Industry & Trade Summary

Animal Feeds

USITC Publication 3275
January 2000

OFFICE OF INDUSTRIES
U.S. International Trade Commission
Washington, DC 20436

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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.[1]

This report on animal feeds covers the period 1994-98. Listed below are the individual summary reports published to date on the agriculture and forest product sectors.

USITC publication number	*Publication date*	*Title*
2459	November 1991	Live Sheep and Meat of Sheep
2462	November 1991	Cigarettes
2477	January 1992	Dairy Produce
2478	January 1992	Oilseeds
2511	March 1992	Live Swine and Fresh, Chilled, or Frozen Pork
2520	June 1992	Poultry
2544	August 1992	Fresh or Frozen Fish
2545	November 1992	Natural Sweeteners
2551	November 1992	Newsprint
2612	March 1993	Wood Pulp and Waste Paper
2615	March 1993	Citrus Fruit
2625	April 1993	Live Cattle and Fresh, Chilled, or Froze Beef and Veal
2631	May 1993	Animal and Vegetable Fats and Oils
2635	June 1993	Cocoa, Chocolate, and Confectionery
2636	May 1993	Olives
2639	June 1993	Wine and Certain Fermented Beverages
2693	October 1993	Printing and Writing Paper
2702	November 1993	Fur Goods
2726	January 1994	Furskins
2737	March 1994	Cut Flowers
2749	March 1994	Paper Boxes and Bags
2762	April 1994	Coffee and Tea
2859	May 1995	Seeds

[1] The information and analysis provided in this report are for the purposes of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

PREFACE—*Continued*

USITC publication number	*Publication date*	*Title*
2865	April 1995	Malt Beverages
2875	May 199	Certain Fresh Deciduous Fruits
2898	June 1995	Certain Miscellaneous Vegetable Substances and Products
2917	October 1995	Lumber, Flooring, and Siding
2918	August 1995	Printed Matter
2928	November 1995	Processed Vegetables
3015	February 1997	Hides, Skins, and Leather
3020	March 1997	Nonalcoholic Beverages
3022	April 1997	Industrial Papers and Paperboards
3080	January 1998	Dairy Products
3083	February 1998	Canned Fish, Except Shellfish
3095	March 1998	Milled Grains, Malts, and Starches
3096	April 1998	Millwork
3145	December 1998	Wool and Related Animal Hair
3148	December 1998	Poultry
3171	March 1999	Dried Fruits Other Than Tropical

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ABSTRACT

This report addresses trade and industry conditions for the animal feed industry for the period 1994-98.

- Animal feed products include (1) ingredients, derived from the processing of grains, oilseeds, meat, vegetable, and fish products; (2) roughages, such as hay and grasses; (3) compound feeds, which combine ingredient feeds; and (4) pet foods. U.S. producers of animal feed products are competitive in foreign markets in certain types of animal feed products, particularly pet foods, soybean meal, and corn gluten. Commercial producers of compound animal feeds in the U.S. typically produce for the local market. Most animal feed products have low levels of import penetration.

- U.S. production of primary animal feeds, including complete feeds, supplements, and premixes, rose by 4 percent during 1994-98. Production of protein meal ingredients, such as soybean meal, rose by 21 percent during this period. In the compound animal feed industry, there has been a trend towards vertically integrated mills, with livestock producers owning feed mills and producing animal feed for their own operations.

- The United States ran a $3.6 billion trade surplus with foreign trade partners in 1998. Major export markets include the European Union, Japan, Canada, China, and Mexico. Almost two-thirds of U.S. animal feed imports comes from Canada and consists of pet food, compound feeds, and canola meal. Exports and imports of animal feed each increased by 24 percent during 1994-98. U.S. tariffs on animal feed products are low, with almost 57 percent of U.S. imports entering duty-free.

- The United States is the largest producer of compound animal feeds in the world. Other major producers include the European Union, China, Brazil, and Japan. The animal feed industry has been growing rapidly in China and Brazil. Foreign tariffs are generally low, though high tariffs exist for products that contain ingredients with government supports, such as milk or starch.

- Purchasers of animal feed products include commercial feedlots, specialty stores, households, and bakers and millers. On-farm mixing of ingredient feeds has become increasingly common. Pet food consumers are increasingly purchasing premium and superpremium brands.

INTRODUCTION

This summary covers animal feed products that are found in parts of chapter 12 and all of chapter 23 of the Harmonized Tariff Schedule (HTS) of the United States. It includes compound feeds, pet foods, and the residues, meals, flours, brans, and wastes that result from the milling of grains or crushing of oilseeds, such as soybean meal, corn gluten, and wheat gluten. Feeds derived from meat and fish are also included, as are roughage and forage crops, such as alfalfa, straw, hay, and rutabagas that are used for animal feeding purposes. Although wheat gluten[1] is primarily used as an input to the baking industry, about 15 to 20 percent is used in the pet food industry,[2] which merits its inclusion in this summary. An explanation of tariff and trade agreement terms can be found in appendix A, while statistical tables are in appendix B.

The U.S. animal feed industry is a relatively large industry in the United States, though its exact size is difficult to estimate since the available data excludes production information by farms that mix their own feed. In the *1997 Economic Census*, the U.S. Census Bureau estimated the value of compound feed shipments by commercial feed mills (those that combine feed ingredients, such as corn and soybeans) at almost $18 billion in 1997, while the value of pet food shipments were estimated at $8.3 billion. Shipments of certain ingredient feeds are also sizable, with crop-year 1997 estimates for soybean meal of $7.1 billion and corn gluten meal and feed of $1.1 billion. The United States exported $4.3 billion of animal feed products in 1998. Major exported products include pet foods, soybean meal, and corn gluten. In general, however, the animal feed industry is not geared towards export markets. Rather, most animal feed production is consumed in the United States. Imports, which totaled $759 million in 1998, come primarily from Canada and consist of pet foods, compound feeds, and canola meal.

There has been increased concentration in the animal feed industry, which mirrors a similar trend towards consolidation in the livestock industry. The animal feed industry has also been affected by an increased incidence of on-farm feed mixing and integrated feed mills. On-farm mixing by livestock producers has reduced demand for complete feeds (i.e. those that serve as a complete ration) and has forced producers to diversify into other products. Integrated feed mills are mills constructed by livestock producers (particularly broiler producers) that produce feed for their own operations.

The U.S. animal feed industry is regulated by the Food and Drug Administration (FDA), which monitors the products and label claims used by the industry. Medicated feeds are subject to added restrictions. The FDA recently imposed restrictions on the feeding of ruminant-based feeds to ruminants in the wake of the "mad-cow disease" scare in Europe. Aside from FDA regulations on animal feed products, government involvement in the

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[1] Although the information on wheat gluten in this summary focuses mainly on feed uses of wheat gluten, the data provided cover all forms of wheat gluten. Data on wheat gluten for baking purposes was excluded from the recent publication USITC, *Milled Grains, Malts, and Starches*, USITC publication 3095, Mar. 1998.

[2] USITC, *Wheat Gluten*, Investigation No. TA-201-67, USITC publication 3088, Mar. 1998, p. II-5.

industry is fairly limited. Government programs in the U.S. feed industry concern the provision of funds for export promotion and facilitation. In recent years, the pet food industry has benefitted from the export promotion funds of the U.S. Department of Agriculture (USDA) for market development in Japan, Taiwan, and Mexico. A number of animal feed products are also included in the General Sales Manager (GSM 102/103) credit guarantee programs of the USDA, which provides credit guarantees for exporters.

On a tonnage basis, the U.S. animal feed industry is the largest in the world. In 1998, the industry publication *Feed International* estimated total U.S. commercial production of compound animal feed and pet food at 140 million metric tons. The European Union (EU) produced 115 million metric tons, followed by China (55 million metric tons), Brazil (29 million metric tons), and Japan (23 million metric tons). There has been significant growth in production from the feed industries of China and Brazil in recent years, while production in the feed industries of the EU and Japan has generally remained flat.

OVERVIEW OF ANIMAL FEED PRODUCTS

Animal feeds can be divided into four major groups. Animal feed ingredients are those derived from the processing of grains, oilseeds, meat, vegetables, fish, and other products. Roughages, such as hay and grasses, serve as a source of fiber for ruminant animals, such as cows, horses, and sheep. Compound feeds provide some or all of the nutritional requirements for a particular animal in one mixture. These also include supplements, minerals, vitamins, and other additives. Pet foods are analogous to compound feeds for livestock, though these almost always provide a complete ration for pets in one mixture. The following sections provide greater detail on the characteristics and production processes for the feeds that constitute ingredients, roughages, compound feeds, and pet foods.

Ingredient Feeds

Ingredient feeds can be divided into two subcategories: energy feeds and protein feeds. Energy feeds consist of staple grain and vegetable crops of varying degrees of refinement. These include whole grains[3] and vegetables, such as corn, wheat, barley, oats, sorghum, and potatoes, as well as residues from milling and other processes, including wheat bran, wheat middlings, corn cobs, rice bran, groats, and dried beet pulp. The most commonly used energy feed is corn, which represents roughly 80 percent of the feed grains fed to animals in the United States. Over three-quarters of the corn grown in the United States is used for feed purposes, with much of the feeding done on-farm. Corn produces the highest yields of any feed grain (in terms of digestible energy per acre) and is especially important in the

[3] Whole grains, such as corn, wheat, and barley, are excluded from the scope of the summary but are nonetheless included in the discussion on basic types of feeds to provide background on the industry.

diets of swine and poultry.[4] Other energy feeds, such as sorghum and wheat, can be used to replace some or all of the corn in feeding rations. Sorghum is typically used in areas where corn does not grow as well, such as the Southern Plains and Southwest, and is used by beef cattle in these areas.[5] Sorghum can also be used in swine and poultry diets. Although wheat has a higher protein and amino acid content than corn, high wheat prices relative to other grain prices generally preclude the utilization of wheat as a feed grain.[6] Other major ingredient feeds include barley, oats (for horses and cattle), rye, and triticale.

Feed grains can be processed in a variety of ways. Grinding is the most common approach used for on-farm feeding. A hammer mill grinds the grain through metal screens of varying sizes depending on the level of refinement desired for a particular animal.[7] Another approach, more typically adopted by commercial feed mills, involves the pelleting of feed grains. Pellets are created by grinding feed through a chamber with holes (called a die), which subsequently cut the feed product into varying sizes.[8] Pellets are particularly utilized in swine and poultry feeds.[9] Flakes can be generated by the steam-rolling and steam-flaking of feed grains, which involves subjecting the feed grain to steam and passing it through a roller to produce the flakes. Steam-flaked grains differ from steam-rolled grains in that the grains are steamed for a greater amount of time and are subjected to corrugated rollers to produce a flatter flake.[10] Flakes are useful in promoting weight gain, since it is easier for the animal to break down the starch in a feed in that form.[11] Other means of processing grains for feed use include soaking, extruding, and roasting.

Energy feeds other than whole grains include residues obtained from the processing of various foods. For example, a number of byproducts arise from the processing of wheat into flour, including wheat bran, wheat middlings, wheat mill run, wheat shorts, and red dog. Wheat bran is the outer coat of the wheat kernel, while wheat middlings are a mixture of bran, flour, germ, and other wheat byproducts.[12] Wheat shorts are similar to middlings, but typically contain more flour, and wheat mill is a blend of wheat middlings and wheat bran. Wheat byproducts are generally used for horses, cows, and beef cattle, though middlings can also be used in small amounts for swine and poultry.[13] In addition, milk byproducts, such

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[4] D.C. Church and Richard O. Kellems, "High-Energy Feedstuffs," ch. in *Livestock Feeds and Feeding*, eds. Richard O. Kellems and D.C. Church (Upper Saddle River, NJ: Prentice Hall, 1998), p. 113.

[5] Mark S. Ash, *Animal Feeds Compendium*, USDA, Economic Research Service, Agricultural Economic Report No. 656, May 1992, p. 22.

[6] Peter R. Cheeke, *Applied Animal Nutrition: Feeds and Feeding*, 2d ed. (Upper Saddle River, NJ: Prentice Hall, 1999), p. 39.

[7] D.C. Church and Richard O. Kellems, "Feed Preparation and Processing," ch. in *Livestock Feeds and Feeding*, eds. Richard O. Kellems and D.C. Church (Upper Saddle River, NJ: Prentice Hall, 1998), p. 192.

[8] Cheeke, *Applied Animal Nutrition*, p. 301.

[9] Church and Kellems, "Feed Preparation and Processing," p. 195.

[10] Ibid., pp. 194-195.

[11] USITC staff interview with K. Harmston, Lab Manager, Manna Pro, Fresno, CA, Sept. 14, 1999.

[12] Tilden Wayne Perry, Arthur E. Cullison, and Robert S. Lowrey , *Feeds & Feeding*, 5th ed. (Upper Saddle River, NJ: Prentice Hall, 1999), p. 172.

[13] Cheeke, *Applied Animal Nutrition*, p. 53 and Gary L. Cromwell, "Feeding Swine," ch. in

(continued...)

as dried whey, are used as milk replacers for young animals, particularly beef cattle, veal cattle, dairy cattle, swine, and poultry. The primary byproduct feed from the dry milling of corn is hominy feed, a mixture of bran, germ, and flour which contains more protein and fiber by weight than corn.[14] Rice millfeeds include rice bran and rice mill byproducts, including bran, hulls, and grains.[15] Although rice millfeeds are mainly used in dairy cattle rations in the United States, they are an important animal feed for poultry in Southeast Asia.[16] Beet pulp and citrus pulp arise as byproducts from the processing of sugar beets and citrus fruits (mainly oranges and grapefruits), respectively.

A number of major protein meals are derived from the processing of oilseeds. The most commonly used protein meal is soybean meal, which constitutes more than two-thirds of the protein feed given to livestock.[17] Soybean meal is the major source of protein for nonruminants, particularly swine and poultry, and is valued for its content of a number of important amino acids, such as lysine, tryptophan, and threonine.[18] Soybean meal is marketed at 44-percent and 49-percent protein levels, with the main difference being that the 44-percent meal adds the hulls back to the soybean meal, while the other does not. The 49-percent-meal variety is normally fed to swine and poultry, given its lower fiber content.[19] Other oilseed meals used for feeding purposes are generally cheaper than soybean meal, but are lower in protein and higher in fiber. As a result, they are generally used for feeding ruminants, though they can replace part of the soybean meal ration in the diets of swine or poultry. Cottonseed meal is the second-most important protein feed used in the United States. It is mainly used by beef cattle in feedlots, but can also be used in the feeding of fish, including catfish, salmon, and trout.[20] Consumption by poultry and swine is limited by the presence of the compound gossypol, which can cause the discoloration of yolks in poultry eggs and toxic reactions in large amounts.[21] The use of canola meal, an important protein feed in Canada derived from rapeseed, has increased in the United States.[22] Like cottonseed meal, it is used mainly for feeding cattle. A number of other minor oilseed meals are used as supplemental protein sources for cattle, including linseed meal, sunflower meal, safflower meal, and peanut meal. Linseed meal is used for show animals, particularly horses and cattle.[23] Peanut meal use is relatively small, given the limited amounts available for meal and concerns over aflatoxin content.[24]

Oilseed meals are the byproduct of the solvent-extraction of oilseeds. Oilseeds are first dried and cleaned, then dehulled and cracked, after which the fragments are separated, heated, and

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[13] (...continued)
Livestock Feeds and Feeding, eds. Richard O. Kellems and D.C. Church (Upper Saddle River, NJ: Prentice Hall, 1998), p. 366.

[14] Ash, *Animal Feeds Compendium*, p. 101.

[15] Ibid., p. 105.

[16] Ibid., p. 105 and Cheeke, *Applied Animal Nutrition*, p. 54.

[17] Perry, Cullison, and Lowrey, *Feeds & Feeding*, p. 185.

[18] Gary L. Cromwell, "Feeding Swine," p. 367.

[19] Ash, *Animal Feeds Compendium*, pp. 33-34.

[20] Ibid., pp. 43-44.

[21] Gary L. Cromwell, "Feeding Swine," ch. in *Livestock Feeds and Feeding*, eds. Richard O. Kellems and D.C. Church (Upper Saddle River, NJ: Prentice Hall, 1998), p. 368.

[22] Perry, Cullison, and Lowrey, *Feeds & Feeding*, p. 189.

[23] Cheeke, *Applied Animal Nutrition*, p. 95.

[24] Ibid., p. 96.

rolled through a roller mill to produce flakes.[25] Oil is extracted through the use of a chemical solvent mixed with the flakes that dissolves the oil. The flakes are then toasted and ground to make the meal. Oilseed meals can also be processed by way of a mechanical expeller, which extracts the oil with a revolving screw. These methods can be combined (prepress solvent extract), whereby part of the oil is removed with an expeller and the residual with a chemical solvent.[26]

Corn gluten meal and corn gluten feed are both byproducts of wet corn milling. Products from the wet milling of corn are used in the production of starch and high-fructose corn syrup. The wet milling process hydrates the grain to remove the starch, which is then converted into other products.[27] The dry milling of grain for alcohol, by contrast, uses the whole kernel in the fermentation process.[28] Corn gluten meal contains only the gluten from corn, whereas corn gluten feed includes the bran, germ, and other residues.[29] Corn gluten meal has a much higher protein level, with a range between 40 percent and 60 percent, while corn gluten feed has a protein level of roughly 21 percent to 23 percent. Both types of feed are typically used in beef and dairy cattle rations as protein supplements. Small amounts can be used in pig and poultry rations.

Brewers and distillers dried grains arise from the fermentation of grain products, whereby the grain product (typically corn or barley) that remains from the fermentation process is dried and ground. Both byproducts have low protein levels relative to soybean meal, though brewers grains are higher in fiber.[30] Both types of ingredients are used in the feeding of beef and dairy cattle. Distillers grains can also be used in limited amounts for poultry and swine, though the fiber content and lack of essential amino acids limits the use of distillers grains as a major protein supplement for these animals, however.[31]

Meat and bone meal are produced from various byproducts of the meat industry. These byproducts are cooked until the moisture is removed, then drained and ground into a meal.[32] Tankage refers to meat and bone meal that uses steam pressure to remove the moisture from the meat products.[33] Meat and bone meal is typically high in protein, with protein levels over 50 percent, while tankage has an even higher protein range of 55 percent to 60 percent.[34] Poultry and swine are the main consumers of meat and bone meal, as it is a good source of protein, amino acids, and vitamins.[35] The FDA bans the consumption of ruminant-based meat meals to ruminants over concerns about bovine spongiform encephalopathy (BSE), also referred to as "mad cow disease" (See the government regulations section later in the summary).

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[25] Ash, *Animal Feeds Compendium*, pp. 33 and 36.

[26] Cheeke, *Applied Animal Nutrition.*, p. 87.

[27] Jerry C. Weigel, Dan Loy and Lee Kilmer, *Feed Co-Products of the Dry Corn Milling Process*, 1997, p. 1.

[28] Ibid.

[29] Ash, *Animal Feeds Compendium*, p. 82.

[30] Cheeke, *Applied Animal Nutrition*, p. 106.

[31] Weigel, Loy and Kilmer, *Feed Co-Products of the Dry Corn Milling Process*, p. 6.

[32] Ash, *Animal Feeds Compendium*, p. 66.

[33] Perry, Cullison, and Lowrey, *Feeds and Feeding*, p. 182.

[34] Ash, *Animal Feeds Compendium*, p. 66.

[35] Ibid.

Fish meal is derived from the processing of whole fish or the byproducts of fish used in the food industry. The fish is first cooked, then pressed to remove the oil. To create the meal, fish residues are dried and ground with a hammer mill, with antioxidants added to prevent rancidity.[36] Fish meals are high in protein (generally marketed at the 65 percent level) and are used primarily in poultry rations, with secondary consumption by young swine and fish.[37]

Roughages and Silages

Roughages are feeds that are derived from forages, such as legumes and grasses. Roughages are consumed by livestock through the grazing of forages or through the transformation of forages into hay or silage. Hay is generated by air-drying forage crops to a moisture level of around 15 percent.[38] Silages are forages that have been anaerobically fermented, which allows for greater nutrient retention and enhanced storage life.[39] The most common type of leguminous roughage utilized in the U.S. is alfalfa hay.[40] Alfalfa is typically found in the Midwest and Western States and is valued for its high yields, multiple harvests per year, high nutritive value, and resistance to drought.[41] Red clover hay is grown in the Corn Belt and Northeastern States, sometimes in conjunction with other types of hay crops, such as Timothy Hay. Red clover hay is less nutritious than alfalfa hay and is not as resistant to drought.[42] Other types of leguminous hay crops include Lespedeza, Sericea, Peanut, Sweet Clover, and Cowpea. A number of common grass crops are also used as roughages, including Timothy, Orchardgrass, Fescue, and Bromegrass.

Compound Feeds and Pet Foods

In addition to ingredient feeds, there are a number of prepared feeds (termed compound feeds) that are marketed to supplement animal diets or serve as the sole source of nutrition. Compound feeds are produced by commercial feed mills by processing together numerous ingredient feeds (energy and protein feeds) and/or vitamins in a manner that is nutritionally appropriate for a particular animal. There are several types of compound feeds produced by commercial feed mills. Complete feeds are those that adequately meet the total nutritional needs of the animal. These feeds may or may not include a roughage component, so that a complete feed for dairy animals, for instance, could be one that is added to hay or silage to make a complete ration.[43] Other products, such as supplements and premixes, are added to animal diets in order to provide additional nutrients and essential amino acids, such as lysine

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[36] Ibid., pp. 73-74.

[37] Ibid., p. 78.

[38] Cheeke, *Applied Animal Nutrition*, p. 181.

[39] Ash, *Animal Feeds Compendium*, p. 16.

[40] Dennis A. Shields and Allen Baker, "The U.S. Hay Market: Higher Prices in 1996/97," *Agricultural Outlook*, Number 236, Nov. 1996, p. 11.

[41] Perry, Cullison, and Lowrey, *Feeds & Feeding*, p. 198.

[42] Ibid., p. 199.

