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Honey: Background for 1995 Farm Legislation. By Frederic L. Hoff, Commercial Agriculture Division, Economic Research Service, U.S. Department of Agriculture. Agricultural Economic Report No. 708.

Abstract

The U.S. Government has supported the price of honey since 1950 by providing market price stability to honey producers to encourage them to maintain honeybee populations sufficient to pollinate important agricultural crops. When honey support prices moved above the average domestic price in the early 1980's, domestic producers found it profitable to forfeit their honey to the Government while packers and industrial users imported lower priced honey for domestic use. Changes made in the program by the Food Security Act of 1985 reduced forfeitures of honey to the Government and made domestic honey competitive with imports. Consequently, imports declined from 138.2 million pounds in 1985 to 55.9 million in 1988. At the same time, Government takeover of forfeited honey declined from 98 million pounds in 1985 to 1.1-3.2 million pounds from 1989 through 1992. Expenditures and takeovers will decline even further in fiscal years 1994 and 1995 with amendments to the Appropriations Acts, which eliminated deficiency payments and loan forfeitures for 1994 and 1995 crop honey.

Keywords: Beekeepers, farm programs, honey, honeybees, policies, price supports.

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Foreword

Congress will soon consider new farm legislation to replace the expiring Food, Agriculture, Conservation, and Trade Act of 1990. In preparation for these deliberations, the U.S. Department of Agriculture and other groups are studying previous legislation and current situations to see what lessons can be learned that are applicable to the 1990's and beyond. This report updates *Honey: Background for 1985 Farm Legislation* (AIB-465) and *Honey: Background for 1990 Farm Legislation* (AGES 89-43), by Frederic L. Hoff and Jane K. Phillips. It is one of a series of updated and new Economic Research Service background papers for farm legislation discussions. These reports summarize the experiences with various farm programs and the key characteristics of the commodities and the industries that produce them. For more information, see Additional Readings at the end of the text.

Washington, DC 20005-4788 April 1995

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Summary

Changes made in the honey program by the Food Security Act of 1985 reduced forfeitures of honey to the Government and made domestic honey competitive with imports. Honey imports, government takeover of domestic honey, and government expenditures all declined as a result. Expenditures and takeovers will decline even further in fiscal 1994 and 1995 with amendments to the fiscal 1994 and 1995 Appropriations Acts, which eliminate deficiency payments and loan forfeitures for 1994 and 1995 crop honey.

Honeybees are vital to the commercial production of many crops, and to the pollination of ornamentals, spices, fruits and vegetables in home gardens, and plants that provide food and shelter for wildlife and help control soil erosion. An estimated 15 percent of the plant-derived portion of the human diet comes from plants dependent upon, or helped by, insect pollination and about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. Crops that benefit from pollination are generally increasing in acreage and yield.

This report provides information on the structure of the beekeeping industry, including trends in domestic and world production, consumption, prices, and trade. The history of the domestic honey program is summarized through the 1980's, then discussed in some detail for 1990 and subsequent legislation. This report also highlights some of the data obtained from national surveys of honey producers, packers, importers, and brokers by Cornell University in 1988 and the International Trade Commission in 1993.

The honey price support program was legislated in the Agricultural Act of 1949 and put into effect in 1950. The program was enacted after honey prices dropped following World War II due to depressed demand and surplus inventories of honey. The program seeks to maintain a viable beekeeping industry so that certain agricultural crops are provided the pollination needed to achieve a commercial level of production. Beekeepers have also benefited from the program, which has smoothed out price fluctuations and provided a market for honey at an assured price.

During the 1960's and 1970's, the honey price support program operated at little government cost. However, inflation in the late 1970's and early 1980's moved the honey support price above both the domestic and import price. Consequently, the industry found it profitable to import lower priced honey for domestic use and to forfeit domestically produced honey to the Government. As a result, forfeitures of honey to the Commodity Credit Corporation (CCC) escalated from 6 million pounds in 1980 to around 106 million pounds in 1983 and 1984.

To make domestic honey more competitive in commercial and export markets, and thus reduce forfeitures and lower government costs of the honey program, the Food Security Act of 1985 contained a market loan provision. The provision, discretionary on the part of the Secretary of Agriculture, allows a producer to repay a loan at a level that the Secretary determines will minimize the number of loan forfeitures, preclude excessive stocks of honey, reduce costs incurred by the Government in storing honey, and maintain the competitiveness of honey in domestic and export markets. The provision was successful as imports steadily declined from 138.2 million pounds in 1985 to 55.9 million pounds in 1989. CCC takeover of forfeited honey declined from 106 million pounds in 1984 to around 3 million pounds in 1991 and 1992.

Congressional concern about reducing government spending and the need to eliminate subsidies to farm programs like honey and wool led to an amendment in the 1994 and 1995 Appropriations Acts. The amendment eliminated payments and forfeitures for 1994 crop honey in fiscal 1994 and for 1994 and 1995 crop honey in fiscal 1995.

U.S. beekeepers are facing challenges and issues that are expected to alter the industry before the end of the 20th century. The growing infestation of tracheal and Varroa mites, the migration of the Africanized honeybee into the Southern United States, the use of certain toxic chemicals in honeybee foraging areas, the current increase in honey imports from China, and changes in the honey price support program are reducing the number of bees available for honey production and crop pollination and may change the way bees are managed.

Estimates of the number of beekeepers in the United States vary from 139,000 to 212,000. An estimated 95 percent of the beekeepers are hobbyists with fewer than 25 colonies. Another 4 percent are part-time beekeepers who operate 25-299 colonies. Commercial beekeepers, those owning 300 or more colonies, are estimated to number about 2,000. Hobbyists and part-time beekeepers combined account for 99 percent of beekeepers, 50 percent of colonies, and 40 percent of honey production. Loan deficiency payments and/or price support loans were obtained by 4,035 producers in 1991 and represented 91 percent of U.S. honey production.

After peaking in 1947 at 5.9 million, the number of honeybee colonies in the United States has gradually declined to slightly under 3 million in 1993. Declining colony numbers are largely due to fewer easily accessible floral sources of nectar, increased use of pesticides, increasing losses from mites, rising production costs, and declining net income. U.S. honey production has ranged from 272 million pounds in 1952 to 150 million pounds in 1985. Despite the declining number of colonies, honey production has increased since 1990, largely due to increasing honey yields per colony.

Honey

Background for 1995 Farm Legislation

Frederic L. Hoff

Introduction

U.S. beekeepers are facing a number of challenges and issues that are expected to alter the industry before the end of the 20th century. The growing infestation of tracheal and Varroa mites, the migration of the Africanized honeybee into the Southern United States, the use of certain toxic chemicals in honeybee foraging areas, the current increase in honey imports from China, and changes in the honey price support program are reducing the number of bees available for honey production and crop pollination and may change the way bees are managed.

This report provides background information on the structure of the beekeeping industry, including trends in domestic and world production, consumption, prices, and trade. The history of the domestic honey program is summarized through the 1980's, then discussed in some detail for 1990 and subsequent legislation. This report also highlights some of the data obtained from a national survey of honey producers, packers, importers, and brokers by Cornell University in 1988 and the International Trade Commission (ITC) in 1993.

The Structure of the Beekeeping Industry

Bee culture is practiced throughout the United States. However, the colony size and management practices of beekeeping operations vary greatly among geographic areas due to widely different types of climate, floral sources, and farming systems. Most beekeepers move their colonies several times a year (from several miles to several thousand miles) to follow the nectar and bloom flow and increase honey production. Beekeepers frequently collect fees for the pollination services they provide to producers of fruit, vegetable, tree nut, field, and seed crops. In areas with abundant nectar-producing plants, some beekeepers specialize in honey production and move their colonies only occasionally. Beekeepers in warmer climates, such as California and the Southern States, may specialize in producing packaged bees and queens for stocking hives.

Beekeeping is specialized like many farm enterprises, but it is quite different from raising crops, poultry, and livestock. It requires an extensive knowledge of biology, a mechanical aptitude, and a relatively large capital investment. The operation is often a family business and is frequently handed down from one generation to the next. The peak labor loads for the beekeeper usually occur when caring for the bees during the spring, when moving bees for pollination (commonly at night), and when harvesting and extracting honey. Beekeeping is not as dependent on landownership as most other farm enterprises. However, most beekeepers own a small acreage, which serves as a base of operation.

There are few barriers to entry into beekeeping and honey processing. However, nearly all States employ county apiary inspectors who examine hives in the field to ensure that each apiary is free from disease. State laws and regulations relating to honeybees and beekeeping are designed primarily to control bee diseases. However, they may also attempt to regulate movement and entry of bees, issuances of permits and certificates, apiary location, quarantines, inspections, and methods of treating diseased colonies.

Beekeeper Population

Beekeepers are classified as hobbyists (fewer than 25 hives), part-time beekeepers or sideliners (25-299 hives), and full-time (commercial) producers (300 or more hives). Estimates of the number of beekeepers in the United States are wide ranging since the Federal Government makes no official estimates. The International Trade Commission (ITC) reported in 1976 that the U.S. honey industry comprised 2,000 commercial beekeepers, 10,000 part-time beekeepers, and 200,000 hobbyists. The 1987 Census of

Agriculture reported 38,625 farms with honeybee colonies, down from 46,833 in 1982.[1] In addition, the A.I. Root Company completed a survey of State apiary inspectors in May 1991 and reported an estimated 139,061 beekeepers in the United States.

Hobbyist Beekeepers

An estimated 90-95 percent of all beekeepers keep honeybees as a hobby or for small-scale pollination of orchard and field crops. Most honey produced by hobbyists is consumed at home, given to friends and relatives, or distributed through local outlets. Many small producers do not operate primarily for profit nor are they necessarily concerned with production efficiency.

