



A Value Chain Analysis of the U.S. Beef and Dairy Industries

Report Prepared for Environmental Defense Fund



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I. Introduction

The Center on Globalization, Governance & Competitiveness at Duke University conducted this analysis on behalf of the Environmental Defense Fund (EDF) to examine the beef and dairy industries in the United States. Cattle raising contributes significantly to global greenhouse emissions.

Although estimates are rough at best, the global livestock sector including cattle production is thought to be responsible for a significant portion of greenhouse gas emissions from anthropogenic sources. Some researchers have even suggested that, if deforestation for feed crops is included, livestock's share of these emissions may be even higher than the share from transport sources (Steinfeld et al., 2006). Other environmental consequences, including crop displacement, water pollution, and pressure on water supplies, are direct effects of cattle raising or indirect effects of feed production that supports those cattle.

The contribution of beef production to greenhouse gas emissions can be divided into the following four basic categories, with estimates of each category's portion: 1) the energy inputs that go into fertilizer production for feed crops, 14%; 2) energy used by heavy equipment in food crops and general farm production, 14%; 3) off-gassing from manure and cattle's digestion process, called enteric fermentation (belching), 32%; and 4) foregone carbon storage on lands devoted to feed crops, 40%. Thus, the primary ways in which livestock contribute to greenhouse gas emissions are related to feed issues and manure management.

The United States is the largest beef producer and one of the largest milk and dairy producers in the world. The U.S. beef and dairy industries thus clearly generate a significant share of greenhouse gas emissions from livestock. It is worth noting, however, that despite the country's dominance in producing consumer value from cattle, the U.S. cattle and calf inventory is not the largest in the world, but rather the fourth largest, behind India, Brazil, and China (the European Union not far behind the United States). India's cattle inventory—much of it not for consumption—is almost three times that of the United States. In fact, U.S. cattle inventory actually represents only 10% of the world's total (Mathews, 2008).

This project, focusing solely on cattle in the United States, seeks to identify key industry actors well positioned to help reduce two of the most severe sources of environmental emissions: enteric fermentation, the largest producer of methane gas; and manure, which produces atmospheric nitrous oxide (a powerful greenhouse gas), ammonia emissions, and nitrogen water pollution. Best practices are evolving in the industry to reduce these impacts, including manipulating cattle diets and improved manure management.

EDF looks to partner with leading U.S. companies and identify innovations that have combined business and environmental benefits. Examples of EDF's corporate partnerships over the past two decades include working with McDonald's to eliminate polystyrene clamshell packaging, with FedEx to develop the first hybrid delivery trucks, and with DuPont to ensure the safe development of nanoscale products. EDF's experience has shown that when it partners with a corporation that has a great deal of influence, this strategy can transform an entire industry. This was the case with McDonald's, wherein many other fast-food companies followed McDonald's lead and realized there was a compelling business case for eliminating polystyrene containers.

This report will begin with a brief overview of the size and nature of U.S. beef and dairy farming, highlighting key differences between them. It will proceed with two major sections, one for the beef industry and one for dairy. For each, we will provide an industry overview and a discussion of the value chain, emphasizing the roles of key industry players and the extent of their direct or indirect influence on cattle raising practices. We will identify key “boxes” in the value chain representing companies that have specific leverage, either through their linkages to beef and dairy farms or through their overall market position; we will identify and compare the top companies in each key box; and finally, we will present a summary of key findings and a conclusion.

Please note that although our analysis will begin with a general overview of the U.S. beef and dairy industries and their value chains, the later discussion of economic key actors and leverage is framed specifically to emphasize major corporate players. For example, we identify veterinarians as an important player in the value chain with a major role in animal health, yet we are not able to identify a major *corporate* player in veterinary services. We therefore de-emphasize the veterinary sector in the ensuing leverage analysis, which focuses instead on corporate entities that have direct or indirect impact on animal health management decisions. In other words, the discussion of economic actors and leverage should be viewed not as a general description of the dynamics within this sector of U.S. agriculture, but rather as an analysis of key corporate leverage points with potential to effect industry-wide change.

II. Overview of U.S. Beef and Dairy Farming

Cattle account for \$72.5 billion, or 30.3%, of the total \$239.3 billion in cash receipts received by farmers (USDA-NASS, 2007). In 2007, there were nearly one million cattle (including both beef and dairy) operations in the United States, and most dairy operations contained at least one beef cow. Many of the cattle operations are small; some 77% of beef cow operations and 46% of dairy operations have fewer than 50 head of cattle (see **Table 1**). Feedlots (where beef cattle are fed an energy-intense grain diet before slaughter) can reach much larger sizes than either beef or dairy operations; 40% of inventory is contained in operations with more than 32,000 head. That said, the majority of feedlot operations have fewer than 1,000 head of cattle. In general, beef cattle, dairy and feedlot operations all have grown larger over the last 10 years, with sharp declines most evident in the number of dairy operators.

The maps in **Figure 1** show animal inventory locations associated with dairy, beef, and feedlot operations across the United States. Map 1 highlights the typical first stage of beef farming, in which cow-calf operations are widely dispersed. Map 2 shows how the second and third stages, beef stocker and feedlot operations, are concentrated in the central plains and Corn Belt, with the greatest concentration of feedlot operations in Texas. Map 3 shows that dairy operations exist in every state, but they are typically concentrated largely in California, Wisconsin, and New York.

Dairy operations are typically integrated on a single farm, although some large farms may have multiple herds at different sites. A notable exception to this general rule is a growing sector made up of custom heifer raisers. Raising heifers, including labor and housing, is the second largest operating expense for dairy farmers behind feeding costs, and dairies do not receive a return on this investment until heifers calve at about 24 months of age. Large dairies especially are thus increasingly arranging by contract to have heifers raised off-site, usually retaining ownership. In a 2007 study conducted by

the USDA's National Animal Health Monitoring System (NAHMS), one in 10 operations raised some dairy heifers off-site (USDA/APHIS, 2007b).

Beef production, in contrast, is organized around three distinct types of farms before the cattle get to the point of slaughter (packing). These three types include cow/calf operations (where calves are produced and kept onsite until weaned at 6-10 months of age); stocker and backgrounding operations (where the animals gain additional weight through pasture, range and forage until 8-14 months of age); and feedlot operations (where the animals are fed grain and are brought to slaughter weight at 12-22 months of age).

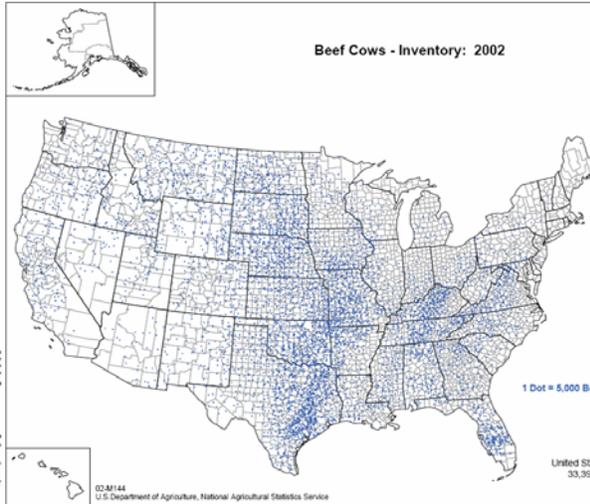
Table 1. U.S. Cattle Operations (Farms) and Cattle Inventory, 1997 and 2007

Farm Size	Operations, 2007	Proportion of Operations, 2007	% Change in Operations, 1997-2007	Proportion of Inventory, 1997	Proportion of Inventory, 2007
All Cattle and Calf Farms					
1-49	601,200	62.1%	-15.9%	12.5%	10.7%
50-99	160,670	16.6%	-19.9%	13.5%	11.2%
100-499	175,820	18.2%	-14.4%	38.1%	34.5%
500-999	19,045	2.0%	7.3%	11.4%	12.9%
1,000+	10,705	1.1%	14.9%	24.5%	30.7%
1,000-1,999	6,600	0.7%	N/A	N/A	8.0%
2,000-4,999	3,000	0.3%	N/A	N/A	8.2%
5,000-9,999	650	0.1%	N/A	N/A	4.1%
10,000-19,999	250	0.0%	N/A	N/A	3.0%
20,000+	205	0.0%	N/A	N/A	7.4%
TOTAL	967,440	100.0%	-15.7%	100.0%	100.0%
Beef Cow Farms					
1-49	585,050	77.2%	-15.5%	30.4%	27.7%
50-99	94,490	12.5%	-9.3%	19.4%	18.6%
100-499	72,855	9.6%	3.1%	35.9%	38.7%
500+	5,505	0.7%	-0.7%	14.3%	15.0%
500-999	4,180	0.6%	N/A	N/A	8.1%
1,000-1,999	980	0.1%	N/A	N/A	3.6%
2,000-4,999	290	0.0%	N/A	N/A	2.0%
5,000+	55	0.0%	N/A	N/A	1.3%
TOTAL	757,900	100.0%	-13.2%	100.0%	100.0%
Milk Cow Farms					
1-29	20,015	28.0%	-48.8%	3.5%	1.7%
30-49	13,420	18.8%	-50.8%	11.5%	5.7%
50-99	20,980	29.3%	-41.5%	26.0%	15.4%
100-199	9,325	13.0%	-33.6%	20.0%	13.4%
200+	7,770	10.9%	4.2%	39.0%	63.8%
200-499	4,555	6.4%	N/A	N/A	14.9%
500+	3,215	4.5%	N/A	N/A	48.9%
500-999	1,700	2.4%	N/A	N/A	12.5%
1,000-1,999	920	1.3%	N/A	N/A	13.3%
2,000+	595	0.8%	N/A	N/A	23.1%
TOTAL	71,510	100.0%	-39.0%	100.0%	100.0%
Feedlot Farms					
<1,000	85,000	97.38%	-18.3%	18.0%	16.1%
1,000-3,999	1,373	1.57%	2.0%	9.4%	9.1%
4,000-7,999	343	0.39%	11.4%	8.5%	7.3%
8,000-15,999	182	0.21%	-4.7%	11.7%	9.9%
16,000-31,999	133	0.15%	-2.9%	20.6%	17.7%
32,000+	129	0.15%	38.7%	31.8%	40.0%
32,000-49,999	71	0.08%	31.5%	13.9%	15.2%
50,000+	58	0.07%	48.7%	17.9%	24.8%
TOTAL	87,289	100.00%	-17.8%	100.0%	100.0%

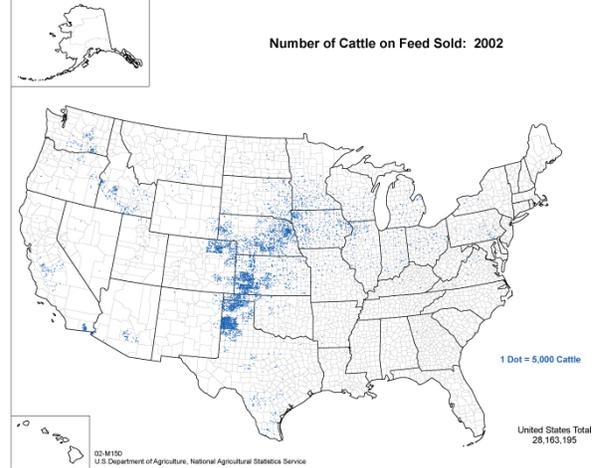
Sources: USDA-NASS 1999a, USDA-NASS-ASB 1999b, USDA-NASS 2008b, and USDA-NASS 2008f

Figure 1. Geographic Concentration of Beef Farms, Feedlots and Dairy Farms

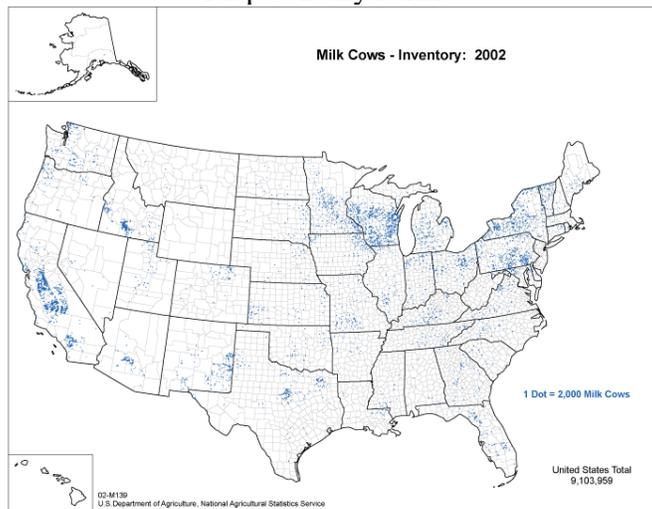
Map 1: Beef Cow & Calf Farms (1st and 2nd production stages)



Map 2: Beef Feedlots (3rd stage)



Map 3: Dairy Farms



Source: USDA, National Agricultural Statistics Service, Census of Agriculture, 2002.