[43] Domenick J. Castaldo, "The North American Feed Industry," ch. in *Feed Manufacturing Technology IV*, ed. Robert R. McEllhiney (Arlington, VA: American Feed Industry Association, Inc., 1994), p. 14.

and methionine. A supplement is a mixed feed that combines ingredients with vitamins and minerals, but requires additional sources of grains or proteins to make a complete ration for animals.[44] Premixes are defined as feeds that contain one or more concentrated products, such as micronutrients, vitamins, or trace elements, that are added to complete feeds.[45] Medicated feeds are those that contain antibiotics and other medications that can be added, with a carrier, to feeds for animals that require them.

The pet food industry developed in earnest after World War II, though a number of pet food products, such as dog biscuits and canned pet food, had existed before this time.[46] The most common type of pet food is dry dog food, which accounts for roughly one-third of total sales. Dry pet foods combine energy and protein feeds (such as corn, rice, soybean meal, and meat meals) and are usually produced using an extruder or through pelleting techniques.[47] Semimoist pet foods have a moisture content of 35 to 40 percent, with additional additives necessary to act as preservatives.[48] Canned pet foods (typically cat foods) either combine grains and meat products or contain mostly meat byproducts and have a moisture content of 74 to 78 percent.[49] Wheat gluten, a byproduct of flour milling, is also used in the pet food industry because of its visco-elastic properties that serve to bind raw materials together in semimoist and canned pet foods.[50]

U.S. INDUSTRY PROFILE

Industry Structure

The structure of the animal feed industry is provided in figure 1. As discussed in the previous section, a number of the ingredients used in the manufacture of compound feed and pet foods come from byproducts of grain, vegetable, oilseed, meat, and fish processing. Whole grains such as corn are also used. Supplies of these ingredients are used by commercial feed mills, integrators, and pet food manufacturers. Products of the animal feed industry are covered by a number of Standard Industrial Classification (SIC) codes, including all of SIC 2047 (dog and cat food) and SIC 2048 (compound feed, including poultry feed, swine feed, cattle feed, and other specialty feeds). In addition, a number of byproducts used as animal feed can be found in portions of SIC 2023 (dried feed-grade milk), SIC 2041 (wheat and other grain byproducts), SIC 2044 (rice byproducts), SIC 2046

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[44] Ibid.

[45] USITC staff interview with W. Fiddelke, Plant Superintendent, Land O'Lakes, Mason City, IA, Sept. 17, 1999.

[46] John M. Connor and William A. Schiek, *Food Processing: An Industrial Powerhouse in Transition* (New York: John Wiley & Sons, 1997), p. 45.

[47] Diane A. Hirakawa, "Feeding and Nutrition of the Dog and Cat," ch. in *Livestock Feeds and Feeding*, eds. Richard O. Kellems and D.C. Church (Upper Saddle River, NJ: Prentice Hall, 1998), p. 442.

[48] Ibid., p. 443.

[49] Cheeke, *Applied Animal Nutrition*, p. 440 and Hirakawa, "Feeding and Nutrition of the Dog and Cat," p. 443.

[50] USITC, *Wheat Gluten*, Mar. 1998, p. II-4.

Figure 1
Structure of the U.S. animal feed industry

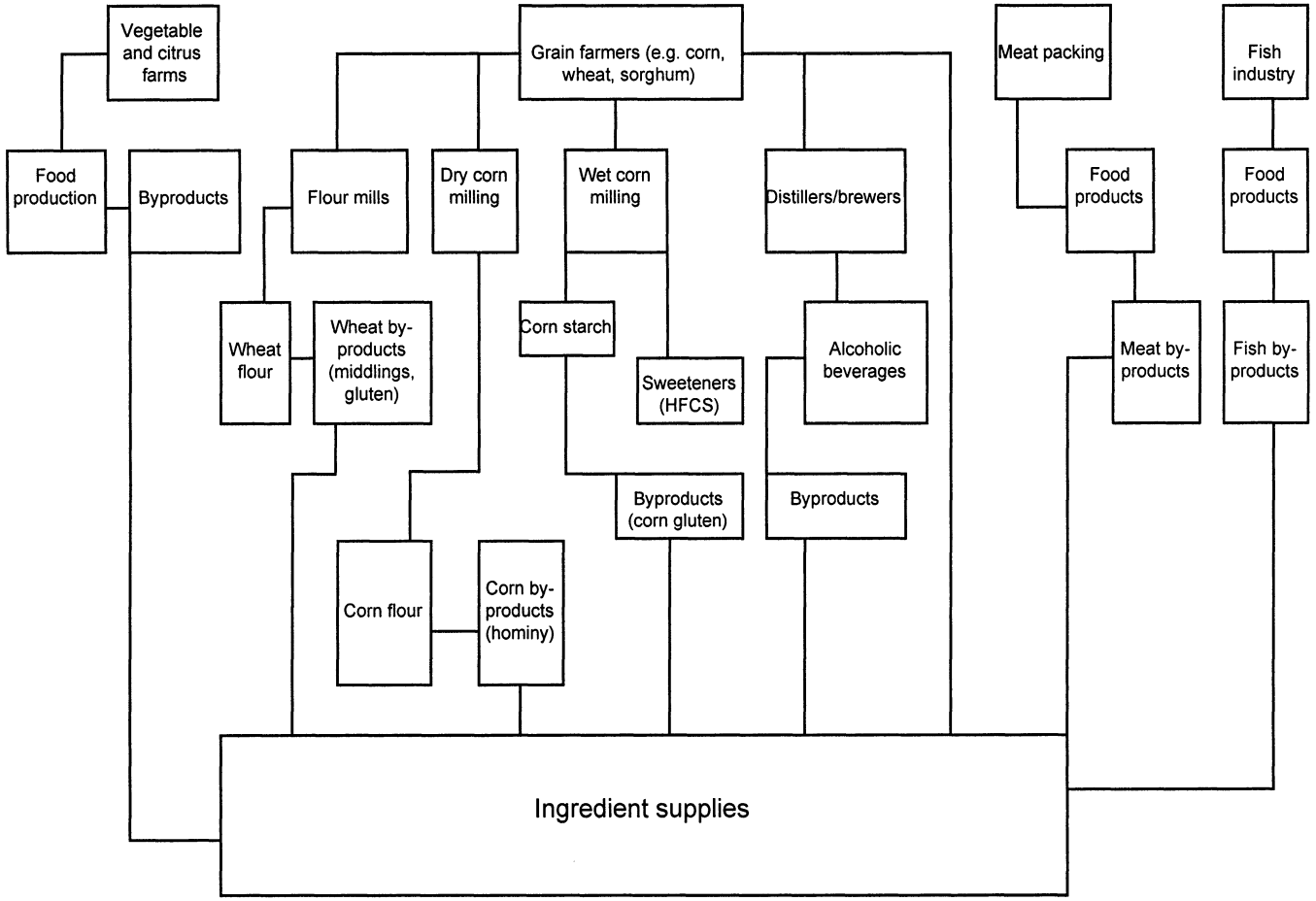
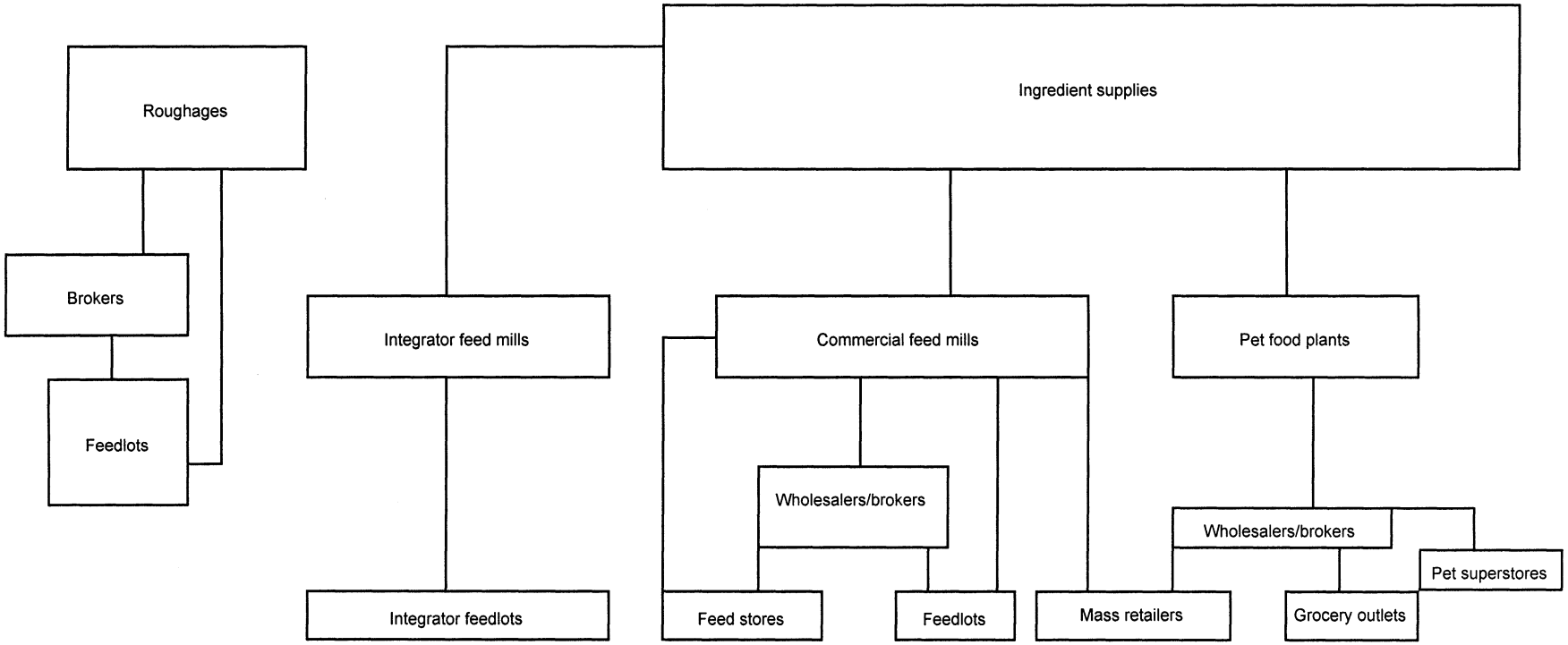


Figure 1–*Continued*
Structure of the U.S. animal feed industry



Source: Compiled by USITC staff.

(corn gluten), SIC 2074 (cottonseed meal), SIC 2075 (soybean meal), SIC 2076 (other oilseed meals), and SIC 2077 (meat and fish meal).[51]

Number, concentration, and geographic distribution of firms

Number and level of concentration of firms

The diversity of the types of feed operations in the United States makes it difficult to assign an exact figure to the number of firms in the feed industry. The statistics that are available typically exclude firms that supply ingredients (e.g. corn, soybeans) as well as farms that mix feed on-site. According to the American Feed Industry Association (AFIA), there were 3,000 primary feed manufacturing plants and 5,500 secondary or custom mix plants. These are complemented by a network of 17,500 feed dealers and "several thousand" ingredient suppliers.[52]

The commercial feed industry is becoming increasingly concentrated, reflecting greater levels of consolidation in the livestock industry. The poultry feed business is dominated by integrators, which are vertically integrated firms that produce their own feed for poultry production. There has been a wave of mergers over the past few years in both the animal feed and pet food industries. These have included Heinz's purchase of Quaker Oats Co. pet food, Proctor & Gamble's purchase of Iams pet food, and a number of additional mergers involving SF Services (merged with Farmland), Windy Hill Pet Food (merged with Doane's), Gold Kist (merged with Southern States Cooperative), Mark II Plan (merged with Land O'Lakes), and Gringer Feed & Grain (purchased by Hubbard).[53]

A recent survey of U.S. feed manufacturers revealed that Cargill, Inc. was the largest feed manufacturer in 1998, with production of 8 million tons per year. Other major producers include Purina Mills (7.5 million tons per year), Land O'Lakes (6.6 million tons per year), PM Ag Products, Inc. (3.6 million tons per year), and Consolidated Nutrition LC (3 million tons per year).[54] Top producers of pet food include Ralston Purina, which holds 15 percent of the U.S. market, followed by Nestle (12 percent), Heinz (11 percent), Doane's (7 percent), and Hill's Pet Nutrition (7 percent).[55]

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[51] The North American Industry Classification System (NAICS) numbers covered by this summary are 311111 (dog and cat food), 311119 (other animal feed), and portions of 311514 (dried feed-grade milk), 311211 (flour byproducts), 311212 (rice byproducts), 311221 (corn gluten), 311223 (cottonseed and other oilseed meals), 311222 (soybean meal), 311613 (meat byproducts), and 311711 and 311712 (fish byproducts).

[52] American Feed Industry Association, *The U.S. Animal Feed Industry* (brochure).

[53] USDA, Economic Research Service (ERS), "Food Marketing Mergers and Divestitures Costing Over $100 Million, 1995," found at Internet address http://www.ers.usda.gov/briefing/foodmark/markets/data/industry/table37.htm, retrieved Aug. 8, 1999; Kevin Hoepker, "Pet food market continues to experience steady growth," *Feedstuffs*, Jan. 4, 1999, p. 12; and Philip Lobo, "Top feed companies: Consolidation sweeps the industry," *Feed Management*, Jan. 1999, p. 5.

[54] Lobo, "Top feed companies: Consolidation sweeps the industry," p. 5.

[55] Ann H. Gurkin and Susan D. Fenstermacher, "The Petfood Report," *Petfood Industry*, Sept./Oct. 1999, pp. 20-21.

Geographical distribution of firms

Facilities and farms that process ingredient feeds are found in close proximity to areas where crops are grown or, in the case of certain types of byproducts, processing facilities are located. The production of staple energy feeds, such as corn, sorghum, and wheat, is found in the Midwest and Plains States (table B-1). Soybean meal production predominates in the Midwest, particularly Illinois, Iowa, Minnesota, and Ohio (table B-2). Cottonseed meal production centers around Texas, California, and Kansas (table B-2). Other oilseed meals, such as canola, linseed, and sunflower are produced in the Upper Midwest (table B-2). Meat meals are generated in areas near the major meat packing facilities.[56] For beef, these are found in Texas, Kansas, Colorado, and Nebraska, while pork production is located in the Midwest and poultry meal production in the Southeast.[57] Fish meal is generated largely from catches of menhaden off the Atlantic and Gulf Coasts and from tuna and anchovy catches from the Pacific coast. Byproduct feeds are produced in the areas where the original product is grown or processed. Citrus pulp, for instance, is produced mainly in California and Florida. Alfalfa production has shifted from the Midwest to the Southwest and West,[58] while red clover hay is commonplace in the Midwest and the Northeast (table B-3).

Commercial feed facilities are dispersed throughout the United States. As evidenced in table B-4, no one region produces more than 18 percent of "primary feed," which includes complete feeds, supplements, and premixes.[59] The Corn Belt[60] is the largest producer of primary feed, accounting for 18 percent of total primary feed. The Southeastern States account for another 16 percent of total primary feed production, followed by the Southern Plains with 13 percent (table B-4). Although no one region dominates primary feed production, certain regions specialize in the production of particular types of feed. The types of feeds produced regionally tend to correspond to the type of livestock predominant in those regions. For example, the majority of swine feed is produced in the Midwest, with the Corn Belt producing 47 percent (7.6 million tons). Broiler feed is concentrated in the Southern part of the United States. The Southeast is the national leader in broiler feed production with almost one-third of U.S. production. In starter/grower/layer/breeder feeds, the Corn Belt is the leading producer (21 percent of U.S. production). This reflects a growing trend of layer facilities relocating to the Midwest in order to be closer to ingredients such as corn and soybeans.[61] In contrast, the production of dairy cattle feed is scattered throughout the U.S., with no region dominating production. The Pacific States are the leading producer of dairy cattle feed, with 20 percent of U.S. production, followed closely by the Northeastern, Southeastern, and Lake States. Pet food production can be found throughout the United States, but is concentrated in Iowa, New York, Kansas, Ohio, and Missouri.[62]

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[56] Ash, *Animal Feeds Compendium*, p. 65.

[57] Ibid.

[58] Perry, Cullison, and Lowrey, *Feeds & Feeding*, p. 198.

[59] "Feed marketing," *1998 Feedstuffs Reference Issue*, vol. 70, No. 30, July 22, 1998, p. 7. This excludes ingredients, feed grains, byproducts, and pet foods.

[60] See table B-4 for a definition of the regional areas presented in this paragraph.

[61] USITC staff interview with B. Gottula, Quality Assurance/Regulatory Manager, Land O'Lakes, Fort Dodge, IA, Sept. 17, 1999.

[62] Connor and Schiek, *Food Processing*, p. 197.

Employment, earnings, and productivity

There is limited information on employment levels in the animal feed industry. The data available from the *Annual Survey of Manufactures* (ASM) and the *1997 Economic Census* from the U.S. Census Bureau detail employment in the compound feed and pet food sectors for 1992-97. Employment in the compound animal feed industry fell irregularly during 1992-96, from 19,700 employees in 1992 to 19,200 employees in 1996 (table B-5). In 1997, employment rose to 19,580.[63] The ASM data reveal that nominal wages rose 2.5 percent over the period 1992-96. The animal feed industry is highly capital-intensive, with ASM data exhibiting that wages comprised only 2.4 percent of the value of shipments. As a result, most commercial feed mills do not employ many employees. A recent survey of feed mills showed that the average number of employees in commercial feed mills was 19 in 1998, down from 21 in 1997.[64] An average of 1.8 shifts were worked per day in 1998 (down from 2 shifts per day in 1997), while production efficiency, defined as number of man-hours per ton of feed produced, rose from 0.81 in 1997 to 0.92 in 1998.[65] Results from the *1997 Economic Census* show that 596 commercial feed mills (40 percent) employed less than 10 employees in 1997 and 1,376 feed mills (91 percent) employed less than 50 employees (figure 2). ASM figures show that capital expenditures rose 9 percent during 1992-96, though they have been steadily falling from their peak in 1994.

Other results from the feed mill survey revealed that commercial feed mills operated at 70 percent capacity in 1998, down from 73 percent in 1997.[66] The lower rate of capacity utilization may be indicative of the trend towards shutting down older facilities in the course of the consolidations and mergers that have occurred in the industry.[67] The survey indicates that the highest level of capacity utilization is in the South Atlantic region, where producers operated at 82 percent capacity. In contrast, the survey showed producers in the Western part of the country to be operating at only a 59-percent capacity rate.

Like the compound food industry, the pet food industry had reductions in employment during 1992-96, with the number of workers falling irregularly from 10,500 in 1992 to 9,600 in 1995, before rising to 10,100 in 1996 (table B-5). Employment rose to 10,701 in 1997.[68] There is no real pattern in the pet food industry in terms of the number of workers employed per establishment. According to the *1997 Economic Census*, while 50 pet food manufacturers (27 percent) employ less than 4 workers, an additional 49 plants (26 percent) employ over 100 employees (figure 3). Wages rose by 9.6 percent in nominal terms during

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[63] U.S. Department of Commerce, U.S. Census Bureau, "Other Animal Food Manufacturing," *1997 Economic Census, Manufacturing, Industry Series*, Report Number EC97M-3111B, December 1999, p. 7. This figure is based on the NAICS rather than the SIC codes used in the ASM.

[64] Philip Lobo, "Capacity is up, capacity used is down," *Feed Management*, Jan. 1999, p. 13.

[65] Ibid.

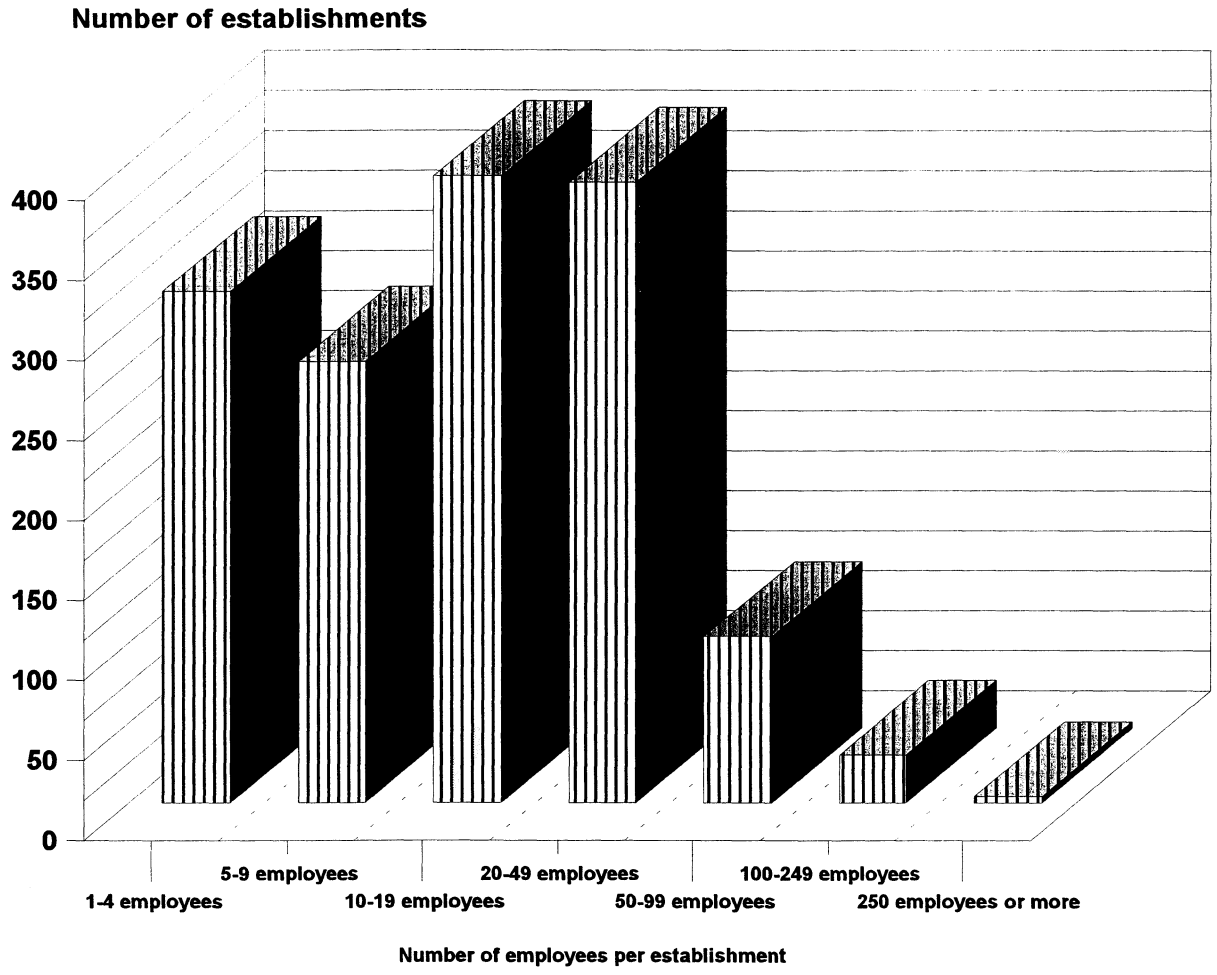
[66] Ibid.