Part-Time Beekeepers (Sideliners)

Part-time beekeepers or sideliners are classified as owners of 25-299 colonies. Units of this size are usually not large enough to employ a beekeeper full time and beekeeping generally does not serve as the principal source of income. However, since part-time beekeepers sell the majority of their honey, they are more concerned with honey prices and production costs than are the hobbyists. Hobbyists and part-time beekeepers together account for about 99 percent of the beekeepers, 50 percent of the colonies, and 40 percent of the honey extracted.

Full-time (Commercial) Beekeepers

Full-time beekeepers, those owning 300 or more colonies, produce about 60 percent of the honey extracted. Full-time beekeepers can be divided into two groups: migratory and nonmigratory. Most full-time beekeepers relocate their bee colonies several times during the year to provide pollination services, to reach more abundant sources of nectar, or to escape damage from pesticides. Migration allows beekeepers to extend the production season by providing their bees with a supply of nectar for a longer period. Nonmigratory beekeepers seldom move their colonies over significant distances but leave them in the same location, summer and winter.

A small group of full-time beekeepers specializes in the production of queens and packaged bees. These beekeepers sell packages of bees to other beekeepers to (1) replace colonies killed or severely damaged in the fall and winter in northern areas; (2) strengthen colonies weakened by overwintering, diseases, or pesticides; and (3) stock new colonies. The majority of packaged bees and queens are shipped in March, April, and May to beekeepers throughout the Nation.

[1]A farm is defined as any place from which $1,000 or more of agricultural products were produced and sold or normally would have been sold during the census year. Consequently, the Census estimate does not include the majority of hobbyists and nonfarm-resident beekeepers.

Colony Numbers

The number of honeybee colonies in the United States has gradually declined from a peak of 5.9 million in 1947 to 2.9 million in 1993 (fig. 1, and app. table 1). Colony numbers significantly increased during World War II because honey was needed as a substitute for rationed sugar. Also, beeswax was used instead of petroleum products to waterproof ammunition and other war equipment. To meet these critical war needs, the Government gave high priority to providing beekeepers with the scarce materials needed to expand their production capacity.

After the war, colony numbers began to drop and continued their decline even after Congress legislated a honey price support program in the Agricultural Act of 1949. USDA estimates of the number of colonies declined gradually from 5.9 million in 1947 to 4.1 million in 1972. From 1973 until 1985, colony numbers ranged between 4.1 and 4.3 million. Although official estimates of colony numbers were not reported for the 1982-85 crop years, USDA's Agricultural Stabilization and Conservation Service (ASCS) estimated colony numbers to average around 4.3 million.

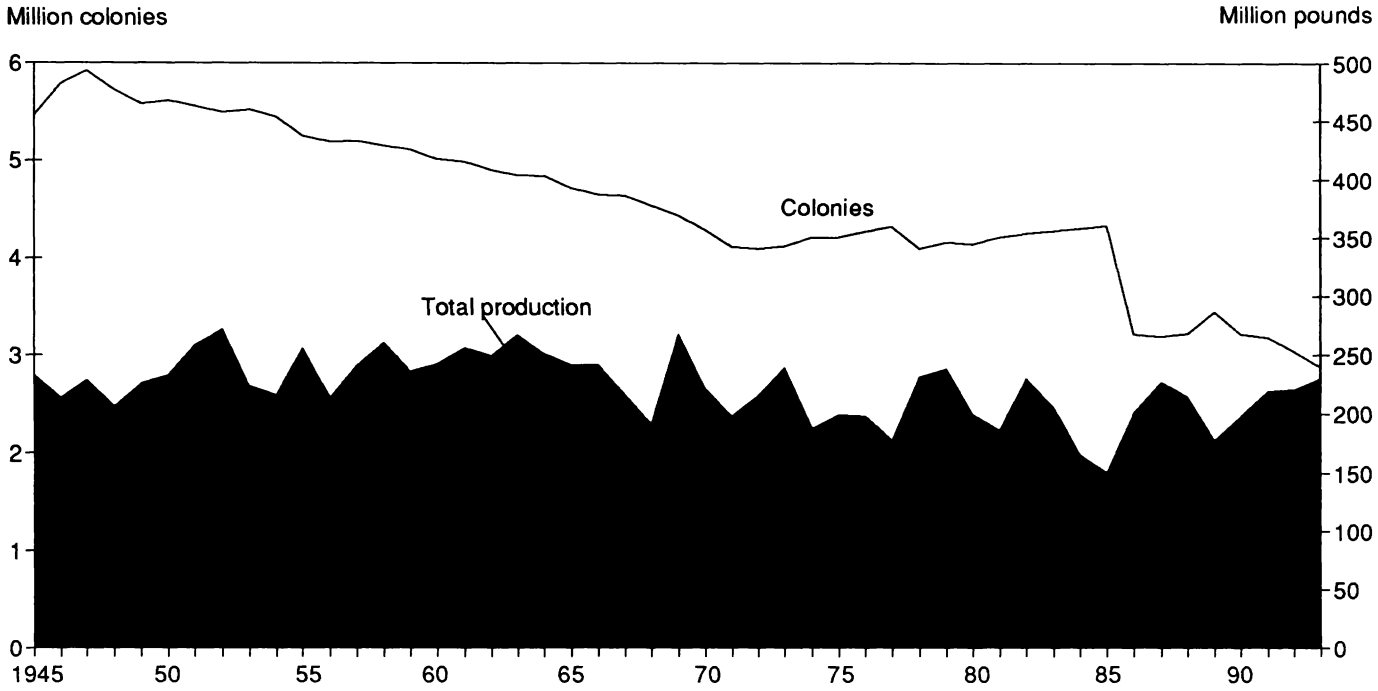
USDA's National Agricultural Statistics Service (NASS) estimates 2.9-3.4 million colonies of honeybees in the United States from 1986 to 1993 in apiaries with 5 or more colonies. These estimates are not comparable with those prior to 1986, however, because the earlier numbers included bees in apiaries with fewer than five colonies. More than 40 percent of all colonies in the United States in 1993 were located in California, South Dakota, North Dakota, and Florida. California alone reported 500,000 colonies in 1993 (app. table 2).

NASS's estimates of colony numbers have declined 16 percent since 1989. Declining colony numbers are largely due to fewer easily accessible floral sources of nectar; pesticides; increasing losses from tracheal mites, an internal parasite found in 1984; rising production costs; and declining net income.

Honey and Beeswax Production

Honey production varies widely among regions and from year to year depending on rainfall, soil conditions, temperature, cropping patterns, management, and other environmental factors. Cold and rainy weather can prevent bees from collecting

Figure 1
U.S. honeybee colonies and honey production, 1945-93



nectar, which reduces honey production. Rain, drought, or freezing temperatures can also cut honey production by damaging nectar sources.

U.S. honey production has ranged from 272 million pounds in 1952 to 150 million pounds in 1985 (fig. 1, app. table 1). Overall, honey production declined between the 1950's and the 1980's, coinciding with the decline in colony numbers. During the 1950's and 1960's, production averaged 240 million pounds a year, but fell to 211 million pounds on average during the 1970's. Although honey production averaged only 195 million pounds during the 1980's, production potential probably didn't change much from the 1970's. If the weather-reduced crops of 1984, 1985, and 1989 are excluded, honey production averaged 209 million pounds during 1980-89. Since 1986, honey production has averaged over 66 pounds per colony. However, it is quite likely that the larger beekeeping operations now sampled by NASS have significantly higher yields than those with fewer than five colonies, which were included in earlier yield estimates.

The amount of honey produced by a colony varies widely among States and even within States from year to year. Among States in 1993, average honey production ranged from 27 pounds per colony in Maryland to 177 pounds in Hawaii (app. table 2). California was the leading honey producer in 1991, 1992, and 1993, but from 1986 to 1993, average honey yield per colony in California ranged from 33 pounds in 1987 to 90 pounds in 1993. U.S. average yields for beekeepers with five or more colonies ranged from 51.4 to 80.1 pounds per colony between 1986 and 1993.

USDA has not reported beeswax production price estimates since 1981.

Value of Production

The value of honey production ranged from $32.3 million to $56.9 million during 1945-71, averaging $42.3 million. Decreased honey production in 1970 and 1971 depleted honey stocks, thus boosting prices and causing the value to jump sharply to $65.1 million in 1972 and $106.1 million in 1973 (app. table 1). The highest value was recorded in 1979 when high honey production and prices combined for a production value of $141.5 million. From 1991 to 1993, the value of production remained at $121-$125 million as declining honey prices were offset by increased honey production.

Honey Prices

The price of honey varies by grade, color, floral source, stage of processing, container size, geographic location, season, and market point. Lighter colored honey is usually sold for table use and is priced higher than darker colored honey, which is primarily sold for industrial uses. The price of processed honey at retail markets is higher than the price of unprocessed honey

in bulk wholesale shipments. Specialty honeys such as blackberry, orange blossom, and tupelo receive a premium price.

After averaging 24.9 cents a pound in 1947, the annual average price of all domestic honey stabilized at 15-19 cents from 1948 to 1970 (app. table 1). The average price trended upward from 17.4 cents per pound in 1970 to a record 63.2 cents per pound in 1981. From 1982 until 1989, the average price declined to around 50 cents per pound. Honey prices strengthened slightly to 53.7 cents in 1990 and 55.6 cents in 1991. A surge of honey imports from China reduced the average price to 55 cents a pound in 1992 and 54.4 cents in 1993. The International Trade Commission (1994) reported similar price movements for bulk, unprocessed, U.S.-produced honey, with an increase of 22-31 percent during 1990-91, and a decline of 4-10 percent during 1992-93.

Financial Characteristics

Honey and beeswax sales, honey price support payments, pollination fees, and sales of queens and packaged bees are the major sources of income for most beekeepers. A 1988 honey industry survey by Cornell University found that honey sales provided about half and honey program payments about one-fourth of total beekeeping income during 1985-88 (Hoff and Willett, 1994). Colony rentals for pollination, the third most important source of beekeeping income, provided 12 percent of the income for full-time beekeepers, 9 percent for part-time beekeepers, and less than 1 percent for hobbyists.

