

SECTION TWO

INTRODUCTION AND PROFILE OF THE MEAT ANIMAL PRODUCING, SLAUGHTERING, AND RENDERING INDUSTRIES

The U.S. Food and Drug Administration (FDA) is considering regulatory options to reduce the risk of an outbreak of transmissible spongiform encephalopathies (TSE) in the United States. In the United Kingdom, one form of TSE, bovine spongiform encephalopathy (BSE), is believed to be linked to cattle feed containing rendered protein by-products from sheep and goats infected with scrapie, a disease that is related to BSE.

The FDA regulatory actions will affect a spectrum of agricultural producers including renderers, slaughterers, animal producers, and animal feed producers. After introducing the FDA options under consideration (see Section 2.1), this discussion introduces the various industry components and discusses their composition, size, and scale of economic activity. Among the affected animal producers are cattle, sheep, and goat producers.

2.1 THE PROPOSED FDA REGULATION

FDA is considering five regulatory options:

- # A prohibition on all mammalian protein in ruminant feed.
- # A prohibition of all ruminant protein in ruminant feed.
- # A prohibition on the inclusion of designated tissues in ruminant feed. This option specifies that ruminant feed is not generally recognized as safe if it includes (1) bovine brain, spinal cord, distal ileum, and eyes; (2) any and all protein that is derived from any portions of the ovine (sheep family), caprine (goat family), cervine (deer family), and mink; or (3) dead, dying, disabled, or diseased bovine.
- # A prohibition on the inclusion of protein derived from sheep (including lamb), goats, deer, elk, and mink in ruminant feed.
- # A prohibition on the inclusion of protein derived from sheep (including lamb) and goats in ruminant feed.

Under these prohibitions, any component of ruminant feed containing prohibited ingredients will be considered adulterated within the meaning of the Federal Food, Drug, and Cosmetic Act. The regulatory options would not place restrictions on the use of ruminant protein by-products for uses other than as an ingredient in ruminant feed nor would they restrict the use of ruminant derived fats and tallows.

2.2 PROFILE OF CATTLE RANCHERS

The U.S. cattle industry is composed of approximately 1.23 million businesses with cattle, including beef and dairy cattle. An estimated 1.064 million farmers and ranchers raise beef cattle. The industry encompasses businesses that produce feeder or breeding cattle, stocker operators that put weight on feeder cattle before they enter feedlots, and cattle feeders who bring the cattle to market weight (National Cattlemens Beef Association [NCBA], 1996).

Sales of cattle and calves account for more than one-fifth of cash receipts from farm and ranch marketing. This business is nearly four times larger than any other sector of animal agriculture. Sales of cattle and calves totaled \$36.5 billion in 1994. Cattle sales include marketing of fed cattle for processing, for further rearing in feedlots, and cattle and calves culled from dairy herds.

Nearly 98 percent of cattlemen are small- and mid-size, single-family businesses with fewer than 500 head. These small businesses own or manage 66.2 percent of all beef cows in the country. The average size of a beef-cow herd in the United States in 1993 was 38.3 head. Table 2-1 presents the distribution of cattle herds by size.

U.S. beef production is forecast to increase by 2.5 percent (25.6 billion pounds) from 1995 to 1996 (Lambert, 1996). The increase in output is due to the growth in the total number of cattle from a cyclical low of 95.8 million head in 1990 to an estimated 105 million head in

Table 2-1

Distribution of Cattle Herds by Size

Herd Size	As Percent of All Cattle	As Percent of All Herds
1,000+ head	22.7	0.7
500-999 head	11.1	1.4
100-499 head	38.5	17.4
50-99 head	14.1	17.1
1-49 head	13.6	63.3
Total	100.0	100.0

Source: NCBA, 1996.

1996. Cow-calf producers had recently been expanding herds in response to a period of stable costs and good cattle prices.

In response to several market trends (increased meat production, higher feeding costs, a drop in feeder cattle prices, and dry weather in the range states suggesting further feed shortages), however, cattlemen are expected to begin reducing their herd sizes. Among these trends, the most important has been the increase in grain prices due to a 25-percent drop in corn production in 1995. The average price of a 450-lb calf fell from \$101 per hundredweight (cwt) in 1993 to \$69 in the fall of 1995, a decline of 32 percent (NCBA, 1996). Cattle prices declined further in early 1996 and in May fell below \$50/cwt.