[67] USITC staff interview with representatives of the American Feed Industry Association (AFIA), Arlington, VA, July 20, 1999.

[68] U.S. Department of Commerce, U.S. Census Bureau, "Dog and Cat Food Manufacturing," *1997 Economic Census, Manufacturing, Industry Series*, Report Number EC97M-3111A, December 1999, p. 7. This figure is based on the NAICS rather than the SIC codes used in the ASM.

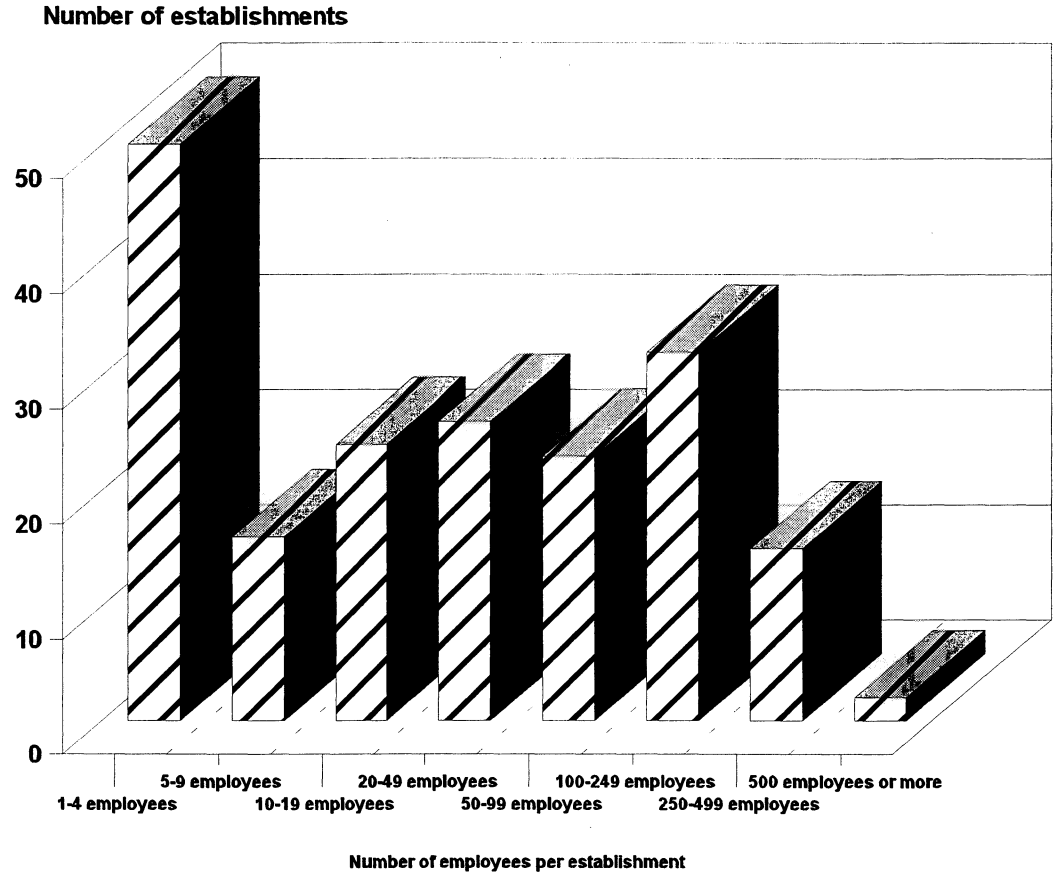
1992-96 (table B-5). Trends in capital expenditures in the pet food industry have been irregular but on an upward trend (17 percent) during the period.

Figure 2
Number of employees per establishment in the compound feed industry



Source: Data computed from the U.S. Census Bureau, "Other Animal Food Manufacturing," *1997 Economic Census*, p.9

Figure 3
Number of employees per establishment in the pet food industry



Source: Data computed from the U.S. Census Bureau, "Dog and Cat Food Manufacturing," *1997 Economic Census*, p. 9.

Marketing methods, integration, distribution, and pricing practices

Ingredient feeds are often produced, processed, and consumed on-farm by operations on farms that raise feed grains and livestock. About 70 percent of hay (which is bulky in nature) is consumed on-farm. Also, between 60 percent to 70 percent of the feed that goes into swine production is mixed on-farm from ingredients produced on-farm and purchased from ingredient manufacturers.[69] The trend towards on-farm mixing has forced commercial feed mills to diversify their product mixes. Some feed plants have started to sell private label pet food to compete in other markets, while other plants have targeted certain niche

[69] USITC staff interview with representatives of AFIA, July 20, 1999.

markets, such as bagged feeds for hobby farmers, premium animal feed products, and premixes.[70] Consolidation in the poultry industry over the past few years has led to fully integrated production systems among major poultry producers. These integrated systems incorporate all aspects of the production chain, from the production of the feed to production of the broilers for market.[71]

Feed manufacturers procure ingredients from brokers, who buy ingredients from farmers, elevators, or processors. Direct procurement arrangements are made with farmers involved in the production of specialized ingredients, such as high-lysine corn.[72] Feed producers that are part of cooperatives will procure directly from farmers as well.[73] Corn and soybean meal are the main ingredients used, but a host of other commodities are purchased by feed manufacturers in the production of feed. Table B-6 provides a breakdown of the various types of ingredients other than corn and soybean meal that are employed by feed manufacturers. In particular, there is significant use of fish meal, distillers grains, blood meal, and corn gluten among commercial mills. Major ingredients, such as corn and soybean meal, are purchased from producers and brokers in the Midwest. Supplemental protein and energy sources are often procured from local sources. In California, for instance, dairy farms utilize a number of byproducts of the local processing industries, including tomato pulp, grape pumice, brewers grains, and citrus pulp.[74]

Feeds are sold to farmers, brokers, wholesalers, or feed stores. Direct sales of dairy feeds are common in California, while feeds in the Midwest are largely sold through an intermediary.[75] In general, most feed is sold in a relatively localized area. In California, for instance, the majority of dairy feed is sold in a 100-mile area within the Central Valley.[76] Discussions with feed manufacturers in Iowa reveal a similar sales network in terms of distance.[77] Hay is also primarily marketed locally, as its bulkiness translates into high transport costs relative to other feed products.[78] Most feed sales (80 percent in 1998) are made in bulk, truck-load sized deliveries to customers.[79] Complete feeds destined for feed stores, supplements, and premixes are typically sold in 50-lb or 80-lb bags. There is a trend towards the use of 1-ton bags for sales to medium-sized customers that cannot handle bulk deliveries.[80] Roughages, such as hay, are marketed through a variety of means, including sales between farmers, sales to dealers and brokers, and direct contracts with dairy farms.[81]

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[70] USITC staff interviews with various feed industry representatives, California and Iowa, Sept. 13-17, 1999.

[71] Castaldo, "The North American Feed Industry," p. 14.

[72] USITC staff interview with representatives of AFIA, July 20, 1999.

[73] USITC staff interview with representatives of Land O'Lakes, Ft. Dodge, IA, Sept. 17, 1999.

[74] USITC staff interviews with various feed industry representatives in California, Sept. 13-14, 1999.

[75] USITC staff interviews with various feed industry representatives in California and Iowa, Sept. 13-17, 1999.

[76] USITC staff interviews with various feed industry representatives in California, Sept. 13-14, 1999.

[77] USITC staff interviews with various feed industry representatives in Iowa, Sept. 16-17, 1999.

[78] Shields and Baker, "The U.S. Hay Market," p. 13.

[79] Lobo, "Top feed companies: Consolidation sweeps the industry," p. 12.

[80] Castaldo, "The North American Feed Industry," p. 18; and USITC staff interviews with various feed industry representatives in California and Iowa, Sept. 13-17, 1999.

[81] Shields and Baker, "The U.S. Hay Market," p. 13.

Several other practices are common in certain regions of the country, including auctions in Pennsylvania and sales to marketing associations in the Western States.[82]

A similar marketing channel exists for pet foods. In terms of procurement, raw materials for pet foods are sold to the pet food manufacturer from producers (e.g. farmers, packing plants) or brokers.[83] Vitamins and supplements are also sold directly to the manufacturer.[84] Pet food is distributed to wholesalers, groceries, pet stores, farm stores, and warehouses. Specialty brands are generally distributed to pet stores, farm stores, and veterinarians rather than to general retailers. Veterinarian diets are usually distributed by veterinarians only. There are also some types of pet foods that are distributed directly to consumers via the Internet.[85] In 1998, grocery stores accounted for 52 percent of retail sales of pet food, followed by specialty stores (15 percent), mass retailers such as Wal-Mart (14 percent), feed stores (7 percent), veterinarians (6 percent), and other outlets (7 percent).[86] There has been a trend away from grocery sales and towards sales in specialty stores, reflecting significant growth in the consumption of premium and superpremium brands of pet food.[87] Substantial increases in sales have also come from mass retailers particularly since 1994; such sales grew by 64 percent during 1994-98.[88]

Most prices for ingredient feeds are determined regionally. Corn and soybean meal are traded on the Chicago Board of Trade. Ingredient prices tend to track the prices of corn (for energy and grain-based feeds) and soybean meal (for protein meals). Prices for ingredient feeds varied irregularly during the crop-years 1993-97 (table B-7).[89] Most feed prices peaked in either crop-year 1995 or crop-year 1996, with sharp declines in crop-year 1997. In the case of soybean meal, the average price rose from $152 per short ton in 1994 to $260 per short ton in crop-year 1996. In crop-year 1997, however, prices fell to $187 per short ton (table B-7). Prices for protein meals, such as cottonseed meal and meat and bone meal, followed a similar trend during the period. Prices for all protein meals dropped significantly in crop-year 1997 with the exception of fish meal. Fish meal prices rose significantly throughout crop-years 1993-97, ranging from an average low of $337 per short ton in crop-year 1993 to $555 per short ton in crop-year 1997. This reflects a decline in the domestic menhaden catch over the period.

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[82] Ibid.

[83] USITC staff interview with R. Hammock, Sunshine Mills, Oct. 20, 1999.

[84] Email message received by USITC staff from N. Cook, Pet Food Institute, Sept. 9, 1999.

[85] Ibid.

[86] Gurkin and Fenstermacher, "The Petfood Report," p. 20.

[87] Bob Bregenzer, "Sales data: Mass merchants offer greater variety and sales grow 14%," *Petfood Industry*, Nov./Dec. 1998, p. 48.

[88] Hoepker, "Pet food market continues to experience steady growth," p. 12.

[89] The marketing year begins on October 1.

U.S. government programs and regulations

Domestic regulations

Regulation on matters such as labeling and the types of additives and drugs permitted in animal feeds is the purview of state feed control agencies.[90] The FDA is the main Federal agency in charge of promulgating feed regulations. The FDA establishes guidelines for the types and dosages of drugs and additives that can be used in animal feeds, initiates action against bogus label claims, and works in conjunction with the States to inspect feed mills that manufacture medicated feeds.[91]

Feed labeling laws require the posting of detailed information about the feed product. Labels must include brand and product names and a guaranteed analysis that provides for the minimum and/or maximum levels of protein, fat, fiber, minerals, and vitamins contained within the product.[92] Medicated feeds must be labeled as such and must have a "claim statement," which specifies uses and warnings associated with the drug used.[93]

Medicated feeds are governed by the Second Generation of Medicated Feed Program of 1986 and the Animal Drug Availability Act of 1996. The Second Generation program classifies FDA-approved drugs into two categories (Category I and Category II)[94] based on whether the drug requires a withdrawal period, defined as the amount of time needed for an animal to excrete the drug from its system before being put up for sale. The program further distinguishes between three types of medicated feed products. Type A products are classified as drugs by the FDA and consist of medicines used in Type B and Type C medicated products.[95] Type B products are considered medicated feeds by the FDA. They must contain a minimum level of nutritive product (at least 25 percent by weight) and are limited in the maximum amount of Category I or Category II drugs they may contain.[96] Type C products are classified by the FDA as animal feeds and can be used as a complete feed.[97] The Animal Drug Availability Act of 1996 simplified the registration procedures related to Type A, Category II drugs by replacing the medicated feed applications (MFA) process with a mill license requirement; prior to 1996, any use of a Type A, Category II drugs had to be approved through MFA. The 1996 act also created a new category of drug which can only be used in a medicated feed if accompanied by a Veterinary Feed Directive (VFD) signed by a veterinarian.[98]

In the wake of the outbreak of bovine spongiform encephaolpathy (BSE), also called "mad cow disease," in the United Kingdom, the FDA banned the practice of feeding ruminant-

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[90] Lee H. Boyd, "Feed regulation," *Feedstuffs 1998 Reference Issue*, p. 126.

[91] Ibid.

[92] Ibid., p. 127.

[93] Ibid.

[94] Category I drugs require no withdrawl period when used in the "lowest approved continuous use level," while Category II drugs require a withdrawl period. See Lee H. Boyd, "Medicated feed regulation," *Feedstuffs 1998 Reference Issue*, p. 131.

[95] Boyd, "Medicated feed regulation," p. 131.

[96] Ibid.

[97] Ibid.

[98] Boyd, "Feed regulation," p. 127.

based animal feeds to ruminants in August 1997. BSE is a neurological disorder that causes severe twitching and contortions in animals prior to their death. Some researchers contend that the practice of feeding diseased sheep meal to ruminants was the mode of transmission of BSE to cattle. BSE has been implicated in a variant of Creutzfeldt-Jakob disease in humans, a similar neurological disorder that usually results in death. The FDA mandated that any ruminant-based meat and bone meal be labeled to clearly state that such feeds are not to be fed to ruminants. Other meat-based meals, such as those derived from poultry and swine, are exempt from this labeling requirement.

Export promotion programs

The U.S. animal feed industry receives funds for export development from the Market Access Program (MAP) and the Foreign Market Development (or Cooperator) Program (FMD), both of which are administered by USDA. The MAP assists exporters and associations with trade promotion activities in order to enhance exports of U.S agricultural products.[99] The emphasis of the FMD is to develop and sustain markets for U.S. agricultural products.[100] The focus of the MAP is on higher value products, while the FMD concentrates on bulk products.[101]

Table B-8 details the allocation of MAP and FMD funds for a number of feed-related associations. Several of these associations, such as the American Soybean Association and U.S. Grains Council, focus on both feed and nonfeed uses of their particular products. The largest recipient of MAP funds for an organization focused primarily on the animal feed industry is the Pet Food Institute (PFI). PFI has been a recipient of funds allocated through the Market Access Program (MAP) since 1993. PFI has used these funds to target three major markets for the export of U.S. pet food: Japan, Taiwan, and Mexico.[102] Trade promotion efforts in Japan and Mexico have focused on disseminating information on U.S. pet food through numerous seminars, trade fairs, brochures, and articles. The target audience for these activities has been veterinarians, nutrition specialists, government officials, and consumers.[103]

A number of feed products are included in the GSM 102/103 credit guarantee programs of USDA. The GSM-102 program provides short-term (up to 36 months) credit guarantees for exporters who have difficulty securing letters of credit for buyers in certain countries, while the GSM-103 program allows for longer term loan guarantees (up to 10 years).[104] Feed products included in each program include protein meals, milk replacers, and pet foods.

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[99] USDA, FAS, "Market Access Program," found at Internet address http://ffas.usda.gov/info/factsheets/mapfact.html, retrieved Aug. 13, 1999.

[100] USDA, FAS, "Foreign Market Development Program: Frequently Asked Questions," found at Internet address http://ffas.usda.gov/mos/programs/fmdfaq.html, retrieved Aug. 19, 1999.

[101] USDA, FAS, "The Competition in 1997: U.S. and Competitor Expenditures on Export Promotion and Export Subsidies for Agricultural, Forestry, and Fishery Products," found at Internet address http://ffas.usda.gov/cmp/com-study/1997/comp97-us.html, retrieved Nov. 8, 1999.

[102] Pet Food Institute, "The Pet Food Institute: A Commitment to Quality," p. 10.

[103] Ibid.

[104] USDA, FAS, "Export Credit Guarantee Programs," found at Internet address http://ffas.usda.gov/excredits/exp-cred-guar.html, retrieved Oct. 29, 1999.

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

The principal purchasers of animal feed products include farmers, commercial feed operations, specialty stores (for certain types of feed and pet food), and households (for pet food). Farmers and commercial feed operations rely heavily on "least-cost analysis" in making feed ingredient decisions. Least-cost analysis involves choosing ingredients based on the best combination of price, local availability, and nutritive properties for a given species. For example, nonruminants generally consume corn (for energy purposes) and soybean meal (as a protein source). However, other feed ingredients can be used to replace a portion of these staple rations depending on the relative price and availability of alternative feeds. The seasonality of ingredient feeds plays a role in least-cost analysis, insofar as it influences feed ingredient availability. Updated nutritional information for specific types of ingredients will also affect the proportions used in a processor's least-cost analysis. Least-cost analysis, as practiced by commercial feed mills, is quite sophisticated, with computer algorithms used to determine the optimal combination of feed ingredients, subject to price and nutritive considerations. These programs change the proportions used in compound feed production frequently, according to changes in prices and availability of ingredients.[105]

Pet food demand primarily depends on the size and composition of the pet population. Data from the Pet Food Institute reveal that there were 58 million dogs and 71 million cats in the United States in 1998.[106] Pet ownership levels have increased at a 1.3 percent annual rate over the 1990s.[107] These trends in ownership can be attributed to a number of factors, including the aging of American society, smaller family sizes, and a greater desire for pet companionship.[108] There has been a trend in recent years toward the development of premium and superpremium brands of pet food aimed at certain types of pet populations (e.g. diets for older pets, low calorie diets for obese pets). Reportedly, three-quarters of new pet food products marketed in the U.S., EU, Japan, and Australia were aimed at the premium/superpremium market.[109]

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[105] USITC staff interview with R. Reifert, Plant Manager, Kent Feeds, Altoona, IA, Sept. 16, 1999.

[106] Data compiled from Pet Food Institute, "1999 Fact Sheet."

[107] Hoepker, "Pet food market continues to experience steady growth," p. 12.

[108] Ibid.

[109] Nick Downing, "1999 & beyond: Trends in competition, distribution and new products," *Petfood Industry*, Jan. 1999, p. 43.

Consumption

Consumption trends

According to USDA, total consumption of protein feed ingredients, such as oilseed meals, byproducts, and meat and fish meals, rose from 41 million metric tons in crop-year[110] 1993 to 47 million metric tons in crop-year 1997, a rise of 16 percent (table B-9). Consumption of proteins derived from oilseeds rose 16 percent during crop-years 1993-97. Soybean meal, the most widely used protein meal, registered a 14-percent increase in consumption during this period, rising from 23 million metric tons to 26 million metric tons. Although cottonseed meal consumption increased 12 percent during the crop-years 1993-1997, there has been an irregular decline in consumption since 1994. Consumption of sunflower and canola meals increased sharply during crop-years 1993-97, though these products only comprise about 7 percent of oilseed meal consumption.

The greatest increase among protein feeds occurred in corn gluten feed and meal, where consumption surged by 293 percent from 827,000 metric tons in crop-year 1993 to 3.2 million metric tons in crop-year 1997. Consumption of alfalfa meal also grew substantially, increasing by 107 percent. Consumption of animal proteins fell sharply during this period. Tankage and meat meal consumption increased marginally, while fish meal consumption fell by 65 percent. There was also a 12-percent decline in the consumption of milk containing feeds, reflecting the decline in dairy herds over the past decade.

Figures computed from the Bureau of Economic Analysis (BEA) of the U.S. Department of Commerce reveal that the value of apparent consumption of compound animal feed products rose by 24 percent during 1993-1997, from $13 billion to $17 billion (table B-10). The BEA data report that the value of apparent consumption of pet foods rose from $6.3 billion to $7.8 billion during 1993-97, an increase of 30 percent (table B-11). Industry data reveal growth in retail sales of dog and cat food of 20 percent during 1994-1998 from $8.8 billion to $10.6 billion (table B-12). Sales growth of cat food increased faster (28 percent) than dog food sales (15 percent) during this period.

Conditions of competition between foreign and U.S. animal feed products

In general, there is limited competition between foreign and U.S. animal feed products within the United States. Most ingredients, particularly corn, soybean meal, and byproducts, are sourced from U.S. farmers or suppliers. Exceptions include oats, canola meal, and fish meal, where imports supplement domestic production. Imports of complete feeds and pet foods are relatively small in comparison to domestic production. The bulky nature of many feed ingredients precludes large volumes of imports, as it is relatively expensive to ship

[110] Note that this section refers to the crop year, which begins October 1. Also, consumption of ingredient feeds in this section is defined as the quantity fed to animals rather than apparent consumption.

these goods over long distances. Moreover, in the case of pet foods, much of the trade that takes place is cross-border trade with Canada involving U.S. firms with Canadian operations.[111]

In the case of compound feeds and pet foods, while the ratio of imports to consumption increased somewhat during 1993-97, overall import penetration remains low. In 1997, imports accounted for only 1.3 percent of the total value of U.S. consumption of compound animal feeds and 1.8 percent of the total value of pet food consumption (tables B-10 and B-11). Other protein feeds show a similar lack of import penetration. In 1997, import penetration was less than 5 percent for corn gluten feed in 1997 and less than 2 percent for corn gluten meal (table B-13). Import penetration in soybean meal was negligible during 1993-97 (table B-14). Fish meals and wheat gluten have had relatively higher degrees of import penetration. After peaking at 46 percent in 1994, import penetration in fish meals hovered between 22 and 24 percent during 1995-98 (table B-15). During 1993-97, there was significant import penetration of wheat gluten, which rose from 47 percent in 1993 to 57 percent in 1997 in value terms (table B-16). In terms of volume, an even greater share of consumption is accounted for by imports, with 62 percent of the consumption of wheat gluten coming from imports in 1997 (up from 56 percent in 1993).

