies are guaranteed by contracting, packers suffer losses when hog supplies are low and high prices must be paid for hogs. Profits are likely to be lower for hog growers in a pool with packing operations, during times of low hog supplies, than for growers in a separate contract production pool.

When Gold Kist owned packing operations in the 1970s, contract hog finishers were cooperative members, but the patronage refund pool for contract production was separate from packing operations (Glover 1992). Farmland Foods, which owns packing plants, does not engage in production contracting and farmers that enter into exclusive purchasing agreements with Farmland Foods are not cooperative members under the terms of the agreements.

If contract growers are not investors in packing operations and are paid fixed prices for hogs, the packer/contractor bears all market price risk for inputs and hogs. Thus, it is unlikely the growers will even be cooperative members, much less share patronage refunds from both contracting and packing operations.

If hog finishers form a cooperative and offer production contracts for feeder pigs, feeder pig growers are unlikely to be offered membership in the cooperative. If the only investors in contracting are hog finishers

purchasing feeder pigs, a separate patronage pool may be formed to include only production contracting activities. If seed money to begin contracting came from a livestock-farmer marketing cooperative, of which hog finishers are only one group of members, the decision whether to form a separate pool or combine contracting operations with other cooperative operations is similar to the situation described above for a feed division offering production contracts.

In the contracts reviewed only one finishing contract included growers as cooperative members. In that contract, grower/members received patronage refunds from hog contracting operations only. In other words, hog contracting operations were in a separate patronage pool. However, grower/members were guaranteed a minimum payment, and thus did not assume downside price risk. This indicates other profit centers in the same division as hog contracting were willing to cross-subsidize contracting operations in negative profit years, if necessary.

6.9.1.3 Recommended Production Contract Terms for Payment

Production contract terms affect incentives for growers and contractors, as well as coordination among levels of the subsector. Recommended payment terms and contract lengths are discussed in this section and the next section.

Payment terms can incorporate incentives for growers to maximize returns by improved management. Separate contracts with different incentives and payment terms are typically

written for growing feeder pigs and finishing hogs. The major differences are the types of incentives and fixed payments versus price risk-sharing payments. The different types of incentives are based on the differences between maintaining breeding stock, farrowing and caring for young pigs versus finishing pigs to slaughter weight. Low feed conversion ratios and death loss may be rewarded in both feeder pig and finishing contracts.

The difference in payment type is related to membership status. Growers who are members usually share market price risk while growers who are not members usually are paid a fixed amount on a per head basis. Feeder pig growers are usually not members for the reasons described in the preceding section. Therefore, feeder pig growers are usually paid a fixed amount. If hog finishers are cooperative members, total payments for slaughter hogs are likely to reflect market price risk.

Specific contract terms vary considerably, but most contracts should provide incentives to reward performance that results in characteristics which better coordinate supply and demand. Contracts should: 1) include incentives for production performance and meat quality; 2) allow flexibility for progressiveness with respect to management techniques; and 3) reward producers who employ new technologies that improve performance.

Payment terms also vary depending upon the number of growers working with a contractor. If there are sufficient

numbers of growers to prevent collusive behavior among them, "tournament" payment systems may improve system performance. "Tournament" systems pay growers based on their performance relative to the average performance of a group of growers. Tournament systems, described in Chapter 4, have the advantages of introducing competition among growers on the factors they can control. Furthermore, these systems allow contractors to be progressive in trying new techniques and technologies.

Tournament growers must have comparable production facilities and management training, as well as feed, breeding stock or feeder pigs to enable them to compete fairly. Separate tournaments should be established if groups of growers have dissimilar characteristics. For example, if one group is using pork growth promotants and another is not, they should be in separate tournaments. Another case may be where one group has new confinement facilities while another group has older facilities.

Tournaments can be organized irrespective of whether or not growers are cooperative members. If growers are cooperative members, member/growers who consistently perform below the tournament group average may be dissatisfied with the competition and try to organize a vote to eliminate the tournament system.

If cooperative feed divisions or cooperatively-owned packing plants are offering production contracts, it is possible to organize tournaments if sufficient numbers of

growers are contracting. Separate tournaments may be needed for feeder pig and finishing growers, because of different performance measures for each group. If only a few feeder pig growers contract to provide pigs for several hog finishing cooperative members,²¹ a tournament system for feeder pig growers is not feasible.

If the most common reason farmers enter production contracts is financial (Rhodes 1990), a guaranteed return or floor price for meeting performance standards may be necessary to attract contract growers. Ability to guarantee a floor price assumes production contracting will return at least that minimum or contractors have outside sources of funds to cross-subsidize production contracting. If production contracting is a separate profit center, minimum price guarantees may not be feasible, unless money is saved from positive profit years to cover negative profit years. To set aside money there could be a ceiling price. When market prices rise above the ceiling price, the difference could go into a fund to cover the cost of assuring growers a minimum price. Alternatively, money could be borrowed in negative profit years. However, self-financing, if it is successful, is likely to be less costly than borrowing. If access to capital markets is restricted for production contracting because, for example, lenders perceive

²¹Relative economies of size are greater for feeder pig production than for hog finishing.

contracting is too risky, then self-financing may be necessary.

Establishing floor and ceiling prices to generate an appropriate-sized fund is critical to the success of a guaranteed minimum price payment scheme. Due to the unpredictability of hog prices, determining appropriate prices is difficult. The problem of determining appropriate payments also faces contractors offering fixed payments to growers who are not cooperative members. Floor prices and/or fixed payments may lead to incentives for overproduction. If a minimum price that covers 100% or more of variable costs of production per hog is guaranteed, one way to increase returns is to increase the quantity of hogs produced. In aggregate, continually increasing production levels results in excess supplies and lower returns, which at some point will make it unprofitable for contractors to maintain the guaranteed floor price. Consequently, if floor prices are offered, contract length must be short enough to allow adjustments in floor prices and/or fixed prices as economic conditions warrant. Incentives for overproduction could also be reduced by guaranteeing a minimum price which is only a percentage of variable costs (for example, 80 percent). The minimum price would then help protect farmers' specialized investments, but not encourage overproduction.

Contract should include a minimum guaranteed return plus flexibility to reflect market prices. One way to

achieve this would be to pay growers an initial amount when pigs or hogs are taken from growers' facilities, then an additional amount after hogs are sold, which reflects market prices. The initial minimum amount should be determined on a cost-plus basis (or cost-minus basis, as discussed above to reduce incentives for overproduction) per pound of pig or hog produced. The actual amount paid depends, in part, on what is provided by the grower as opposed to provided by the contractor. Growers' costs, including costs of borrowed capital and minimum acceptable return to labor, should be included. The first payment reflects costs. The relative payments of growers within a tournament group should be based on cost-saving ability. For example, one appropriate measure is the feed conversion ratio achieved by each grower.

The second payment should be based on product performance.²² A percentage of market prices actually received for hogs sold on a carcass merit basis should be paid to growers. It may not be feasible to market all hogs

²²To the extent that contractors are able to control quality factors by genetics, feed types, recommended management techniques and handling during shipping, quality incentives for growers are unnecessary. However, growers' care in actually carrying out suggested management techniques and in handling hogs can affect quality. Rahn's statement noted in Chapter 4 that broiler contractors are likely to move toward ownership of broiler production units as opposed to contracting, because contracting does not permit sufficient control over management techniques, indicates contract growers' actions affect performance results, despite contractors' attempts to control performance by training growers and regularly checking growers' operations.

fr

wi

sh

ba

Gr

fo

Co

de

tr

ho

to

me

fr

th

re

fl

ma

no

we

pe

co

st

pe

gr

fo

re

from all growers on a single day. Instead all hogs marketed within a certain time period, such as one or two weeks, should be considered as a group. Growers' returns should be based on the average price received during that time period. Growers' returns are pooled to reduce penalties (bonuses) for particularly low (high) price days in the market. Contractors should be allowed some flexibility in timing the delivery of their hogs so they can best utilize their transportation and holding facilities (as well as market hogs when they expect to get the most profit). Within each tournament group, growers should be ranked on the carcass merit of the hogs they produced. Growers would be insulated from the day-to-day fluctuations in market prices, although they would still accept market risk over time. With these recommended payment terms, growers would have both a price floor and possibly a price ceiling, but they would share market incentives and disincentives with contractors and non-contracting farmers.

The initial and the final payments would reflect how well each grower performed relative to the average performance of the group of growers in the tournament. The contractor would set minimum acceptable performance standards for growers and peg the minimum payment to that performance level. The average performance of the group of growers would be above the minimum level. Actual payment for each grower would be determined by where they fell relative to the average performance.

f.

co

co

fi

ac

re

an

th

re

on

gr

su

pi

wo

sa

6.

co

fl

is

Th

pa

Ch

co

The above payment terms would be appropriate for finishing hogs or for farrow-to-finish operations. However, contractors have historically chosen to separate feeder pig contracts from hog finishing contracts even for farrow-to-finish operations. This allows growers to specialize in one activity or the other. It also allows the contractor to redistribute feeder pigs among finishers. When feeder pigs are not actually sold in the market, the market price for those feeder pigs is not known. Thus feeder pig growers' returns cannot be based on market prices.

One solution is to base returns to feeder pig growers on a single cost-based payment. Growers within a tournament group would be ranked on cost-saving performance measures such as feed conversion ratios for breeding stock and piglets. Growers paid per pound of feeder pig produced would have incentives to produce as many piglets per sow and save as many pigs per litter as possible.

6.9.1.4 Contract Lengths

Production contract length affects the degree of coordination achieved by the contract, as well as the flexibility to respond to changes in the subsector. There is no "best" contract length for all contracting situations. The unique characteristics of each grower-contractor partnership determine the best contract length. Characteristics which favor either longer or shorter contract lengths are discussed below.

ti

co

th

A

as

wh

inc

fou

con

are

fin

abo

and

cha

ind

wou

coo

lon

cont

for

oppe

of t

and

long

Minimum contract length is determined by production time to farrow and raise feeder pigs for feeder pig contracts or finish hogs for finishing contracts. However, the productive farrowing life of a sow is about three years. A feeder pig contract length of three years minimizes costs associated with moving sows during their productive life, which reduces the number of piglets a sow can produce and increases the potential for injury or death. Rhodes (1990) found the mean length to be 30 months for feeder pig contracts. Finishing hogs takes about 18 weeks. Facilities are cleaned between lots of hogs. The mean length of finishing contracts in Rhodes (1990) study was 15 months, or about three lots of hogs.

Shorter term contracts allow parties more flexibility and independence over time. They allow parties to adjust to changing costs and prices, switch contract partners, become independent or exit hog production more frequently than would be the case with long term contracts. Less coordination is achieved with short term contracts than with longer term contracts, unless parties continually renew the contracts. Short term contracts allow more opportunities for the party with negotiating power to behave opportunistically toward the weaker party.

Contract length should be longer the higher the level of transactions costs for matching contractors with growers and negotiating contract terms. Contract length should be longer the higher the level of fixed or specialized assets.

As assets become more specialized there are fewer alternative uses for them. The lower the value of assets in the next best alternative use, the higher the amount an opportunistic partner can extract and thus the greater the incentive to act opportunistically. Longer contracts assure growers an income over more of the useful life of fixed assets and reduce the potential for opportunism during that time.

Long term contracts do have disadvantages. Long contracts may encourage over investment in fixed assets that reduce unit costs of production, but at the social cost of less economic flexibility to deal with changing demand patterns, etc. Some tradeoff is needed between lowering unit costs of production and assuring flexibility.

One method of increasing contract flexibility is the use of exit clauses. If it can be foreseen that certain conditions could arise which would make continuing the contract impossible or would put one or both parties in severe financial straits, those conditions could be stated in the contract to allow default. For example, some of the contracts reviewed had a clause stating "acts of God" which destroyed facilities and/or swine could void the contract. Problems could still arise when conditions change in a manner which was not foreseen. Provisions that allow one party to buy out its obligations to the other party could lead to socially more desirable reallocations of resources

i

r

p

e

b

t

t

d

a

i

i

c

F

i

a

A

c

a

c

R

v

v

r

in the event that alternative investments have higher returns.

