

Development of a corn-based beef industry

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HISTORICAL PERSPECTIVE

The origin of cattle in the western hemisphere is generally linked to the second voyage of Columbus in 1493. For the first 400 years, the relatively few cattle on this continent were solely forage dependent. The earliest mention of corn feeding and cattle “fattening” in historical proceedings appeared in the late 1800s (Ball, C.E., 1998). That is concurrent with the arrival of British breeds, which were probably more suited to grain fattening than the earlier Spanish derivatives.

However, nearly all of the beef consumed in the U.S. for several more decades was from cattle harvested directly off grass or as 200 to 240 kg calves directly off the cow (Wilford, 1951). Researchers (Kemp et al., 1954; Wilford, 1951) reported that consumer acceptability of meat from calves was very good and that many of the calves graded high Good or Choice.

Published research showing the impact of feeding corn to weaned calves or yearlings did not appear until the 1950s. Most studies (Craig and Blumer, 1956; Butler et al., 1956; Kidwell et al., 1958; King et al., 1958; and Zinn et al., 1970) indicated the concentrate portion of the diet at 40 to 60 percent of total dry matter intake.

By the mid-1950s, the published research began to show the effect of feeding a higher proportion of the diet as corn, or even using all-concentrate diets. Perry et al. (1956) claimed to be the first to report the use of an all-corn grain diet for fattening steers.

Geurin et al., 1954, reported steers gained up to 1.24 kg/day and graded 62 to 63 percent Prime when fed an all-corn diet (cobs providing the only roughage). Craig and Blumer, 1956, reported animals on grass, fed 1.5 percent of their bodyweight as corn, produced carcasses with more intramuscular fat (283.3 units) than non-supplemented animals (190.0 units).

The first meat consumer data, published by the American Meat Institute in 1920, showed that pork was the meat of choice. In 1926, USDA organized the Federal Meat Grading Service because consumers were confused by the various “house” brands and wanted a uniform system to compare beef from different packers (Matsushima, 1995). By 1953, beef had replaced pork as the preferred meat, based on per-capita consumption (carcass weight basis). Fueled by the higher quality resulting from feeding corn, beef consumption continued to grow; peaking in 1977 with the amount of beef consumed then double that of pork. From the mid-1970s to the late 1990s, the demand for beef declined (Purcell, 1998), with poultry consumption exceeding that of beef in 1997.

Development of the Commercial Cattle Feeding Industry

In the early 1900s, Midwest farmer feeders started buying calves and yearlings in the fall and wintering the cattle on corn silage for 220 to 280 days. By 1940, cattle feeding was starting in eastern Nebraska, Colorado, and as far west as New Mexico, Arizona, and California. By mid-1940s, the advent of the large commercial feedlot era had begun, but this boom was located more in the Plains rather than the Corn Belt states.

Some of the pioneers in the cattle feeding industry included Warren H. Monfort, who by the early 1940s had developed what was described as an *enormous* feedlot in Colorado, with capacity for 3,500 cattle (Matsushima, 1998). By 1968, the Monforts had grown into the world's first 100,000-head cattle feeder. Also in the early 1940s in Colorado, William H. Farr, large-scale lamb feeder from 1920 to 1940, was applying the lamb feeding practices to cattle. Another early cattle feeder was Earl Brookover of Kansas, often credited with developing the first commercial feedlot in the High Plains in 1951. By 1960, cattle feeding had migrated to the Panhandle areas of Oklahoma and Texas.

The shift in cattle feeding has been related to climatic advantage and improved transportation, but generally, the development of large-scale irrigated corn production is credited as the primary driver. Soon to follow was the relocation of packing plants from the Midwest region to the southern Great Plains.

The growth in cattle feeding in the High Plains expanded rapidly. In the late 1960s, Iowa was still the number one cattle feeding state. But by 1976, Texas had assumed the number one ranking and still holds that distinction. Today, 85 percent of fed cattle marketed are produced in five Plains states (Texas, Oklahoma, Kansas, Colorado, and Nebraska) (Blach, 2008). Numerous alliances between packers and feedlots began to form in the 1970s and 1980s (Blach, 2008).

The 25-year growth in the corn-based cattle feeding industry paralleled the growth in beef consumption that peaked in 1977. The unique flavor profile achieved through grain feeding (Matsushima, 1998) had won over the meat consuming public, and beef had established a lofty position with consumers worldwide. By 2003, 10 percent of all U.S. fed beef was exported, with the Pacific Rim the primary target.

THE TWENTY-FIRST CENTURY

Purdue economist Dr. Michael Boehlje et al., 1999^{a,b}, characterized the *new* agriculture of the 21st Century focusing on five challenges:

1. Global competition
2. Industrialization
3. Differentiated branded products
4. Precision production
5. Formation of food supply chains

The beef industry is steeped in tradition, yet eight years into the 21st Century each of these challenges is being met, albeit with varying degrees of success. The magnitude and scope of changes that have occurred in these first eight years will shape the beef industry for decades. Let's identify a few key happenings.