Key characteristics of the U.S. beef and dairy industries are shown in **Table 2**, including the value of each industry, the states most involved, and the different types of farming and manufacturing operations. Additional notes include:

- The majority of the 96.7 million head of cattle in U.S. inventory are part of the beef industry.
- Dairy farms are typically larger than beef cattle farms.
- While many beef operations are diverse farms containing at least one beef cow, dairy operations typically specialize in milk production.
- Milk production typically takes place on a single farm (with the exception of the growing custom heifer raising sector), whereas beef production entails moving cattle to different locations, often across state lines.
- Both milk and beef production are relatively dispersed throughout the United States on small and large farms. In beef production, however, once the early phase of cattle raising is complete, the later stages—grazing and feedlot feeding—are concentrated in the Great Plains and Cornbelt. According to the most recent Census of Agriculture in 2002, the majority of beef cows are concentrated in Texas (USDA/NASS, 2002).
- Different breeds are used in each industry, with the intent of optimizing certain tendencies such as milk production for dairy, or weight gain and marbling for beef.

Table 2. Key Characteristics of the U.S. Beef and Dairy Industries

	<i>Beef</i>	<i>Dairy</i>
Industry Value, Farm Level	\$49.4 billion	\$35.4 billion
Number of Farmers	~900,000	71,510 ¹
Proportion of Cattle (Inventory)	~75-85%	~15%-25%
Key Desirable Traits	Meat production, reproductive capacity	Milk production, reproductive capacity
Typical Lifespan*	22-24 months	4 years
Major States	Texas, Nebraska, Kansas, Colorado	California, Wisconsin, New York, Pennsylvania
States where Product is #1 Agricultural Output*	Arizona, Colorado, Kansas, Missouri, Montana, Nebraska, Nevada, Oklahoma, South Dakota, Tennessee, Texas, Utah, Wyoming	California, Idaho, Michigan, New Mexico, New York, Pennsylvania, Vermont, Wisconsin
Major Products, Farm Level	Grade-quality beef, culled cattle meat	Raw milk, culled cattle meat, veal
Types of Farming Operations	3 (Cow-calf, stocker, feedlot)	2 (Dairy farms, custom heifer raising ranches)
Types of Manufacturing Operations	2 (Meatpackers/Processors, Processors)	3 (Marketing cooperatives, fluid milk processors, dairy product manufacturers)
<p>*Note: Characteristic applies to the main product of the industry, not to replacement cattle (beef) or male calves (dairy)</p> <p>¹Farms with at least one dairy cow; number of herds licensed to sell milk is smaller, approximately 55,000-60,000 (Mathews, 2008)</p>		

Source: CGGC, based on USDA/NASS, 2002

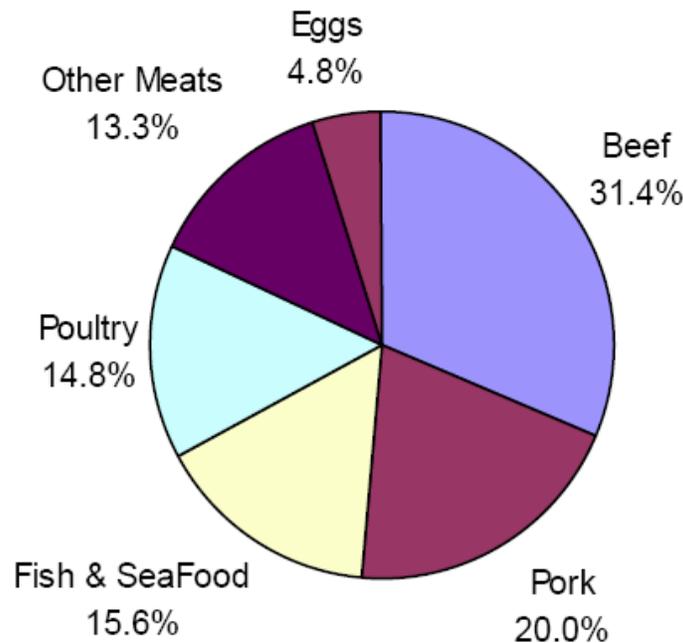
III. U.S. Beef Industry

This section will focus on the U.S. beef industry, beginning with an overview of the size of the industry and the key characteristics of beef cattle farming.

A. Beef Industry: Overview

Beef cattle production represents the largest segment in American agriculture. The United States has the largest fed-cattle industry in the world, serving both domestic and export beef markets (OneSource, 2008). In 2006 the U.S. meat market generated total retail revenues of \$88 billion, of which the beef segment was the most lucrative, generating \$28 billion—or 31% of the meat market's overall retail value (see **Figure 2**) (Datamonitor, 2007). In 2007, 34 million cattle were harvested and 26 billion pounds of beef were produced (National Cattlemen's Beef Association, 2008).

Figure 2. U.S. Meat Market Segments: % Share, by Value, 2006



Source: Datamonitor

Cattle and calves represent the largest value of agricultural production in 13 states (Arizona, Colorado, Kansas, Missouri, Montana, Nebraska, Nevada, Oklahoma, South Dakota, Tennessee, Texas, Utah, Wyoming) and ranks second in another 11 (Alabama, Idaho, Kentucky, New Mexico, North Dakota, Oregon, Pennsylvania, Vermont, Virginia, West Virginia, Wisconsin). Measured by gross income, Texas is the leading beef state, producing \$7.5 billion in cattle and calf raising and slaughter, or 15% of the U.S. total (USDA-NASS 2008d). Other leading states include Kansas, Nebraska, Colorado and Wisconsin (see **Table 3**).

Table 3. Top Five States by Cattle Slaughtered, 1997 and 2007

State	Unit of Value	% US, 2007	% change, 1997-2007
Beef Production (millions of pounds, commercial production, LIVE WEIGHT)			
Kansas	9,700.0	22.3%	13.5%
Nebraska	9,262.2	21.3%	3.8%
Texas	7,445.9	17.1%	1.3%
Colorado	2,861.7	6.6%	-7.4%
Wisconsin	2,264.5	5.2%	12.9%
<i>United States</i>	43,483.1	100.0%	2.1%
<i>United States (dressed weight)</i>	26,420.8		N/A
Cattle Slaughtered (thousands head, commercial slaughter)			
Kansas	7,725.9	22.5%	4.8%
Nebraska	7,071.4	20.6%	-4.5%
Texas	6,111.1	17.8%	-7.6%
Colorado	2,209.8	6.4%	-14.8%
Wisconsin	1,708.4	5.0%	4.0%
<i>United States</i>	34,264.0	100.0%	-5.7%
Gross Income (billions of dollars, cattle AND calves for slaughter and for raising)			
Texas	7.5	15.1%	37.8%
Nebraska	6.6	13.4%	62.1%
Kansas	6.3	12.7%	57.4%
Colorado	3.3	6.6%	57.0%
Oklahoma	2.8	5.6%	93.7%
<i>United States</i>	49.4	100.0%	57.5%

Source: USDA-NASS 1998, USDA-NASS 2008d

According to the U.S. Department of Agriculture (USDA), cattle operations in 2004 represented 34% of total farms in the United States. On average, a beef cattle operation is home to 40 head of cattle. There are over 70 different breeds of beef cattle in the United States today (National Cattlemen's Beef Association, 2008).

Table 4. U.S. Farm Characteristics, by Farm Type, 2004

Item	Small family farms					Large-scale family farms		Nonfamily farms	All farms
	Limited-resource	Retirement	Residential/lifestyle	Farming-occupation		Large	Very large		
				Low-sales	Medium-sales				
	<i>Number</i>								
Total farms	197,734	338,671	837,542	395,781	133,299	86,087	71,708	47,103	2,107,925
	<i>Percent</i>								
Commodity specialization: ¹									
Cash grain ²	11.4	8.2	11.3	14.3	38.7	42.0	24.5	*9.9	14.8
Other field crops ³	23.2	27.8	23.8	19.6	10.9	11.2	9.9	33.9	22.0
High-value crops ⁴	*9.5	5.7	**3.3	9.1	5.9	9.6	12.6	23.4	6.5
Beef	34.3	40.5	37.9	34.0	20.0	11.9	12.1	23.9	33.9
Hogs	d	d	*1.1	*0.6	*3.5	4.2	9.2	1.1	1.6
Dairy	d	d	d	3.0	16.2	13.0	11.3	2.1	2.9
Poultry	d	d	**0.9	d	*2.2	6.5	18.1	#1.2	**1.6
Other livestock ⁵	18.5	15.9	*21.3	19.1	#2.6	1.7	*2.2	*4.4	16.7

Source: Economic Research Service/USDA.

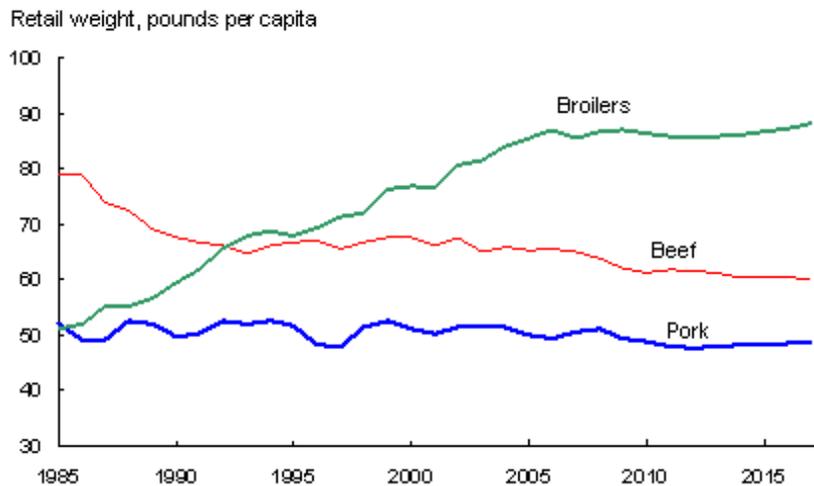
Although U.S. beef consumption has declined in the past 20 years (see **Figure 3**), the value of beef has increased, largely because of efforts to market beef in higher value-added products similar to pork and chicken. In 1985 the U.S. government created the Beef Board, also known as the Cattlemen’s Beef Board (CBB), which oversees the collection of \$1 per head on all domestic and imported cattle sold in the United States. Funds from this “national check-off,” are used to promote demand for beef, through consumer advertising (e.g. the national campaign “Beef: It’s What’s for Dinner”), marketing partnerships, public relations, education, research and new-product development. The USDA is involved extensively in these check-off activities (Cattlemen’s Beef Board, 2008a).

Over the past decade the Beef Board and others have worked to “de-commoditize” the beef industry, in other words, to shift beef from a commodity to a value-added product. In general these efforts have focused on forming strategic alliances along the value chain to achieve a more brandable product with consistent quality. In 1999 McDonald’s initiated the Beef Advantage Project (BAP) in partnership with a large cattle merchandiser, cattle feeding company, and meat processor—respectively, Capital Land and Livestock, Friona Industries (described in Table 8 on page 25), and Excel, which was then the third largest meat and poultry processor in the United States (Reavis, 2000). With this alliance McDonald’s aimed to create a more efficient, consistent and appealing product. Many such alliances are forming in the U.S. beef value chain, and they are having the desired effect of transforming the industry (Mulrony and Chaddad, 2005).