Flexibility can also be enhanced if adjustments of predetermined factors in the contracts are permitted, for example; the number of sows or pigs placed, genetics of breeding stock or pigs and production practices. However, the contract must also state who determines the adjustments to be made. Adjustments can be made at the contractors' discretion, at the growers' discretion or by mutual agreement. If one party is allowed to make adjustments at its discretion, the other party may be harmed. For example, if the contractor reduces the number of sows or pigs placed or the frequency at which new lots are placed, a grower paid per feeder pig or hog finished would experience reduced income.

In the contracts reviewed, the number of sows or pigs and the times they were to be placed were stated. Apparently, those numbers and times could not be changed during the contract. If the contract length is only one or a few production cycles, the number of swine placed could change each time a new contract is signed, allowing for the possibility that the growers' facilities could be underutilized. However, when contracts are renewed, growers would have to agree in advance to underutilize their facilities or make arrangements to allow additional swine,

which are not covered under the contracts, to be raised in the facilities.²³

If each party is able to adjust the factors for which that party is responsible for the outcome, the decision to make an adjustment may be more carefully weighed. For example, if growers are able to make adjustments in production practices resulting in better performance, both parties may benefit. Of course, there is the risk an adjustment may result in worse performance and a readjustment may need to be made. In the contracts reviewed, contractors determined the genetics of swine. In some cases, the grower agreed to follow production practices as determined by the contractor. In most cases, the growers agree to "use good husbandry practices" or use practices "in accordance with the highest current industry standards".

One of the finishing contracts reviewed allowed either party to discontinue the contract with an advance notice of 30 days. Exit clauses add flexibility to contract, but an advance notice of only 30 days effectively eliminates any long-run protection of growers' investments in fixed assets.

In summary, factors to be considered when determining contract length include: 1) the farrowing or finishing production cycle; 2) level of fixed or specialized assets,

²³Most contracts specifically state that no swine, other than those under contract, are to be present on the growers' facilities. Other swine could carry disease, be exchanged for contractors' swine, be fed contractor-provided feed or be inseminated by contractors' boars.

transactions costs of finding a partner and negotiating a contract; 3) specific contract terms which add flexibility to the contracts; 4) the potential for opportunistic behavior by the contractor; and 5) the relationship of the grower to the contractor outside the production contract.

6.9.2 A Model of Vertical Coordination by Cooperatives

A model of coordination of the hog/pork subsector by cooperatives is described next. First, however, it should be noted that several models of coordination are likely to coexist in the subsector due to regional differences, organizational structure, etc. Alternative models of vertical coordination are possible from different combinations of alternative institutions and methods described earlier in the chapter. The model to be described combines the methods of coordination judged most likely in the subsector with cooperatives as coordinating institutions.

Three features of the model (Figure 9) should be noted: 1) ownership of facilities at each level; 2) coordinating institutions and mechanisms between levels; and 3) levels included in each profit center or pool. Ownership of facilities is either by: a) IOFs; b) hog farmers; or c) cooperatively-owned by farmers.

Coordinating mechanisms are either: a) forward contracts; b) internal transfer at cost when levels are

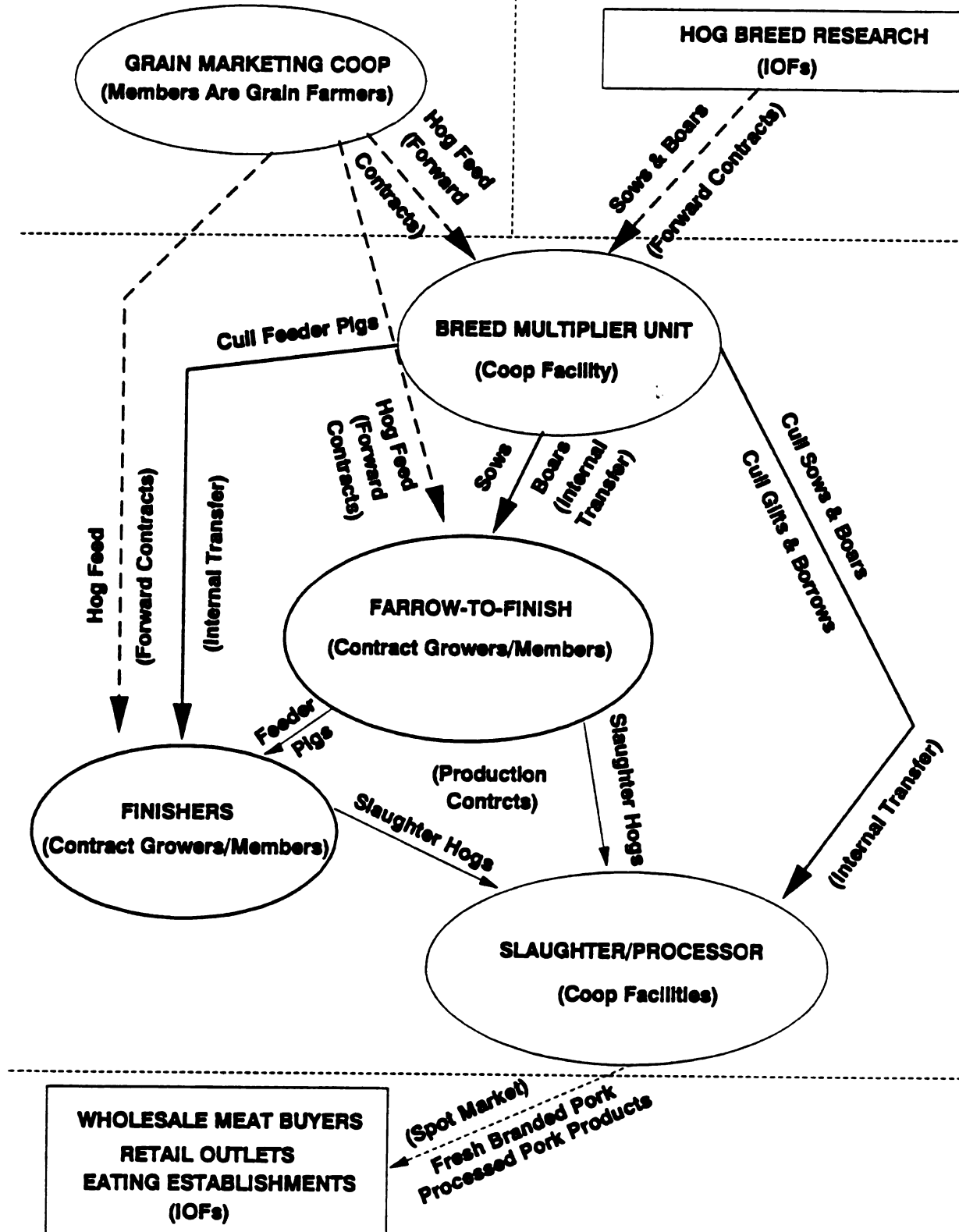


Figure 9. Model of the Hog/Pork Subsector Coordinated by Cooperatives

integrated; c) production contracts; or d) spot market prices. Profit centers are separated by broken lines.

6.9.2.1 Model Hog Farms

Hog farmers are the decision makers in the model. Hog farmers own either farrow-to-finish or finishing facilities. The reason there are no separate farrowing units is two-fold. The first reason is due to relatively larger economies of size for hog farrowing than for finishing. Farrow-to-finish farms should be large enough to capture economies of size for farrowing. The farm should also have finishing facilities large enough to capture economies of size for finishing. Due to the different relative economies of size the finishing facilities do not have to be large enough to finish all feeder pigs born on the farm. Excess feeder pigs are delivered to farms that specialize in hog finishing. The second reason is that hog farmers are granted membership to the cooperative based on production of slaughter hogs under production contracts. Farmers are not offered production contracts to produce only feeder pigs. Providers of inputs and users of those inputs to produce outputs should not both be members in the same cooperative pool to avoid conflicts of interest which could break up the cooperative coalition. To avoid conflicts of interest and still have all hog farmers be cooperative members, farmers are either farrow-to-finishers or finishers. Then, since

all hog farmers are also finishers, all hog farmers are cooperative members with voice and voting rights.

6.9.2.2 Model Slaughter/Processing

Hog farmers collectively own slaughter/processing facilities. Hog farmers should invest in cooperatively-owned facilities and services in order to be entitled to membership rights and patronage refunds. If investors other than hog farmers own slaughter/processing facilities conflicts of interest will arise between hog farmers and other investors which may not be resolved in the best interest of hog farmers. If hog farmers want control in the subsector, then hog farmers need control of financial investments in industry assets, such as slaughter/processing plants, breed-stock multiplier units, as well as hog farms.

6.9.2.3 Model Production Contracts

Cooperatively-owned slaughter/processors should coordinate hog supplies by production contracts with hog farmers. Separate production contracts should be offered for feeder pig production and finishing. Growers should be organized into tournaments. Payment for feeder pigs should be based on "costs" with performance incentives, as recommended above. Payment for slaughter hogs should be a two-part payment. The first payment should be based on "costs" with production performance incentives. The second payment should be based on wholesale prices received for

fresh branded pork and processed pork products with quality incentives, as recommended above. Growers accept wholesale market price risk in the second payment. The second payment should come as a patronage refund and return any profits from ownership of slaughter/processing and breed-stock multiplying to growers/members.

6.9.2.4 Model Breed-Stock Multiplying

Hog farmers should cooperatively own breed-stock multiplying units. Control of genetics is critical. Integration into breed-stock multiplying is likely to be the best way to obtain control. Integration avoids conflicts of interest and input price determination problems that could arise if breeding stock is multiplied under production contracts.

6.9.2.5 Model Profit Centers

In this model, hog farmers accept profits or losses from investments in farm facilities and cooperatively-owned facilities. It is recommended that all cooperative operations connected to production contracting be in a single profit (loss) center. Slaughter/processing facilities and services and breed-stock multiplying facilities and services should be in the same cooperative pool. Profits and losses generated from hogs slaughtered and pork marketed within a specified time period, such as a three month or shorter time period, should be pooled

together to address the temporal coordination problem. Having multiple time pools creates price incentives for growers to respond to anticipated seasonal changes in quantities demanded with concurrent changes in quantities supplied. Slaughter/processing and breed multiplying facilities would then be utilized as near to full capacity as possible throughout the year. Feed grain cooperatives, hog breeders, meat wholesalers, retailers and away-from-home eating establishments should each be separate profit centers.

6.9.2.6 Model Grain Farmer Cooperatives and Forward Contracts

Hog feed suppliers should be cooperatives owned by grain farmers. Cooperatively-coordinated hog production contractors owned by hog farmers should forward contract with grain farmer cooperatives for hog feed. Economies of size in feed milling should be realized by feed grain cooperatives. Hog production contractors in the model should be large enough purchasers of feed to have strong negotiating power with grain farmer cooperatives.

6.9.2.7 Model Hog Breeders

Hog breeders are likely to remain as IOFs for some time in the future. Cooperatively-owned hog production contractors should forward contract with hog breeders to purchase genetically superior boars and sows. Contracts

should permit the hog production contractors to multiply breeding stock for the purpose of supplying sows and boars to contract feeder pig growers.

6.9.2.8 Model Wholesale, Retail and Eating Establishments

Cooperatively-owned slaughter/processors should sell branded fresh pork and processed pork products to wholesalers, retailers and eating establishments at competitive market prices. Purchase agreements for branded fresh pork and specialty cuts or processed pork products should be entered into to reduce the potential for holdups²⁴ of perishable products. Purchase agreements also help slaughter/processors to plan quantities and qualities of hogs to be produced through production contracts.

6.10 Advantages of Farmer Cooperatives Coordinating the Hog/Pork Subsector

The primary advantage of cooperative coordination of the hog/pork subsector by hog farmers is keeping hog farmers in decision making positions. Independent hog farmers value the freedom of making business decisions and the sense of control over success or failure of the business. The specter of moving from independent business owners to piece-wage workers under production contracts is not appealing.

²⁴Holdups are a transactions cost problem with the timely transfer of pigs, hogs and/or pork from one adjacent level of the subsector to the next. Holdups affect the quality, and thereby the value, of perishable products.

The economic reality is hog farms must be competitive with the low-cost producers in the industry. Improved coordination between different levels of the subsector is a factor that reduces costs beyond the cost savings possible from only capturing economies of size with large production units. Improved coordination reduces transactions costs.

