

Animal Identification



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Some Issues Related to Beef Traceability: Transforming Cattle into Beef in the United States

Overview

The technological steps used in transforming live cattle into consumer beef items and the nature of wholesale beef prices present some interesting issues regarding the traceability or the maintenance of identity throughout the beef packing process in the United States. These limitations are sometimes overlooked when policy makers, agricultural producers, retailers, and restaurants discuss animal identification.

A steer that enters a packing plant is transformed into many different products. This fact sheet provides a description of the beef packing steps and highlights the nature of traceability, focusing on the difficulty of maintaining animal identification (ID) in the fabrication process. Next, the nature of wholesale prices is briefly discussed to indicate the large differences in value of major carcass components. In recent years, data available from the USDA Agricultural Marketing Service shows how beef carcass component values vary due to beef quality grades and marketing approaches such as branding. Traceability is potentially a new market characteristic at the wholesale level.

Background

Over the past 30 years, the U.S. cattle and beef industry has undergone significant changes in the production, processing, and marketing segments. Retail and foodservice customers have driven many of these changes. A key development in the cattle/beef industry often overlooked is how beef is marketed today at the wholesale level. Not long ago the beef industry was considered a carcass-based industry, in that much of the beef was marketed to retailers and further processors in full carcass form. Today the majority of beef marketed by packers is traded in cuts derived from the primal (i.e. rib, chuck, round, loin, etc.) and sub-primal sections. Once the carcass has been processed, cuts are assembled, typically from several carcasses, and are boxed in preparation for shipping to retailers and food service buyers. More recently, some retailers



now buy beef products from packers in case ready form. Additionally, more and more beef products sold to restaurants and other food service institutions is pre-processed and sometimes fully pre-cooked.

This modern U.S. beef processing and marketing system is a major contrast to the much more traditional production systems that dominate other regions of the world where traceability from farm to retail consumer has generally moved forward more rapidly than in the United States, specifically in parts of Europe and Japan. In those countries, carcasses are often the packer's end product with a traditional butcher processing the carcass into consumer cuts. A typical U.S. beef slaughter facility is much larger with higher capacity than in other countries. Additionally, the U.S. packer typically purchases cattle from a rather large geographical area and transports the end-product long distances to domestic population centers and to foreign destinations.

These changes in the U.S. beef industry have been associated with a variety of economic and technological factors. The U.S. packing industry can be described as a low cost, high volume business. A rather high proportion of costs are fixed in the form of plant, equipment, etc. That is, they are not easily adjusted, and processing a high volume is key to maintaining low total costs. The packing/processing sector of the beef industry can also be described as relatively concentrated in terms of the number of firms involved (Ward, 2002) and the geographical location of the firms (beef packing plants tend to be located near the areas where feedlots are

concentrated, especially in the High Plains). In general, the processing sector of the beef industry mass produces high quality and very safe beef products. In the context of implementing traceability systems and policy, how the processing sector operates in the United States may help identify issues and constraints.

Some Details of the Production Process

The majority of cattle for slaughter are marketed by feedlots to a packing (meat processing) company. Feedlots typically identify and group (or sort) cattle based on a variety of physiological characteristics such as frame size, breed, sex, in-weight, and expected degree of finish at the time of the sale. During the feedlot stage, cattle may be sorted again, and prior to offering, they are sometimes re-sorted.

When negotiating the purchase price of slaughter cattle, delivery specifications such as date are usually defined. Upon arrival at the packing plant there may be some sorting of animals. But usually sorting becomes more significant during the initial and subsequent inspection processes (live animal health inspections and the sanitary and meat evaluation inspection processes).

Transforming cattle into beef is often described as a disassembly process. A general schematic is provided in Figure 7-1 (note the wide arrows that indicate cattle, carcass and meat flow). Disassembly is a good descriptor of the beef packing process and highlights the contrast of this business with most other manufacturing processes. For instance, most manufacturing processes construct products by

putting pieces and parts together, but packers take a complex unit, a carcass, and take it apart to create their final product. The end-products of a modern beef packing plant are boxes of cuts (e.g., tenderloin, chuck, top round, strip steak, beef trimmings for hamburger), not whole carcasses.

The first major packer operation (Stage 1 in Figure 7-1) involves slaughter or harvest of the animal. Then the hide and internal organs are removed and a carcass is left hanging (hooked to a trolley transportation system). Carcass evaluations and inspections are then conducted. Next the carcass is moved to a cooler.