Unprecedented cattle prices – Triggered by the May 2003 bovine spongiform encephalopathy (BSE) discovery in Canada and subsequent closing of the Canadian border, U.S. cattle prices reached record high levels. Fed cattle, for the first time, averaged over \$80/cwt in 2003 and for short periods exceeded \$1/lb. This trend continued during the 2004-2008 window, with fed cattle averaging \$92.50/cwt during 2007 (Cattle-Fax, 2008).

Twenty-year decline in beef demand halted – *Decreased demand for beef has been the wrecking ball that has wreaked havoc on the industry and has been occurring each year since 1979* (Purcell, 1998). Purcell attributed this trend to four key factors desired by consumers:

- Low-fat and low-cholesterol products
- High-quality products for a favorable eating experience
- Products that offer a positive eating experience consistently
- Products and product forms that are convenient and easy to prepare

Purcell (1998) stated, “Demand had declined 50 percent from 1979 to 1998.”

Buoyed by the development of new *heat-and-serve products*, new uses for underutilized muscles from the chuck (such as the *teres major* and *flat iron*), continued growth of brands, and the renewed consumer interest in beef, the decline was reversed. This reversal became a key factor driving beef prices (Cattle-Fax, 2008).

Occurrence of BSE shatters global demand for U.S. product – In December 2003, the first discovery of BSE occurred in the United States. The most immediate effect was the closing of world markets to U.S. beef. Global sales that had reached 10 percent of domestic production were reduced to 1.8 percent in 2004 (Nalivka, 2007). Fortunately, the issue had very little impact on domestic beef consumption.

Surge in energy costs triggers record corn prices – As the global demand for energy heightened, the price of crude oil maintained a sharp trend upward. This led to the development of the *ethanol era* with new ethanol plants dotting many areas, especially in the western Corn Belts states like Iowa. The compounded increased demand for corn rapidly escalated corn and land prices to record levels (Westcott, 2007). Westcott (2007) also speculated these price changes would reduce pork, poultry, and beef production in the United States.

Differentiation of cattle prices based on quality grade – Prior to the 21st Century, beef was basically traded as a commodity with little price differentiation attributed to quality grade. Starting in the late 1990s, distinct price differentials driven by the consumer occurred for premium Choice brands, like *Certified Angus Beef*[®] (CAB[®]) and for USDA Prime (Blach, 2008). The Choice-Select spread that typically ranged from \$2 to \$5/cwt exceeded \$10 for the 2004 to 07-window (Blach, 2008). A new market indicator appeared, as the “Yellow Sheet” publisher, Urner-Barry, of P.O. Box 389, Toms River, N.J., started reporting a Choice-CAB[®] spread, which often rivals the Choice-Select spread. The growth in beef

brands has continued, with over 50 percent of all beef now sold as branded. Over 80 percent of average Choice and higher is now branded, leaving the makeup of the commodity beef mix as Select and Low Choice.

Continued consolidation and ownership changes. One of the greatest changes to occur in the beef food chain has been consolidation. Retail, foodservice distribution, packing, feeding, and the cow-calf sector have all consolidated into larger units (Cattle-Fax, 2008).

Over the past five years, significant change has occurred in the ownership of the major packing companies. Through mergers and acquisitions, four of the five major beef packing companies changed ownership. The number of farms and ranches owning cattle has continued to decline. Ranches with more than 100 cows now raise more than 50 percent of all calves (Cattle-Fax, 2008). The top 20 feedlots feed 85 percent of all fed cattle. There is also consolidation in how beef is sold, as the top five retailers sell more than 40 percent of all retail beef. Growth by consolidation of beef foodservice distributors also has occurred.

THE FUTURE

As dynamic as agriculture has been in the 21st Century, palm reading and fortune telling might be a more accurate way to project the future. In spite of the accuracy disparity, usually associated with price forecasts, certain trends in the beef industry likely will continue.

In 2004, Dr. Harlan Ritchie identified eighteen beef industry trends, compiled using the consensus of numerous analysts in varying sectors of the beef food chain. Modifying this slightly to encompass recent developments, the following capture *possible* occurrences over the next decade or two.

Growth in the global market for animal protein will continue – Today, livestock production accounts for 30 to 40 percent of world agriculture production and the demand for animal protein is increasing (Roberts, 2008). This growth is associated with increased incomes in developing countries and in high-population countries such as China (Gale and Huang, 2007). Studies of food demand in China have focused on the rising demand for meat and beef specifically. Another untapped market for U.S. corn-fed beef is the European market if tariffs imposed by the European Union change. A *key question* is whether global political and economic conditions will allow U.S. beef producers access to global markets. Another *key question* is whether the United States can maintain its niche as the supplier of quality grain-fed beef. Competition is rapidly developing in Argentina, Brazil, and Australia, and there is a question of whether we can remain competitive in the global market as the primary exporter of high quality beef. More than half of cattle classified as beef cows are located in China and Brazil, while the United States accounts for 14.8 percent (Blach, 2008).