Farmer cooperatives are likely to improve coordination, and thus reduce transactions costs, beyond the degree possible for IOFs coordinating the subsector. A high trust level is possible between cooperative members and managers of cooperatively-owned facilities and services because financial records and files of the cooperative are open for member surveillance. Trust eliminates transactions costs that result from strategic negotiations between parties unable to trust one another. Therefore, farmer cooperatives have the capacity to coordinate the subsector more efficiently (from an economic cost standpoint) than IOFs, because cooperatives can eliminate more of the transactions costs associated with negotiations between hog farmers and management of firms at adjacent levels of the subsector.

In order to be competitive, independent hog farmers must become part of a coordinated system. Forming hog farmer cooperatives which competitively coordinate the subsector allows hog farmers to continue to make independent business decisions and influence decisions made at adjoining levels of the subsector as well. Managing hog farms in a cooperatively coordinated system using contracts will not be

the same as "in the good old days". However, in the future hog farming will be different regardless of whether or not cooperatives coordinate the subsector. There will be fewer and larger hog farms. Large hog farmers today are more likely than smaller hog farmers to coordinate production with slaughter/processors or feed suppliers by some type of contract, such as an exclusive purchase agreement. The future hog/pork system will be more closely coordinated than the system today. The question is will hog farmers remain decision makers. Increasing concentration of packers, plus relative economies of size of feed milling, hog breeding and slaughter/processing indicate that independent hog farmers continue to be in the weakest negotiating position in the subsector. Hog farmer cooperatives coordinating the subsector would change hog farmers' position to one of strength from weakness and, in addition, be more efficient at reducing transactions costs than IOFs.

Through cooperative ownership hog farmers earn profits (or losses) from upstream and downstream levels of the subsector.

In the model above, hog farm businesses are coordinated with slaughter/processing plants. Cooperatively-owned slaughter/processing plants operate in competition with IOF slaughter/processing plants. The difference between cooperatives and IOFs is that hog farmers are the investors/owners in cooperatives. Ownership of IOFs is by

investors who may not be participants in the hog/pork subsector.

Hog farmers, who grow pigs under production contracts with cooperatively-owned slaughter/processors and who are cooperative members, have a say about the terms of production contracts. As owners, hog farmers/members also have a say about operations of cooperative slaughter/processing facilities. If the production contracts are with IOF slaughter/processors, farmers/growers do not have the negotiating power to influence the terms of contracts. Furthermore, growers for IOF contractors cannot forestall opportunistic behavior by contractors, such as reducing contract payments or reducing the number of hogs produced, when new contracts are signed. IOF contractors can reduce returns to contract growers until returns drop to the level of returns from the next best alternative before growers will choose the next best alternative instead of renewing the contract for lower returns. Depending on growers' circumstances there may not be many good alternatives, especially as the subsector becomes more concentrated. If hog farmers cooperatively-own the contracting program, managers of the contract program are unlikely to behave opportunistically²¹ towards growers,

²¹There is a difference between opportunistic behavior and making adjustments for legitimate economic reasons. Opportunistic behavior involves taking a bigger piece of the pie because market power allows it. Legitimate economic reasons include the pie, itself, shrinking.

because growers (through the Board of Directors) hire and fire the managers.

The amount of information shared between hog farmers and slaughter/processors is likely to be greater when slaughter/processors are owned-cooperatively by hog farmers than when slaughter/processors are IOFs.²² Sharing information about demand and supply characteristics is the key to improved coordination. Sharing information alone is not enough to change performance. Economic incentives coupled with clear information is necessary. Carcass merit pricing systems are more likely to be effective when more information is shared. Therefore, cooperatives offering carcass merit pricing to members and sharing more information are likely to be more successful in changing independent hog farmers' performance than IOF slaughter/processors.

Hog farmer cooperatives vertically coordinating the hog/pork subsector are not likely to become the dominant form of organization in the subsector in the near future, because cooperatives now control only a small percentage of hogs marketed and a smaller percentage of hogs slaughtered. However, hog farmer cooperatives act as a countervailing power to the IOFs the cooperatives compete against. Countervailing power enables cooperatives to set minimum

²²Cooperative ownership of breed-stock multiplying and feed milling is likely to increase the information shared with hog farmers as well.

standards for the subsector. For example, if cooperatively-owned slaughter/processors are able to get better performance from independent hog farmers using carcass merit pricing because cooperatives share more information, then IOF slaughter/processors are likely to share more information as well to effectively compete against the cooperative.

The prevalent institution for achieving coordination through contracts is private treaty contract markets. Private treaty contracts are negotiated in private between contractors and growers. Terms of the contracts, especially payments, are kept confidential for the most part by both parties. Contracts shared with the author had the names of all parties to the contracts and payment information deleted. Contractors are often reluctant to disclose any specific terms of contracts which could allow growers to compare returns from different contractors. Transactions costs are high to approach each contractor individually and negotiate contract terms before making a choice. Private treaty contracts do not provide public information which subsector participants (who are not parties to the contracts) can use to reduce uncertainty surrounding decision making.

Cooperatives coordinating by contracts employ the negotiation methods of private treaty contracts, but increase access to markets and information on price and other contract terms, at least for cooperative members. If

cooperatively-owned production contractors set terms of production contracts which are as favorable as possible for growers (and economically sound for the contractors as well), IOF contractors are likely to be forced to offer favorable contract terms to growers in order to compete.

6.11 Challenges to Coordination by Cooperatives

Hog farmers face many challenges to coordinate the hog/pork subsector by cooperatives. The first is organization of hog farmers. Independent hog farmers need reasons to change practices. Understanding the structural changes taking place in the hog/pork subsector is a first step. Deciding where hog farmers want to be in the future is the next step. Then hog farmers must determine how to get there and what compromises will have to be made based on economic realities. Leaders of the hog/pork subsector are already asking and answering these questions. Some of those leaders belong to livestock marketing farmer cooperatives. An initial core for organization already exists.

Medium-size and small-size livestock farmer marketing cooperatives do not have the membership base to offer production contracts or purchase slaughter/processing and breed-stock multiplying facilities. Other coordination mechanisms discussed throughout this chapter, such as forward contracts prior to production decisions or bargaining associations, are likely to be appropriate services for cooperatives with fewer members. Joint-

ventures with larger cooperatives should also be considered. At some point, mergers with large federated cooperatives may be appropriate.

Farmland, Cenex/Land O' Lakes and Gold Kist already have many elements of vertical coordination of the subsector by cooperatives. Farmland is the only cooperative with slaughter/processing facilities. Farmland and Land O' Lakes had unsuccessful merger talks prior to 1990. It is still possible that Farmland and Land O' Lakes could merge hog operations allowing Land O' Lakes hog farmers to benefit from Farmland's slaughter/processing operations.

There is limited participation by hog farmers in cooperative production contracting programs. One reason may be social pressure from other hog farmers not to enter contract production. Some hog farmers/cooperative members are opposed to their cooperative offering production contracts. Those hog farmers believe hogs produced under contract compete against, and lower returns for, hogs raised by farmers who do not contract. Cooperatives are a coalition of farmers with common interests and different interests. Resolving conflicts of interest to hold the coalition together is another challenge.

Cooperatives are likely to find it difficult to act before anticipated changes in the subsector occur, because members may be slow to accept changes.

Financing cooperative ownership of facilities and services is a challenge. Hog farmers may not have excess

funds or have already borrowed against their assets. One approach for financing is for another division of diversified cooperatives to finance start up operations. Farmland requires an investment of \$1000 in equity for hog growers to become members. Growers can make the payment directly or gradually accumulate the equity as non-member patrons by delivering hogs to Farmland (Lange 1992). A plan to allow hog farmers to invest over time is one approach to the finance problem.

If the theory of the competitive yardstick is correct, then hog farmers who are not cooperative members benefit from programs offered by cooperatives and lack incentives to join the cooperative. This is the free rider problem. Without sufficient participation cooperatives are not able to capture economies of size and competitively offer services. Maintaining membership is a continual challenge for cooperatives.

In summary, there are challenges for hog farmers vertically coordinating the hog/pork subsector using farmer cooperatives. However, farmer cooperatives can allow hog farmers to remain as independent decision makers while coordinating the subsector more efficiently than IOFs.

6.12 Macro Coordination of the Hog/Pork Subsector

Vertical coordination of the hog/pork subsector by cooperatives will not eliminate price and quantity instability. The broiler subsector is vertically

coordinated by a few dozen firms. A handful of those firms control the majority of supplies, yet there are still significant price and quantity fluctuations for broilers. Demand signals are still being misinterpreted or not clearly sent through the markets to broiler suppliers. Although the time lag is much shorter for broiler production than for hog production, several weeks pass between production decisions and price determination. Ideas advanced by Shaffer (1989) and Kauffman (1983) to solve the macro-coordination problem involve establishing open markets in contracts for commodities.

6.12.1 Open Markets in Contracts

Open or "transparent" markets in contracts differ from private treaty contracts by establishing a method to publicly trade contracts. Contract terms would be public information. Anyone could then bid on the contracts. An open market in contracts would increase access to markets for both sellers and buyers. Contract terms and prices would be public records available to decision makers and planners. Teleauctions, discussed in Chapter 3, are open markets in contracts for pigs and hogs that are already produced and available for immediate delivery. As such, teleauctions do not reduce uncertainty of future prices for subsector participants.

Kauffman (1983) addressed the macroeconomic question of price instability in the hog/pork subsector. He recommended

developing electronically traded forward contract markets for hogs. An electronic forward contract market as proposed by Kauffman has many features which could aid coordination of supply and demand, however the impetus to organize such a market has not been evident.

Shaffer (1989) proposed a full participation market in future delivery contracts, as a market alternative to government programs of farm price supports. Shaffer's proposal eliminates many of the problems of decision making in an uncertain environment. Significant institutional development would be needed to implement the proposal. Macro-coordination is an area where further research is needed.

6.13 Summary

This chapter analyzed problems for coordination between levels of the subsector and coordination alternatives that reduce the severity of (or eliminate) these problems. In particular, coordination by farmer cooperatives was analyzed. Questions farmer cooperatives offering hog production contracts must answer were examined. Then a model of vertical coordination of the hog/pork subsector by hog farmer cooperatives was described. Advantages and challenges for cooperative coordination were discussed. Finally, macro coordination issues were discussed.

Hog farmer cooperatives can improve vertical coordination in the subsector by a combination of contracts

and cooperative ownership. Cooperative coordination has advantages over IOF coordination in giving hog farmers decision making power and profits from upstream and downstream levels of the subsector. Coordination by farmer cooperatives can also be more cost efficient than coordination by IOFs, because cooperatives can have lower transactions costs. Cooperatives can be competitive yardsticks for IOFs. Challenges to cooperative coordination include organizing and maintaining membership.

Chapter 7 summarizes the study and conclusions. A section on future research needs complete the study.

CHAPTER SEVEN

CONCLUSIONS

7.1 Introduction

This chapter briefly summarizes the study and draws conclusions from the research. Suggestions for future research complete the chapter.

7.2 Summary and Conclusions

The hog/pork subsector is undergoing structural change. Structural change is driven by changes in the basic conditions of supply and demand. Basic conditions of supply that are driving change include new technologies and herd management techniques. Most new technologies result in increased economies of size for production units. Basic conditions of demand that are driving change include consumer demands for lean meat and convenient food products.

Structural change is occurring at every level in the subsector. The number of hog farmers continues to decrease while the average size of hog farms continues to increase. Modern hog farming requires large investments in specialized assets. Specialized assets have low values if put to alternative uses. Specialized assets include confinement production facilities for farrowing and finishing pigs. Hog

breeding is more specialized. Raising genetically superior hybrid hogs requires off-farm purchases of sows as opposed to using farm-raised sows. Specialized feeds are tailored to the lifestage and sex of hogs. Human assets are more specialized as well. Skilled hog farm managers are needed to employ new cost-saving technologies and production techniques.

The number of hog slaughter plants is decreasing while the average plant size is increasing. Firms capture economies of scope by owning several slaughter plants. As a result, concentration, ownership of slaughter capacity by fewer firms, is increasing. Slaughter plants are specializing in the slaughter of a single species, such as hogs, as opposed to the multi-species slaughter plants of the past.

The practice of differentiating products to obtain and maintain market share is being applied to fresh pork. Processed pork products have carried brand names for decades. Branded fresh pork product lines are gradually being introduced into wholesale and retail meat markets. Branded fresh pork is differentiated by packaging that lengthens case-life, labels with nutritional and preparation information and uniform product characteristics.