At the cooler (Stage 2 in Figure 7-1) the temperatures of the carcasses are reduced and carcasses are stored (meat locker). Cooler sorting for specific carcass grades and other characteristics (e.g., size) is common. After chilling and sometimes additional ageing, batches of carcasses are scheduled for further fabrication (disassembly).

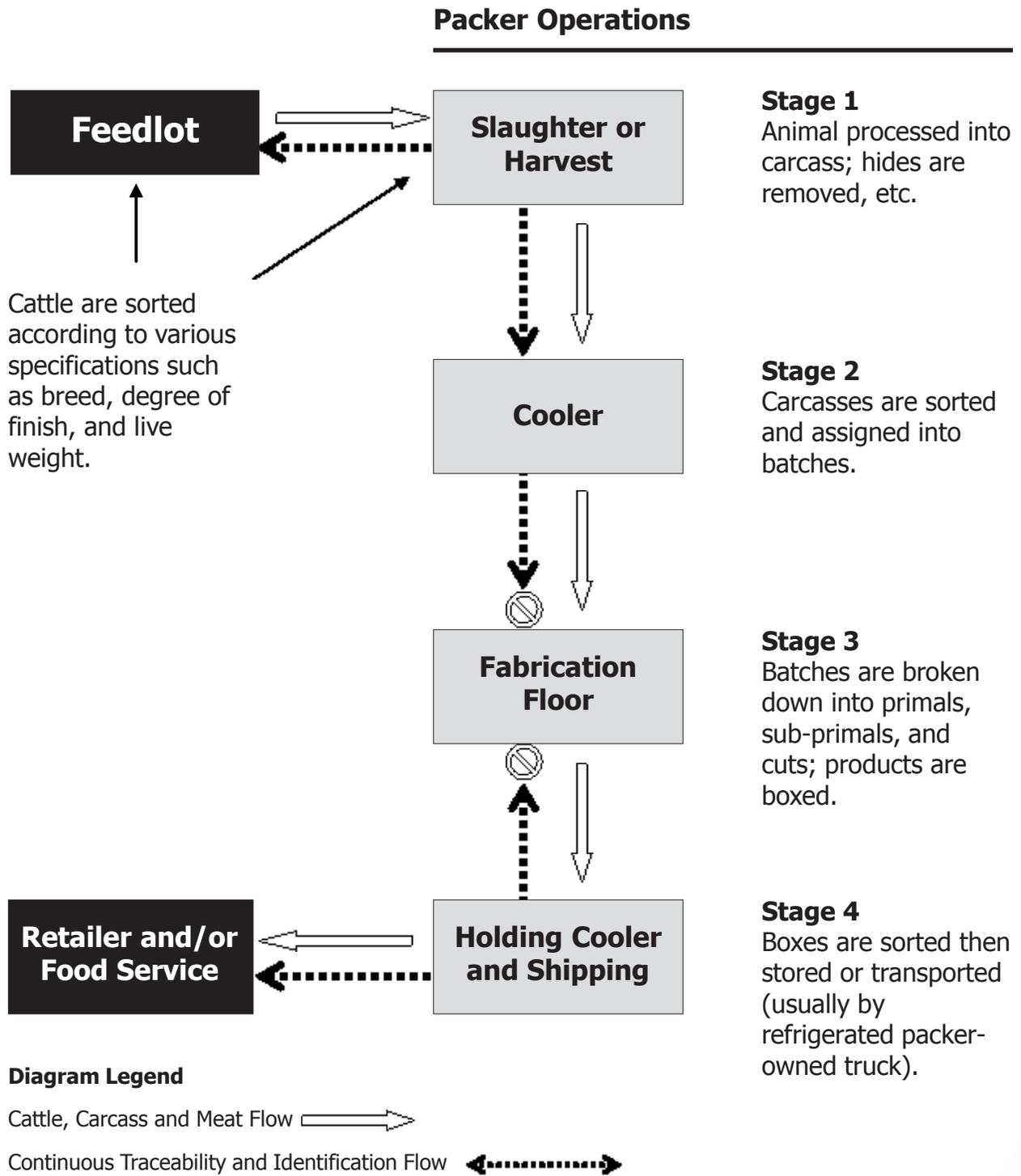
The fabrication stage (Stage 3 of Figure 7-1) is often referred to as the “fab floor.” This stage is not a linear process. First carcasses are made into large primals (i.e., quarters of the carcass). Parts of carcasses move in different directions throughout the fabrication facility while being further cut, trimmed, sized, etc. Many specialized butchers work on different parts of a carcass, and processing involves crisscrossing carcass components and products to many people in different locations. At each

cutting stage, trim from the process is collected from many carcasses. At the end of the fabrication stage, for example, cuts from several carcasses are combined into boxes according to standard industry specifications, such as size, quality grade (e.g., Prime, Choice, and Select), and increasingly to pre-specified purchaser or special program specifications.

