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# INFORMATION TRANSMISSION IN CATTLE MARKETS: A CASE STUDY OF THE CHARITON VALLEY BEEF ALLIANCE

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# INFORMATION TRANSMISSION IN CATTLE MARKETS: A CASE STUDY OF THE CHARITON VALLEY BEEF ALLIANCE

ABSTRACT. The declining share of beef in total U.S. meat consumption has motivated industry-wide efforts to improve average beef quality through more effective coordination among the various market participants. Increased use of explicit “grid” pricing mechanisms over the last decade represent initial efforts at improved coordination. More recent efforts include animal-specific carcass data collection, with subsequent transmission to feeders and the relevant cow/calf operations, and improved “source verification” procedures aimed at (among other things) reducing the overall cost of medical treatment for live animals. None of these organizational innovations is costless, and indeed a number of significant barriers must be overcome before more widespread adoption of such practices takes place. This paper takes a detailed look at one organization’s attempts to overcome some of these barriers, and provides a qualitative assessment of this and other potential organizational responses.

## Introduction

Beef consumption has declined steadily over the last two decades both in aggregate quantity, and as a share of total U.S. meat consumption. Reductions in the price of pork and poultry relative to beef, and health concerns regarding the consumption of red meat, account for a large portion of this trend. However, relative improvements in the quality and consistency of pork and poultry products are also cited as important contributing factors (Purcell, 2000; Schroeder et al., 2000). Perhaps not coincidentally, beef has lagged behind pork and poultry in adopting mechanisms for vertical coordination among the various production stages from farm to market; contract arrangements and direct vertical linkages are common in pork and poultry production, while beef production is still predominantly coordinated through “market” mechanisms (Hayenga et al., 2000).

Whether vertical coordination of the kind observed in pork and poultry markets is necessary for further improvement in beef quality is a question that beef industry participants are currently trying to sort out. A variety of novel marketing practices has been adopted in recent years in an apparent attempt to improve quality and reduce overall production costs. At one extreme, there have been (very recent) attempts to fully integrate the beef production process with a single firm coordinating genetic selection, feeding practices, slaughter

and fabrication, and marketing. Long-term marketing arrangements between feedlots and packers represent a somewhat less extreme form of integration, and have been used in some production areas for many years. Interestingly, the mostly widely adopted change in recent years—so called grid pricing—represents an attempt to improve *market* coordination through more sophisticated quality-based pricing mechanisms. In this case, and in contrast with direct vertical integration, there are essentially no formal vertical linkages, though there is an attempt to improve vertical coordination by sending more precise signals concerning the relative value of alternative carcass attributes.

Behind all these efforts is at least one common objective: to align incentives among the various specialized segments involved in beef production so that quality improvement is in everyone's self interest. As we explain in more detail in the next section, many of the traditional mechanisms for marketing live cattle (both feeder and finished cattle) are seemingly not designed with this objective in mind. In particular, there are significant restrictions on the flow of production-relevant information across the various stages of beef production. For example, feedlot operators are typically not provided detailed information on the genetic characteristics and health status of animals arriving at their feedlots, even when efficient feeding strategies may be contingent on each of these pieces of information. Similarly, ranchers normally receive at most lot-average information on the carcass characteristics of cattle they produce, making it impossible to evaluate the performance of individual breeder cows for improved genetic selection. Of course, removing these sorts of restrictions is not costless. Information has to be collected and transmitted, and perhaps most importantly, incentive structures (i.e., marketing arrangements) must be developed that provide the relevant parties appropriate incentives for doing so. One can only expect organizational change of this nature to occur if the associated benefits are sufficiently large relative to the costs.

To get some feel for the potential magnitude of these benefits and costs, we take a detailed look at one organization's—Chariton Valley Beef Alliance—attempt to overcome restrictions on information flows among cow/calf operations, feedlots, and packers. This particular organization operates as a sort of market intermediary by facilitating coordination within existing market mechanisms, and thus achieves a degree of vertical coordination without formal vertical linkages. As noted earlier, this is in contrast to other types of coordinating institutions—e.g., fully integrated organizations, and other forms of formal vertical linkages.