Production

Data on production in the animal feed industry from the BEA detail the commercial compound feed industry and the pet food industry; this excludes on-farm and ingredient production. According to the BEA, the value of U.S. shipments of compound animal feed products (premixes, concentrates, supplements, specialty feeds, and other miscellaneous feed products) increased from $14 billion in 1993 to $18 billion in 1997 (table B-10). Major products include chicken and turkey feed supplements, concentrates, and premixes (shipments of $8.1 billion in 1997), complete dairy feeds (shipments of $1.6 billion in 1997), and swine feed supplements, concentrates, and premixes (shipments of $981 million in 1997).[112] According to the *1997 Economic Census*, the value of chicken and turkey feed supplement shipments surged 66 percent relative to its 1992 value, while changes in the values of other feeds were more modest.[113] The value of pet food shipments rose 26 percent during 1993-1997 from $6.5 billion to $8.3 billion, according to data from the BEA and the *1997 Economic Census*, (table B-11). Dog food shipments were valued at $5.3 billion in 1997 and cat food shipments were valued at $2.8 billion.[114]

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[111] U.S. Department of Commerce, International Trade Administration (USDOC, ITA), "Canada -- Pet Food Industry & Market Profile," Market Research Report, Oct. 1998.

[112] U.S. Department of Commerce, U.S. Census Bureau, "Other Animal Food Manufacturing," *1997 Economic Census*, pp. 12-13.

[113] Ibid.

[114] U.S. Department of Commerce, U.S. Census Bureau, "Dog and Cat Food Manufacturing," *1997 Economic Census*, p. 10.

Other available data from the trade journal *Feedstuffs* show that on a volume basis, the production of primary feeds rose by 4 percent, from 115 million short tons in 1994 to 120 million short tons in 1998 (table B-17). Production of broiler feeds exhibited strong growth, rising 13 percent from 33 million short tons in 1994 to 38 million short tons in 1998 (table B-17). Growth in some types of feed production contracted during 1994-98. Turkey feed production declined 6 percent, while dairy feed production fell 4 percent and beef and sheep feed production fell 3 percent.

In terms of ingredient feeds, data from USDA show that production of major oilseed proteins rose steadily during crop-years 1993-97 (table B-18).[115] There was a 25-percent increase in the volume of soybean meal production, which rose from 31 million short tons in crop-year 1993 to 38 million short tons in crop-year 1997. Sunflowerseed meal production rose by 57 percent during crop-years 1993-1997, while fish meal production experienced a considerable decline. Production of fish meal fell from 404 million short tons in 1994 to 296 million short tons in 1998.

A recent survey showed that dairy feeds are produced by almost 92 percent of commercial feed mills, followed by beef feeds at 89 percent and swine feeds at 87 percent (table B-19). Pet foods are being produced by an increasing number of feed mills, with 11 percent producing pet food in 1998 (compared to 6 percent in 1997).

U.S. TRADE

Overview

Animal feed products are an important contributor to agricultural trade. In 1998, the trade surplus for all animal feed products, including ingredient feeds, compound feeds, and pet foods, was valued at $3.6 billion, an increase of 24 percent since 1994, but down from its peak of $4.1 billion in 1997 (table B-20). The United States holds substantial trade surpluses with all of its major trading partners. The trade surplus with Japan was $615 million in 1998. The trade surpluses with European countries ranged from a low of $44 million for Germany to $231 million for the Netherlands. The only country with which the United States had a trade deficit during 1994-98 was China in 1994, when the deficit was valued at $1 million. By 1998, this deficit was transformed into a $195 million surplus.

[115] With respect to oilseed production, the years in question refer to crop-years rather than calendar years. For soybean meal, cottonseed meal, and sunflowerseed meal, the crop-year begins Oct. 1. For linseed meal and canola meal, the crop-year begins June 1.

U.S. Imports

Principal import suppliers and import levels

Products imported

In 1998, U.S. imports of animal feed products totaled $759 million (table B-20). Almost one-half (48 percent) of these imports consisted of compound animal feeds and pet foods. Imports of compound animal feeds were valued at $214 million in 1998 and consisted primarily of mixed feeds for dairy cattle, poultry, swine, and other animals (table B-21). Imports of dog and cat food totaled at $149 million in 1998 (table B-22). Other important feed products imported in 1998 included canola meal ($163 million)[116], wheat gluten[117] ($98 million), and meat and fish meal ($53 million) (tables B-23 and B-24).

Import levels and trends

U.S. imports of animal feeds increased by almost 24 percent in value terms and 9 percent in terms of volume during 1994-98 (table B-25). Imports of compound animal feeds increased by 33 percent in value terms, from $161 million in 1994 to $214 million in 1998 (table B-21). The volume of imported compound feeds increased at a slower rate, exhibiting 18-percent growth during 1994-98. Both the value and volume of compound feed imports peaked in 1996 at 453,248 metric tons valued at $230 million, before declining during 1996-98 (table B-21).

The greatest growth in imports has occurred in dog and cat food. Imports of dog and cat food rose by 78 percent during 1994-98, from $84 million to $149 million (table B-22). Import volumes increased by 58 percent over this period, rising from 106,157 metric tons in 1994 to 168,253 metric tons in 1998 (table B-22). The volume of wheat gluten imports rose irregularly but decisively from 82 million kg in 1994 to 94 million kg in 1998, while the value of imports rose with similar irregularity, from $92 million in 1994 to $98 million in 1998 (table B-23). Meat and fish meal imports tapered off considerably during 1994-98. Import volumes fell by 58 percent, from 267,404 tons in 1994 to 110,990 tons in 1998, while the value of imports dropped by 36 percent (table B-24). Most of the decline occurred during 1994-95 as a result of a steep drop in imports from Peru. Imports of Canadian canola meal jumped by 71 percent during 1994-98, increasing in value from $95 million in 1994 to $163 million in 1998.

[116] Trade data for canola meal obtained from data of the U.S. International Trade Commission.
[117] Wheat gluten imports include non-feed uses of wheat gluten.

Principal import suppliers

Canada is by far the most important source of imported animal feeds (table B-25). In 1998, imports from Canada totaled nearly $500 million, which represented almost two-thirds of total animal feed imports. In value terms, Canada accounts for all canola meal imports, 75 percent of dog and cat food imports, and 65 percent of compound feed imports. The EU is the second-leading source of such imports (valued at $109 million in 1998), with Germany and the Netherlands supplying the majority of EU animal feed products to the United States. Imports from Australia were valued at $40 million in 1998 and were concentrated in wheat gluten ($32 million) and meat and fish meals ($8 million). Almost $27 million in imports came from Thailand in 1998, the majority of which consisted of dog and cat food imports. Other minor suppliers of animal feed imports include Japan, China, Iceland, and New Zealand.

U.S. trade measures

Tariff and nontariff measures

The vast majority of animal feed products enter the United States duty-free or at a very low duty rate. Column 1 animal feed tariffs for the United States in 1999 are summarized in table B-26. In 1998, the aggregate trade-weighted import duty rate for all animal feed products was just 0.8 percent; the average trade-weighted import duty rate based on dutiable products was 5.9 percent. Almost 57 percent of U.S. imports of animal feed products enter duty-free, including meat and fish meals, milled grain brans, dog and cat foods, and mixed animal feeds. Oilseed meal imports are assessed duties that range from 0.14¢/kg for linseed meal to 0.58¢/kg for cottonseed meal. Wheat gluten used in animal feed production is assessed a duty rate of 2.2 percent ad valorem. Most other feed products have tariffs that range from 1.7 to 2.1 percent ad valorem.

Certain types of milk replacers are subject to the tariff-rate quota (TRQ) that exists for these items. A total of 7,399,700 kg of milk-containing feeds are allowed entry into the United States at the in-quota rate, which is allocated to 4 countries and an "other country" category. Ireland receives the largest quota quantity at 5,470,323 kg, followed by New Zealand at 1,782,618 kg, the United Kingdom at 83,914 kg, Australia at 56,699 kg, and other countries at 6,146 kg. The in-quota tariff rate for these milk replacers is 7.5 percent, while the over-quota rate is 82.8¢/kg plus 6.6 percent ad valorem. Additional safeguard duties (as defined in section 9904 of the HTS) are added to the over-quota duty depending on the value or quantity of the product. In 1998, only 14 percent, or 1,064,180 kg of the TRQ was filled. New Zealand utilized the greatest proportion of its quota, with 921,610 kg of imports (52-percent fill rate) in 1998. Other countries imports were 2,570 kg (42 percent) in 1998, while imports from Ireland were only 140,000 kg (3-percent fill rate). There were no imports of milk-containing feeds from Australia or the United Kingdom in 1998. Small amounts of over-quota imports from Canada (5,102 kg) entered the United States in 1998.

Under NAFTA, milk-containing feeds from Mexico are excluded from the TRQ. Rather, they are included in TRQs placed on dried milk and cream from Mexico (see note 6 of chapter 99 of the HTS). The TRQ for these products was set at 489,000 kg in 1999, with a 3-percent annual increase in the TRQ volume until 2003 when the TRQ will be eliminated.

In-quota milk-containing feeds from Mexico enter into the U.S. duty-free. Over-quota imports are assessed a duty that depends on the value of the feed product. Those valued at not over $1.21/kg receive a tariff of 37.8¢/kg, while all others have a tariff rate of 31.2 percent. In 1998, imports of dried milk and cream from Mexico, as specified under note 6 of chapter 99 of the HTS totaled 244,537 kg (51-percent fill rate).

Since 1989, USDA has prohibited imports of live ruminants and ruminant-based products into the United States from countries where known outbreaks of BSE have occurred. Meat and bone meal are included in the ban. Countries covered by the ban include the United Kingdom, France, Ireland, Oman, Portugal, Switzerland, and the Netherlands. The list was extended to include Belgium and Luxembourg in November 1997 following the diagnosis of BSE cattle in those two countries.[118] In December 1997, the USDA extended the prohibition to the rest of Europe.[119]

U.S. Government trade-related investigations

On September 26, 1997, on behalf of the Wheat Gluten Industry Council, the Commission initiated an investigation under section 202(b) of the Trade Act of 1974 (19 U.S.C. 2252) to determine whether wheat gluten, as defined under subheadings 1109.00.10 and 1109.00.90 of the HTS, was being imported into the United States in such increased quantities as to be a substantial cause of serious injury, or the threat thereof, to the domestic industry producing an article like or directly competitive with the imported article. On January 15, 1998, the Commission made a unanimous determination that increased imports of wheat gluten were a substantial cause of injury to the domestic industry. The Commission ruled, however, that under section 311 of the NAFTA, increased imports from Mexico and Canada were not responsible for injury and excluded these countries from the remedy action taken by the Commission. On May 30, 1998, the President formally implemented a quota on wheat gluten imports through Presidential Proclaimation 7103. The President set the duration of the quota at 3 years and 1 day and extended relief from the quota to countries covered under the Generalized System of Preferences (GSP). The initial quota was set at 57.6 million kg (126.812 million pounds) and allocated by country based on the average import shares between the crop years ending June 30, 1993 and June 30, 1995. The initial quota allocation accorded Australia was 28.315 million kg, the EU received 24.513 million kg, and all other countries were allocated 4.693 million kg for the period June 1, 1998 to May 31, 1999. These volumes will rise 6 percent per year over the subsequent 2 years of the quota.

In 1999, it was revealed that the EU exceeded its quota of wheat gluten imports by over 5 million kg. The U.S. Customs Service attributed this to the incorrect submission of customs forms by importers and brokers, who did not identify wheat gluten as being subject to the quota.[120] Through Presidential Proclamation 7202, announced on May 28, 1999, the President addressed the overage by modifying the original quota action. For the quota year June 1, 1999 to May 31, 2000, the quota for wheat gluten imports from the EU was reduced

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[118] "USDA restricts ruminant imports from Belgium," *Feedstuffs*, Nov. 24, 1997, found at Internet address http://www.feedstuffs.com/subscrip/1997/n10b6948.htm, retrieved July 7, 1999.

[119] "USDA restricts animal imports from Europe," *Feedstuffs*, Dec. 29, 1997, found at Internet address http://www.feedstuffs.com/subscrip/1997/n17s6952.htm, retrieved July 7, 1999.

[120] Ed Maixner, "Wheat gluten pours through Clinton quota," *Feedstuffs*, Apr. 12, 1999, p. 4.

from 25,983,000 kg to 20,581,000 kg. The quota allocation for the EU in the third quota year (June 1, 2000 to May 31, 2001) remains unchanged. In addition, over-quota imports from subject countries during the quota year June 1, 1999 to May 31, 2000 will be applied to the following year's quota, while over-quota imports during the quota year June 1, 2000 to May 31, 2001 will be placed in bonded warehouses or exported back to the country of origin. On June 17, 1999, the quota for the EU for the quota year June 1, 1999 to May 31, 2000 was completely filled.[121]

U.S. Exports

Principal markets and export levels

Products exported

In 1998, U.S. exports of animal feed products totaled $4.3 billion (table B-20). Tables B-27 through B-32 summarize export levels for major animal feed products. Most exports of animal feed products are ingredients rather than compound feeds, though pet food exports have been growing rapidly. Products derived from the crushing of soybeans are a major component of animal feed exports. In value terms, almost 27 percent of U.S. soybean meal production was exported during crop year 1997 (table B-14). As a share of total U.S. animal feed exports, soybean meals accounted for 37 percent, or $1.6 billion, of total exports in 1998, with soybean flours contributing an additional 2 percent, or $99 million. Dog and cat food exports totaled $681 million in 1998, accounting for 16 percent of total animal feed exports (table B-27), while residues of the corn wet milling industry (e.g. corn gluten feed and corn gluten meal) contributed an additional $656 million in 1998 (table B-32). Other important animal feed exports include compound animal feeds, with exports totaling $495 million in 1998, and alfalfa and hay, with $315 million in exports in 1998. There is relatively less trade in byproduct feeds, with the major exported byproducts being meat and fish meals ($155 million of exports in 1998), brewers and distillers grains ($72 million of exports in 1998), and beet pulp ($69 million of exports in 1998) (table B-26).

Export levels and trends

Exports of animal feed products rose by 24 percent in value terms and by 17 percent in volume terms during 1994-98 (table B-33). The gains in animal feed exports have been largely due to strong growth in exports of pet foods and oilseed meals. The value of pet food exports rose by 76 percent over 1994-98, from $387 million to $681 million, while the rate of growth in terms of volume during this period was 70 percent (table B-27). The value of oilseed meal exports (primarily soybean meal) rose 67 percent, from $980 million in 1994 to $1.6 billion in 1998, with export volumes increasing 63 percent (table B-28).

[121] Based on information obtained from the Customs Electronic Bulletin Board, found at Internet address http://www.cebb.customs.treas.gov.

Meat and fish meal exports showed substantial growth over 1994-98 as well, increasing 60 percent in value terms, from $97 million in 1994 to $155 million in 1998, and 41 percent in volume terms (table B-29). The value of meat and fish meal exports grew swiftly during 1994-96, peaked in 1997, and fell by 2 percent in 1998; volumes have grown steadily throughout the period. Despite this growth, exports of meat meal (exclusive of fish meal) to several markets decreased during the period, particularly exports to Indonesia and Thailand. This was primarily a result of the Asian financial crisis. Exports of meat meal to other markets have also been hampered by fears over BSE.[122] Alfalfa and hay exports rose by 14 percent in volume terms and by 15 percent in value terms during this period (table B-30). Compound animal feed exports declined by 8 percent in value terms during 1994-98, with the steepest decline occurring over the last year (table B-31). Corn gluten exports fell by 26 percent in terms of value during 1994-98, with most of the decline occurring in 1998 (table B-32).

Principal export markets

U.S. exports to principal markets are summarized in table B-33. Almost 26 percent, or $1.1 billion, of U.S. animal feed exports went to the EU in 1998. The value of such exports declined by 3 percent during 1994-98, with a sharp decrease in exports of 23 percent during 1997-98. Principal exports to the EU include corn gluten, pet food, and compound animal feeds. The largest individual market for animal feed exports in the EU is the Netherlands, which accounted for $252 million of U.S. exports in 1998 (table B-33). Almost 71 percent ($178 million) of animal feed exports to the Netherlands consisted of corn gluten feed and meal (tables B-32 and B-33). Other important export markets in the EU include Spain, the United Kingdom, and Ireland (table B-33).

Japan was the destination for 15 percent, or $628 million, of all U.S. exports of animal feed products in 1998. The value of exports to Japan increased by 13 percent during 1994-1998, rising from $555 million to $628 million (table B-33). A significant component ($284 million) of U.S. feed exports to Japan consist of alfalfa and hay, which are used predominately in dairy cattle production (tables B-30 and B-33). Japan is also the second-leading destination for dog and cat food exports, which were valued at $128 million in 1998 (table B-27). Other important U.S. exports of animal feed products to Japan include oilseed meals ($60 million of exports in 1998) and compound animal feeds ($48 million of exports in 1998) (tables B-28 and B-31).

U.S. animal feed exports to Canada were valued at $578 million in 1998. The value of exports to Canada rose by 19 percent during 1994-1998 (table B-33). Canada is the leading export market for compound feeds, dog and cat food, and oilseed meals. Since NAFTA, it has become more common for multinational firms to export pet food to Canada from facilities in the United States, rather than maintain plants in Canada.[123] At the same time, export growth in these feed products during 1994-98 was relatively modest, with the value of pet food exports increasing by 16 percent, compound feed exports by 14 percent, and oilseed meal exports by just 6 percent (tables B-27, B-28, and B-31).

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[122] USITC staff interview with representatives of AFIA, July 20, 1999.
[123] USDOC, ITA, "Canada -- Pet Food Industry & Market Profile," p. 3.

Exports to Mexico declined irregularly during 1994-98. Exports were valued at $256 million in 1998, a decline of 12 percent over the value in 1994 of $291 million (table B-33). U.S. exports to Mexico include almost equal values of compound animal feeds ($58 million), pet foods ($53 million), and corn gluten ($51 million) in 1998 (tables B-27, B-31, and B-32). Pet food exports to Mexico have increased rapidly over 1994-98, registering a 342-percent gain over the period (table B-27). The pet food market has been targeted by U.S. manufacturers as having significant growth potential, as evidenced by the rapid growth of U.S. exports to Mexico. The Pet Food Institute has utilized resources, mainly through the use of market promotion funds made possible by the Market Access Program of USDA, to educate consumers and veterinarians in Mexico of the value of commercial pet foods.[124]

Animal feed exports to China grew significantly over the past few years. This is due in part to significant growth in the commercial livestock sector in China.[125] U.S. animal feed exports to China were valued at $205 million in 1998, compared to just $4 million in 1994 (table B-33). The bulk of animal feed exports to China consists of soybean meal exports. Total oilseed meal exports (including soybean meal) rose from about zero in 1994 to about $160 million in 1998 (table B-28).

Foreign trade measures

Tariff measures

In general, foreign tariffs on animal feed products are relatively low, even for value-added products such as pet food and compound feeds. In some cases, however, certain types of pet foods and compound feeds are subject to higher tariffs if they contain certain ingredients, such as milk or starch, that are subject to government price or other supports. Foreign tariffs on animal feed products are summarized in table B-34 for major export markets.

Tariffs in the EU are high for many feed products. The EU differentiates tariffs for dog and cat food and compound animal feeds based on the level of starch and milk each type of feed contains. Of the 12 tariff rates for dog and cat foods, 11 are based on the relative starch and milk content that each type of pet food contains. Pet food products with between 10 percent and 30 percent starch content, for instance, are assessed tariffs ranging from free (if the milk content is below 10 percent) to 1,054.3 Ecu/metric ton ($1,180.82/metric ton) if the milk content is greater than 50 percent.[126] A similar tariff regime exists for compound animal feeds, with all compound feeds containing less than 10 percent milk by weight also subject to a TRQ.

Most tariffs on oilseed meals, alfalfa, meat and fish meals, and byproducts in the EU are set at zero. Tariffs on brans, sharps, and other milled grain residues range from 52 Ecu/metric

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[124] "U.S. Pet Food Exports are Enjoying Rapid Growth in Latin America," USDA Grain Circular, Foreign Countries' Policies and Programs, found at Internet address http://ffas.usda.gov/grain/circular/1998/98%2D04/dtricks.htm, retrieved May 4, 1999.

[125] "A Brief Introduction on China's Animal Husbandry," found at Internet address http://www.cav.net.cn/xmj/eng/97xumu.htm, retrieved Oct. 19, 1999.

[126] The 1998 exchange rate for the EU was Ecu 0.8929 = $1.

ton ($58.24/metric ton) to 105.7 Ecu/metric ton ($118.38/metric ton), depending on the starch content of the product, while corn gluten tariffs range from free to 380 Ecu/metric ton ($425.60/metric ton), depending on the protein content. In addition, brans and sharps that are derived from wheat and other cereals are subject to a TRQ.

Tariffs in Japan for feed products are generally low, with most products entering Japan duty-free. Two major exceptions are dog and cat food and compound animal feeds. For dog and cat food, products that contain 10 percent or more lactose by weight are assessed a ¥63/kg ($0.48/kg) tariff, plus a ¥6.33/kg ($0.05/kg) charge for every 1 percent quantity of lactose by weight that exceeds 10 percent.[127] Most other dog and cat foods enter Japan duty-free. Likewise, compound animal feeds with 10 percent or more lactose by weight are subject to a similar tariff structure (unless they are being fed to veal cattle), involving a ¥58.33/kg ($0.45/kg) tariff plus ¥5.87/kg ($0.04/kg) for every 1 percent quantity of lactose by weight that exceeds 10 percent. Premixed feeds that are less than 10 percent lactose enter duty-free or, in the case of vitamin supplements, are assessed a 3.7 percent ad valorem tariff. Two other feed products enter Japan with a nonzero tariff. Oilseed flours enter Japan at a 5.1 percent ad valorem tariff rate, while wheat gluten receives a significant duty of 22.5 percent ad valorem.