Many cow-calf producers will cull or even sell off herds in 1996, pushing beef production up further and compounding price pressures on beef. The cyclical market for beef is expected to peak in regard to output expected in 1997. The liquidation of herds will result in additional beef supplies and even lower consumer beef prices (Lambert, 1996). The average featured beef price in March 1996 was \$2.43 per pound, compared to \$2.72 in early 1993 (Lambert, 1996). Based on the resulting forecast of low beef prices, many cow-calf producers are expected to be unprofitable for 2 to 3 years, with some leaving the business. At current prices, even the lowest cost producers of calves are not likely to cover variable cash costs of production.

Table 2-2 shows return cash costs and returns for cow-calf producers from 1990 through 1994. The data show that net per bred cow returns were over \$15 in 1993, but fell to a net loss of over \$22 in 1994. In 1994, returns continued to cover variable costs, however. The reports from NCBA (1996), however, suggest that current returns are not covering variable costs, encouraging the liquidation of some herds.

Export growth has been alleviating some of the market pressure on cattle ranchers. During 1995, beef and beef variety meat export value exceeded \$3.25 billion. Exports of cattle, hides, and other by-products brought the industry export revenues to \$5.4 billion, compared to an import total of \$3.0 billion. Exports account for 7 percent of output (Lambert, 1996).

2.3 PROFILE OF PORK PRODUCERS

Hog producing and slaughtering represent major sectors of U.S. agriculture. In 1994 there were 149,000 operations producing pork (National Pork Producers Council [NPPC], 1996a). Table 2-3 presents pork production information by size of operation.

Most hog production is located in the Northern Midwest. Iowa produces the largest share of swine, marketing 24.2 million head in 1995. Other large pork producing states include North Carolina (11.5 million head), Minnesota (9.7 million head), Illinois (9.5 million head), and Indiana (7.8 million head) (NPPC, 1996b).

The number of hogs slaughtered per year, approximately 93 million in 1995, far exceeds the number of cattle slaughtered. Like cattle, most hogs are slaughtered at large packer/render operations. Hog slaughtering is concentrated at a small number of major operations.

The average live weight across all categories is approximately 250 pounds and will yield a carcass of approximately 185 pounds. After the hide is removed, the offal is estimated to be 63 pounds or 25 percent of the live weight. The weight of offal generated from the slaughtering and processing of swine is estimated at approximately 6.0 billion pounds annually. Almost 95 percent

Table 2-3
Pork Production Profile

Size of Operation	Number of Operations	Hogs Marketed (millions)	Percent of Producers	Percent of Hogs Produced
Under 1,000 head	120,433	16.6	80.8	17.3
1,001 - 2,000 head	15,188	16.7	10.2	17.5
2,001 - 3,000 head	6,191	11.7	4.2	12.2
3,001 - 5,000 head	3,806	11.2	2.6	11.7
5,001 - 10,000 head	2,208	11.4	1.5	11.9
10,000 - 50,000 head	1,108	12.0	0.7	12.5
More than 50,001 head	66	16.1	0.1	16.8
Total	149,000	95.7	100.0	100.0

Source: NPPC, 1996a.

of swine slaughtered are barrows (male hogs) and gilts (young sows), followed by sows (fully grown female pigs), and stags and boars (uncastrated pigs).

Pork producers, like cattle producers, have been liquidating their herds in 1996 as a result of increased grain prices (Hogs Today, 1996). Increases in the price of corn have been a driving force in this liquidation.