More recently, the ITC (1994) reported that honey sales accounted for 71 percent of the responding producers' total beekeeping revenues in 1992. Pollination fees accounted for 13 percent of revenues and agricultural program payments accounted for about 8 percent. Sales of package bees, beeswax, and other miscellaneous products accounted for the remaining revenues. The sharp decline in total honey program payments from $100 million in 1988 to $16 million in 1992 is responsible for the decline in honey program payments as a source of beekeeping revenue.

The survey by Cornell University found that 19 percent of the 601 respondents had a negative net income from beekeeping operations in 1988 and one-third had a positive net income of less than $2,500. For the Cornell University survey, net income represented the return to unpaid land, labor, capital, and management used in the beekeeping operation and was estimated as the gross income less gross expenses.

The 1994 ITC report indicated very similar findings from about 190 responding firms. A net loss was incurred by 22 percent of the firms in 1990, 26 percent in 1991, and 23 percent in 1992. Beekeeping expenses increased 17.5 percent between 1990 and 1992 and net income declined 13.5 percent. For the ITC report, net income (before income taxes) was estimated as beekeeping revenues less beekeeping and operating expenses.

Pollination Services

Achieving maximum yield and optimum quality of many agricultural crops requires more insect pollinators than are naturally present in the area at flowering time (table 1). Increased yields boost production and eventually reduce food costs to consumers. McGregor (1976) estimates that 15 percent of the plant-derived portion of the human diet comes from plants dependent upon, or helped by, insect pollination and that about one-third of the human diet is derived directly or indirectly from insect-pollinated plants. Honeybees also pollinate ornamentals, spices, fruits and vegetables in home gardens, and plants that provide food and shelter for wildlife and help control soil erosion.

Since honeybee colonies can be easily concentrated, some beekeepers rent their colonies to crop producers to provide pollination. These services are generally provided by large full-time beekeepers. Most hobbyists and part-time beekeepers do not provide pollination services for rent because they cannot economically justify investment in equipment to transport honeybees from one pollination site to another. The 1988 survey of U.S. beekeepers indicated that 36 percent of full-time beekeepers received pollination fees in 1988, compared with only 17 percent of part-time and 2 percent of hobby beekeepers. These percentages indicate that most beekeepers supply pollination free as a byproduct of their honey-producing activities.

Robinson, Nowogrodzki, and Morse (1989) estimated that 2.035 million rentals of honeybee colonies for pollination of major crops occur each year. Many colonies are used on two different crops in the same year, and a small number pollinate three crops. Thus, about 1 million colonies are estimated to be involved in rental pollination.

The value of production inputs, such as bee pollination services, is typically based on the amount used and the value of the output added from the last unit employed. Estimating pollination value by calculating reductions in total output without bees

inflates the value of honeybee pollination by understating, or even ignoring, the contributions of other inputs such as water, fertilizer, pesticides, labor, and machinery. The customary method for estimating an input's value is to multiply the quantity used times its price (which is assumed to approximate the value of added output from the last unit employed). Under conditions representative of agricultural production, this approach ensures that the sum of the values of all production inputs equals the market value of the output.

Pollination fees vary by crop and geographical area, ranging from $9.50 per colony (Burgett, 1988) to $35 per colony (Mayer, 1988) in 1988. Thus, if $20 per colony rental represents the average input price for 2.035 million rentals, the value of purchased honeybee pollination services was $40.7 million in

Table 1—Crops pollinated by honeybees

Crop	Crops dependent[1]		Crops increased[2]	
Fruits and nuts	Almond	Orange	Apple	Mandarin
	Apple—most varieties	Peach—some varieties	Apricot	Mango
	Apricot—some varieties	Pear—most varieties	Bushberry	Nectarine
	Avocado	Plum	Blackberry	Passion fruit
	Cherry	Prune	Blueberry	Peach
	Chestnut	Tangelo	Cranberry	Pear
	Grapefruit	Tangerine	Dewberry	Persimmon
	Lychee fruit	Tung	Gooseberry	Raspberry
			Huckleberry	Strawberry
			Macadamia nut	
Forage seed	Alfalfa	Ladino clover	Crimson clover	
	Alsike	Red clover		
	Berseem	Sanfoin		
	Birdsfoot trefoil	Crownvetch		
Vegetable seed	Asparagus	Kohlrabi	Eggplant	
	Broccoli	Leek	Pepper	
	Brussels sprouts	Melon		
	Cabbage	Mustard		
	Carrot	Onion		
	Cauliflower	Parsley		
	Celery	Parsnip		
	Chinese cabbage	Pumpkin		
	Collards	Radish		
	Cucumber	Rutabaga		
	Kale	Squash		
Vegetables	Cucumber	Pumpkin		
	Melon	Squash		
Oilseed			Flaxseed	
			Rape	
			Safflower	
Tree seed	Catalpa	Yellow poplar		
	Black locust	Holly		
	Red maple			

[1]Cross-pollination needed to produce a commercial crop.
[2]A larger crop is generally produced when bee-pollinated.

Source: Stanger, W. (1967).

1988. However, this figure does not include the value of pollination provided free as a byproduct of honey production.

Most crops that benefit from pollination are generally increasing in acreage and yield. More food will be needed for the growing U.S. population, which passed 250 million in 1990 and is projected to reach 267.5 million by the end of the century. Also, increased per capita consumption of many fruits and vegetables is expected to continue. As production of these crops grows, the demand for honeybee pollination of agricultural crops will continue to increase into the next century.

Processing, Packing, and Storing

Honey attains its peak quality when properly cured and sealed in the comb by honeybees. Processing methods and storage conditions following its removal from the comb determine honey's quality when consumed. Thus, except for processing capacity, complexity, and configuration, extracting equipment used by hobby and part-time beekeepers is similar to that used by large full-time beekeepers.

Processing

The processing of most honey begins in the extraction plant with removal of honey from the comb. This operation (1) removes the capping from the comb (see Glossary) using either hot knives or power uncappers, (2) employs centrifugal force to remove the honey from the comb, and (3) separates the honey from the large wax particles and other foreign material. Extraction usually is performed by the honey producer. Honey at this stage can be bottled and sold to consumers as "unprocessed" or "raw" honey, sold to a packer for additional processing, or processed further by the producer.

In most processing facilities, extracted honey flows into a sump. The sump is a tank, usually water-jacketed, that collects honey from the extracting process and delivers it for further processing at a uniform rate. A series of baffles or screens in the sump remove coarse wax particles and other foreign material.

After the bulk of the wax has been removed from the honey, the very fine material, such as insect parts, must be removed. Processors may pump the honey into settling tanks at a temperature of at least 100° F to permit separation of suspended particles. The honey is next passed through a straining operation to remove any remaining foreign material so that it will meet desired grade requirements. Many types and sizes of strainers are used, and the straining media may be metal screen, crushed granite, silica sand, or cloth. Honey is usually moved through the strainer by pressure (pumping) or by gravity flow.

Packing

Packing places the honey in containers for sale to another packer, a dealer, or to the retail market. The packing segment of the industry is composed of relatively few firms, most of which buy either bulk or, more commonly, processed honey for resale. U.S. honey packers may be classified as producer-packers, cooperatives, or commercial packer/bottlers.

Three types of firms process, pack, and market honey:

- Producer-packers are beekeepers who process and pack their own honey (although some purchase small amounts from other beekeepers). The honey is generally sold to retail stores and industrial users from roadside stands, farmer's markets, beekeepers' homes, local stores and restaurants, or door to door. Some beekeepers employ brokers or dealers to sell their honey.

- Cooperative marketing organizations process, pack, and market their members' honey under the cooperative label. These cooperatives may also purchase imported honey. Some cooperatives pool and market their honey in bulk containers. Cooperatives, along with private dealers and brokers, may also export a small amount of honey.

- Independent packers (bottlers) are generally large, well-organized firms that market advertised brands of honey or provide private-label packing for retail chains. These firms process, pack, and market a large share of the domestic honey and almost all imported honey. The final product may be blended to keep color and flavor as uniform as possible for end users.

The ITC (1994) estimates there were approximately 500 producer/packers, 1 large-scale cooperative (Sioux Honey), and 450 packer/bottlers in 1992. The 15 largest of these packers account for 80-95 percent of the honey sold through wholesale and industrial channels.

Few changes have occurred in honey packaging during the past two decades. Most honey is still sold in liquid, creamed, comb, cut-comb, and chunk form. Glass or plastic containers are the most popular material for packing and selling honey in retail

markets. Honey marketed in bulk is generally packed in 60-pound cans, 55-gallon drums, totes, or tankers. About half of the honey produced is marketed by producers and packers in bulk.

Storage

Honey can be stored for years, under proper conditions of temperature and humidity, without serious deterioration in color, flavor, or aroma. Honey should be stored in a dry, cool room in tightly sealed containers. Most deterioration in honey during storage can be prevented by maintaining storage temperatures below 52° F (11° C). The quality of stored honey declines as the temperature in the storage room is allowed to increase. However, even properly stored honey will darken and undergo slight chemical changes over time.