One of the ways that the above efforts are most felt by consumers is the shift in the marketing of beef to higher value-added products. For example, the Beef Board provides extensive resources to retailers to transform the beef offerings in the meat case to have the variety, appeal, and ready-to-cook features that have long been associated with pork and chicken. Initiatives of the Beef Board include beef recipes, trainings, cook-offs, and packing guidelines that replace traditional beef cuts with new, consumer-friendly options such as stir-fry beef, stew beef, kabob beef (Cattlemen’s Beef Board,

2008b). Despite declining per-capita beef consumption, U.S. consumers in 2007 spent \$75 billion on beef from supermarkets (retail) and food services, including restaurants, \$26 billion more than in 1999. In 2001 per capita beef spending was \$200 per year, while in 2007 this number increased to \$247 per capita (National Cattlemen’s Beef Association, 2008).

Figure 3. U.S. per capita meat consumption, 1995-2017 projection



Source: USDA Agricultural Projections to 2017, February 2008.
 USDA, Economic Research Service.

The following are the four primary segments in beef production (www.tyson.com, 2008):

- 1) *Cow/calf operators*, traditional ranchers and farmers breed cows to produce calves, which are kept onsite until weaned at 6- 10 months of age
- 2) *Stocker operators* put additional weight on the animals through pasture or range; *backgrounding operations* confine the cattle and give them hay, wheat, or other forage; both types of operation bring cattle to 600-800 pounds, or 8-14 months of age
- 3) *Feedlot operators* feed grain to the animals (at this stage called “feeder cattle”) and bring them to slaughter weight of 900 to 1,400 pounds, or 12-22 months of age
- 4) *Packer/processors* slaughter the cattle and package and/or process the beef onsite

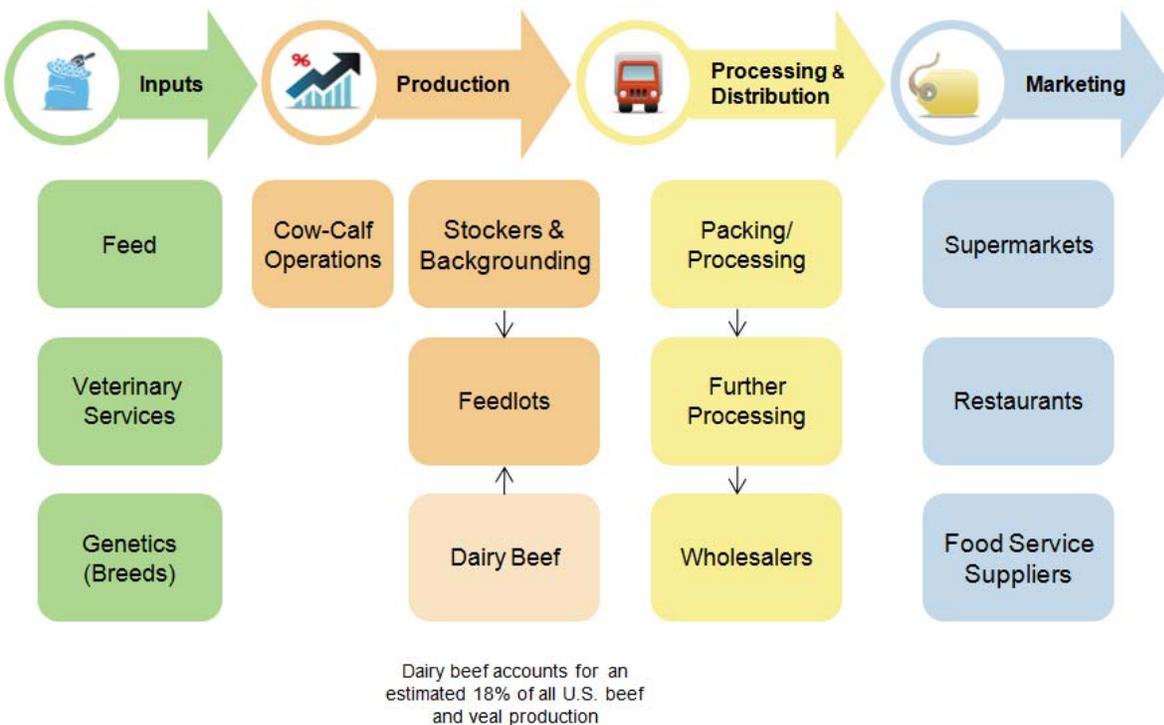
As noted in the above stages of production, U.S. beef cattle are fed principally on pasture and grains. Apart from the cost of the animal itself (which is much larger than feed or other variable costs), feed is the largest production cost. In the second stage, when stocker/operators graze cattle and background operators give them forage, feed costs reach 62% of costs excluding the value of the animal (Cattle-Fax, 2007). In the third stage, when cattle are sent to feedlots and fed with grain, the cost of feeding increases to 84% of these costs (Gill & Lalman, 1999 revised 2001).

The USDA projects a small decline in beef production due to higher feed costs resulting from a rise in corn prices as more corn is diverted to use in ethanol production. It should be noted that distiller grains, a co-product of ethanol production, can be used to feed beef cattle and dairy cows. According to recent research, it is now also considered feasible to feed hogs and poultry successfully on distillers' grains, up to 30% and 10%, respectively (Mathews, 2008). As one result of continued high corn prices, cattle in the near future will likely remain in the grazing stage for longer periods before being sent to feedlots.

B. Beef Industry: Value Chain

The basic structure of the U.S. beef industry is depicted in the value chain shown in **Figure 4**. The first column in the chain, "Inputs," refers to the main products and services that cattle farmers need in order to raise beef cattle, including feed, veterinary services, and seedstock (breeding). The "Production" column includes three separate stages of beef cattle farming, representing three different types of farmers: those with cow-calf operations (who keep calves until weaned), stockers and backgrounding (who add weight to cattle with pasture, range, and forage), and feedlot operators (who confine cattle and feed them a high-energy diet of grains to bring them to slaughter weight). Cattle are moved from farm to farm according to these production stages, often crossing state lines.

Figure 4. U.S. Beef Industry Value Chain



Source: CGGC. Dairy beef figure from Mathews, 2008.

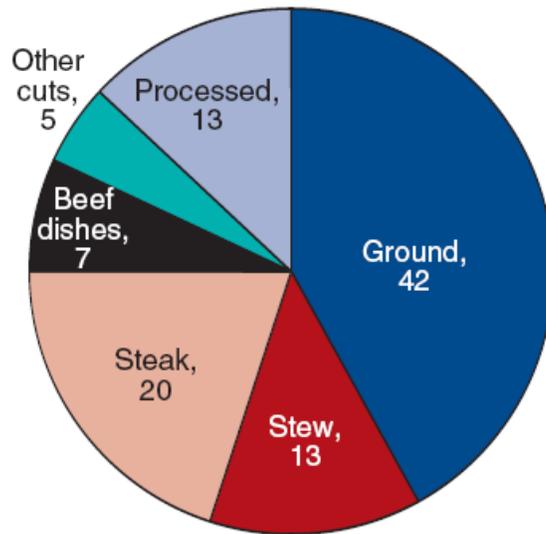
One important box, “dairy beef,” enters the U.S. beef industry value chain laterally, from the dairy industry. A portion of the U.S. beef industry is made up of dairy beef that comes from cows culled from dairy herds because, for age or other reasons, they are not productive for dairy purposes. An estimated 18% of total beef and veal production originates from dairy cattle (Mathews, 2008). The meat from culled dairy cows is primarily processed into ground beef for fast food hamburgers or supermarket retail, discussed in detail in the section “key boxes.”

Once cattle have reached slaughter weight at 1,100-1,300 pounds, they are slaughtered by packing operations, some of which also produce processed beef products such as sausage or meat balls. Many of these operations also perform further processing into more elaborate beef products including those that appear in prepared frozen meals. Distribution is achieved through wholesalers or direct sales to retailers, although the wholesale role is increasingly being performed by the large packers and processors themselves (see section on “Wholesalers” below). Distribution is also performed by food service suppliers such as SYSCO and Aramark. At the end of the chain, in the “Marketing” column, are supermarkets, restaurants, and food service operators. Food service operators outside the restaurant category include Compass Group and Sodexo, which provide dining and vending services for corporate clients such as offices, universities, and healthcare institutions.

To create a complete picture of the value chain, it would be useful to know exactly where U.S. beef goes after the processing and distribution stage—in other words, what portion of total beef sales is accounted for by supermarkets versus restaurants and other food service suppliers. The USDA does not track this information (Hollis, 2008), nor does it appear to be available from industry associations or firms. However, two data sets do help provide a snapshot of the final destinations of U.S. beef : the share of beef consumption by cuts, and the share of beef consumption that occurs at home versus away from home.

Information on beef consumption by cuts is found in the USDA’s most recent published food intake survey, from 1994-96 and 1998. According to a 2005 USDA study based on these data—the most recent available—87% of U.S. beef consumption is fresh, in other words, cuts of beef purchased by restaurants, food services or consumers and cooked just before eating. The remaining 13% of beef is processed, referring to products that have been transformed by curing, smoking or seasoning before cooking. Ground beef is the largest category overall, accounting for 42% of consumption, followed by steaks (20%) and stew beef (13%). The total breakout is shown in **Figure 5**.

Figure 5. U.S. Beef Consumption, by Cuts



Source: USDA/ERS researchers Davis and Lin, 2005, citing USDA 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals.

The portion of beef that is eaten at home versus away from home is useful in estimating the relative roles of supermarkets (at-home consumption) vis-à-vis restaurants and other food service companies (away-from-home consumption). Data from the above-mentioned food intake survey using 1994-96 and 1998 data show that beef is predominantly an at-home food, with Americans consuming nearly 65% of all beef (43 pounds per person) at home and only 35% (23 pounds per person) away from home. Ground beef appears to be the only cut that is primarily eaten outside the home (see **Table 5**).

Table 5. U.S. Beef Consumption at Home and Away from Home

Food sources	All beef		Processed		Ground		Stew	
	<i>Pounds per capita</i>	<i>Percent</i>	<i>Pounds per capita</i>	<i>Percent</i>	<i>Pounds per capita</i>	<i>Percent</i>	<i>Pounds per capita</i>	
Home	43.13	73.97	6.46	49.59	13.81	79.27	6.60	
Away from home	23.38	26.02	2.27	50.41	14.04	20.73	1.73	
Restaurants	19.45	18.39	1.61	42.95	11.97	17.83	1.48	
Others	3.93	7.63	.67	7.46	2.08	2.90	.24	
			Steak		Beef dishes		Other cuts	
			<i>Percent</i>	<i>Pounds per capita</i>	<i>Percent</i>	<i>Pounds per capita</i>	<i>Percent</i>	<i>Pounds per capita</i>
Home		74.20	9.68	78.50	3.88	74.86	2.69	
Away from home		25.80	3.36	21.50	1.06	25.14	.90	
Restaurants		22.22	2.90	17.28	.85	17.71	.64	
Others		3.58	.47	4.22	.21	7.43	.27	

Notes: Processed consists of canned and dehydrated. See section, "Calculating Per Capita Shares," on p. 6, for an explanation of methodology.

Source: U.S. Department of Agriculture (USDA), Economic Research Service, using data from USDA, Agricultural Research Service, 2000: 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals.

Source: USDA/ERS researchers Davis and Lin, 2005, citing USDA 1994-96 and 1998 Continuing Survey of Food Intakes by Individuals.

C. Beef Industry: Economic Actors and Leverage

We analyzed each box in the value chain for the U.S. beef industry to determine the degree of leverage each economic actor has with cattle farming operations, and hence the potential it might have to influence relevant cattle farming practices in ways that offer environmental and economic benefits. Please note that this analysis emphasizes *corporate* entities that have direct or indirect impact on cattle diets and manure management decisions. Thus, this discussion of economic actors and important leverage points should be viewed not as a general description of the dynamics within this sector of U.S. agriculture, but rather an analysis of key leverage points via major corporations with potential to effect industry-wide change.