In what follows, we begin with a brief overview of cattle production and marketing, and provide more detail on the informational barriers that exist in these markets. We then analyze the activities of the Chariton Valley Beef Alliance (CVBA) in the context of these markets. In the subsequent section, we analyze the relative merits of organizations like CVBA that operate largely within the structure of existing cattle markets, and other forms of vertical coordination that may involve significant consolidation of asset ownership and decision-making authority among cattle market participants. The final section concludes.

## **Cattle Markets and Information Transmission**

Our intent in this section is not to provide a comprehensive description of cattle markets, but rather to focus on a particular set of issues having to do with the transmission of production relevant information across the various stages of production. In particular, we examine existing barriers to the flow of production relevant information from cow/calf operators (or “ranchers”) to feeders, and in reverse from packers to feeders and ranchers.

The production process for beef cattle is typically characterized in terms of a number of discrete stages starting with genetic selection and breeding, then rearing and weaning, and finally fattening to market weight (“finishing”) and slaughter.<sup>1</sup> Specialization in cattle markets to some extent mirrors each of these stages: seedstock firms control genetic selection and breed development; ranchers manage cow/calf herds and raise young calves through the weaning stage; feeders raise animals from weaning to market weight; and packers slaughter and process live animals. Although there are many variations on this specialization structure,<sup>2</sup> for the moment we will focus on this particular arrangement.

Ignoring the need to coordinate these various specialized units, one can in principle characterize efficient decision making at each production stage, subject to a given set of growing conditions, breed type, feed costs and other market parameters, and subject to many other pieces of production relevant information. For instance, a feeder’s nutrition and health maintenance program for a given animal (or lot of animals) might conceivably depend on nutrition and treatment histories during the rearing and weaning production stages, thus

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<sup>1</sup>Often the finishing stage is preceded by a “backgrounding” stage that serves as preparation for finishing.

<sup>2</sup>An individual producer might simultaneously ranch, feed, and develop seedstock; some packers own feedlots that supply their plants; and so on.

creating the need for information transmission from ranchers to feeders. Evidence of latent demand for this kind of information comes from two sources. First, in a recent survey of feedlot managers, respondents indicated that they typically receive little information about incoming feeder cattle vaccination schedules, implant or nutritional histories, and even less about genetics and feedlot and carcass performance (Behrends et al., 2001). This is the case even though the vast majority of respondents also indicated a willingness to pay a premium for cattle with accurate information on these criteria. Second, Yeboah and Lawrence (2002) analyzed source verified (SV) and pooled feeder cattle auctions held in Bloomfield, Iowa each October, November and December from 1997-2000. Among other things, source verification programs involve the documentation and third party verification of genetic information, feeding regimes, and health status for sale animals (we discuss the CVBA source verification program in more detail below). This study compared price data from these SV auctions to traditional auctions at the same location to determine whether a premium exists for SV feeder cattle. Hedonic pricing models were estimated to evaluate the price effects of lot characteristics, market forces, and type of market (SV vs. regular sale). After accounting for lot size, the SV premium for lighter cattle (<650/600 lb steers/heifers) was estimated at \$1.30/cwt. and was significant. The SV premium over and above lot size was not significant for heavier feeder cattle.

Transmission of production-relevant information from rancher to feeders is important for real-time decision making in feedlots, while information about management procedures and production outcomes during feeding and finishing is important for future decision making and efficient adaptation by ranchers. Thus, it may also be important to transmit information in the reverse direction, from feeders and packers to ranchers. For example, ranchers need information on feeders' management procedures, finishing performance (e.g., average daily gain, feed efficiency, health status), and post-slaughter carcass quality in order to evaluate past decision making. That such information can indeed improve decision making is documented in Hall et al. (1993) where multi-year participants in steer test programs who received carcass data were able to achieve a greater degree of uniformity as evidenced by smaller standard deviations for hot carcass weight; average daily gain; fat thickness; percentage of kidney, pelvic and heart fat; ribeye area; yield grade; and retail product per day on feed. Forristall et al. (2002) identify important economic tradeoffs among many of these

variables, and Strohbehn (1999) shows that carcass values for producers selling on a grid can vary by as much as \$350 per head within a load.<sup>3</sup> Thus, information that allows producers to more carefully manage and sort cattle can be of considerable value.