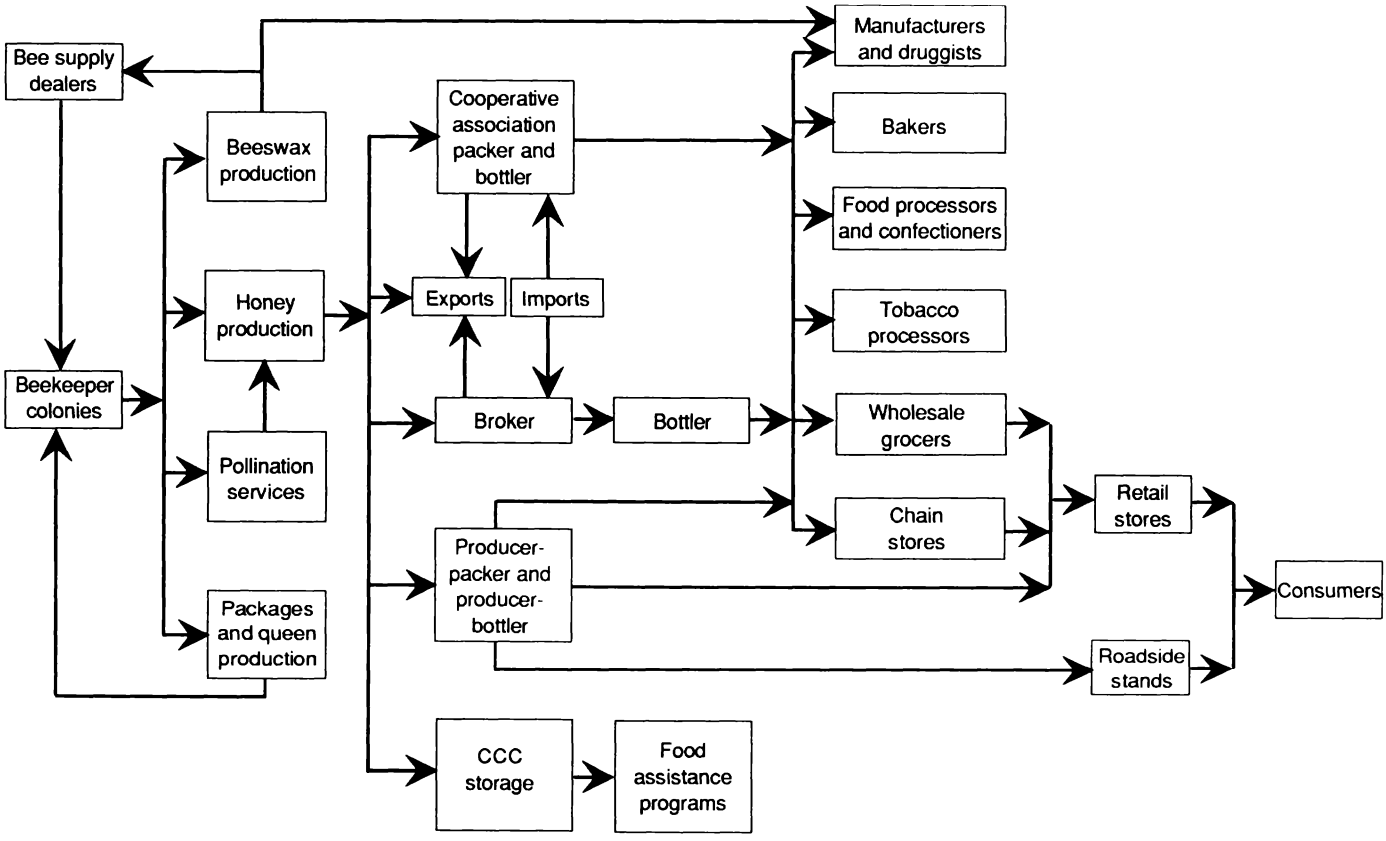
Marketing

Honey is marketed nationwide since production and consumption occur in all States. Beekeepers have a choice of markets for disposing of their honey crop (fig. 2). Some producers sell their honey crop in bulk containers to cooperative marketing associations, packers, bottlers, and food manufacturers. Beekeepers may also use a broker or dealer who assumes the responsibility for contacting a bottler and distributing the honey, or they may package or bottle their own honey in retail containers and sell directly to stores, consumers, or both.

In recent years, most large beekeepers have chosen to use their honey as collateral to secure a loan from the USDA's Commodity Credit Corporation (CCC). For honey placed under loan in fiscal year 1993, beekeepers could forfeit their honey to the CCC rather than repay the loan upon maturity or they could repay the loan at the buy-back rate and retain ownership to the honey (see "U.S. Honey Price Support Policy," p. 11). Beekeepers who did not obtain a loan on their honey could obtain a deficiency payment equal to the difference between the loan rate and the buy-back rate.

The options for disposing of honey through the CCC were eliminated for fiscal years 1994 and 1995 when the amount of payments and loan forfeitures that

Figure 2
U.S. beekeeping industry



Source: Willett, 1988.

could be received by a beekeeper were reduced to zero. Although beekeepers could obtain CCC loans on their honey in fiscal years 1994 and 1995, all loans were due at maturity with interest.

The CCC donates honey from stocks acquired through the honey price support program. Most donations are made to the National School Lunch Program and The Emergency Food Assistance Program (TEFAP), operated by USDA's Food and Consumer Service. Most TEFAP donations go to food banks distributing emergency food assistance. The Bureau of Prisons has also received some CCC honey stocks.

Quality Standardization

There is no official U.S. definition of "honey" or legal standards for honey composition, although the general provisions of the Food, Drug, and Cosmetic Act of 1938 apply. The Food and Drug Administration (FDA) is authorized to make factory inspections and randomly check honey imports for purity and cleanliness upon entry into the United States.

Honey is usually marketed by color, since color often indicates a significant difference in flavor. Lighter honeys are demanded more as table honey since they usually taste milder. The stronger flavored dark honeys are usually used in the baking trade.

Grade standards have been established by the USDA for extracted and comb honey. Although not compulsory, the standards provide a convenient basis for inspection and sales, for establishing quality control programs, and for determining loan values under the price support program.

The grades for extracted honey are "U.S. Grade A" or "U.S. Fancy," "U.S. Grade B" or "U.S. Choice," "U.S. Grade C" or "U.S. Standard," and "U.S. Grade D" or "Substandard." These grades are based on three quality factors (flavor, absence of defects, and clarity) and minimum soluble solids requirements. Flavor refers to the prominence of the honey flavor and aroma and to its conformity to the flavor and aroma of the predominant floral source or blend of sources. Absence of defects refers to the degree of cleanliness and to the degree of freedom from particles of comb, propolis, or other defects that may be suspended or deposited as sediment in the container. Clarity refers to the degree of freedom from air bubbles, pollen grains, or fine particles of any material that may be suspended in the product. Each quality factor is expressed on a scale of 100, with the maximum number of points accorded each factor as follows:

Flavor and aroma	50
Absence of defects	40
Clarity	10
Total	100

The USDA also has approved color standards, which include water white, extra white, white, extra light amber, light amber, amber, and dark amber. The most popular devices to determine the color of honey in the commercial trade are the Pfund grader and the USDA color comparator, which match the color of a unit of honey with colored wedges or colored glass sheets that represent the accepted color standards.

According to USDA grades, comb honey falls into five categories: comb-section, shallow-frame comb, wrapped cut-comb, chunk or bulk comb, and unclassified chunk or bulk comb. The quality factors used to ascertain the grades are appearance of cappings, presence of pollen grains, uniformity of honey, attachment of comb to section, absence of granulation, presence of honeydew, and weight. USDA grades for comb-section honey are "U.S. Fancy," "U.S. No. 1," "U.S. No. 1 Mixed Color," "U.S. No. 2," and "Unclassified." Grades for shallow-frame comb, wrapped cut-comb, and chunk or bulk honey packed in tin or glass are "U.S. Fancy," "U.S. No. 1," and "Unclassified." The four color grades for comb honey are white, light amber, amber, and dark amber.

Promotion

Honey is promoted at the national level by the National Honey Board (NHB) which was created by the Honey Research, Promotion, and Consumer Information Act (PL 98-590) on October 30, 1984. The purpose of the Act was to establish a program for funding of marketing research, advertising, and promotion to benefit the entire honey industry. In May 1986, honey producers and importers approved by referendum a National Honey Board appointed by the Secretary of Agriculture to administer the Act. The Board is composed of 13 members selected from various sectors of the industry. The current Board is composed of seven producers, two packers, two importers, one cooperative representative, and one member from the general public. Annually, the NHB develops a promotional plan for honey that includes advertising, developing new uses, and providing consumer information. The program is funded through an assessment of 1 cent/pound on honey entering the market.

The Market Promotion Program (MPP) and its predecessor, the Targeted Export Assistance (TEA) program, both administered by the Foreign Agricultural Service (FAS), have provided funds to the National Honey Board to assist in the promotion of U.S. honey exports. The TEA program, created by the Food Security Act of 1985, was developed to help products enter foreign markets affected by unfair trade practices of the importing country or other countries exporting to the same market. The MPP, established by the 1990 Farm Act, performs basically the same function, but its promotional efforts are not limited to commodities affected by unfair trade practices.

Many organizations promote specific aspects of beekeeping at the national, regional, State, or local level. Organizations exist for honey producers, queen breeders, royal jelly (see Glossary) producers and dealers, apiary inspectors, manufacturers of beekeeping supplies and equipment, honey packers and dealers, and apiculture researchers and scientists.

World Honey Trade

Honey is produced and consumed worldwide and traded in international markets. Appendix table 3 presents production, import, and export data for 1976-93 for selected countries. In 1993, about 40 percent of honey production entered world trade.

Production

Annual honey production in the major producing countries trended upward from 1976 to 1991 at about 4 percent a year (app. table 3). However, China has expanded honey production at nearly 16 percent a year since 1976. China became the world's largest producer and exporter of honey following the breakup of the Soviet Union. The three leading honey producers in 1993 (China, the United States, and Mexico) accounted for about two-thirds of world production from the major countries.

Exports

Since 1976, Mexico and Argentina have exported around 85 percent of their domestic honey production. However, China has become the largest exporter with around 40 percent of the international trade. Mexico and Argentina are the major suppliers of honey to Germany. China's major markets are Japan and the United States.

Imports

Germany, Japan, and the United States are the principal importers of honey, accounting for almost 99 percent of imports of the 10 countries studied. In recent years, Germany, the largest importer, has obtained about 45 percent of its honey imports from Mexico and Argentina. Most countries have increased the quantity of honey imported since 1976.