At the final stage in a typical U.S. beef packing plant (Stage 4 of Figure 7-1) boxes of cuts are moved into coolers prior to transportation to end users (retailers or food service companies). Each packer sells a whole range of cuts, portion cuts, and quality grades. For example, USDA’s Institutional Meat Purchase Specifications (IMPS) lists about 30 beef products for the loin, each with four standard weight ranges and 20 “portion cuts” products for the loin. IMPS also lists products from the beef round in four weight categories. In addition to standard meat cuts, many packers also sell branded and further processed products.

Often the beef is not yet sold at the final stage in the packing process. So the packer may not know who the buyer will be. Therefore, throughout the production process, the packer will often not know if the buyer is interested in or willing to pay for traceability. Consequently, some firms view beef traceability as an “all or nothing” situation for a particular production plant, meaning that every product is traced or nothing is traced.

Figure 7-1. Schematic of Wholesale (Packer) Sector Stages and Linkages



A Challenge for Traceability: The Fabrication Stage

Individual animal ID has emerged as one of the key issues confronting today's beef and cattle industry. ID is also part of the broader issues of traceability from producer to consumer (Bailey, 2004). Assuming ID is in place, what happens next?

The National Animal Identification System (NAIS) is often referred to as a "live animal" traceback system because this identification approach typically stops during the initial stages of the packer operations. That is, a system must move beyond live animal or whole carcass ID to allow traceback of a beef product from a consumer's plate or retail establishment to the farm gate. As discussed in the previous section and as shown in Figure 7-1, the nonlinearity of most beef packers' fabrication production stage causes a disconnection between an individual carcass and the resulting beef products.

Tracking products within the packing process is an ongoing and rather routine business practice. Traceability implies that information and tracking flows both forward with the product and can also be followed back to previous stages in the production/marketing system. Of course, many plants have made substantial investments in technology to implement aspects of traceability. Figure 7-1 (note the dashed arrows) depicts where continuous traceability and identification can be achieved with technology investments.

For an animal carrying an ID system, some packing plants will transfer pertinent data to an electronic data device attached to the hook

that carries the carcass. This system provides traceability beginning at slaughter and, with computer software, back to the feedlot of origin. Since the carcass stays on the same hook, traceability can be maintained to the cooler.

However, as the carcass goes to the fabrication floor (Stage 3 in Figure 7-1), linear traceability of one animal from the time it begins fabrication to the time it becomes boxed beef is a problem in modern, large-scale packing operations. The rapid reduction of carcasses into many beef products in different parts of the fabrication floor and the commingling of like cuts from different carcasses to create consistent boxes of beef cuts and products makes direct tracking of products back to an individual animal/carcass or farm-of-origin during the fabrication process almost impossible with current processing systems and animal ID technology. Plus, the final product (boxed beef) usually contains products from one to many different carcasses. Therefore, at the processing stage the direct traceability link established through individual animal ID is broken once the carcass is fabricated and cuts from other carcasses are commingled.

However, at the fabrication stage other record keeping linkages are possible with prior and subsequent stages in the production system. For example, instead of linear flow of individual animal identification, groups of carcasses could be traced through the fabrication floor based on time and batch. That is, a system of time and date indicators (e.g., stamps) can be associated with this stage. So the carcass and final box are traceable within a

group or batch. However, getting an exact link back to an earlier stage of the production system is not typically done. Processors who currently use this system are able to deal with problems such as food safety concerns for a whole batch of meat products; however, they are not able to trace the meat back to the feedlot or an individual producer. Thus, the batch traceback system is helpful in the case of food safety related meat recalls that occurred at the processing level, but it does not help if the concern was related to a live animal disease.

The product the packer sells is a box of beef cuts. At the completion of the fabrication stage, labeling and full individual linear traceability can potentially be resumed. In fact, many packing plants have already made investments in this technology. The final product box is labeled (with a bar code, for example), and throughout the holding and shipping process (Stage 4 in Figure 7-1) instant updates are available regarding location of the product and the capability of traceback to the fabrication batch would be possible.