While information transmission of these sorts might seem like an obvious requirement for efficient decision making in beef production systems, in fact it rarely occurs. Tracking, recording, and transmitting information is costly; precisely how costly depends in large part on how coordination is achieved. Imagine, for example, that each production segment is represented by a single firm and that these firms are fully “integrated” in that they do business only with each other. Information transmission in such a setting is relatively straightforward, so long as the parties can control various kinds of strategic behavior that might arise. For example, depending on how prices are determined for feeder calves, ranchers may want to falsely report information about their calves that would increase their value in the eyes of the feeder. Unless all relevant information about the calves can be obtained from visual inspection (in which case information transmission occurs trivially), some procedure is needed for verifying information reports. In the relatively simple organizational structure contemplated here, where in particular the parties are engaged in a repeated relationship, it is perhaps natural to suppose that these kinds of strategic problems can be overcome with dynamic incentives, and without incurring the cost of third-party information verification. This might be the case when a small farmer-feeder obtains cattle from the same ranch or ranches with whom long-standing relationships exist.

Now imagine a slightly more complicated organizational arrangement with a single feeder firm, a single packing firm, and a large anonymous group of ranchers who supply weaned calves to the feeder. Because the ranchers are anonymous, the parties can no longer rely on dynamic incentives, and must rely instead on some form of costly third party verification. We can complicate things still further by supposing that there are two or more feeders who compete for the supply of feeder calves at any given point in time. Then, in addition to third party information verification, some mechanism (e.g., auction) is needed to allocate available calf supplies efficiently. Although it is not immediately apparent how the need for such a mechanism further complicates information transmission, it is important to recognize that

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<sup>3</sup>Most of this variation is accounted for by discounts for “nonconforming” cattle (Trenkle, 2000; Ward and Lee, 1999)

once established, its proprietors may have an economic interest in restricting information transmission. Such is apparently the case for some livestock auctions. There is anecdotal evidence that traditional auction barns fear detailed information transmission and communication between feeders and ranchers (i.e., the removal of anonymity). Transacting parties may conduct their business outside the auction to avoid associated marketing and commission charges. Finally, we can add one more layer of complication: in actual markets between ranchers and feeders, it is typically the case that only *some* ranchers and feeders wish to engage in more intensive information transmission.<sup>4</sup> If the cost of setting up a separate market for these feeder cattle is excessively high, then the existing market must simultaneously handle both types of animals; as we will see below this induces significant transaction costs.

If the previously described costs are sufficiently high, the transacting parties may choose to either forgo information transmission entirely or may seek some substitute information that is perhaps not quite as detailed but less costly to obtain. In the context of markets for feeder calves, so-called order buyers possibly fill this role. These are specialized individuals (and sometimes firms) whose expertise lies in evaluating feeder calves through visual inspection. Many feedlots either employ (or “contract”) order buyers to supply calves with traits that are appropriate given the expected environmental conditions, end product markets, and management practices of the particular feeding operation.<sup>5</sup> However, any such visual inspection, no matter how experienced the buyer, is an imperfect substitute for perfect transmission of all production relevant information. Specifically, vaccination, nutrition, and treatments histories cannot be observed. Feedlots conservatively assume the worst case, often expecting the need to readminister treatments, and therefore reduce bid offers.

A similar set of arguments and discussion can be applied to information transmission in the reverse direction from packers to feeders and ranchers. As noted above, information about carcass traits is important to firms upstream from packers in order to assess the impact of

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<sup>4</sup>For example, some ranchers and feeders may choose to specialize in the production of “commodity” beef, yet still wish to use traditional marketing channels.