The hog/pork subsector is characterized by quantity and price instability which leads to profit instability. Increasing asset specialization means greater losses are sustained when participants in the hog/pork subsector exit

or cut back production. Start up costs are also higher. Entering and exiting production or large quantity adjustments in response to unstable prices has become a less viable option. As a result, subsector participants are taking actions to reduce the uncertainty of prices and profits in their operating environment. Improving coordination reduces price instability.

7.2.1 Improving Coordination

Improving coordination involves improving the match between the quantities and qualities of products demanded with the quantities and qualities of products supplied. Coordination requires mechanisms to communicate to suppliers the quantities of hogs demanded and quality characteristics of pork demanded. Spot market prices are poor communicators of future demand. Hog farmers must estimate future demand when they make production decisions, because of the time it takes to farrow and raise pigs to hogs for slaughter or breeding stock. Forward planning mechanisms are necessary to improve coordination in the hog/pork subsector.

Widely divergent relative economies of size between trading partners in the hog/pork subsector increase the difficulty of improving coordination. Widely divergent relative economies of size pit a large number of trading partners at one level against a small number of trading partners at the adjacent level of the subsector. The asymmetry allows the partners in more concentrated levels to

have negotiating power over partners in less concentrated levels. Market power allows opportunistic behavior, such as holdups of perishable products. Relative economies of size are the smallest for hog finishing and feeder pig production, respectively. Relative economies of size are the highest for hog breed research, breed stock multiplying, processing and slaughter, respectively. If each production unit were large enough to capture known economies of size, there would be approximately 100 hog farms, 3 breed multiplying farms and 2 processing plants to each hog slaughter plant. In other words, hog farms have significantly lower relative economies of size and thus individual hog farmers have the least negotiating power in the subsector. Forward planning requires commitments to forward contracts. Unless farmers can negotiate contracts that the farmers perceive as fair, they may be unwilling to make commitments to trading partners. Improving coordination requires institutions that reduce the imbalance of market power between adjacent levels of the subsector.

7.2.2 Transaction Costs

Improving coordination also entails reducing transaction costs. Transaction costs are those costs incurred in making an exchange of a good or service. Transaction costs increase as asset specificity, the number of transactions and the degree of uncertainty increase. Transaction cost theory is based on the premise that the

governance structures that minimize transactions costs dominate vertical coordination of the subsector. In other words, institutions that will dominate the structurally changing hog/pork subsector will: 1) minimize the potential losses associated with investing in increasingly more specific assets; 2) effectively handle the numerous transfers of hogs and inputs into hog production; and 3) reduce uncertainty associated with making production decisions months or years before the actual return on investment is realized. Hog farmers make decisions in uncertain environments, but hog breeders, feed millers, slaughter and processing plants must also commit to building plants designed to handle specific capacities.

7.2.3 Vertical Coordination

Coordination problems at each transaction level of the hog/pork subsector were determined. Alternative institutions and coordination mechanisms were analyzed that reduce the coordination problems. Specifically, hog farmer cooperatives were analyzed as an alternative institution to reduce coordination problems. Coordination mechanisms, such as production contracts, can be used by either IOFs or farmer cooperatives. However, the likelihood that a specific mechanism will be used and the costs and benefits to the various participants in the hog/pork subsector are likely to differ if coordination mechanisms are used by farmer cooperatives versus IOFs.

A model of vertical coordination by hog farmer cooperatives incorporates the institutions and coordination mechanisms the analysis concluded are most likely to dominate the hog/pork subsector. Analysis of advantages and disadvantages of farmer cooperatives distinguishes the costs and benefits to subsector participants of farmer cooperatives versus IOFs as coordinating institutions. It should be noted that several models of coordination are likely to coexist in the subsector due to regional differences, organizational structure, etc. Alternative models of vertical coordination are possible from different combinations of alternative institutions and methods described in Chapter 6. The model to be described combines the methods of coordination judged most likely in the subsector with cooperatives as coordinating institutions.

In the model (Figure 9), hog farmers own farrow-to-finish or finishing facilities. All hogs are grown under production contracts offered by cooperatively-owned slaughter plants. All hog farmers are cooperative members/owners under the terms of the production contracts. Slaughter plants and pork processing plants are vertically integrated through cooperative ownership of both by hog farmers. Hog farmers cooperatively-own breed-stock multiplying facilities. In this system, hog farmers control the genetics of the hogs grown, production practices, slaughter and processing. Production contracts ensure forward planning of quantities and specify characteristics

and production practices that meet the needs of the slaughter/processing managers. All hogs slaughtered are evaluated on carcass merit. Carcass information is given to hog farmers. Carcass performance is one of the variables used to calculate growers' payment bonuses and discounts. Uniformity of hogs is critical if branded fresh pork is sold by slaughter/processors.

All of the cooperatively-owned facilities described above operate in a single profit/loss pool. Hog farmers/owners receive two payments. The first payment reflects the "costs" of growing hogs plus bonuses and discounts for production performance. The second payment, a patronage refund; is based on wholesale prices received for fresh and processed pork. Profits or losses from cooperatively-owned facilities and market price risk are reflected in the second payment.

Grain farmer cooperatives, hog breeders and wholesale, retail and away-from-home eating establishments are separate profit/loss centers. Grain farmer cooperatives forward contract prior to production decisions to deliver hog feed to hog farmer cooperatives. Hog breeders are likely to remain as IOFs for some time in the future. Hog farmer cooperatives forward contract with hog breeders to deliver sows and boars. Under the terms of the contract farmer cooperatives are allowed to multiply breeding stock. Cooperatively-owned slaughter/processors sell pork to wholesale, retail and away-from-home eating establishments

at spot market prices. Purchase agreements for fresh branded pork and specialty processed products should be entered into to reduce the potential for holdups of perishable products. Purchase agreements also help slaughter/processors to plan quantities and qualities of hogs to be produced through production contracts.

7.2.4 Advantages of Farmer Cooperatives Coordinating the Hog/Pork Subsector

Currently, several firms are participants at most levels of the hog/pork subsector by ownership and/or contracting. Tyson, an IOF, contracts for hog production and processes pork, but does not yet own slaughter facilities. Tyson recently broke off negotiations to purchase a slaughter plant. It is likely Tyson will soon be in a position to vertically coordinate all levels of the hog/pork subsector. Farmland, a farmer cooperative, currently operates at all levels of the subsector, but is just entering production contracting. Vertical coordination of the hog/pork subsector by firms is a complex process, but clearly within the reach of several firms over the next few years. Industry analysts expect production contracting by slaughter/processors to expand in the future (Hayenga 1992).

The question is what roles will hog farmers take? Will all hog farmers be contract growers like broiler farmers?¹

Vertical coordination by hog farmer cooperatives has several advantages over vertical coordination by IOFs. The primary advantage is keeping hog farmers as decision makers. Cooperative membership gives hog farmers both voice for farmers' viewpoint and votes on actions to be taken by cooperatively-owned plants. Structural changes in the hog/pork subsector and higher asset specificity increase transactions costs of coordinating the subsector by open markets as has been done in the past. Capturing economies of size in order to produce at least-cost at each level in the subsector is not sufficient when per unit costs can be lowered further by reducing transactions costs through vertical coordination. In order to be competitive, independent hog farmers must become part of a coordinated system.

Farmer cooperatives are likely to improve coordination, and thus reduce transactions costs, beyond the degree possible for IOFs coordinating the subsector. A high trust level is possible between cooperative members and managers of cooperatively-owned facilities and services because financial records and files of the cooperative are open for member surveillance. Trust eliminates transactions costs

¹Broiler growers are organizing to challenge IOF broiler contractors about actions broiler growers perceive as opportunistic behavior towards growers by broiler contractors (Feedstuffs, September 1992).

tha

una

hav

ef:

be

co

ma

pr

th

pr

be

(t

Co

ne

in

ot

ho

fo

be

ho

an

Op

pi

re

that result from strategic negotiations between parties unable to trust one another. Therefore, farmer cooperatives have the capacity to coordinate the subsector more efficiently (from an economic cost standpoint) than IOFs, because cooperatives can eliminate more of the transactions costs associated with negotiations between hog farmers and management of firms at adjacent levels of the subsector.

Cooperative ownership allows hog farmers to earn profits (or losses) from upstream and downstream levels of the subsector.

If hog farmers cooperatively-own production contracting programs, managers of the contract program are unlikely to behave opportunistically² towards growers, because growers (through the Board of Directors) hire and fire the managers. Cooperatives coordinating by contracts employ the negotiation methods of private treaty contracts, but increase access to markets and information on price and other contract terms, at least for cooperative members.

Hog farmer cooperatives vertically coordinating the hog/pork subsector are not likely to become the dominant form of organization in the subsector in the near future, because cooperatives now control only a small percentage of hogs marketed and a smaller percentage of hogs slaughtered.

²There is a difference between opportunistic behavior and making adjustments for legitimate economic reasons. Opportunistic behavior involves taking a bigger piece of the pie because market power allows it. Legitimate economic reasons include the pie, itself, shrinking.

However, hog farmer cooperatives act as a competitive alternatives to the IOFs the cooperatives compete against. As competitive yardsticks, cooperatives are able to set minimum standards for the subsector.

7.2.5 Challenges for Hog Farmer Cooperatives as Coordinators

There are many challenges for hog farmers coordinating the hog/pork subsector by cooperatives. The first is organization of hog farmers. A core group of hog farmers are already organized in livestock farmer cooperatives. Most industry leaders are aware of structural changes and the implications for hog farming in the future. More hog farmers need to be made aware of the future implications of structural change. The earlier hog farmers actively participate in determining the future direction of the hog/pork subsector, the more effective hog farmers are likely to be in operating from a position of strength rather than from a position of weakness. The more concentrated hog farmers' trading partners become, the less competitive pressures will bear on them to satisfy hog farmers' demands for price and non-price terms in order to obtain supplies of hogs.

Medium-size and small-size livestock farmer marketing cooperatives do not have the membership base to offer production contracts or purchase slaughter/processing and breed-stock multiplying facilities. Other coordination

med

for

bar

ser

ver

At

be

in

in

ch

be

me

se

fu

to

th

th

f

j

w

t

c

c

mechanisms discussed throughout this chapter, such as forward contracts prior to production decisions or bargaining associations, are likely to be appropriate services for cooperatives with fewer members. Joint-ventures with larger cooperatives should also be considered. At some point, mergers with large federated cooperatives may be appropriate.

Cooperatives are a coalition of farmers with common interests and different interests. Resolving conflicts of interest to hold the coalition together is another challenge.

Cooperatives are likely to find it difficult to act before anticipated changes in the subsector occur, because members may be slow to accept changes.

Financing cooperative ownership of facilities and services is a challenge. Hog farmers may not have excess funds or have already borrowed against their assets. A plan to allow hog farmers to invest over time is one approach to the finance problem.

If the theory of the competitive yardstick is correct, then hog farmers who are not cooperative members benefit from programs offered by cooperatives and lack incentives to join the cooperative. This is the free rider problem. Without sufficient participation cooperatives are not able to capture economies of size and offer services competitively. Maintaining membership is a continual challenge for cooperatives.

In summary, there are challenges for hog farmers vertically coordinating the hog/pork subsector using farmer cooperatives. However, farmer cooperatives can allow hog farmers to remain as independent decision makers while coordinating the subsector more efficiently than IOFs.

7.3 Suggestions for Future Research

This research showed that hog farmer cooperatives have the capacity to improve vertical coordination and benefit hog farmers. However, further research is needed.

7.3.1 Macro Coordination

Vertical coordination from inputs to the slaughter/processing level improves coordination and stabilizes prices between coordinated transactions levels. However, prices are still likely to fluctuate widely at the wholesale level, as evidence from the broiler subsector shows. The broiler subsector, as discussed in Chapter 4, is highly concentrated and integrated. It still suffered from price instability only slightly lower than that of pork between 1950 and 1982 (Dalziell, p. 187). For this 32 year period, quantity instability for broilers was the lowest in the livestock sector. However, in a period of rapidly changing demand for meats when broiler output was expanding rapidly, 1972-1982, the proportional change in quantity instability of broilers was greater than either that for beef or pork as compared to the previous period of

196

lev

tim

uns

les

con

wi

to

In

su

ne

Sh

fu

pr

pu

in

op

fo

wo

pl

de

coo

pit

Con

1961-1971. Feed inputs experienced some of the highest levels of instability of all commodities during these same time periods. Corn and soybean prices were among the most unstable of more than 100 commodities (Dalziel, p. 143). A lesson from the broiler subsector is that even as firms control destabilizing factors by integrating and contracting with farmers, there continue to be powerful forces external to integrated firms which influence the subsector. Instability can result from rapidly changing demand or supply conditions.