2.4 PROFILE OF SHEEP PRODUCERS

Before discontinuing the practice at the end of 1989, the U.S. Department of Agriculture (USDA) compiled information on the profitability of sheep and lamb production. The most recent USDA "budget" of sheep production is presented in Table 2-4, which lists the contribution to cash receipts and expenses from each element of a sheep producer's activities on a "per ewe" basis. The table shows that the majority of revenues are generated from slaughter lambs, which

Table 2-4
U.S. Sheep Production
Average Receipts and Expenses
(\$ per Ewe) (a)

Year	1979	1981	1983	1985	1987	1989
Cash Receipts						
Slaughter lambs (31.9 lbs)	\$21.03	\$16.03	\$16.39	\$21.58	\$22.64	\$19.51
Feeder lambs (26.6 lbs)	\$18.41	\$13.30	\$12.30	\$18.48	\$23.19	\$19.54
Cull ewes (29.1 lbs)	\$5.52	\$3.43	\$2.17	\$6.06	\$6.69	\$6.74
Wool (10.0 lbs)	\$6.42	\$7.45	\$6.72	\$6.84	\$10.05	\$13.43
Wool payment	\$2.13	\$6.30	\$9.47	\$10.99	\$9.77	\$6.07
Unshorn lamb payment	\$0.71	\$0.88	\$1.56	\$2.21	\$1.94	\$1.21
Total	\$54.21	\$47.39	\$48.61	\$66.16	\$74.28	\$66.50
Cash Expenses						
Feed						
Grain (0.74 bushels)	\$2.24	\$2.13	\$2.38	\$2.01	\$1.39	\$2.16
Protein supplements (0.38 cwt)	\$3.21	\$3.38	\$3.60	\$3.40	\$3.80	\$4.54
Salt and minerals (7.0 lbs)	\$0.26	\$0.35	\$0.38	\$0.40	\$0.40	\$0.42
Hay (0.10)	\$2.45	\$3.53	\$3.65	\$3.90	\$2.85	\$3.48
Pasture	\$2.70	\$3.19	\$3.16	\$3.31	\$2.89	\$3.36
Public grazing	\$0.93	\$1.11	\$0.70	\$0.67	\$0.67	\$0.93
Crop residue	\$0.04	\$0.06	\$0.06	\$0.05	\$0.05	\$0.06
Total feed costs	\$11.84	\$13.75	\$13.93	\$13.74	\$12.05	\$14.95
Other						
Veterinary and medicine	\$0.73	\$0.91	\$0.99	\$1.05	\$1.10	\$1.22
Livestock hauling	\$0.87	\$1.12	\$1.20	\$1.28	\$1.23	\$1.36
Marketing	\$0.19	\$0.24	\$0.27	\$0.29	\$0.30	\$0.34
Ram death loss	\$0.34	\$0.31	\$0.28	\$0.27	\$0.33	\$0.28
Shearing and tagging	\$0.98	\$1.14	\$1.21	\$1.24	\$1.20	\$1.30
Fuel, lubrication, and electricity						
Machinery and building repairs	\$1.28	\$1.98	\$1.82	\$1.53	\$1.17	\$1.38
Hired labor (1.42 hr)	\$1.45	\$1.74	\$2.29	\$2.39	\$2.35	\$2.54
Miscellaneous	\$5.05	\$5.83	\$6.22	\$6.49	\$6.53	\$6.99
Total variable cash expenses	\$0.77	\$0.96	\$1.04	\$1.12	\$1.17	\$1.32
	\$23.51	\$27.98	\$29.25	\$29.40	\$27.43	\$31.68
General farm overhead	\$2.89	\$3.20	\$2.86	\$3.25	\$4.46	\$3.48
Taxes and insurance	\$1.45	\$1.57	\$1.82	\$1.82	\$2.75	\$2.87
Interest	\$5.56	\$6.69	\$5.32	\$6.87	\$6.69	\$5.82
Total fixed cash expenses	\$9.90	\$11.47	\$10.00	\$11.94	\$13.90	\$12.17
Total cash expenses	\$33.41	\$39.45	\$39.25	\$41.34	\$41.33	\$43.85
Cash receipts less cash expenses	\$20.80	\$7.94	\$9.36	\$24.82	\$32.95	\$22.65
Capital replacement	\$4.90	\$5.69	\$6.95	\$7.61	\$7.83	\$8.14
Total cash expenses and capital replacement	\$38.31	\$45.14	\$46.20	\$48.95	\$49.16	\$51.99
Net cash receipts	\$15.90	\$2.25	\$2.41	\$17.21	\$25.12	\$14.51

(a) All values are calculated on a per ewe basis. The ranch receipts and expenses are divided by the number of ewes on the ranch.

