

CHAPTER 2

Beef Industry Price Discovery: A Look Ahead

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Introduction

Price discovery is the process of buyers and sellers arriving at a transaction price for a given quality and quantity of a product at a given time and place. Price discovery involves several interrelated concepts, among them:

- Market structure (number, size, location, and competitiveness of buyers and sellers);
- Market behavior (buyer procurement and pricing methods);
- Market information and price reporting (amount, timeliness, and reliability of information); and
- Futures markets and risk management alternatives.

Price discovery is frequently confused with price determination. These are two *related but different* concepts which need to be understood when discussing prices and pricing issues.

Price determination is the interaction of the broad forces of supply and demand which determine the market price *level*. For fed cattle, supply determinants or factors affecting the quantity of beef produced include:

- Input prices (feeder cattle and grain);
- Technology (growth promotants, etc.); and
- Price of outputs produced from those inputs (fed cattle).

Demand determinants or the broad demand factors affecting the amount of beef consumed include:

- Price of products produced from fed cattle (beef);
- Prices of competing products (pork and poultry);
- Consumer income; and
- Consumer tastes and preferences.

Price determination and price discovery are interrelated. Price determination finds the market price level. That general level of prices may be high or low. However, when market prices are low or are falling, questions and concerns about price discovery increase.

Price discovery begins with the market price level. Because buyers and sellers discover prices on the basis of uncertain expectations, transaction prices fluctuate around that market price level. This fluctuation is attributable to the quantity and quality of the commodity brought to market, the time and place of the transaction, and the number of potential buyers and sellers present. Other factors are the amount and type of public market information available, captive supplies, and packer concentration in the case of fed cattle prices.

One type of price discovery research attempts to determine factors that explain variation in transaction prices. In the 1970s, most fed cattle were priced on a live weight, cash market basis. Factors affecting fed cattle prices included (Ward 1981):

- (1) carcass beef prices;
- (2) live cattle futures market prices;
- (3) cattle quality (including sex, weight, quality grade, and yield grade);
- (4) sale lot size;
- (5) number of days between purchase and delivery of cattle;
- (6) number of packers bidding on cattle;
- (7) individual packing plants or firms;
- (8) time of year; and
- (9) region of the country.

Many things have changed since the 1970s. Transaction prices for the same kind of price discovery research today would include more dressed beef (in the beef) prices and dressed weight and grade prices (formula prices) and more forward contract prices. Pricing models would include the following variables (Jones *et al.* 1992; Ward 1992; Schroeder *et al.* 1993; Ward, Koontz, and Schroeder 1996):

- (1) boxed beef cutout values (instead of carcass beef prices);
- (2) live cattle futures market prices;
- (3) cattle quality (including sex, weight, quality grade, and yield grade);
- (4) sale lot size;
- (5) number of days between purchase and delivery of cattle;
- (6) number of packers bidding on cattle;
- (7) individual packing plants or firms;
- (8) individual feedlots;
- (9) day of the week;
- (10) time of year;
- (11) region of the country; and
- (12) extent and type of captive supplies.

A multitude of factors has caused price discovery to become a major concern to cattle producers and others in the past few years. Cattle feeders tend to market and packers tend to purchase whole showlists of fed cattle at a single price. Thus, better and poorer cattle are priced the same, despite significant differences in quality. Cattle feeders and packers pit their supply and demand conditions and expectations on each other until someone makes a move. When a cattle feeders accepts a bid, there is a rush of transactions, everyone attempting to trade cattle at the same price. This results in what has

been termed the “45-minute market” for fed cattle. Essentially, large numbers of fed cattle are traded in a short time period each week, though not necessarily the same day each week. As packers attempt to move toward case ready and branded beef programs, more consistency is needed and there is a clearer reason to pay different prices for different quality cattle. However, this need may be offset by the sheer volume needs by packers in order to keep plant operating costs low and as competitive as possible. Volume needs have led to increased use of captive supply procurement methods (Barkley and Schroeder 1996). A final factor is the absolute amount of fed cattle handled by just three large packers and the question of packer concentration and market power in fed cattle procurement.

As a result of the above, this research was initiated to examine vertical coordination and price discovery issues in the beef industry. The overall objective was to determine how vertical coordination and price discovery in the beef industry will change over the next 10 years. Specific objectives were:

- (1) Determine the relative importance of factors influencing vertical coordination and price discovery at various levels in the beef industry;
- (2) Project probable changes in vertical coordination and price discovery by the year 2005; and
- (3) Assess the role of market information, technology, risk management tools, and market structure on vertical coordination and price discovery in the next decade.

Most information for this study came from two sources. First was a series of personal and telephone interviews with persons associated with selected cattle feeding, beef packing, and related industry firms and organizations. Second, the economics research literature was used to complement and contrast information obtained in personal interviews. Several topics were discussed in each interview and the outline of this chapter was based on the topics and issues which we heard repeatedly in the interview process. The authors wish to caution readers that there are, predictably and unavoidably, areas of overlap among sections.

Price Discovery: Industry Perspectives

Interview Design

To discern industry perspectives regarding cattle price discovery problems and future prospects, a series of in-person and telephone interviews were conducted. Individuals interviewed included upper-level management and/or principal owner-managers of selected cattle feeding firms, beef packing firms, beef product retailers, and related industry firms and organizations. Interview participants were selected based upon a desire to have representation from the major cattle feeding region, a diversity of firm sizes (but with emphasis on firms with large market shares), and representation from operations likely to be a significant force in the beef industry over the next decade. As such, the interviews do not represent a random, scientific sample. Instead, individuals interviewed are from a targeted group of specific operations located primarily in the major cattle feeding and packing regions of the central U.S.

Individuals interviewed will remain anonymous in accordance with agreements made prior to each interview. Each individual interviewed was provided the opportunity to review notes detailing the essence of the interview and make corrections, clarifications, and/or elaborations. Firms interviewed included 5 of the largest beef packers representing an approximate annual kill capacity of 25.5 million head. Packers interviewed were among the largest multi-plant firms and single-plant firms. Also

included in the interview sample were 8 of the 25 largest cattle feeding operations and a few smaller cattle feedlots representing a combined total of approximately 3.4 million head of annual fed cattle marketings. Feedlots represented were primarily located in Nebraska, Kansas, Colorado, Oklahoma, and Texas with some yards located in other surrounding states.

Several topics were covered in each interview and the specific major sections of this report highlight important issues that repeatedly surfaced in the interviews. The purpose of this section is to summarize industry sentiments about cattle price discovery issues and perspectives based on these interviews. In attempting to summarize industry perspectives it is apparent that many issues have a divergence of opinion. The divergence of opinions is associated with differences in firms' comparative advantages. Comparative advantages stem from the stage in the market system the firm primarily occupies (e.g., feeder, packer, or retailer), facility numbers and locations, firm and facility sizes, access to and ability to analyze market information, access to capital, legal structure, and management resources and philosophy. The ensuing discussion highlights opinions based on comparative advantages. However, generalizations are tenuous and should be taken as observations rather than rules because of the qualitative nature of information collected, the nonscientific sample interviewed, necessarily subjective judgements regarding perceived comparative advantages, and the multi-dimensional attributes of comparative advantages.

Fed Cattle Price Discovery: What are the Issues?

The authors found interviews with packers, feeders, and others both interesting and revealing. Individuals interviewed were candid and displayed a sincere interest in the future of the beef industry. There was considerable agreement in some areas and wide differences of opinion in other areas. As many differences were identified *among* packers and *among* feeders as there were *between* packers and feeders.

Some packers and feeders thought price discovery was not really a problem or issue. Others thought it was a major problem. To some, trading large numbers of cattle in a short time period each week, i.e. the "45-minute" trading week was not a price discovery problem. To others, it exemplified the severity of the problem.

Three issues may have received more unanimity than others related to price discovery. One was the need to better identify quality, ideally by a more objective means. Quality often, but not always, referred to tenderness and the "eating experience" of consumers. Second was the need for greater pricing accuracy, moving from average pricing to more value-based pricing. Both packers and feeders mentioned this issue frequently. Third was an issue addressed more often by feeders than packers. That was the need for more complete and better market information. Much of the information mentioned related to short-term, week-to-week market supplies and packer demand positions, especially related to captive supply purchases. The other most-mentioned type of information related to more and better reporting of prices for boxed beef. Those interviewed did not use the term asymmetry, but the discrepancy in access to information between packers and feeders is a real concern.

Considerable variation surfaced regarding price discovery solutions and other solutions to related beef industry woes in recent years. Many solutions pertained to more and better market information, more objective measures of beef quality (as defined by tenderness or eating experience), and closer ties between feeders and packers to reduce the adversarial relationship that exists currently. Variation became especially apparent when questions were raised about who should lead in making

appropriate changes. In some cases, feeders were mentioned as the obvious leaders for change. In other cases, packers were identified.

Some differences of opinion related to position in the industry (packer or feeder), some to geographic location (southern plains vs. northern plains), and some to size (smaller vs. larger firms, feeders or packers). However, nearly always, exceptions arose, thus highlighting perhaps the most notable difference among those interviewed, i.e., management and management philosophy. For example, large or small feeders might differ on the future of alliances, or large or small packers might differ on the need to privatize quality grading. How management viewed the problem influenced their potential solution and their role in reaching the solution.

One thread seemed to tie much of the discussions together. *Economics will dictate where the beef industry goes and how it gets there.* Economics will ultimately determine what beef's market share will be in 2005 and 2010. Economics will dictate how important public grades and grading will be and whether consumer brands for fresh beef become common. Economics will affect how much influence alliances will have and whether most cattle are marketed by some value-based pricing system. Economics will drive changes in market information and futures markets. Some of those interviewed explicitly mentioned the influence economics will have, others alluded to it.

Six price discovery issues which surfaced frequently are listed below. These issues are discussed in more detail in later sections.

(1) *More accurate, less subjective measurements of beef quality are needed.*

Most cattle feeders and packers alike felt that any movement to less subjective grading would be beneficial. Cattle producers located in the northern regions felt that regional biases in cattle quality grading increase the need to develop less subjective grading systems. Regional grading biases were echoed by several beef packers. Many participants generally agreed that third party quality grading was essential. However, larger packers felt that they could quickly adjust to elimination of federal quality grading. A consensus felt that mechanized, objective quality grading is preferable to current, subjective quality grading.

Several cattle feeders and packers indicated that there is a large market for lower-quality cheaper beef products and that the entire industry should not necessarily be encouraged to produce the same high-quality, high-priced products. These participants felt that having only high quality, high priced beef would price some consumers out of the market and reduce the overall demand for beef. The issue is that these lower quality beef products need to be accurately identified and targeted to the appropriate markets and lower prices paid for these animals at the time they are marketed. The problem was described as not so much one of excessively bad beef quality, but one of inaccurate and inconsistent identification and sorting of higher versus lower quality beef.

Many also voiced considerable concerns regarding predictability of red meat yields. Boxed beef yields from the same quality and yield grade of carcasses vary considerably and current technology does not accurately estimate boxed beef yields. Technological developments including video imaging and others seem to have the most promise in this regard in the near future.

(2) *Price premiums and discounts for fed cattle do not adequately reflect cattle value differences.*

Cattle feeders with small operations located in areas with access to higher quality, more uniform cattle (e.g., Nebraska) had strong sentiments regarding this issue. They felt that the way to receive prices

that reflect value was to sell cattle on a grade and yield, dressed weight basis. As a result, a large percentage of cattle in this area are sold on a dressed weight basis. However, in areas with less uniform cattle, large custom cattle feeders tend to be less concerned about their selling cattle on averages as they have significant incentives to do so. Large cattle feeding operations that feed large numbers of their own cattle varied in their opinion on this issue depending upon their management strategy. Cattle feeders striving to be low-cost cattle feeders tended to be less concerned about price differentials and more willing to sell cattle on averages than those attempting to target their cattle to specific markets.

Another way cattle feeders more closely tie cattle price to quality was through development of vertical alliances. Some cattle feeders felt that if they could develop vertical alliances with cattle of known genetic bases, they could brand market beef from these cattle to higher-value markets and secure part of the premium themselves. Longer-term alliances were viewed as a way to accomplish this. Here again, some larger feeding operations that tended to be volume-driven were less interested in developing such arrangements.

Most beef packers interviewed felt that buying cattle on averages was detrimental to the industry. All packers indicated a willingness to buy cattle based on quality. Buying cattle based on dressed weight seemed to be more prominent than grade and yield. Packers felt more cattle would move away from being bought on a live basis, i.e., on averages, over time but it would be slow to happen because of some cattle feeders' resistance to change.

(3) *Inadequate market information inhibits efficient price discovery.*

Almost every cattle feeder interviewed, many of the beef packers, and even retailers indicated needs for increased and more reliable market information. Of course, different individuals and firms stressed different needs. Cattle feeders felt more information was needed on short-run week-to-week supply and demand conditions. In particular, they wanted more information regarding formula and contract cattle being delivered to packers.

Many of the industry participants across different sectors indicated a need for better price reporting of wholesale boxed beef products. They felt current price reports were not representative of boxed trade primarily because of insufficient volume of trade sampled, especially close-trim products. Recommendations included using less than carlot prices to increase the volume of trade and increased efforts on capturing more of the total boxed beef trade in price reports.

Inadequacy of public retail price reporting received even greater concerns by those who need this information. Concerns included the need for volume-weighting retail prices to reflect actual trade rather than just published prices, and a desire that retail specials be better reflected in retail price reports.

(4) *Live cattle futures basis risk is excessive.*

Some cattle feeders felt live cattle futures basis risk has become excessive since contract specification changes were made starting with the June 1995 contract. They indicated problems with the delivery process for the live cattle contract, especially for cattle that do not meet contract specifications. Stipulated discounts for cattle not meeting specifications are not market determined which cause divergence of futures and cash prices at times. These participants advocated cash settlement of live cattle futures.

Concerns regarding live cattle futures tended to be regional. Cattle feeders in the northern states were generally less concerned than cattle feeders located in Texas and Kansas. This may be in part

because of differences in quality distributions of cattle fed in northern states relative to the south. Many cattle fed in the north may fit futures contract quality specifications more closely.

(5) *Formula pricing arrangements adversely affect cash fed cattle markets.*

Cattle feeders who do not participate in formula marketing agreements had strong sentiments against such agreements. This was true regardless of feedlot operation size. These feeders voiced considerable concerns that existence of formula pricing arrangements made it difficult for them to discern fed cattle supply and demand on a week-to-week basis. As a result, they indicated that this contributes to panic selling of fed cattle by cattle feeders who have limited access to this information. Some of these cattle feeders called for a need for weekly information on how many cattle each packing plant had secured for delivery under formula. Some cattle feeders indicated that when formula cattle deliveries were at high levels, certain packing firms did not bid for cattle in the cash market and they felt this depressed live prices.

Cattle feeders involved in formula marketing agreements generally had much different perspectives than their counterparts who did not participate in such agreements. These cattle feeders marketing via formulas indicated that formula pricing taught them more about advantages of sorting cattle, including sorting several times prior to marketing. They indicated formula prices better reflect true value and eliminate pricing on averages. They felt that pricing fed cattle on formulas helped them improve their feeder cattle purchasing strategies. Some participants in formulas voiced concerns that if only better quality cattle are sold on formula, and the formula price is based on live cattle cash market trade, then poorer quality cattle are establishing the base price for better quality cattle.

(6) *Group marketing of fed cattle may offer solutions to some price discovery problems*

Cattle feeders who had smaller operations, especially those not located in strategic locations relative to several competing packing plants, felt that group marketing efforts could help reduce some of the problems associated with fed cattle price discovery. Some perceived countervailing the power of large packers as one potential benefit of joint cattle feeder marketing. Generally, large feeding operations had less enthusiasm regarding these arrangements. Many felt that group fed cattle marketing efforts would fail because nothing would bind participants to the group and actual benefits may not be as large as some organizers perceive.

Packers tended to be less excited about group marketing efforts. Several issues they felt important to consider included the fact that group marketing would not solve the problems associated with pricing on averages for the industry as a whole. They voiced concern that cattle producers need to be cautious about getting tied into group marketing efforts that promise big returns by branding beef products and owning them all the way to retail. They felt that considerable capital, infrastructure, and marketing expertise is needed to develop and sustain this kind of effort.

Consensus Opinion

If there was a consensus opinion among those interviewed, it was that cattle prices need to be more closely tied to red meat yield and eating quality of the meat. The first step in improving these aspects of meat pricing is to find ways to more accurately predict these attributes. A number of technological developments are being explored to improve the accuracy of meat yield and quality prediction. As these are developed and become commercially feasible, it would appear that changes are imminent in cattle production management, marketing, and pricing, as well as beef processing, preparation, and merchandising.

Assessing Beef Quality

Accurate determination of slaughter cattle value is essential to coordinate the beef marketing system. Price is the single most important signal to encourage production of beef products demanded by consumers. Price incentives must be present for producers and processors to react to and target production and marketing management decisions. In order for the pricing system to provide appropriate signals to producers, accurate measurements of desired beef quality attributes are necessary. Inadequate measures of beef quality and lack of pricing cattle according to their wholesale values have caused considerable consternation in the beef industry for a long time.

The top five ranked quality concerns regarding beef identified from surveys of beef purveyors, packers, restaurateurs, and retailers in the 1995 National Beef Quality Audit (Smith *et al.* 1995, p. 3), were:

- (1) low overall uniformity and consistency;
- (2) inadequate tenderness;
- (3) low overall palatability;
- (4) excessive external fat; and
- (5) beef's price is too high for the value received.

These are not new problems to the beef industry. In fact, most of these same problems were among the top 10 concerns determined from surveys conducted during the 1991 National Beef Quality Audit (Smith *et al.* 1992). These problems are all related to determining and paying for the value of fed cattle. This section examines problems regarding how value of fed cattle has been determined and explores probable changes in the future.

Solving problems related to beef quality and consistency first requires the ability to measure the magnitude of the particular problems and then distinguish among cattle possessing different levels of the desired traits. Second, different prices reflecting value differences need to be paid for beef possessing varying levels of these traits.

This and the next sections address:

- (1) accurately measuring or determining beef quality, and
- (2) paying prices for fed cattle consistent with measured quality differences.

These are two of the most important issues facing the beef industry over the next decade. Progress in these areas is imperative for the beef industry to be competitive in the meat sector in the future.

Brief History of Grades

Traditionally, federal quality grades have been used to categorize beef quality. Measuring fed cattle quality has been an important and often emotion-laden issue in the U.S. beef industry for more than a century. In 1878 the Illinois State Board of Agriculture instituted the first Fat Stock Show in which cattle were judged for their merit. The best steer was "...a grade Shorthorn, three years and seven months

old, that weighed 2,185 pounds. The steer was nearly the model of perfection for a choice butcher's bullock, that of an oblong square" (Whitaker 1975, p. 103). At that time, official quality standards had not been developed and controversy surrounded these shows as owners and promoters of different cattle breeds jostled for the limelight. In 1918, although no official federal grades were published, the USDA adopted beef quality grades for market price reporting purposes (McCoy 1979).

Considerable concern was present during the 1920s that some retailers were deceptively misrepresenting beef quality to consumers and this was considered harmful to the industry. This and other concerns with regards to meat quality led to development of official voluntary federal quality grades in 1927, despite beef packer resistance to federal grades (Rhodes 1960). The use of grading started slowly and only the top two grades, Prime and Choice, were used much. Interestingly, government grading enticed Swift, the largest beef packer, to initiate private branding and within a year the four largest packers were private branding beef whereas smaller packers preferred USDA grades (Rhodes 1960).

The first published federal slaughter cattle grades in 1927 established quality grade nomenclature similar to that used today. The original federal quality grade standards were (highest to lowest quality): Prime, Choice, Good, Medium, Common, Cutter, and Low Cutter (McCoy 1979). This compares with today's beef carcass grades: Prime, Choice, Select, Standard, Commercial, Utility, and Cutter. Over the years, 14 official modifications have been made to the federal slaughter cattle quality grades (Smith, G.C. 1997). Sometimes, relatively small changes have had significant impacts. An example is the 1987 change in name of the Good quality grade category to Select. Following the name change, the percentage of beef graded Select increased from 9% in 1990 to approximately 25% in 1995. The most recent change in federal beef quality grades is the removal of B-maturity cattle having small or slight marbling from consideration in the Choice and Select quality grades beginning January 1997.

Some lessons can be learned from beef grading history. First, controversy has and likely will always surround subjectively determined quality grading. Generally, changes made to grading standards have non-neutral impacts on market participants. Those negatively impacted by a grade change often drag their feet or launch strong lobbying efforts against proposed changes. This was apparent in the recent changes regarding B-maturity cattle. What could be considered a relatively minor change for the market as a whole generated considerable controversy among several factions of the beef industry. Second, changes in the grading system should not be taken lightly. Changes in grades may impact the market system in a number of ways. Such was the case with the introduction of grades in the 1920s where packers quickly developed their own brand grades following the introduction of federal grading standards. Likewise, simple name changes made in 1987 appear to have had significant impacts on quality grade usage, although other factors likely contributed to this surge in quality grading. Because different factions are affected differently, making changes to federal beef grades will continue to be a painstaking, expensive, and slow process.

Lingering Problems

Since their inception, concern has existed about whether federal beef quality grades accurately measure quality and therefore, value. Beef quality grades are correlated with consumer meat palatability ratings. Smith *et al.* (1987) studied palatability of 1,005 loin steaks with several different quality grades and concluded that Prime, Choice, Select, and Standard steaks had 5.6%, 10.8%, 26.4%, and 59.1% respectively, undesirable overall palatability ratings. However, Wheeler *et al.* (1994, p. 3150) concluded that beef "... marbling explained at most 5% of the variation in palatability traits." They further

suggested that “USDA quality grade does not sufficiently segregate carcasses for palatability differences, and thus a direct measure of meat tenderness is needed to supplement USDA quality grade.” The top five concerns identified in the 1995 National Beef Quality Audit suggest the current beef grading system inadequately identifies uniformity, consistency, tenderness, and palatability.