In the hog/pork subsector improved coordination is needed between wholesale buyers and slaughter/processors. Shaffer (1989) and Kauffman (1983) proposed open markets in future delivery contracts to improve macro coordination.

Open or "transparent" markets in contracts differ from private treaty contracts by establishing a method to publicly trade contracts. Contract terms would be public information. Anyone could then bid on the contracts. An open market in contracts would increase access to markets for both sellers and buyers. Contract terms and prices would be public records available to decision makers and planners.

Farmer cooperatives may be the best institutions to develop open markets in contracts. Livestock farmer Cooperatives have established teleauctions and learned the pitfalls and benefits of open markets in contracts. Contracts, to date, have been contracts for already produced

liv

the

de

su

in

c

n

c

c

r

c

c

c

c

c

c

c

c

c

c

c

c

c

livestock, not future delivery contracts as proposed, but there are likely to be parallels with open markets in future delivery contracts.

Future research on macro coordination of the hog/pork subsector is needed. Macro coordination research should include examining open markets in future delivery contracts.

7.3.2 Applied Research on Cooperatives

This research analyzed the roles livestock farmer cooperatives could take to improve coordination of the hog/pork subsector. However, moving from the existing roles of livestock farmer cooperatives to more effective coordination roles in the future will involve significant redirection and restructuring. Applied research is needed analyzing roles of livestock farmer cooperatives on a regional basis and developing strategic plans for the future.

APPENDIX

APPENDIX A

TOPICS OF INTERVIEWS AND TITLES OF INDIVIDUALS INTERVIEWED

Pig and Hog Production Practices

Independent hog farmers

Manager of a hybrid swine breed multiplying farm owned by
Gold Kist in Georgia

Branded Pork

Executive director of the Michigan Pork Producer's
Association

Meat managers at retail grocery store chains

New Technology for Hogs, Production Practices, Future Developments in the Livestock Subsectors

University-based swine extension specialists in Michigan and
Missouri

Poultry extension specialists in Michigan.

Extent of Cooperative Involvement in the Hog/Pork Subsector, Representative Cooperatives in the Subsector to be Included in the Study, Important Issues for Livestock Cooperatives

Livestock Specialist, Julie Hogeland, Agricultural
Cooperative Service, U.S.D.A., Washington, D.C.

Past, Current and Projected Future Roles of Livestock Cooperatives, Uniqueness of Cooperatives

General managers, swine program managers and economic
researchers at ten livestock farmer cooperatives located in
ten hog producing states in the Midwest and Southeast

REFERENCES

REFERENCES

- Adams, Walter, Editor, The Structure of American Industry, Fifth Edition, Macmillan Publishing Co., Inc., New York, 1977.
- Agriculture Canada and Canadian Pork Council, Proceedings of the National Workshop on Hog Marketing Alternatives, Ottawa, February 26-27, 1987.
- Allewelt, William F., Jr., Agricultural Cooperatives: Are They Still Relevant?, Agricultural Issues Center, University of California, Davis, CA, UC/AIC Issues Paper No 87-2, October 1987.
- American Cooperation, including "Journal of Agricultural Cooperation", American Institute of Cooperation, Washington, D.C., 1986, 1987.
- Anderson, Bruce L., An Evaluation of Marketing Strategies, unpublished paper, 1987 American Agricultural Economics Association Symposium, The Future of Agricultural Marketing Cooperatives: Succeeding Into Extinction?, East Lansing, Michigan.
- _____, "Understanding Cooperative Marketing Strategies", American Cooperation 1988, American Institute of Cooperation, 1988.
- Armour, Henry Ogden and David J. Teece, Vertical Integration and Technological Innovation, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper No. 56, August 1979.
- Armstrong, Jack H., "Lessons from Beef Coordination Experiences", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc. Westport, Connecticut, pp. 232-239, 1972.
- _____, "Strategies for Research Related to Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

- Babb, Emerson M. and Mahlon G. Lang, "Implications of Comparative Performance of Cooperatives and Investor Owned Firms", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Bache, David H. and James R. Foster, Pork Production Systems with Business Analyses: The High-Investment, High-Intensity Confinement System (3 Groups of Sows Farrow-to-Finish), Pork Industry Handbook, Production Systems, Fact Sheet 19.41.05, Extension Bulletin E-1092, Cooperative Extension Service, Michigan State University, March 1977.
- _____, Pork Production Systems with Business Analyses: The Low-Investment, Low-Intensity System (2 Groups of Sows Farrow-to-Finish), Pork Industry Handbook, Production Systems, Fact Sheet 19.41.04, Extension Bulletin E-1091, Cooperative Extension Service, Michigan State University, October 1986.
- Baker, Allen and Lawrence Duewer, Meat Distribution Patterns in Six Southern Metro Areas, AER-498, USDA-ERS, April 1983.
- Bateson, Patrick, "The Biological Evolution of Cooperation and Trust", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.
- Bement, Jerrold Frank, A Description and Economic Analysis of Investment Alternatives in Hog Production Systems in Michigan, unpublished Master's Thesis, Michigan State University, 1980.
- Bennett, R. I., "Current and Emerging Systems and Techniques of Coordination in the Canadian Swine Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc. Westport, Connecticut, pp. 106-117, 1972.
- Bentley, Orville G., "Responding to Change", American Cooperation 1988, American Institute of Cooperation, 1988.
- Bishop, Robert V. and Lee A. Christensen, "America's Poultry Industry", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

- Black, William E., "Understanding the Cooperative Member", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Blazer, Evelyn, Livestock and Meat Statistics, 1983, SB-715, U.S.D.A., Economic Research Service, December 1984.
- Boggs, Donald L. and Robert A. Merkel, Live Animal/Carcass Evaluation and Selection Manual, Second Edition, Kendall/Hunt Publishing Company, Dubuque, Iowa, 1984.
- Bolling, Dennis, General Manager, Producers Livestock Association, Columbus, Ohio, personal conversation, Summer 1989.
- Brandt, Jon A. and Michael Roth, Annotated Bibliography of Research on the Hog-Pork Industry, Department of Agricultural Economics, Agricultural Experiment Station, Purdue University, West Lafayette, Indiana, Station Bulletin No. 297, October 1980.
- Brester, Gary W. and Michael K. Wohlgenant, "Estimating Interrelated Demands for Meats Using New Measures for Ground and Table Cut Beef, paper presented at the American Agricultural Economics Association 1989 meetings in Baton Rouge, Louisiana, July 1989.
- Broadbent, E. E., "Coordination in the Corn Belt Pork Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 46-67, 1972.
- Broiler Industry, "NBC Survey Results: How Broilers are Marketed", December 1988a.
- _____, "Nation's Top Broiler Firms", December 1988b.
- Bromley, Daniel W., "Economic Institutions and the Development Problem: History and Prognosis", unpublished paper, Department of Agricultural Economics, University of Wisconsin, Madison, 1989.
- Brumm, Michael C., "How to do it with Less than 100 Sows", pp. 32-34, Pork '91, March 1991.
- Bunch, Karen, Food Consumption, Prices, and Expenditures, 1963-83, SB-713, U.S.D.A., Economic Research Service, November 1984.

- Bunje, Ralph B., Cooperative Farm Bargaining and Price Negotiations, U.S.D.A., Economics, Statistics and Cooperatives Service, Cooperative Information Report No. 26, July 1980.
- Butz, D. E., "Status, Problems and Future of Vertical Coordination", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 179-182, 1972.
- Butz, E. L., "An Optimist Looks at the Swine Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 3-8, 1972.
- Capps, Oral, Jr., Scanner Data and Meat Demand, American Journal of Agricultural Economics, Volume 71, Number 3, August 1989.
- Caves, Richard, American Industry: Structure, Conduct, Performance, Sixth Edition, Prentice-Hall, Inc., 1987.
- Central Livestock Association, Inc. and Subsidiaries, Annual Report, For the Years Ended December 31, 1988 and 1987, South St. Paul, Minnesota.
-
- Central Livestock News, No. 10, South St. Paul, Minnesota, March 1989.
- Chastine, Jeff, Manager, Pork Production Center, Gold Kist Inc., Atlanta, Georgia, personal conversation, Summer, 1989.
- Christian, Lauren et al., "U.S. Trends in Hog Production and Farms", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 35-42, December 1988.
- Christy, Ralph D., "The Role of Farmer Cooperatives in a Changing Agricultural Economy", Southern Journal of Agricultural Economics, pp. 21-28, July 1987.
- Coaldrake, Karen and Steve Sonka, "Leaner Pork: Can New Sector Linkages Be Formed?", NE-165 Case Study, Private Strategies, Public Policies and Food System Performance, Working Paper Series, WP-26, October 1991.
- Coase, R. H., "The Nature of the Firm", Economica, n.s. 4(1937):386-405. Reprinted in Readings in Price Theory, ed. G. G. Stigler and K. E. Boulding, pp. 331-51, Homewood, Illinois, Richard D. Irwin for American Economic Association, 1952.

Cobia, David W., Editor, Cooperatives in Agriculture, Prentice Hall, Englewood Cliffs, New Jersey, 1989.

Cochrane, Willard W., The Development of American Agriculture: A Historical Analysis, University of Minnesota Press, 1979.

Colvis, L. L., "Vertical Coordination in the Pork Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc. Westport, Connecticut, pp. 183-187, 1972.

Condon, Andrew M., "The Methodology and Requirements of a Theory of Modern Cooperative Enterprise", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

Connor, John M., Competition in the U.S. Food Marketing System, USDA-ESS Staff Report, 1980.

_____, Concentration Issues in the U.S. Beef Subsector, Staff Paper 89-12, Department of Agricultural Economics, Purdue University, West Lafayette, Indiana, August 1989.

_____, Food Processing: An Industrial Powerhouse in Transition, Lexington Books, Lexington, Massachusetts, 1988.

_____ et al., "Competitive Issues in the Beef Subsector: Can Beef Compete in the 1990s?", executive summary, National Cattlemen's Association, 1989.

Coop Leadership, "Easy Money", Coop Leadership, Kansas City, Missouri, Summer 1989.

Cotterill, Ronald W., "Agricultural Cooperatives: A Unified Theory of Pricing, Finance and Investment", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

Crom, Richard, Economics of the U.S. Meat Industry, USDA, Economic Research Service, Agricultural Information Bulletin Number 545, November 1988.

_____ and L. Duewer, Trends and Development in the Hog/Pork Industry, U.S.D.A.-E.S.S. Staff Report AGESS801027, 1980.

Crom,
Y
U
R

Cromwe
R
R
R

Dalzi
:
:

Dasgu

Davis

Dobso

Duewe

Dunn,

Dyer

East

- Crom, Richar, and James Sullivan, Effects of Changes in Vertical Coordination on Pork Production and Prices, USDA, Economic Research Service, Agricultural Economic Report No. 303, August 1975.
- Cromwell, Gary L., et al, Management to Prevent Drug Residue Problems in Pork, Cooperative Extension Service, Michigan State University, Extension Bulletin E-1749, Reprinted May 1985.
- Dalziell, Ian L., "Sources of Agricultural Market Instability", unpublished PhD dissertation, Michigan State University, 1985.
- Dasgupta, Partha, "Trust as a Commodity", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.
- Davis, Mel, Director of Price Risk Management and Corporate Research, Farmland Foods, Inc., Kansas City, Missouri, personal conversation, September 1989.
- Dobson, William D., "Implications of the Future Macroenvironment for Successful Evolution of Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Duewer, Lawrence A., "Changes in the Beef and Pork Industries", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.
- Dunn, John R., "Trust and Political Agency", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.
- _____, Tracy L. Kennedy and Randall E. Torgerson, "Cooperatives' Best Hope for Farmers' Economic Survival: Senate Study", American Cooperation 1988, American Institute of Cooperation, 1988.
- Dyer, Janice, Structural Change in the Livestock Sector, Working Paper, Agricultural Canada, Policy Branch, Ottawa, Ontario, April 1988.
- Easterling, Edward, C. Braschler, G. Geiger and J. Kuehn, An Analysis of Broiler Industry Location, Research Bulletin 1058, Missouri Agricultural Experiment Station, Columbia, Missouri, March 1986.