Trends in U.S. Honey Trade

The United States was basically a net exporter of honey from 1951 until 1966. With the exception of 1973, the United States has been a net importer of honey since 1967. In 1973, honey exports jumped to 17.6 million pounds due to a bumper domestic honey crop and a significant increase in world honey prices, which encouraged liquidation of domestic stocks. After 1973, the United States once again was a net importer of honey and exports remained below 10 million pounds until 1987. Exports started increasing after 1985 due to changes in the honey price support program. Exports of high-quality, consumer-packed honey have been increasing in recent years due to increased world demand and promotional efforts under the MPP.

Honey imports reached successive record levels between 1981 and 1985 (table 2). The surge in imports from 77 million pounds in 1981 to 138 million pounds in 1985 can be attributed largely to high honey support prices, which made it more profitable for the honey industry to import lower priced honey for domestic use and forfeit to the Government the domestic honey used as loan collateral. To make domestic honey more competitive, and thus reduce forfeitures and lower government costs of the honey program, the Food Security Act of 1985 contained a market loan provision. The provision, which let a honey producer repay a loan at a level below the support price, allowed domestic honey to compete with imports. Thus, shipments of honey into the United States declined sharply from 1986 through 1988. However, honey imports started increasing significantly again in 1989 as China stepped up exports to the United States with honey priced below the loan repayment level. China supplied over 50 percent of the honey imported by the United States in 1992.

Imports

The major countries exporting honey to the United States have been fairly constant for a number of years (app. table 4). Since 1981, China, Argentina, Canada, and Mexico have been the leading suppliers of honey to the United States, accounting for nearly 90 percent of U.S. honey imports. However, imports

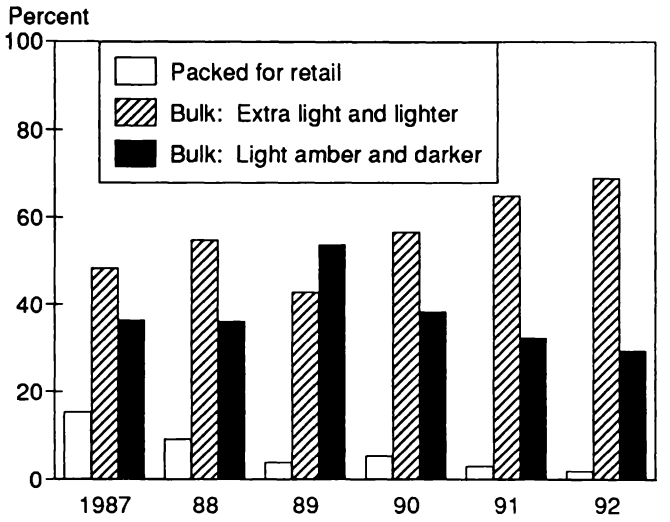
of honey from China increased 141 percent from 19.4 million pounds in 1987 to 60.1 million pounds in 1992. U.S. imports from China are estimated to be up another 20 percent in 1993 to 72.4 million pounds.

Most of the honey imported consists of bulk shipments (fig. 3). The proportion of honey imports packed for retail sale declined from 15.5 percent in 1987 to only 1.9 percent in 1992. Also, bulk shipments have shifted from the light amber and darker grades to extra light and lighter grades.

Exports

From 1986 to 1991, Saudi Arabia and Germany were the two major markets for U.S. honey, accounting for about half the exports (app. table 5). In 1991, U.S. honey exports to Germany declined significantly, while Yemen, Japan, Canada, and China became leading markets. U.S. exports of consumer-packed honey have increased in recent years, accounting for about 47 percent of total U.S. honey exports in 1992, compared with 26 percent in 1989. The National Honey Board has obtained MPP funds to develop consumer and trade awareness for consumer-packed specialty honey in markets in the Middle East and Northern Europe.

Figure 3
U.S. honey imports by class, 1987-92



Source: U.S. Department of Commerce, Bureau of the Census.

Consumption

Domestic honey consumption or disappearance includes commercial sales and government donations. Since 1990, annual honey consumption in the United

Table 2—U.S. honey trade, by volume and value, 1976-92 calendar years

Year	Imports			Exports		
	Volume	Value		Volume	Value	
		Total	Average		Total	Average
	Thousand pounds	*Thousand dollars*	*Cents/pound*	*Thousand pounds*	*Thousand dollars*	*Cents/pound*
1976	66,402	20,561	31.0	4,693	2,992	63.8
1977	63,890	19,644	30.7	5,521	3,665	66.4
1978	55,963	19,325	34.5	8,045	5,371	66.8
1979	58,578	22,768	38.9	8,840	6,324	71.5
1980	49,048	21,084	43.0	8,547	6,611	77.3
1981	77,318	32,171	41.6	9,200	7,153	77.8
1982	91,965	37,241	40.5	8,534	6,361	74.5
1983	109,833	43,408	39.5	7,476	5,866	78.5
1984	128,687	47,864	37.2	7,507	5,383	71.7
1985	138,242	45,554	33.0	6,515	4,088	62.8
1986	119,974	43,301	36.1	9,206	5,810	63.1
1987	58,263	20,732	35.6	12,359	7,865	63.6
1988	55,931	19,112	34.2	14,101	8,906	63.2
1989	77,271	28,145	36.4	9,949	6,334	63.7
1990	77,038	30,293	39.3	12,412	7,109	57.3
1991	92,254	39,831	43.2	9,553	6,810	71.3
1992	114,628	48,884	42.6	10,426	7,155	68.6

Source: *Foreign Agricultural Trade of the United States, Calendar Year* (various issues), Economic Research Service, USDA.

States has ranged between 298 million pounds and 304 million pounds (table 3). Annual domestic use of honey has increased about 31 percent from an average of 231 million pounds in the 1950's. However, most of the increase in domestic consumption has been associated with the growing U.S. population, which increased 65 percent between the 1950's and early 1990's. Despite the total consumption gains, average U.S. per capita consumption declined each decade from the 1950's (1.4 pounds) to the 1980's (1 pound). Per capita consumption has increased in the 1990's to an average of 1.19 pounds.

U.S. Honey Price Support Policy

The price support program for honey was established by the Agricultural Act of 1949 to support and raise depressed honey prices. The honey market had become depressed when overcapacity developed within the industry after sugar rationing was terminated at the end of World War II. The honey price support legislation in the 1949 Act and subsequent legislation aim to induce beekeepers to remain in business so that pollination of certain agricultural crops is maintained. It was deemed impractical for the Government to subsidize beekeepers through payments for pollination. The alternative is to support honey prices at levels that enable beekeepers to maintain viable operations. Beekeepers have benefited from the program, which has smoothed out price fluctuations and provided a market for honey at an assured price.

Description of Basic Program Features

Under the 1950 and 1951 programs, the price of honey was supported through purchases, export payments, and diversion payments. After 1951, the program basically evolved into two parts—a loan program and a purchase program. The purchase program has not been in operation since 1986.

Support Through Loans

Loans at the applicable price support rate on warehouse- and farm-stored honey are made available to honey producers and honey marketing cooperatives who agree to comply with the program provisions. These loans are available no earlier than April 1 of the crop year and, prior to 1986, no later than January 1 of the year following the applicable crop year. In 1986, the loan availability date was extended 3 months from January 1 to March 31. Loans are made for 100 percent of the certified honey pledged as collateral in eligible farm storage or in an approved warehouse.

In accordance with a price support loan, a producer can store the honey, wait for a more advantageous market price, and repay the loan at any time prior to the loan's maturity date, which prior to 1986, was on demand, but not later than April 30 of the year following the year in which the honey is produced or extracted. In 1986, at the urging of the honey industry, the maturity date of honey loans was changed to 9 months after the month in which the loan was disbursed. Consequently, instead of all honey loans maturing at the same time, maturity dates are staggered based on the time that the loan was disbursed.

If loan recipients choose to sell their honey in the marketplace, the loan principal is repaid with interest. Borrowers unable or unwilling to market their honey for a price sufficient to repay the loan plus interest can forfeit the honey to the Commodity Credit Corporation (CCC). Since the loans are nonrecourse, the CCC is obligated to accept the honey as full payment of the loan.

A market loan option, contained in the Food Security Act of 1985 and continued in the Food, Agriculture, Conservation, and Trade Act of 1990, allows beekeepers, at the discretion of the Secretary of Agriculture, to repay their loans at a rate that is lower than the announced loan rates. The Secretary has announced market loan repayment (MLR) rates for each honey crop since 1986. When a market loan option is in effect, interest is not charged on price support loans.

Support Through Loan Deficiency Payments (LDP's)

Provisions for LDP's were contained in the legislation authorizing market loans. A beekeeper can elect to receive an LDP in lieu of a price support loan. The LDP is calculated by multiplying the amount by which the crop's announced loan level exceeds the MLR rate times the quantity of honey a producer could have placed under loan. The LDP allows the producer to receive the market loan subsidy without going through the time and paperwork involved in applying for a price support loan. The LDP is also advantageous to the Government because there is no risk of acquiring honey collateral through forfeiture.