As a result of the NAFTA, almost all U.S. exports of animal feed products enter Canada duty-free. The major exception relates to milk-containing compound feed products. Canada maintains a TRQ on feed products that contain 50 percent or more of non-fat milk solids. In-quota imports of dairy-based compound feed products enter Canada duty-free, while over-quota imports face a significant tariff of 217.5 percent ad valorem, but not less than C$1.74/kg ($1.17/kg).[128]

Animal feed tariffs have been declining in Mexico as a result of the NAFTA, though most tariffs remained between 5 and 7.5 percent ad valorem in 1998. Products that enter duty-free are wastes and residues of the milling and processing of nongrain or nonoilseed crops. Protein feeds, such as oilseed meals, corn gluten, and meat and fish meals face tariffs of 7.5 percent ad valorem. Brans of milled grains and dog and cat foods are assessed duties of 5 percent ad valorem. Tariffs on compound animal feeds vary between zero and 10 percent ad valorem.

Most tariffs on feed products in China are set at 5 percent ad valorem. Compound feed preparations face tariffs between 5 and 8 percent ad valorem. The tariff on pet food is 30 percent ad valorem, while soy flour has a 40-percent ad valorem tariff and alfalfa and hay products are assessed a 15-percent ad valorem tariff. The tariff structure in China has contributed to strong growth in soybean meal imports. Unlike raw soybeans, which are subject to both a 3-percent ad valorem tariff and 13-percent value-added tax, soybean meal imports are only subject to a 5-percent ad valorem tariff. This has placed increasing pressure on domestic processors of soybean meal, as they are finding it difficult to compete with

[127] The 1998 exchange rate for Japan was ¥130.91 = $1.
[128] The 1998 exchange rate for Canada was C$1.4835 = $1.

increased imports of soybean meal.[129] On January 1, 1999, the Chinese Government began applying the 13-percent value-added tax to soybean meal imports as well.[130]

Nontariff measures

There are few nontariff measures in the animal feed industry. Increasingly, however, concerns over genetically modified organisms have restricted trade with the EU, mainly with respect to feed corn. Feed regulations also impede trade with Canada. The Canadian Food Inspection Agency uses what are known as Table 3 regulations from the Feeds Act to determine the requirements, in terms of nutrition, label claims, and so forth, that compound feeds must meet in order to be sold in Canada. Any Canadian firm that exceeds the requirements of the Table 3 regulations is exempt from registering its feed. However, feeds from foreign sources, including the United States, must register any compound feeds that enter Canada, regardless of whether the feed meets or exceeds the standards spelled out in the Table 3 regulations. The application of these laws often results into delays of up to 7 weeks for the approval of new U.S. feeds into Canada.[131]

FOREIGN INDUSTRY PROFILE

Overview of World Market

The only world production data available for the animal feed industry are for manufactured feed production, which includes compound feed and pet food. A 1998 survey by *Feed International* estimated global manufactured feed production[132] (excluding on-farm production) at 575 million metric tons, down by 5 percent from 1997.[133] Table B-35 summarizes the survey results for world feed production in 1998. The United States is the world's largest producer of manufactured feed at 140 million metric tons. The EU ranks second in feed production at 115 million metric tons, followed by China (55 million metric tons), Brazil (29 million metric tons), Japan (23 million metric tons), and Canada (19 million metric tons). Thirty-five percent of the world's manufactured feed consists of poultry feed, with swine feed (31 percent) and dairy feed (17 percent) important secondary products. The trend in the world market is towards greater consolidation of feed plants and

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[129] Hsin-Hui Hsu and Frederick W. Crook, "Soybean Supply and Use Tables Published for First Time in China," *Oil Crops Yearbook 1998*, (Washington, DC: USDA-ERS, 1998), and "Despite Rise of Market Forces, Continued Government Intervention in China's Soybean Economy Adds Uncertainty in World Oilseed Markets," *Oil Crops Yearbook 1998* (Washington, DC: USDA-ERS, 1998).

[130] USDA, FAS, "Soybean Meal Trade in China Will Slow with 13 Percent Value-Added Tax," Oilseeds: World Markets and Trade, Circular Series FOP 04-99, Apr. 1999.

[131] USITC staff interview with representatives of AFIA, July 20, 1999.

[132] In a USITC telephone conversation with C. Gill, Editor, *Feed International*, Jan. 5, 2000, it was noted that the volumes of manufactured feed reported in the *Feed International* survey include commercial feed mill tonnage and integrator tonnage.

[133] Clayton Gill, "First Asian feed slump . . . Now global stagnation?" *Feed International*, Jan. 1999, p. 4.

integration of feed mills with livestock production. Specialization of product lines has becoming increasingly common in feed mills in developed countries, such as the United States and the EU.[134]

Market Profiles

European Union

The EU is a significant producer of animal feed and feed products. Data from *Feedstuffs* show that total EU production of commercial animal feed products (compound feeds and pet foods) was 119 million metric tons in 1997 (table B-36). Swine feeds comprise roughly 35 percent of EU production of animal feed products, followed by poultry feeds at 29 percent of production. France is the largest producer of animal feed products in the EU, producing 23 million metric tons (19 percent of total EU production). Germany, the Netherlands, Spain, and the United Kingdom are also major producers of animal feed products. Feed production in France is concentrated in poultry feeds, with sizable production of swine and cattle feeds. In Germany, cattle and swine feeds predominate. The Netherlands is the top EU producer of pet foods and milk replacers and is a leader in the production of swine feed.

Feed production has been slowly declining in the EU in the past few years. EU feed producers have been beset with regulations that have increased production costs.[135] Moreover, problems in Europe concerning BSE have dampened demand for feed. In the pet food industry, demand varies by country. In Germany, pet food sales have grown by roughly 5 percent per year.[136] Demand in Germany has been adversely affected by aging populations and single-person households, both of which have limited interest in pets, and lower levels of disposable income.[137] Growth in the demand for pet food has been slow in France (roughly 3 percent per year), though demand for premium products, especially those enriched with vitamins, is increasing.[138] In the United Kingdom, the volume of cat food sales during 1990-95 increased by 5 percent, while dog food sales fell by 12 percent.[139]

China

The Chinese feed industry has been fueled by increased demand for livestock products. According to USDA, manufactured feed production was 66 million metric tons in 1998, including just under 56 million metric tons of compound feed, 9 million metric tons of

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[134] Ibid., p. 8.
[135] Ibid., p. 10.
[136] USDA, FAS, "German Pet Food Market," Bonn, AGR Report GM7034, July 1997, p. 2.
[137] Ibid.
[138] Ibid., pp. 4-5.
[139] Hoepker, "Pet food offers industry members worldwide opportunities," *Feedstuffs*, Jan. 5, 1998, found at Internet address *http://www.feedstuffs.com/subscrip/1997/f0ls7001.htm, retrieved Oct. 25, 1999.*

supplements, and over 1 million metric tons of premixes.[140] In 1997, China had roughly 11,300 mills, down from 12,000 a year earlier, as the number of state-owned mills continues to decline. While state-owned feed mills in China account for 37 percent of all feed mills, they have experienced competition from cooperative feed mills, private feed mills, and joint ventures.[141] In 1996, the value of shipments from the feed industry totaled 71.87 billion yuan ($8.6 billion).[142]

The feed industry in China has shifted over the past decade from an industry dominated by swine feed production to one geared towards the production of feeds for poultry and aquaculture.[143] The poultry industry in China is dominated by integrators that own both feed mills and poultry production facilities.[144] In 1998, poultry feed accounted for 48 percent of the market for compound feed (27 million metric tons), with swine feed accounting for 42 percent (23 million metric tons) and aquaculture accounting for 7 percent (4 million metric tons).[145]

Japan

The Japanese commercial feed industry has been in a slow decline over the past few years. Data on compound feed production reveal a decline from 30 million metric tons in 1993 to 23 million metric tons in 1998.[146] Feed demand has been dampened by lower meat consumption in Japan and higher food imports.[147] The pet food market in Japan, valued at $1.8 billion in 1997[148], has been growing at a faster rate than the animal feed industry, although it has slowed in recent years. The market grew rapidly over 1990-95, with total tonnage (domestic production plus imports) increasing from 331,900 metric tons in 1990 to 664,400 metric tons in 1995.[149] In 1995, however, the rate of growth in the pet food market fell to 2 percent in volume terms, with 4 percent growth in 1996. The slowdown in domestic growth is attributed to high levels of competition within the domestic industry.[150] More than one-half of the pet food market in Japan is supplied by imports. The United States and Australia are the main suppliers of pet food to Japan, though some Japanese producers also contract out production to countries in Southeast Asia, where costs are

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[140] Frederick W. Crook, Hsin-Hui Hsu, and Michael Lopez, "The Long-Term Boom in China's Feed Manufacturing Industry," *Agricultural Outlook*, Number 267, Dec. 1999, p. 13.

[141] Ibid.

[142] "A Brief Introduction on China's Animal Husbandry."

[143] Crook, Hsu, and Lopez, "The Long-Term Boom in China's Feed Manufacturing Industry," p. 16.

[144] Clayton Gill, "Feed Manufacturing: An International Perspective," ch. in *Feed Manufacturing Technology IV*, ed. Robert R. McEllhiney (Arlington, VA: American Feed Industry Association, Inc., 1994), pp. 22-23.

[145] Crook, Hsu, and Lopez, "The Long-Term Boom in China's Feed Manufacturing Industry,"pp. 16-17.

[146] Data obtained from figures in Gill, "Feed Manufacturing: An International Perspective," p. 23 and Gill, "First, Asian feed slump . . . Now, global stagnation," p. 6.

[147] Gill, "First, Asian feed slump . . . Now, global stagnation," p. 4.

[148] USDOC, ITA, "Japan--Pet Foods and Supplies," Market Research Report, Feb. 1998, p. 4.

[149] Hoepker, "Pet food offers industry members worldwide opportunities."

[150] USDOC, ITA, "Japan--Pet Foods and Supplies," p. 6.

lower.[151] The domestic industry also relies heavily on imports of raw materials, such as grains and byproducts.[152]

Brazil

The Brazilian feed industry has been growing at a rapid rate. Data on commercial compound feed production show that compound feed production in 1998 was projected at over 30 million metric tons, representing a 50-percent increase over the levels 5 years ago.[153] Feed demand has been fueled by rapid development of the livestock sector, particularly poultry and swine.[154] Brazil has also become a major producer of soybean meal, spurred on by the expansion of soybean production. The pet food market has expanded rapidly, with USDA reporting a 57-percent annual increase in the market since 1995.[155] Dog food is produced domestically by Brazilian and multinational firms, while most cat food and premium products are imported.[156] Imports are gradually being displaced by increased domestic production.[157] USDA reports domestic production of pet food in 1997 at 550,000 metric tons, with sales valued at $333 million.

Canada

Canada is a relatively small producer of animal feed products. The Animal Nutrition Association of Canada (ANAC)[158] estimates that there were 500 commercial feed producers employing 8,800 people in Canada in 1998, of which over two-thirds were located in Ontario and Quebec.[159] Eighty-five percent of production is composed of swine, dairy, and poultry feeds.[160] Complete feeds are produced in Ontario, Quebec, Manitoba, and Alberta.[161] Pet food production is concentrated in Ontario, while alfalfa production is centered in Alberta and Saskatchewan.[162] There is considerable concentration in both the Canadian feed and pet food industry among commercial manufacturers. According to Agriculture and Agri-Food Canada, 70 percent of commercial feed production is produced by less than 10 companies while six companies (four multinational, two domestically owned) account for most pet food production.[163]

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[151] Ibid., pp. 9 and 12.

[152] Ibid., p. 12.

[153] Jorge A. Cassinelli, "Explosive growth: Brazilian integrators lead with poultry and pigs," *Feed International*, Aug. 1998, p. 7.

[154] Ibid.

[155] USDA, FAS, "Pet Food Market in Brazil," Brasilia, GAIN Report BR9608, Feb. 1999, p. 1.

[156] Ibid., pp. 2-3.

[157] Ibid., p. 5.

[158] ANAC was formerly known as the Canadian Feed Industry Association (CFIA).

[159] "The Canadian feed industry: a snapshot," *Feedstuffs 1999 Reference Issue*, p. 21.

[160] "CFIA: Facts and Figures," found at Internet address http://www.cfia-aciaa.ca/e_facts.htm, retrieved on May 27, 1999.

[161] "The Canadian feed industry: a snapshot," *Feedstuffs 1999 Reference Issue*, p. 21.

[162] "The Canadian Feed Industry: Sub-Sector Profile," found at Internet address http://www.agr.ca/food/facts/e_profile/feed/feed-pro.html, retrieved May 27, 1999.

[163] Ibid.

The Canadian feed industry is quite similar to the U.S. feed industry in terms of structure and relative market trends. As in the United States, the feed industry in Canada services local markets. There are also growing trends towards increased on-farm mixing, greater vertical integration of feed mills, and a decline in feed establishments.[164] ANAC reports that roughly one-half of the feed produced in Canada in 1998 was mixed on-farm.[165] Domestic sales of complete feeds, supplements, and premixes were valued at $3.5 billion in 1998.[166] Domestic pet food production is primarily geared toward branded and private-label manufacturing, with much of the high-end speciality market (i.e. the premium nutrition market) dominated by U.S. imports.[167] USDA estimated the Canadian pet food market to be $650 million in 1997.[168] The majority of Canadian exports consist of pet foods, alfalfa, and complete feeds. The Canadian feed industry relies heavily on imports of vitamins, minerals, and amino acids to supplement its production of complete feeds.[169]

Mexico

Feed production has grown rapidly in Mexico. Data on commercial compound feed production reveal that compound feed production totaled 15 million metric tons in 1997 (table B-37), up from 11 million metric tons in 1993.[170] The Mexican feed industry consisted of 360 feed plants in 1997, with a total production capacity of 20 million metric tons.[171] Feed production in Mexico is dominated by layer and broiler feeds, which comprised 7.2 million metric tons, or 48 percent of the feed produced in 1997 (table B-37). Swine feed (3.4 million metric tons) and dairy feed (2.8 million metric tons) are also major feeds produced in Mexico (table B-37). The major ingredient feeds used in Mexico are sorghum and soybean meal. Protection of corn (through high farm prices) and regulations limiting corn use for feed have prompted the use of sorghum instead of corn in the Mexican feed market.[172]

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[164] Ibid.

[165] "The Canadian feed industry: a snapshot," p. 21.

[166] Ibid.

[167] "The Canadian Feed Industry: Sub-Sector Profile."

[168] George Myles and Marilyn Bailey, "In Canada, a New Competitive Edge," *AgExporter*, Jan. 1999, p. 8.

[169] "The Canadian Feed Industry: Sub-Sector Profile."

[170] Castaldo, "The North American Feed Industry," p. 15.

[171] "The feed industry in Mexico," *Feedstuffs 1998 Reference Issue,* p. 22.

[172] Jose Garcea-Vega and Gary W. Williams, "The Mexican Livestock, Meat, and Feed Industries: Economic Structure and Government Policy," TAMRC International Market Research Report No. IM-1-96, July 1996, found at Internet address http://tamrc.tamu.edu/tamrc/pubs/im196.htm, retrieved Aug. 6, 1999.

As in the United States and Canada, integrated feed production is a burgeoning trend. All layers and a sizable majority of broilers (85 percent) are produced by integrators, which own feed mills and livestock production facilities.[173] Unlike the United States and Canada, however, there is limited demand for on-farm mixing of feeds in Mexico. Complete feeds are preferred to supplements or individual ingredient feeds, given capital constraints among livestock producers.[174] The pet food sector in Mexico is dominated by dog food sales, which represented over 80 percent of sales in 1995.[175] A majority of production (55 percent) is supplied by three American multinationals based in Mexico, with Mexican-owned production focusing on the lower end of the market.[176]

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[173] Castaldo, "The North American Feed Industry," p. 15.

[174] Ibid.

[175] "The Pet Food Market in Mexico, July 1998," Team Canada Market Research Centre and the Canadian Trade Commissioner Service, found at Internet address http://atn-riae.agr.ca/public/htmldocs/e2124.htm, retrieved Oct. 5, 1999.

[176] Ibid.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

TARIFF AND TRADE AGREEMENT TERMS

In the ***Harmonized Tariff Schedule of the United States*** (HTS), chapters 1 through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the ***general*** subcolumn of HTS column 1 are normal trade relations rates, many of which have been eliminated or are being reduced as concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those listed in HTS general note 3(b) (Afghanistan, Cuba, Laos, North Korea, and Vietnam) plus Serbia and Montenegro, which are subject to the statutory rates set forth in ***column 2***. Specified goods from designated general-rate countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the ***special*** subcolumn of HTS rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not enumerate those countries as to which a total or partial embargo has been declared.

The ***Generalized System of Preferences*** (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 for 10 years and extended several times thereafter, applies to merchandise imported on or after January 1, 1976 and before the close of September 30, 2001. Indicated by the symbol "A", "A*", or "A+" in the special subcolumn, the GSP provides duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 4 to the HTS.

The ***Caribbean Basin Economic Recovery Act*** (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984. Indicated by the symbol "E" or "E*" in the special subcolumn, the CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries, as set forth in general note 7 to the HTS.

Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free Trade Area Implementation Act*** of 1985 (IFTA), as provided in general note 8 to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the ***Andean Trade Preference Act*** (ATPA), enacted as title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 11 to the HTS.

Preferential free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement,*** as provided in general note 12 to the HTS and implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Other special tariff treatment applies to particular ***products of insular possessions*** (general note 3(a)(iv)), ***products of the West Bank and Gaza Strip*** (general note 3(a)(v)), goods covered by the ***Automotive Products Trade Act*** (APTA) (general note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (general note 6), ***articles imported from freely associated states*** (general note 10), ***pharmaceutical products*** (general note 13), and ***intermediate chemicals for dyes*** (general note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), pursuant to the Agreement Establishing the World Trade Organization, is based upon the earlier GATT 1947 (61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786) as the primary multilateral system of disciplines and principles governing international trade. Signatories' obligations under both the 1994 and 1947 agreements focus upon most-favored-nation treatment, the maintenance of scheduled concession rates of duty, and national treatment for imported products; the GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. The results of the Uruguay Round of multilateral tariff negotiations are set forth by way of separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as Schedule XX. Pursuant to the **Agreement on Textiles and Clothing** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the **Multifiber Arrangement** (MFA)). Under the MFA, which was a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action in the absence or violation of an agreement. Quantitative limits had been established on imported textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 over a ten-year period, or by Jan. 1, 2005.

APPENDIX B
STATISTICAL TABLES

Table B-1
Major producer locations and principal consumers of energy feeds

Feed Ingredient	Location	Principal animals fed
Corn	Midwest (Illinois, Iowa, Indiana, Missouri, Minnesota), Nebraska	Swine, poultry, dairy cattle, beef cattle
Sorghum	Central and Southern Plains (Kansas, Texas, Nebraska)	Beef cattle, swine, poultry
Barley	Pacific Northwest (Idaho, Washington), Northern Plains (North Dakota, Montana, Minnesota)	Beef cattle, sheep, swine
Oats	Upper Midwest, Northern Plains	Horses, dairy cattle, rabbits
Wheat	Southern Plains (Kansas, Nebraska), Southwest	Beef cattle, poultry, swine
Wheat by-products	Minnesota, New York, Kansas	Beef cattle, swine, poultry
Hominy feed	Illinois, Tennessee	Dairy cattle
Beet pulp	California, North Dakota, Minnesota, Idaho	Dairy cattle
Citrus pulp	California, Florida	Dairy cattle

Source: Compiled from information in Mark S. Ash, *Animal Feeds Compendium*, USDA, ERS, Agricultural Economic Report No. 656, 1992; Tilden Wayne Perry, Arthur E. Cullison, and Robert S. Lowrey, *Feeds & Feeding*, 5th ed., (Upper Saddle River, NJ: Prentice Hall, 1999); and Peter R. Cheeke, *Applied Animal Nutrition: Feeds and Feeding*, 2d ed., (Upper Saddle River, NJ: Prentice Hall, 1999).

Table B-2
Major producer locations and principal consumers of protein feeds

Feed Ingredient	Location	Principal animals fed
Soybean meal	Midwest (Illinois, Iowa, Minnesota, Ohio)	Swine, poultry, cattle
Cottonseed meal	Central and Southern Plains (Texas, Kansas), California	Dairy cattle, beef cattle
Canola meal	North Dakota, Minnesota, Idaho, Montana	Dairy cattle, beef cattle, swine
Sunflowerseed meal	Upper Midwest/Northern Plains (North Dakota, South Dakota, Minnesota)	Dairy cattle, beef cattle
Linseed meal	Upper Midwest/Northern Plains (North Dakota, South Dakota, Minnesota)	Horses, dairy cattle, beef cattle
Corn gluten feed and meal	Midwest	Dairy cattle
Brewers grains	California, Texas, Wisconsin, Florida	Dairy cattle
Distillers grains	Kentucky, Indiana	Dairy cattle, swine, poultry
Meat and bone meal	Midwest, Southern Plains, Southeast	Swine, poultry
Fish meal	Gulf/Atlantic coasts (menhaden meal), Pacific coasts (tuna, anchovy)	Swine, poultry, fish

Source: Compiled from information in Mark S. Ash, *Animal Feeds Compendium*, USDA, ERS, Agricultural Economic Report No. 656, 1992; Tilden Wayne Perry, Arthur E. Cullison, and Robert S. Lowrey, *Feeds & Feeding*, 5th ed., (Upper Saddle River, NJ: Prentice Hall, 1999); and Peter R. Cheeke, *Applied Animal Nutrition: Feeds and Feeding*, 2d ed., (Upper Saddle River, NJ: Prentice Hall, 1999).

Table B-3
Major producer locations and principal consumers of roughages and silages

Feed Ingredient	Location	Principal animals fed
Alfalfa	Southwest (Nevada, New Mexico, Utah), Midwest (Wisconsin)	Dairy cattle, Beef cattle, sheep, horses
Red clover	Midwest, Northeast	Beef cattle, dairy cattle
Lespedeza	Southern Plains, Southeast	Beef cattle, dairy cattle
Timothy	Midwest, Northeast	Horses, beef cattle, dairy cattle
Orchardgrass	Midwest, Northeast	Beef cattle, dairy cattle
Fescue	Southeast	Beef cattle
Bromegrass	Northern Plains	Cattle, sheep

Source: Compiled from information in Mark S. Ash, *Animal Feeds Compendium*, USDA, ERS, Agricultural Economic Report No. 656, 1992; Tilden Wayne Perry, Arthur E. Cullison, and Robert S. Lowrey, *Feeds & Feeding*, 5th ed., (Upper Saddle River, NJ: Prentice Hall, 1999); and Peter R. Cheeke, *Applied Animal Nutrition: Feeds and Feeding*, 2d ed., (Upper Saddle River, NJ: Prentice Hall, 1999).