Aspects of Beef Wholesale Values

Traceback of meat products to individual carcasses and farms-of-origin may be difficult, but technology may soon be developed that makes the traceback process more and more feasible. In order for the technology investment to occur, there likely needs to be an economic incentive for the processor (or someone else downstream in the supply chain) to invest in the technology necessary to provide individual animal and product traceback throughout the supply chain. A

question then exists regarding what economic incentive is there for a processor to invest in technology allowing traceback of beef products to the original carcass. When buyers desire product attribute verification or the maintenance of identity, there is increased interest in full traceback (Curtis, 2004). For some beef products, branded items already bring a premium, and branding implies traceback at least to the packer. Those interested in maintaining identity preservation through the packer stage need to understand how values differ within and between carcasses.

The major indicators describing the wholesale market are the boxed beef cutout values. The boxed beef cutout value is an aggregation of individual meat cut prices designed to estimate an average carcass-related price at the wholesale level. These values are calculated by USDA's Agricultural Marketing Service (AMS) and include several values representing Choice and Select wholesale values.

In 2002, as part of Mandatory Price Reporting legislation, AMS introduced the Comprehensive Boxed Beef Cutout Report. Unlike the boxed beef cutout, the comprehensive report is based on all sales of Prime, Choice, Select, Ungraded (cuts, grinds, and trim), and Branded beef that are sold on a negotiated, formula, forward contract, other domestic, or export basis. Beginning in April 2003 AMS began to report the individual primal component cutout values (Prime, Branded, Choice, Select, and Ungraded) of beef in this weekly report.

Analysis of the Comprehensive Boxed Beef Cutout value data provides information on the pricing of meat in the wholesale beef market and shows that beef cutout values vary greatly depending on grade, branding, and the part of the carcass the beef comes from. Figure 7-2 shows recent average wholesale cutout value data for various grades of boxed beef. Additionally, Figures 7-3 and 7-4 show separate cutout values and for two key primals, the loin and the chuck, respectively.

In comparing the different quality grades of the beef cutout values (Figure 7-2), the Prime cutout value consistently has the highest value among all the other quality categories on a monthly basis, but only a small percentage of beef is of Prime grade. This represents the distinct premium received for Prime graded beef, most of which is purchased by upscale restaurants. Branded beef is the next highest price category, followed closely by Choice. The Select grade has a slight value premium over the Ungraded cutout, as shown in Figure 7-2. On the other hand, further statistical analysis concluded that the Select and Ungraded cutout values are not significantly different in terms of value in the wholesale market (Stone, 2004). However, this relationship does not hold true for many of the individual primal (chuck, loin, rib, round) quality grade cutout values.

Certain products such as a Prime graded loin receive a substantial premium; whereas it appears there is no market incentive to pay a premium for a Prime graded chuck, round, brisket, or flank in the wholesale market. This finding is not surprising, given that many high-value beef cuts are derived from the loin

Figure 7-2. Selected Wholesale Beef Cutout Values

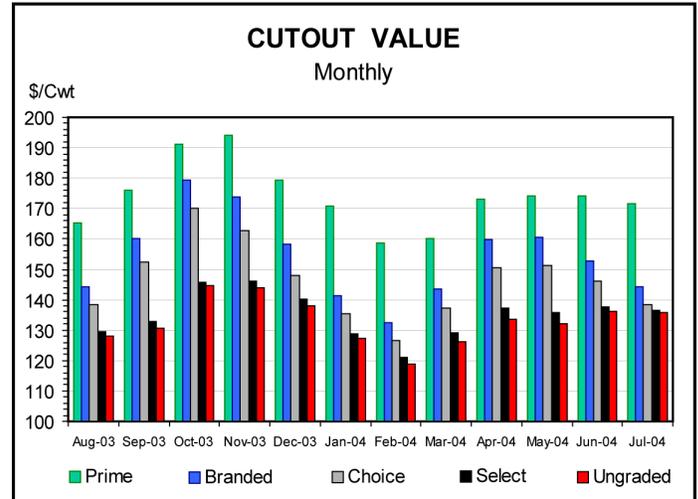
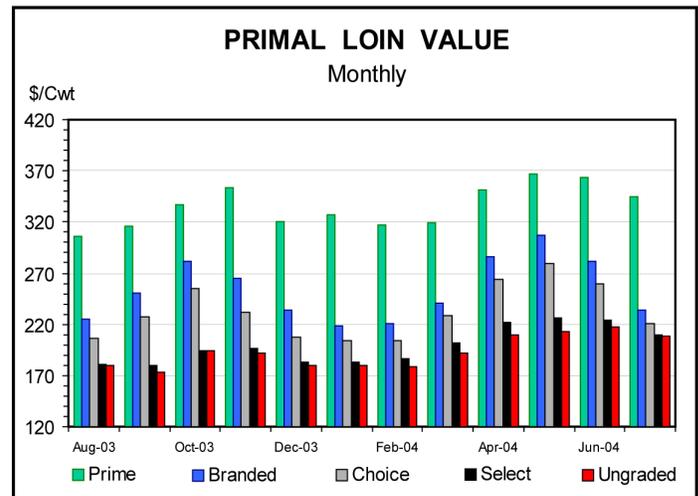