Cwt = 100 lb.

Source: Shapouri, 1991.

are at the appropriate market weight for slaughter, and feeder lambs, which must spend 2 to 3 months on feedlots before slaughter. Cull ewes (i.e., ewes selected out from the flock for slaughter) produced approximately 10 percent of revenues in 1989. Wool payments and unshorn lamb payments provided under a government subsidy program, also contributed over 10 percent of revenues. In some years, the wool payments contributed closer to 20 percent of revenues. Congress eliminated the wool subsidy in 1993, however, with a phase-out over 3 years.

The USDA sheep budget indicates the modest scale of most operations: the average sheep producer in 1989 had 65 ewes (Shapouri, 1991). Applying this size parameter to the 1989 budget shows that the average producer earned a net profit of \$943 per year. The scale of operations is partly explained by the role of sheep production in the farm economy. Sheep are generally produced jointly with other outputs. Nationally, income from sheep production represents 27 percent of the total income for farms and ranches with sheep. Producers generate other income from cattle (58 percent of the total), crops (7 percent), and other sources (7 percent) (Shapouri, 1991). Many ranchers and farmers produce sheep partly to use their available labor. Sheep producing activities often can be performed at times of the year when other ranch or farm activities cannot be performed (e.g., after the end of the crop growing season). Thus, the sheep producer can continue to engage available labor in revenue-generating activities that help cover operational costs and provide additional income for the farm (Rogers, 1993).

These data, however, obscure the regional variation in the industry. While most sheep producing operations are in the eastern United States, the majority of sheep production is carried on in the West. Although most sheep producing operations are quite small, very large western operations are the dominant producers in the industry. For example, 5.6 percent of western sheep operations (in Rocky Mountain and far west states) have over 500 head of stock, but only 0.4 percent of eastern operations are this large. The highest sheep production operations are in Iowa (9,500), Texas (8,000), and Ohio (7,300) (National Agricultural Statistics Service, 1993).

A portion of sheep producers sell to export markets, particularly Mexico. Most exports originate from the western states due to their proximity to Mexico, and export potential is limited in the eastern states. The industry exported approximately 750,000 live ewes in 1992, more than twice as many as were slaughtered in the United States that year. This export market grew

substantially in the early 1990s, influenced partly by growth in the Mexican economy (Parker, 1993).

Despite the apparent profitability of sheep production, USDA reports that a variety of internal and external factors have caused an industry decline. These factors include the seasonal nature of the demand for lamb meat, declining per capita consumption of lamb and mutton, low wool prices, substitution of synthetic fibers, increased problems with predators, lack of suitable labor, and reduced involvement in slaughtering. Nationally, the inventory of sheep and lamb declined from the 1970s to the late 1980s from 18.7 million to 10.9 million (Shapouri, 1991). The number of sheep operations has also been declining in recent years. In 1992 the number of sheep operations totaled 101,040 (Shapouri, 1991) while in 1995 the number of operations totaled 82,120 (NASS, 1996a). Further, for the past 4 years, Texas has suffered a drought that has reduced the forage for sheep and worsened industry financial conditions. Many Texas sheep producers are barely viable and unless drought or market conditions improve, numerous business failures can be expected (Montes, 1996).

2.5 PROFILE OF GOAT PRODUCERS

Most goats are sold by producers to slaughterhouses, which then sell whole carcasses to the market for ethnic foods. While not widely consumed, goat meat has some market advantage because it is comparably low in fat and cholesterol compared to red meat. Goats also can be raised for milk production. California, for example, has a substantial dairy goat population (Craddock, 1993).

Texas produces the largest share of goats. Two slaughter facilities in Texas kill approximately 1,000 goats per week (Craddock, 1993); together these facilities conduct nearly one-half of the goat slaughtering in the United States. Another large goat slaughtering facility operates in Connecticut. Elsewhere, small goat producers predominate, and slaughtering operations are distributed widely. Many slaughterhouses perform only custom slaughtering services for area farmers and ranchers.

Some goat producers have been affected by the phasing out of the government mohair subsidies, but most are less dependent on these payments than are sheep producers. Angora goats, which represent the vast majority of all goats, are used for mohair production. Texas goat operations, also, have been significantly affected by the sustained drought in that region.