As shown in **Table 6**, we applied the following seven criteria to determine leverage:

- Segment includes firms with direct control over manure management. The only economic actors in this category are the cattle farms that make up the three stages of the production column: cow-calf operations, stockers and backgrounding operations, and feedlots. Other players have either varying degrees of indirect influence, or no influence.
- Segment includes firms with indirect control over manure management. Players that have indirect influence over cattle farmers' decisions about manure management are likely limited to the packer/processor firms that buy beef directly from producers. Additional indirect influence may be possible for players with significant purchasing power upstream, near the final end of the chain, but we chose not to mark the "indirect control" box for these players

because this type of buyer power is already reflected in the categories of “market concentration,” “single player with 20% market share,” and “significant name recognition.”

- Segment includes firms with direct control over cattle diets. As with manure management, the main economic actors in this category are the cattle farms in the production column: cow-calf operations, stockers and backgrounding operations, and feedlots. Feed companies, however, play a direct role in determining the composition of prepared feed. Other players have either varying degrees of indirect influence, or no influence.
- Segment includes firms with indirect control over cattle diets. Players that have indirect influence over the cattle diet decisions of cattle farmers likely include providers of feed and veterinary services as well as packer/processor firms that buy beef directly from producers. Additional indirect influence may be possible for players with significant purchasing power upstream, near the final end of the chain, as noted above.
- Highly concentrated market. We use the term “concentrated” here to indicate that the top five firms in the segment control at least 50% of the market. This degree of consolidated market share may lead to important leverage over cattle farmers’ decisions.
- Single player in the segment controls at least 20% of the market. This category also indicates the degree of market concentration within a segment, but distinguishes cases such as the seedstock segment (referring to large genetics companies, not breeder operations), in which a single player still manages to stand out even in a market that is dominated by a handful of very large players.
- Segment includes players with significant name recognition. This category is intended to capture firms that have significant name recognition “on the street,” i.e., even among people not involved in the industry.

Table 6. U.S. Beef Industry: Economic Actors and Leverage

Value Chain Box	Feed	Vet Service	Genetics	Cow-calf	Stocker	Feedlot	Package /Process	Further Processing	Wholesale	Super-market	Food Service Supplier & Operator	Restaurant ¹
Direct Control of Manure												
Indirect Control of Manure												
Direct Control of Cattle Diets												
Indirect Control of Cattle Diets												
Highly Concentrated Market*												
Single Player with >20% of Market Share												
Players with Significant Name Recognition												



¹Although the restaurant industry as a whole is fragmented, the Fast Food Hamburger Restaurant (FFHR) segment—the one most relevant to beef (especially dairy beef)—is highly concentrated. The top three FFHRs (McDonald’s, Burger King and Wendy’s) represent 73% of all fast food sales (Burger King, 2008).

*Top five firms control at least 50% of the market.

Source: CGGC.

Eliminated Boxes

Genetics

The U.S. cattle breeding and genetics industry is dominated by three major players: World Wide Sires (WWS); Cooperative Resources International (CRI); and ABS Global (ABS). WWS coordinates the two major cattle breeders (Select Sires, Inc. and Accelerated Genetics, Inc.) with a large number of distributors around the world. Select Sires, Inc. is the largest cattle breeder in the United States, controlling more than 20% of the U.S. beef and dairy artificial insemination market. Select Sires raises 1,800 breeding bulls and tests an additional 700 young bulls annually. The company produces nine million doses of frozen semen, five million of which are used for the U.S. domestic market. Among the top 50 breeding bulls in the United States, typically 20 bulls belong to Select Sires, Inc.

The second largest cattle breeder is Genex Cooperative, Inc. A subsidiary of CRI, this company provides over 10 million doses of frozen semen, four million of which are used for the U.S. domestic market. The third breeder, ABS Global, Inc, produces 2 million doses of frozen semen, half of which are used for the domestic market. In total, these three companies sell 10 million doses of frozen semen for the U.S. domestic market. Two additional important U.S. cattle breeders are Accelerated Genetics and Alta California.

Genetic scientists try to identify and link certain genes to specific traits of economic importance, such as production of milk protein in dairy cows.¹ At this time, no genetics companies appear to be involved in practical applications of research to alter traits in cattle that would specifically affect enteric fermentation or the manure they produce. Instead, the most effective way to manage belching and manure production in beef and dairy cattle is likely through feed or diet (Vanraden, 2008).

While the cattle breeding sector is highly concentrated in a few top firms, none of these large players has significant name recognition outside the sector. In any case, since the major beef producers largely determine the traits that genetics companies breed for, if a genetic link were to be identified in the future, the most logical leverage points for developing it as a solution may be through the large beef producers such as Tyson Foods, Cargill Meat Solutions, and JBS-Swift.

Cow-calf Operations and Stockers/backgrounding

Nearly half the farms in the United States produce beef cattle, and nearly all of these operations are cow-calf or stockers/backgrounding. The vast majority—77%—have fewer than 50 head, and 34% are small family farms with low sales (USDA/ERS, 2008). Cow/calf operations raise cattle for the first 9-12 months, until weaning, while stocker operations typically raise cattle during their second year of life.

Most cow-calf operators sell their weaned calves to the highest bidder at livestock auction markets where they are purchased by stockers/backgrounders. According to the USDA there are approximately 815 fixed auction sites in the United States (Cattlemen's Beef Board and National Cattlemen's Beef Association, 2008).

Although about one-third of cow-calf producers maintain ownership of their calves at least through the yearling stage (Mathews, 2009), there is less vertical integration in the U.S. beef industry than in the pork or poultry industries. A major reason is the amount of land that is necessary to graze cattle, which is much greater than the space needed to raise pigs or chickens. For one company to undertake the entire cattle life cycle including stocking and backgrounding through feedlot, slaughter and processing requires extremely large amounts of capital. Instead, cattle producers are often small and independent, and some graze their animals on public lands on which they are not permitted to erect any type of confine or structure. Permits are obtained from the Bureau of Land Management or the U.S. Forest Service, and leases are worked out for varying periods, including some long-term arrangements of up to 90 years (Hollis, 2008).

¹Beef producers and breed associations are responsible for determining what traits are important in beef cattle. In the dairy industry, these determinations are made from a more centralized source (such as the research geneticist group at the USDA).

Because of the fragmented and local nature of the beef industry at these early stages of production (pre-feedlot), we have chosen not to focus on these boxes in our leverage analysis, instead highlighting the more concentrated players downstream at the feedlot stage and beyond.

Dairy Beef

Dairy farms remove one out of four (23.6%) cows per year (USDA APHIS, 2007a). Four out of five of these cows are cull cows, dairy cows that have been removed because of lowered performance or productivity after an average productive lifespan of four to six years. Dairy cows make up 5-8% of all cattle slaughtered annually (USDA, NASS, 2008d).

Sale of cull dairy cows makes up 5-15% of gross income for dairy enterprises (Wren, 2008). The meat is primarily processed into ground beef for fast food hamburgers or supermarket retail, so dairy farmers do not expect a high price for the carcasses. Historically, fast food restaurants used 60% cull-cow beef and 40% fed-beef trimmings. According to Keith Carlson, Executive Director of the Milk and Dairy Beef Quality Assurance Center, it would be very difficult to get McDonald's to release current data on its purchasing of dairy beef, but the company is among the top 5% of dairy beef purchasers. Wal-Mart and Costco buy more dairy beef than McDonald's, according to Carlson.

Even if company level data were available, however, distinguishing the meat from culled dairy animals versus that from culled beef cattle is a challenge. According to Joanne C. Peterson, USDA Freedom of Information Act Officer in the Grain Inspection, Packers and Stockyards Administration (GIPSA), packers who slaughter animals for ground meat products tend to commingle different livestock types at slaughter, and the meat is often further mixed when it is ground at downstream processors. Thus, processors or retailers may know they have purchased meat of a grade consistent with non-fed animals, but not know whether it came from a dairy or beef breeding herd. Peterson suggests that the best indicator is the proximity of the slaughter plant to the respective sources. For example, slaughter plants in the Great Lakes region would tend to source from dairy herds (Peterson, 2008).

Wholesalers

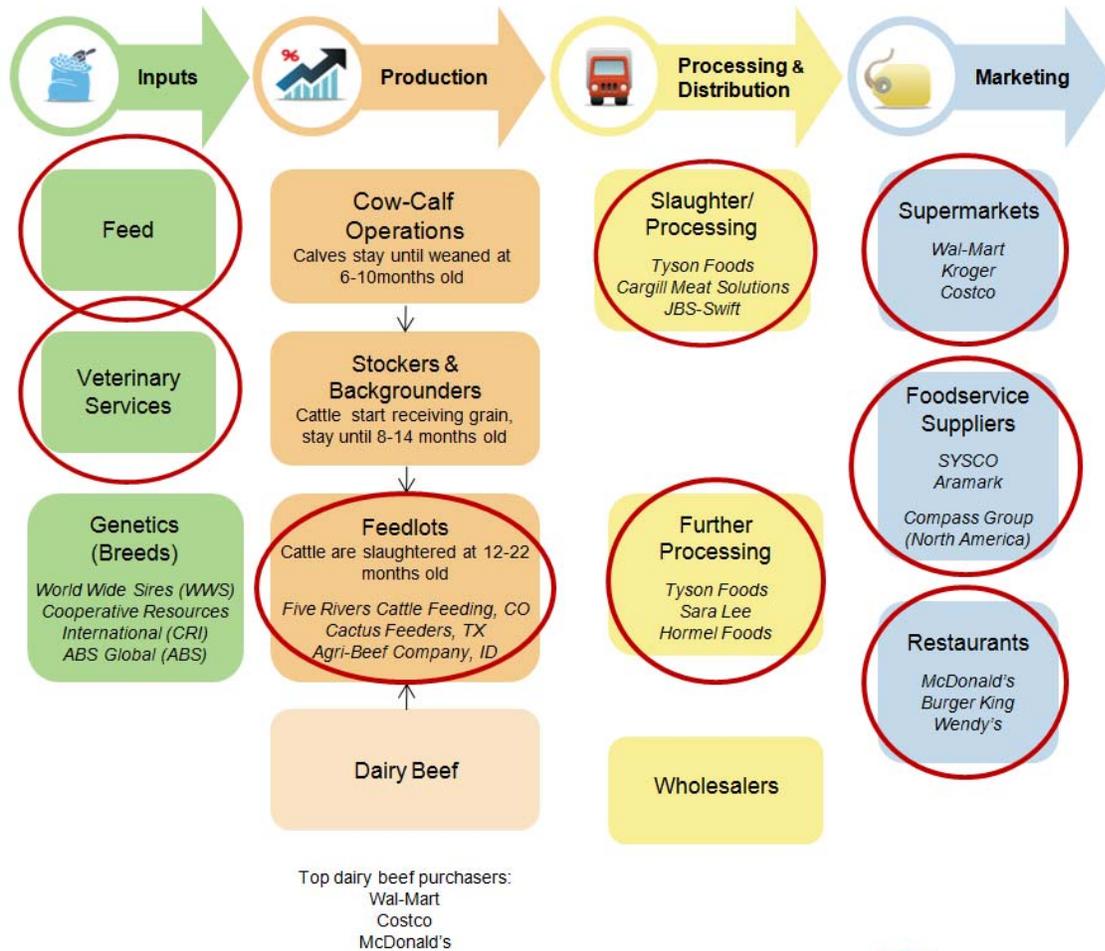
Beef wholesalers currently occupy 16% of the beef market (RTI International 2007). In recent years, the conventional relationships between retailers, wholesalers, and manufacturers have been changing. The increasing presence of nontraditional grocery retailers, such as supercenters and drugstores, as well as competitive responses by traditional grocers, such as supermarket chains, has contributed to sharp increases in concentration in the grocery retail sector (Martinez 2007). Wholesalers are playing a shrinking role in the beef industry because packing companies are often connected to retailers directly, eliminating the need for a middleman. Additionally, wholesale companies are increasingly becoming involved in further processing activities (Tyson, 2008c).

We have eliminated wholesalers from our leverage analysis because the leading firms in this category are also the industry leaders in packing and processing, including Tyson Fresh Meats, Inc., Cargill Meat Solutions, and JBS Swift. These companies are highlighted in the “key boxes” section below.

Key Boxes

We chose several key boxes in the beef industry value chain that have the most potential leverage with respect to cattle operations' practices in feed and manure management. They are Feed, Veterinary Services, Feedlots, Packing/Processing, Supermarkets, Restaurants, and Food Service Management (See Figure 6).