Edmondson, V. W., "The Danish Systems of Swine and Pork Production Marketing", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 93-105, 1972.

Equity Cooperative Livestock Sales, Annual Report 1988, Baraboo, Wisconsin.

Erickson, C. E., "An Input Supplier Looks at the Challenges of the Decade Ahead", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 42-45, 1972.

Etherton, Terry D., "Livestock Growth Hormones - They're Safe", Choices: The Magazine of Food, Farm and Resource Issues, American Agricultural Economics Association, Ames, Iowa, First Quarter 1992.

Farmer Cooperatives, "Farmland Foods Comes of Age", U.S.D.A., Economics, Statistics and Cooperatives Service, April 1980a.

_____, "Farmland Foods Pioneering In Boxed Pork and Pigskins", U.S.D.A., Economics, Statistics and Cooperatives Service, November 1980b.

Farm Journal, February, 1987.

Farmland Food Future, Farmland Foods, Kansas City, Missouri, 1990.

Farmland Foods, "The Minnesota Swine Industry Situation Analysis", unpublished paper presented to the Minnesota State Legislature, April 1989.

Farmland News, "Farmland Lends Capital for Farm Production", Farmland Industries, April 1990a.

_____, "Farmland Selects Location for 700-Sow Hybrid Unit", Farmland Industries, April 1990b.

_____, "No Choice But to Adapt to Hog Production Trend", Farmland Industries, April 1990c.

_____, "Quality Pork Requires Producer, Processor Cooperation", Farmland Industries, April 1990d.

Farris, D. E. and W. R. Masch, "Vertical Coordination in the Pork Industry in the Southwest", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 82-92, 1972.

Fetterman, Lewis M., Innovative Pork Concepts, presentation to Professional Swine Producers Symposium, Lansing, Michigan, February 1, 1990.

Fleming, Ann and Jeannine Kenney, "Will Consumers Benefit from New Dairy Technologies?", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

Fombrun, Charles and W. Graham Astley, Beyond Corporate Strategy: A Framework for Collective Action, The Wharton School, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper #111, Philadelphia, Pennsylvania, September 1981.

Fort, Dwayne, Director of Livestock Programs, Land O' Lakes/Cenex, Fort Dodge, Iowa, personal conversation, Summer, 1989.

Frank, Robert H., Passions within Reason: The Strategic Role of the Emotions, W. W. Norton and Company, New York, London, 1988.

Frank, Stuart D. and Dennis R. Henderson, "Market Structure and Industrial Performance: Measuring and Analyzing Vertical Coordination", Selected Paper presented at the 1989 annual meeting of the American Agricultural Economics Association, Louisiana State University, July 1989.

_____, "The Measurement and Determinants of Vertical Coordination: A Transactions Cost Approach", Department of Agricultural Economics and Rural Sociology, Ohio State University, OP-8, March 1990.

_____, "Vertical Coordination and the Competitive Performance of the U.S. Food Industries", paper presented at the conference for Competitive Strategy Analysis in the Food System, Alexandria, Virginia, June 3-5, 1991.

Fritz, Michael, "Producer Cooperatives", Hog Farm Management, May 1983.

Futrell, Gene, "Hog Production Returns", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 52-55, December 1988.

_____, "Production Efficiency", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 49-52, December 1988.

Futrell, Gene, Seasonality of Hog Prices, Producer Marketing Management, FACT Sheet #11, NCR Extension Publication No. 217, March 1987.

_____, and Gary Williams, "Factors Affecting Supply of Pork and Pork Products", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 11-22, December 1988.

Gambetta, Diego, "Can We Trust Trust?", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988a.

_____, "Mafia: the Price of Distrust", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988b.

Gardner, J. M., "Producer's View on Vertical Coordination", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 146-150, 1972.

Garoyan, Leon, California's Contribution to Cooperation, Center for Cooperatives, University of California, Davis, Working Paper Series, No. 1-A, July 1989.

Geary, William, Market Trends Challenge Co-ops, Wisconsin Federation of Cooperatives, Madison, Wisconsin, Winter 1988.

Gerber, Allen, "Cooperatives Could Help Producers Regain Lost Ground in Hog Industry", Farmer Cooperatives, Volume 58, Number 12, March 1992.

Gilson, J. C. and R. Saint-Louis, Policy Alternatives Facing the Canadian Hog Industry, Agriculture Canada, Canadian Pork Council, 1986.

Ginder, Roger G., Changing Pork Industry Structure, Department of Economics, Iowa State University, Ames, Iowa, Draft, November 1989.

_____, Extension Programs for Cooperatives in a Changing Agriculture, Department of Economics Staff Paper, Iowa State University, Ames, Iowa, August 1988a.

_____, "Restructuring of the Grain Industry and Cooperatives' Role", American Cooperation 1988, American Institute of Cooperation, 1988b.

Ginder, Roger G., Restructuring of the Pork Industry, Economics Department Staff Paper, Iowa State University, presented to the Iowa Pork Congress, January 24, 1985, revised July 1985a.

_____, The Structure of Production Agricultural and the Farm Debt Crisis, Economics Department, Iowa State University, revised July 1985b.

_____, et al., "Impact of the Farm Financial Crisis on Agribusiness Firms and Rural Communities", American Journal of Agricultural Economics, Vol. 67, No. 5, December 1985.

Glaser, Lewrene K., "Options for Making Animal Products Part of a Leaner Diet", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

Glover, Glenn, Director of Corporate Planning and Economic Research, Gold Kist, Inc., Atlanta, Georgia, personal conversation, Summer 1989.

Gold Kist Inc., 1988 Annual Report, Atlanta, Georgia.

Good, David, "Individuals, Interpersonal Relations and Trust", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.

Goodwin, Barry K., Multivariate Gradual Switching Systems and the Stability of the U.S. Meat Demands: A Bayesian Analysis, Staff Paper No. 90-2, Department of Agricultural Economics, Kansas State University, July 1989.

Gonzales, Jorge, V. James Rhodes and Glenn Grimes, U.S. Hog Producers: Size Comparisons, University of Missouri Agricultural Experiment Station Special Report 299, 1983.

Grandin, Temple et al., Handling Hogs, Pork Industry Handbook, Management, Extension Bulletin E-2183, Cooperative Extension Service, Michigan State University, April 1989.

Guither, Harold D., The Food Lobbyists: Behind the Scenes of Food and Agri-Politics, Lexington Books, D.C. Heath and Company, Lexington, Massachusetts, Toronto, 1980.

Haas, John T., "Approaches to Cooperative Development", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

- Haas, John T., David R. Holder and Timothy Ulrich, Feasibility of Cooperative Hog Slaughtering and Processing in the Eastern Corn Belt, Technical Assistance Report 5, U.S.D.A., Economics, Statistics and Cooperatives Service, Cooperative Program, May 1979.
- _____ et al., The Future Role of Cooperatives in the Red Meats Industry, U.S.D.A., Economics, Statistics and Cooperatives Service, Marketing Research Report 1089, April 1978.
- Haase, W. C., "Experience with Vertical Coordination in the Pork Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 188-192, 1972.
- Hahn, William F., Asymmetric Price Interactions in Pork and Beef Markets, U.S.D.A., Economic Research Service, Technical Bulletin Number 1769, December 1989.
- Halbrendt, Catherine et al, "Socioeconomic Determinants of Attitudes Toward the Use of Bioengineered Products in Food Production", paper presented at American Association of Agricultural Economics annual meetings, August 1989.
- Hanson, John, Assistant Manager, Michigan Live Stock Exchange, Lansing, Michigan, personal conversation, Summer 1989.
- Harlander, Susan K., "Biotechnology: On the Cutting Edge", presentation at the 61st National Institute on Cooperative Education, Indianapolis, Indiana, July 26, 1989.
- Harris, Marshall and Dean T. Massey, Vertical Coordination Via Contract Farming, Natural Resource Economics Division, Economic Research Service, U.S.D.A., Miscellaneous Publication No. 1073, March 1968.
- Hart, Keith, "Kinship, Contract and Trust: The Economic Organization of Migrants in an African City Slum", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.
- Hawkins, Lisa, "Carcass Data Now at Cattlemen's Fingertips", Kansas Stockman, Volume 77, Number 9, July 1992.

Haydu, John, "Barriers and Opportunities Facing Cooperatives in Improving the Economic Coordination of the Farm Supply Industry", Unpublished PhD Dissertation, Michigan State University, 1988.

Hayenga, Marvin et al., "An Industry Survey of Coordination in the Pork Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 202-208, 1972.

_____, et al., The U.S. Pork Sector: Changing Structure and Organization, Iowa State University Press, Ames, Iowa, 1985.

_____ and John McDaniel, "Processing-Plant Locations and Current Industry Trends", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 29-34, December 1988.

_____ and Kevin Kimle, "Evolution of Pork Producer/Packer Relationships", Paper presented to the Minnesota Swine Conference for Veterinarians, September 20, 1992.

Hepp, Ralph E., Swine Farrowing Cooperatives, Cooperative Extension Service, Michigan State University, Extension Bulletin E-1056, February 1977.

Hillburn, Chris et al., A Comparison of High and Low Profit Swine Producers in Iowa, Staff Paper Number 193, Department of Economics, Iowa State University, 1988.

Hirschman, Albert O., Exit, Voice and Loyalty: Responses to Decline in Firms, Organizations and States, Harvard University Press, 1970.

Hofstad, Ralph, "Structural Changes in Cooperatives with an Emphasis on Joint Ventures", American Cooperation 1988, American Institute of Cooperation, 1988.

Hogeland, Julie A., "Livestock Cooperatives Adapt Technology to Develop Niches with Market Services", Farmer Cooperatives, U.S.D.A., Agricultural Cooperative Service, Volume 55, Number 1, April 1988.

_____, New Directions for Coordinating Slaughter Hog Marketing, U.S.D.A., Agricultural Cooperative Service, September 1982.

_____, Market Access in an Era of Structural Change in the Livestock Industry, U.S.D.A., A.C.S., September 1988.

Hogeland, Julie A., The Future Role of Livestock Cooperatives, ACS Research Report Number 61, United States Department of Agriculture, Agricultural Cooperative Service, May 1987.

"Testing Time Too Short to Assess New Electronic Livestock Auctions?", Farmer Cooperatives, U.S.D.A., Agricultural Cooperative Service, April 1982.

Holden, Palmer et al., "Iowa Trends in Hog Production and Hog Farms in Iowa", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 43-48, December 1988.

Holder, David L., Cooperative Marketing Alternatives for Sheep and Lamb Producers, U.S.D.A., Farmer Cooperative Service, Marketing Research Report No. 1081, August 1977.

and Ralph E. Hepp, Cooperatives Strategies for the Pork Industry, U.S.D.A., Economics, Statistics and Cooperatives Service, Marketing Research Report No. 1097, July 1978.

Holloway, Garth J. and Thomas W. Hertel, "Market Power and Its Effects on Equilibrium in the Food System", Selected Paper presented at the 1989 annual meeting of the American Agricultural Economics Association, Louisiana State University, July 1989.

Hopkin, J. A., "Financing a Technologically Modern Coordinated Production-Marketing System", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 209-219, 1972.

Howerton, Phil, "12 Who Get the Job Done", pp. 46-66, Pork '91, March 1991.

Hulslander Thomas A. and Daniel B. Taylor, "Assessing Cooperative Structure and Profitability: A Case Study of Nine Southern State Stores", American Cooperation 1988, American Institute of Cooperation, 1988.

Hurt, Chris, Kenneth A. Foster, John E. Kadlec, and George F. Patrick, "Industry Revolution: By 2000, Packers Expected to Coordinate Pork Production", Feedstuffs, Volume 64, Number 35, pp. 1,18, August, 1992.

Ikerd, John E., "Consumer Demand Analysis for Meats: Back to the Basics", summary and review, Proceedings: Key Issues in Livestock Pricing: A Perspective for the 1990s, Wayne D. Purcell and Teresa Altizer, Editors, Published by the Research Institute on Livestock Pricing, Blacksburg, Virginia, May 1988.