The problem of measuring beef tenderness and palatability is an on-going struggle. Aging of beef has long been recognized as one way to increase tenderness. However, this does not necessarily solve the tenderness problem because it only improves tenderness (a tough steak will still be tough after aging, just less tough than before) and does not separate steaks according to tenderness levels. In addition, aging may not be feasible for many reasons including requiring vacuum packing or other means to ensure freshness during the 14-day aging period as well as costs associated with storage.

In surveys of industry participants, the large majority of individuals or firms surveyed indicated that the current federal beef quality grading system is too subjective. Some packing firms indicated that they had split loads and sent them to different plants and observed significant differences (as much as 25%) in quality grades at two or more different plants. Several industry participants felt that USDA beef quality graders located at packing plants in the south had upward biased grades because of generally lower average quality cattle in the region. Others felt the problems of grading inaccuracy were more random in nature, but were subject to human judgement error. There was general agreement that the current system’s subjectivity was a problem that needs to be addressed.

The evidence suggests that the USDA quality grade is not adequately performing its desired role. That is, although the grade is related to overall palatability, variance among eating experiences is great enough within and across each quality grade to have significant probabilities of undesirable eating experiences. In addition, marbling has not been a good predictor of beef tenderness or palatability. Finally, the subjectiveness of the current beef quality grading system has raised serious concerns about its ability to accurately discern quality. Thus, it is time to examine what can be or even should be done to remedy this problem.

Possible Solutions

Many cattle feeders indicated that they felt that their role in influencing beef quality was limited to sorting for weight and perhaps color or breed, finishing for projected Choice quality grade, and managing cattle so as not to induce dark cutters. Koohmaraie *et al.* (1996) agreed and indicated that to increase the probability of tenderness, the producer should obtain the best genetics and follow sound management during growth, slaughter, and processing of carcasses. However, Koohmaraie *et al.* cautioned that although breed is related to tenderness, breed alone does not ensure tenderness. In fact, variation of tenderness and palatability *within* breeds is greater than variability *across* breeds. This is important because some producer alliances with the goal of targeting beef to specific markets demanding particular quality attributes will likely find success elusive if they rely predominantly on current beef quality grades, cattle breeds, and genetics to ensure tenderness and consistency of their products. Producers may also need to employ some type of tenderness testing.

Koohmaraie *et al.* (1993 and 1996) have developed a beef processing system that could be used to ensure tenderness. Their system amounts to conducting a Warner-Bratzler shear force test on each carcass. They indicated (Koohmaraie *et al.* 1996 p. 4):

“Ideally we would like to be able to measure (predict) meat tenderness with a rapid, automated, tamper-proof, noninvasive, accurate instrument. None of ..[the current].. technologies have successfully predicted meat tenderness because these technologies are all based on indirect measurements that are not capable of sensing the subtle changes in raw meat that are responsible for variation in cooked meat tenderness.”

They further suggested that steaks found not to be tender could be chemically tenderized using Calcium-Activated Tenderization which consists of injection-marinating cuts of meat with calcium chloride. A similar process is already being used on some retail fresh pork products.

Assurance of beef tenderness would go a long way towards solving quality problems in the beef industry. Consumers have demonstrated a willingness to pay for tender steaks (Boleman *et al.* 1996). Therefore, if feasible quality identification processes can be developed, there is an opportunity to recover these costs.

In addition to problems in measuring beef quality, difficulty in predicting red meat yields from live cattle or even from carcasses presents a significant obstacle. Projecting primal weights using carcass information is essential if producers are going to be paid for value differences. If red meat yields cannot be accurately predicted on a carcass-by-carcass basis, packers face risks of primal yield variability which increases their costs and leads to lower prices for fed cattle. To solve this problem, meat yields either need to be projected from carcass traits by further development of technologies such as video imaging, or identity preserving technology needs to be developed that can effectively track primal cuts from carcasses through fabrication. Improvement in projecting meat yields from carcasses would reduce packers' yield risks thereby increasing fed cattle prices. In addition, video imaging can be used to digitize marbling which would provide information that could help reduce grading subjectivity. Video imaging technology is scheduled to be employed in some commercial beef packing plants in Canada during the spring of 1997. This will provide a test for the commercial feasibility of this technology and provide a measure of its benefits relative to costs.

Tracking primal cuts through fabrication is superior to video imaging for yield projections since yield prediction errors are eliminated and additional information important for retail yield and perhaps food safety could be retained from each carcass. However, individual meat cut tracking technology is further from being commercially feasible than technology such as video imaging.

Merchandising Meat of Varying Quality

Several packers and feedyards surveyed were leery about categorizing meat according to tenderness because they felt that no one would want to purchase steaks in the least tender categories. Obviously, consumers are not likely to be willing to pay much for steaks they know are tough. Koochmaraie *et al.* (1996) recommended using mechanical tenderization for the least tender steaks to ensure tenderness. More importantly, this suggests that processors need to better target steaks of particular quality to different markets. For example, the most tender steaks may be targeted specifically to more selective food service markets such as high-quality white tablecloth restaurants. Less tender and/or chemically-tenderized steaks may be targeted to lower-priced meat market outlets that are significant markets for lower-quality beef, such as lower-priced steakhouses.

Targeting meat products to specific consumer demands requires careful meat sorting and identification in beef packing plants. Increased costs of additional sorting would need to be offset by

higher prices for higher quality meat products. “Guaranteed tender” beef cuts would probably be more expensive than current beef cuts. More research is needed on the willingness of consumers to pay for guaranteed tender steaks. The beef industry needs to move more toward producing products specifically targeted for segments of consumers with specific demands. Without better matching of beef products to consumer demands, the industry will continue to face a weakening demand for beef.

Future of Federal Grading

In addition to discussion regarding whether current USDA quality grades adequately measure quality differences, there has also been discussion about whether to even have USDA federal beef quality grading. Cox *et al.* (1990), in a survey of 306 consumers who purchased beef, concluded that consumers were confused regarding the information provided by USDA and housebrand beef grades. Many consumers who thought they were purchasing lower-fat content beef actually purchased Choice and many who thought they bought Choice actually purchased ungraded housebrands (which were likely Select grade or lower). Thus, there is some question regarding the amount of information consumers discern from quality grades.

Some have advocated transferring government beef quality grading to the private sector. They believe the current grading system hinders development of branded beef products (Smith, R. 1996). Others contend that third-party unbiased quality beef grading is essential, citing numerous reasons in support of government grading (e.g., Ensminger 1996). In addition, the branded beef products that have been developed (e.g., Certified Angus Beef and others) use the USDA federal beef quality grade as one important part of their specifications which provides information describing the product.

Individuals visited with in our interviews were somewhat split on this issue. Many felt that despite problems with the current federal grading system, it is the best we have to monitor quality and should be maintained. They also argued that USDA quality grading is entirely voluntary and therefore could not be constraining the industry’s movement to branding products. There was widespread agreement that the primary constraint is predictable consistency of eating quality of beef products. Proponents of federal grades felt that a third independent party involved in quality grading was essential to preserve grade integrity. Most of these individuals felt that less subjectivity in grading such as mechanical grading would be better than the current methods used if accurate, reliable, and economically feasible mechanical grading systems could be developed.

A minority of those interviewed favored discontinuing federal beef quality grading. They felt that federal grading was somewhat of a hindrance to development of branded beef products. Most of the proponents of quality grades felt that discontinuing grades could be harmful to segments of the beef sector, particularly the export market.

A surprising number of individuals/firms were somewhat complacent about keeping or discontinuing federal beef quality grades. Those holding this position indicated that their business would not be adversely affected appreciably if federal quality grades were discontinued. They felt that other means of describing quality would quickly replace the USDA system.

Interestingly, a majority of the feeders, packers, and retailers we interviewed, including both opponents and proponents of the current system, felt that federal beef grades would gradually be of less and less importance to the industry in the future. They believe that the federal beef quality grades will be replaced by branded beef products targeted to specific markets over the next 5 to 10 years. This

general sense was consistent with expectations regarding increased vertical alliances over time to better control and ensure product quality and consistency. That is, alliances allow for more opportunity to control quality and therefore develop branded products which can substitute for federal quality grades. Of course, branded products generally use federal quality grades as one of their quality specification standards. Thus, federal quality grades can be complementary to the development of branded beef products, not hindrances.

A few of those interviewed felt that extensive beef product branding was far from being profitable because of difficulties associated with differentiating fresh beef products and a lack of capital necessary to establish a national brand name. They also cited a lack of networks to assist local retailers with product merchandising. In addition, some felt that if fresh beef products could be differentiated, this would have to occur through supply sourcing and alliances which could only differentiate part of the product and would have to compete in the large volume commodity trade (e.g., roasts, hamburger, etc.) with the rest of their product. The concern was whether such strategies could be accomplished at a low enough cost relative to possible premiums that may or may not exist in the retail meat trade.

Some have suggested that the beef quality grading system in Canada may provide a useful model for the U.S. Canadian beef quality grading was privatized, beginning in April 1996. The privatization involved moving administration of beef quality grades out of Agriculture Canada to a private non-profit corporation, Canadian Beef Grading Agency. This agency administers grading using the same grading standards that were used by Agriculture Canada federal graders (i.e., the changes were in administration and not in quality standards). The process used to modify grade standards remained unchanged under this new administration (which is a process including introduction of proposed changes by a consultative committee made up of a broad set of industry and consumer representatives and placing changes up for public comment--much as is done in the U.S.). As a result, beef grading in Canada relies on quality grades with subjective standards not dramatically different from those in the U.S.

The primary motivation for moving the Canadian federal grading administration to a private agency was to reduce federal government costs. The number of graders were reduced and grading accuracy improved. Strong sentiments are still present in Canada to have an independent third party administer grades. Pork grading in Canada is completely mechanized and the packing plants own the equipment that does the grading. However, an independent third party monitors the integrity of the grading equipment.

Quality Assessment Summary

Consumers have indicated a willingness to pay more for consistent high quality beef. Therefore, packers or processors that can efficiently identify beef quality more accurately than current USDA quality standards may be able to brand beef products to capture greater premiums. Federal beef quality grades still have a role in identifying particular quality attributes. However, current quality grading methods need to be reexamined as they are too subjective and they do not accurately predict consistent eating quality. As the industry moves more toward targeted beef products, with particular product specifications including trim, tenderness, etc., USDA grades may become less important than other quality attributes.

If long term agreements between retailers and/or food institutions are desired, it may be necessary to develop vertical alliances together with improved quality monitoring. This is because in

order to meet long-term demands, contractual arrangements may be necessary between various segments of the industry to better ensure the quality of product demanded.

Pricing to Value

As discussed in the previous section, considerable effort is being invested in improving our ability to identify and control beef quality. However, in conjunction with technological advancements in quality identification, fundamental changes are needed in the way fed cattle are priced. Changes are occurring and both feeders and packers interviewed expect further changes. This section discusses the nature of the problem and examines attempts by some to overcome price discovery problems by forming exclusive marketing agreements and strategic alliances and pricing fed cattle by formulas and grids.

Pricing on Averages

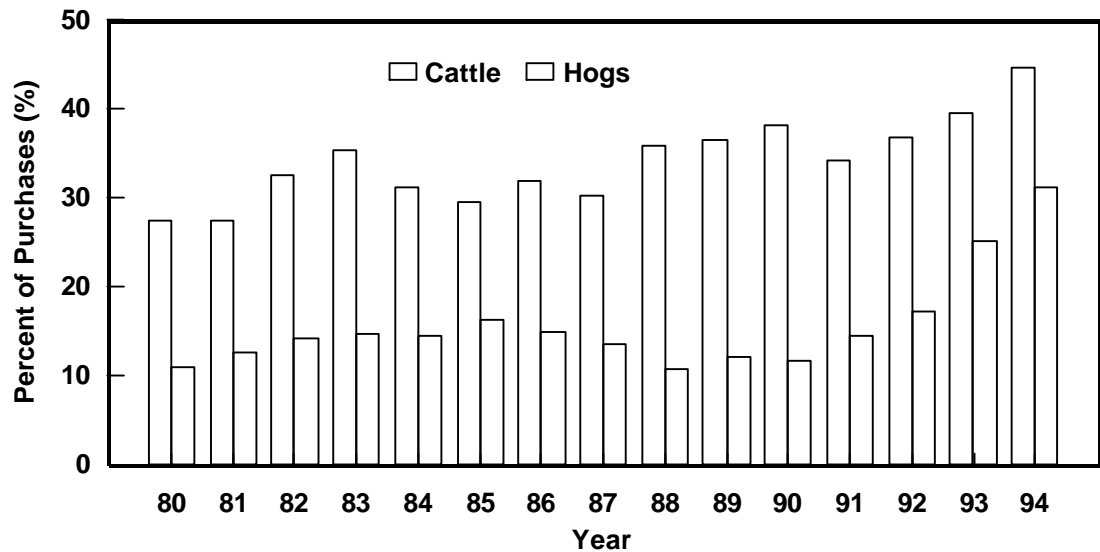
Fed cattle pricing has been based predominantly on a live weight basis, though Packers and Stockyards Administration data (GIPSA) indicate carcass weight or dressed weight pricing has trended up since 1980 (Figure 1). Recent research found the percentage of fed cattle priced on a carcass basis varies considerably among the major cattle feeding states (Figure 2), from 65.9 % in Nebraska to just 14.1 % in Texas (TAMRC 1996). Research in the 1960s clearly showed that pricing accuracy, i.e., how closely fed cattle prices reflect actual wholesale values, increases when fed cattle are priced on a carcass weight or dressed weight basis compared with live weight pricing (Stout and Thomas 1970). Research in the 1990s reached the same conclusion (Feuz, Fausti, and Wagner 1993). Pricing accuracy increases as cattle pricing moves from live weight, to dressed weight, to dressed weight and grade.

Cattle feeders have long complained that most fed cattle are bought “on the average.” This implies both an average price and an average quality. They assert that higher quality cattle are paid the same price as lower quality cattle. Research shows that not to be the case (Ward 1981; Jones *et al.* 1992; Schroeder *et al.* 1993; Ward 1992; Ward, Koontz, and Schroeder 1996). Packers pay higher prices for pens of cattle with a higher percentage of Choice or Prime quality grade and a higher percentage of yield grade 1-3 cattle. However, Jones *et al.* (1992) found that differences in live weight transaction prices paid for fed cattle in western Kansas during 1990 reflected only about 25 % of estimated wholesale value differences. While price differences exist for cattle of varying qualities, price differences do not fully represent value differences at the wholesale level. And typically, price differences can only be detected by extensive statistical analyses. Therefore, price signals are not being sent clearly from packers to feeders. Most packers and feeders we interviewed agreed that buying cattle on averages is bad for the industry and that it does not send needed price signals to producers.

Price discovery needs include pricing fed cattle to more closely reflect wholesale value. Value based marketing and value based pricing are concepts meant to link price and value more directly. The direction needs to move from marketing a showlist at one price, to marketing each pen of cattle at a different price, to marketing each animal at a different price, i.e., a price reflecting its true value.

Value based marketing is a stated goal of the beef industry (Value Based Marketing Task Force), but achieving it is difficult. There are economic incentives in place today and have been for some time to trade cattle on averages. Many feedyards sell a large number of their own cattle with a quality distribution roughly equal to the distribution of all cattle in the region offered for sale that day. The

Figure 1. Percentage of Slaughter Cattle and Hog Purchases on a Carcass Basis, 1980-94.



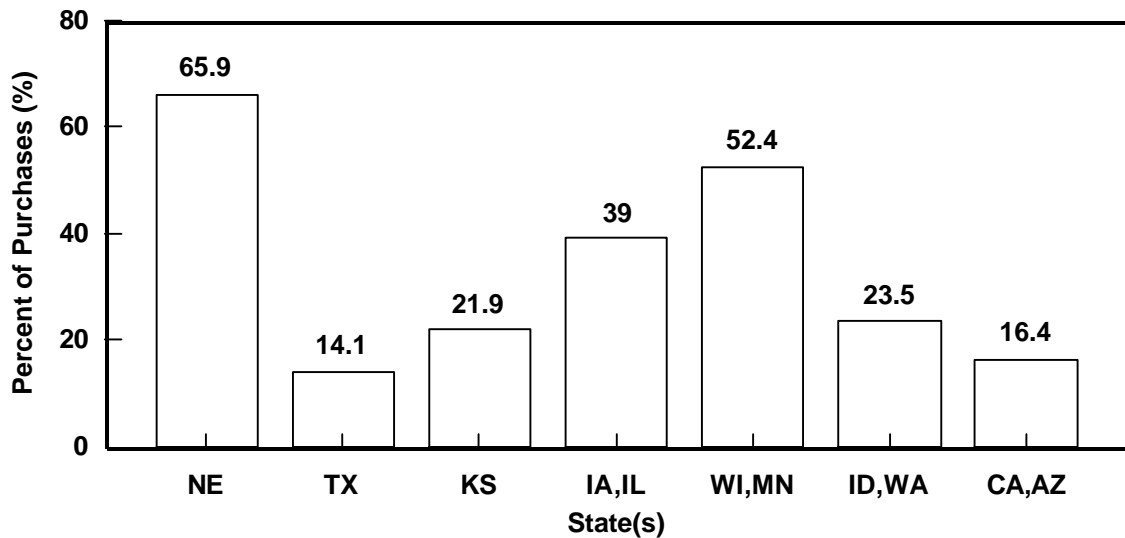
Source: GIPSA, USDA

typical packer also buys large numbers of cattle in that area that day. Both the packer and the feedlot gain by grouping cattle into one large lot and pricing them at the average price for the day. The feedlot benefits by not having to search for buyers and not having to separately determine asking prices and negotiate a price for each pen of cattle. The packer benefits by getting a large number of cattle, perhaps a significant percentage of its daily slaughter needs, from one location in a short period of time. This is a simple fact regarding transactions costs. In this situation, both the packer and the feeder benefit. In the end, the feedlot gets the same average price and the packer pays the same average price. Thus, feedlots have incentives to sell and packers have incentives to buy on averages in certain circumstances.

This argument changes if cattle in the feedlot are not all owned by the same individual. In this case, significant welfare losses occur to owners of high quality cattle who subsidize owners of poor quality cattle when both are combined in the same sale lot. But even in this case, the feedlot manager has incentives to sell a large group of cattle on the average and the packer still has the same incentive to buy them in this manner. Consider a custom feedlot manager's situation. The manager can sell cattle owned by several owners at the same price and tell each owner that their cattle received the "market price" for that day or week. Such economic incentives help explain why carcass-based cattle pricing is more popular in areas like Nebraska with smaller feedyards, often marketing their own cattle or cattle in retained ownership programs. These feeders have more control over the type of cattle they feed relative to larger custom feeding areas and larger feedlots such as in Texas and Kansas. Cattle feeders have more incentive to price cattle closer to true value when they benefit directly if their cattle are higher quality. Several feeders indicated that "northern" feeders are more willing to market on a carcass weight basis because they have better cattle, and research supports the observation that quality differs by region (TAMRC 1996).

Another incentive for pricing on averages was raised by packers. Whenever packers pay more for a pen of live cattle because some cattle are of higher quality, cattle feeders perceive the higher price as the new market price level and adjust their asking prices upwards accordingly. Thus, if packers can buy higher quality cattle without paying a higher price, they will. Current trading practices provide an incentive for feedyards and packers to trade cattle without reporting prices on the transaction. In this way the feedlot may get a premium for the whole showlist or, perhaps, just the pens of better quality cattle. The packer may be more willing to pay a premium, knowing the higher price will not be reported, thus not raising the market price for other cash market cattle.

Figure 2. Percentage of Slaughter Cattle Purchases on a Carcass Weight Basis (Excluding Formulas), by State, April 1992-April 1993.



Source: Texas Ag. Mkt. Res. Cntr., Texas A&M

For some large feedyards which own their own cattle, incentives to sell on averages may be large enough that no change is likely to occur. These feeders may be as volume driven and cost oriented as large packers. They may feed average or below-average cattle and not want to be paid according to true cattle quality. On the contrary, other large feedyards have provided the leadership to begin moving away from pricing on averages and toward value-based marketing. The distinction is not larger vs. smaller feedlots or feedlots with predominantly company-owned vs. custom fed cattle. The difference is management and management philosophy. Feeders and packers agreed; the industry needs to move toward pricing fed cattle according to value. Cattle owners with high quality cattle need to insist that they not subsidize prices for someone else's inferior cattle. Essentially, the only way to resolve this is for the cattle owner to insist that cattle are sold on a carcass basis with discounts and premiums reflecting yield and quality differentials.

Marketing Agreements and Alliances

Several efforts have been made to move toward value based marketing and pricing. Among them are exclusive marketing agreements, strategic alliances, formula pricing, and grid pricing. One of the first and largest exclusive marketing agreements was formed in the late 1980s by Cactus Feeders and IBP. While different in many details, the Cactus-IBP agreement had some general characteristics similar to a profit-sharing joint venture between IBP and a cooperative of large cattle feeders in the Pacific Northwest in the mid-1970s. Both arrangements were controversial then and remain so today.

The Cactus-IBP agreement deviated from the common practice of negotiating with packers for each pen or showlist of cattle and all sales were on a carcass merit basis. Several other similar arrangements followed over the next few years. Essentially these exclusive marketing agreements are long-term, full-supply contracts. While described here as long-term contracts, they may be ended by either party with relatively short notice. They are long-term in the sense they are on-going, revolving contracts, rather than a contract for each pen or each showlist of cattle traded each week. Cattle feeders agree to provide cattle on a regular basis to a packer with price based on some type of formula arrangement. The formulas may specify an acceptable quality range of cattle, e.g., yield, quality grade, yield grade, and carcass weight, with provisions for cattle not fitting the specification range. The agreement details which party is responsible for determining the timing of deliveries to the packing plant. Feeders indicated that they usually specify the delivery week or day which means packers schedule other deliveries around the marketing agreement cattle.