Support Through Purchases

In years when a purchase option was available, honey producers who did not use the loan program could enter into purchase agreements with the CCC. While the producer had no obligation to deliver any honey to the

Table 3—Supply and disposition of honey, United States, 1950-93

Crop year	Supply				Disposition			
	Carryin[1]	Production	Imports	Total	Domestic	Exports	Total	Per capita consumption
	Million pounds				*Pounds*			
1950	83.2	233.0	12.0	328.2	228.3	9.4	237.7	1.50
1951	90.5	258.1	8.2	356.8	255.2	12.7	267.9	1.65
1952	88.9	272.0	8.5	369.4	262.1	23.2	285.3	1.66
1953	84.1	223.8	9.8	317.7	229.5	32.9	262.4	1.43
1954	55.3	216.4	9.2	280.9	215.7	24.3	240.0	1.32
1955	40.9	255.2	9.9	306.0	229.1	20.5	249.6	1.38
1956	56.4	214.0	4.8	275.2	207.7	18.2	225.9	1.23
1957	49.3	241.2	4.8	295.3	211.7	19.8	231.5	1.23
1958	63.8	260.5	3.9	328.2	234.9	22.4	257.3	1.34
1959	70.9	236.6	4.5	312.0	239.7	12.5	252.2	1.35
1960	59.8	242.8	12.4	315.0	253.6	9.4	263.0	1.40
1961	52.0	255.9	9.0	316.9	241.8	7.2	249.0	1.32
1962	67.9	249.6	7.1	324.6	255.3	13.6	268.9	1.37
1963	55.7	266.8	2.6	325.1	245.1	25.0	270.1	1.30
1964	55.0	251.2	4.9	311.1	236.5	8.9	245.4	1.23
1965	65.7	241.8	13.3	320.8	249.4	13.8	263.2	1.28
1966	57.6	241.6	9.5	308.7	239.1	14.4	253.5	1.22
1967	55.2	215.8	16.8	287.8	219.5	11.7	231.2	1.10
1968	56.6	191.4	16.9	264.9	215.9	8.1	224.0	1.08
1969	40.9	267.5	14.7	323.1	250.6	9.9	260.5	1.24
1970	62.6	221.7	8.9	293.2	234.6	8.2	242.8	1.14
1971	50.4	197.8	11.4	259.6	219.9	7.6	227.5	1.06
1972	32.1	215.6	39.0	286.7	252.7	4.1	256.8	1.20
1973	29.9	239.1	10.7	279.7	224.9	17.6	242.5	1.06
1974	37.2	187.9	26.0	251.1	212.3	4.6	216.9	0.99
1975	34.2	199.2	46.4	279.8	242.8	4.0	246.8	1.12
1976	33.0	198.0	66.4	297.4	258.7	4.7	263.4	1.19
1977	34.0	178.1	63.9	276.0	240.8	5.5	246.3	1.09
1978	29.7	231.5	56.0	317.2	277.3	8.0	285.3	1.25
1979	31.9	238.7	58.6	329.2	282.7	8.8	291.5	1.26
1980	37.7	199.8	49.0	286.5	226.2	8.5	234.7	0.99
1981	51.8	185.9	77.3	315.0	232.0	9.2	241.2	1.01
1982	73.8	230.0[2]	92.0	395.8	250.8	8.5	259.3	1.08
1983	136.5	205.0[2]	109.8	451.3	269.0	7.5	276.5	1.15
1984	174.8	165.1[2]	128.7	468.6	251.7	7.5	259.2	1.06
1985	209.4	150.1[2]	138.2	497.7	256.9	6.5	263.4	1.08
1986[3]	234.3	200.4	120.0	554.7	282.9	9.2	292.1	1.18
1987	262.6	226.8	58.3	547.7	320.9	12.4	333.3	1.32
1988	214.4	214.1	55.9	484.4	278.0	14.0	292.0	1.13
1989	192.4	177.0	77.3	446.7	292.0	10.0	302.0	1.18
1990	144.7	197.8	77.0	419.5	303.4	12.4	315.8	1.21
1991	103.7	219.2	92.2	415.1	303.4	9.6	313.0	1.20
1992	102.1	220.6	114.6	437.3	298.2	10.4	308.6	1.17
1993	128.7	230.4	133.6	492.7	304.2[4]	8.8[4]	313.0	1.18

NA = Not available.
[1]Includes government inventory and commercial stocks.
[2]Production data are estimated by the Agricultural Stabilization and Conservation Service.
[3]National Agricultural Statistics Service reinstated annual honey production reporting. Subsequent years are official USDA production numbers. Data now based on beekeepers with five or more colonies.
[4]Forecast by USDA.

Source: Agricultural Stabilization and Conservation Service and National Agricultural Statistics Service, U.S. Department of Agriculture, and Bureau of the Census, U.S. Department of Commerce.

CCC, the CCC was obligated to accept as much as 110 percent of eligible honey covered by the agreement and pay the producer the applicable support price. Purchase agreements supported the honey price for producers who did not want to obtain a loan. The purchase feature is not available when a market loan option is in effect.

Other Program Features

The honey price support program contains other features that determine the eligibility of honey to receive price supports or a price differential.

Ineligible floral sources. Certain honeys are ineligible to be pledged as collateral for a price support loan because of undesirable flavor characteristics as a result of their floral sources. Among these honeys are those derived from bittersweet, carrot, onion, prickly pear, and tarweed.

Table honey. The floral sources in this category are considered suitable for table use anywhere in the country, and include honeys derived from clover, alfalfa, gallberry, tupelo, and similar mild-flavored honeys or mild-flavored blends.

Nontable honey. This category includes many floral sources accepted as table type in areas where they are produced, but not considered suitable for national acceptance. In this group are honeys derived from aster, goldenrod, tulip poplar, and similarly flavored honeys or blends of such honeys.

Color and Area Differential Structure

A price support differential based on color and class is applied to honey at the time of forfeiture. These differentials are calculated yearly based on the relative market values of each color and class of honey. A premium over the loan rate or a discount from the loan rate is applied at settlement of the forfeited loan collateral.

From 1952 to 1970, a honey support price differential was also in effect between the Western and Eastern States. The Western States included Montana, Wyoming, Colorado, and New Mexico. Honey produced in the Western States had a slightly lower support rate. This differential represented the average market price differential between honey shipped from surplus-producing Mountain States and that shipped from surplus-producing Central States into Chicago. Under normal conditions, western producers found it necessary to ship surplus honey to the East where there was a ready market. The differential permitted the continuation of that historical marketing pattern. The differential was eliminated in 1971. Both the American Beekeeping Federation and the American Honey Producers Association had adopted resolutions in 1971 that requested elimination of the east-west differential. Western honey was supported at 0.4 cent per pound less than eastern honey in 1971 in recognition of the cost of moving surplus honey from the West to other areas of the country. However, since 1952, when the differential was instituted, the patterns of honey movement from producing areas to consuming areas had changed. Movement was now predominantly from midcontinent toward either coast, rather than from West to East, and there was no longer a significant surplus of honey in the West.

History of Honey Price Support Programs

The First 40 Years

Following the legislation changing the honey price support program to a loan program and a purchase program in 1952, the program operated at little government cost until the early 1980's. (A detailed description of the first 40 years of the program is contained in the background papers for the 1985 and 1990 farm bills—see Foreword.) However, inflation in the late 1970's and early 1980's moved the honey support price above both the domestic and import price. Consequently, the industry found it profitable to import lower priced honey for domestic use and to forfeit domestically produced honey to the Government. As a result, forfeitures of honey to the Commodity Credit Corporation (CCC) escalated from 6 million pounds in 1980 to around 106 million pounds in 1983 and 1984.

To make domestic honey more competitive in commercial and export markets, and thus reduce forfeitures and lower government costs of the honey program, the Food Security Act of 1985 contained a market loan provision. The provision, discretionary on the part of the Secretary of Agriculture, allows a producer to repay a loan at a level that the Secretary determines will minimize the number of loan forfeitures, preclude excessive stocks of honey, reduce costs incurred by the Government in storing honey, and maintain the competitiveness of honey in domestic and export markets. The provision was successful as imports steadily declined from 138.2 million pounds in 1985 to 55.9 million pounds in 1988. Also, CCC takeover of forfeited honey declined from over 100 million pounds in 1984 to around 1.1 million pounds in 1990.

Food, Agriculture, Conservation, and Trade Act of 1990. The 1990 farm legislation provided price

support through loans, purchases, or other means for the 1991-95 honey crops at not less than 53.8 cents per pound and reauthorized a market loan option for the 1991-95 honey crops. To cut administrative costs, loan deficiency payments (based on the difference between the loan rate and the market loan repayment rate) were made available to producers in lieu of price support loans. The amount of payments that a person may receive was set at $200,000 for the 1991 crop, $175,000 for 1992, $150,000 for 1993, and $125,000 for 1994 and subsequent crop years. Loan forfeiture limits were established at $200,000 for the 1991 crop year, $175,000 for 1992, $150,000 for 1993, and $125,000 for 1994 and subsequent crop years. A subsequent amendment to the 1990 Act provided for a budget-reduction assessment on honey production equal to 1 percent of the loan rate.

Omnibus Budget Reconciliation Act of 1993. The 1993 Act reduced the minimum honey loan rate from 53.8 cents per pound for the 1991-95 crops to 50 cents for the 1994 and 1995 crops, 49 cents for the 1996 crop, 48 cents for the 1997 crop, and 47 cents for the 1998 crop.

The 1993 Act also dropped the 1-percent (0.538-cent) assessment that growers paid on honey production. In addition, payment limits were reduced from $125,000 for the 1994 crop and subsequent crops to $100,000 for the 1995 crop, $75,000 for the 1996 crop, and $50,000 for the 1997 and 1998 crops.

Policy Adjustments to Rising Program Costs

Several factors have brought about the legislative changes in the honey program since the mid-1980's. The cost of the program began escalating sharply in the early 1980's, increasing from $8.7 million in 1980 to $90.2 million by 1984 (table 4). While the CCC did not acquire any honey in the 1970's, CCC acquisitions of forfeited honey climbed from 6 million pounds in 1980 to around 106 million pounds in 1983 and 1984 (fig. 4).

The economic forces precipitating these changes began in the mid-1970's when inflation caused the honey support price to escalate from 32.7 cents per pound for the 1977 crop to 65.8 cents for the 1984 crop (table 4).

Inflation also led to an increase in the index of prices paid by farmers, which led to an increase in the parity price used to compute the support price. In 1981, the support price rose to 57.4 cents per pound, which exceeded import and domestic market prices.