_____ and Emmitt L. Rawls, Using Futures Markets for Hedging, Pork Industry Handbook, Marketing, Fact Sheet 19.48.03, Extension Bulletin E-1096, Cooperative Extension Service, Michigan State University, April 1981.

Indiana Farm Bureau Cooperative Association, Annual Report, 1989.

Iowa State University, The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 76, December 1988.

Jacobs, James A., "Comparison of Coordination Mechanisms and Performance between the Sugarbeet and Navy Bean Subsectors", unpublished Master's thesis, Department of Agricultural Economics, Michigan State University, 1988.

Jenny, W., "Coordination in the Swine Industry", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 161-167, 1972.

Jenks, John, Executive Vice-President and General Manager, Equity Cooperative Livestock Sales Association, Baraboo, Wisconsin, personal conversation, September 1989.

Johnson, Glenn L., "Institutional Reform: Accomplishments and Unmet Needs in China, Newly Industrialized Countries of Asia, the Soviet Union and Eastern Europe and the Developed Countries", Proceedings of Conference on Directions and Strategies of Agricultural Development in the Asia-Pacific Region, Vol. I, The Institute of Economics, Academic Sinica, Taipei, Taiwan, Republic of China, pp. 9-43, January 5-7, 1988.

_____ and C. Leroy Quance, The Overproduction Trap in United States Agriculture, John Hopkins University Press for Resources for the Future, Baltimore, 1972.

Jones, B. H. (Bill), Packers and Stockyards Administration Statement Before the House Subcommittee on Monopolies and Commercial Law Committee on the Judiciary, 1988.

Jones, D. J., D. B. Anderson, W. P. Waitt, J. F. Wagner and D. H. Mowrey, Journal of Animal Science, Vol. 67, p. 277, 1989.

Jones, Michael and V. James Rhodes, Meat Distribution to Kansas City's Food Service Industry, University of Missouri-Columbia Agricultural Experiment Station, Special Report 257, 1980.

Jorde, Thomas M. and David J. Teece, Innovation and Cooperation: Implications for Competition and Antitrust, Journal of Economic Perspectives, Volume 4, Number 3, pp. 75-96, Summer 1990.

Justus, Fred E. and Dennis O. Liptrap, 1986 Farrow-to-Finish Swine Costs and Returns, Department of Agricultural Economics Extension Publication #74, University of Kentucky, May 1988.

Kansas Farmer, various issues, Fall 1990.

Kampmeier, Donald, President and General Manager, Central Livestock Exchange, St. Paul, Minnesota, personal conversation, September 1989.

Kauffman, Daniel E. and James D. Shaffer, "Forward Contract Markets: Can They Improve Coordination of Supply and Demand?", The Farm and Food System in Transition, Emerging Policy Issues, Cooperative Extension Service, Michigan State University, 1985.

Kauffman, Robert G., Richard J. Epley and Tom R. Carr, Carcass Evaluation, Pork Industry Handbook, Pork and Pork Quality, Extension Bulletin E-1222, Cooperative Extension Service, Michigan State University, May 1988.

King, Robert P., "The Potential for Market Failure in the Information Industry and the Role of Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

Kliebenstein, James et al., "Comparison of Iowa High- and Low-Profit Swine Producers", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 56-58, December 1988.

et al., "Iowa's Pork Production Costs Compared to the Competition's", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 59-63, December 1988.

- Knoeber, Charles R., "A Real Game of Chicken: Contracts, Tournaments and the Production of Broilers", Journal of Law, Economics and Organization, Volume 5, Number 2, pp. 271-291, Fall 1989.
- Knutson, Ronald D., "Cooperative Principles and Practices: Future Needs", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Kolmer, Lee R., "Cooperatives and Change", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Koontz, Stephen R., Michael A. Hudson and Philip Garcia, Oligopsony Power, Meatpacker Conduct and Price Dynamics: A Preliminary Investigation of Live Cattle Markets, Proceedings NCR-134 Conference, Applied Commodity Price Analysis, Forecasting and Market Risk Management, April 20-21, 1989.
- Kraenzie, Charles A. et al, "Historical Trends and Current Status of Farmers' Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.
- Kuchler, Fred and John McClelland, Issues Raised by New Agricultural Technologies: Livestock Growth Hormones, U.S.D.A., Economic Research Service, Agricultural Economic Report Number 608, April 1989.
- Land O' Lakes, Annual Report, 1989.
- Lang, Mahlon, Farmland Foods, Inc., Kansas City, Missouri, personal conversation, September 1989, August 1992.
- Lasley, Floyd A. et al., The U.S. Broiler Industry, U.S.D.A., Economic Research Service, Agricultural Economic Report Number 591, November 1988.
- _____, William L. Henson and Harold B. Jones, Jr., The U.S. Turkey Industry, U.S.D.A., Economic Research Service, Agricultural Economic Report Number 525, March 1985.
- Lesser, William H., Editor, Animal Patents: The Legal, Economic and Social Issues, Stockton Press, 1989.
- Liittjohann, R., "Techniques of Coordination in the Western Corn Belt", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 68-71, 1972.

Lorenz, Edward H., "Neither Friends nor Strangers: Informal Networks of Subcontracting in French Industry", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.

Luhmann, Niklas, Familiarity, Confidence, Trust: Problems and Alternatives", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.

Luzar, James C. et al., Farrow-to-Finish Swine Enterprises: 1987 Costs and Returns, Department of Agricultural Economics Extension Publication #80, University of Kentucky, April 1989.

Marbery, Steve, "The Co-op Challenge: Keeping Hogs in the Midwest", Hog Farm Management, August 1988.

_____, "Corporate Farming Law in Kansas Tested by Swine Investors", Feedstuffs, Vol. 63, #51, December 16, 1991.

_____, "Lean-Value Hog Buying System Ending Under-, Over-Feeding", Feedstuffs, Vol. 64, #35, August 24, 1992.

Marion, Bruce W., The Organization and Performance of the U.S. Food System, NC-117 Committee, Lexington Books, Lexington, MA, 1986.

Masten, Scott E., Once the Die is Cast: The Hazards of Incomplete Contracting, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper No. 113, November 1981.

_____, "Transaction Cost Economics and The Organization of Agricultural Transactions", paper prepared for the NC-194 World Food Systems Project Symposium: Examining the Economic Theory Base for Vertical Coordination, Chicago, Illinois, October 17-18, 1991, University of Michigan School of Business Administration, December 23, 1991.

McBride, Glynn, Agricultural Cooperatives: Their Why and Their How, Avi Publishing Company Company Inc., Westport, Connecticut, 1986.

McDaniel, John S. et al., Producing and Marketing Hogs Under Contract, Marketing, Extension Bulletin E-1083, Cooperative Extension Service, Michigan State University, September 1988.

McNabney, Jim, "Farmland Unveils New Buying Plan", p. 101, Pork '91, January 1991.

McNabney, Jim, Economist Emeritus (Retired?)",
pp. 48, 50, Pork '91, October 1991.

_____, "10 More Years of Hogs Cycles", pp. 28-29,
Pork '91, June 1991.

Meat Processing, September 1988.

Meisinger, D. J., Potential Impact of Carcass Modifiers,
Journal of Animal Science, Volume Number 67,
pp. 2150-2154, 1989.

Michigan Live Stock Exchange, Annual Report 1989.

Michigan Pork Producers Association News, Vol. 14, No. 6,
July 1989.

Mighell, Ronald and Lawrence Jones, Vertical Coordination in
Agriculture, U.S.D.A., Economic Research Service, Farm
Economics Division, Agricultural Economics Report No.
19, February 1963.

Miller, Marlys, "What's Ahead for the Next Decade?",
pp. 38-39, March 1991.

Moore, Hugh L., Manager, Food and Farm Supplies Division,
Indiana Farm Bureau Cooperative Association, "Swine
Industry Changes: The Cooperatives Role", unpublished
paper presented to the NCR-140 Conference, April 1989.

Myers, Robert J., et al, Estimating Sources of Fluctuations
in the Australian Wool Market: An Application of VAR
Methods, Working Papers in Agricultural Economics,
89-10, Department of Agricultural Economics, Cornell
University, November 1989.

National Cattlemen's Association, "Beef Industry
Concentration/Integration Task Force Progress Report,
Englewood, Colorado, January 1989.

Nicholson, Walter, Microeconomic Theory: Basic Principles
and Extensions, Third Edition, The Dryden Press,
Chicago, 1985.

Olson, Mancur, Logic of Collective Action: Public Goods and
the Theory of the Group, Harvard Economic Studies,
Harvard University Press, 1965.

Osbourne, L., "A Look at the Emerging Pork Industry in West
Texas", Symposium: Vertical Coordination in the Pork
Industry, Robert E. Schneidau and Lawrence A. Duewer,
editors, The Avi Publishing Company, Inc., Westport,
Connecticut, pp. 196-201, 1972.

Packers and Stockyards Administration, Packers and Stockyards' Statistical Resume: 1983, P&SA Statistical Report 85-1, Washington, D.C., August 1985.

Paris, C.W., "An Approach to Coordination", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 155-160, 1972.

Patrico, Jim, "The Conglomerization of Co-ops", Farm Journal, pp. 16-17, February 1989.

Paulson, Arnold and Michael Rahm, Development of Subsidiary Sow-Farrowing Firms in Iowa, Iowa State University Department of Economics, Special Report 83, 1978.

Payne, C. R., "Agribusiness and Vertical Coordination", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 168-178, 1972.

Pedersen, Bjarne K., "The Danish Swine Industry: Maintaining the Competitive Edge", paper presented to the Professional Swine Producers' Symposium, Lansing, Michigan, February 1, 1990.

Peterson, Dennis, Swine Business Operations Manager, Land O' Lakes/Cenex, Fort Dodge, Iowa, personal conversation, Summer 1989.

Pork '89, Pork '90, Pork '91, Pork '92, various issues, 1989-1992.

Porter, Michael E., Competitive Strategy: Techniques for Analyzing Industries and Competitors, The Free Press, Macmillian Publishing Co., Inc., 1980.

Pruett, D. H., "Problems in Vertical Coordination and Future Developments", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 193-195, 1972.

Purcell, Wayne D. and Teresa Altizer, editors, Proceedings: Key Issues in Livestock Pricing: A Perspective for the 1990s, Research Institute on Livestock Pricing, Virginia Tech, May 1988.

and John B. Rowsell, Eds., Symposium Proceedings: Structural Change in Meatpacking: Causes and Implications, Misc. Bulletin 1-89, Research Institute on Livestock Pricing, Virginia Tech, October 1989.

Purcell, J. C., "Pork Industry in the Southwest", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 72-81, 1972.

Purkhiser, E. Dale, "Market Statistics on Swine", Animal Science Department, Michigan State University, presented at the Professional Swine Producers Symposium, Improving Risk Management with Marketing Strategies, Lansing, Michigan, February 1989.

Rahn, Allen, Professor of Animal Science and Poultry Economist at Michigan State University, discussion in April 1990.

Reed, Tom, "What Are Your Marketing Alternatives?", presentation at the Professional Swine Producers Symposium, Improving Risk Management with Marketing Strategies, Lansing, Michigan, February 1989.

_____, General Manager, Michigan Live Stock Exchange, Lansing, Michigan, personal conversation, Summer 1989.

Rhodes, V. James, "Cooperatives and Contestable/Sustainable Markets", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

_____, "Competition Among Cooperatives", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

_____, "Large Agricultural Cooperatives: On the Road to Where?", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

_____, "Market Failure and the Role of Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

_____ and Charles L. Cramer. "Preliminary Report on the Feasibility of Group Marketing of Hogs", unpublished draft, May 11, 1988.

_____ and Donald Van Dyne, "Preliminary Report of the Missouri Pork Producers Association on Group Buying of Farm Supplies", unpublished, February 1988.

_____ et al., A 1974 Survey of Large-Scale Hog Production in the U.S., SR 165, University of Missouri-Columbia, Extension Division, August 1974.

Rhodes, V. James et al., "U.S. Contract Production of Hogs", University of Missouri Agricultural Economics Report No: 1990-1, 1990.