<sup>5</sup>Interestingly, there are also USDA established grades for feeder cattle, though they are rarely used explicitly in actual pricing mechanisms between ranchers and feeders. Twelve distinct grades classify calves into various combinations of “frame size” (skeletal structure in relation to age) and “thickness” (development of the muscular system in relation to the skeletal system)(U.S. Department of Agriculture, 2000). Importantly, these grade attributes all pertain to physical characteristics of animals—there is no assessment of health status, prior feeding regimes, or any other “unobserved” attributes that may be important to feedlot operators.



decisions on performance, and to update decision making rules. Traditionally, cattle markets have functioned without explicit transmission of carcass attributes to upstream producers.<sup>6</sup> Recently, however, grid pricing—where the price paid for a given animal depends on various measured quality attributes, in addition to the total weight of the animal—has become increasingly common. Relative to traditional spot markets where price is based on live or carcass weight with no explicit adjustment for quality, significantly more information is reported back to ranchers and feeders. However, the information that is reported back is generally not animal specific, and even if it is, it often is reported only to feeders (and not ranchers). We explain why this is so below, but for now we just note that in most grid pricing mechanisms, packers report the distribution of carcass quality for a given lot of animals,<sup>7</sup> rather than the carcass quality of each individual animal. Thus, for example, a feeder might learn that 60 percent of a given lot graded “Choice,” 40 percent graded “Select,” 70 percent “Yield Grade 2,” and 30 percent “Yield Grade 3,” but not know how individual animals within the lot graded. This is important because management decisions often vary across different animals that are priced in the same lot,<sup>8</sup> and feeders may want to know the carcass traits of individual animals in order to assess the efficacy of their management decisions.

In the next section, we describe the activities of one organization that is attempting to overcome these kinds of informational barriers in an effort to improve farm-level decision making. We then provide a qualitative analysis of the organization’s activities and discuss alternative organizational structures that are attempting to achieve a similar level of informational transparency and coordination between the various stages of production. Our intent is to use the activities of this organization as a sort of case study of organizational innovation in agricultural markets. We also hope to shed some light on the important organization-theoretic question of why markets generally seem to be poor mechanisms for transmitting non-price information across individual producing agents.

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<sup>6</sup>Some information is implicitly transmitted when buyers visually inspect animals for purchase and arrive at a bid price. Indeed, Schroeder et al. (2000) note how packing plants often provided order buyers with grid sheets indicating price premiums and discounts to award (or penalize) various expected (based on the buyer’s *visual inspection*) quality outcomes. Nevertheless, the information conveyed through a buyer’s bid aggregates information about individual carcass attributes that may be valuable in disaggregate form.

<sup>7</sup>A “lot” of cattle in a typical feeding operation represents roughly 150-200 head.

<sup>8</sup>This is an unavoidable consequence of uncertainty that’s inherent in the biological production process for cattle. Animals mature at uneven rates so that a feeder may need to pool cattle across heterogeneous feeding and health maintenance regimes when preparing a lot for delivery to the packer.

## **The Chariton Valley Beef Alliance**

The CVBA, which represents about 350 cattle producers in southern Iowa and northern Missouri, has been in place since early 1998. Initial motivation for the alliance arose from an increasing use of grid pricing arrangements by area packers, and resulting producer interest in learning to effectively produce, sort, and market cattle under these arrangements. There was also general interest among area producers in “adding value” to their cattle by improving quality and identifying higher paying markets. In this section, we provide a brief overview of the organizational structure, administration, and funding of CVBA, and then describe the set of activities in which the organization is currently engaged. The organization’s primary activities directly address the informational barriers discussed in the previous section.

### *Organizational Structure and Membership*

The CVBA legally is structured as a 501C non-profit organization. It is governed by a seventeen member elected board of directors representing twelve counties and five at-large seats. The organization was initially founded by local area cattle producers and with technical assistance from several partners including Iowa State University Extension, Iowa Cattleman’s Association, and the Iowa Farm Bureau. Initial funding for the organization was based on a three year grant from the Leopold Center of Sustainable Agriculture, with additional support provided by the Iowa Farm Bureau, and various other small grant programs. The organization also receives funds from annual membership dues (\$25 plus \$.25 per head marketed, not to exceed \$100), and charges various service fees (explained below) on a cost-recovery basis. There is no commitment of any kind associated with membership, and anyone can become a member. In addition to outside grant support, the organization benefits from significant in-kind support (office, computer, and phone) from local county Extension. Annual operating costs for the organization (roughly thirty thousand dollars) are comprised mostly of salary for one part-time and one full-time employee.