2.6 PROFILE OF DEER PRODUCERS

Deer farming is a developing industry in the U.S. There are an estimated 58 businesses raising farm deer commercially in the U.S. Some of these are still developing their breeding stock and marketing channels and have yet to bring animals to slaughter. The total annual slaughter of farm-bred deer in the U.S. is less than 9,000 head (Fox, 1996). Texas produces the largest share of venison, with approximately 25 percent of total U.S. production.

In 1994 approximately 2 million pounds of commercially slaughtered venison was consumed in the U.S., although approximately 80 percent of this was imported from New Zealand (Burns, 1996). The demand for venison has increased in recent years prompting new deer farmers to enter the market. Nevertheless, startup costs for a deer farm can be high due to the costs of breeding stock and the costs of deer-proof fencing at up to \$12,000 per mile (Burns, 1996).

Some deer farmers have built or are building their own slaughtering facilities because deer slaughtering is not compatible with other USDA inspected slaughtering operations. If deer are slaughtered in the same facility as other animals, the slaughtering equipment must be carefully cleaned before nondeer slaughter is resumed.

The typical fallow deer weighs about 100 pounds at slaughter with a carcass weight of approximately 60 pounds. Approximately 60 percent of the carcass, including cuts from the leg and loin, is used for venison steaks and medallions for upscale restaurant and retail sale, while the remaining 40 percent of the carcass goes to venison patties and jerky. The offal minus the hide weighs approximately 20 to 30 pounds. Using an average of 25 pounds of offal per slaughtered deer, less than 225,000 pounds of offal are generated from the commercial slaughter of deer.

Larger quantities of deer offal are generated through recreational deer hunting and from deer killed on roadways. Some hunters eviscerate their killed deer in the woods, and bury the offal at the site. Others, however, bring the entire animal home for slaughter. In the latter circumstance, a small local plant generally performs the slaughter and adds deer offal in with offal from other species it handles. No data are available on the total recreational deer kill or on deer roadkill.

2.7 PROFILE OF BISON PRODUCERS

Bison are raised for their meat, hides, head mounts, and wool. Bison is considered a specialty meat that is leaner and higher in protein than beef. Preferred cuts of bison meat sell at a large premium to beef. Bison meat is sold as steaks, roasts, patties, and jerky. The markets for bison meat include restaurants, health food stores, gourmet shops, and direct consumer sales. Domestic commercial bison slaughter is estimated at 10,000 to 15,000 head per year (Dineen, 1996).

Bison have grazing requirements similar to those for cattle although bison use pasture more efficiently. Also, bison are more resistant to disease and extreme temperatures than cattle, utilize a wide variety of forage resources, and do not require calving assistance. One additional cost for some bison producers is bison-resistant fencing. Bison can jump fences up to six feet high and bison-resistant fences cost approximately \$3,500 per mile.

Bison are slaughtered at an age of 18 to 30 months, before the meat has toughened. Bison weigh approximately 1,200 pounds at slaughter, or slightly more than the average cow. Dressing procedures are approximately the same as for cattle and the USDA requires no cleanup between bison and cattle slaughter. A 1,200 pound bison will yield a carcass of approximately 684 pounds or 57 percent of live weight. The offal minus the head, hide, and edible viscera is estimated to total 300 pounds per animal. With commercial production estimated at an average of 12,500 per year, there is approximately 3.7 million pounds of bison offal processed annually.

2.8 PROFILE OF MINK PRODUCERS

Mink are raised for their pelts and oil. Most mink farmers kill and pelt their own animals once a year near the end of November or in early December. Once the pelts are removed, the fat is then scrapped from the hide. This fat is used to manufacture mink oil that is sought for cosmetic uses because of its hypoallergenic qualities and in leather treatments. The total value of mink production in 1995 was \$143 million, an increase of 72 percent from 1994.

In 1995, 446 mink farms produced a total of 2.69 million pelts (NASS, 1996b). Mink producers vary in size but most are small operations. Mink farming is concentrated in Utah (130

farms), Wisconsin (77 farms), and Minnesota (52 farms). There has been recent consolidation within the industry, with the number of farms decreasing by 8 percent from 1993 to 1994 and 3 percent from 1994 to 1995. The market price for mink pelts is subject to wide demand fluctuations based on fashion and weather.