As honey support prices moved above the average domestic price, the industry found it profitable to import lower priced honey for domestic use and to forfeit domestically produced honey to the Government (fig. 4). U.S. honey imports reached successively record-high levels in 1981-85, forcing the domestic market price downward and further widening the gap between the support price and market prices. Forfeitures of honey to the Government peaked with the 1984 crop when it acquired 98 percent of the 107.5 million pounds of honey placed under loan at a net cost of $90.2 million. This represented about 64 percent of domestic honey production. U.S. honey imports rose from 49 million pounds in 1980 to over 138 million pounds by 1985 (table 2).

To trim the huge budget deficit, Congress and the administration proposed to discontinue the honey price support program in the 1985 farm bill. However, Congress and the honey industry agreed to a compromise that dropped the parity formula and lowered the support price for honey.

Even though government outlays would be reduced by lower loan rates, program costs remained high due to the excessive forfeiture rate. Forfeited honey cannot be sold from inventory because, according to CCC sales policy, honey in inventory must be sold at 110 percent or more of the loan rate. Since the loan rate was higher than the market price for several years, most forfeited honey was disposed of through USDA domestic food assistance programs. When honey is donated, the program incurs an additional cost of about 12-15 cents per pound for storage, handling, transportation, processing, packaging, and other distribution costs.

The market loan provision was put in the Food Security Act of 1985 to make domestic honey more competitive in commercial and export markets, and thus reduce forfeitures and lower government costs. The provision was successful as imports steadily declined from 138.2 million pounds in 1985 to 55.9 million pounds in 1989. At the same time, CCC takeover of forfeited honey declined from 98 million pounds in 1985 to 2.8 million pounds in 1989. With honey forfeitures significantly reduced due to the market loan provision, the main government outlay for the honey program was for deficiency and market loan gain payments (the difference between the loan rate and the repayment rate). Consequently, the net government expenditure for the honey program declined from $100 million in 1988 to $17-$22 million for the 1991-93 crop years.

Table 4—Honey price support rates and loan activity, 1950-94

Crop year	National average price support rate[1]	Weighted average buy-back rate	Parity price adjusted	Support rate as a percentage of parity	Program activity: Quantity placed under loan	Program activity: Quantity receiving deficiency payments	Program activity: CCC take over	Program activity: Net government (return) or expenditure[2]
	Cents/pound			*Percent*	*Million pounds*			*Million dollars*
1950	9.0		15.0	60.0	[3]		7.4	NA
1951[4]	10.1		16.7	60.0	[3]		17.8	NA
1952	11.4		16.3	70.0	9.3		7.0	NA
1953	10.5		15.0	70.0	3.1		0.5	NA
1954	10.2		17.0	60.0	1.5		0.0	NA
1955	9.9		13.2	75.0	1.8		0.0	NA
1956	9.7		13.9	70.0	1.6		0.0	NA
1957	9.7		13.9	70.0	2.9		0.1	NA
1958	9.6		13.7	70.0	5.6		2.0	NA
1959	8.3		13.8	60.0	1.3		0.0	NA
1960	8.6		14.3	60.0	1.1		0.0	NA
1961	11.2		14.9	75.0	4.2		1.1	0.0
1962	11.2		15.1	74.0	3.4		0.0	0.1
1963	11.2		16.7	67.0	3.2		0.0	(0.1)
1964	11.2		17.2	65.0	9.5		2.2	0.0
1965	11.2		17.8	63.0	17.3		3.3	0.7
1966	11.4		18.6	61.3	33.9		4.1	0.1
1967	12.5		19.5	64.0	31.0		5.4	(0.1)
1968	12.5		18.7	66.8	24.9		0.1	0.4
1969	13.0		19.5	66.7	45.7		3.5	(0.9)
1970	13.0		20.4	63.7	40.6		[5]	0.8
1971	14.0		21.0	66.7	22.9		0.0	(0.9)
1972	14.0		22.3	62.8	19.8		0.0	[6]
1973	16.1		26.7	60.2	12.1		0.0	0.0
1974	20.6		34.3	60.0	13.9		0.0	0.3
1975	25.5		42.4	60.1	[7]		0.0	(0.3)
1976	29.4		49.0	60.0	[7]		0.0	(0.2)
1977	32.7		54.4	60.0	14.1		0.0	1.5
1978	36.8		61.3	60.0	40.5		0.0	3.5
1979	43.9		73.1	60.0	49.1		0.0	(1.7)
1980	50.3		83.9	60.0	41.1		6.0	8.7
1981	57.4		95.6	60.0	55.2		35.2	8.4
1982	60.4		100.7	60.0	88.4		74.5	27.4
1983	62.2		103.7	60.0	113.6		106.4	48.0
1984	65.8		109.7	60.0	107.5		105.8	90.2
1985	65.3		108.7	60.0	102.0		98.0	80.8
1986	64.0	41.0[8]	109.0[9]	[10]	180.4		41.0	89.4
1987	61.0[11]	40.4	106.0[9]	[10]	218.0		52.7	72.6
1988	59.1	38.4	111.0[9]	[10]	209.5		32.0	100.1
1989	56.4	38.4	114.0[9]	[10]	161.7		2.8	41.7
1990	53.8	43.2	115.0[9]	[10]	183.5		1.1	46.7
1991	53.8	47.9	113.0[9]	[10]	112.9	85.7[12]	3.2	18.6
1992	53.8	47.4	NA	[10]	122.4	74.1	2.9	16.6
1993	53.8	47.0	NA	[10]	130.7	62.1	0.1	22.1
1994	50.0	00.0[13]	NA	[10]	2.3[14]	00.0[13]	NA	NA

NA = Not available. [1]For extracted honey in 60-pound or larger container. [2]Fiscal year. [3]Direct packer purchase program. [4]On March 22, 1951, support for most flavors of honey was announced at 10 cents per pound with a dozen flavors of honey of limited domestic acceptability supported at 9 cents. On April 5, 1951, it was announced that the support price of honey of wide table acceptability would be increased from 10.0 to 10.1 cents per pound. [5]5,900 pounds. [6]Less than $50,000. [7]Purchase agreements only, no loan program. [8]Program option started in 1986. [9]National Agricultural Statistics Service estimates. [10]Parity formula dropped from the loan calculation and no purchase program. [11]Loan rate was reduced from 63 to 61 cents per pound on December 23, 1987, because of the Omnibus Budget Reconciliation Act of 1987. [12]Program option started April 1, 1991 with the 1991 honey crop. [13]No funds for loan deficiency payments or forfeitures in fiscal year 1994. [14]As of May 17, 1994.

Congressional concern about reducing government spending and the need to eliminate subsidies to farm programs like honey and wool led to passage of the 1994 Appropriations Act (Public Law 103-111, signed October 21, 1993), which reduced payments and forfeitures for 1994 crop honey in fiscal 1994 to zero. The amendment for honey was a compromise between honey producers and Congress, a majority of which wanted to terminate the honey program. When the legislation expired on September 30, 1994, the 1995 Appropriations Act (Public Law 103-330, signed September 30, 1994) extended the provisions for honey of the FY 1994 appropriations into FY 1995 and made those provisions applicable for both the 1994 and 1995 crops. The budgetary impact of these cost cutting measures was no net expenditures for 1994 crop honey in FY 1994 and no net expenditures for 1994 and 1995 crop honey in FY 1995.

Effects of the Honey Program

The Agricultural Act of 1949 legislated a price support program for honey to maintain honeybee populations vital for pollination of many agricultural crops. Beekeepers, consumers, processors, industrial users, and taxpayers are affected by the honey program.

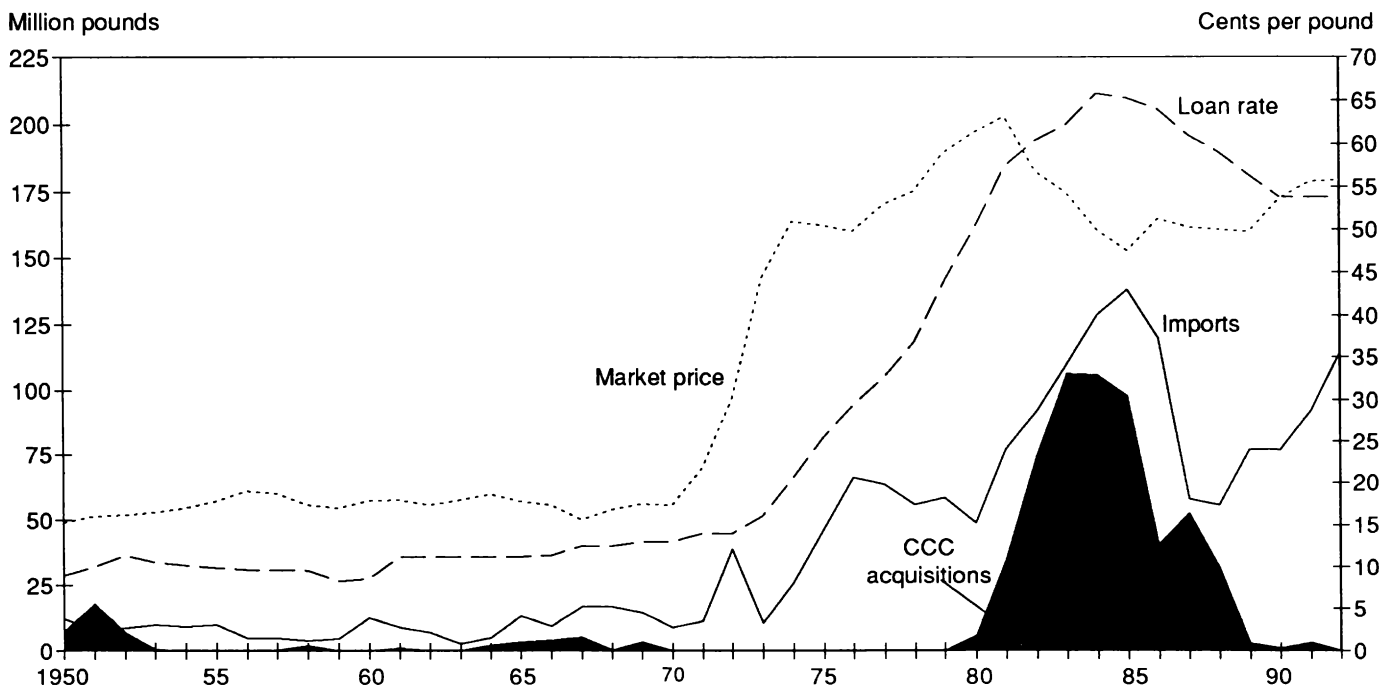
Beekeepers

The honey price support program has provided beekeepers with a market for honey at an assured price. Government support prices exceeded those in the domestic and world markets from 1982 through 1990 based on honey market prices shown in app. table 1. The national average price support rate moved above the domestic average honey price in 1982 by 2.6 cents per pound. This gap widened to 12.7 cents per pound in 1986, largely due to honey imports (fig. 4).