Productivity growth for agriculture – Gains in productivity have been the driving force for growth in U.S. agriculture (Fuglie et al., 2007). Examples of these changes in the second half of the 20th Century have been dramatic! Between 1950 and

2000, the average milk produced per cow increased from 5,314 to 18,201 pounds per year, and the average corn yield rose from 39 to 153 bushels per acre (Fuglie et al., 2007). We are now 10 years after the first generation of genetically engineered grain varieties, with adoption widespread (Fernandez-Cornejo and Caswell, 2006). As genetically engineered corn allows expanded use in arid regions and as shorter growing-season varieties are developed, the potential for expanded corn production clearly exists. During this similar time period, the advances in beef production have not been as dramatic, but development and use of ionophores, implants, and more recently beta-agonists have shown economic benefits (Lawrence and Ibarburu, 2007) allowing beef produced per cow to increase by 130 kg in the last 30 years. Unfortunately, with the exception of genetic predictors, such as expected progeny difference (EPD) values, recent advances most often reduce eating quality as indicated by reduced marbling levels (Vasconcelos et al., 2008).

Genetic advances will continue and likely will soon address hard-to-measure traits like tenderness, marbling, feed efficiency, and health – The past 20 years have seen tremendous advances in genetic progress, and the use of EPDs has greatly improved growth rate without having to sacrifice calving ease. The mapping of the bovine genome completed in 2004 (Taylor, 2007) will allow the gene or marker identification of traits involving multiple genes – those traits such as marbling, tenderness, feed efficiency, and health. The potential for genetic advances in cattle breeding are immense, giving purebred breeders the ability to analyze and adapt production systems based on their customers' needs.

Focus on feed efficiency will be driven by high feed costs – Ritchie, 2002, stated “efficiency impacts unit cost of production, thereby having the potential to increase beef’s competitiveness in both domestic and global market places, to improve industry profitability, and to enhance long-term sustainability of the industry.” Unfortunately, in the competition for the animal protein market, beef does not convert grain to food as efficiently as pork and poultry. Spiraling land costs reduce beef’s advantage of being able to use harvested roughages and grazed forages. Utilizing management practices that improve feed efficiency and development of genetic predictors for feed utilization will become very important.

Industry consolidation will continue – Today, the top five supermarkets account for 50 percent of all beef sales, and that could reach 75 percent. Feedlots with over 32,000 head capacity market 50 percent of all fed cattle (Blach, 2008). The top 25 cattle companies now feed 40 percent of all fed cattle and could feed 60 percent in the future. Fewer than 600,000 producers will own cattle and the top 3 or 4 packers could process 80 percent of all fed cattle. The names of these companies will likely change, but their growth will continue.

The competition for land use will intensify – Urban sprawl continues to erode the land available for agriculture. As the U.S. and global demand for corn and other grains grows and genetically modified grain varieties expand usage into arid regions, the potential land available for cattle production will shrink. *The key question* is will the United States maintain the existing cowherd size or will extensive forage-based regions in South America and Australia become the basic source of calves for the world markets?

Adoption of some form of animal identification and country-of-origin system is inevitable – Implementation will not be easy, but our ability to compete in the global marketplace will require it (Murphy et al, 2008).

Instrument use for determining tenderness, marbling, and yield grade will reach some level of adoption – Tenderness screening systems are already being used, with marbling and yield grade instrumentation close to widespread usage.

Growth of both national brands and *house* brands will continue – Currently, estimates suggest 40 to 50 percent of all beef sold is branded with national or store (“house”) brands (Blach, 2008). The desire of the consumer to shop by brand continues to grow, and the potential exists for this to reach 75 percent of beef sales.

Focus on quality beef production will continue – The United States is looked to as the source of high-quality, grain-fed beef. Our ability to maintain that domestic and global market is pivotal for continued economic success (Blach, 2008). Our niche is not grass-fattened beef, but small niche markets will be developed by producer groups. Today, we produce only 60 percent of the 2005 National Beef Quality Audit’s suggested level of premium Choice and Prime, despite economic incentives to produce more.

Competition for labor will continue to challenge the beef industry – From 1948 to 2004, agricultural labor declined by 3.2 percent per year, but output per worker increased 4.9 percent per year, allowing farm output to grow at an annual rate of 1.7 percent (Fuglie et al., 2007). New technologies in equipment and having functional cattle will continue to be important.

Niche markets that focus on natural and organic production systems will continue to evolve – Some have speculated that consumption trends that exist in Europe determine future patterns in the United States (Davis and Lin, 2005). There continues to be an increase in the number of producers networking in various ways – partnerships, alliances, cooperatives, etc. – to produce beef for these specialty markets.

Beef sales through foodservice will continue to grow – In 1995, 47 percent of all beef sales were foodservice, while today that figure is 52 percent (Blach, 2008). In the future, that level could reach 55 to 58 percent. Nearly all fast food and *fine* dining restaurants have developed “take out” sales that cater to the increasing trend of people wanting to eat at home, but not cook. These trends are important because foodservice is heavily focused on ground beef, and Choice or higher quality grades, thus further increasing the demand for grain-fed cattle.

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