The average beef cowherd size in Iowa is 37.5 head. The 12 counties in South Central Iowa where CVBA originated have over 20 percent of Iowa’s beef cowherd and the average herd size is slightly larger than the state average—over 42 head. Active CVBA members are described as larger and more progressive than typical Iowa cow/calf producers with most

ranging in size from 80 to 350 beef cows. The 100 or so active users of CVBA services treat their herds as a commercial enterprise and many of these producers also feed their own calves and may buy other cattle to feed in their small feedlots. The relatively small cowherds and feedlots the members own allow them to utilize carcass data and market information services to improve management and marketing options. However, their small size also makes it difficult to justify the cost of providing these services by themselves.

### *Services*

CVBA provides three kinds of services to member producers: grid marketing support and coordination of load deliveries, carcass data collection, and source verification. We discuss each service in turn.

*Grid Marketing Support and Load Coordination.* Grid pricing greatly increases the incentive to sort cattle into relatively uniform lots that will perform well on particular grids. A typical grid offers a base price for “Choice Yield Grade 3,” and then premiums and discounts for quality outcomes above and below this base. However, the specific premiums and discounts offered can vary substantially across different grids. Table 1 contains actual premiums and discounts offered on a subset of quality and yield grades for three different grids (labeled A, B, and C) during the week of November 27, 2001.

Direct observation of the numbers in these grids (and ignoring other quality premiums and discounts not reported here), reveals the potential opportunities for growers (and packers, assuming that specified premiums and discounts reflect market opportunities) to gain from efficient sorting. For quality grades Prime, Choice, and Choice+, grid B offers a higher premium than grid A for yield grades 1-3, but also a larger penalty for yield grades 4 and 5. Also, grid B weakly dominates grid C across all quality and yield grades reported in Table 1. Finally, note that quality and yield grade premiums are not additive in the sense that the marginal premium for an increment in quality (yield) grade is conditionally dependent on the level of yield (quality) grade.

Of course, it is impossible to know the exact distribution of quality within a given lot at the time a feeder markets his or her cattle. Relative to traditional spot markets, where buyers pay a fixed price for live animals, feeders thus bear substantial quality risk. However, this

TABLE 1. Selected Southern Iowa Price Grids.

Grid	Yield Grade	Quality Grade				
		Prime	Choice+	Choice	Select	Standard
		premium (\$/cwt)				
A	1	8.75	6.75	3.75	-2.25	-35.00
	2	8.25	6.25	3.25	-2.75	-35.00
	3	5.00	3.00	0.00	-6.00	-35.00
	4	-10.00	-12.00	-15.00	-21.00	-50.00
	5	-15.00	-17.00	-20.00	-26.00	-55.00
B	1	13.00	8.50	5.00	-2.00	-20.00
	2	11.00	6.50	3.00	-2.50	-20.00
	3	8.00	3.50	0.00	-3.00	-20.00
	4	-12.00	-16.50	-20.00	-23.00	-40.00
	5	-17.00	-21.50	-25.00	-28.00	-45.00
C	1	11.00	8.50	5.00	-3.00	-20.00
	2	9.00	6.50	3.00	-3.00	-20.00
	3	6.00	3.50	0.00	-3.00	-20.00
	4	-14.00	-16.50	-20.00	-23.00	-40.00
	5	-19.00	-21.50	-25.00	-28.00	-45.00

Source: Personal communication with Diana Bodensteiner, Chariton Valley Beef Alliance.

risk also entails a benefit which is the added incentive feeders have to produce high quality animals, and to carefully sort a given distribution of quality. To the extent that growers and feeders are able to influence the quality of their cattle, and match heterogeneous cattle with the appropriate grid, these incentives can yield substantial benefit. Sellers and Bodensteiner (2001) summarize year 2000 performance for CVBA participants on roughly 4000 cattle marketed into 4 different grids. On a per lot basis, premiums averaged \$26.05 per head with a range of negative \$40.44 to positive \$79.01 per head.