Once the pelt and fat are removed, the entire carcass is then rendered. Mink carcasses sent to rendering (minus the pelt and fat) weigh an average of 2.5 pounds, so the total estimated offal produced per year is 6.7 million pounds. Mink farmers are reported to have difficulty with getting renderers to pick-up their material because of its low volume and the infrequency of offal generation.

2.9 PROFILE OF HORSE PRODUCERS

Horse producing, slaughtering, and rendering activities are also among the agricultural operations that could be affected by the FDA regulatory options. In the U.S., horses are not raised specifically for slaughter, but old horses are sold at auction to slaughterers.

In 1995, 106,200 head of equine were slaughtered at federally inspected plants (USDA, 1996). Horse slaughtering has been decreasing in the U.S. due to public outrage over horse slaughtering and foreign embargoes on the imports of U.S. horse meat. The 1995 figures represent a decrease of more than 50 percent from a total slaughter of approximately 244,000 equine in 1992 (Bauer, 1993). On average horses have a live weight of 1,200 pounds and produce approximately 360 pounds of offal per head, or 30 percent of live weight. Almost all of the horses slaughtered in the U.S. are shipped overseas for human consumption.

2.10 PROFILE OF SLAUGHTERING AND RENDERING INDUSTRIES

Slaughter houses and packer plants process live animals and produce meat-bearing carcasses or trimmed meats, hides and pelts, and animal offal (including viscera, heads, and other wastes). Animal offal from slaughtering is the primary raw material for rendering operations. From animal offal, renderers manufacture meat and bone meal (MBM) and tallow, which serves a variety of consumer and industrial needs.

Some slaughterers, renderers, and other operations in agricultural production can be integrated in a number of ways. For instance, some of the largest agricultural companies control production from the farm to final distribution. Alternatively, some slaughterhouses are affiliated with an adjoining stockyard and/or with a rendering plant. Such operations are referred to as packer/renderers. Renderers that are not located at the slaughterhouse site (i.e., independent renderers) typically obtain raw materials from a variety of clients, including large slaughterhouses that do not render, smaller slaughterhouses (referred to as locker plants), farmers dead stock, grocery stores (that supply meat trimmings from in-store butcher shops and out-of-date meats), and restaurants that supply kitchen grease.

Approximately 130 packer/renderers (i.e., facilities that perform both functions) operate nationwide. About 55 of these are cattle slaughterers, and the remainder are hog slaughterers or poultry processors. The number of facilities involved in rendering is estimated at 282, including the packer/renderers. The remainder, 152, are independent renderers (Bisplinghoff, 1996).

The number of animals slaughtered may vary from a few dozen per week, as in the case of the smallest operations providing little more than custom services, to over 5,000 head per day. Although the majority of animals are slaughtered in large slaughterhouses, many are slaughtered in small groups or on a custom basis at small slaughterhouses.

The weight of the animals processed determines the revenues for the slaughterer and the amount of animal offal available for rendering. For example, a live steer weighs on average 1,150 lb, from which 567.8 lb of beef fit for retail sale are produced and approximately 360 lb of offal are generated. Rendering converts approximately 40 billion pounds of animal offal into useful products annually (APPI/NRA, 1996). The breakdown of end use markets for rendered animal protein is given in Table 2-5.

Table 2-5

**End Use Markets for
Animal Protein**

End Use Market	Percent of Total
Pet Food	36
Poultry	36
Swine	15
Cattle	10
Miscellaneous	3
Total	100

Source: APPI/NRA, 1996.

Renderers do not generally designate their MBM for consumption by specific species. Most renderers sell to general feed manufacturers that supply different mixes to a variety of species.

An average ewe produces a dressed weight (i.e., the meat products prepared for shipment to wholesale meat outlets) of 58 lb and approximately 40 lb of offal (Meyer, 1993; AMI, 1993). Lambs yield an average dressed weight of 64 lb and approximately 30 lb of offal (Meyer, 1993; AMI, 1993). Mature goats yield as much meat as adult sheep; however, many immature goats are also slaughtered for meat. No federal statistics are published on average goat weights. Based on the mix of slaughtering practices, however, it is estimated that the average slaughtered goat yields approximately one-half the meat of an adult sheep.