Figure 6. U.S. Beef Industry Value Chain, with Top Companies



Source: CGGC, based on references cited in text.

Feed

Feed is the single most important box in the value chain in terms of relevance to greenhouse gas emissions. As noted earlier, on a global basis an estimated 40% of the greenhouse gas impact of beef production is attributable to the loss of carbon sinks on land cleared for feed crops. In addition, an estimated 32% of beef's overall contribution consists of greenhouse gas emissions from the animals themselves, through enteric fermentation, and through their wastes (Fiala, 2009). Emissions from these two sources, enteric fermentation and livestock wastes, can be abated to some extent by manipulating feed and manure management practices.

Identifying a corporate entry point for leverage in the feed box is a challenge. Feed types change according to the different stages of cattle production. During the first two stages, cow-calf operations followed by stockers and backgrounding, cattle may pasture or graze on harvested forages, with some grain introduced in the second stage. Since forage and grains are purchased from local grain elevators, cattle feed in these stages is not a concentrated market, nor does it contain large or well-known players. In the third stage, cattle are sent to feedlots where they are fed primarily on grains, again from local grain sources. Feedlot operators add supplements and growth promoting products to cattle feed, including minerals and hormones. It is perhaps in this stage that cattle diet can be most significantly manipulated to affect animal digestion and the makeup of nutrients in manure.

The manipulation of feed content and manure management is described in greater detail in the discussion of feedlots in the "Key Boxes" section.

Veterinary Services

Veterinarians are considered the most important source of off-farm information on animal nutrition for cow/calf operations, and one of the most important for feedlots.

The veterinary service branch of the USDA is called the Animal and Plant Health Inspection Service (APHIS), which is responsible for protecting and improving the health and quality of the nation's agricultural animals, animal products, and veterinary biologics. APHIS has registered more than 25% of U.S. cattle farms in its National Animal Identification System (NAIS), a network intended to foster collaboration among Federal and State animal health officials, colleges of veterinary medicine, and private veterinarians.

The U.S. veterinary service sector is highly fragmented; the 50 largest companies hold less than 10 percent of the market. In 2007 there were an estimated 87,946 veterinarians, among which 58,240 were private clinical practices, 14,435 were public and corporate, 13,342 were employment unknown, and 1,919 were not listed. Public and corporate veterinarians thus account for only 16% of the total, and most veterinary services are provided by private companies or individual clinics. Veterinary Centers of America (VCA) is the largest operator of animal hospitals and testing labs. The typical veterinary services company operates a single 4,000 square foot animal hospital with a staff of ten, including two veterinarians, and has annual revenue under \$1 million (First Research 2008).

The veterinary sector plays a crucial role in animal nutrition and management practices, and thus represents an important leverage point in potentially reducing greenhouse gas emissions from beef

production. In terms of firm-level leverage, however, the sector is highly fragmented and localized, and thus a major corporate leverage point may be difficult to identify.

Feedlots

Feedlots satisfy three leverage criteria: direct control of manure management, direct control of cattle diets, and a highly concentrated market.

Once cattle reach an entry-level weight, about 650 pounds (300 kg), they are transferred to a feedlot and fed a specialized diet. During approximately four months on the feedlot the animal may gain an additional 400 pounds (180 kg). Cattle feedlots are concentrated in the Great Plains, mainly in Texas, Kansas, Nebraska and Colorado. Feedlots with fewer than 1,000 head of capacity comprise the vast majority, but these small and medium-sized operations market a relatively small share of fed cattle. In contrast, feedlots with 1,000 head or more of capacity (comprising less than 5 percent of total feedlots) account for 80-90 percent of fed cattle. Feedlots with 32,000 head or more of capacity market around 40 percent of fed cattle (USDA/ERS, 2008a).

Cattle feeding practices have been identified as a possible approach to reducing methane emissions from the beef industry. A brief summary of such methods appears in **Table 7**.

Table 7. Summary of Feed Strategies to Reduce Methane Emissions from Cattle Operations

Practice	Effect
High-grain diet	Reduce methane emissions, increase animal production efficiency
Less ruminal fermentation time for feed	Convert less carbon to methane
Use of feed additives (Ionophores)	Used in most fed cattle; inhibit formation of methane by rumen bacteria
Higher production efficiency	Reduce methane emissions by increasing productivity per animal
Use of feed other than forages	Reduce methane in animal

Source: CGGC, based on Oshida, 2002.

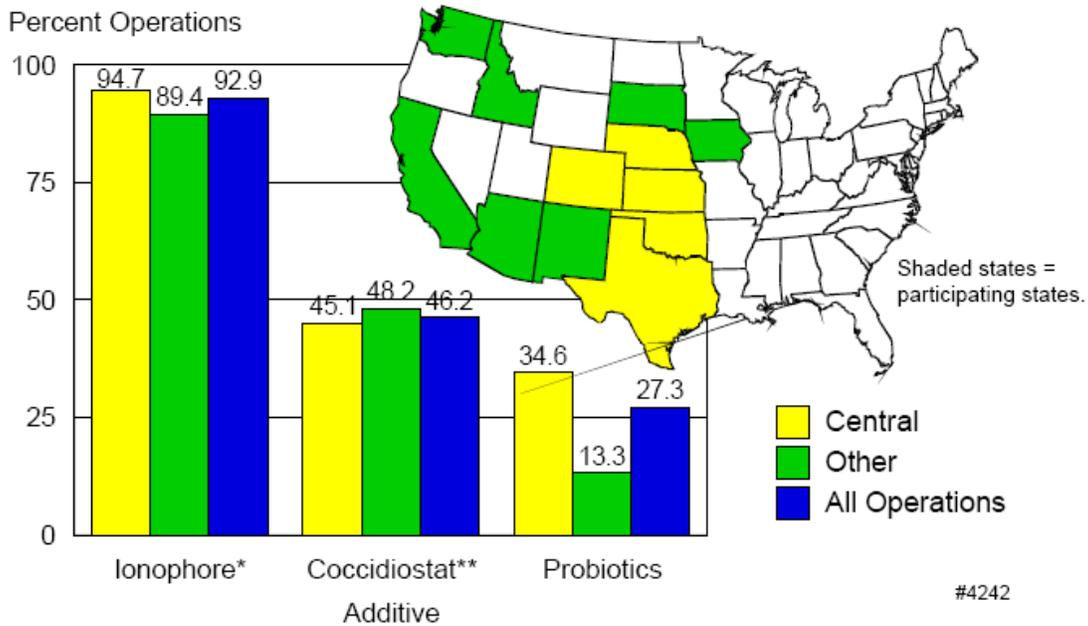
The feeding strategies of most feedlots are focused primarily on using nutritional additives to increase feed efficiency, including hormones to promote growth. Estrogen, progesterone, and testosterone (three natural hormones), and zeranol and trenbolone acetate (two synthetic hormones) may be used as an implant on the animal's ear. While the main objective appears to be maximizing feed efficiency, some widely used additives have potential environmental effects, including the following:

- **Ionophores** increase feed efficiency and inhibit the formation of methane by rumen bacteria (U.S. Climate Technology Program, 2003).

- **Coccidiostats** are used to reduce coccidial infections in calves. Some coccidiostats act as ionophores to increase feed efficiency and weight gain
- **Probiotics** reduce manure quantity, nitrogen excretion quantity, and typically reduce methane emissions in cattle (Oshida, 2002).

Figure 7 shows the use of ionophores, coccidiostats, and probiotics on feedlots across the United States. Ionophores are widely used on all cattle, but coccidiostats are used mainly on calves. The use of probiotics is more prevalent in the Central United States.

Figure 7. Percent of Operations that Fed Placed Cattle Selected Additives, by Region



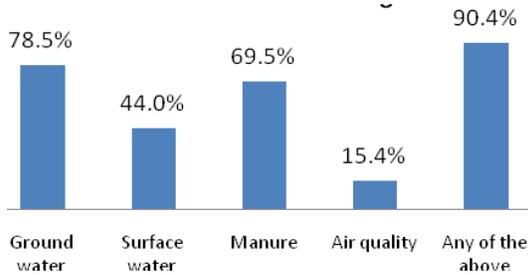
* Ionophore: such as Rumensin⁷, Bovatec⁷, or Cattlyst⁷.

** Coccidiostat other than an ionophore such as Corid⁷ or Deccox⁷.

Source: USDA-APHIS, 2000.

Most feedlot companies engage in environmental testing for pollution, and their focus is on the nitrous content of manure and groundwater (See **Figure 8**). Most feedlots lack sufficient environmental programs, however. Only about 60% of the larger feedlots have any formal written guidelines for environmental issues in general, and about half have manure management programs (See **Figure 9**).

Figure 8. U.S. Feedlots: Different Types of Environmental Testing



Source: USDA-APHIS, 2000.

Feedlots dispose of cattle manure through a variety of methods, including land application, selling or giving away, paying for removal, or removal by another method (See **Figure 10**). Most feedlots use waste lagoons to capture runoff, and many use berms and fencing or landscaping to control runoff and minimize erosion (See **Figure 11**).

Figure 9. U.S. Feedlots: Environmental Programs

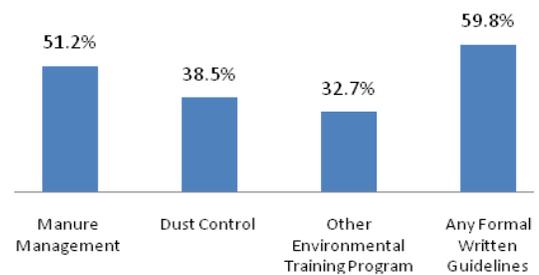
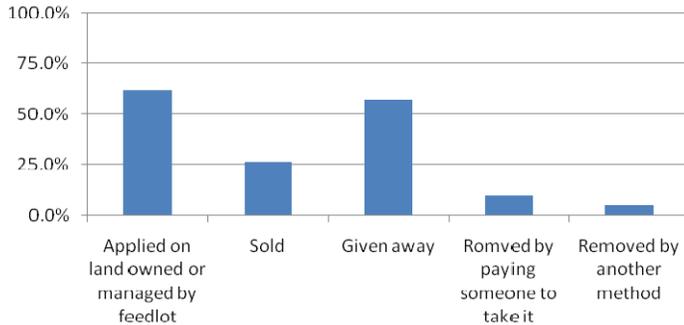
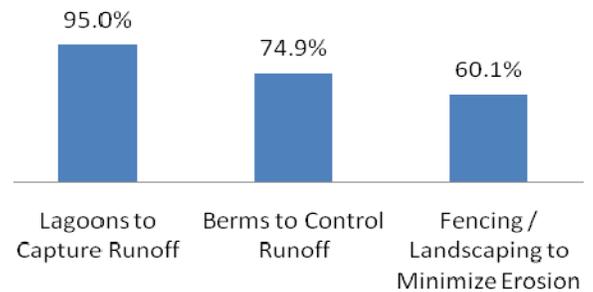


Figure 10. U.S. Feedlots: Manure Disposal Methods



Source: USDA-APHIS, 2000.

Figure 11. U.S. Feedlots: Water Runoff Management



Feedlots are becoming increasingly concentrated. By 2005, the largest 2% of feedlot companies accounted for 85% of finished cattle (ready for slaughter). The buyer power of the highly concentrated supermarket sector is the principal driver of this consolidation (OneSource, 2008b). The top U.S. feedlot companies are listed and described in **Table 8**. Ranked by one-time maximum capacity (heads of cattle), top firms include Five Rivers Cattle Feeding (a joint venture between ContiGroup and Smithfield Foods), Cactus Feeders, Inc., Agri-Beef Company, and Caprock Industries (a subsidiary of Cargill).