The first feeder-packer arrangements were called marketing agreements. Cattle traded in these arrangements became known as marketing agreement cattle. Sometime later the terms strategic alliances, alliances, and partnerships came into vogue and the pricing method in marketing agreements was termed formula pricing or grid pricing. Exact distinctions between the terms are unclear and several variations are found. Marketing agreements and alliances are variations of contract integration. The strategic alliance project managed by the National Cattlemen's Association in the early 1990s (National Cattlemen's Association 1993) contributed to the use of the terms strategic alliances and alliances. Benefits from early marketing agreements and alliances contributed to their growth in the 1990s.

Sartwelle (1996) quotes the definition of an alliance from Webster's dictionary, "an association to further the common interests of the members." That states succinctly the intent of *most* marketing agreements and alliances. Exceptions will be noted later. Sartwelle categorizes several alliances into four types:

- (1) Breed association-sponsored carcass alliances, such as Certified Angus Beef;
- (2) Commercial beef carcass alliances, such as Farmland Supreme Beef Alliance;
- (3) Natural/implant-free carcass alliances, such as Coleman's Natural Meats; and
- (4) Other vertically oriented cattle and beef marketing programs, such as U.S. Premium Beef.

Some types of these alliances preceded the exclusive marketing agreements and NCA-sponsored alliance project mentioned above.

Several incentives can be identified for forming or participating in exclusive marketing agreements or alliances. Nearly all relate to moving toward value based pricing, improving the price signaling function between stages in the vertical production, processing, distribution channel, overcoming problems associated with and related to pricing on averages, and reducing the adversarial relationship between feeders and packers. Nearly all, therefore, are attempts to improve one or more aspects of price discovery.

Nearly all marketing agreements and alliances involve pricing fed cattle on carcass characteristics. This is a clear attempt to better link prices and quality by rewarding better cattle and penalizing poorer cattle. Certainly this is in accordance with both older and more recent economics research (Stout and Thomas 1970; Feuz, Fausti, and Wagner 1993). Nearly all involve sharing information not typically shared in cash market transactions on a live weight basis. Packers return slaughter summaries or kill sheets to feedlots so feeders learn how their cattle performed on the rail.

Most base prices are computed on a weekly average, thus reducing the risk associated with pricing cattle on a specific day. Fed cattle prices exhibit distinct and significant within-week variability, but the high-price or low-price day of the week varies (Schroeder et al. 1993; Ward 1992; Ward, Koontz, and Schroeder 1996). Using weekly average prices removes the risk of day-to-day price fluctuations for feeders and packers. Marketing agreements and alliances eliminate the frustration expressed by feeders and packers with the "45-minute" trading week. Trades are arranged in advance of putting cattle on a showlist. Prices are discovered by formula without the time costs of negotiating fed cattle prices with packers.

Marketing agreements and alliances specify that fed cattle will be marketed to a specific packer, and possibly a specific plant. Market access is guaranteed in advance. Feeders reduce the concern expressed by some that packers will have their entire week's slaughter scheduled with captive supply cattle and will not be able to slaughter their cattle when the cattle are ready. Frequently, cattle feeders determine the day or week cattle will be delivered, giving them more control over deliveries and the terminal feeding date than in cash market trades.

Formula Pricing and Price Grids

Value-based pricing, given current technology, requires pricing fed cattle on carcass traits, not live animal characteristics. Value-based pricing requires fed cattle to be priced on a carcass merit basis. Resistance to pricing on a carcass merit basis is not new. Meyer and Lang (1981) found that limited use of carcass-based marketing was due to cattle feeders' rather than packers' decisions. While several reasons were stated for nonuse of carcass merit pricing, many are judged to be symptoms rather than causes. Most resistance stems from a distrust of packers by cattle feeders. There have been concerns

expressed that packers will mix cattle and pay feeders for someone else's lower quality cattle. Some are concerned that packers will not accurately measure carcass weights, and that USDA graders will not accurately determine quality and yield grades. These issues need to be resolved. Several persons interviewed said the adversarial attitude between cattle feeders and packers may be one of the biggest hindrances to progress faced by the beef industry. Meyer and Lang (1981) indicated one answer was education. Education certainly would help. Other alternatives are possible and are likely needed. Cattle feeder organizations could hire someone to be in the plants to check on packers, assuming cattlemen would rather hire someone than trust USDA regulatory agencies to do the same sort of checking.

Problems are also viewed as opportunities by creative, innovative businessmen and leaders. Thus, on the reverse side of the adversarial issue, there are opportunities for progress by feedlots and packers who choose to work together. In our interviews, cattle feeders and packers who developed mutual trust were working toward problem solutions and more toward value-based pricing than others who seemed disgruntled with each other and were pessimistic about the overall prospects for the beef industry. More progressive, and perhaps more successful feeders, saw packers as their customers, not competitors.

Most marketing agreements and alliances involve formula pricing and since most price cattle on a carcass weight basis, most are variations of a grid pricing system. Formulas need not be grid based, though grid pricing is usually a formula in the sense that the final price is only discovered after animals have been slaughtered. The pricing formula in most marketing agreements and alliances consists of a base price with specified premiums and discounts for carcasses above and below the base or standard quality specifications.

Packers comment that they have been buying cattle with grids for 20 years or more. In a sense they have, but in other ways they have not. Purchase orders have been given from the corporate or head buyer to field buyers on a carcass weight basis for years (Ward 1979). Buyers were told how much to discount various cattle with estimated carcass characteristics, i.e., Select (formerly Good), yield grade 4-5, and heavy carcasses. In that sense, packers have had a grid system for decades. But there are distinct differences today. The so-called grids of 20 years ago were internal to the packer and used internally to arrive at live weight bid prices. The grids contained discounts for poorer quality carcass attributes, but few premiums for desirable characteristics. Today, grids are more balanced in that they contain premiums for desirable carcass traits and discounts for undesirable traits. However, some feeders still feel the discounts are excessive and the premiums minimal. Grids are also more public today. More grids have a carcass weight base price and more involve assigning premiums and discounts to individual carcasses rather than estimates of carcass characteristics when the cattle are still alive.

Several base prices were mentioned in our interviews. One was the average price of cattle purchased by the plant where the marketing agreement cattle were scheduled to be slaughtered. The average cost of cattle purchased might be for the week prior to or the week of slaughter. Other base prices were specific market reports, e.g., highest reported price for a specific geographic market for the week prior to or week of slaughter. One base price was tied to a reported price for the live cattle futures market price. In some cases the base price was a negotiated price. Some base prices were stated on a carcass weight basis. Others were on a live weight basis, but based on actual yields of the cattle slaughtered. Many feeders expressed a preference for live weight quotes, based on their familiarity with live weight prices. However, more progressive cattle feeders recognized the need to think of prices on a carcass weight basis and move away from considering live weight prices. Some feeders expressed the need to tie the base price to boxed beef prices, especially if a means could be identified to accurately

measure red meat yield for each primal cut. Alternatively, current technology would allow the base price to be tied to USDA's boxed beef cutout, on a daily, weekly, or moving average basis.

Premiums and discounts stated in grids or formulas varied. Some were based on plant averages. Others were negotiated. Some were simply accepted by a given packer as part of the grid based bid price. Some feeders indicated they considered the premiums and discounts estimated from software developed by Dolezal (1996) and tried to negotiate based on his estimates. Dolezal's (1996) premium and discount estimates are based on fabrication cutting tests of various quality and yield grades of close trimmed and commodity trimmed primals and subprimals. His estimates do not include significant reductions in value due to non-conforming or "misfit" cattle. Value differences based on cutting tests nearly always exceed market-derived values, but can serve as a starting point for negotiations.

Once cattle are slaughtered, there is no opportunity for price negotiation. The method of arriving at the final price has been predetermined by the agreed upon formula. As a result, some feeders feel like they give up control over selling prices if prices are not established until after cattle are slaughtered. One solution to this is better market information. The need for more and better market information is one of the key recommendations of the recent USDA (1996) Advisory Committee on Agricultural Concentration. Among the Committee's fundamental recommendations was "Achieve, as close as possible, equal market information for buyers and sellers" (p. 15). They went further to recommend that

"...contract or formula pricing premiums and discounts, based on carcass merit, should be captured and reported" (p. 19) and "the committee strongly encourages the Secretary [of Agriculture] to assist the beef industry in the development of a negotiated grid pricing structure, with the base price and spreads determined by competitive bidding between buying interests..." (p. 20).

The call for better market information regarding packer price grids has been heeded. The USDA Agricultural Marketing Service (AMS) office in Des Moines, Iowa started reporting national summaries of carcass premiums and discounts for slaughter steers and heifers on a weekly basis in October 1996. A sample of this report is provided in Table 1. The USDA price grid report should help cattle feeders compare prices offered by individual packers with market prices. In this case, cattle feeders may maintain some control over pricing by negotiating the base price with the packer as well as the possible grid premiums and discounts. The sample in Table 1 confirms what appeared evident from our interviews, that premiums and discounts varied widely.

Using grid pricing requires that cattle feeders know more about the cattle being sold. Most feeders and packers agree that feeders do not know the quality of the fed cattle they market. Related to this, all of the packers interviewed indicated a willingness to provide detailed slaughter summary or kill sheets to cattle owners regarding pens of cattle priced on a carcass basis. This is important information for cattle owners to have in order to provide them with the opportunity, over time, to target their cattle to the appropriate market or packer.

Given that several potential base prices can be identified and used and that premiums and discounts vary widely, it should be no surprise that one pen of cattle could be sold using various formulas or grids and its computed price vary greatly. Consequently, it is important that cattle feeders understand the options for choosing base prices, premiums, and discounts, and that they understand the trade-offs within the grids, especially regarding cattle quality. Feeders repeatedly told us that to use grid pricing

effectively, cattle feeders need to understand the quality of their cattle. Feeders who tried grid pricing and moved away from it found, in some cases, that their cattle quality was not as high as they thought. Poor quality cattle received below average prices. While this is the proper economic price signal, lower prices were not what those cattle feeders expected or wanted. Consequently, they returned to average pricing on a live-weight basis.

Table 1. Sample of Information Contained in the USDA-AMS Report on National Carcass Premiums and Discounts for Slaughter Steers and Heifers, for the week of November 18, 1996.

Quality	Price Range (\$/cwt)	Simple Average (\$/cwt)	Change from last week (\$/cwt)
Prime	3.00 to 10.00	5.71	0.14
Choice	0.00 to 0.00	0.00	0.00
Select	-16.00 to -21.00	-19.07	-5.33
Standard	-21.00 to -40.00	-27.21	-5.18
Certified Programs			
Avg Choice/Higher	0.00 to 3.50	1.29	0.07
Bullock/Stag	-17.00 to -63.00	-35.50	-0.83
Hardbone	-16.00 to -40.00	-27.71	-1.71
Dark Cutter	-20.00 to -63.00	-37.00	-0.83
Cutability			
Yield Grade, Fat (in.)			
1.0-2.0, <.1"	0.00 to 3.00	1.71	0.00
2.0-2.5, <.2"	0.00 to 2.00	0.89	0.00
2.5-3.0, <.4"	0.00 to 2.00	0.89	0.00
3.0-3.5, <.6"	0.00 to -1.00	-0.14	0.00
3.5-4.0, <.8"	0.00 to -1.00	-0.29	0.00
4.0-5.0, <1.2"	-10.00 to -20.00	-12.43	0.43
5.0/up, <1.2"	-15.00 to -25.00	-18.14	1.57
Weight			
400-500 lbs.	-10.00 to -30.00	-21.29	-0.71
500-550 lbs.	-10.00 to -28.00	-15.83	-0.50
550-900 lbs.	0.00 to 0.00	0.00	0.00
900-950 lbs.	0.00 to 0.00	0.00	0.00
950-1000 lbs.	-5.00 to -20.00	-13.71	0.14
Over 1000 lbs.	-10.00 to -25.00	-18.00	0.14

Source: NW LS195, USDA, AMS.

Benefits, Costs, and Expectations

Most, but not all, feeders we interviewed who had been involved in a marketing agreement or alliance and that relied on a formula or a grid said they learned a lot from the experience. All indicated grid pricing sends clearer price signals about what the marketplace prefers and does not prefer. Feeders said they quickly learned to respond to the premiums and discounts in the grid. They sought to purchase the kind of cattle that matched the grid premiums, bidding more for better quality feeder cattle and bidding less for poorer quality feeder cattle that would not meet the grid premiums. This represents a significant improvement in pricing efficiency, i.e. sending clear signals from cattle feeders to cattle producers. Feeders also commented that as more feedlots become involved in alliances and grid pricing, the premiums necessary to purchase the better quality feeder cattle increase, to the point of eroding the potential higher margins from better quality cattle. Some feeders quickly learned that sorting was necessary, both when cattle were placed on feed and again once or twice prior to marketing finished cattle. Feeders learned quickly how they needed to change their feeding regimes, especially eliminating over-finished and other “non-specification” cattle. Feeders said grid pricing helped them respond to market conditions, e.g., changing the length of time on feed in response to changes in the Choice-Select price spread. Alliances and grid pricing are not without costs. At least a couple of feeders learned their cattle did not perform well and returned to live weight pricing and pricing on averages. Prices sent the correct signal, but those feeders found it more profitable to sell their cattle on a live basis.

Cattle marketed through marketing agreements and alliances, by formulas or grids, bypass the traditional method of marketing and reporting prices. They are part of what the industry calls captive supplies. Some feeders are still concerned about potential negative effects captive supplies may have on remaining cash prices. Some feeders believe large inventories of captive supplies result in packers being less aggressive resulting in softer or downward moving prices. This issue is discussed in detail in a later section.

Some feeders are concerned that only the better quality cattle will move through marketing agreements and alliances and will be priced by carcass merit and grid methods. Then poorer quality cattle may be forming the base price for the better quality cattle. This concern relates directly to the type of base price used. It is most relevant when the base price is a cash-based price, such as a live weight reported price or plant average price. It is less of a concern if the base price is tied to an up-stream price, such as boxed beef prices. However, the concern is present at the wholesale reported price level also. Dolezal argues that over the last few years, the USDA-reported boxed beef cutout values represent predominantly commodity trim beef rather than close trim beef. Reported boxed beef cutout values also exclude prices for exported beef, much of which is higher valued products.

Nearly all packers and most feeders interviewed expect alliances and grid pricing to increase in the future. Some caveats were stated, however. Comments were made that some feeders are confusing real value with perceived value. Some feeders continue to search for the best base price, to obtain the best current return, without recognizing the need to change the quality of feeder cattle purchased and fed. Some feeders are participating in alliances to share in large packer margins which are tied to the cattle cycle. When the cattle cycle moves into a tighter supply phase and packer margins decline, there may be less interest in alliances.

Caveats about the future growth of alliances and grid pricing represented a small minority of comments. Nearly all packers and most feeders expect alliances and grid pricing to increase. Feeders are more receptive now to carcass merit pricing than ever before. Packers and feeders recognize a need

to tie cattle genetics to price and value. This need will increase further as more beef is branded and the need for consistent quality increases further. Branding is expected either through breed-based programs, expansion of packer brands, or increased use of private label retail brands. Most thought the use of alliances and grid pricing would expand to about 30 % of fed cattle slaughter. That percentage was believed by some to be the percentage of cattle that could benefit most from value based pricing. Persons interviewed remarked that the growth in alliances will level out when alliances account for about 30 % of fed cattle marketings. That represents a saturation point in the opinion of some. The message here is clear. Seventy percent of fed cattle currently will not benefit from value based pricing. The industry must find a way to identify that lower 70 % and eliminate the poorest quality from the slaughter mix. The bottom end of the quality spectrum is dragging down the upper end.

Alliances and grid pricing will increase, in the opinion of most people interviewed, because experience shows alliances and grid pricing help reduce the adversarial relationship between feeders and packers. Alliances can help the industry work together to solve common problems. Alliances help both partners understand value and changes needed to increase value to both parties. Alliances and grid pricing clarifies the signals which need to be sent from retail to packer to feeder to cow-calf producer. Some feeders want to be linked more closely with packers. This comment parallels the findings for hogs. A recent survey found that large hog producers expect closer coordination between themselves and packers in the future (Hayenga *et al.* 1996). The same view seems to prevail for fed cattle.

The authors believe, and our interviews confirm, both the need to move to value based pricing and a growth in value based pricing. The practice of buying cattle on averages does not coordinate consumer demand with cattle production and marketing. Clearer price signals improve price discovery. They signal needed changes in cattle genetics and production practices which might slow the long term erosion in beef demand. Cattle owners need to know the quality of their cattle, use sound management practices to target their cattle to desired markets, and get paid the value of those cattle when they are sold.

Many cattle feeders expect to receive bids in the form of grids, each packer having a separate grid. In fact, a packer could have multiple grids, each associated with procuring a specific type of cattle for a specific customer demand. Some feeders already receive multiple grid-based bids from packers. Some feeders compared this to hog pricing. Each packer has a different carcass merit program and a different base price. Hog finishers learn which grid fits their production best. Cattle feeders will have to evaluate each grid in relation to the quality of cattle for sale and target sales to specific grids.

With improved public information about pricing grids, cattle feeders are in a better position than ever to sell cattle on a carcass basis. Improved market information allows them to know more about market discounts and premiums so they can target their sales to the most advantageous market outlet. However, cattle feeders must realistically evaluate their cattle quality, e.g. expected yields, carcass weights, quality grades, and yield grades. The best way to learn more about these traits is to sell more cattle in this way. Consumers have indicated a willingness to pay more for consistent high quality. Therefore, packers or processors that can efficiently identify beef quality more accurately than current USDA quality standards may be able to develop branded beef products and capture brand premiums. Being able to identify and guarantee consistent high quality beef products would allow packers to better target and segment their markets. Long term agreements with retailers and food service firms or institutions may be a necessary component of vertical alliances and these agreements may need to include improved monitoring of product quality.

Role of Market Information

Availability of and access to market information has a big impact on price discovery in cattle markets. Broadly defined, market information includes all data and analysis used by market participants to make decisions. Historically, much of the information used by buyers and sellers in the cattle and beef markets has been provided by public institutions, such as the USDA and Land Grant Universities' Extension Services. However, there has been dramatic growth in the number of private firms collecting, analyzing, and disseminating information to clients. This evolution leads to questions regarding the roles of public vs. private information services in cattle markets. In addition, structural changes in the beef industry are leading to changes in both the type of information needed by market participants and the manner in which it is collected and disseminated. In particular, some market participants are becoming increasingly concerned that changes in beef industry pricing practices are leading to asymmetric availability of market information, which might contribute to price discovery problems. The remainder of this section discusses the functions of market information, concerns identified by industry participants, and changes taking place in the beef sector expected to impact information needs and availability. This section concludes with our thoughts regarding possible improvements in information gathering and reporting.

Functions of Market Information

The primary economic function of markets is to coordinate the allocation of scarce resources among production alternatives. Markets must communicate information about relative consumer desires for products back to those who control the resources to produce those products. The beef cattle market is a complex production and marketing system composed of geographically diverse primary producers (cow/calf) moving through a multilevel production/marketing system that adds productive value (growing and feeding animals) in addition to the value added by a multitude of transportation, processing and storage activities. The complexity of the system is enhanced by two factors: Neither meat nor cattle can be stored long without changing the quality characteristics of the product, and beef production is a disassembly process where a single primary input is disassembled and sold into hundreds of wholesale and retail product markets. Movement of cattle from the cow/calf pasture gate to the consumer's plate involves at least one to, more commonly, four, five or six transfers of ownership. Prices are the primary thread that link this complex industry from primary supply to primary demand. The importance of prices in linking the various segments of the industry makes market information in the beef industry very important.

Market information serves several important functions. A primary function of market information is that of facilitating price discovery. In cattle and beef markets, price is the primary coordinating mechanism and market information helps market participants develop expectations regarding current supply and demand conditions to provide them with an idea of where to begin price negotiations. Over the longer run, market information helps producers make production and marketing decisions. Market information is also employed by government agencies, private firms, and academic researchers to monitor and evaluate industry structure, conduct and performance.

The functions described above imply various users of market information have different needs with respect to quantity and quality of information. For example, in a relative sense, cow-calf operators' information needs are oriented more towards long run changes in the industry whereas cattle feeders, packers, wholesalers and retailers need information both for long- and short-run decision making.

Timeliness is a critical component of information quality, particularly for price discovery and those interested in forecasting future price changes. In contrast, market performance monitoring and evaluation functions tend to use different information and focus more on longer time dimensions. Finally, the information needs of various users depend on the market structure at a point in time and may change as industry structure evolves.

Beef Industry Pricing Issues

Pricing issues in the beef industry can be categorized into three principal areas of concern: information adequacy; asymmetric availability of information to buyers and sellers; and whether information will be collected voluntarily or on a mandatory basis. Some beef industry participants question whether currently available market information is adequate to accurately determine market values and convey consumer preferences to producers. Most cattle are still sold on a liveweight cash price basis, but an increasing percentage of fed cattle are being sold on dressed weight, grade and yield, formula price or on a price grid basis. The transition in pricing techniques suggests that both buyers' and sellers' information needs are changing, yet price reporting has been slow to change. Asymmetry of market information has long been a concern in agricultural markets. Some of the earliest justification for public price reporting was to correct a perceived imbalance between traders in centralized markets and farmers that lacked access to information (Henderson, Schrader and Rhodes 1983).