Table B-4
Primary feed production by feed type and region[1], 1998

Region	Starter, grower, layer, breeder feed	Broiler feed	Turkey feed	Dairy feed	Beef cattle and lamb feed	Swine feed	Other feed	Total
	Quantity (*thousand metric tons, percentage feed use by region*)							
Northeastern States	2,324	2,752	423	2,804	89	329	916	9,637
	(15.0%)	(7.3%)	(5.2%)	(18.2%)	(0.5%)	(2.0%)	(10.9%)	(8.0%)
Lake States	1,356	385	1,780	1,998	360	2,328	460	8,667
	(8.8%)	(1.0%)	(21.7%)	(12.9%)	(2.0%)	(14.4%)	(5.5%)	(7.2%)
Mountain States	458	([2])	([2])	1,440	2,519	416	490	5,323
	(3.0%)			(9.3%)	(13.6%)	(2.6%)	(5.8%)	(4.4%)
Corn Belt	3,217	4,036	1,459	1,418	1,501	7,592	2,268	21,491
	(20.8%)	(10.7%)	(17.8%)	(9.2%)	(8.1%)	(47.1%)	(27.0%)	(17.9%)
Appalachian States	1,061	5,348	2,409	827	196	2,512	630	12,983
	(6.9%)	(14.2%)	(29.4%)	(5.4%)	(1.1%)	(15.6%)	(7.5%)	(10.8%)
Northern Plains	559	6	140	290	4,629	1,649	376	7,649
	(3.6%)	(0.0%)	(1.7%)	(1.9%)	(25.1%)	(10.2%)	(4.5%)	(6.4%)
Southeastern States	2,614	12,169	350	2,166	353	227	733	18,612
	(16.9%)	(32.3%)	(4.3%)	(14.0%)	(1.9%)	(1.4%)	(8.7%)	(15.5%)
Delta States	1,387	9,465	784	209	253	264	1,335	13,697
	(9.0%)	(25.1%)	(9.6%)	(1.4%)	(1.4%)	(1.6%)	(15.9%)	(11.4%)
Southern Plains	1,223	3,480	344	1,114	7,580	717	896	15,354
	(7.9%)	(9.2%)	(4.2%)	(7.2%)	(41.1%)	(4.4%)	(10.7%)	(12.8%)
Pacific States	1,288	([2])	513	3,163	981	94	302	6,341
	(8.3%)		(6.3%)	(20.5%)	(5.3%)	(0.6%)	(3.6%)	(5.3%)
Total	15,487	37,641	8,202	15,429	18,461	16,128	8,406	119,754
	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

[1] Region definitions are as follows: Northeastern States (Maine, New Hampshire, Vermont, New York, Massachusetts, Rhode Island, Connecticut, New Jersey, Maryland, Pennsylvania, Delaware); Lake States (Minnesota, Wisconsin, Michigan); Mountain States (Montana, Idaho, Wyoming, Nevada, Utah, Colorado, Arizona, New Mexico); Corn Belt (Iowa, Missouri, Illinois, Indiana, Ohio); Appalachian States (Virginia, West Virginia, North Carolina, Tennessee, Kentucky); Northern Plains (North Dakota, South Dakota, Nebraska, Kansas); Southeastern States (South Carolina, Georgia, Alabama, Florida); Delta States (Arkansas, Louisiana, Mississippi); Southern Plains (Oklahoma, Texas); and Pacific States (California, Oregon, Washington).

[2] Not available.

Source: Data derived from *Feedstuffs 1999 Reference Issue* and Domenick J. Castaldo, "The North American Feed Industry", ch., in *Feed Manufacturing Technology IV*, ed. Robert R. McEllhiney (Arlington, VA: American Feed Industry Association, Inc., 1994), p. 14. Figures may not add up to totals shown due to rounding.

Table B-5
Animal feed: Industrial statistics on employment and production for selected products, 1992-96

Product/Year	Production workers		Wages	Value-added of manufacturing	Cost of materials	Value of shipments	New capital expenditures
	Number	Manhours					
	1,000 persons	*Million manhours*	*Million dollars*				
Pet food (SIC 2047):							
1992	10.5	22.4	301.5	3,729.9	3,295.5	7,023.9	179.8
1993	10.7	23.5	323.5	3,643.0	3,591.7	7,245.3	141.4
1994	9.8	22.1	302.9	3,477.5	3,465.2	6,938.2	191.2
1995	9.6	22.0	301.0	3,279.1	3,961.9	7,253.0	233.3
1996	10.1	23.3	330.5	3,496.6	4,113.4	7,572.2	210.5
Compound feed (SIC 2048):							
1992	19.7	41.5	417.1	2,875.6	11,487.7	14,373.9	183.6
1993	19.1	41.4	416.3	3,783.1	11,068.3	14,857.0	154.4
1994	19.1	41.2	414.4	4,148.8	10,911.5	15,063.6	223.2
1995	20.3	43.0	441.6	4,943.4	11,421.7	16,327.1	215.0
1996	19.2	41.6	427.4	4,050.2	14,061.6	18,075.0	200.4

Source: U.S. Census Bureau, *Annual Survey of Manufactures*, various years.

Table B-6
Feed ingredients used by commercial feed mills (percent), 1997-98

Feed category	Feed type	1997	1998
		Percentage of mills	
Grains	Barley	21.8	25.8
	High oil corn	2.0	1.6
	Oats	53.5	45.1
	Sorghum	15.8	14.5
	Wheat	38.6	40.3
Oilseed meals	Canola	34.7	38.7
	Peanut	9.9	4.8
	Sunflower	48.5	43.5
By-products	Bakery	32.7	25.8
	Blood	63.4	70.9
	Corn gluten	58.4	58.0
	Distillers grains	68.3	64.5
	Feather	34.7	40.3
	Fish	74.3	74.1
	Meat and bone	76.2	67.7
	Dried plasma	46.5	48.3
	Porcine by-product	26.7	43.5
	Poultry by-product	13.9	24.1
Binders	Clay	11.9	17.7
	Lignosulfonate	50.5	45.1
	Wheat	13.9	8.1

Source: Derived from table in Philip Lobo, "How mills are managed: Capacity is up, capacity used is down," *Feed Management*, Jan. 1999, p. 18.

Table B-7
Prices for selected varieties of feed and feed by-products, 1993-1997

Marketing year[1]	Soybean meal 44 percent solvent Decatur, Illinois	Cottonseed meal, 41 percent solvent Memphis	Corn gluten feed, 21 percent protein, Illinois	Corn gluten meal, 60 percent protein, Illinois	Meat and bone meal, Central U.S.	Fish meal, 67 percent protein, East Coast	Distillers dried grains, Lawrenceburg, Indiana	Wheat middlings, Kansas City, Missouri	Dehydrated alfalfa meal, 17 percent protein, Kansas City, Missouri
	Dollars per ton[2]								
1993	181.82	168.36	88.62	286.61	206.81	336.88	123.79	81.51	125.15
1994	151.77	112.64	82.77	221.95	170.51	357.52	106.70	65.04	118.17
1995	217.27	186.12	116.47	319.35	222.07	468.11	151.37	118.08	128.98
1996	260.37	191.47	93.05	341.50	272.44	499.61	142.87	91.18	142.45
1997	186.55	150.40	69.65	290.45	192.56	555.20	109.76	76.30	129.62

[1] Marketing year begins Sept. 1.
[2] Tons are short tons, not metric tons.

Source: Compiled from statistics in USDA, ERS, *Feed Situation and Outlook Yearbook*, Apr. 1999.

Table B-8
USDA market development funding, by program and feed product association, 1994-98[1]

Program	1994	1995	1996	1997	1998
	Thousand dollars				
Market Access Program:					
American Soybean Association	1,720	1,280	1,215	2,204	1,409
Millers National Federation	0	0	0	0	0
National Cottonseed Products Association	0	0	0	0	0
National Hay Association	0	0	0	0	0
National Sunflower Association	620	1,130	980	822	810
Pet Food Institute	1,140	1,230	420	596	923
Protein Grain Products International	0	0	0	0	0
U.S. Grains Council	3,650	3,220	2,670	2,865	3,043
Foreign Market Development:					
American Soybean Association	6,629	4,250	5,461	5,249	5,293
Millers National Federation	11	0	13	7	9
National Cottonseed Products Association	177	0	116	125	154
National Hay Association	40	10	42	48	50
National Sunflower Association	242	110	100	174	259
Pet Food Institute	0	0	0	0	0
Protein Grain Products International	0	86	10	11	18
U.S. Grains Council	3,700	2,829	3,972	5,551	4,341
Total:					
American Soybean Association	8,349	5,530	6,676	7,453	6,702
Millers National Federation	11	0	13	7	9
National Cottonseed Products Association	177	0	116	125	154
National Hay Association	40	10	42	48	50
National Sunflower Association	862	1,240	1,080	996	1,069
Pet Food Institute	1,140	1,230	420	596	923
Protein Grain Products International	0	86	10	11	18
U.S. Grains Council	7,350	6,049	6,642	8,416	7,384

[1] Year represents fiscal year allocation.

Source: Compiled from statistics of the U.S. Department of Agriculture, Foreign Agricultural Service.

Table B-9
Consumption of major feed ingredients[1], 1993-97[2]

Feed type product	1993	1994	1995	1996	1997	Percentage change 93/97
	Quantity (*thousand metric tons*)					
Oilseed meals:						
Soybean	22,936	24,079	24,141	24,784	26,208	14.3
Cottonseed	2,393	2,965	2,686	2,824	2,682	12.1
Linseed	103	95	104	99	111	7.8
Peanut	103	175	164	128	86	-16.5
Sunflower	291	565	434	419	482	65.6
Canola	1,002	952	1,172	1,102	1,552	54.9
Total	26,828	28,831	28,701	29,356	31,121	16.0
Animal proteins:						
Tankage and meat meal	2,219	2,315	2,300	2,525	2,269	2.3
Fish meal	653	303	263	297	228	-65.1
Milk products	426	420	381	389	375	-12.0
Total	3,298	3,038	2,944	3,211	2,872	-12.9
Grain protein feeds:						
Corn gluten feed and meal	827	126	799	3,599	3,247	292.6
Other feeds:						
Wheat millfeeds	6,746	6,591	6,601	6,398	6,575	-2.5
Rice millfeeds	588	597	546	507	378	-35.7
Alfalfa meal	121	190	231	225	250	106.6
Fats and oils	1,061	1,018	1,137	1,157	1,319	24.3
Miscellaneous by-products feeds	1,390	1,404	1,418	1,432	1,446	4.0
Total	9,906	9,800	9,933	9,719	9,968	0.6
Total	40,859	41,795	42,377	45,885	47,208	15.5

[1] Consumption refers to quantity fed.
[2] Quantities are calculated on a crop year basis, which begins Oct. 1

Source: USDA, *Feed Outlook Yearbook*, 1999.

Table B-10
Compound animal feed: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1993-97

Year	U.S. shipments[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
	Million dollars				*Percentage*
1993	13,741	488	124	13,377	0.93
1994	13,782	539	161	13,404	1.20
1995	15,107	599	187	14,695	1.27
1996	17,105	538	230	16,797	1.37
1997	17,777	563	229	17,443	1.31

[1] U.S. shipments for 1993-96 are based on the value of product shipments as reported from the Bureau of Economic Analysis, U.S. Department of Commerce for SIC code 2048. U.S. shipments for 1997 are based on the value of product shipments as reported from the *1997 Economic Census*, U.S. Census Bureau, for NAICS code 311119. Export and import figures are for HS 2309.90.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table B-11
Pet food: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1993-97

Year	U.S. shipments[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
	Million dollars				*Percentage*
1993	6,534	315	77	6,296	1.22
1994	6,277	386	84	5,975	1.41
1995	6,504	433	101	6,172	1.64
1996	7,195	534	127	6,788	1.87
1997	8,262	621	144	7,785	1.85

[1] U.S. shipments for 1993-96 are based on the value of product shipments as reported from the Bureau of Economic Analysis, U.S. Department of Commerce for SIC code 2047. U.S. shipments for 1997 are based on the value of product shipments as reported from the *1997 Economic Census*, U.S. Census Bureau, for NAICS code 311111. Export and import figures are for HS 2309.10.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table B-12
Annual sales of dog and cat food, 1994-98

Pet food type	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*million dollars*)					
Dry dog food	2,844	3,052	3,115	3,276	3,471	22.0
Canned dog food	1,186	1,228	1,080	1,098	1,120	-5.6
Dog treats	1,015	1,090	1,114	1,155	1,204	18.6
Semi-moist dog food	95	102	103	103	105	10.5
Total dog food	5,140	5,472	5,411	5,632	5,900	14.8
Canned cat food	1,911	2,010	2,041	2,199	2,414	26.3
Dry cat food	1,538	1,613	1,705	1,872	2,026	31.7
Moist cat food	110	109	102	95	91	-17.3
Cat treats	77	100	105	116	129	67.5
Total cat food	3,636	3,832	3,954	4,282	4,660	28.2
Total	8,776	9,304	9,364	9,914	10,560	20.3

Source: Compiled from data from the Pet Food Institute and "The Petfood Report", *Pet Food Industry,* Sept./Oct. 1999. Figures may not add to totals shown due to rounding.

Table B-13
Corn gluten feed and meal: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1993-97

Product marketing year[1]	U.S. shipments[2]	U.S. exports[3]	U.S. imports[4]	Apparent U.S. consumption	Ratio of imports to consumption
	Quantity (*million kilograms*)				*Percentage*
Corn gluten feed:					
1993	7,253	5,653	96	1,696	5.65
1994	7,609	6,220	84	1,473	5.70
1995	7,203	5,485	96	1,814	5.27
1996	7,576	5,223	96	2,449	3.93
1997	7,963	4,948	72	3,087	2.33
	Value (*million dollars*)				
1993	707	637	10	80	12.50
1994	693	660	8	41	19.51
1995	923	711	12	224	5.36
1996	775	603	11	184	6.01
1997	610	441	8	177	4.52
	Quantity (million kilograms)				
Corn gluten meal:					
1993	1,421	735	6	692	0.87
1994	1,490	631	10	869	1.15
1995	1,411	771	14	654	2.14
1996	1,484	778	13	719	1.81
1997	1,560	769	12	803	1.49
	Value (million dollars)				
1993	448	224	1	225	0.44
1994	364	177	2	189	1.06
1995	496	252	4	247	1.61
1996	557	279	4	282	1.42
1997	498	261	4	241	1.66

[1] Marketing year starts Sept. 1.

[2] Shipments estimated using Corn Refiners Association production data on HFCS, glucose, starch, and ethanol production. It was assumed that 1 bushel of corn yields 13.48 lbs of corn gluten feed and 2.64 lbs. of corn gluten meal, based on estimates by the Corn Refiners Association that were published in Peter A. Meyer, "Corn buyers, sellers should refrain from 'counting chickens' yet," *Milling & Baking News*, Oct. 20, 1998. Shipment data is reported on a Sept.-Aug. marketing year.

[3] U.S. export data reported for Sept.-Aug. marketing year.

[4] U.S. import data reported for Sept.-Aug. marketing year.

Source: Compiled from statistics in Corn Refiners Association, *Corn Annual 1999* and official statistics of the U.S. Department of Commerce.

Table B-14
Soybean meal: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1993-97

Product marketing year	U.S. shipments[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
		Million kilograms			*Percentage*
1993	27,740	4,321	33	23,452	0.14
1994	30,245	5,152	19	25,112	0.08
1995	29,570	4,761	41	24,850	0.16
1996	31,101	5,783	55	25,373	0.22
1997	34,701	8,103	14	26,612	0.05
		Million dollars			
1993	5,548	965	7	4,589	0.15
1994	5,049	991	4	4,062	0.10
1995	7,067	1,232	10	5,845	0.17
1996	8,908	1,689	14	7,233	0.19
1997	7,121	1,914	3	5,210	0.06

[1] U.S. shipments are based on production values for the crop year starting Oct. 1 from statistics of USDA. U.S. exports and imports are calculated from official statistics of the U.S. Department of Commerce for the year beginning Oct. 1 to be consistent with shipment figures.

Source: Compiled from official statistics of the U.S. Department of Commerce and USDA.

Table B-15
Fish meal: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1994-98

Year	U.S. shipments[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
		Thousand pounds			*Percentage*
1994	807,833	159,937	548,288	1,196,184	45.84
1995	667,240	176,981	139,101	629,360	22.10
1996	643,124	186,412	135,561	592,273	22.89
1997	724,668	216,289	142,049	650,428	21.84
1998	592,552	210,658	125,404	507,298	24.72

[1] U.S. shipments are based on production data from the U.S. Department of Commerce, National Marine Fisheries Service.

Source: Compiled from official statistics of the U.S. Department of Commerce, National Marine Fisheries Service.

Table B-16
Wheat gluten: U.S. shipments, exports of domestic merchandise, imports for consumption, and apparent U.S. consumption, 1993-97

Year	U.S. shipments[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
	Million kilograms				*Percentage*
1993	55	9	58	104	55.77
1994	60	3	78	136	57.78
1995	58	4	58	112	51.79
1996	49	4	71	116	61.21
1997	53	5	80	129	62.50
	Million dollars				
1993	81	5	68	144	47.22
1994	109	4	82	187	43.86
1995	87	6	74	155	47.74
1996	70	5	77	142	53.23
1997	71	6	86	152	56.95

[1] U.S. shipments are based on wholesale values for the year ending June 30 as reported in *Wheat Gluten*, Inv. No. TA-201-67, USITC publication 3088, Mar. 1998. U.S. exports and imports are calculated from official statistics of the U.S. Department of Commerce for the year ending June 30 to be consistent with shipment figures.

Source: Compiled from official statistics of the U.S. Department of Commerce and USITC questionnaires.

Table B-17
Production of primary feed, 1994-98

Feed type	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand short tons*)					
Starter/grower/layer/breeder	14,586	14,674	14,835	15,071	15,487	6.2
Broiler	33,257	34,726	36,065	36,788	37,641	13.2
Turkey	8,712	8,891	9,115	9,068	8,202	-5.9
Dairy	16,125	15,632	15,673	15,596	15,429	-4.3
Beef/sheep	19,054	19,728	18,285	18,227	18,461	-3.1
Hog	15,496	14,999	14,599	15,509	16,128	4.1
All other	7,702	8,002	8,011	8,096	8,406	9.1
Total	114,932	116,652	116,583	118,355	119,754	4.2

Source: Derived from table in *Feedstuffs 1999 Reference Issue.*

Table B-18
Production of major feed protein meals, 1993-97[1]

Feed type	1993	1994	1995	1996	1997	Percentage change 93/97
	Quantity (*thousand short tons*)					
Soybean meal	30,514	33,269	32,527	34,211	38,171	25.1
Cottonseed meal	1,563	1,830	1,748	1,752	1,770	13.2
Linseed meal	160	158	167	185	194	21.3
Sunflowerseed meal	360	718	504	484	564	56.7
Canola meal	322	236	281	269	383	18.9
Corn gluten meal	1,563	1,639	1,552	1,632	1,716	9.8
Corn gluten feed	7,979	8,370	7,924	8,333	8,759	9.8
Fish meal	404	334	322	362	296	-26.6
Total	42,865	46,554	45,024	47,228	51,854	21.0

[1] Quantities are calculated on a crop year basis, which begins Oct. 1 for soybean meal, cottonseed meal, and sunflowerseed meal; June 1 for linseed meal and canola meal; and Sept. 1 for corn gluten meal and feed. For fish meal, production figures are calendar year figures starting in 1994.

Source: Compiled from statistics from USDA, ERS and U.S. Department of Commerce, National Marine Fisheries Service. Figures may not add to totals shown due to rounding.

Table B-19
Types of feeds produced by commercial feed mills (percent), 1997-98

Feed type	1997	1998
	Percentage of mills	
Beef	92.1	88.7
Dairy	92.1	91.9
Swine	87.1	87.0
Poultry	88.1	82.2
Sheep	75.2	70.9
Horse	78.2	70.9
Pet	5.9	11.2
Fish	7.9	9.6
Ratite	49.5	33.8

Source: Derived from table in Philip Lobo, "How mills are managed: Capacity is up, capacity used is down," *Feed Management*, Jan. 1999, p. 13.