Table 8. Top U.S. Beef Feedlot Companies, Ranked by One-Time Maximum Capacity

Cattle Feedlot Companies	Total Annual Sales	Market Position	
		One Time Maximum Capacity (heads)	Feedlots
Five Rivers Cattle Feeding Loveland, CO (Joint Venture between Contigroup and Smithfield Foods)	\$138.2 million (2007)	820,000	10
Cactus Feeders, Inc. Amarillo, TX (Private)	\$678.1 million (2007)	520,000	9
Agri-Beef Company Boise, Idaho	\$280.6, million (2007)	350,000	6
Caprock Industries Amarillo, Texas (Subsidiary of Cargill)	\$120.4 billion, Cargill Incorporated (2008)	285,000	4
Friona Industries, L.P. Amarillo, TX (Private)	\$64.4 million, (2007) ² Supplies beef to McDonald's	275,000	4
AzTx Cattle Company Hereford, TX	\$2.3 million	247,000	5

Source: CGGC, based on company annual reports, Hoover's and Cattle Buyer's Weekly.



² Annual sales figure is from Hoover's. OneSource gave the figure \$400,000 million, a huge discrepancy. A third source, Cortera.com, estimated annual sales of \$25-\$75 million. Therefore, we chose to go with Hoover's.

Slaughter (Packer)/Processing

U.S. packer/processing companies satisfy five leverage criteria: indirect control of manure management, indirect control of cattle diets, a highly concentrated market, a single player with at least 20% market share (to date, Tyson Foods), and several players with significant name recognition.

The U.S. beef slaughter and processing industry has shown increasing consolidation over time. In 2004 the four largest slaughter firms accounted for 69% of cattle slaughter (Martinez, 2007). As of early 2008 there were about 64 major beef packing operations (Tyson, 2000b). At that time, the leading U.S. beef producer—Tyson Foods—controlled some 25% of the market. However, the world's largest meat company, JBS SA of Brazil—which became the 3rd largest meat packer in the United States after purchasing Swift & Co.'s meat business in 2007—has recently changed the landscape.

On October 23, 2008, JBS completed its acquisition of Smithfield Beef Group (5th largest in the United States) and Smithfield's cattle feeding division, Five Rivers Cattle Company for \$565 million. Five Rivers Cattle is listed in **Table 8** above as the largest-capacity feedlot company in the United States, with 10 feed yards and a one-time capacity of 820,000. These new acquisitions will enable JBS to warehouse and process about 2 million head of cattle annually. The controversial deals were announced in March of 2008, and although the Department of Justice eventually decided to allow the transaction, many have argued that it is anti-competitive to allow a single company to control so much of the industry (Lindell, 2008).

JBS also announced a \$560 million merger with National Beef Packing Co. (U.S. 4th largest), which would create the largest beef packer in the United States. The Justice Department announced on October 20, 2008 that it would challenge the merger, and National Beef has pledged to fight this challenge. A total of seventeen states have joined the lawsuit: Arizona, Colorado, Connecticut, Iowa, Kansas, Minnesota, Mississippi, Missouri, Montana, North Dakota, New Mexico, Ohio, Oklahoma, Oregon, South Dakota, Texas and Wyoming; but Nebraska, a key state for cattle, is not yet opposing the merger. These states have a high concentration of cow/calf production and not feeding operations, which indicates that packers, in particular, are concerned (Associated Press, November 13, 2008).

A list and description of the top U.S. beef packing companies as they currently stand appears in **Table 9**. These include Tyson Foods, Cargill Meat Solutions (subsidiary of Cargill), JBS-Swift, and National Beef (private company and the target of JBS' proposed merger).

Table 9. Top U.S. Beef Packer/Processor Companies

Beef Packer/ Processors	Total Annual Sales	U.S. Market Position
Tyson Foods Inc.	\$26.9 billion, company \$12.7 billion, Beef division \$2.6 billion, prepared foods	25% - Beef Market Share* Largest beef packer in US (after 2001 acquisition of IBP) Largest producer and marketer of beef, poultry, and pork in world
Cargill Meat Solutions Corp. (Subsidiary of Cargill, Incorporated, private company)	\$88.3 billion, parent company	21% - Beef Market Share* Company recalled about 1.9 million pounds of beef because of potential e. coli contamination in 2007.
JBS-Swift (Brazil) World's largest beef producer: slaughter, production, export capacity	\$14.1 billion, company \$9.2 billion, US division \$1.7 billion, US beef division	18.5% - Beef Market Share* (includes Smithfield Beef Group) Second-largest processor of fresh beef and pork products in world Slaughtering Capacity - 57.3 thousand heads / day In 2008 acquired Smithfield Beef Group U.S. 5th largest producer.
National Beef (private company)	\$249 million, company	10.5% - Beef Market Share*



* According to Cattle Buyer's Weekly

Source: CGGC, based on Hoovers, OneSource, DataMonitor, Ward's Business Directory, and company annual reports

Further Processing

The further processing segment in the beef value chain satisfies three leverage criteria: a highly concentrated market, a single player with at least 20% market share (Tyson Foods), and several players with significant name recognition.

This segment is rapidly becoming a subset of the major packing companies, which are highly concentrated, vertically integrated, and becoming increasingly involved in the higher value-added activities of further processing. The major packers are now acquiring processing companies; for example, in 2007 JBS Co. acquired Swift, the world's third-largest processor of fresh beef and pork products (JBS-SA, 2007). As a consequence of this trend, beef further processing is also becoming more concentrated, with the same top companies dominating: Tyson, JBS Co., and Cargill. Tyson manages three main brands for further processing: Bonici, Tyson and Wright (Tyson, 2008b). These brands are involved in the preparation of ready to eat meals, hamburgers and marinated beef sold in supermarkets in the form of frozen, refrigerated or canned products. In the case of JBS Co., the company also manages a variety of further processing brands such Friboi, Sola, Swift and Anglo. It also trades its products under clients' customized brands or under the company's brand (JBS-S.A., 2008).

The top U.S. food processing companies involved in further processing of beef appear in **Table 10**.

Table 10. Top U.S. Food Processing Companies

Food Processors	Total Annual Sales	Market Position
Tyson Foods	\$26.9 billion, company \$12.7 billion, Beef division \$2.6 billion, prepared foods	25% - Beef Market Share* Largest beef packer in US (after 2001 acquisition of IBP which had was involved in producing pre-cooked meats for foodservice and retail industries)
Sara Lee Corp.	\$13.3 billion, company \$2.4 billion, North American Meat segment	North American Retail Meats segment's products include pork, turkey, beef and chicken, which are purchased from independent farmers and vendors.
Hormel Foods Corporation	\$6.2 billion, company	Perishable meat segment estimated to make up about 53% of company revenues*
Keystone Foods LLC	\$3.3 billion, company	Produces 350 million pounds of beef products annually Major supplier of hamburger meat to McDonald's, services 24,000 other restaurants nationwide
Kraft Foods	\$37.2 billion, company \$5.1 billion, Convenient Meals segment (includes packaged dinners, lunch combinations and processed meats)	Relevant brands include Lunchables, Oscar Meyer, Taco Bell Home Originals, and Louis Rich Cold Cuts



Source: CGGC, based on Hoovers, OneSource, DataMonitor, Ward's Business Directory, and Company Annual Reports

Supermarkets/Retailers

Supermarkets/Retailers satisfy three leverage criteria: a highly concentrated market, a single player with at least 20% market share (Wal-Mart's total retail share), and several players with significant name recognition.

Supermarkets are the largest buyer of beef products, accounting for 32% of the beef market (RTI International, 2007). Concentration in the supermarket industry has been increasing since the late 1980s (Callahan & Zimmerman, 2003).

The rise of Wal-Mart and other supercenters is squeezing out some traditional retail grocery outlets. Although the nation's 56,000 supermarkets remain dominant in food shopping, their share of the business has been steadily declining. By 2004, Wal-Mart had roughly 20% of U.S. market share, while supermarkets' share declined and Whole Foods' share remained under 1% (see **Figure 12**). In the roughly four years since that time, Wal-Mart has expanded its reach considerably into its competitors' niches, including organic and natural offerings. In an economy where, in 2008, the price of consumer goods rose 5%, Wal-Mart has thus continued to draw customers away from higher-priced outlets such as Whole Foods.

Figure 12. U.S. Grocery Market, 2002 and 2004



Source: The New York Times

The top U.S. supermarkets appear in **Table 11**. Ranked by annual sales, they are Wal-Mart, Kroger, Costco, Supervalu, and Safeway (Supermarket News, 2008). Wal-Mart is the largest food retailer in the world, with annual sales of \$379 billion, larger than the combined total of the top four European supermarkets Carrefour, Tesco, Metro Group, and Schwarz Group—a total of \$363 billion (Supermarket News, 2008).

Table 11. Top U.S. Supermarkets

Supermarkets	Total Annual Sales	Market Position
<p>Wal-Mart [Big Box Retailer]</p>	\$378.8 billion	<p>Largest retailer in the U.S. and worldwide. Roughly 20% of total market share.</p> <p>Wal-Mart does not make its food numbers public. However, trade publications project its market share at 12-20% of the total U.S. retail grocery business. Estimates are that Wal-Mart's meat sales generally follow its overall food penetration.</p> <p>12.7% market share (2006)*</p>
<p>Kroger [Traditional Grocer]</p>	\$70.2 billion	<p>Largest operator of traditional grocery stores. Second largest food retailer in the United States.</p> <p>Kroger holds the number one or two market share position in 39 out of its 44 major markets.</p> <p>11.4% market share (2006)*</p>
<p>Costco [Wholesale Warehouse]</p>	\$64.4 billion	<p>Leader in the retail warehouse industry.</p> <p>Majority of market share from its competition. 54.2% (2006) in wholesale club market share.</p>
<p>Supervalu [Supermarket Chain]</p>	\$44.05 billion	8.2% market share (2006)*
<p>Safeway [Traditional Grocer]</p>	\$42.3 billion	<p>Third largest retail grocery chain.</p> <p>7.1% market share (2006)*</p>

All figures for 2007 unless otherwise noted.

Source: CGGC, based on company annual reports, OneSource, Hoover's, wkinvest, and Peck, 2003.

Food Service Suppliers and Operators

Foodservice suppliers and operators satisfy one leverage criterion: players with significant name recognition. The segment certainly has major players (Compass Group, Sodexo, Aramark) but since it is difficult to obtain data on market share, we have not determined the degree of concentration in the industry.

Foodservice can be defined as all meals, snacks and beverages that are prepared away from the home. Foodservice is different from the retail industry (see supermarkets, above) in that retail food either does not require any preparation, or it is intended to be prepared in the home. Establishments that offer foodservice, by contrast, include restaurants, hotels, cafeterias, schools, hospitals, and correctional facilities, among others. However, the industry also encompasses activities from the adjacent segment of the value chain (Processing/ Distribution), including food product processing, equipment and supplies, and the wholesale delivery of these products to foodservice establishments (Technomic, Inc. 2006).

Chris Urban, Director of the Knowledge Center at Technomic, Inc. explains that the foodservice industry can be divided into four main categories. It is important to understand that there is a great deal of overlap between the functions of these different segments (Urban, 2008). The four main categories, along with lead companies, are as follows:³

- Distributors or suppliers: Sysco Corporation, U.S. Foodservice, Performance Food Group
- Foodservice management companies: Compass Group, ARAMARK, Bon Appétit Management Company
- Restaurants: McDonald's, Burger King, Subway
- Foodservice manufacturers: ConAgra, Campbell Soup, Heinz

In its handbook on the foodservice industry, Technomic, Inc. explains what differentiates foodservice from other industries. The distinctive characteristics of the foodservice industry are as follows:

- High fragmentation: there are nearly 900,000 foodservice outlets in the United States, compared with only 27,000 supermarkets
- High segmentation: the industry is divided into 18 major segments and multiple sub-segments
- Lack of trade information: few data exist about foodservice purchases; no market data are currently available on the foodservice industry to track product movement
- Private label importance: a number of controlled, private-label products are manufactured either for distributors/suppliers (such as SYSCO) or operators (such as chain restaurants like McDonald's)
- Decision makers: although consumers are the ultimate users of foodservice products, foodservice operators are responsible for making food purchasing decisions and selecting products and brands

³ Leading companies based on Hoovers report and other industry data.

The top three U.S. foodservice management companies are Compass Group, Sodexo, and Aramark. The top five companies appear in **Table 12**.