The CVBA assists growers in acquiring the skills to manage and sort for quality. This is primarily accomplished with analysis of growers' carcass data, which we discuss in the next subsection. CVBA also provides weekly grid-market reports, comparing base-price bids across grids, that include publicly available price information, and base price information collected from each packer individually. The base price information requires a bit of explanation. Briefly, grids commonly used in Iowa are "formula" grids that pay growers a base price which is a function of the U.S. Department of Agriculture's Nebraska weighted average price, and the distribution of quality for each individual plant where a grid is offered. The specific functional relationship is composed of the USDA weighted average price report,

plus a packer specific adjustment (or “cleanup”) to ensure that the average price paid for cattle in any given week (including premiums and discounts) is equivalent to the Nebraska weighted average price. Thus, the clean up is calculated as the average premium (discount, if negative) across all animals delivered in a given week, and this amount is subtracted from the Nebraska weighted average price to yield the actual base price. Such an adjustment effectively ensures that each packer pays roughly the same average cost for cattle (as is the case in the market).

Finally, given the size of most cattle operations in southern Iowa, it is often the case that a producer will have a number of cattle ready for sale on a given grid, but insufficient quantity to fill an entire truck. In such cases, CVBA also provides support for growers to coordinate in jointly filling a truck load for delivery to a particular packer. This service can result in substantial transportation efficiencies for long distance hauls, allowing growers to sort more precisely and access grids at more distant packers.

*Carcass Data Collection.* As mentioned in the previous section, grid marketing involves the pricing of individual animals (rather than lots of animals) based on the measurement of various carcass-quality attributes, yet animal-specific carcass measurements are rarely transmitted back to the feeders and cow/calf producers who deliver under these arrangements. One important—perhaps the most important—activity of CVBA is to facilitate and coordinate this transmission. Producers interested in obtaining carcass data pay a service fee to CVBA (\$3-\$8 per head), who then coordinates with a third party to physically carry out carcass measurement during slaughter; these measurements are then recorded in electronic form for access by the relevant producer. Packers cooperate in this process by allowing third party access to the slaughter floor to measure economically important carcass traits (beyond those reported in USDA yield and quality grades). CVBA additionally provides computational and analytic support for accessing and interpreting the relevant data. This analysis allows growers to make better marketing, nutrition, and genetic decisions.

While it might seem a trivial matter to distribute animal specific carcass quality data to producers (given that prices are determined with this data), in fact it is quite a complicated and costly endeavor. As indicated above, doing so adds anywhere between \$3 and \$8 dollars per head to the cost of production; Iowa State University Extension estimates a gross margin

of roughly \$15 per head for Iowa feedlots, so these amounts are quite large.<sup>9</sup> In any case, ranchers are the primary potential users of animal specific carcass data,<sup>10</sup> but are one step removed from packers. This further complicates collection of the data, because feeders must cooperate in obtaining the relevant data.

*Source Verification.* Assessing quality in markets for feeder cattle is a notoriously difficult task. As discussed above, USDA quality grades do exist for feeder cattle, but they are rarely used; quality assessment is instead largely carried out through visual inspection by experienced buyers. Many of the important “quality” characteristics of feeder calves are of course not fully expressed until the calves have been fattened and readied for slaughter. In practice, this difficulty is overcome to a certain extent through the nature of contracting arrangements between ranchers and feedlots. In some cases, revenue from finished cattle sales are shared between the two parties, and in other cases ranchers retain ownership of their cattle through the finishing stage. Nevertheless, the bulk of cattle are “sold” by ranchers to feedlots through traditional market mechanisms (e.g., auctions and spot negotiations), and quality assessment at the point of sale is a highly subjective process.

One means of making this process more objective is to provide third-party verification of genetic and health characteristics of feeder cattle. While the ultimate “quality” of the finished animal is impossible to assess at the point of sale between rancher and feeder, it is possible to evaluate quality potential through this type of information. Moreover, if we define quality broadly to include potential cost efficiencies from acquisition of production relevant information as described earlier, then such information can be of further value. Anecdotal evidence suggests that significant amounts of “excess” treatment occur in feedlots as a prophylactic response to uncertainty about animal health status. CVBA assists in arranging third party verification through its source verification program. In addition to providing an objective measure of quality, source verification provides feedlots with accurate information on the status of medical treatments that have occurred prior to the point of sale, and the

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<sup>9</sup>The difficulty in obtaining the data lies in the nature of the cattle slaughter and packing process. When an animal enters the plant and is slaughtered, it is immediately hung on a rail tracking system and assigned a plant identification code. However, “rail outs” of some animals disrupt the matching of plant ID’s with growers’ ID’s at the point of grading. The task of the third party is to manually track animals through to the grading point using the growers’ ID’s, and to physically measure economically important carcass traits.