Table B-20
Animal feed: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries, 1994-98[1]

Market	1994	1995	1996	1997	1998	Percentage change 94/98
			Million dollars			
U.S. exports of domestic merchandise:						
Canada	487.3	505.9	551.8	600.4	578.2	18.7
Japan	554.7	651.4	644.9	707.5	628.0	13.2
Netherlands	371.7	405.0	396.2	349.7	252.3	-32.1
Mexico	291.2	214.6	238.8	212.7	256.2	-12.0
China	4.4	14.6	141.2	115.5	204.6	4,550.0
Philippines	63.6	141.5	140.0	167.0	191.2	200.6
Spain	137.7	160.9	125.9	205.8	167.9	21.9
Germany	84.2	97.1	129.6	121.5	96.6	14.7
United Kingdom	159.9	163.4	169.7	166.1	129.7	-18.9
Ireland	136.2	155.0	131.3	124.2	126.7	-7.0
All other	1,191.5	1,312.3	1,705.2	2,066.5	1,685.2	41.4
Total	3,482.4	3,821.7	4,374.6	4,836.9	4,316.6	24.0
U.S. imports for consumption:						
Canada	340.4	370.5	517.7	535.8	499.3	46.7
Japan	14.7	11.8	5.5	11.3	12.7	-13.6
Netherlands	19.4	13.1	14.9	13.3	21.5	10.8
Mexico	0.6	5.4	13.2	13.8	7.0	1,066.7
China	5.7	5.7	6.5	13.5	9.8	71.9
Philippines	(2)	0.0	(2)	0.0	(2)	(3)
Spain	(2)	(2)	0.1	0.2	0.4	(3)
Germany	43.5	53.3	59.0	48.1	52.3	20.2
United Kingdom	2.8	2.2	4.0	2.4	4.0	42.9
Ireland	5.6	1.8	2.6	3.5	2.0	-64.3
All other	180.0	116.3	156.0	141.1	150.3	-16.5
Total	612.7	580.1	779.5	783.0	759.3	23.9
U.S. merchandise trade balance:						
Canada	146.9	135.4	34.1	64.6	78.9	-46.3
Japan	540.0	639.6	639.4	696.2	615.3	13.9
Netherlands	352.3	391.9	381.3	336.4	230.8	-34.5
Mexico	290.6	209.2	225.6	198.9	249.2	-14.2
China	-1.3	8.9	134.7	102.0	194.8	(3)
Philippines	63.6	141.5	140.0	167.0	191.2	200.6
Spain	137.7	160.9	125.8	205.6	167.5	21.6
Germany	40.7	43.8	70.6	73.4	44.3	8.8
United Kingdom	157.1	161.2	165.7	163.7	125.7	-20.0
Ireland	130.6	153.2	128.7	120.7	124.7	-4.5
All other	1,011.5	1,196.0	1,549.2	1,925.4	1,534.9	51.7
Total	2,869.7	3,241.6	3,595.1	4,053.9	3,557.3	24.0

[1] Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export.
[2] Less than $50,000.
[3] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-21
Compound animal feeds[1]: U.S. imports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*metric tons*)					
Canada	276,407	305,655	426,931	388,744	333,758	20.7
Germany	2,830	3,595	4,127	3,241	3,954	39.7
Japan	1,212	1,075	548	1,116	1,373	13.3
China	1,189	1,794	2,086	4,467	4,489	277.5
Netherlands	3,303	509	1,718	2,059	1,848	-44.1
Myanmar	2,842	1,922	5,255	2,324	3,047	7.2
Ireland	4,199	320	861	2,719	2,441	-41.9
New Zealand	2,412	1,348	1,423	4,128	2,074	-14.0
Italy	1,971	1,129	495	144	263	-86.7
Taiwan	584	285	355	478	495	-15.2
All other	10,308	7,032	9,448	16,910	7,236	-29.8
Total	307,257	324,664	453,248	426,330	360,978	17.5
	Value (*thousand dollars*)					
Canada	77,825	97,628	144,144	146,446	138,588	78.1
Germany	26,526	39,702	41,137	35,033	33,137	24.9
Japan	14,586	11,599	5,063	9,917	11,027	-24.4
China	2,630	4,338	4,636	9,782	7,954	202.4
Netherlands	6,708	2,854	3,126	2,841	3,277	-51.1
Myanmar	1,374	1,370	4,103	1,481	2,250	63.8
Ireland	5,621	1,826	2,555	3,518	1,884	-66.5
New Zealand	2,379	1,050	1,721	3,576	1,862	-21.7
Italy	4,171	6,349	2,782	1,492	1,688	-59.5
Taiwan	1,103	1,058	1,074	1,475	1,608	45.8
All other	17,687	19,207	19,973	13,069	10,673	-39.7
Total	160,610	186,981	230,314	228,630	213,947	33.2
	Unit value (*dollars per metric ton*)					
Canada	282	319	338	377	415	47.5
Germany	9,373	11,044	9,968	10,809	8,381	-10.6
Japan	12,035	10,790	9,239	8,886	8,031	-33.3
China	2,212	2,418	2,222	2,190	1,772	-19.9
Netherlands	2,031	5,607	1,820	1,380	1,773	-12.7
Myanmar	483	713	781	637	738	52.7
Ireland	1,339	5,706	2,967	1,294	772	-42.3
New Zealand	986	779	1,209	866	898	-9.0
Italy	2,116	5,624	5,620	10,361	6,418	203.3
Taiwan	1,889	3,712	3,025	3,086	3,248	72.0
All other	1,716	2,731	2,114	773	1,475	-14.0
Total	523	576	508	536	593	13.4

[1] Contains products classified under HS 2309.90.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-22
Pet food[1]: U.S. imports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*metric tons*)					
Canada	89,615	114,379	129,966	149,570	144,858	61.6
Thailand	15,045	14,718	14,959	15,842	17,399	15.6
Denmark	143	142	483	662	475	232.2
Italy	0	7	26	172	723	(2)
France	(3)	8	0	0	742	(2)
Germany	17	58	62	108	234	1,276.5
Mexico	1	85	4,283	11,729	1,125	112,400.0
Ecuador	575	732	0	612	1,185	106.1
Korea	0	0	34	140	67	(2)
Brazil	9	35	37	97	53	488.9
All other	751	2,795	2,038	1,601	1,393	85.5
Total	106,157	132,959	151,888	180,533	168,253	58.5
	Value (*thousand dollars*)					
Canada	63,102	79,069	95,823	110,530	111,394	76.5
Thailand	19,463	18,675	21,332	21,572	25,991	33.5
Denmark	289	314	2,861	4,278	2,924	911.8
Italy	(2)	8	61	586	2,525	(2)
France	2	25	(2)	(2)	1,491	74,450.0
Germany	31	215	469	644	1,223	3,845.2
Mexico	3	57	2,578	2,641	808	26,833.3
Ecuador	187	265	(2)	669	385	105.9
Korea	(2)	(2)	162	735	376	(2)
Brazil	9	89	268	303	319	3,444.4
All other	953	2,088	3,248	2,287	1,938	103.4
Total	84,037	100,805	126,802	144,245	149,373	77.7
	Unit value (*dollars per metric ton*)					
Canada	704	691	737	739	769	9.2
Thailand	1,294	1,269	1,426	1,362	1,494	15.5
Denmark	2,021	2,211	5,923	6,462	6,156	204.6
Italy	(2)	1,143	2,346	3,407	3,492	(2)
France	(2)	3,125	(2)	(2)	2,009	(2)
Germany	1,824	3,707	7,565	5,963	5,226	186.6
Mexico	3,000	671	602	225	718	-76.1
Ecuador	325	362	(2)	1,093	325	0
Korea	(2)	(2)	4,765	5,250	5,612	(2)
Brazil	1,000	2,543	7,243	3,124	6,019	502
All other	1,269	747	1,594	1,428	1,391	10
Total	792	758	835	799	888	12

[1] Contains products classified under HS 2309.10.
[2] Not applicable.
[3] Less than 500 kg.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-23
Wheat gluten[1]: U.S. imports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand kilograms*)					
Australia	23,673	25,545	31,266	22,131	29,645	25.2
Germany	9,659	12,871	18,181	14,332	19,375	100.6
Netherlands	7,758	8,624	10,319	9,442	15,838	104.2
Canada	28,821	6,928	7,690	6,851	8,624	-70.1
Belgium	996	588	3,054	3,194	7,184	621.3
France	2,358	2,401	2,721	3,585	4,564	93.6
United Kingdom	668	237	788	587	2,045	206.1
Poland	0	0	0	0	1,159	(2)
China	2,380	1,149	1,502	1,205	1,261	-47.0
Finland	500	1,395	2,264	1,787	1,335	167.0
All other	5,234	3,837	4,472	3,765	3,244	-38.0
Total	82,047	63,575	82,258	66,880	94,273	14.9
	Value (*thousand dollars*)					
Australia	34,300	26,433	35,850	22,302	31,422	-8.4
Germany	12,543	13,319	17,266	12,293	17,944	43.1
Netherlands	12,695	10,141	11,336	9,418	16,204	27.6
Canada	14,891	9,585	10,782	8,683	10,811	-27.4
Belgium	1,901	731	3,152	2,962	7,403	289.4
France	3,021	2,513	2,624	3,021	4,690	55.2
United Kingdom	967	279	832	558	2,181	125.5
Poland	(2)	(2)	(2)	(2)	1,478	(2)
China	2,986	1,285	1,605	1,290	1,362	-54.4
Finland	810	1,535	2,431	1,654	1,224	51.1
All other	7,522	4,240	4,596	3,826	3,196	-57.5
Total	91,636	70,061	90,474	66,008	97,914	6.9
	Unit value (*dollars per kilogram*)					
Australia	1.45	1.03	1.15	1.01	1.06	-26.8
Germany	1.30	1.03	0.95	0.86	0.93	-28.7
Netherlands	1.64	1.18	1.10	1.00	1.02	-37.5
Canada	0.52	1.38	1.40	1.27	1.25	142.6
Belgium	1.91	1.24	1.03	0.93	1.03	-46.0
France	1.28	1.05	0.96	0.84	1.03	-19.8
United Kingdom	1.45	1.18	1.06	0.95	1.07	-26.3
Poland	(2)	(2)	(2)	(2)	1.28	(2)
China	1.25	1.12	1.07	1.07	1.08	-13.9
Finland	1.62	1.10	1.07	0.93	0.92	-43.4
All other	1.44	1.11	1.03	1.02	0.99	-31.4
Total	1.12	1.10	1.10	0.99	1.04	-7.0

[1] Contains products classified under HS 1109.
[2] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-24
Flours and meals of meat and fish[1]: U.S. imports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*metric tons*)					
Canada	28,905	33,792	37,427	38,455	27,918	-3.4
Iceland	5,428	1,497	5,100	7,931	15,930	193.5
Australia	34	6,467	4,808	19,719	18,364	53,911.8
New Zealand	20	2,170	5,020	11,099	14,647	73,135.0
Panama	12,310	16,260	5,060	9,093	13,164	6.9
Mexico	124	8,703	17,406	15,264	7,884	6,258.1
Chile	27,502	11,288	13,859	2,847	6,505	-76.3
Peru	192,223	10,779	7,658	21,710	4,731	-97.5
Japan	0	18	33	48	609	(2)
Denmark	714	4,221	6,089	82	483	-32.4
All other	144	61	356	231	755	424.3
Total	267,404	95,256	102,816	126,479	110,990	-58.5
	Value (*thousand dollars*)					
Canada	12,919	12,438	14,060	15,692	10,053	-22.2
Iceland	2,192	737	3,302	5,229	9,632	339.4
Australia	12	3,519	2,193	9,455	7,767	64,625.0
New Zealand	9	1,027	2,733	6,373	6,718	74,544.4
Panama	2,745	3,449	1,965	3,923	5,079	85.0
Mexico	46	3,756	9,000	7,963	4,661	10,032.6
Chile	7,851	3,764	7,076	1,602	4,325	-44.9
Peru	56,220	3,845	3,633	11,017	2,628	-95.3
Japan	(2)	21	84	671	700	(2)
Denmark	369	2,488	4,388	59	369	0.0
All other	159	83	335	514	712	347.8
Total	82,522	35,126	48,769	62,498	52,644	-36.2
	Unit value (*dollars per metric ton*)					
Canada	447	368	376	408	360	-19.4
Iceland	404	492	647	659	605	49.7
Australia	353	544	456	479	423	19.8
New Zealand	450	473	544	574	459	1.9
Panama	223	212	388	431	386	73.0
Mexico	371	432	517	522	591	59.4
Chile	285	333	511	563	665	132.9
Peru	292	357	474	507	555	89.9
Japan	(2)	1,167	2,545	13,979	1,149	(2)
Denmark	517	589	721	720	764	47.8
All other	1,104	1,361	941	2,225	943	-14.6
Total	309	369	474	494	474	53.7

[1] Contains products classified under HS 2301.
[2] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-25
Animal feed: U.S. imports for consumption, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*million kilograms*)[1]					
Canada	1,847.3	1,832.1	2,179.4	2,170.9	2,238.9	21.2
Germany	50.9	16.5	22.6	17.7	23.6	-53.6
Australia	23.9	32.2	36.9	42.4	48.4	102.5
Thailand	15.5	15.9	16.6	17.2	18.2	17.4
Netherlands	11.1	9.2	12.2	12.1	18.7	68.5
Japan	1.3	1.1	1.1	2.3	5.6	330.8
China	3.6	3.0	4.0	12.3	6.5	80.6
Iceland	5.4	1.5	5.1	7.9	15.9	194.4
France	5.8	4.9	5.4	6.2	8.2	41.4
New Zealand	2.9	4.9	6.4	15.2	16.8	479.3
All other	440.7	232.3	314.8	300.4	229.8	-47.9
Total	2,408.4	2,153.6	2,604.5	2,604.6	2,630.6	9.2
European Union	127.1	66.1	88.8	80.6	83.3	-34.4
Asia	31.8	28.4	37.6	48.0	48.6	52.9
Latin America	270.1	93.1	127.1	125.2	55.9	-79.3
	Value (*million dollars*)					
Canada	340.4	370.5	517.7	535.8	499.3	46.7
Germany	43.5	53.3	59.0	48.1	52.3	20.2
Australia	34.6	30.4	39.6	32.6	39.7	14.7
Thailand	19.7	19.3	22.5	22.6	26.5	34.5
Netherlands	19.4	13.1	14.9	13.3	21.5	10.8
Japan	14.7	11.8	5.5	11.3	12.7	-13.6
China	5.7	5.7	6.5	13.5	9.8	71.9
Iceland	2.2	0.8	3.3	5.2	9.6	336.4
France	5.7	5.1	4.7	5.5	9.3	63.2
New Zealand	2.8	2.9	4.5	10.0	8.7	210.7
All other	124.0	67.2	101.3	85.1	69.9	-43.6
Total	612.7	580.1	779.5	783.0	759.3	23.9
European Union	92.5	91.1	105.7	88.9	109.3	18.1
Asia	47.2	43.7	47.9	58.4	57.7	22.3
Latin America	72.4	19.6	36.2	37.2	20.7	-71.5

[1] For each country, quantities measured in tons were converted to kilograms.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-26
Animal feeds: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 1999; bound concession rate of duty; U.S. exports, 1998; and U.S. imports, 1998

HTS subheading	Description	Column 1 rate of duty, as of Jan. 1, 1999		Bound duty, Uruguay Round	U.S. exports, 1998	U.S. imports, 1998
		General	Special[1]		*Million dollars*	*Million dollars*
1109.00.10	Wheat gluten, whether or not dried, to be used as animal feed	2.2%	Free (A,CA,E,IL,J,MX)	1.8%	4.7	14.3
1109.00.90	Wheat gluten, whether or not dried, other	7%	Free (A,CA,E,IL,J,MX)	6.8%	4.7	83.7
1208.10.00	Flours and meals of soybeans	2.1%	Free (A+,CA,E,IL,J,MX)	1.9%	99.1	2.5
1208.90.00	Flours and meals of oil seeds or oleaginous fruits other than those of mustard or soybeans	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	2.6	(2)
1213.00.00	Cereal straw and husks, unprepared, whether or not chopped, ground, pressed or in the form of pellets	Free		Free	7.7	0.9
1214.10.00	Alfalfa (lucerne) meal and pellets	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	42.7	6.2
1214.90.00	Rutabagas, mangolds, fodder roots, hay, clover, sainfoin, kale, lupines, vetches & forage products, nesoi	Free		Free	264.2	11.8
2301.10.00	Flours, meals, and pellets, of meat or meat offal unfit for human consumption; greaves (cracklings)	Free		Free	87.8	19.1
2301.20.00	Flours, meals, and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption	Free		Free	67.4	33.6
2302.10.00	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of corn (maize)	Free		Free	11.1	1.5
2302.20.00	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of rice	Free		Free	8.9	0.6
2302.30.00	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of wheat	Free		Free	11.1	13.5

See footnotes at end of table.

Table B-26—*Continued*
Animal feeds: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 1999; bound concession rate of duty; U.S. exports, 1998; and U.S. imports, 1998

HTS subheading	Description	Column 1 rate of duty, as of Jan. 1, 1999		Bound duty, Uruguay Round	U.S. exports, 1998	U.S. imports, 1998
		General	Special[1]		*Million dollars*	*Million dollars*
2302.40.00	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of cereals, excluding corn, rice and wheat	Free		Free	2.9	5.3
2302.50.00	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of leguminous plants	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	30.9	2.5
2303.10.00	Residues of starch manufacture and similar residues	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	655.9	12.5
2303.20.00	Beet-pulp, bagasse and other waste of sugar manufacture	Free		Free	68.9	0.9
2303.30.00	Brewing or distilling dregs and waste	Free		Free	72.4	12.1
2304.00.00	Oilcake and other solid residues, resulting from the extraction of soybean oil	0.49¢/kg	Free (A+,CA,E,IL,J,MX)	0.45¢/kg	1604.2	2.5
2305.00.00	Oilcake and other solid residues, resulting from the extraction of peanut (ground-nut) oil	0.38¢/kg	Free (A,CA,E,IL,J,MX)	0.32¢/kg	1.9	0
2306.10.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of cotton seeds	0.58¢/kg	Free (A+,CA,E,IL,J,MX)	0.56¢/kg	13.9	(2)
2306.20.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of linseed	0.14¢/kg	Free (A,CA,E,IL,J,MX)	0.12¢/kg	3.3	(2)
2306.30.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of sunflower seeds	0.49¢/kg	Free (A,CA,E,IL,J,MX)	0.45¢/kg	2.2	(2)
2306.40.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of rape or colza seeds	0.18¢/kg	Free (A,CA,E,IL,J,MX)	0.17¢/kg	3.3	162.9

See footnotes at end of table.

Table B-26—*Continued*
Animal feeds: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 1999; bound concession rate of duty; U.S. exports, 1998; and U.S. imports, 1998

HTS subheading	Description	Column 1 rate of duty, as of Jan. 1, 1999		Bound duty, Uruguay Round	U.S. exports, 1998	U.S. imports, 1998
		General	Special[1]		*Million dollars*	*Million dollars*
2306.50.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of coconut or copra	0.49¢/kg	Free (A,CA,E,IL,J,MX)	0.45¢/kg	0	(2)
2306.60.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of palm nuts or kernels	0.32¢/kg	Free (A,CA,E,IL,J,MX)	0.32¢/kg	0	0
2306.70.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of corn (maize) germ	0.38¢/kg	Free (A,CA,E,IL,J,MX)	0.32¢/kg	1.6	0
2306.90.00	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, nesoi	0.38¢/kg	Free (A,CA,E,IL,J,MX)	0.32¢/kg	4.0	0.6
2307.00.00	Wine lees; argol	Free		Free	1.4	(2)
2308.10.00	Acorns and horse-chestnuts	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	3.0	(2)
2308.90.30	Screenings, scalpings, chaff or scourings, ground or not ground of flaxseed (linseed), of a kind used in animal feeding	Free		Free	12.4	(2)
2308.90.50	Dehydrated marigolds	2.1%	Free (A,CA,E,IL,J,MX)	1.9%	3.1	
2308.90.80	Vegetable materials and vegetable waste, vegetable residues and by products, nesi, of a kind used in animal feeding	1.7%	Free (A+,CA,E,IL,J,MX)	1.4%	43.5	7.8
2309.10.00	Dog or cat food, put up for retail sale	Free		Free	681.2	149.4
2309.90.10	Mixed feed or mixed feed ingredients used in animal feeding	Free		Free	290.1	183.2

See footnotes at end of table.

Table B-26—*Continued*
Animal feeds: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 1999; bound concession rate of duty; U.S. exports, 1998; and U.S. imports, 1998

HTS subheading	Description	Column 1 rate of duty, as of Jan. 1, 1999		Bound duty, Uruguay Round	U.S. exports, 1998	U.S. imports, 1998
		General	Special[1]		*Million dollars*	*Million dollars*
2309.90.22	Animal feeds w/milk or milk derivatives, o/10% by weight of milk solids, subject to gen. note 15 of the HTS	7.5%	Free (A+,CA,E,IL,J,MX)		30.8	(2)
2309.90.24	Animal feeds w/milk or milk derivatives, o/10% by weight of milk solids, subject to add note 2 to Ch. 23, not GN15	7.5%	Free (A+,CA,E,IL,J,MX)	7.5%	30.8	1.2
2309.90.28	Animal feeds w/milk or milk derivatives, o/10% by weight of milk solids, not subject to gen. note 15 or add note 2 to Ch. 23	82.8¢/kg + 6.6%	(3)	80.4¢/kg + 6.4%	30.8	0
2309.90.42	Animal feeds w/milk or milk derivatives, n/o10% by weight of milk solids, subject to gen. note 15 of the HTS	7.5%	Free (A+,CA,E,IL,J,MX)		30.8	0
2309.90.44	Animal feeds w/milk or milk derivatives, n/o10% by weight of milk solids, subject to add note 2 to Ch. 23, not GN15	7.5%	Free (A+,CA,E,IL,J,MX)	7.5%	30.7	(2)
2309.90.48	Animal feeds w/milk or milk derivatives, n/o 10% by weight of milk solids, not subject to gen. note 15 or add note 2 to Ch. 23	82.8¢/kg + 6.6%	(3)	80.4¢/kg + 6.4%	30.7	(2)
2309.90.60	Animal feeds, containing egg, other than mixed feeds or mixed feed ingredients, not containing milk or milk derivatives	2.1%	Free (A+,CA,E,IL,J,MX)	1.9%	4.0	(2)
2309.90.70	Other preparations nesoi with a basis of vitamin B12, for supplementing animals in animal feeding, not containing milk or egg products	1.7%	Free (A,CA,E,IL,J,MX)		6.0	(2)
2309.90.95	Other preparations nesoi of a kind used in animal feeding, not containing milk or egg products	1.7%	Free (A+,CA,E,IL,J,MX)		10.0	28.9

See footnotes at end of table.

Table B-26—*Continued*

Animal feeds: Harmonized Tariff Schedule subheadings; description; U.S. column 1 rate of duty as of Jan. 1, 1999; bound concession rate of duty; U.S. exports, 1998; and U.S. imports, 1998

HTS subheading	Description	Column 1 rate of duty, as of Jan. 1, 1999		Bound duty, Uruguay Round	U.S. exports, 1998	U.S. imports, 1998
		General	Special[1]		*Million dollars*	*Million dollars*

[1] Programs under which special tariff treatment may be provided' and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn' are as follows: Generalized System of Preferences (A); United States-Canada Free-Trade Agreement, goods of Canada (CA); Mexico (MX); Caribbean Basic Economic recovery Act (E); United States-Israel Free-Trade Area (IL); and the Andean Trade Preference Act (J). See appendix A for more details on these programs.

[2] Less than $500,000.

[3] Dairy-containing animal feeds from Mexico are subject to quantitative restrictions. In 1999, the quantitative restriction for certain dairy-containing products from Mexico, including animal feeds, was set at 489,000 kg. Dairy-containing animal feeds that fall within this restriction enter the United States duty-free. Otherwise, the tariff assessed is 37.8¢/kg if the product is valued less than $1.21/kg or 31.2 percent otherwise.