Table 12. Top U.S. Foodservice Management Companies

Foodservice Management Companies	Total Annual Sales	Market Position
<p>Compass Group PLC (England) Compass Group, USA Inc</p> <p>[Compass has 13 operating divisions. One of which is Bon Appétit Management Company, acquired by Compass in 2002.]</p>	<p>\$21.02 billion</p>	<p>World leader.</p> <p>The Americas Division is the largest contract foodservice company with \$8,200 million in revenues.</p>
<p>Sodexo, Inc. (North American operating arm of French foodservice giant Sodexo)</p>	<p>\$12.5 billion</p>	<p>Leading provider of integrated food and facilities management services in the U.S., Canada, and Mexico.</p>
<p>ARAMARK Corporation</p>	<p>\$12.4 billion</p>	<p>Food and support services sales: \$8.4 billion (U.S.) and \$2.3 billion (International).</p>
<p>Delaware North Companies</p>	<p>\$2.04 billion</p>	<p>Company has a large market share of food service operations at sports and conference facilities; as well as a full-service catering and restaurant services group.</p>
<p>Centerplate, Inc</p>	<p>\$741 million</p>	<p>One of North America's leading hospitality companies.</p>



All figures for 2007 unless otherwise noted.

Source: CGGC, based on OneSource, Hoover's, company annual reports, and Food Management Magazine, 2008.

Restaurants

For the beef industry, restaurants satisfy two of our leverage criteria: a highly concentrated market *in the Fast Food Hamburger Restaurant (FFHR) category*—see below—and several players with significant name recognition.

The U.S. dining industry accounts for more than \$500 billion in sales and encompasses about 945,000 eating outlets (Hoover's, 2008). The largest restaurants by sales are chain restaurants, also called Quick Service Restaurants (QSR), estimated to represent \$228 billion in sales in 2008 (Burger King, 2008). According to a ranking provided by Restaurants and Institutions Magazine, the dominant chains are McDonald's, Burger King, Subway and Starbucks (see **Table 13**).

The QSR market as a whole is fairly fragmented, comprising many independent sites as well as the larger chains (Datamonitor, 2007). One niche stands out, however: Fast Food Hamburger Restaurants (FFHR), with an estimated \$61 billion in sales in 2008, or 27% of the QSR total. The three largest FFHRs are McDonald's, Burger King, and Wendy's. Combined, these three represent 73% of all fast food sales (Burger King, 2008).

All of the restaurants listed in **Table 13** are QSRs, and we highlight those that are FFHRs. Company sales and revenues figures do not line up neatly with the overall ranking. In part, this is because of discrepancies among data sources. It is also due to complications concerning company-owned versus franchise sales. **Table 13** presents the best figures we could compile from company annual reports and the R&I ranking.

Top companies in the restaurant sector seem to be an attractive leverage point in the beef value chain. McDonald's is the single largest beef purchaser in the United States, buying nearly one billion pounds annually at about \$1.3 billion (Roybal, 2007). As for the dairy value chain, Starbucks, which appears 4th on the R&I ranking, is of interest. Starbucks spends \$200 million per year on dairy products in the United States. Although this represents only 3.2% of its total U.S. costs, the company's 10-K report emphasizes fluid milk as central to its operations, on a parallel with Arabica coffee in terms of importance. The report also notes that rising milk costs have affected profitability, and that the company sources all its milk from just two dairy suppliers (Starbucks, 2008).

Table 13. Top U.S. Restaurants

Restaurants (Quick Service Restaurants)	Total Annual Sales	Market Position
McDonald's (1)*	<p>\$22.8 billion total revenues</p> <p>\$7.9 billion U.S. revenues (includes royalties from franchises)</p> <p>Estimated \$28.5 billion total U.S. sales</p>	<p>Estimated 48% of total U.S. FFHR sales</p> <p>Estimated 13% of QSR sales</p>
<p>Yum! Brands (2) (Includes KFC, Pizza Hut, Taco Bell, Long John Silver's, and A&W)</p>	<p>\$10.4 billion total revenues</p> <p>\$5.2 billion total U.S. revenues</p> <p>Company owned restaurants account for 20% of all U.S. restaurants. Assuming sales are equivalent in owned and non-owned stores, we estimate U.S. sales at \$23.1 billion</p>	<p>Estimated 10% of QSR sales</p>
Burger King (3)	<p>\$2.2 billion total revenues</p> <p>\$1.4 billion total US revenues</p> <p>Estimated \$8.2 billion total U.S. sales</p>	<p>Estimated 14% of total FFHR sales</p> <p>Estimated 4% of total QSR sales</p>

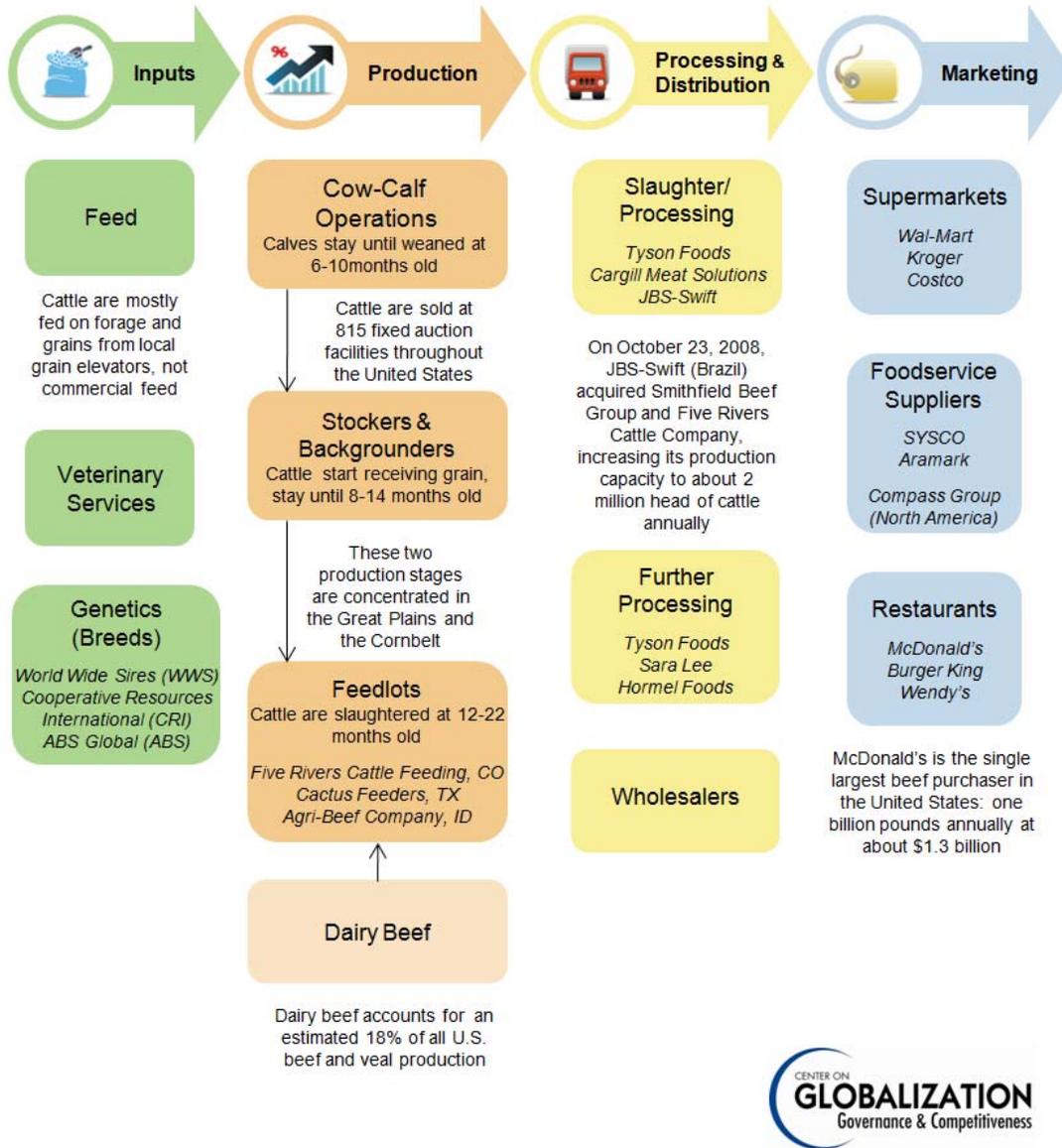
<p>Starbucks Corporation (4)</p>	<p>\$9.4 billion total revenues</p> <p>\$7.3 billion total U.S. revenues</p> <p>\$6.6 billion U.S. sales, restaurants only</p>	<p>\$200 million (est.) - Total cost of dairy products, U.S. only</p> <p>3.2% - Dairy as proportion of total U.S. costs</p> <p>Estimated 3.0% of QSR sales</p>
<p>Subway (5)</p> <p>*Private Company*</p>	<p>\$11.3 billion estimated total sales (Hume 2008). No estimate of total U.S. sales available</p> <p>No estimate of total company revenue is available</p>	<p>Estimated 5.1% of total QSR sales</p>
<p>Wendy's (6)</p>	<p>\$2.5 billion total revenues</p> <p>\$6.3 billion total North American sales (primarily U.S.)</p>	<p>Estimated 10.7% of total FFHR sales</p> <p>Estimated 2.9% of QSR sales</p>



Source: CGGC, based on company annual reports and Hume, 2008.

A summary value chain of the U.S. beef industry with layered information and company names is found in **Figure 13**.

Figure 13. U.S. Beef Industry, Summary Value Chain



Source: CGGC, based on sources cited in text.

IV. U.S. Dairy Industry

This section will focus on the U.S. dairy industry, beginning with an overview of the size of the industry and the key characteristics of dairy farming.

A. Dairy Industry: Overview

Measured in gross income at the farm level, the dairy industry is valued at more than \$35 billion (USDA-NASS 2008d). Every state has dairy operations, but higher concentrations are found in California, Wisconsin, and New York. Dairy is the most valuable agricultural output in eight states (California, Idaho, Michigan, New Mexico, New York, Pennsylvania, Vermont, Wisconsin) and the second most valuable in another eight states (Arizona, Colorado, Connecticut, Maine, New Hampshire, Rhode Island, Utah, Washington).

California is the top dairy state, with 21% of the nation's gross income from milk production (see **Table 14**). The top three states account for more than 40% of cow inventory and milk sales.

Table 14. Top Five States by Milk Production and Income, 1997 and 2007

<i>State</i>	<i>Unit of Value</i>	<i>% US</i>	<i>% 2006 Value Unit</i>
<i>Gross milk production (million pounds)</i>			
California	40,683.0	21.9%	104.8%
Wisconsin	24,080.0	13.0%	102.9%
New York	12,103.0	6.5%	100.5%
Pennsylvania	10,682.0	5.8%	99.4%
Idaho	11,549.0	6.2%	105.9%
<i>United States</i>	185,602.0	100.0%	102.1%
<i>Milkfat (million pounds)</i>			
California	1,497.1	21.9%	104.8%
Wisconsin	891.0	13.0%	102.4%
New York	447.8	6.6%	100.2%
Idaho	419.2	6.1%	105.6%
Pennsylvania	395.2	5.8%	98.9%
<i>United States</i>	6,829.7	100.0%	101.9%
<i>Gross Income (billions of dollars)</i>			
California	7.3	20.7%	163.1%
Wisconsin	4.6	13.0%	149.3%
New York	2.4	6.7%	147.7%
Pennsylvania	2.2	6.3%	142.2%
Idaho	2.1	5.8%	159.8%
<i>United States</i>	35.4	100.0%	151.4%

Source: USDA-NASS 2008d

In contrast to the beef industry, dairy production from calving to milk production often takes place on a single farm, although, as noted earlier, some large farms may have several herds at different sites. An additional exception is the growing tendency to raise heifers off site, at custom heifer raising

operations (see earlier discussion on page 5). First calving generally comes at 24 months of age (USDA-APHIS, 2007a). Ideally, cows can calve every 12 months. Productivity tapers as time elapses after calving, and cows are “dried off” 60 days before calving, after an average period of 205-235 days of milking (Hare et al., 2006). Calves are weaned immediately and most females are retained or sold to other dairy farms, while most males are sold into the veal market, with a few retained for breeding. Over the lifetime of dairy cows, 73% are productive to the second parity (production of milk after birth), and 50% to parity three. The average parities for Holsteins, the most widely used dairy variety in the United States, was 2.8 in 1994 (Hare et al., 2006).