<sup>10</sup>Other users of this data include feeders, breeders interested in the performance of progeny, pharmaceutical companies, university researchers, and others who want to measure carcass performance for research purposes.

genetic composition of animals in a given lot. Finally, CVBA's source verification program includes agreements by those receiving information on feeder cattle to return information on carcass quality. Information thus flows in both directions.

Interestingly, CVBA attempts to operate within existing market institutions to facilitate further vertical coordination of this sort. However, perhaps for this very reason the organization has had limited success so far in establishing a self-sustaining source verification program. Existing market mechanisms are extremely well adapted to aggregating supplies and coordinating their efficient allocation to prospective buyers. However, they are less able to handle idiosyncratic and specialized transactions. For example, source verified cattle are only of value to buyers if they are purchased in lot sizes that are sufficiently large to be treated separately from other (non-source verified) cattle. If a buyer must form a lot with both source and non-source verified cattle, he or she will likely treat the entire lot as though it were non-source verified to avoid the additional cost of maintaining separate management information for each animal. Moreover, as mentioned earlier, the proprietors of existing markets have a vested interest in maintaining the status quo. As a result, any move toward further vertical coordination between buyers and sellers is viewed with great suspicion, and efforts to facilitate the logistical needs of these parties are limited.

### **Barriers to Information Transmission and Incentives for Vertical Integration**

The activities of CVBA described above highlight the difficulty in transmitting information across firm boundaries and in processing information for use in actual decision making. At least three generic sorts of problems seemingly limit the free flow (and subsequent use) of information among the various stages of beef production.

1. *Information Asymmetries.* There are opportunities for strategic misreporting of information that arise from information asymmetries and differences in objectives of the contracting parties. A single rancher who sells feeder calves to a finishing lot may wish to overstate the health status of his or her animals in an attempt to bargain for a relatively high price. To the extent that health status is difficult to observe from visual inspection, full (and accurate) information transmission may require some form of documentation (e.g., treatments and test outcomes) and verification.

2. *Relationship Specificity.* The relevant parties must agree on a procedure for documenting and coding information. This requires agreement on a specific set of terms and definitions that each party must learn, and a specific format for recording information. Moreover, the relevant parties must devote labor effort to learning any such procedure that is developed, and to the actual recording and tracking of the relevant information.<sup>11</sup> Ranchers may be unwilling to invest in learning the procedures of one buyer, if they expect this effort to go unrewarded when dealing with some other buyer. Similarly, the parties must collectively solve logistical barriers to recording and tracking information so that it may be transmitted to the relevant parties. Packers apparently have little incentive to overcome the logistical barriers involved in tracking grower and animal specific identifications during processing. This lack of incentive arises in part because each packer individually does not expect to earn the full benefits of improved future cattle quality—all packers benefit to some extent.
3. *Bounded Rationality.* Individual producers (e.g, ranchers or feedlot operators) may lack the capacity to process information for use in actual decision making. Data analysis is a highly specialized skill.

As noted in our introduction, some authors have suggested that vertical integration is necessary for further improvement in cattle quality. This conjecture is consistent with the fact that organizational theorists often cite the generic problems enumerated above as principle motivations for vertical integration (e.g., Milgrom and Roberts, 1992). However, there are many different ways in which vertical integration can be defined, so it is not entirely clear what specific kind of vertical integration is necessary for further coordination improvements. Vertical integration may be defined in terms of the set of contractual requirements placed on sellers (e.g., the suggested use of specific inputs or management practices; product specifications), or possibly by the ownership of physical assets across multiples stages of production. The key feature of a vertically integrated system that seems important in the context of