Renderers also process animals not sent to slaughtering, including diseased, dying, disabled, or dead animals (i.e., "4-D" animals). The renderers' operation provides a valuable service to farmers, who may have no means of disposing of such animals. The addition of "fallen" animals to the rendering feedstock increases the protein content of the meat and bone meal (MBM) produced (i.e., the meaty carcass of the animal is processed along with the offal). Most renderers, especially those located in urban areas, collect and process meat scraps and fat and grease from supermarkets, restaurants, and butcher shops.

The large majority of rendering processes are continuous processes, although a few batch processes still operate. Continuous processes account for approximately 75 percent of all offal operations and 81 percent of adult sheep offal operations (APHIS, 1993). Large continuous rendering systems can process 20,000 to 40,000 lb of raw materials per hour. During rendering, raw material is fed into grinding machines and then passed to a steam-jacketed cylinder for cooking. Cooking removes moisture and releases fat. After the moisture is removed, the solid material is cooked with the fat. Finally, the fat is separated from the protein mass. Cooking temperatures range from 240 to 290 degrees Fahrenheit, and cooking times vary from 20 minutes to 3 hours.

Renderers need to be located reasonably close to one or more slaughterhouses to minimize the cost of transporting large volumes of offal. A majority of plants are within 50 miles of their sources of cattle, adult sheep, or other species offal. Further, over 90 percent of plants are within 150 miles of offal sources. Rendering plants are also likely to be reasonably close to end use markets. Slightly more than one-third of all rendered products are transported less than 50 miles to end-use markets, and nearly 65 percent are within 150 miles of their markets. Nevertheless, certain products, particularly MBM, are transported hundreds of miles in some cases.

Consumer health concerns in recent years regarding dietary fats and cholesterol have produced a shift in meat demand from red meat to poultry and a decline in demand for certain rendering end products, specifically edible tallow and lard. These changes have weakened business conditions, leading to substantial consolidation and contraction within both industries. For example, the number of large slaughter plants for cattle (processing over 50,000 head per week) declined by 34 percent, and the number of large hog slaughter plants (processing over 100,000 head per week) declined by 40 percent from 1982 to 1991 (AMI, 1992).

Additionally, in some areas the number of small slaughterhouses has declined. Even though many of these small plants handled numerous species, they were adversely affected by the decline in animal production levels. Declines in slaughter levels also have tended to drive up the prices that slaughterers charge for processing (or decreased their prices for live animals), since the firms must attempt to cover their fixed costs over a smaller volume of processing. Similarly, the total number of rendering facilities dropped from more than 800 in the early 1970s to the current number of less than 300 (Pietraszek, 1991).

2.11 PROFILE OF MEAT PROCESSING OPERATIONS

Meat processing operations include grocery stores, meat and fish markets, sausage and prepared meat producers, and large restaurants. These facilities process, trim, and/or produce cuts of meat. As a result of these activities meat processors produce wastes that are picked up by renderers. The number of meat processing operations is estimated at 300,000.

2.12 PROFILE OF FEEDMILL OPERATIONS

Feed manufacturers and feedmills that combine animal-derived MBM with other nutrients in preparing feed for farm or ranch animals will be affected by FDA regulatory actions. The most common feed mixture for livestock includes predominantly grains, with a supplement of MBM added at a rate of a few percent of the total weight. Historically, the MBM additive has not been distinguished by species origin and has been included generally without restriction to any livestock feed.

There are a few very large feed manufacturers, including Conagra and Ralston Purina, a number of major feed manufacturers, and several thousand local-service feedmills. The largest companies own several dozen mills apiece scattered throughout agricultural areas and manufacture wide ranges of products. The local mills might purchase a premix from one of the large feed manufacturers and add locally produced grain. Because livestock feed is prepared in multi-ton loads, livestock producers generally obtain feed from local feedmills. The radius of service of feedmills, however, has gradually widened to the point where some feedmills might deliver feed to producers as far as 200 miles away. Overall, there are an estimated 30,000 feedmills in the United States. The majority are estimated to be small (i.e., employing fewer than 20 people).