B. Dairy Industry: Value Chain

The basic structure of the U.S. dairy industry is depicted in the value chain shown in **Figure 14**. The first column in the chain, “Inputs,” refers to the main products and services a dairy farmer needs to run the operation. The “Milk Production” column contains only one type of producer, the single dairy farm on which all the activities take place, from calving and cattle raising through milking and pasteurizing. “Distribution” from milk producers to processors is largely accomplished through marketing cooperatives, some of which also do processing. The final column, “Marketing,” refers to supermarkets and restaurants where dairy products are sold.

Figure 14. U.S. Dairy Industry Value Chain



Source: CGGC; sale of culled cows from Wren, 2008.

C. Dairy Industry: Economic Actors and Leverage

Using the seven criteria listed in the beef section on page 14, we analyzed each box in the value chain for the U.S. dairy industry to determine the degree of leverage each economic actor has with dairy operations, and hence the potential it might have to influence relevant dairy cattle management practices in ways that offer environmental and economic benefits (see **Table 15**).

Eliminated Boxes

Several boxes from the beef value chain also appear in the dairy value chain. Two categories that we eliminated from the beef leverage analysis were also removed from dairy for similar reasons; they are “Vet Services” and “Seedstock/Breeds.” Two other eliminated dairy boxes, with their separate explanations, appear below.

Pasture, Silage and Hay

As with fed beef, dairy cattle consume food high in calories, supplemented with roughage and protein. This translates into alfalfa hay, grain or corn silage, and soybean meal provided mainly from dispersed local providers. Many farms also provide much of their own forage or pastureland for grazing and feed. Most producers purchase some feed, especially supplements.

Wholesalers

In recent years wholesale companies have altered the way in which they function in the dairy industry. Concentration of dairy processing and manufacturing firms has become increasingly notable, and many of these firms effectively perform the wholesaler function. Much of the dairy-product sector concentration has been paralleled by the concentration of firms that purchase the products (Miller and Blayney, 2006).

Table 15. U.S. Dairy Industry Leverage Table

Value Chain Box	Pasture, Silage and Hay	Genetics	Vet Service	Dairy Producer	Dairy Cooperative	Milk & Dairy Processors	Wholesale	Supermarket	Food Service Supplier & Operator	Restaurants
Direct Control of Manure Management										
Indirect Control of Manure Management										
Direct Control of Cattle Diets										
Indirect Control of Cattle Diets										
Highly Concentrated Market*										
Single Player with >20% of Market Share										
Players with Significant Name Recognition										

*Top five firms control at least 50% of the market

Source: CGGC.



Key Boxes

We chose several key boxes in the dairy industry value chain that have the most potential leverage with respect to dairy operations' practices in feed and manure management. In addition to the boxes that overlap with key boxes in the beef value chain—"Supermarkets," "Foodservice Operators," and "Restaurants"—the leverage analysis for the dairy industry includes "Marketing and Producer Cooperatives" and "Milk and Dairy Processors" (See **Figure 15**).

Figure 15. U.S. Dairy Industry Value Chain, with Top Companies



Source: CGGC. Top 100 companies from Dairy Foods, 2008; supermarkets' share of dairy from Yonkers 2008.

Dairy Cooperatives

Dairy marketing cooperatives satisfy three leverage criteria: indirect control of manure management, indirect control of cattle diets, and several players with significant name recognition.

In 2006, cooperatives marketed roughly 180 billion pounds of milk, the top 10 cooperatives accounting for 59% of this total (Family Dairies USA, 2007). Since many cooperatives produce several products other than milk, the amount of milk marketed is a more reliable measure of market share than total sales. Thus, by volume, the top five cooperatives are Dairy Farmers of America; California Dairies, Inc.; Land O’Lakes, Inc.; Northwest Dairy Association, and Dairy Lea Cooperative, Inc.

There is substantial overlap between major cooperatives and the major processors described below. We have ordered the companies according to their rankings within the top 100 dairy firms, as published in *Dairy Foods* (See **Table 16**).

Table 16. Top U.S. Dairy Cooperatives

Dairy Cooperatives	Total Annual Sales	Market Position
Land O’ Lakes	\$8.9 billion net sales \$4.2 billion net sales, dairy foods segment	Generates 12.5 billion pounds of member milk annually Markets 300 dairy products Provides members with farming inputs 5.4% of dairy sales for the top 100 companies DF ranking: 3*
Agropur Cooperative (Canadian)	\$2.6 billion net sales (only produces dairy products)	1.89 billion liters of milk processed annually Active throughout North America, but centered in Canada 3.2% of dairy sales for the top 100 companies DF ranking: 6

<p>Dairy Farmers of America (Marketer Primarily)</p>	<p>\$7.9 billion revenues</p> <p>\$1.9 billion dairy revenues</p>	<p>61.9 billion pounds of milk marketed in 2007</p> <p>Members in 48 states, 18,000 members</p> <p>2.5% of dairy sales for the top 100 companies</p> <p>DF ranking: 11</p>
<p>California Dairies Inc.</p>	<p>\$3.5 billion total sales (2002)</p> <p>\$1.9 billion estimated dairy sales (DF)</p>	<p>18 billion pounds of milk sold or processed annually (2002)</p> <p>628 members</p> <p>2.4% of dairy sales for the top 100 companies (DF)</p> <p>DF ranking: 13</p>
<p>Prairie Farms Dairy Inc.</p>	<p>\$1.6 billion net dairy sales</p>	<p>700 members</p> <p>2.1% of dairy sales for the top 100 companies</p> <p>DF ranking: 16</p>
<p>Associated Milk Producers Inc.</p>	<p>\$1.6 billion net dairy sales</p>	<p>3,600 member farms</p> <p>5.5 billion pounds of milk</p> <p>2.1% of dairy sales for the top 100 companies</p> <p>DF ranking: 18</p>



Source: CGGC, based on company annual reports, Dairy Field, 2006; and Dairy Foods, 2008

Milk and Dairy Processors

According to *Dairy Field*, the top five dairy processors sold \$26.5 billion in dairy products in 2005 (Dairy Field 2006). The top five are Dean Foods Co., Kraft Foods Inc., Land O'Lakes Inc., Schreiber Foods Inc., The Kroger Co., and Dairy Farmers of America, Inc. Some of these companies produce both fluid milk and dairy products. In addition, two of these companies, Land O'Lakes and Dairy Farmers of America, are producer cooperatives. Most milk is marketed as private label products (for example, Kroger or Safeway brand), indicating the importance of local processors and retail companies. In contrast, dairy products tend to be produced with an eye toward the national market.

The top five fluid milk producers, measured by sales to wholesalers and retailers, are Dean Foods Co., Kroger Co., HP Hood LLC, Safeway Dairy Group, and Publix Super Markets. Top dairy product manufacturers include Kraft Foods Inc., Schreiber Foods Inc., Dreyer's Grand Ice Cream Holdings Inc. (owned by Nestle), Good Humor-Breyers (owned by Unilever), and Great Lakes Cheese Company (\$1.375 billion in sales, all products). Additional cooperatives include WestFarm Foods (owned by Northwest Dairy Association), Prairie Farms Dairy Inc., Foremost Farms USA, National Dairy Holdings LLC (half owned by Dairy Farmers of America), California Dairies Inc., and Associated Milk Producers Inc.

Table 17. Top U.S. Milk and Dairy Processors

Milk and Dairy Processors	Total Annual Sales	Market Position
Dean Foods Co.	\$11.8 billion total sales and total dairy sales	Largest processor and distributor of milk and dairy products 15.3% of dairy sales for the top 100 companies DF ranking: 1*
Kraft Foods North America, Inc.	\$37.2 billion net sales worldwide \$23.9 billion net sales, North America \$4.6 billion, estimated net dairy sales	Non-fluid dairy products only 5.9% of dairy sales for the top 100 companies DF ranking: 2

<p>Saputo Inc.</p>	<p>\$4.0 billion net sales</p> <p>\$3.8 billion dairy sales</p> <p>U.S. sales account for 44% of total sales for 2008. The rest are for Canada.</p>	<p>5 billion liters of milk processed annually in 2008</p> <p>Non-fluid dairy products only</p> <p>5.0% of dairy sales for the top 100 companies</p> <p>DF ranking: 4</p>
<p>Schreiber Foods, Inc.</p> <p>*Private Company*</p>	<p>\$3.3 billion estimated dairy sales (DF); no estimate available for total company revenues</p>	<p>Non-fluid dairy products only</p> <p>4.3% of dairy sales for the top 100 companies</p> <p>DF ranking: 5</p>
<p>Leprino Foods Co.</p> <p>*Private Company*</p>	<p>\$2.4 billion estimated dairy sales (DF); no estimate available for total company revenues</p>	<p>Non-fluid dairy products only</p> <p>3.1% of dairy sales for the top 100 companies</p> <p>DF ranking: 7</p>

Source: CGGC, based on company annual reports, Dairy Field, 2006; and Dairy Foods, 2008



V. Key Findings and Conclusion

The livestock industry is a major source of greenhouse gas emissions and water pollution. Considerable fossil fuel is used to produce fertilizers for feed crops, operate farm equipment, transport animals, and process and distribute final products. In addition to these fossil-fuel related emissions, even greater greenhouse gas impacts are attributable to 1) the loss of carbon sinks from land conversion for feed crops, and 2) emissions from the animals' wastes and enteric fermentation. Several practices have been identified in cattle feeding and manure management that can help reduce the animals' methane emissions and nitrogen excretions in manure.

Although efforts are being made to vertically integrate the beef industry in order to better track and manage the origins of beef products to meet concerns over quality and food safety, U.S. cattle

production is still dispersed among 967,440 farms nationwide.⁴ Hence, ensuring that best practices are adopted requires identifying key points downstream in the value chain through which important changes can be leveraged. We have laid out the value chain for the U.S. beef and dairy industries and analyzed the main points of entry for such leverage. Our key findings include the following:

- In the beef value chain, the first point of leverage is just downstream from farming operations: the large feedlot companies (Five Rivers Cattle Feeding in Colorado, Cactus Feeders in Texas, Agri-Beef Company in Idaho). These companies represent the most concentrated opportunity to influence feed content and manure management practices. Most of these feedlot practices, particularly with manure management, have considerable room for improvement.
- The large beef producers (Tyson Foods, Cargill Meat Solutions, JBS-Swift) have a great deal of influence upstream and downstream in the chain, beginning with determining the traits that the producers breed for, and ending with defining how beef products are marketed in supermarket display cases. They are increasingly vertically integrated, growing ever larger through mergers, and are taking on more processing and marketing roles.
- For beef, in the three segments in the Marketing category (Supermarkets, Foodservice, and Restaurants) the greatest leverage is likely found in the supermarket giants (Wal-Mart and Costco) and the Fast Food Hamburger Restaurants (McDonald's, Burger King, Wendy's).
- In dairy, this first point of major leverage includes the large dairy marketing cooperatives (Land O'Lakes, Agropur, and Dairy Farmers of America)
- The companies downstream from the dairy producer category, Milk and Dairy Processors, include large, diversified companies that, despite being diversified well beyond milk and dairy products, nonetheless include companies that have higher shares of the dairy market than the largest producer cooperatives. These companies include Dean Foods, Kraft Foods North America, and Saputo.
- Dairy beef is clearly an important segment of U.S. beef production, with very large purchasers including Wal-Mart, Costco and McDonald's. Although it is difficult to determine the exact path of dairy beef to a given buyer because the meat is typically co-mingled with non-dairy beef after slaughter, one way to determine to what extent a company purchases dairy beef is by the location of the slaughter plants it sources from, for example, a Great Lakes source would tend to indicate beef from dairy herds.

Cattle farmers' decisions are increasingly influenced by a number of large players in the final segments of the beef value chain, from Tyson Foods to Wal-Mart to McDonald's. These companies' tendency to source beef from the dairy industry provides some potential leverage with dairy producers as well. If the beef packing/processing giant JBS-Swift succeeds in completing its current, controversial merger with National Beef, the increase in this single company's size and influence could change the U.S. industry significantly.

⁴ This figure includes all cattle and calf farms, including beef, dairy and feedlot operations (see Table 1 on page 6).

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