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<sup>11</sup>Interestingly, increasing concern about food safety (and more recently, “country of origin labeling”) has resulted in efforts to establish systems for “traceability”; i.e., the tracking of firm identifications, and slaughter and packing dates associated with individual animals. In principle, there is no reason why other pieces of information, such as medical treatments, growth and carcass performance, etc., could not be added to each animal’s record. However there is still the need to coordinate on the format and content of this additional information. Recent experience with National Cattlemen Association efforts to establish a voluntary standard for data recording suggests this is not a trivial matter (Smith, 2002).



cattle markets is the establishment of a long-term (potentially exclusive) relationship among the relevant transacting parties. Standard transaction cost arguments (e.g., Williamson, 1985) suggest that a group of ranchers and a feedlot who commit to a long-term relationship (via an arms length contract, or by becoming a single firm) can have confidence that any investment undertaken to establish an information tracking system will not be wasted. Similarly, committing all future deliveries to a single packer can ensure that any investments undertaken by the packer to solve the logistical problems associated with reporting (animal specific) information on cattle quality will be fully rewarded. With a long-term relationship, the transacting parties may also avoid the need for third party information verification,<sup>12</sup> and can save on information processing costs by establishing a “culture” for coordinating the accumulation of firm-specific knowledge (Cr mer, 1993; Kreps, 1990).

While clearly beneficial in some respects, long-term commitments (i.e., vertical integration) of this sort also entail costs. In particular, the parties to such an agreement limit their use of markets, which offer greater flexibility in procurement and sourcing options, enhanced price discovery, and arguably higher powered incentives toward cost-reducing activities. “Firms” inevitably involve elements of bureaucracy that can lead to inefficient resource allocation decisions, and possibly higher overall production costs. Activities by organizations like CVBA can thus be viewed as attempts to achieve the degree of coordination and information transmission observed in firms, but without sacrificing the benefits associated with market institutions. Whether or not such an outcome can in fact be achieved is an empirical question that will be answered with time. In the interim, attempts to further characterize the relative costs and benefits of alternative organizational structures represents an important area for further research. For example, the discussion in this paper (and in much of theoretical literature on organizational design) views “firms” and “markets” as substitute organizational structures. In cattle markets, there seem to be instances of important complementarities

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<sup>12</sup>In a repeated relationship, the transacting parties can rely on reputation as an enforcement device, thus eliminating the need for third-party involvement (e.g., Schotter, 1984; Bull, 1987).

where, for example, market prices are used within firms and among participants in vertically coordinated arrangements as a reference point in establishing terms of trade.<sup>13</sup>

## Conclusions

In this paper we identify a number of seemingly obvious shortcomings in the way cattle production is organized, and discuss one organizational response to these shortcomings. Traditional cattle markets, while extremely efficient means of allocating cattle supplies across buyers, lack mechanisms for animal-specific information transmission. Given the segmentation observed in cattle production, information transmission is important for efficient decision making at each of the various production stages. The lack of information transmission represents a coordination failure: All parties involved apparently understand the potential gains from improving communication, but lack appropriate incentives to do so. In some cases, various kinds of transaction costs must be incurred to bring about change. Given that actual change has been slow to occur in these markets, either these transaction costs are large relative to the benefits from improved coordination, or the uneven distribution of benefits across industry participants limits incentives for one or more of the parties to participate.

If an alliance of producers such as the one considered here is unable to achieve greater coordination within existing market institutions, some form of direct vertical integration may emerge instead. The recent (and failed) initiative by the organizers of Future Beef to form a ranch-to-market production organization represents one example of movement in this direction (Economist, 2003). Recently proposed legislation to ban or limit the extent of contracting and vertical integration in cattle markets (e.g., Schuff, 2002) clearly provides support for efforts to achieve coordination within markets, though possibly at the cost of biasing organizational evolution, and slowing the development of improved coordination systems.

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<sup>13</sup>See Holmstrom (1999) for a discussion of complementarities between firms and markets where imperfect performance measurement is the key contractual friction. For recent surveys of empirical work on organizational design see MacLeod (1995) and Prendergast (1999). Hueth and Hennessy (2002) survey recent empirical work in agricultural markets with a focus on risk.

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