As the beef industry (packers and feeding operations) becomes more concentrated, proprietary information will become more valuable. This encourages more information asymmetry between buyers and sellers as both sides attempt to take advantage of their proprietary information. Concerns about concentration in the beef sector have been heightened as large firms have increasingly utilized non-market mechanisms, generally some form of captive supplies, to augment or replace traditional procurement and pricing methods. Declining acquisition costs and easier access to information have led some to suggest the government's role in providing information is declining (Just 1983), whereas others believe that the government's role will merely shift toward a greater emphasis on the information system rather than actually delivering the information (Bahn and Parham 1996). The unwillingness of some firms in an increasingly concentrated beef sector to voluntarily provide market data has led some participants to clamor for mandatory price reporting whereas others abhor the notion that price reporting be on anything but a voluntary basis. Thus, the governmental role in data collection and information dissemination has surfaced again.

Industry Viewpoint

Participants in our interviews were primarily concerned with two fundamental problems regarding market information in the beef sector. Changes within the industry mean participants' market information needs are changing and market information has not always kept pace. Examples cited include a need for information about carcass grid pricing and base prices used in both grid pricing schemes and various formula marketing agreements. Second, a number of cattle feeders expressed misgivings about the asymmetric availability of market information within the industry. In particular, cattle feeders were concerned that their lack of knowledge about the volume and timing of packers' captive supply make it difficult for them to assess potential packer demand in the price discovery process. Both of these problems are related to the degree of public involvement desired in providing market information to the beef and cattle markets.

Although private sector firms are providing a much greater percentage of the information desired by beef industry participants than in the past, it was clear from our surveys that most firms still rely heavily on data and information provided by public sector entities. Nearly all of the firms contacted in our surveys indicated they used both data and information published by the USDA in conjunction with private sector data and analysis. Most participants indicated they used USDA's inventory reports (e.g., *Cattle on Feed* and *Cattle* inventory reports) to judge longer term trends, although some cattle feeders expressed frustration with the revised *Cattle on Feed* report system implemented by USDA in 1996. Frustrations with the new report format included the small amount of historical data provided by USDA which, in the short run, made the reports difficult to use for forecasting and USDA's apparent difficulties in reconciling marketings estimates with steer and heifer slaughter estimates published in the monthly slaughter reports. Most of the cattle feeders interviewed indicated they also used various reports published by the USDA's Agricultural Marketing Service (AMS) such as daily live cattle and boxed beef prices, but many of them supplemented these reports with information gathered from private services such as Cattle-Fax and other consultants. Thus, our interviews substantiated growing use of private sector firms for market information, but at the same time confirmed the public sector continues to play a key role in providing the beef industry with information.

Growth in the volume of cattle sold on a dressed weight basis, grade and yield or via a price grid mean an increasing percentage of cattle producers need more detailed pricing information than in the past. Several cattle feeders indicated they use price grid information extensively when making marketing decisions. Until recently, price grid information was only available on a request basis from packers and was then sometimes circulated among a small group of cattle feeders and consultants. Price grids are now being reported on a weekly basis by the AMS. Cattle feeders that were aware of the new AMS price report generally felt it was a step in the right direction. One cattle feeder indicated that, if the industry moves toward selling a higher percentage of cattle using price grids, cattle feeders and packers will devote their energy to negotiating base prices used within the grid pricing system. This implies there will be a need for public reporting of base prices used and more information about the premiums and discounts employed in the grids.

Expectations that an increasing percentage of cattle will be marketed in ways other than live weight cash pricing led several cattle feeders, and at least one packer, to express a desire for improved reporting of boxed beef prices by AMS. The single biggest problem identified was the relatively low volume of trade upon which prices in the report are based. The low trade volume led users of the report to question whether the quoted prices accurately reflect current supply and demand conditions. One packer indicated that AMS needs to reconsider what prices it is willing to accept when obtaining price information and, in particular, should consider accepting prices from partial loads instead of requiring prices be reported only from full loads. Additionally, it was pointed out that the percentage of beef sold as close-trimmed product is approaching 50%, but AMS does not report a close-trimmed price. Finally, another cattle feeder voiced an often heard concern that both reported boxed beef cutout values and hide and offal values understate their value to packers and, in that sense, might be misleading. The growing importance of wholesale prices in establishing cattle prices means that demand for better boxed beef price information will increase over time.

The possibility of shifting from voluntary to mandatory price reporting has been discussed for some time in the beef sector. The unwillingness of some firms to regularly report wholesale prices contributes to thin boxed beef price reports. The growth of non-cash price reporting schemes and the unwillingness of some participants to reveal prices from these agreements is leading to concerns that mandatory price reporting may be required in the future to ensure that price reports are representative

and not just based on a small segment of the market. Packers participating in our surveys did not favor mandatory price reporting. Most cattle feeders were not in favor of mandatory price reporting either, but several indicated a willingness to consider mandatory reporting if, over time, it became apparent that voluntary price reports were not representative of the trade taking place.

Information asymmetry was a big concern among our survey participants, primarily on the part of cattle feeders. In particular they desired access to information regarding the movement and prices of cattle forward contracted for sale to packers and cattle marketed via the various formula pricing arrangements. Since packers know how many cattle they have obtained via forward contracts and formula price arrangements (at least for their firm) they possess better information than feeders regarding their need to purchase cattle in the cash market. One complaint voiced by some cattle feeders was, during some weeks, large volumes of cash trade occur in relatively short periods of time. Some cattle feeders indicated that the information asymmetry present in the fed cattle market was contributing to this shift in marketing behavior. They felt information asymmetry created fear among cattle feeders that they must sell cattle as soon as trading materializes or risk the possibility that packers will not need cattle for slaughter if their slaughter schedules have been filled with captive supply cattle. As a result, these cattle feeders indicated a desire to level the playing field by obtaining better information regarding packers' non-cash cattle procurement. A new weekly report first published by the AMS in the fall of 1996, *Forward Contract Slaughter Cattle Summary*, attempts to fill this gap by providing public access to regional estimates of forward contract cattle supplies by delivery month. Although the new AMS report provides information about the volume of forward contract cattle trade, little information is available regarding the volume of formula priced cattle or prices at which non-cash purchases are traded. Thus, it appears that the information asymmetry regarding both the volume and prices of captive supply cattle has not yet been eradicated.

Changes in beef industry structure are changing the quantity and, possibly, the quality of market information available to market participants. Some of the problems the industry faces today resemble those associated with thin markets. Early concerns about thin markets arose with the decentralization of markets and the decline of terminal markets as primary points of price discovery (Buccola 1985; Hayenga 1979; Tomek 1980). As price reporting practices evolved from simply observing prices revealed in centralized markets to confirmed direct trade reporting, these concerns were largely eliminated. Reduced use of cash markets and non-reportable prices associated with use of forward contracts and marketing agreements mean that a new era of thin price reporting concerns is present. Additionally, lack of standardization among various carcass weight and grade pricing grids has also contributed to price reporting problems. Nelson and Turner (1995) indicated that prices obtained from thin markets exhibit no apparent bias, but price variability may be greater than in markets with greater trade volume. This suggests long term price averages calculated from thinly reported markets may be reflective of supply and demand conditions, but individual price quotes or negotiated transaction prices may vary considerably from longer term averages which means infrequent sellers are exposed to more price risk in thin markets.

Summary

Availability of and access to market information has a big impact on price discovery in cattle markets. Historically, much of the information used by buyers and sellers in the cattle and beef markets has been provided by public institutions, such as the USDA and the Land Grant Universities' Extension Services. Although private sector firms are providing a much higher percentage of the information desired by beef industry participants than in the past, it was clear from our interviews that most firms rely heavily on data and information provided by public sector entities. However, unwillingness of some

firms to report prices and trade volume voluntarily is creating concerns among information users that market reports might not be representative of actual trade. Although our survey respondents, in general, were not ready to call for mandatory price and volume reporting on fed cattle and boxed beef trade, a number of those interviewed were willing to consider mandatory reporting in the future if it becomes apparent the market reports are not representative of actual trade.

Many of the cattle feeders interviewed for this project expressed concerns about asymmetric availability of information among cattle producers and packers. Growth of non-cash market pricing agreements has created a situation where feeders have less access to information about packer demand than in the past. The USDA, responding to concerns expressed in a report from the USDA Advisory Committee on Agricultural Concentration, has begun reporting the volume of cattle forward contracted (by month) on a weekly basis. However, little information regarding short-term variation in formula priced cattle and their prices is available. Thus, the asymmetry in information availability remains a concern of cattle producers. Cattle producers' lack of information about cattle marketed via non-cash methods makes it difficult for them to assess future supply and demand conditions and make pricing decisions. A desire to correct a perceived imbalance between traders and farmers was one of the primary justifications for involvement of the public sector in collecting and disseminating market information. It is apparent there is still a need to provide information to minimize this information imbalance.

Evolution in the way cattle and beef are marketed means that the beef industry's information needs are changing. Growth in the volume of cattle sold on a dressed weight basis, grade and yield, or via price grids means an increasing percentage of cattle producers need more detailed pricing information than in the past. Although AMS has begun to report price grids on a weekly basis, more emphasis on reporting discounts and premiums offered for various carcass characteristics is needed as a greater proportion of cattle trade is marketed based upon these characteristics. Moreover, the industry will need frequent reports of carcass weight base prices used when pricing cattle via grids or formulas to facilitate the price discovery process. Finally, several cattle feeders and one major packer indicated the USDA needs to reconsider how it collects wholesale prices to ensure that they are more representative of actual trade in the marketplace.

Live Cattle Futures Issues

Futures markets serve two primary roles. First, futures markets provide a risk transfer mechanism suitable for use by both cash market participants and speculators. Although risk can be transferred to other market participants via various types of cash market transactions, futures markets were developed because they offer several potential advantages over cash market risk transfer mechanisms. Second, futures markets are generally perceived to be an important component of price discovery, the process by which buyers and sellers arrive at specific transaction prices (Tomek and Robinson 1972). For commodities where a futures contract exists, futures trading typically interacts with cash commodity markets to play a large role in price discovery.

Futures markets offer several potential advantages over cash markets from a risk transfer and price discovery perspective. In a futures contract all of the contract terms, such as the total volume, commodity grade, maximum and minimum price changes, and potential delivery locations, are standardized. Consequently, traders focus their attention on the commodity's price since it alone can change values from one transaction to the next. This feature of futures contracts makes them attractive to both hedgers and speculators because they are interested primarily in either shedding or absorbing price risk and, hence, desire a trading vehicle where price is the focal point. The fact that price variation from one transaction to the next is not related to changes in contract terms also encourages use of futures markets as a price discovery marketplace since information about supply and demand are quickly reflected in price. Other characteristics of futures contracts that make them advantageous for both hedgers and speculators include the fact that futures markets provide a dispute settlement mechanism and the individual futures exchange serves as a guarantor of contract settlement and financial obligations associated with trading. These features of futures contracts mean traders do not have to worry about other trader's financial wherewithal and, in the event that a dispute arises, can expect it to be resolved more quickly via the exchange's dispute settlement mechanism than if the dispute had to be settled in the U.S. court system.

There are several other key points that are relevant to a discussion of live cattle futures markets. First, futures contracts are not designed to be an effective cash merchandising tool. When conducting cash transactions, cattle feeders and beef packers generally find it more economical to use cash contracts where the contract specifications can be structured to meet the individual needs of both parties rather than be constrained by the standardized terms in the futures contract (Garbade and Silber 1983). Consequently, if a futures contract results in a large number of deliveries it often is a sign that the contract is not well designed since deliveries only occur when an incentive to deliver the physical commodity exists. If deliveries are large it signifies the futures contract is not doing a good job of reflecting what is taking place in the underlying cash market.

Second, futures trading is well suited only for homogeneous commodities where one lot of the commodity is a good substitute for another lot (after price adjustments for quality differences). Development of differentiated production processes whereby various lots of cattle are no longer near perfect substitutes for one another could make the live cattle futures contract a less useful price risk transfer tool in the future.

Futures markets exist because producers and merchandisers need a market where they can selectively transfer risk from themselves to other traders. For a contract to remain successful, it must continue to provide a risk transfer mechanism that both buyers and sellers find useful. The use of a futures contract for risk management requires the futures contract price be highly correlated with the

underlying cash commodity price. Moreover, the differential between the futures contract price and the underlying cash commodity price, known as the basis, must be predictable and less variable than the cash price.

Industry Perspective on Live Cattle Futures

Live cattle futures are an often discussed feature of the cattle feeding and beef packing industries. Interviews with cattle feeders revealed a wide divergence of opinions regarding the usefulness of the current live cattle futures contract as a price discovery mechanism and as a risk transfer mechanism. In general, packers did not report any significant concerns about the current futures contract's usefulness, but some cattle feeders expressed deep seated concerns about the live cattle futures contract's viability as a price discovery and risk management tool.

Price Discovery

Nearly all cattle feeders and packers interviewed said they considered live cattle futures prices when determining what price to ask or offer for slaughter cattle. The influence of nearby live cattle futures prices on transaction prices has also been confirmed by various researchers. Results from models of individual fed cattle transaction prices confirm that nearby live cattle futures prices are an important determinant of cash fed cattle transaction prices (Jones *et al.* 1992; Schroeder *et al.* 1993; Ward 1981; Ward 1992; and Ward, Koontz, and Schroeder 1996). Aside from the live cattle futures market, most feeders indicated they also used the boxed beef market as a price indicator along with volume in both the boxed beef and fed cattle markets. Packers generally reported they used their own sales as a price indicator. The degree to which each relied on futures prices when formulating bid and offer prices varied, but nearly all interviewed reported using live cattle futures as an indicator. Research on the role of live cattle futures markets in price discovery indicates that cash market participants rely on futures prices for information. Oellermann and Farris (1985) concluded that futures market prices for live cattle were used extensively to price cash market transactions and that, in most instances, the futures market was the center of price discovery. Later work by Koontz, Garcia and Hudson (1990) concluded that direct cash markets dominate the price discovery process, but that futures play an important role, particularly when the cash markets are inactive. Comments from market participants and research results confirm that live cattle futures play an important role in the price discovery process.

Risk Management

A broad consensus did not exist regarding usefulness of live cattle futures as a risk management tool. Little concern was expressed regarding live cattle futures usefulness for hedgers by packers and some cattle feeders, especially feeders located in the Northern Plains. However, among cattle feeders that were concerned about live cattle futures viability as a hedging medium, two principal concerns were expressed. First, a small number of feeders indicated that lack of volume, and a resulting lack of liquidity in the live cattle futures contract, was a long run problem because it makes execution of large hedge orders difficult. Second, cattle feeders in the Southern Plains indicated recent changes in delivery provisions of the live cattle futures contract (effective with the June 1995 contract) had an adverse impact on their ability to predict basis because both the basis level and variability changed. As a result, several feeders indicated basis risk has become so large they believe the current contract no longer provides an effective price risk transfer mechanism.

Trading Volume

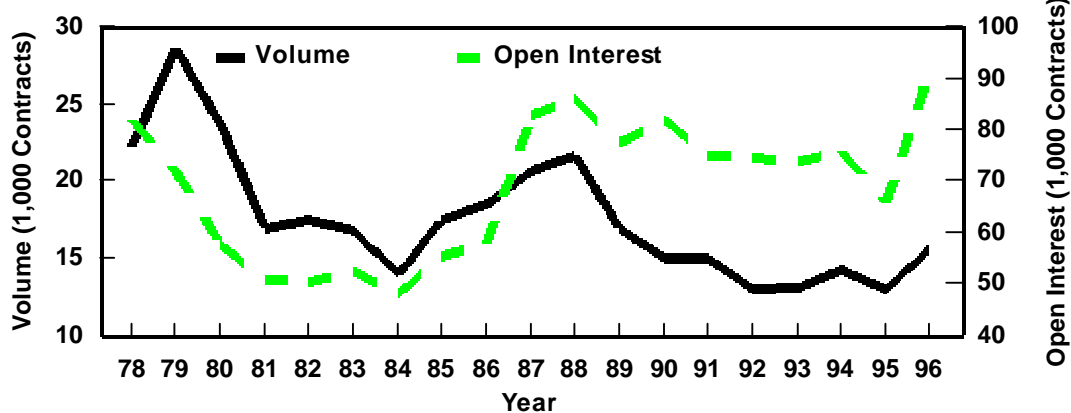
Trading volume in the live cattle futures contract has been a subject of much debate for some time. Several large cattle feeders indicated that, on occasion, they find it difficult to execute hedges because they represent a sizable portion of the open interest in live cattle futures and trading volume is inadequate to execute their hedges without causing a change in price. Trading volume data from the CME helps clarify the problem (Figure 3). Daily open interest and trading volume data from January 1, 1978 through October 1, 1996 indicate that, during this time period, annual trading volume peaked in 1979 at 7.2 million contracts, a daily average of 28.6 thousand contracts. Trading volume fell through 1985 before rising briefly in the mid-1980s. However, daily trading volume in 1995 averaged just 13 thousand contracts, less than half its 1979 peak. Open interest in live cattle futures followed a somewhat different path than average daily trading volume. Although open interest declined in the mid-1980s from its late 1970s level, it rebounded sharply by the early 1990s. Unlike trading volume, average open interest during the 1978-96 period peaked in 1996, at 91.3 thousand contracts. Although further study is needed to determine why trading volume has declined precipitously and open interest has actually increased, it suggests traders are holding positions longer than in the past. The decline in trading volume tends to validate concerns expressed by large feeders that executing trades without inducing a price change in the futures market is becoming a bigger problem. It is particularly troubling since it occurred during a time frame when the cattle feeding industry was consolidating which means that, potentially, there were more large hedgers trading live cattle futures in 1995 than in 1979.

Delivery Specifications

Beginning with the contract that expired in June 1995, two fundamental changes, and a host of smaller changes, were incorporated in the delivery provisions of the Chicago Mercantile Exchange (CME) live cattle futures contract. Par delivery in the new contract called for 55 % of the cattle in a 40,000 pound delivery unit to grade Choice and 45 % of the cattle to grade Select. Previously, par delivery in the live cattle futures contract called for all cattle in a delivery unit to grade Choice, with no more than eight head of cattle to grade Select at a discount of \$0.03 per pound. Secondly, the new contract allows the buyer to decide whether the grading will be performed on a live or a carcass basis. Prior to the June 1995 contract, all grading was conducted on live cattle at the stockyards. Finally, other provisions were added to the contract which prescribed how the actual settlement price would be adjusted if the various grading specifications were not met. For example, if the pen grades more than 55 % Choice, settlement prices for animals exceeding the 55 % level are adjusted by multiplying the result of the USDA's Choice Yield Grade 1-3 Box Beef Cutout Value minus the Select yield grade 1-3 boxed beef cutout value on the day of slaughter by 0.63. Similarly, yield grade 4 cattle in the delivery unit, beyond the one head deliverable at par, are discounted \$20 per cwt. (liveweight) or 25 % of the futures contract's settlement price, whichever is greater.

The shift in contract terms altered the relationship between buyers and sellers. Previously,

Figure 3. CME Live Cattle Futures Average Daily Volume & Open Interest, Annual, 1978-1996*



Source: CME

*1996 Data Through 10/31/96

buyers were forced to absorb the risk that not all cattle meeting the live specifications would meet the equivalent grade specification after the carcasses were graded. Under the new contract specification, sellers are exposed to the risk that the long accepting delivery will opt for carcass grading and that the cattle will not meet the contract's grade specifications, resulting in large discounts from the nominal settlement price for cattle not meeting par specifications. Delivery data provided by the CME indicates the majority of the cattle delivered since the contract specification change have been carcass graded suggesting longs prefer carcass grading over live grading. For example, delivery data from the June 1995 through October 1996 contracts indicates 74.1 % of the cattle delivered were carcass graded and, during two of the contract months, all deliveries were carcass graded.

Another problem identified by several cattle feeders was the arbitrary way in which carcass discounts were determined under the CME's delivery specifications. Specifically, feeders believed that the current system of applying predetermined discounts to cattle that do not meet the par delivery standards leads to an excessive amount of arbitrage. Currently, some longs accept delivery in the expectation cattle will be marketed to the packer slaughtering the cattle at less severe discounts than those prescribed in the CME's delivery specifications. Partly in response to these concerns, the CME is formulating a revised set of delivery specifications that rely on a market determined discount and premium grid, identified in the USDA's *National Premiums and Discounts for Steers and Heifers* report, for cattle that deviate from the par delivery specification. Although the details for this revision have not yet been finalized, this change appears to address concerns expressed about arbitrage taking place to take advantage of differences between market level prices and discounts identified in the live cattle futures contract specifications. Some concerns have been expressed, however, that the price grid reported by the USDA is only based on prices collected one day per week, that reports are only provided by one side of the market (packers), and that the grid is not generated from transactions. If this report is used in the live cattle futures settlement specifications, refinements in the USDA's data collection process should be considered.

Live Cattle Basis Predictability

A lack of trading in the live cattle futures contract by long hedgers has long been a concern. The most recent changes in the delivery specifications serve to reduce the uncertainty long hedgers have about the quality of the cattle received via the delivery mechanism and represented an attempt to encourage more long participation in the contract. Conversations with packers did not reveal a significant change in usage of the live cattle contract following the specification changes. Cattle feeders, particularly those in the Southern Plains that often have little carcass information about the cattle they feed, potentially face more basis risk than under the old contract. Not surprisingly, cattle feeders that were most concerned about the implications of the contract specification changes were primarily located in the Southern Plains, not the Northern Plains.

Whenever futures contract specifications change, there is a possibility that basis levels and patterns will change. Many of the cattle feeders interviewed indicated that the basis changed following the June 1995 live cattle contract specification change. In particular, Southern Plains cattle feeders were upset about perceived changes in both the level and variability of the live cattle basis. An examination of the daily basis in western Kansas for the June CME live cattle futures contract illustrates the nature of the complaint voiced by Southern Plains cattle feeders.