Typical feedmills consist of approximately a dozen storage bins for various grain and nutrients that are blended in different combinations for different livestock needs. The storage tanks are connected to a turnhead that allow the mixing of ingredients. In the great majority of cases, MBM is stored in a single storage tank. Also, while the addition of a second storage tank to distinguish non-ruminant and ruminant MBM is technically feasible, many feedmills cannot easily expand their facilities. The most problematic to expand are the poured concrete feedmills that represent a large share of the feedmills constructed in the past twenty years.

REFERENCES

- American Meat Institute (AMI). 1993. Meat and Poultry Facts.
- Animal Plant Health Inspection Service (APHIS). 1993. United States Rendering and Feed-Manufacturing Industries: Evaluation of Practices with Risk Potential for Bovine Spongiform Encephalopathy. U.S. Department of Agriculture, APHIS, Centers for Epidemiology and Animal Health.
- Animal Protein Producers Institute and National Renderers Association (APPI/NRA). 1996. Comments to FDA docket on BSE.
- Bauer, N. 1993. USDA/FSIS/Slaughter Inspection Standards and Procedures Division. Animal Disease Reporting System Data on Livestock Slaughtered in Each State or U.S. Territory, FY 1992. November 8.
- Burns, Robert. 1996. Exotic deer farming researched in east Texas. http://leviathan.tamu.edu/dac/rburns/overton/htmsub/deerfarm_long.html. July 26.
- Craddock, Dr. Frank. 1993. Telephone communication between Len Shokum of ERG and Stan Keene, American Goat Breeders Association. October 27.
- Dineen, Bob. 1996. Telephone communication between Len Shokum of ERG and Bob Dineen, Rocky Mountain Natural Meats. July 30.
- Fox, Barbara. 1996. Telephone communication between Len Shokum of ERG and Barbara Fox, North American Deer Farmers Association. July 29.
- Hogs Today. 1996. July 1996: Outlook. [Http://www.farmjournal...ay_article.dbm&ID=1210](http://www.farmjournal...ay_article.dbm&ID=1210). August 19.
- Lambert, Dr. Chuck. 1996. U.S. Beef Industry: May 1996 Situation. National Cattlemens Association. Staff Economist.
- Montes, Eduardo. Texas sun withers ranchers' incomes. Associated Press. Santa Barbara News-Press. July 5, 1996.
- Meyer, Steve. 1993. Telephone conversation between John Eyraud of ERG and Steve Meyer, Marketing Analyst, American Sheep Industry Association. October 27, 1993.
- National Agricultural Statistics Service (NASS). 1996a. Sheep and Goat Narrative and Tables. January 26, 1996.
- National Agriculture Statistics Service (NASS). 1996b. Mink. July 22, 1996.
- National Agricultural Statistics Service (NASS). 1993. Sheep and goats total sheep and lamb inventory down 5 percent: Stock sheep and lamb and ewes at record lows.
- National Cattlemens Beef Association (NCBA). 1996. The Beef Handbook.

- National Pork Producers Council (NPPC). 1996a. Production Profile.
<http://www.nppc.org/porkfacts/pfprodprofile.html>. August 19.
- National Pork Producers Council (NPPC). 1996b. Annual Marketings by State, 1995.
<http://www.nppc.org/porkfacts/pfmktgsbystate.html>. August 19.
- Parker, Charles. 1993. Telephone communication between John Eyraud of ERG and Charles Parker, Director of Producer Education and Research, American Sheep Industry Association. Christianburg, VA. November 24.
- Pietraszek, Greg. 1991. Renderers Still Reel from Changes in Demand. National Provisioner. December 9, pp. 10-11.
- Rogers, Paul. 1993. Telephone conversation between John Eyraud of ERG and Paul Rogers, Associate Director, Producer Education and Research, American Sheep Industry Association. November 29.
- Shapouri, Hosein. 1991. Sheep Production in Eleven Western States. USDA, Economic Research Service.
- USDA, Economic Research Service. 1996. Costs of Production.
- USDA, National Agriculture Statistics Service. 1996. Annual Livestock Slaughter Report.