_____, and G. A. Grimes, "The Structure of Hog Production", Confinement Magazine, September 1976.

_____, Jorge Gonzalez and Glenn Grimes, "Farm Study", Hog Farm Management, Producer's Planner, 1981.

_____, Professor of Agricultural Economics, University of Missouri-Columbia, personal conversations, July 1989 and January 1992.

Rich, Doug, "Keeping an Eye on Quality", The High Plains Journal, Eastern Kansas and Missouri Issue, page 1, May 6, 1991.

Rogers, Richard T., "Participation by 100 Large Agricultural Marketing Cooperatives in Food and Tobacco Manufacturing", Department of Agricultural and Resource Economics, University of Massachusetts-Amherst, paper presented to NCR-140 Spring Meeting, St. Paul, Minnesota, April 13, 1989.

Rothenberger, W. R., "Vertical Coordination - A Producer's Viewpoint", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 151-154, 1972.

Roy, E. P., "Lessons from Poultry Coordination Experiences", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 220-231, 1972.

Royer, Jeffery S., "Strategies for Capitalizing Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

Rust, Robert and Vaughn Speer, "Future Direction of Pork Supply and Demand", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 22-28, December 1988.

Sarhan, M. E. and E. L. Kunda, Livestock Auction Markets in Illinois, Cooperative Extension Service, Department of Agricultural Economics, University of Illinois, Urbana-Champaign, Illinois, AE 4538, September, 1982.

Scherer, F. M., Industrial Market Structure and Economic Performance, Second Edition, Houghton-Mifflin Company, Boston, Massachusetts, 1980.

S

S

S

2

Schmelzer, J.R., The Commercial Food Service Sector: Trends in Growth and Market Structure, North Central Project 117, Working Paper 56, 1981.

Schmid, A. Allan, Property, Power and Public Choice: An Inquiry into Law and Economics, Praeger Publishers, 1987.

Schneidau, R.E. and L.A. Duewer, "An Introduction to Vertical Coordination", Symposium: Vertical Coordination in the Pork Industry, Robert E. Schneidau and Lawrence A. Duewer, editors, The Avi Publishing Company, Inc., Westport, Connecticut, pp. 1-3, 1972.

Schneider, Vernon E. et al., Corporation Involvement in Agricultural Cooperatives, Departmental Technical Report, Texas Agricultural Experiment Station, Texas A & M, College Station, Texas, December 1978.

Schomisch, Thomas P., "The Challenge of Maintaining Producer Control", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

Schrader, Lee F. et al., The Egg Subsector of U.S. Agriculture: A Review of Organization and Performance, North Central Regional Research Publication #258, N.C. Project 117 Monograph 6, Studies of the Organization and Control of the U.S. Food System, Published by Purdue University, June 1978.

Schroeder, Ted C., "Economies of Scale and Scope for Agricultural Supply and Marketing Cooperatives", Review of Agricultural Economics, Volume Fourteen, Number One, January 1992.

_____, "Pork Carcass Merit Pricing System", unpublished paper, Department of Agricultural Economics, Kansas State University, prepared for Excel Corporation, October 9, 1991.

_____, personal conversation, January 1992.

_____ et al., Analysis of Feeder Pig Auction Price Differentials, Staff Paper No. 89-4, Department of Agricultural Economics, Kansas State University, January 1989.

Schwab, Gerald D., Business Analysis Summary for Swine Farms, 1985 Telefarm Data, Agricultural Economics Report Number 485, Department of Agricultural Economics, Michigan State University, 1985.

Schwab, Jerry, "Farmland Foods' Change to a Market-Driven Organization", American Cooperation 1988, American Institute of Cooperation, 1988.

Sexton, Richard J. and Terri A. Sexton, "Cooperatives as Entrants", Rand Journal of Economics, Vol. 18, No. 4, pp. 581-595, Winter 1987.

Shaffer, James D., A Market Alternative to Farm Price Support Programs: Full Participation Markets in Contracts for Future Delivery, National Center for Food and Agricultural Policy, Discussion Paper Series No. FAP89-02, Resources for the Future, Washington, D.C., May 1989.

, "Thinking About Farmers' Cooperatives, Contracts and Economic Coordination", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987.

and John M. Staatz, "Potential Coordinating Functions of Farmer Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

Shagam, Shayle and Linda Bailey, "World Meat Consumption and Trade Patterns", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

Short, Sara D., "U.S. Dairy Markets Since 1970", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

Simon, Herbert A., "Rationality in Psychology and Economics", Journal of Business, Volume 59, Number 4, 1986.

Skadberg, J. Marvin, Delivering on a Hog Futures Contract, Producer Marketing Management, Fact Sheet #7, NCR Extension Publication No. 217, March 1986.

Skadberg, J. Marvin, et al., Choosing a Slaughter Hog Market, Fact Sheet #19.48.01, Michigan State University, Cooperative Extension Service, Extension Bulletin E-1089, July 1979.

Smith, Frank J., Some Regional Cooperative Dilemmas, Department of Agricultural and Applied Economics, University of Minnesota, Institute of Agriculture, Forestry and Home Economics, St. Paul, Minnesota, Staff Paper P87-2, January 1987.

Speer, Vaughn and Gene Futrell, "Factors Affecting Demand for Pork and Pork Products", The Iowa Pork Industry: Competitive Situation and Prospects, Iowa State University, pp. 1-10, December 1988.

Staatz, John M., "Farmers' Incentives to Take Collective Action via Cooperatives: A Transaction Cost Approach", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987a.

_____, "A Game-Theoretic Analysis of Decisionmaking in Farmer Cooperatives", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987b.

_____, "The New Agricultural Economics: Applications of Transaction Cost/Institutional Analysis to Agricultural Economics", Seminar presented to the Scientific Society for Finnish Agriculture and Faculty of Agriculture and Forestry, University of Helsinki, April 14, 1988.

_____, "Recent Developments in the Theory of Agricultural Cooperation", Journal of Agricultural Cooperation, 1987c.

_____, "The Structural Characteristics of Farmer Cooperatives and Their Behavioral Consequences", Cooperative Theory: New Approaches, U.S.D.A., Agricultural Cooperative Service Research Report Number 18, June 1987d.

_____, "A Theoretical Perspective on the Behavior of Farmers' Cooperatives", unpublished Ph.D. dissertation, Michigan State University, 1984.

Stahl, Jill, "Which Packer Pays More For Your Hogs?", pp. 21-28, Pork '91, October, 1991.

Stevens, Betty, "Beef Industry Shrink Viewed", The National Provisioner, pp. 14-15, July 15, 1989.

Stillman, Richard, "The 1988 Drought and the Livestock Sector", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

Strasman, James, General Manager, Interstate Livestock Producers Association, Peoria, Illinois, personal conversation, September 1989.

Sullivan, James D. et al., A Systems Analysis of the Hog-Pork Subsector, U.S.D.A., Economic Research Service, Technical Bulletin No. 1535, February 1976.

Sweeney, Donna, Organizational Dynamics: An Analysis of the Michigan Agricultural Cooperative Marketing Association, Master's Thesis published by Cooperative Extension Service (Marketing), Michigan State University, 1971.

Talpaz, Hovav, "Simulation, Decomposition and Control of a Multi-Frequency Dynamic System: The United States Hog Production Cycle", PhD Dissertation, Michigan State University, 1973.

Thulin, Andrew J., "Issues and Technologies for Swine Production in the 1990s", Department of Animal Science, Michigan State University, AS-SW-8901, 1990.

_____, Professor of Animal Science, Michigan State University, discussion on February 14, 1991.

Torgerson, Randall E., "Horizontal vs. Vertical Structure for Market Influence", American Cooperation 1988, American Institute of Cooperation, 1988.

_____, "Strategies for Cooperative System Design: The Case for Coordination Among Cooperatives", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

_____ and Gene Ingalsbe, "The Future of Farmer Cooperatives", The Farm and Food System in Transition, Emerging Policy Issues, Cooperative Extension Service, Michigan State University, 1984.

Trostle, Ronald G., "Food Aid Needs During the 1990s", Today's Livestock Sector, National Food Review, USDA, Economic Research Service, Volume 12, Issue 1, January-March, 1989.

U.S.D.A., "Investigating Food Safety", National Food Review, Economic Research Service, Volume 12, Issue 3, July-September 1989.

U.S.D.A., Poultry and Egg Cooperatives, Agricultural Cooperative Service, Farmer Cooperatives in the United States, Cooperative Information Report 1, Section 17, September 1984.

Van Arsdall, Roy N., Structural Characteristics of the U.S. Hog Production Industry, USDA, Economics, Statistics and Cooperatives Service, Agricultural Economic Report No. 415, December 1978.

Van Arsdall, Roy N. and Kenneth E. Nelson, Economies of Size in Hog Production, USDA, Economic Research Service, Technical Bulletin Number 1712, December 1985.

_____ and Kenneth E. Nelson, U.S. Hog Industry, USDA, Economic Research Service, Agricultural Economics Report Number 511, June 1984.

Van Dyne, Donald L. and V. James Rhodes, Changes in Financial Performance, Missouri Local Farm Supply Cooperatives 1983-1985, Department of Agricultural Economics, University of Missouri-Columbia, SR 352, January 1987.

Vitaliano, Peter, "Potential Benefits and Costs to Agricultural Cooperatives from Assuring Access to Input and Product Markets", Farmer Cooperatives for the Future, A Workshop, November 4-6, 1985, St. Louis, Missouri, sponsored by ACS, USDA.

Voltz, Richard, Director of Marketing, Equity Cooperative Livestock Sales Association, Baraboo, Wisconsin, personal conversation, September 1989.

Ward, Clement E., "Assessing Structural Changes in the U.S. Meatpacking Industry", Consulting Report for American Meat Institute, January 1988a.

_____, Contract Integrated, Cooperative Cattle Marketing System, U.S.D.A., Farmer Cooperative Service, Marketing Research Report No. 1078, July 1977.

_____, Cooperative Meat Packing: Lessons Learned from Sterling Colorado Beef Company, U.S.D.A., Agricultural Cooperative Service Research Report Number 6, April 1981.

_____, Meatpacking Competition and Pricing, Research Institute on Livestock Pricing, Blacksburg, Virginia, July 1988b.

_____, Meatpacking Industry Changes: Causes and Consequences, paper presented at Kansas State University seminar series, Oklahoma State University, November 1991.

Ward, Clement E., "Packer Concentration is Likely to Increase", Pork '89, November 1989.

_____, "Structural Change: Implications for Competition and Pricing in the Feeder-Packer Subsector", Structural Change in Livestock: Causes, Implications, Alternatives, Research Institute on Livestock Pricing, Blacksburg, Virginia, pp. 59-103, February 1990.

Warwick, Everett J., Breeding and Improvement of Farm Animals, McGraw-Hill, New York, 1979.

Watson, Dave, Swine Production Manager, Farmland Foods, Kansas City, Missouri, personal conversation, April 1989.

Weinstock, David, "For All Your Livestock Needs", Michigan Farmer, pp. 20-21, July 1988.

Williams, Bernard, "Formal Structures and Social Reality", Trust: Making and Breaking Cooperative Relations, Edited by Diego Gambetta, Basil Blackwell Inc., New York, New York, 1988.

Williams, Willard F. and James A. Clower, How and Where is Price Established?, Pork Industry Handbook, Marketing, Fact Sheet 19.48.05, Extension Bulletin E-1255, Cooperative Extension Service, Michigan State University, April 1981.

Williamson, Oliver E., The Economic Institutions of Capitalism, The Free Press, A Division of MacMillan, Inc., New York, New York, 1985.

_____, The Economics of Organization: The Transaction Cost Approach, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper No. 82, August 1980a.

_____, Contract Analysis: The Transaction Cost Approach, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper No. 67, March 1980b.

_____, Cost Escalation and Contracting, Center for the Study of Organizational Innovation, University of Pennsylvania, Discussion Paper No. 95, January 1981.

_____, "Transaction Cost Economics: Governance of Contractual Relations", Journal of Law and Economics, 1979.

Yeboah, Anthony and Earl O. Heady, Changes in Structural Characteristics and Estimates of Supply Response Elasticities in U.S. Hog Production, CARD Report 128, Center for Agricultural and Rural Development, Iowa State University, April 1984.

Zering, Kelly and Allen Beals, "Financial Characteristics of Swine Production Contracts", Selected Paper presented at the American Agricultural Economics Association annual meeting, August 1989.