Basis levels appear to have shifted since the CME changed the specifications of the live cattle futures contract effective with the contract that expired in June 1995. Although basis during June 1995 did not differ appreciably from the average basis level observed during the previous five years, basis during 1996 was negative more often than exhibited previously. Western Kansas daily steer basis computed using the June CME live cattle closing futures price from the time the April contract expired until the June contract expired averaged \$2.15 per cwt. from 1990 through 1994. After the contract specification change in 1995, western Kansas steer basis over this same time frame averaged \$2.63 per cwt. However, in 1996, the second year of the new contract specification, basis became negative, averaging \$-0.56 per cwt. Basis at other locations and for other contract months also became negative more often following the live cattle contract change. The sharp decline in the basis level was not expected by many cattle feeders and, as a result, led to actual net sale prices for hedged cattle substantially below expected net sale prices forecast when short hedges were initiated. It's not yet clear whether the contract changes merely led to a one-time basis level shift or whether basis variability actually increased following adoption of the new delivery specifications. The shift in the basis pattern warrants further study to determine whether the contract's basis predictability has actually declined over the long run. The apparent shift in the basis pattern also points out that continually revising the live cattle futures contract specifications creates difficulties for risk managers during the transition period from one set of specifications to the next. Risk managers often find it difficult to fully assess impacts of specification changes until after the new contract has had an opportunity to trade for an extended period of time. In the interim, hedging results often suffer.

Cash Settlement

Concerns about the viability of the live cattle futures market and its usefulness as a hedging vehicle have produced calls for changing the live cattle contract yet again. Aside from the possibility of

fine tuning the delivery specifications, as discussed previously, a resurgence of interest in switching to a cash settlement from a physical delivery contract has also taken place. The principal reason futures contracts incorporate a delivery option is to force the cash price and the futures price to converge at the delivery point during the delivery period. Convergence helps ensure that futures contracts can serve as a hedging vehicle for cash market participants (Jones 1982).

Although the physical delivery option is designed to force convergence between the cash and futures prices, it doesn't always perform satisfactorily. There are two potential problems with physical delivery. First, if delivery costs are high, the futures and cash price may converge, but only within a relatively wide band. Within the band, cash and futures prices can move independently. Second, cash trading by futures market traders who plan to make or take delivery may cause the deliverable grade's cash price at the delivery point to differ from its commercial value (Garbade and Silber 1983). In both cases, the delivery option fails to force convergence between cash and futures prices and, as a result, hedgers will find the basis difficult to forecast accurately. Some users of the live cattle futures contract are convinced that both of these problems are inherent in the CME's current live cattle futures contract and, as a result, are encouraging the CME and the industry to consider cash settlement.

Table 2 outlines the key fed cattle market characteristics that make either cash settlement or physical delivery preferable. Characteristics can be sorted into two broad categories: delivery characteristics and pricing characteristics. Difficulties associated with physical delivery of live cattle indicate that a move to cash settlement would be preferable. Under physical delivery, short hedgers face potentially high delivery costs and have difficulty identifying cattle on a live basis that will meet carcass specifications outlined in the contract, problems that would be eliminated if cash settlement was adopted. Both longs and shorts face problems associated with delivery of a nonstorable commodity. However, there are difficulties associated with a switch to cash settlement as well. Garbade and Silber (1983) indicated that cash settlement would only be preferred to physical delivery if delivery costs are high and an accurate settlement index is available. Constructing an accurate cash settlement index which is not subject to manipulation is not easy. Problems associated with construction of an accurate index include the relatively high cost of collecting accurate cash market prices from buyers and sellers, the fact that a variety of different pricing methods are employed which are not easily compared (e.g., liveweight vs. carcass vs. carcass grade and yield vs. grid pricing), and the fact that cash trade is, at times, quite thin making it difficult to collect any cash prices that can be used to compute a settlement index.

Development of a reliable cash settlement index to use for the live cattle futures contract is an empirical problem that was examined in the late 1980s (Kahl, Hudson, and Ward 1989). They indicated that for cash settlement to be preferred over physical delivery, it must reduce basis variability, the cash price must be an accurate representation of commercial value, and the potential for manipulation of cash prices must be small. Although the authors examined more than one possible index, they offered no conclusive evidence that a switch to cash settlement would be advantageous. In particular, Kahl, Hudson and Ward (1989) expressed concerns about the representativeness of reported prices used to construct an index and the potential for the index's manipulation. Modifications to the cash price reporting regime followed by the USDA since that time makes revisiting the cash price settlement index problem worthwhile. Specifically, USDA now reports volume weighted prices by region which offer less potential for manipulation than the high-low price ranges reported previously. Given the problems hedgers have experienced using the live cattle futures contract and the decline in trading volume that has occurred over time, it seems apparent that cash settlement of the live cattle futures contract should be reexamined in depth.

Table 2. Fed Cattle Market Characteristics That Make Cash Settlement of Physical Delivery Preferable.

Fed Cattle Market Characteristic	Cash Settlement Preferable	Physical Delivery Preferable
Delivery Characteristics:		
<i>High Delivery Costs</i>	X	
<i>Difficult to Identify Deliverable Supplies on Live Basis that Meet Contract Specifications</i>	X	
<i>Nonstorable Commodity</i>	X	
Pricing Characteristics:		
<i>Difficult to Collect Cash Prices</i>		X
<i>Variety of Pricing Methods Employed</i>		X
<i>Cash Trade Sometimes Thin</i>		X

Dressed Beef Futures Contract

Several cattle feeders indicated that, ultimately, they believe a dressed beef futures contract could resolve some of the difficulties inherent in the live cattle futures contract. Over time the percentage of live cattle priced on either a dressed weight or on a grade and yield basis has been growing. If this trend continues as expected, more cash market participants will want to use a dressed weight or boxed beef contract instead of a live cattle contract for risk management. A recent example of this occurred in the hog sector. The CME switched from a physical delivery live hog contract to a cash settled dressed weight contract effective with the February 1997 contract. The driving force behind this change was a dramatic shift in U.S. hog pricing away from live to grid based pricing which generally starts with a dressed weight base price.

A dressed weight or boxed beef contract would, by necessity, be a cash settled contract because of the inherent difficulties in physically delivering dressed carcasses or boxed beef to satisfy the delivery provisions of a futures contract. Thus, a move to a dressed contract will eliminate problems associated with the delivery system. But it will not eliminate the principal concern regarding development of a live-weight cash settlement contract, namely the development of a dressed weight or boxed beef cash price index which can be used to settle the contract. Current thin price reports on both boxed beef and dressed weight prices suggest that better price reporting will be required before the development of a boxed beef or dressed weight futures contract can take place.

Summary

The live cattle futures market provides a risk transfer mechanism to cattle market participants and plays an important role in price discovery. Interviews conducted with packers and cattle feeders revealed that packers did not have major concerns about the current live cattle futures contract's usefulness. However, some cattle feeders expressed concerns about the live cattle futures contracts viability as a risk management tool. Problems cited with the current live cattle contract were a lack of liquidity, which makes large hedge order execution difficult, and basis levels that are difficult to forecast accurately. A review of live cattle volume and open interest indicated that average daily trading volume fell sharply from the late 1970s to the early 1990s, which tends to substantiate the liquidity problems potentially faced by large hedgers. Additional research is needed to determine why live cattle futures trading volume declined so sharply over the last 20 years and to learn what impact it has had on the contract's risk shifting ability. Furthermore, historical basis data for various slaughter cattle markets suggest that live cattle basis levels shifted following the change in the live cattle delivery specifications that were effective with the June 1995 contract. More research is needed to verify the impact changes in contract specifications had on live cattle basis. Problems associated with the current live cattle futures contract led many cattle feeders to suggest that cash settlement of live cattle futures be reexamined. Previous research indicated the principal concern thwarting adoption of a cash settled live cattle futures contract was development of an accurate cash settlement index that was not easily manipulated.

The beef industry's risk management needs are expected to change in the next decade. More cattle are expected to be priced on a dressed weight basis today than ever before. As dressed weight pricing becomes more prevalent, demand from risk managers for a dressed beef futures contract will also increase. As the beef industry's risk management needs evolve, the live cattle futures contract will likely be replaced by a cash settled dressed weight futures contract. For this to happen, development of an accurate dressed beef price index that is not easily manipulated will be required which, in turn, means more accurate dressed beef and boxed beef prices will be needed to construct the index.

Captive Supplies in Fed Cattle Markets

Vertical integration by beef packers into fed cattle markets, commonly referred to as captive supplies, has been a concern in the beef industry for nearly a decade. Recent cyclical declines in cattle prices and greater vertical integration by packers have fueled cattle producer concerns regarding integration and its impact on the fed cattle market. The purposes of this section are to:

- (1) outline motivations and benefits associated with vertical integration,
- (2) review economic concerns associated with vertical integration in fed cattle markets and summarize research results investigating the impacts of this integration, and
- (3) identify and assess potential policies to address impacts associated with beef packer vertical integration.

Included here is information from the U.S. Department of Agriculture's report on the subject released in 1996. The USDA study is noteworthy because it is the most comprehensive work to date examining short-run factors affecting fed cattle prices and the impacts of vertical integration on cash cattle prices. The studies analyzed data from all transactions involving 35 head or more for the 43 largest steer and heifer slaughter plants owned by 25 firms over the April 1992-April 1993 period.

Definitions and Background

One approach to vertical integration in fed cattle markets has been packers' and feeders' use of captive supplies. Vertical integration in fed cattle markets has been referred to as *captive supplies*. Captive supply, as defined by the Grain Inspection, Packers and Stockyards Administration (GIPSA), includes any livestock owned or otherwise contractually controlled by a packer two or more weeks prior to slaughter. This includes:

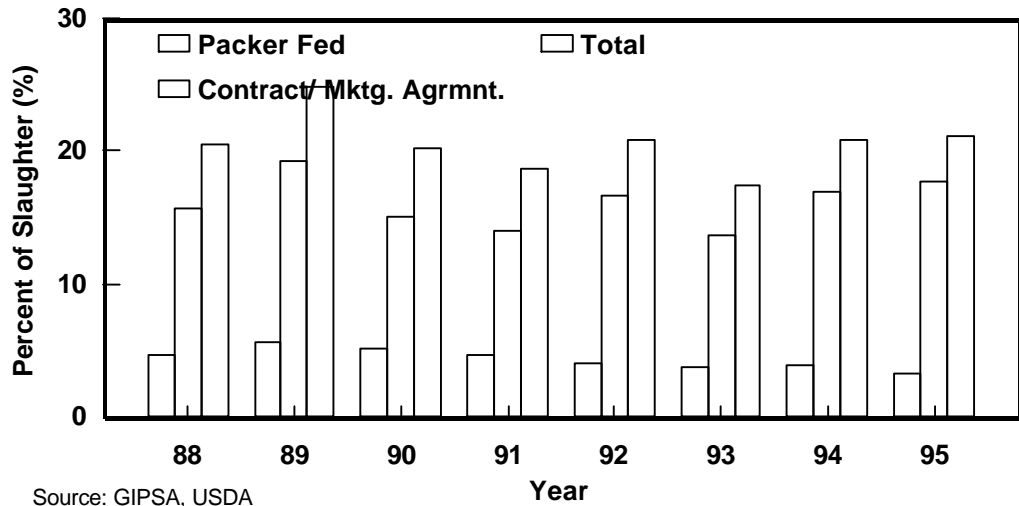
- (1) Cattle sold by feedlots to packers using forward contracts which are generally basis contracts or flat price contracts,
- (2) Cattle sold by feedlots to packers via marketing agreements with price typically established using a negotiated formula, usually consisting of a base price and perhaps stipulated premiums or discounts for quality differences, and
- (3) Cattle that were owned and controlled by packers during feeding.

Some livestock associations have requested that the definition of captive supply be expanded to include any cattle purchased using formula pricing, regardless of when the commitment to deliver cattle may have been established. This expanded definition of captive supply has not been adopted by GIPSA.

The percentage of cattle procured via captive supply arrangements by the four largest beef packing firms in the U.S. from 1988-95 is summarized in Figure 4. The percentage of packer-owned fed cattle remained relatively steady over the period, representing about 3-5% of annual slaughter. Contract and marketing agreement cattle procurement varied from a minimum of about 13% in 1993 to a maximum of nearly 20% of slaughter in 1989. Combined, cattle procured under packer-owned, forward contract, and marketing agreement methods represent roughly 20-25% of annual commercial fed cattle slaughter. Over the past 8 years, annual average levels of captive supplies have essentially remained unchanged. On a weekly basis, captive supply levels are more variable ranging from less than 10% to 50% or more of local slaughter. The percentage of cattle marketed using captive supply arrangements typically increases during April-May, declines during summer, and increases in December.

Incentives to Enter Captive Supply Agreements

Figure 4. Captive Supplies of Largest Four Beef Packers



Cattle producers and beef packers both potentially benefit from entering into captive supply agreements. Table 3 summarizes potential incentives of cattle feeders and beef packers to enter into particular captive supply agreements. Primary benefits to cattle feeders may include improved price risk management, access to more financing options, guaranteed buyer for cattle, improved opportunity for carcass quality premiums, and reduced marketing costs. Packers’ primary benefits include securing cattle slaughter needs so they can operate large packing plants near capacity, having more control over the type and quality of cattle to fill their plants, and reducing procurement costs.

Captive cattle supply can also contribute to overall efficiency in the beef marketing system. Reducing risks faced by cattle feeders and beef packers allows both parties to perform their economic activities of production and processing, respectively, at lower cost. Beef packers must operate near capacity to fully capture cost efficiencies of their large slaughter plants. When packers operate close to capacity, producers benefit with higher fed cattle prices and consumers benefit with lower beef prices. Captive supplies enable beef packers to improve the timing of cattle deliveries to operate slaughter plants near capacity. However, research to date has not estimated the size of beef packer efficiency gains associated with the use of captive supplies.

Cattle producers can use forward contracts to reduce their exposure to price risk. By pricing cattle in advance of delivery, cattle feeders eliminate market risk thereby allowing them to obtain favorable financing (Ward and Bliss 1989). Forward contracting shifts fed cattle price (or basis) risk from the cattle feeder to the beef packer.

Table 3. Summary of Potential Incentives to Enter into Captive Supply Agreements

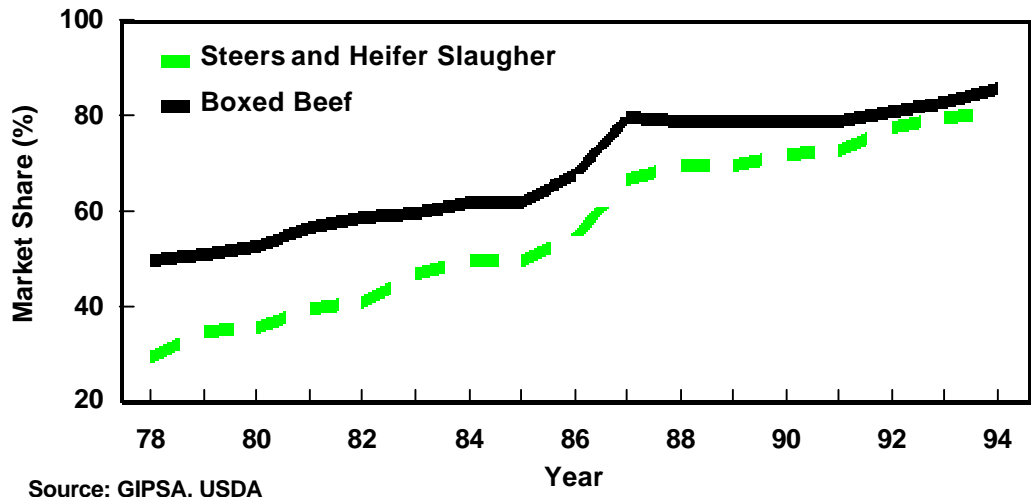
Method of Captive Supply	Cattle Feeder/Feedlot Benefits	Beef Packer Benefits
<u>Forward Contracts</u>	<ol style="list-style-type: none"> 1. Reduce price risk if cattle are hedged or flat priced 2. Obtain favorable financing 3. Ensure a buyer for cattle 4. Reduce marketing cost 	<ol style="list-style-type: none"> 1. Secure slaughter needs 2. Secure quality supply 3. Reduce procurement costs 4. Reduce price risk
<u>Marketing Agreements</u>	<ol style="list-style-type: none"> 1. Premiums for some cattle quality characteristics 2. Obtain carcass information 3. Ensure a buyer for cattle 4. Reduce marketing costs 	<ol style="list-style-type: none"> 1. Increase cattle quality control 2. Secure slaughter needs 3. Reduce procurement costs
<u>Packer-Owned Feeding</u>	<ol style="list-style-type: none"> 1. Increase feedlot utilization 2. Improve packer to feedlot relationship 	<ol style="list-style-type: none"> 1. Secure slaughter needs 2. Increase cattle/beef quality control

Some captive supply agreements are also a step toward value-based marketing of live cattle. Captive supply agreements that contain price adjustments for varying carcass quality attributes provide cattle feeders increased incentives to produce cattle possessing desired quality characteristics. Most marketing agreement and/or formula-priced cattle are priced based on carcass grade and yield or other quality specifications (see Pricing to Value section). Fed cattle sold in the spot market are largely sold on a live basis. Schroeder *et al.* (1993), Jones *et al.* (1992), and others have determined that price differentials for spot cattle do not fully reflect wholesale meat value differentials associated with differences in carcass quality. This has been referred to in the industry as cattle being "bought on the average," with little difference in prices related to quality differences. Beef carcass value-based marketing ultimately contributes to improved meat product quality and consistency and may strengthen retail consumer beef demand helping beef compete more effectively with other meat products.

Captive Supply Concerns

Packer concentration in the beef industry has received considerable attention from cattle producers. Figure 5 illustrates the significant increase in market share of the four largest beef packers since 1978. The four largest packers represented 36% of steer and heifer slaughter in 1980, and by 1994 this share increased to 81%. In contrast, during this same time period hog slaughter four-firm packer concentration increased from 34% to 46%. In some local regions, the four-firm beef packer market share is 100% causing increased concerns in local areas. One of the recent GIPSA packer concentration studies (Hayenga, Koontz, and Schroeder 1996) revealed that, although 95% of cattle in average plants are purchased within a 270-mile radius of the plant, beef packers compete in more nearly a national market

Figure 5. Market Share of Largest Four Beef Packers



for cattle, especially in the primary cattle feeding regions of the country. This indicates that national, rather than local four-firm concentration measures are most reflective of beef packer market structure.

Beef packer concentration of this magnitude raises concerns that these large firms could exert market power and reduce fed cattle prices, either by themselves or in collusion with other beef packers. Research to date has been mixed regarding whether beef packers exert market power. A comprehensive review of past research contained in the GIPSA packer concentration study (Azzam and Anderson 1996) revealed that the body of evidence was insufficient to support a finding of noncompetitive behavior, but it also could not conclude that the industry was competitive. Beef packing firms have increased in size to take advantage of economies of size. These include spreading fixed assets and management over more output and the ability to provide cost efficient processing services to specific markets such as the food service and export sectors. Packers' efficiency gains reduce their costs and may lead to higher prices for fed cattle and lower consumer beef prices. Therefore, possible market power that could depress live cattle prices could be offset by cost efficiencies that would be expected to increase live cattle prices. Recent published research by Azzam and Schroeter (1995) concluded that increased beef packer concentration resulted in about 1.7 times greater savings in costs associated with size efficiencies than market power costs. They concluded that, on balance, increased concentration has enhanced fed cattle prices and the GIPSA study found that larger plants and firms paid higher prices than smaller firms for fed cattle.

Concerns regarding fed cattle procurement via contracts, marketing agreements, and packer-owned feeding are related to packer concentration. Without packer concentration, many of the concerns would not be as pungent. These concerns are summarized in Table 4. When packers obtain a large percentage of their slaughter requirements from various captive supply arrangements, they may withdraw from the cash market for short time periods and rely on their captive supply to fill their slaughter needs. This elimination of a market outlet may create temporary, but at times dramatic, loss of market access for some producers (usually, though not always, smaller feedyards who have difficulty getting more than one packer-buyer to regularly bid on cattle). *If* this behavior caused by increased concentration has a negative impact on cash prices, cattle feeders may face reduced cash price bids. Empirical research to

date suggests that this has taken place, to some extent, in cattle markets. For example, Schroeder *et al.* (1993) found cash market fed cattle transaction prices in western Kansas were reduced by \$0.22/cwt when 10% of cattle slaughtered in the region were from captive supplies.

Table 4. Concerns Regarding Captive Supplies

Concern:	Cause:
1. Lack of and reduced public market information	1. Captive supply arrangements are private negotiations between packers and participating cattle feeders. No mechanism exists to report prices or other conditions of trade.
2. Reduced competition for fed cattle	2. When packers have large percentages of slaughter secured by captive supply they may bid less aggressively for cattle in the cash market.
3. Increased market power of packers holding captive supply cattle	3. Packers may maintain complete rights on timing of cattle delivery under captive supply.

Elam (1988) concluded that aggregate fed cattle market prices in Kansas and Colorado declined by \$0.02-0.05/cwt for each 1,000 head of contract fed cattle shipments. However, he found no significant price impacts arising from contract shipments in Texas or Nebraska. In the GIPSA packer concentration study, Ward, Koontz, and Schroeder (1996) found that a 1% increase in captive supplies was associated with less than a 0.003% decrease in cash fed cattle price. Thus, the balance of research on the short-run impacts of captive supply on fed cattle cash market prices indicates that price impacts are negative, but very small.

The existence of captive supplies could alter the elasticity of demand for cash cattle. Since more substitutes for cattle purchased in the cash market (namely captive supply cattle) are available in the presence of captive cattle supply (relative to prior to its existence), demand for cash cattle could become more elastic making price less responsive to quantity changes than if captive supplies were not present. If this were the case, the typical range in cash market prices over time (not necessarily within a day) would be smaller in the presence of captive supplies than without captive supplies.