Figure 7-3. Selected Wholesale Beef Values - Loin



(i.e., tenderloin). Similar to many of the individual primal component cutout values, there is distinctive difference between the values for Select and Ungraded loins (Figure 7-3). Overall, these are also the lowest valued and, thus, the least desirable quality grades for the loin. This relationship is also exhibited when comparing across quality grades for the primal rib.

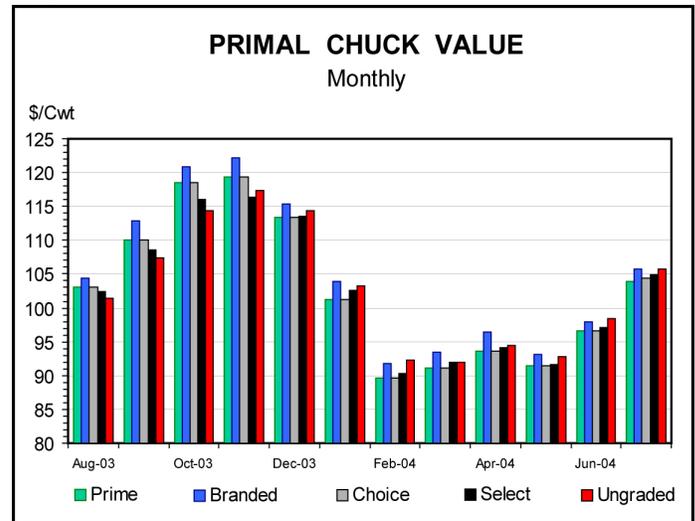
With exception to the loin and rib primals, Prime is not always the highest valued quality for many of the remaining primal cuts. For example, the Branded chuck primal commands the highest value of the quality grades followed by Prime and Choice chucks (Figure 7-4). Of note, it appears that there is not much of a difference between the Prime and Choice chuck in value terms. As expected, the Select and Ungraded quality chucks are not statistically different when assessed over time. However, on a monthly basis Ungraded chucks have often had a slight premium over the Select graded chucks. Similar relationships can be found for other relatively low-value beef items such as the short plank and flank (Prime and Select have essentially the same value).

The carcass cutout value is heavily driven by those few key primals where quality commands a premium; in particular, the Prime and Choice loin and rib primals account for much of the overall wholesale value. These primals are a rather small percentage of a carcass (about 25% of the carcass). At the wholesale level, differentiation of beef cuts by branding and meat quality grade of relatively low value cuts (about 75% of the carcass) has not added much value, if any, for several major products. The question remains whether traceability can become an economically important value for beef items, especially for relatively lower valued items.

Summary

The nonlinear flow of the beef through the fabrication process is why it is relatively difficult to trace a specific beef primal or beef cut back to an individual carcass, animal, or producer with most of the current beef pro-

Figure 7-4. Selected Wholesale Beef Values - Chuck



cessing facilities. Thus, the same modern U.S. processing technology that allows carcasses to be efficiently turned into beef products causes individual product traceback to the original animal or farm to be difficult and potentially extremely costly. This disconnection between the farm-of-origin, live animal, carcass and its beef products is why the NAIS is referred to as a “live animal” identification and traceback system versus a complete “beef” or “meat” traceback system. The question still remains whether the economic incentives (market access or consumer driven) exist to drive processing plants to invest in the development of new individual animal ID technology that will facilitate farm-to-fork traceback. Other fact sheets in this series further discuss whether there is a consumer or market incentive for traceback systems beyond the NAIS.





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