Source: Compiled from official statistics of the U.S. Department of Commerce and USITC, *Harmonized Tariff Schedule of the United States (1999)*, USITC publication 3138, Nov. 1998.

Table B-27
Pet food[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Canada	183	176	198	211	222	21.3
Japan	64	85	82	90	121	89.1
Mexico	15	16	29	43	60	300.0
Germany	10	11	19	19	16	60.0
Italy	7	9	11	13	15	114.3
Spain	3	4	6	9	12	300.0
United Kingdom	12	12	14	13	18	50.0
Taiwan	11	11	12	14	21	90.9
Switzerland	6	1	2	4	6	0.0
Netherlands	2	2	3	6	6	200.0
All other	49	68	83	113	118	140.8
Total	360	395	459	536	615	69.9
	Value (*million dollars*)					
Canada	180	179	199	198	208	15.6
Japan	65	88	97	104	128	96.9
Mexico	12	10	21	37	53	341.7
Germany	13	16	28	36	30	130.8
Italy	13	16	24	27	27	107.7
Spain	6	8	10	15	22	266.7
United Kingdom	17	18	18	16	21	23.5
Taiwan	13	12	12	12	14	7.7
Switzerland	6	3	5	9	12	100.0
Netherlands	4	5	7	11	11	175.0
All other	58	77	113	156	155	167.2
Total	387	432	534	621	681	76.0
	Unit value (*dollars per metric ton*)					
Canada	984	1,017	1,005	938	937	-4.7
Japan	1,016	1,035	1,183	1,156	1,058	4.2
Mexico	800	625	724	860	883	10.4
Germany	1,300	1,455	1,474	1,895	1,875	44.2
Italy	1,857	1,778	2,182	2,077	1,800	-3.1
Spain	2,000	2,000	1,667	1,667	1,833	-8.3
United Kingdom	1,417	1,500	1,286	1,231	1,167	-17.6
Taiwan	1,182	1,091	1,000	857	667	-43.6
Switzerland	1,000	3,000	2,500	2,250	2,000	100.0
Netherlands	2,000	2,500	2,333	1,833	1,833	-8.3
All other	1,184	1,132	1,361	1,381	1,314	11.0
Total	1,075	1,094	1,163	1,159	1,107	3.6

[1] Contains products classified under HS 2309.10.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-28
Oilseed meals[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Canada	715	808	696	663	790	10.5
China	0	0	418	293	780	(2)
Philippines	258	594	423	483	759	194.2
Venezuela	259	180	273	333	439	69.5
Saudi Arabia	214	269	357	450	334	56.1
Korea	9	17	18	25	307	3,311.1
Spain	212	151	20	308	277	30.7
Japan	78	245	223	287	266	241.0
Algeria	234	217	203	251	263	12.4
Colombia	215	194	257	250	274	27.4
All other	2,621	2,797	2,621	3,414	3,344	27.6
Total	4,815	5,473	5,511	6,757	7,834	62.7
	Value (*million dollars*)					
Canada	158	160	187	192	168	6.3
China	(2)	(2)	117	84	160	(2)
Philippines	54	121	120	144	145	168.5
Venezuela	55	37	78	103	92	67.3
Saudi Arabia	45	54	100	131	71	57.8
Korea	2	3	2	3	63	3,050.0
Spain	28	20	6	81	62	121.4
Japan	18	49	62	87	60	233.3
Algeria	50	43	57	73	54	8.0
Colombia	46	39	70	76	53	15.2
All other	524	525	675	936	707	34.9
Total	980	1,052	1,475	1,910	1,634	66.7
	Unit value (*dollars per metric ton*)					
Canada	221	198	269	290	213	-3.8
China	(2)	(2)	280	287	205	(2)
Philippines	209	204	284	298	191	-8.7
Venezuela	212	206	286	309	210	-1.3
Saudi Arabia	210	201	280	291	213	1.1
Korea	172	153	133	120	205	19.3
Spain	132	132	275	263	224	69.5
Japan	231	200	278	303	226	-2.3
Algeria	214	198	281	291	205	-3.9
Colombia	214	201	272	304	193	-9.6
All other	200	188	258	274	211	5.8
Total	204	192	268	283	209	2.5

[1] Contains products classified under HS 2304, 2305, and 2306.
[2] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-29
Meat and fish meals[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Mexico	68	66	79	67	102	50.0
China	5	12	18	65	57	1040.0
Canada	35	38	40	59	64	82.9
Taiwan	54	47	48	42	48	-11.1
Japan	27	36	19	21	24	-11.1
Philippines	5	12	12	9	18	260.0
Indonesia	60	69	103	76	23	-61.7
Thailand	14	24	40	24	19	35.7
Germany	(2)	(2)	3	(2)	6	(3)
Italy	1	1	5	0	5	400.0
All other	21	41	23	26	42	100.0
Total	290	346	391	389	408	40.7
	Value (*thousand dollars*)					
Mexico	18,812	15,996	24,770	24,887	29,626	57.5
China	1,508	6,248	10,268	20,840	22,075	1363.9
Canada	11,320	12,516	14,853	22,924	21,252	87.7
Taiwan	22,271	18,411	22,853	20,247	20,566	-7.7
Japan	11,306	11,768	9,516	10,828	11,294	-0.1
Philippines	1,477	3,992	5,582	4,431	8,966	507.0
Indonesia	17,786	18,301	33,994	29,805	7,597	-57.3
Thailand	5,368	7,979	15,023	10,558	6,248	16.4
Germany	136	44	1,419	593	3,232	2276.5
Italy	79	79	2,962	289	3,220	3975.9
All other	6,673	15,931	13,022	13,655	21,172	217.3
Total	96,734	111,265	154,261	159,057	155,247	60.5
	Unit value (*dollars per metric ton*)					
Mexico	277	242	314	371	290	5.0
China	302	521	570	321	387	28.4
Canada	323	329	371	389	332	2.7
Taiwan	412	392	476	482	428	3.9
Japan	419	327	501	516	471	12.4
Philippines	295	333	465	492	498	68.6
Indonesia	296	265	330	392	330	11.4
Thailand	383	332	376	440	329	-14.2
Germany	(3)	(3)	473	(3)	539	(3)
Italy	79	79	592	(3)	644	715.2
All other	318	389	566	525	504	58.6
Total	334	322	395	409	381	14.1

[1] Contains products classified under HS 2301.
[2] Less than 500 tons.
[3] Not applicable.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-30
Alfalfa and other straw[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Japan	1,626	1,781	1,745	1,755	1,828	12.4
Taiwan	76	92	101	89	74	-2.6
Korea	16	45	95	111	75	368.8
Canada	65	74	97	87	59	-9.2
United Arab Emirates	2	4	4	3	8	300.0
Mexico	12	4	15	12	15	25.0
United Kingdom	1	3	2	4	4	300.0
Hong Kong	1	1	4	3	2	100.0
Belize	0	0	(2)	0	2	(3)
China	(2)	0	0	(2)	3	(3)
All other	28	9	8	10	12	-57.1
Total	1,827	2,014	2,070	2,076	2,081	13.9
	Value (*million dollars*)					
Japan	252	272	273	292	284	12.8
Taiwan	10	12	13	13	10	0.0
Korea	2	6	14	16	9	350.0
Canada	6	7	10	9	5	-16.7
United Arab Emirates	(4)	1	1	1	1	(3)
Mexico	1	(4)	2	2	1	0.0
United Kingdom	(4)	(4)	(4)	1	1	(3)
Hong Kong	(4)	(4)	(4)	1	(4)	(3)
Belize	(3)	(3)	(4)	(3)	(4)	(3)
China	(4)	(3)	(3)	(4)	(4)	(3)
All other	3	1	1	1	1	-66.7
Total	274	301	314	336	315	15.0
	Unit value (*dollars per metric ton*)					
Japan	155	153	156	166	155	0.2
Taiwan	132	130	129	146	135	2.7
Korea	125	133	147	144	120	-4.0
Canada	92	95	103	103	85	-8.2
United Arab Emirates	(3)	250	250	333	125	(3)
Mexico	83	(3)	133	167	67	-20.0
United Kingdom	(3)	(3)	(3)	250	250	(3)
Hong Kong	(3)	(3)	(3)	333	(3)	(3)
Belize	(3)	(3)	(3)	(3)	(3)	(3)
China	(3)	(3)	(3)	(3)	(3)	(3)
All other	107	111	125	100	83	-22.2
Total	150	149	152	162	150	-0.1

[1] Contains products classified under HS 1213 and 1214.
[2] Less than 500 metric tons.
[3] Not applicable
[4] Less than $500,000.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-31
Compound animal feeds[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Canada	92	152	162	152	101	9.8
Mexico	169	141	198	246	173	2.4
Japan	185	169	140	158	96	-48.1
Belgium	1	4	15	30	49	4,800.0
Korea	9	24	22	25	33	266.7
Taiwan	32	37	49	36	28	-12.5
Brazil	25	19	30	24	33	32.0
Trinidad & Tobago	49	41	19	61	60	22.4
United Kingdom	33	28	23	20	11	-66.7
Thailand	10	27	44	37	25	150.0
All other	341	450	408	472	440	29.0
Total	946	1,092	1,110	1,261	1,051	11.1
	Value (*million dollars*)					
Canada	111	123	104	114	126	13.5
Mexico	73	43	44	47	58	-20.5
Japan	106	125	76	79	48	-54.7
Belgium	1	6	17	19	17	1,700.0
Korea	9	14	15	14	13	44.4
Taiwan	21	25	21	17	13	-38.1
Brazil	8	10	14	17	12	50.0
Trinidad & Tobago	10	9	6	15	12	20.0
United Kingdom	31	27	27	18	11	-64.5
Thailand	7	12	14	13	9	28.6
All other	163	204	201	209	175	7.4
Total	539	599	538	563	495	-8.2
	Unit value (*dollars per metric ton*)					
Canada	1,207	809	642	750	1,248	3.4
Mexico	432	305	222	191	335	-22.4
Japan	573	740	543	500	500	-12.7
Belgium	1,000	1,500	1,133	633	347	-65.3
Korea	1,000	583	682	560	394	-60.6
Taiwan	656	676	429	472	464	-29.3
Brazil	320	526	467	708	364	13.6
Trinidad & Tobago	204	220	316	246	200	-2.0
United Kingdom	939	964	1,174	900	1,000	6.5
Thailand	700	444	318	351	360	-48.6
All other	478	453	493	443	398	-16.8
Total	570	549	485	446	471	-17.3

[1] Contains products classified under HS 2309.90.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-32
Corn gluten[1]: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*thousand metric tons*)					
Netherlands	2,170	2,302	1,981	1,866	1,860	-14.3
United Kingdom	677	762	666	790	666	-1.6
Mexico	212	172	155	145	196	-7.5
Spain	696	839	557	749	624	-10.3
Portugal	656	614	493	616	562	-14.3
Japan	102	143	178	166	143	40.2
Germany	409	481	363	377	509	24.5
Ireland	836	714	468	366	458	-45.2
Taiwan	54	62	77	73	59	9.3
Canada	30	38	45	65	56	86.7
All other	900	1,016	858	870	643	-28.6
Total	6,744	7,143	5,841	6,082	5,778	-14.3
	Value (*million dollars*)					
Netherlands	252	247	278	221	178	-29.4
United Kingdom	77	82	91	82	56	-27.3
Mexico	53	44	47	47	51	-3.8
Spain	78	90	75	78	50	-35.9
Portugal	73	66	66	63	46	-37.0
Japan	33	37	62	63	44	33.3
Germany	46	50	48	39	43	-6.5
Ireland	97	79	64	39	38	-60.8
Taiwan	19	19	25	22	18	-5.3
Canada	9	11	15	22	17	88.9
All other	147	159	180	174	113	-23.1
Total	884	883	951	852	656	-25.8
	Unit value (*dollars per ton*)					
Netherlands	116	107	140	118	96	-17.6
United Kingdom	114	108	137	104	84	-26.1
Mexico	250	256	303	324	260	4.1
Spain	112	107	135	104	80	-28.5
Portugal	111	107	134	102	82	-26.4
Japan	324	259	348	380	308	-4.9
Germany	112	104	132	103	84	-24.9
Ireland	116	111	137	107	83	-28.5
Taiwan	344	306	325	309	311	-9.6
Canada	315	282	333	338	304	-3.5
All other	163	156	210	200	176	8.0
Total	131	124	163	140	114	-13.4

[1] Contains products classified under HS 2303.10.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-33
Animal feed: U.S. exports of domestic merchandise, by principal markets, 1994-98

Market	1994	1995	1996	1997	1998	Percentage change 94/98
	Quantity (*million kilograms*)[1]					
Japan	2,596	2,930	2,805	2,883	2,781	7.1
Canada	1,194	1,380	1,353	1,442	1,473	23.4
Mexico	1,153	912	916	784	911	-21.0
Netherlands	3,247	3,613	2,813	2,710	2,449	-24.6
China	10	58	477	388	937	9,178.2
Philippines	285	664	471	542	923	223.7
Spain	1,095	1,337	829	1,301	1,164	6.3
United Kingdom	986	1,089	899	1,090	954	-3.3
Ireland	1,169	1,279	914	826	1,105	-5.4
Venezuela	263	193	293	355	480	82.7
All other	5,780	6,820	6,685	7,843	7,619	31.8
Total	17,776	20,275	18,454	20,164	20,795	17.0
Asia	3,559	4,701	5,062	5,137	5,974	67.9
European Union	8,813	10,341	7,987	9,170	8,362	-5.1
Latin America	2,415	2,280	2,511	2,644	3,169	31.2
	Value (*million dollars*)					
Japan	555	651	645	708	628	13.2
Canada	487	506	552	600	578	18.7
Mexico	291	215	239	213	256	-12.0
Netherlands	372	405	396	350	252	-32.1
China	4	15	141	116	205	5,025.0
Philippines	64	142	140	167	191	198.4
Spain	138	161	126	206	168	21.9
United Kingdom	160	163	170	166	130	-18.9
Ireland	136	155	131	124	127	-7.0
Venezuela	57	42	85	111	104	82.5
All other	1,218	1,367	1,750	2,076	1,678	37.7
Total	3,482	3,822	4,375	4,837	4,317	24.0
Asia	857	1,108	1,332	1,414	1,365	59.3
European Union	1,150	1,320	1,320	1,450	1,111	-3.4
Latin America	598	540	725	828	816	36.3

[1] For each country, quantities measured in tons were converted to kilograms.

Source: Compiled from official statistics of the U.S. Department of Commerce. Figures may not add to totals shown due to rounding.

Table B-34
Applied animal feed tariffs for major trading partners by country and HTS subheading, 1998

HTS subheading	Description	Applied tariff levels, 1998 (median tariff) Japan	Canada	EU-15	Mexico	China
1109.00	Wheat gluten	22.5%	Free	608 Ecu/ton	7.5%	30%
1208.10	Flours and meals of soybeans	5.1%	Free	5.3%	7.5%	40%
1208.90	Other flours and meals of oil seeds or oleaginous fruits other than those of mustard or soybeans	5.1%	Free	Free	7.5%	20%
1213.00	Cereal straw and husks, unprepared, whether or not chopped, ground, pressed or in the form of pellets	Free	Free	Free	Free	15%
1214.10	Alfalfa (lucerne) meal and pellets	Free	Free	Free	7.5%	15%
1214.90	Rutabagas, mangolds, fodder roots, hay, clover, sainfoin, kale, lupines, vetches & forage products, nesoi	Free	Free	Free-6.9% (Free)	5%-7.5%	15%
2301.10	Flours, meals, and pellets, of meat or meat offal unfit for human consumption; greaves (cracklings)	Free	Free	Free	7.5%	2%-5% (5%)
2301.20	Flours, meals, and pellets, of fish or of crustaceans, molluscs or other aquatic invertebrates, unfit for human consumption	Free	Free	Free	7.5%	3%-5%
2302.10	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of corn (maize)	Free	Free	52 Ecu/ton-105.7 Ecu/ton	5%	5%
2302.20	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of rice	Free	Free	52 Ecu/ton-105.7 Ecu/ton	5%	5%
2302.30	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of wheat	Free	Free	30 Ecu/ton-105.7 Ecu/ton[1]	5%	5%
2302.40	Bran, sharps (middlings) and other residues, derived from the the sifting, milling or other working of cereals, excluding corn, rice and wheat	Free	Free	30 Ecu/ton-105.7 Ecu/ton[1]	Free	5%
2302.50	Bran, sharps (middlings) and other residues, derived from the sifting, milling or other working of leguminous plants	Free	Free	6.1%	Free	5%
2303.10	Residues of starch manufacture and similar residues	Free	Free	Free-380 Ecu//ton	7.5%	5%
2303.20	Beet-pulp, bagasse and other waste of sugar manufacture	Free	Free	Free	Free	5%
2303.30	Brewing or distilling dregs and waste	Free	Free	Free	Free	5%
2304.00	Oilcake and other solid residues, resulting from the extraction of soybean oil	Free	Free	Free	7.5%	5%

See footnotes at end of table.

Table B-34—*Continued*
Applied animal feed tariffs for major trading partners by country and HTS subheading, 1998

HTS subheading	Description	Applied tariff levels, 1998 (median tariff) Japan	Canada	EU-15	Mexico	China
2305.00	Oilcake and other solid residues, resulting from the extraction of peanut (ground-nut) oil	Free	Free	Free	7.5%	5%
2306.10	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of cotton seeds	Free	Free	Free	7.5%	5%
2306.20	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of linseed	Free	Free	Free	7.5%	5%
2306.30	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of sunflower seeds	Free	Free	Free	7.5%	5%
2306.40	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of rape or colza seeds	Free	Free	Free	7.5%	5%
2306.50	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of coconut or copra	Free	Free	Free	7.5%	5%
2306.60	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of palm nuts or kernels	Free	Free	Free	7.5%	5%
2306.70	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, of corn (maize) germ	Free	Free	Free	7.5%	5%
2306.90	Oilcake and other solid residues, resulting from the extraction of vegetable fats or oils, nesoi	Free	Free	Free-52 Ecu/ton (Free)	7.5%	5%
2307.00	Wine lees; argol	Free	Free	Free-1.76 Ecu/kg total alcohol content (Free)	Free	5%
2308.10	Acorns and horse-chestnuts, of a kind used in animal feeding	Free	Free	Free	Free	5%
2308.90	Screenings, scalpings, chaff or scourings, ground or not ground of flaxseed (linseed), of a kind used in animal feeding, dehydrated marigolds, other vegetable materials, wastes, and residues used in animal feeding	Free	Free	Free-1.7% and 1.76 Ecu/kg total alcohol content (Free)	Free	5%
2309.10	Dog or cat food, put up for retail sale	Free-¥44/kg[2] (Free)	Free	Free-11.4% plus 0 Ecu/ton-1,126 Ecu/ton	5%	30%

See footnotes at end of table.

Table B-34—*Continued*
Applied animal feed tariffs for major trading partners by country and HTS subheading, 1998

HTS subheading	Description	Applied tariff levels, 1998 (median tariff)				
		Japan	Canada	EU-15	Mexico	China
2309.90	Mixed feed or mixed feed ingredients used in animal feeding	Free-3.7%[3] (Free)	Free-"217.5% but not less than C$1.74/kg" (Free)	Free-13% plus 0 Ecu/ton-1,126 Ecu/ton[4]	Free-10% (Free)	5%-8%

[1] Subject to a TRQ of 475,000 tons. In-quota rates range from 30.6 Ecu/ton to 62.25 Ecu/ton, while over-quota rates range from 52 Ecu/ton to 107 Ecu/ton.
[2] Also includes tariff of ¥63/kg + ¥6.33 for every 1 percent exceeding 10 percent by weight of lactose.
[3] Also includes tariff of ¥58.33/kg + ¥5.87 for every 1 percent exceeding 10 percent by weight of lactose.
[4] Certain products are subject to varying TRQs depending on the starch and/or milk content within each product.

Source: Tariffs for Japan are from the tariff schedule posted by the APEC Secretariat, found at Internet address http://www.apectariff.org. Tariffs for Canada and Mexico are those specified in the NAFTA for 1998. Tariffs for the EU are from the *Official Journal of the European Communities, No. L 312* (Nov. 14, 1997). Tariffs for China are from UNCTAD, TRAINS, 1999 (CDROM).

Table B-35
World compound feed production, 1998

Country	Quantity	Percentage
	Million metric tons	
United States	140.5	24.4
China	54.7	9.5
Brazil	29.0	5.0
France	24.1	4.1
Japan	23.0	4.0
Canada	19.3	3.4
Germany	18.9	3.3
Spain	15.3	2.7
Netherlands	14.5	2.5
Russia	13.9	2.4
Others	221.8	38.6
Total	575.0	100.0

Source: Derived from figure in Clayton Gill, "First, Asian feed slump . . . Now, global stagnation," *Feed International*, Jan. 1999, p. 4.

Table B-36
Feed production in the European Union, 1997

Country	Cattle feed	Swine feed	Poultry feed	Milk replacers	Pet food	Other feed	Total
	Quantity (*thousand metric tons*)						
France	4,175	6,932	9,428	505	622	1,156	22,818
Germany	7,632	6,274	4,255	84	0	551	18,796
Netherlands	3,600	6,700	3,600	750	700	350	15,700
Spain	3,250	6,530	4,050	60	190	1,200	15,280
United Kingdom	4,082	2,702	4,123	21	0	1,194	12,122
Italy	3,580	2,350	4,400	150	120	1,000	11,600
Belgium	934	3,577	1,122	57	0	140	5,830
Denmark	1,408	3,456	654	5	0	164	5,687
Portugal	1,010	1,320	1,340	0	5	235	3,910
Ireland	1,452	705	487	5	11	287	2,947
Sweden	1,160	700	490	10	100	50	2,510
Finland	471	323	221	0	12	141	1,168
Austria	195	227	380	4	100	82	988
European Union	32,949	41,796	34,550	1,651	1,860	6,550	119,356

Source: Feedstuffs 1998 Reference Issue.

Table B-37
Compound feed production in Mexico, 1997

Feed type	Quantity	Percentage
	Thousand tons	
Poultry feed	7,150	47.7
Swine feed	3,350	22.3
Dairy feed	2,750	18.3
Beef cattle feed	1,300	8.7
Other feed	450	3.0
Total	15,000	100.0

Source: Feedstuffs 1998 Reference Issue.