Alternatively, captive supplies could lead to more fed cattle cash price variability if information regarding the number of captive supply cattle being delivered is largely unknown by market participants. This can increase price variability because, in the process of discovering price, cattle producers and packers negotiate on the basis of expectations regarding current unknown market demand and supply conditions. The less information packers and/or producers have regarding current market fundamentals, the more variable discovered prices are likely to be relative to the true market equilibrium. The effects of this increased price variability resulting from reduced market information could easily be greater than declines in price variability associated with changes in demand elasticity.

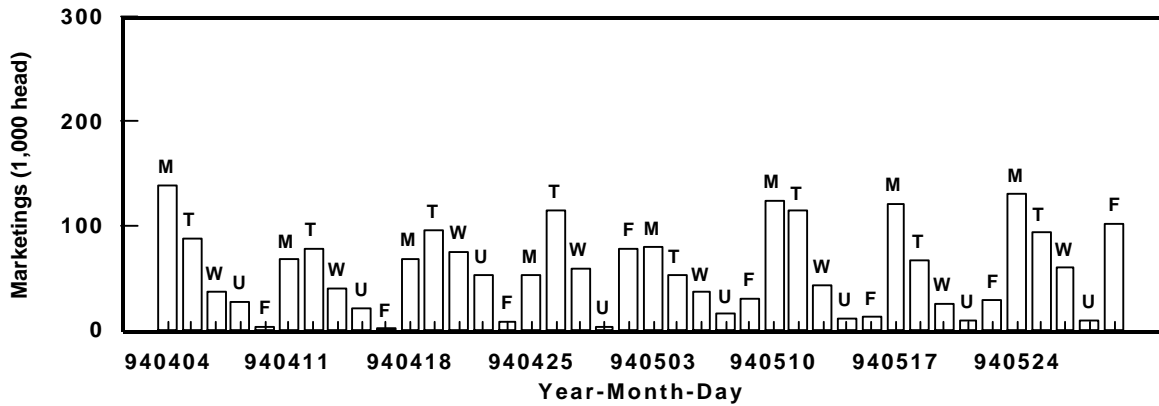
Terms of contracts and prices paid under marketing agreements with formula prices, forward contracts, or production contracts are not public information. During times when large quantities of cattle are being delivered under various captive supply arrangements, publicly reported price information, which reflects only cash market transactions, is not representative of all fed cattle traded. This creates two potential problems: (1) the cash market is a representative measure of market conditions, and (2) producers may not know whether contract terms offered to them are representative of current market conditions. Considerable information asymmetry exists between packers and cattle feeders regarding prices and quantities under captive supply arrangements. This can increase price or basis variability and also contribute to variability in other contract terms across different producers. Filling this information void is essential to allow cattle feeders to negotiate fair contract terms and better negotiate cash fed cattle sale prices.

Finally, packer market power may increase in the short-run in the presence of captive supply. The increase in market power stems from packers having flexibility regarding the timing of delivery on forward contracts, thereby increasing their flexibility in both the contract and spot markets. The ability to determine precise timing of contract delivery allows packers to substitute contracted cattle for cash market cattle if local cash prices are strong relative to expected cash prices in the near future. This market power argument is less apparent with many formula cattle purchasing arrangements in which the cattle feeder determines timing of cattle delivery.

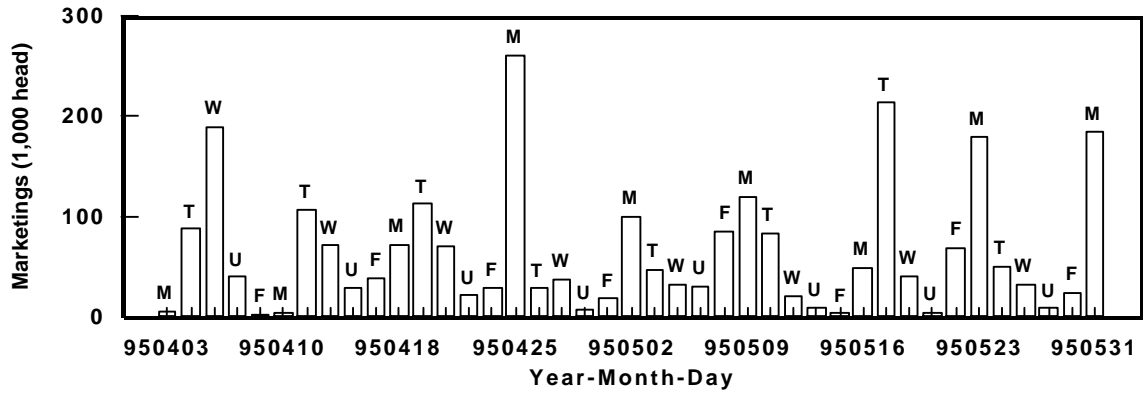
In interviews with cattle feeders, a lot of varied opinions about captive supplies and their impact on cash fed cattle trade surfaced. However, one significant concern was lack of market information. In discovery of fed cattle price each week, an important component of information is the current supply of and demand for fed cattle on the market. This supply includes cash cattle on showlists as well as forward contract cattle and formula agreement cattle scheduled for delivery. In general, asymmetric information exists in this regard. Because of their size, large packers know how much of each type of cattle are available each week whereas cattle feeders only have an idea of cash market cattle available. This contributes to what some have termed psychological markets or panic selling by cattle feeders in part because they lack sufficient information to make market timing decisions. This psychology may be especially apparent during periods of large cattle numbers and declining or low fed cattle prices, such as occurred in recent years.

Daily fed cattle marketings have been highly sporadic, varying from nearly 200,000 head to less than 5,000 head marketed on any particular day in the 5 largest cattle feeding regions. Daily 5-region fed cattle marketings during the April-May periods for 1994-96 are illustrated in Figures 6A-6C. Greater variability in daily marketings was present in 1995 and 1996 than in 1994. Exactly what causes this marketing variability is not apparent. Some cattle feeders and packers indicated this was a result of producers panic selling cattle all at once when a price break is perceived. A regression of the change in daily marketings as a function of the change in daily fed cattle price over

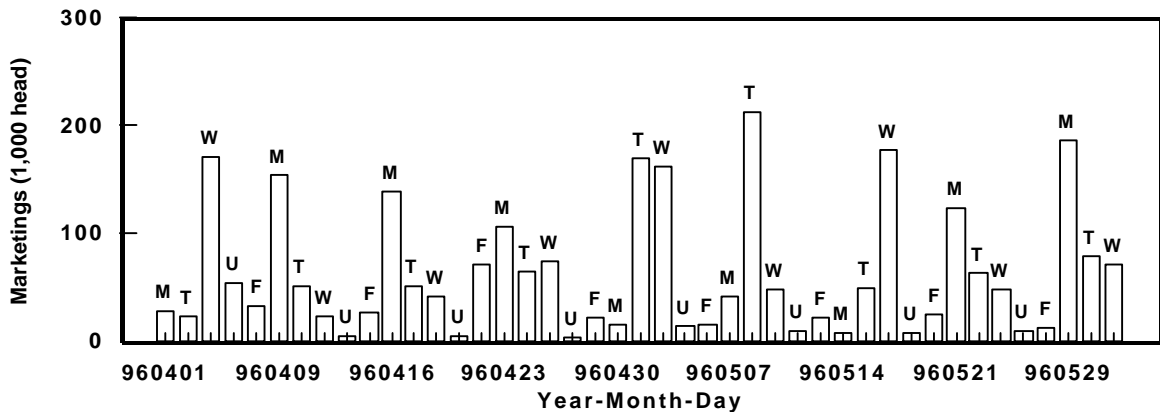
**Figure 6A. Daily 5-Region Fed Cattle Marketings
Duing April-May 1994.**



**Figure 6B. Daily 5-Region Fed Cattle Marketings
Duing April-May 1995.**



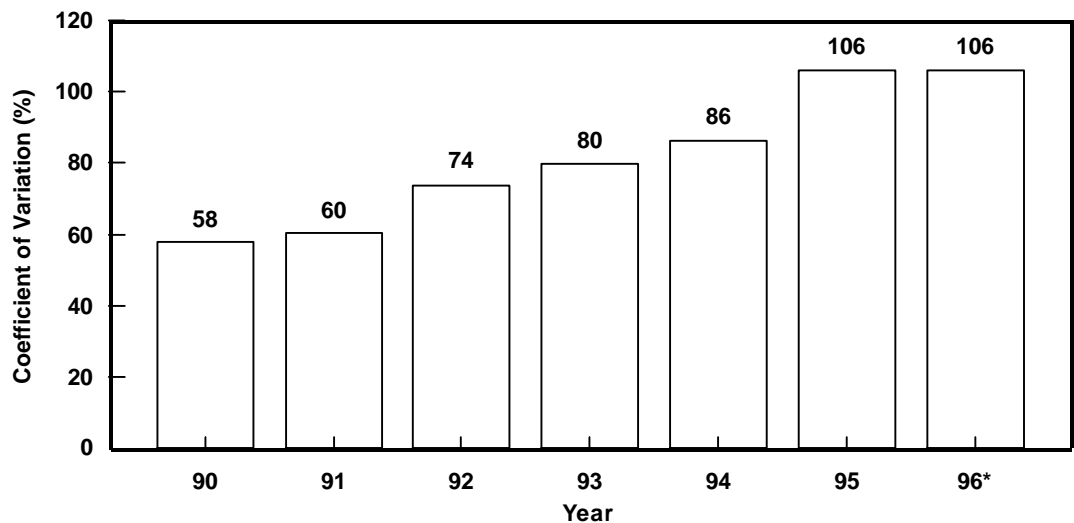
**Figure 6C. Daily 5-Region Fed Cattle Marketings
Duing April-May 1996.**



the 1990-August 1996 period had a positive and statistically significant parameter, indicating that when price increases from one day to the next, cattle feeders market more cattle. This is essentially a normal, expected supply response; when price increases, more cattle are supplied. This quantity response to a positive day-to-day price change may be especially apparent when prices are in long-term downtrends as during 1995-96.

Variability in daily fed cattle marketings has increased considerably over the past two years. Figure 7 illustrates the coefficient of variation in daily fed cattle marketings on an annual basis over the 1990-96 period. This statistic measures variability in daily fed cattle marketings after adjusting for changes in

Figure 7. Coefficient of Variation in Daily Fed Cattle Marketings, 5-Regions, 1990-96*



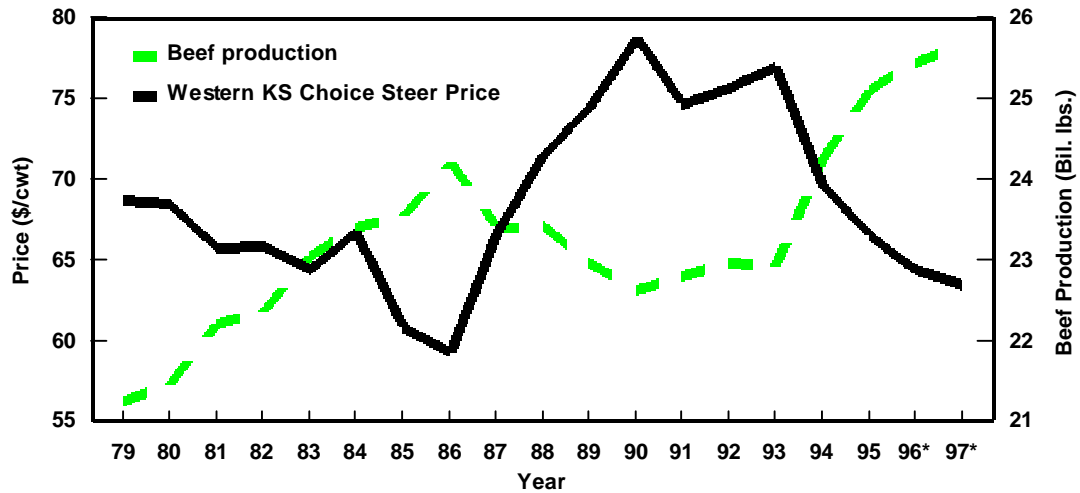
Source: USDA, 96* is through August

total annual marketings. As is apparent, variability in daily marketings has nearly doubled over this time period.

Lingering Questions

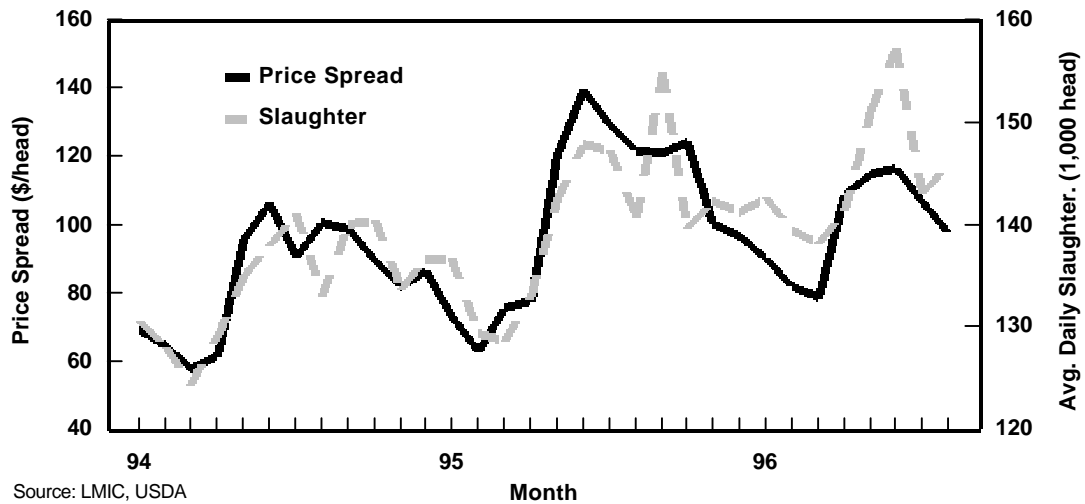
Two questions that surfaced recently relative to packer concentration and captive supplies are: (1) whether recent declines in fed cattle prices have been created by packer captive supply? and (2) whether recent high margins of beef packers are related to captive supply levels? The answer to each is no. Recent fed cattle price declines are a result of record per capita meat supplies in general, and increases in aggregate beef supplies in particular. Figure 8 illustrates how the single most important determinant of fed cattle price, beef production, has induced prices to fluctuate over time. Beef production and prices are inversely related, having nearly mirror patterns in Figure 8. Beef production increased 9% from 1993 to 1995 while fed steer price declined 13%. Per capita beef supply in the U.S. was up modestly in 1996 from the 65-66 pounds of the early 1990s, and this combined with record levels of competing meat supplies will result in 1996 having nearly the highest ever per capita consumption of meat in the U.S. These large overall meat supplies depress prices more than all other factors combined.

**Figure 8. Commercial Beef Production vs. Choice Steer Price
1979-1997**



Source: LMIC, USDA, * indicates LMIC Projection

**Figure 9. Monthly Farm-to-Wholesale Beef Price Spread
vs. Commercial Cattle Slaughter, 1994-Aug. 1996**



Source: LMIC, USDA

Questions also surfaced regarding recent packer margins. Margins (wholesale boxed beef price plus by-product value less live cattle price) and operating profits in beef packing were large in 1995 compared with recent years. During 1992 and 1993, estimates suggest beef packer margins were, on average, negative. However, packer margins follow beef production. When beef production is high, farm-to-wholesale price spreads are high, and when production is low, margins tend to be low (Figure 9). Approximately 90% (or more) of beef packer variable cost is the cost of fed cattle. Thus, when production is high and prices low, packers' major input costs are reduced. In addition, plant capacity utilization is a critical determinant of packer profits. When production is high, plant utilization is high, and packer profits tend to be high. Therefore, beef price spreads are, essentially, an indicator of beef production and provide limited information regarding impacts of captive supply on market performance.

Future Prospects

Most industry participants interviewed felt that captive supplies will not change much over the next 5 to 10 years, much as they have remained relatively constant over the last 5 years. However, most of those interviewed felt some form of alliances would increase in the future. Increased development of alliances over time could lead to different forms of contractual arrangements than the beef industry has been accustomed to. How alliances might affect fed cattle markets and price discovery is difficult to project since so many different types of alliances with different objectives, structures, make-ups, and administrations are being explored. However, most alliances by-pass live cattle cash market trade as we know it today. Therefore, if alliances grow, progressively fewer fed cattle will be traded in cash markets.

In addition, alliances could be considered a portion of captive supplies in the future, although the owners and benefactors of the captive supplies may be less apparent than under current contractual arrangements.

Policy Implications and Options

Some industry groups have called for legislated elimination of all captive supply arrangements between packers and livestock producers. Others proposed imposing limits on the level of captive supply arrangements allowed. Clearly such policies have costs and benefits. Benefits of such policies include placing cattle that might be removed from cash market trade back into the cash market. This would improve cash market liquidity, and if marketings and prices of these cattle were publicly reported when the cattle were sold, it would likely increase market information. In addition, this would force beef packers to compete head-to-head in the cash market for all fed cattle slaughter needs which may increase the number of bidders at particular feedlots on any particular day. The total number of buyers and level of concentration would remain unchanged, of course.

However, restricting the use of captive supply arrangements would also come with significant economic costs. First, banning forward contracts eliminates a risk reduction tool for both cattle feeders and beef packers. Not allowing cattle feeders to lock-in either a flat price or a cash-to-futures basis with a beef packer eliminates a price risk management option. Cattle feeders could still hedge cattle in the futures market independently, but they could not secure a basis and they would need to manage futures trading margin accounts themselves. Currently, when a feeder contracts cattle with a packer, the packer generally covers price risk by selling cattle in the futures market at the time price is established. Suspending forward contracts would eliminate an important tool for packers to use to assure slaughter needs. This would increase packers' risk of not being able to operate plants at capacity and likely result in some long run reductions in fed cattle prices and/or increases in wholesale beef prices.

Precluding use of marketing agreements could also reduce the percentage of cattle sold on a value-based pricing system. Unless cattle that would have previously been sold under marketing agreements were still sold on a grade and yield basis, pricing on a live basis would tend to eliminate most of the price premiums or discounts cattle feeders would otherwise have received for cattle quality differentials. This penalizes producers who produce high quality cattle and rewards those with animals having less desirable traits. Of course, this would not have to be the result if cattle feeders and beef packers could figure out ways to market more cattle on a grade and yield basis, or if technology would allow us to better predict these characteristics when evaluating live cattle.

Importantly, both cattle feeders and beef packers voluntarily developed and regularly pursue forward contract and marketing agreement fed cattle trade. This indicates that both benefit individually from the transaction methods. Precluding this marketing activity eliminates the benefits accrued to each party from the use of captive supplies.

Are there alternative policies to consider instead of regulating livestock markets? One possibility is to provide better market information. Market information asymmetry is an important determinant of livestock producers' competitive marketing positions relative to beef packers. For example, if formula bids, flat price contract bids, basis bid offers, quality premium offers, and other cattle pricing and quantity information were publicly available, concentrated buyers (packers) would have less of a competitive advantage over dispersed sellers (feedlots). Under current marketing practices, livestock producers have virtually no market information regarding pricing arrangements for cattle marketed under captive supply arrangements. The result of this information void is that when cattle feeders enter contract or marketing agreement negotiations with packers, they have little market information to determine the competitiveness of the packer's offer. For example, they do not have information regarding where the market is trading on forward contract basis levels. Packers, on the other hand, have considerably more knowledge in this regard because they represent such a large share of the market.

Improved market information is also important for producers selling cattle in the cash market. Part of the short marketing period ("45 minute market") and sporadic daily fed cattle marketings could be related to complete lack of information on the part of cattle feeders regarding that particular week's available cattle supply and packer demand. The fear of missing the market in absence of better knowledge about formula agreement and other non-cash cattle trade that week makes cattle feeders anxious and may contribute to concentrated marketings.

Methods to develop such price and information reporting need to be carefully explored if this alternative is pursued. Livestock producers could potentially benefit through better access to improved market information without having to resort to additional regulation of marketing practices.

New issues surrounding market information in the beef industry are on the horizon and deserve consideration. Alliances that integrate cow calf producers, cattle feeders, beef packers, processors, retailers, and food service establishments, will probably bypass many of the traditional markets. The industry would benefit from consideration now of how to collect and report information on these transactions that will not generally be part of public trade.

Group Marketing Alternatives

Cyclically low fed cattle prices, cyclically high packer profits, and price discovery concerns have led cattle feeders to consider fed cattle marketing and pricing alternatives. Pricing alternatives such as grid pricing have already been discussed in previous sections. Other alternatives include groups of cattle feeders acting collectively. Three alternatives discussed here are electronic trading, bargaining, and closed cooperative integration.

Historically, marketing cooperatives have been organized in response to changing needs of producers, and changing economic conditions and technology (Haas *et al.* 1979). Agricultural producers have long recognized that cooperatives enable them to do collectively what they cannot do individually. Producers act together to offset the inherent disadvantages found sometimes from acting alone. While

most group marketing efforts by producers are organized as cooperatives, not all are and not all need to be.

For each marketing alternative, cattle feeders individually or collectively must systematically approach the decision of whether to organize or participate in the marketing alternative. A few suggested steps are proposed here which need to be considered in deciding whether or not to organize or participate in fed cattle marketing alternatives (Ward, Bliss, and Hogeland 1993).

Cattle feeders need to understand the production and marketing environment in which they operate. That sounds basic, but there is strong evidence indicating it is more difficult than implied. Marketing means being customer oriented. Cattle feeders need to understand the needs and wants of their immediate customers, packers, and ultimate customers, beef consumers.

Cattle feeders must *specifically* identify the problem that needs to be addressed. Generalities are of little value. Cattle feeders need to focus on causes, not symptoms. An even more difficult task is to identify which alternatives can *realistically* reduce or eliminate which problems. There are several examples of money being thrown at perceived price discovery problems which had little chance of resolving the real problem.

Cattle feeders also need to state clearly their objectives in forming or participating in a marketing alternative. Again there are examples of efforts to form group marketing alternatives where the objectives for organizing or participating in the venture were not clear. As a result, the effort failed. The advantages and disadvantages, more clearly stated as the economic benefits and costs of each alternative, need to be assessed for each participant and for the industry as a whole.

Electronic Trading¹

Electronic trading provides a mechanism to centralize the price discovery process for fed cattle. Several electronic trading systems have been developed for livestock and meat (Bell *et al.* 1984). Some were implemented successfully and have operated for many years, such as computer auctions for slaughter lambs and satellite video auctions for feeder cattle. Others were designed, pilot tested, and perhaps operated for some time before failing, such as a computer-assisted trading system for wholesale meat.

Feeders and packers either commented on or were specifically asked about an electronic trading system for fed cattle. In this section, electronic trading of fed cattle is discussed in general terms and comments made by feeders and packers during our personal interviews are summarized.

A primary objective of an electronic trading system is to expose fed cattle to more potential buyers, and simultaneously, to facilitate better access by buyers to more fed cattle. Trading volume is important in electronic markets for two reasons. First, large volume can reduce operating costs of the electronic market. Regardless of the type and design of the electronic market, it incurs costs which are borne by sellers. Such costs, while not necessarily large for individual sellers, are a visible cost to cattle feeders when compared with direct marketing to packers. A second volume-related aspect deals with maintaining meatpacker and cattle feeder participation over time. Volume attracts buyers. Buyers'

¹ The term electronic trading recognizes the dual function of marketing by sellers and purchasing by buyers.

interest, in turn, attracts additional volume from feeders. If packers can consistently purchase several truckloads of cattle from an electronic market, which in turn helps them meet their procurement requirements, they are more apt to participate regularly. Conversely, if only one or two available packers participate in the electronic market, sellers may lose interest and discontinue using it. Lack of adequate trading volume reduces packer interest, causing them to cease buying through the electronic market. Higher volume increases the probability of success, both for cattle feeders and packers.

Commodities traded electronically must have characteristics which can be communicated to buyers, and buyers and sellers must be willing to accept a common system for describing the commodity. Packer buyers may or may not physically examine fed cattle offered for sale through an electronic market. Consequently, buyers must rely on accurate and meaningful fed cattle descriptions by the sponsoring firm or organization. Persons interviewed commented on the difficulty of accurately describing fed cattle without visual inspection. Without accurate quality descriptions, the electronic market is doomed to failure.

Fed cattle may change quality appreciably if there is a several-day lag between the time cattle are described and when they are delivered to the buyer. Thus, a procedure is needed for reconciling differences between how the cattle were described and what the buyer expected to receive based on that description. Commonly-accepted terminology understood by buyers and sellers may need to supplement standard or official sex, weight, and grade descriptions. The key is helping buyers evaluate fed cattle being offered for sale so they can better match price and quality.

Participants in any given electronic market transaction may be unknown to each other. Since face-to-face communication does not occur in electronic markets, the sponsoring organization must provide a means to identify and certify potential buyers and must ensure that sellers will deliver what was offered. Persons interviewed said that some type of warranty or guarantee of cattle being described accurately was crucial in an electronic market. Similarly, they commented that some method of warranting buyer and seller behavior is also needed. Appropriate performance guarantees must be provided both for cattle feeders and packers, so all are assured they are dealing with reliable individuals and firms.

Evaluations of several electronic marketing systems reveal a number of rather consistent observations about their benefits to buyers and sellers (Bell *et al.* 1984). The magnitude and relative importance of each of these benefits can vary because of differences in geographic locations, commodity traded, market structure, type of electronic marketing system, and other factors. Three benefits have been realized in most instances, but would not be *guaranteed* in an electronic trading system for fed cattle: (1) improved market information and pricing accuracy; (2) improved market access for buyers and sellers; and (3) higher prices from reduced marketing costs and/or enhanced buyer competition.

Market information is generally considered to be a public good, in that the availability of accurate, complete, and timely information creates benefits to all market participants. Its importance in price discovery has been discussed in a previous section. Because electronic markets centralize the price discovery process, the collection of accurate and comprehensive information is enhanced. That in turn facilitates accurate and timely dissemination of market information for price discovery. Interviewees noted that electronic trading could eliminate the industry problem of non-reported trades by feeders and packers. Market information from electronic markets can be tied directly to how fed cattle are described. Then, statistical methods can analyze the price and volume data to determine the value of specific types

of fed cattle or of specific animal characteristics. Such analyses can improve the price signaling process between packers and feeders, thus moving toward value-based marketing.

Access by cattle feeders to an electronic market and description trading can improve access to packers by sellers and improve access to cattle by buyers, especially when either is geographically dispersed or isolated. Because of the centralized nature of these markets, a greater number of potential trading opportunities exist than is typical in many direct trading situations. In particular, market opportunities for smaller feeders and packers are enhanced.

Buyers pay higher prices when they operate more cost-efficient plants (Ward, Koontz, and Schroeder 1996). To the extent that electronic markets reduce procurement costs for fed cattle, some of those cost savings may be passed back to feeders in the form of higher fed cattle prices. Cattle feeders noted in interviews that pricing on a grid basis was important to the success of an electronic market for fed cattle. Cattle feeders expressed the belief that packers could then bid higher on better quality cattle without raising the average or market price level for all cattle.

Increased competition is an objective of most electronic markets. An electronic market for fed cattle is intended to increase effective competition among buyers by exposing fed cattle to available buyers and by creating trading procedures that encourage competitive interaction. Ideally, a cattle feeder who sells by private treaty to one or two buyers might sell through an electronic auction to three or more buyers. The same potential competition exists in private-treaty selling as in electronic markets, but an electronic market converts what may be termed latent competitive potential into effective competition by ensuring that each potential buyer has the opportunity to purchase cattle offered for sale. Higher prices from enhanced buyer competition and reduced procurement costs is one of the most consistent findings from electronic livestock markets (Holder 1979; Ward 1984; Sporleder and Colling 1986).

Electronic trading systems also have costs or disadvantages for cattle feeders. Cattle feeders must make a commitment of fed cattle to the electronic trading system. Volume marketing is important and cattle feeders need to support the electronic market by marketing most or all of their fed cattle through the electronic trading system. Cattle feeders may experience increased marketing costs, especially relative to direct marketing to buyers. Depending on the type of electronic market, there may be a small capital commitment for computers and related equipment. This investment is in addition to the operating costs, usually paid by sellers through marketing charges, for hiring a manager and staff to operate the electronic market.

A major difficulty with organizing and implementing an electronic market will be packer resistance. Some feeders expressed the view that packers were too tied to the current method of procuring cattle. Feeders noted that packers need an incentive to participate in an electronic trading system. That incentive might be better access to the quality and quantity of cattle they need or the opportunity to pay higher prices for higher quality cattle without paying higher prices for poorer cattle. However, any effort to increase competition and potentially raise prices, unless it simultaneously provides buyers with additional benefits (such as access to more cattle or lower procurement costs) will be resisted. If packers oppose electronic trading, they may bid higher for fed cattle in the area to discredit the new trading system. Sufficient commitment by cattle feeders must be present during early implementation of the electronic market to offset packers' attempts to undermine the electronic market before it becomes firmly established.

Several cattle feeders believed electronic trading would be desirable. The key as noted above is packer support. One evolutionary path mentioned is moving from spot markets to formula or grid pricing to electronic trading.

Bargaining

One cattle feeding organization has been exploring a group bargaining approach to fed cattle marketing. There are also individuals and firms marketing cattle on behalf of several cattle feeders. This section does not describe either approach in detail. Rather, it discusses bargaining of fed cattle in general terms and summarizes comments made by feeders and packers during the personal interviews.

The alternative being discussed involves organizing to market fed cattle on behalf of one or more cattle feeders. A management team would be hired to organize the paper pooling of fed cattle for sale, negotiate sales on behalf of cattle owners, and coordinate delivery to packers. The organization would be involved to varying degrees in managing the flow of information between buyers and sellers, such as kill sheets to sellers, among other activities.²

The goal of group bargaining should be to improve coordination between cattle feeders and packers. Improved coordination should reduce buyer costs or improve the buyer's ability to procure desired cattle types and quantities, which in turn can enable a packer to pay higher prices for cattle purchased. At the same time, giving each available buyer the opportunity to bid on available cattle may result in added buyer competition and higher prices for fed cattle.

The success of organized bargaining hinges largely on its ability to organize and control a sufficient volume of cattle to evoke a higher price or improve terms of trade with buyers. The firm may perform functions which assist packers in the procurement process and increase marketing efficiency. Examples include: delivering at specified times to meet the buyer's slaughter schedule, delivering quantities needed for efficient plant operation, meeting quality standards needed to satisfy wholesale buyers of beef and byproducts, etc.

The principal leverage a group bargaining effort might exercise is pitting buyers against one another for the volume handled in order to secure the highest bid. However, the firm will likely have more difficulty negotiating favorable prices or terms of trade on the basis of volume alone, than if it also improves coordination of fed cattle supplies with packers' needs. Large volume increases the probability that the firm can provide packers with the quantity, quality, and type of cattle desired where and when the cattle are needed. If the bargaining firm could guarantee to supply a high percentage of a packer's cattle needs for a given time period, the packer will likely be more interested in negotiating a price premium for the fed cattle. Volume combined with improved coordination offers potential benefits to packers which might translate into higher fed cattle prices. Several feeders commented that volume is necessary, but is not sufficient to leverage packers into paying higher prices.

For effective bargaining, the firm may need to exercise some control over the quantity, quality, and timing of fed cattle marketed. Then the firm can merchandise those services to a packer. In essence, cattle feeders may need to transfer some of their decision-making autonomy to the bargaining firm's hired management. Market volume will depend upon the willingness of feeders to commit cattle to the firm

² A group bargaining effort may involve an individual representing one or a group of cattle feeders, a privately-owned firm, or a cooperative. The term firm is used here to cover a range of alternatives.

and to honor their commitment. Cattle feeders' commitment of cattle, in turn, will affect the size of packers' efficiency gains and how large a price premium it can afford to pay. As was noted by several cattle feeders, independent cattle feeders may be reluctant to transfer marketing decisions to a bargaining firm. Questions were also asked about operating procedures. For example, whose cattle would be sold first in rising or declining markets? In addition, group bargaining will almost certainly meet resistance from established buyers who may feel their competitive advantage is threatened. Buyers may offer above-market prices, better terms of trade, or engage in other practices to discourage feeders from organizing or participating in a bargaining program.

Bargaining success or effectiveness should be evaluated based on its net impacts, thereby considering both advantages and disadvantages. One potential benefit is an opportunity to obtain higher prices and better terms of trade for cattle feeders. If feeders unite to market large numbers of fed cattle, the bargaining firm may increase the price received for fed cattle. Bargaining does not increase the number of packers, but it can ensure that all available packers have an opportunity to bid on fed cattle marketed, thus increasing buyer competition.

A bargaining firm may negotiate with the packer to return slaughter results (kill sheets) to cattle owners. With slaughter results from packers, feeders can evaluate how their cattle performed in carcass form. As a result, they can make necessary changes in type of cattle fed, feeding programs, and timing of marketings. This type of information can be important and valuable to feeders over time. Some feeders thought a group bargaining firm could market cattle via grid pricing on a dressed weight basis, thus better matching price with product quality. As a result, there could be enhanced pricing accuracy and an improved flow of market information and price signals from packers to producers.

Among the potential disadvantages (costs) to cattle feeders from effective bargaining, one already mentioned is reduced individual decision-making and transfer of specific marketing-related decisions to the cattle marketing firm. Both volume and commitment of cattle are necessary for success, and involve putting the collective good of the bargaining firm ahead of personal preferences. Giving up that individualism is difficult for many cattle producers.

Another problem mentioned several times was the adversarial relationship between feeders and packers with group bargaining. In many interviews, the need for reducing this adversarial relationship was mentioned. Group bargaining may increase the "us vs. them" attitude in the industry if the primary objective is to countervail packer's bargaining leverage. Group bargaining which relies on a leveraged marketing approach does not improve the quality of cattle or increase the supply of cattle. Furthermore, bargaining strength would be limited because fed cattle are a perishable product. Cattle being held for higher prices continue to gain weight, affecting their quality, cost, and the total production of beef in the market. Combined, this works to undermine the negotiating position of the bargaining firm. Group bargaining where the objective is to improve coordination may reduce the adversarial relationship between feeders and packers. Finally, some feeders also expressed concern about the higher costs associated with a bargaining alternative when beef production costs are already higher than for competing meats.

Closed Cooperative Integration

Vertical integration into meatpacking allows cattle feeders to maintain control of fed cattle and resulting products farther up the marketing channel. Vertical integration enables cattle feeders to participate in *potential* profits generated by slaughtering fed cattle, fabricating beef, and marketing beef

products and byproducts. Several groups are considering closed cooperatives as a means of integrating into beef marketing. These efforts are not described here. Instead, the intent of this section is to discuss this alternative in general terms and to report on comments made by feeders and packers during our personal interviews.

There are essentially two paths cattle feeders can take to develop integrated cattle feeding-meatpacking cooperatives. These divergent paths are referred to here as high-volume cooperatives and niche-market cooperatives. A high-volume cooperative would be organized by cattle feeders to compete head-to-head with the largest packers in the industry. A niche-market cooperative would be organized by cattle feeders to capitalize on new market development opportunities stemming from new customer markets, new products, new processes, or new packaging methods. Closed cooperatives being considered correspond more to the latter type of integrated cooperative rather than the former.

Before vertically integrating into meatpacking, cattle feeders must carefully consider the nature of the packing industry, requirements for successful operation, and goals and objectives of cattle feeder members. Disagreement among cattle feeders over the type of meatpacking cooperative to organize will likely destine the venture to failure from the beginning.

Meatpacking is typically characterized as a high-volume, high-risk, cyclical, low profit-margin industry. For a successful high-volume cooperative, cattle feeders must enter meatpacking on a large enough scale to be cost-competitive with large existing firms and to serve high-volume beef customers such as retail supermarkets and food service firms. Cattle feeders may enter meatpacking in one of three ways or some combination of the three: (1) build one or more new plants; (2) purchase one or more existing plants; or (3) contract with one or more existing plants to have cattle custom slaughtered and fabricated.

Limitations to building a new plant include adding slaughtering-fabricating capacity to an industry characterized by excess capacity. New plants are capital intensive, both investment capital and operating capital. They typically incur substantial start-up losses and require large amounts of capital to penetrate existing markets and secure market share from existing competitors. Existing packers may lower their beef product prices to customers and undercut new competitors. A new firm will not likely produce the same quality of products initially as existing packers. Consequently, a new entrant may have to significantly discount prices for its products in order to penetrate existing customer-supplier relationships. Such price discounts will likely mean unprofitable operations for some period of time until product quality can be improved, customer confidence secured, and prices raised to competitive levels consistent with customer services.

An alternative to building a new meatpacking plant is to purchase an existing meatpacking plant or firm. Purchasing existing slaughtering and fabricating capacity may have an advantage in market penetration. If a plant is currently operating, it has a management team, a labor force, feedlot-suppliers from which it purchases fed cattle, and regular customers to whom it markets beef products and byproducts. However, there may be significant disadvantages. Cattle feeders must always ask why the existing firm is for sale. Maybe the plant is not well-managed, not well-located, not cost-competitive, has poor employee relations and low-quality production, cannot secure adequate supplies of fed cattle, or does not have a cadre of satisfied customers. Some problems may be addressed with new management, but some problems may be inherent in the plant. The cooperative may simply be purchasing existing problems for which there are no satisfactory solutions. If the existing plant is idle, several of the same questions as to why it closed must be asked.

Lastly, custom slaughtering and fabricating is an option. As with a closed plant or one for sale, cattle feeders must ask why an existing firm would consider custom slaughtering and fabricating for a group of cattle feeders rather than slaughtering and fabricating for itself. There may be reasons why a custom processing arrangement could benefit both the existing packer and a new cooperative. The existing firm would only concentrate on plant operations such as slaughtering, fabricating, and byproducts processing, and not be concerned with cattle procurement or product sales. The custom arrangement would stabilize income flow and reduce price risk to the custom processor. The cooperative could potentially benefit by acquiring control of product without investing large amounts of capital for a processing facility. Cattle feeder members could supply cattle for custom slaughtering-fabricating and the cooperative could market beef products and byproducts. Investment capital requirements would be considerably lower than building or purchasing a plant, though operating costs (custom fees) may be higher unless the custom plant is cost-competitive with existing firms. Market penetration problems would likely still exist. Existing beef product and byproduct customers would need to be convinced they could continue purchasing the same or higher quality products from the cooperative that they had previously purchased from the existing packer.

Not all meatpacking operations serve the same market segments or customer groups. Cattle feeders may not have to enter the packing industry on a large-volume scale to be successful. Cattle feeders may find a small target market or niche market to serve and effectively improve their marketing position. Markets can be segmented or targeted in various ways. Most could be categorized into two broad groups: (1) products; and (2) services. Either of these may have geographic market opportunities or limitations as well. Closed cooperatives currently being considered are most interested in developing new, value-added products and focusing on increasing the quality and consistency of beef products. Several feeders and packers thought this was the right direction for the beef industry.

A niche-market cooperative must identify one or more target or niche market segments. Cattle feeders considering a niche market must ask why other firms have not identified the same niche and pursued it. There may be sound economic reasons why other firms have chosen not to venture into the seemingly untapped niche market. In many cases, there are profit opportunities but they may be insufficient to offset large costs. For example, the extremely high costs of developing branded products with brand loyalty may be higher than expected profits. Cattle feeders must evaluate whether or not those economic obstacles can be overcome with a new cooperative.

A niche-market cooperative may organize in a manner that enables it to explore several niche-market alternatives. Innovation coupled with careful study may uncover several opportunities. In some cases, physical facilities may be required. Much of the discussion pertaining to building or buying a large-volume meatpacking plant applies to niche-market cooperatives, but on a smaller scale. Several feeders and packers said that building new facilities was not a viable approach. As indicated earlier, a niche-market cooperative, while being concerned about procurement and processing costs, may need to devote comparatively more resources into product and market development, customer service, promotion and advertising, and product distribution and merchandising.

Capital requirements for a niche-market cooperative may not be significantly less than a large-volume cooperative. Investment capital for facilities will likely be significantly less. Operating capital requirements may be more, in order to develop and merchandise new products. There will also be considerable risk involved in penetrating untapped market niches.

Vertically integrating into meatpacking offers cattle feeders several *potential* benefits. Vertical integration can guarantee cattle feeders access to a market for their fed cattle. Cattle feeders would also retain ownership of beef products and byproducts through the wholesale market stage. Thus, cattle feeders would be positioned to participate in *potential* profits generated from slaughtering, fabricating, and marketing value-added products. A cooperative meatpacker could significantly benefit cattle feeders by increasing the flow of information back to its cattle feeder members. Cattle feeders need to know the quality and quantity of beef their cattle produce and how their cattle and feeding regimes measure up to a "standard" or "desired" animal. A meatpacking cooperative would be in a unique position to provide this needed information to its cattle feeder members. Perhaps a cooperative could more quickly and efficiently move the industry toward value-based marketing and pricing than under the current market structure, since the cooperative's primary purpose is serving its members' best interests.

Vertical integration, however, is not a panacea. Implementing a vertically integrated cooperative is not without problems. One of the most serious anticipated problems is cattle feeder commitment, which is a dual problem consisting of cattle commitment and capital commitment. Cattle feeder members would likely have to sign marketing agreements which limit them to marketing fed cattle solely through the cooperative. This commitment will likely include quality as well as quantity of cattle. Below-average or poor-quality cattle will have to be discounted severely in developing consistent, high quality beef products. Insufficient quality and quantity will increase operating costs and restrict the cooperative from guaranteeing customers the volume and quality of products they need.

As was mentioned, organizing an integrated cooperative will likely require a significant capital commitment by cattle feeder-members. Persuading cattle feeders to invest in a new cooperative which will engage in a high-risk, low-profit activity will be difficult. Persons interviewed expressed the view that many cattle feeders do not have reasonable expectations for closed cooperative performance. A competitive return on investment will be difficult to estimate and impossible to guarantee.

While vertical integration by cattle feeders into meatpacking offers potential opportunities, along with it are assured risks. Perhaps the single most important factor affecting the success or failure of such a venture is understanding clearly the objectives and expectations of the new cooperative. Having unclear objectives or unrealistic expectations will doom the initiative from the outset. Clear, specific objectives and expectations are essential for the cooperative to have a reasonable chance of succeeding. Integration into meatpacking is often thought by producers to be the answer to their market access and buyer competition problems. However, meatpacking cooperatives historically have experienced little success (Haas *et al.* 1979). Legitimate opportunities may exist, but cattle feeders must carefully study the feasibility of realistically succeeding in such a venture.

Summary

In summary, cattle feeders interested in organizing or participating in innovative or group marketing alternatives for fed cattle must understand what they can *realistically* accomplish. Group marketing is not a guaranteed solution to their perceived marketing problems. Cattle feeders must consider such alternatives with open eyes and an open mind. There are economic reasons why the existing market structure has evolved to what it is today. Cattle feeders, by organizing group marketing alternatives, are attempting to alter the existing market structure in some way. They must understand the economic reasons which may favor the group marketing alternative's success, but must also understand the economic reasons which may be working against successfully implementing a group

marketing alternative. Once those reasons are identified and a plan developed to overcome them, the probability of success increases.

Price Discovery: Future Prospects

Improved price discovery and vertical coordination in the beef industry are essential for beef to maintain market share in the future. This chapter has detailed important forces influencing how price discovery and vertical coordination have evolved in the beef sector. The roles of technology, pricing methods, market structure, risk management tools, market institutions, information, and management philosophies and strategies on price discovery and market coordination in the beef industry were assessed. The purpose of this section is to use key findings of this study to provide projections for the next decade.

Projecting the market environment, technology, market institutions, and management directions in such a complex sector as the beef industry is difficult. So many different factors are interrelated and dependent upon each other. About the only certain projections are that change is imminent and economics will dictate the direction of change. Change will occur as untapped profit opportunities are discovered by innovative beef market participants. Precisely who in the industry will step forward and be the leaders of change is not always apparent, but all market participants will be affected.

One theme that pervades all change in the beef sector is that the industry desperately needs to produce products possessing greater value to consumers. Value means the product must be priced competitively, it must be convenient, and it must provide a consistently desirable eating experience for consumers. These attributes, though simple conceptually, have proven immensely difficult for the beef industry to manage. A myriad of beef products and product qualities are produced from cattle and the target markets represent such a diverse set of consumer demands, that there is no simple solution to the industry's struggle for market share. This diversity of beef products and array of target markets suggests the industry and beef products are likely to become progressively more segmented in the future. In order for beef product segmentation at the consumer level to succeed, segmentation will increase at all levels of the cattle and beef production chain as each level strives to become more customer focused.

Significant forces influencing price discovery and vertical market coordination in the beef industry over the next decade are:

- *Technology to improve our ability to identify and sort beef products according to varying quality attributes and value will be developed and adopted commercially by processors.* Several such technologies are already being developed including beef tenderness tests, video imaging, and product identification tracking. Technology will create quantitative and/or mechanical quality determination procedures reducing subjective meat quality assessment. This is a necessary step toward better identifying and paying for quality attributes of fed cattle.
- *Federal beef quality grades are likely to be less important in 10 years.* Many different means will be adopted to measure and describe beef quality differences depending upon the targeted consumer. Because standardized quality grades are not likely to adequately measure all the different needs of varied consumers, standardized grades will have less general value. However, in transition, federal quality grades are *valuable* to the industry and should be *maintained*. They

do not inhibit private beef product branding. In fact, federal quality grades are one of the quality specifications used to describe most branded beef products marketed today. The current grading system, however, does not adequately describe beef tenderness and, therefore, does not adequately characterize the eating experience consumers can expect. Thus, a significant overhaul of the quality grading system may be in order rather than attempting to fine tune the current system. Making even small grade changes has proven to be slow, divisive, and ineffective. Because of inherent problems with the current quality grading methods and the difficulty in modifying the standards, a significant change in the system is needed.

- *Our ability to predict meat quality from visual inspection of live cattle will not improve much over the next decade.* Thus, live cattle price differentials will not adequately reflect cattle and beef value differences. This will lead to more fed cattle being sold on a dressed weight, carcass quality and yield grade basis.
- *Grid pricing will become more common in procurement of fed cattle by packers.* Pricing methods that more accurately reflect value differences will replace systems not based on product value. Grids may continue to have a variety of base prices and a range of premiums and discounts. It will continue to be important for the USDA to continue to collect and report grid prices.
- *More cattle will be produced under alliances that directly link cow-calf producers all the way to retail and food service outlets.* Alliances provide opportunities for clearer price signals encouraging producers to produce beef products targeted to specific consumers. However, only a relatively small portion of the industry will find alliances profitable as they involve considerable risk, coordination, infrastructure, and control, and generally offer only modest opportunities for additional profit. All parties involved in an alliance must benefit or it will not succeed. Alliances will not replace the predominant pricing methods, carcass weight and grade and live weight pricing. However, information exchanged in alliances will supplement price signals in the market place. Alliances may also contribute to better understanding between feeders and packers and a reduction in the disruptive adversarial relationship that plagues the beef industry.
- *The result of more fed cattle being sold on a dressed weight, carcass quality and yield grade basis, greater use of price grids, and increased alliances, will shift the center of price discovery more to the wholesale level.* This suggests greater need for continued efforts to improve boxed beef and byproducts price reporting by USDA.
- *Producer group marketing and closed cooperative efforts will increase, but they will not represent a significant portion of the fed cattle market.* The most probable beneficiaries of producer group marketing activities will be smaller and mid-sized operations. Group efforts for these producers may offer significant opportunities for information sharing and capturing of volume-premiums associated with grouping cattle for large beef processors.
- *Certified beef marketing programs may expand modestly in the future.* However, the success of these programs will depend critically upon the certification program integrity and whether the certified beef is perceived to be differentiated from other beef products.
- *An increased share of beef will be branded in the future.* However, who will take the lead in branding beef products may vary; some alliances may introduce branded products; some producer

groups may initiate branded products; some certified programs already involve branded products; many restaurants differentiate themselves by the beef they sell with their name serving as a brand; some packers may brand beef products; and more retailer product branding could occur. Large beef processors appear to be a natural place for branding to expand. However, large packers will not brand much beef until profitability of doing so is clear and they can make the large investment in capital required for a branded beef program. Relative to current large packer operations, successful beef product branding requires much more control over the type of cattle procured, careful beef quality measurement and sorting, extensive coordination between product merchandisers and commodity procurement, and national brand promotion programs. This more intensive management and control is costly and a large packer whose comparative advantage is large volume, low-cost processing sees little benefit relative to the increase in costs and risks associated with large-scale branding. This will slow development of branded beef.

- *Asymmetry of market information plagues the beef industry.* The USDA has been very responsive to industry demands by developing new information and reports. Even more information is needed especially regarding close trim and all boxed beef prices, export prices, hide and offal values, and short-run captive supplies. However, at times industry participants resist public reporting requests. *If industry participants do not cooperate and provide information as requested, mandatory reporting may be the inevitable policy solution.* The need for more market information regarding captive supplies is *not* an indictment against this marketing method or against packer concentration, it simply represents a need to balance information flows when these marketing alternatives are prevalent.
- *Market institutions need to evolve with the industry.* *The live cattle futures contract will see increased pressure to move to a dressed weight specification.* This was not necessarily a position held by most industry participants interviewed for this study. However, overwhelming evidence suggests that live cattle cash trade will decline and dressed weight pricing will increase in the future. *Carcass weight pricing will likely become the predominant fed cattle pricing method in 10 years, though a significant percentage of fed cattle will still be priced on a live weight basis.* In addition, the dressed beef contract will likely be cash settled because of the inherent difficulties in delivering dressed beef. Developing a cash settled dressed beef contract will require improved boxed beef and carcass price reporting by the USDA.
- *Electronic trade of fed cattle (either on a live or carcass basis) may have had a role at one time in the beef industry.* However, it appears less likely it will play a role for large, integrated, vertically coordinated firms targeting beef to specific consumer segments. An electronic market is likely to suffer from insufficient volume and therefore, is not likely to succeed.
- *Negotiation of cattle terms of trade will increase significantly in fed cattle marketing.* Larger operations, group efforts by producers, producer cooperative ventures, alliances, and product branding all require more negotiation of terms of trade than previous marketing methods. Beef product specifications, base prices, formulas for premiums and discounts, volume needs, and control and verification of production practices all associated with targeting products that focus on specific consumer demands increase the need for, and benefits of, negotiations among market participants. Increased negotiations require better market information, technology to more accurately measure negotiated meat product specifications, increased knowledge of how to control product quality, and more coordination among stages of the marketing and production system.

- *When technology and incentives for improved meat product market segmentation develop, the highly concentrated packing and increasingly concentrated cattle feeding industry structures will lead to rapid adoption throughout the industry.* Conversely, if technology is slow to develop or market price differentials are inadequate to induce change, the beef industry will continue to lose market share.
- This report focused very little on feeder cattle pricing. *However, better determination of value at the meat level and less emphasis on live fed cattle pricing may have implications for feeder cattle pricing.* Many pricing issues may be transferred to feeder cattle markets if value determination at the fed cattle level improves. The risk of variable animal quality that was previously borne at the packer level will be passed back to cattle feeders and will heighten issues of pricing and value determination of feeder cattle. Considerable market coordination will continue to be needed between the cow/calf, stocker and feeder levels and improvements in fed cattle pricing will be followed by increased attention to latent feeder cattle pricing issues.

Change in the way beef is produced and marketed, in the institutions used to coordinate the market, in the way product quality is determined, in the way markets are segmented and consumer demands are met, and in the information and skill needs of industry participants are inevitable. These changes will not come without costs, risks, resistance, and some failures. The beef industry has traditionally been slow and reluctant to change in accordance with market conditions. Many reasons contribute to the industry's sluggishness including significant biological production lags, decentralized production with divergent comparative advantages of producers in different geographic regions, commodity focused mentality of the industry, risk, and market structure. Ultimately, the beef sector will not maintain its market share unless the industry faces the changes necessary to meet consumer demand over the next decade. Those that successfully adapt will survive, those that do not will disappear. *A necessary condition to a return to a more competitive position and to an ability to command and hold a larger market share in the traditional price-based system will be improvement in price discovery. If significant improvement does not occur, then the industry can expect a still greater emphasis on contracts and other non-price means of achieving high levels of coordination across the production, processing, and merchandising of beef.*

References

- Azzam, A.M. and D.G. Anderson. *Assessing Competition in Meatpacking: Economic History, Theory, and Evidence.* Inspection, Packers and Stockyards Administration, Packers and Stockyards Programs, U.S. Department of Agriculture. GIPSA-RR-96-6. May 1996.
- Azzam, A.M. and J.R. Schroeter. "The Tradeoff Between Oligopsony Power and Cost Efficiency in Horizontal Consolidation: An Example from Beef Packing." *American Journal of Agricultural Economics* 77(November 1995):825-836.
- Bahn, Henry M. and Gregory Parham. "The Role of the Federal Government as Information Technology Provider to the Agricultural and Food System." *Global Restructuring of Agro-Food Markets: Need of Change in Marketing Policy.* Proceedings of a January 1996 Symposium sponsored by the Food and Agricultural Marketing Consortium, FAMC 96-1. University of Florida, Gainesville, Florida.

- Barkley, A.P. and T.C. Schroeder. "Long-Run Impacts of Captive Supplies." In Ward, C.E., T.C. Schroeder, A.P. Barkley, S.R. Koontz. *Role of Captive Supplies in Beef Packing*. Grain Inspection, Packers and Stockyards Administration, Packers and Stockyards Programs, U.S. Department of Agriculture. GIPSA-RR-96-3. May 1996 pp. 1-52.
- Bell, J.B., D.R. Henderson, D.L. Holder, W.D. Purcell, J.R. Russell, T.L. Sporleder, and C.E. Ward. *Electronic Marketing: What, Why, How*. Oklahoma Cooperative Extension Service, Circular E-833, May 1984.
- Boleman, S.J., S.L. Boleman, J.W. Savell, R.K. Miller, H.R. Cross, T.L. Wheeler, M. Koohmaraie, S.D., S.D. Shakelford, M.F. Miller, R.L. West, and D.D. Johnson. "Consumer Evaluation of Beef of Known Tenderness Levels." *Journal of Animal Science* 1996 (In press).
- Buccola, Steven T. "Pricing Efficiency in Centralized and Noncentralized Markets." *American Journal of Agricultural Economics* 67(1985):583-599.
- Cox, L.J., B.S. McMullen, and P.V. Garrod. "An Analysis of the Use of Grades and Housebrand Labels in the Retail Beef Market." *Western Journal of Agricultural Economics* 15(1990):245-253.
- Dolezal, H.G. *Grid Pricing -- The Known and Unknown*. Texas Cattle Feeders Association, 1996.
- Elam, E. "Estimated Hedging Risk with Cash Settlement Feeder Cattle Futures." *Western Journal of Agricultural Economics* 13(1988):45-52.
- Ensminger, M.E. "Beef Industry Can't Afford to Overlook Federal Grading." *Feedstuffs*, vol. 68, no. 44, October 21, 1996, p. 8.
- Feuz, D.M., S.W. Fausti, and J.J. Wagner. "An Analysis of the Efficiency of Four Marketing Methods for Slaughter Cattle." *Agribusiness: An International Journal*. 9(1993):6 453-63.
- Garbade, K.D. and W.L. Silber. "Cash Settlement of Futures Contracts." *Journal of Futures Markets*. 3(1983):451-472.
- Grain Inspection, Packers and Stockyards Administration (GIPSA), U.S. Department of Agriculture, *Packers and Stockyards Statistical Report*, several years, 1989-95.
- Haas, J.T., D.L. Holder, and C.E. Ward. *Livestock and Wool Cooperatives*. U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service, Cooperative Information Report 1, Section 14. May 1979.
- Hayenga, M.L., S.R. Koontz, and T.C. Schroeder. *Definition of Regional Cattle Procurement Markets*.
Inspection,
Packers and
Stockyards
Administration,
Packers and
Stockyards
Programs, U.S.

- Hayenga, M.L., V.J. Rhodes, G.A. Grimes, and J.D. Lawrence. *Vertical Coordination in Hog Production*. Washington, D.C.: Grain Inspection, Packers and Stockyards Administration, U.S. Department of Agriculture, GIPSA-RR96-5. May 1996.
- Hayenga, M.L. Pricing Problems in the Food Industry (With Emphasis on Thin Markets). *North Central 117 Monograph No. 7*. University of Wisconsin, Madison, Wisconsin, 1979.
- Henderson, Dennis R., Lee F. Schrader and V. James Rhodes. "Public Price Reporting." *Federal Marketing Programs in Agriculture: Issues and Options*. Edited by Walter Armbruster, Dennis Henderson, and Ronald Knutson. The Interstate Printers and Publishers, Danville, Illinois, 1983.
- Holder, D.L. "Benefits of a Sheep and Lamb Teleauction in Virginia and West Virginia." U.S. Department of Agriculture, Economics, Statistics, and Cooperatives Service. Selected paper at the Southern Agricultural Economics Association meetings. February 1979.
- Jones, F.F. "Cash Settlement Issues for Live Cattle Futures Contracts." *Journal of Futures Markets*. 9(1989):237-248.
- Jones R., T. Schroeder, J. Mintert, and F. Brazle. "The Impacts of Quality on Cash Cattle Prices." *Southern Journal of Agricultural Economics*. 24(1992):2 149-162.
- Just, Richard E. "The Impact of Less Data on the Agricultural Economy and Society." *American Journal of Agricultural Economics* 65(1983):872-881.
- Kahl, K.H., M.A. Hudson, and C.E. Ward. "Cash Settlement Issues for Live Cattle Futures Contracts." *Journal of Futures Markets*. 9(1989):237-248.
- Koohmaraie, M., C.N. Cutter, W.J. Dorsta, S.D. Shackelford, G.R. Siragusa, and T.L. Wheeler. "A Summary of Beef Quality and Meat Safety Research." Unpublished Report, USDA-ARS, U.S. Meat Animal Research Center, Clay Center, Nebraska. 1996.
- Koohmaraie, M., T.L. Wheeler, and S.D. Shackelford. "Eliminating Inconsistent Beef Tenderness with Calcium-Activated Tenderization." Proceedings, Nebraska Cattlemen's Association Workshop, Kearney, NE. 1993.
- Koontz, S. R., Garcia, P., and Hudson, M.A. "Dominant-Satellite Relationships Between Live Cattle Cash and Futures Markets." *Journal of Futures Markets*. 10(1990):123-136.
- McCoy, J.H. *Livestock and Meat Marketing* Second Edition, The AVI Publishing Company: Westport, CT. 1979.
- Meyer, A.L. and M. Lang. "Obstacles to Carcass-Based Livestock Marketing and Implications for Extension Programs." Department of Agricultural Economics, University of Kentucky, Staff Paper 130, 1981.

- National Cattlemen's Association. *Strategic Alliances Field Study: Executive Summary*. Englewood, CO, 1993.
- Nelson, Robert G. and Steven C. Turner. "Experimental Examination of a Thin Market: Price Behavior in a Declining Terminal Market Revisited." *Journal of Agricultural and Applied Economics* 27(1995):149-160.
- Oellermann, C.M. and Farris, P. L. "Futures or Cash: Which Market Leads Live Beef Cattle Prices?" *Journal of Futures Markets*. 5(1983):529-538.
- Rhodes, V.J. "How the Marking of Beef Grades was Obtained." *Journal of Farm Economics* 42(1960):133-149.
- Sartwelle, J.D. III. "Marketing and Informational Alliances in the Fed Cattle Sector." Paper presented at the Kansas State University Agricultural Lenders Conferences, Garden City, KS, 1996.
- Schroeder, T.C., R. Jones, J. Mintert, and A.P. Barkley. "The Impact of Forward Contracting on Fed Cattle Transaction Prices." *Review of Agricultural Economics* 15(1993):325-37.
- Smith, G.C. "History of USDA Beef Grading." Presented at the National Cattlemen's Beef Association Grading Privatization Task Force Meeting, Denver CO, January 5, 1997.
- Smith, G.C., J.W. Savell, H.G. Dolezal, T.G. Field, D.R. Gill, D.B. Griffin, D.S. Hale, J.B. Morgan, S.L. Northcutt, J.D. Tatum. 1995. *Improving the Quality, Consistency, Competitiveness, and Market-Share of Beef. The Final Report of the Second Blueprint for Total Quality Management in the Fed-Beef (Slaughter Steer/Heifer) Industry. National Beef Quality Audit*. Conducted by Colorado State University, Texas A&M University, and Oklahoma State University for the National Cattlemen's Association. December 1995.
- Smith, G.C., J.W. Savell, R.P. Clayton, T.G. Field, D.B. Griffin, D.S. Hale, M.F. Miller, T.H. Montgomery, J.B. Morgan, J.D. Tatum, and J.W. Wise. *Improving the Consistency and Competitiveness of Beef. A Blueprint for Total Quality Management in the Fed-Beef Industry. The Final Report of the National Beef Quality Audit - 1991*. Conducted by Colorado State University and Texas A&M University for the National Cattlemen's Association. April 1992.
- Smith, G.C., J.W. Savell, H.R. Cross, Z.L. Carpenter, C.E. Murphey, G.W. Davis, H.C. Abraham, F.C. Parrish, Jr., and B.W. Berry. "Relationship of USDA Quality Grades to Palatability of Cooked Beef." *Journal of Food Quality* 10(1987):269
- Smith, R. "Helming Argues Beef Industry at Moment Where it Must Take Over Quality Grading." *Feedstuffs*, vol. 68, no. 29, July 15, 1996, p. 9.
- Sporleder, T.L. and P.L. Colling. "Competition and Price Relationships for an Electronic Market." Texas A&M University, Department of Agricultural Economics. Selected paper for the American Agricultural Economics Association meetings. August 1986.

- Stout, T.T. and P.R. Thomas. "Implementing Improved Pricing Accuracy for Cattle and Beef." *Long-Run Adjustments in the Livestock and Meat Industry: Implications and Alternatives*. Thomas T. Stout, ed. Wooster, OH: North Central Regional Research Publication 199, 1970.
- TAMRC (Texas Agricultural Market Research Center). *Price Determination in Slaughter Cattle Procurement*. Washington, D.C.: Grain Inspection, Packers and Stockyards Administration, U.S. Department of Agriculture, GIPSA-RR96-2. May 1996.
- Tomek, W. G. "Price Behavior on a Declining Terminal Market." *American Journal of Agricultural Economics* 62(1980):434-444.
- Tomek, W.G. and K.L. Robinson. *Agricultural Product Prices*, First edition, Cornell University Press: Ithaca, NY. 1972.
- USDA Advisory Committee on Agricultural Concentration. *Concentration in Agriculture*. Agricultural Marketing Service, U.S. Department of Agriculture, June 1996.
- Value Based Marketing Task Force. *The War on Fat*. Engelwood, CO: National Cattlemen's Association, 1990.
- Ward, C.E. *Slaughter-Cattle Pricing and Procurement Practices of Meatpackers*. Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture, Agricultural Information Bulletin 432, 1979.
- Ward, C.E. "Short-Period Pricing Models for Fed Cattle and Impacts of Wholesale Carcass Beef and Live Cattle Futures Market Prices." *Southern Journal of Agricultural Economics*. 13(1981):125-132.
- Ward, C.E. "An Empirical Study of Price Discovery and Competition for Slaughter Lambs." *Western Journal of Agricultural Economics*. 9(1984):135-44.
- Ward, C.E. "Inter-Firm Differences Between Fed Cattle Prices in the Southern Plains." *American Journal of Agricultural Economics*. 74(1992):2 480-485.
- Ward, C. and T.J. Bliss. *Forward Contracting of Fed Cattle: Extent, Benefits, Impacts, and Solutions*. Blacksburg, VA: Research Institute on Livestock Pricing, Research Institute on Livestock Pricing, Research Bulletin 4-89, November 1989.
- Ward, C.E., T.J. Bliss, and J.A. Hogeland. *Marketing Fed Cattle: Cooperative Opportunities*. Washington, D.C.: Agricultural Cooperative Service, U.S. Department of Agriculture. Service Report 38, 1993.
- Ward, C.E., S.R. Koontz, and T.C. Schroeder. "Short-Run Captive Supply Relationships with Fed Cattle Transaction Prices." Ward, C.E., T.C. Schroeder, A.P. Barkley, and S.R. Koontz. *Role of Captive Supplies in Beef Packing*. Washington, D.C.: Grain Inspection, Packers and Stockyards Administration, U.S. Department of Agriculture, GIPSA-RR96-3. May 1996.
- Wheeler, T.L., L.V. Cundiff, and R.M. Koch. "Effect of Marbling Degree on Beef Palatability in *Bos taurus* and *Bos indicus* Cattle." *Journal of Animal Science* 72(1994):3145-3151.

Whitaker, J.W. *Feedlot Empire: Beef Cattle Feeding in Illinois and Iowa, 1840-1900*. Iowa State University Press: Ames, IA. 1975.