Beekeepers may have portions of their honey crop pledged as collateral for several price support loans. Therefore, the number of loans made is not the same as the number of beekeepers using the honey program. The number of loans made under the honey price support program increased throughout the 1980's. The increase in loan activity from 1982 through 1985 was largely due to the widening gap between the support price and the market price. During this period, the number of loans made increased from about 2,300 for the 1982 crop (88.4 million pounds) to 6,300 for the 1985 crop (102 million pounds).

Loan activity continued to increased significantly thereafter, due to large crops in 1987 and 1988 and the market loan option in effect since the 1986 crop.

Figure 4
U.S. honey imports, prices, and program activity, 1950-92



The number of loans increased from about 8,100 for the 1986 crop (180.4 million pounds) to nearly 15,600 for the 1989 crop (161.7 million pounds). For the 1990 honey crop, 15,398 loans were obtained by 5,028 honey producers. The number of producers that placed their 1991 honey crop under loan declined sharply to 2,101, and consequently, the number of loans declined to 7,288. This decline in honey loans was mainly due to the availability of loan deficiency payments mandated by the 1990 Farm Act, which allowed producers to receive subsidy payments without putting honey under loan. Loan deficiency payments and/or price support loans were obtained by 4,035 producers for the 1991 crop. A strengthening of honey prices may have reduced producer participation in the honey program for the 1991 crop.

Data collected by Cornell University and the National Honey Board from the 1988 national survey of honey producers, packers, importers, and brokers indicated that 85 percent of the beekeepers surveyed used the honey program at least once during 1981-88. By firm type, 92 percent of full-time beekeepers, 84 percent of part-time beekeepers, and 65 percent of hobbyists used the honey program (Hoff and Willett, 1994).

Use of the honey program increased from 6 percent of the respondents in 1981 to 67 percent in 1988 (fig. 5). From 1981 through 1984, full-time beekeepers were the dominant honey program users. After the market loan option was authorized by the 1985 Act, the rate of program participation increased for all three firm types, especially part-time and hobby beekeepers. For the 1992 honey crop, 28 percent of the program participants received government payments of less than $250, about 58 percent received payments of less than $1,000, and almost 90 percent received less than $5,000.

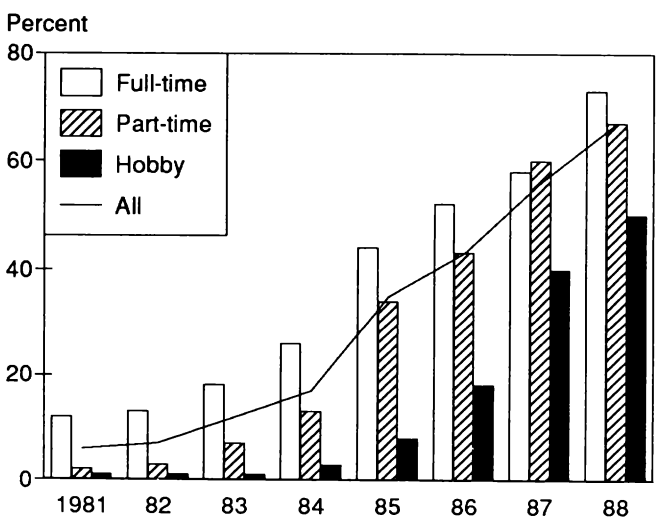
Consumers

Domestic honey consumption includes commercial sales and government sales and donations. Approximately 40 percent of the honey consumed in the United States is for table use in the home. Honey for table use is generally liquid, light color (extra light amber or lighter), and mild flavor. Honey sold for table use is often blended to obtain a uniform taste and color (fig. 6). Comb, chunk, and creamed honey are also available for table use. Both domestic and imported honey are used for table use, as well as blends of domestic and imported honey.

Direct program effects on consumers are measured by the changes in prices paid and quantities consumed of honey and honey-containing products. Domestic disposition of honey was estimated to be a record 320.9 million pounds in 1987, up from 282.9 million pounds in 1986. However, disposition declined to 278 million pounds in 1988 as fewer forfeitures reduced CCC stocks and the quantity of honey distributed through Federal disposal programs. Domestic disposition has since increased to 304.2 million pounds in 1993 (table 3).

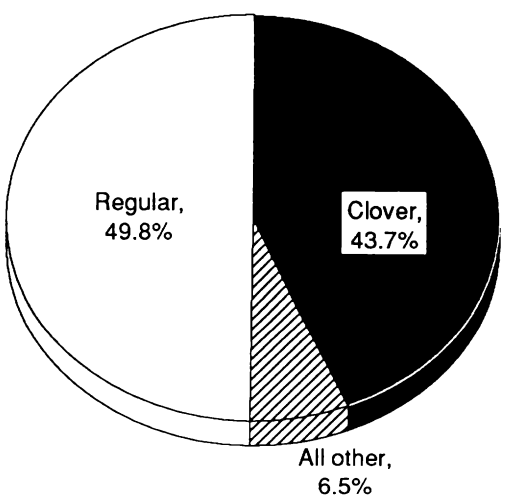
The honey promotion programs of the National Honey Board have likely increased commercial sales of honey and honey-containing products. According

Figure 5
Participation in U.S. honey program by firm type, 1981-88



Source: 1988 Honey Industry Survey.

Figure 6
U.S. honey consumption by flavor, 1992



Source: National Honey Board.

to the Board, 493 different honey-containing products were available for consumers in 1988. In most supermarkets, today's shopper can usually find 40-50 products containing honey, including bakery goods, beverages, candies, cereals, condiments, dairy products, desserts, entrees, spreads, sauces, and side dishes.

Recipients of CCC honey stocks through the various government food donation programs also benefit from the honey price support program. The amount of honey acquired by the CCC and available for distribution through food assistance programs has declined from 32 million pounds in 1988 to 1-3 million pounds in 1989-92.

Consumers benefit indirectly from the honey program because it helps maintain honeybee colonies sufficient to pollinate many important food and fiber crops. Increased yields boost production and eventually reduce food costs to consumers. An estimated 15 percent of the plant-derived portion of the human diet comes from plants dependent upon or benefited by insect pollination. Also, many beef and dairy products consumed in the United States are produced from insect-pollinated legumes. In total, about one-third of the human diet is derived directly or indirectly from insect-pollinated plants.

Industrial Users

The United States is one of the world's largest markets for industrial honey which accounts for about 45 percent of total consumption. Packers are the primary suppliers of honey to industrial users.

The food manufacturing industry, primarily bakery, health food, and cereal manufacturers, is the major user of industrial honey. The 1993 Retail Baking Marketing Plan prepared by the Nation Honey Board indicates that about 80 percent of the estimated 26,000 independent retail bakeries in the United States use honey in their baked products for flavor, sweetness, moisture retention, color, and consumer appeal. Extra-light to light amber is the color most used by food industry manufacturers. The tobacco, pharmaceutical, and cosmetic industries also use some honey.

The foodservice industry, which is comprised of restaurants, schools, hospitals, and other institutional operations, accounts for about 15 percent of the honey consumed in the United States. Foodservice honey, like table-use honey, can be composed of domestic or imported honey, or a blend of the two.

The honey program influences the procurement decisions of the food manufacturing and service industries, as well as other industrial users. With the high support rates characteristic of the early to mid-1980's, producers found it most profitable to forfeit their honey to the Government. Industrial users of honey found it more profitable to use imported honey, which could be purchased at prices below the domestic market price. However, the market loan option and lower support prices legislated in the 1985 Farm Act combined to make domestic honey available to industrial users at prices competitive with imports. Thus, an increasing number of these users began to use domestic honey. This reduced imports in 1986-88 and increased domestic honey sales to record levels. However, due to a price advantage, imports from China began increasing in 1989 and by 1992 had reached 52 percent of U.S. honey imports and 27.2 percent of honey production. These percentages are estimated to have increased again in 1993.

Taxpayers

Taxpayers bear the cost of government expenditures on the honey program, which are primarily a transfer of income from taxpayers to honey producers. These costs may be partially offset with revenues collected from the tariff on imported honey and any sale of government honey stocks.

The changes made in the honey program by the Food Security Act of 1985, specifically the market loan option, led to increased quantities of 1986- and 1987-crop honey being used as collateral for government loans (table 4). However, forfeiture levels for the 1986 and 1987 crops were down dramatically from previous years. From 1981 through 1985, forfeiture rates ranged from 64 percent of the 1981 crop loan collateral to 98.4 percent in 1984. For the 1986 crop, the first crop covered by the market loan option, forfeitures dropped to 23 percent of loan collateral. By 1990, less than 1 percent of the honey placed under loan was forfeited to the Government in repayment of price support loans.

With more domestic honey being sold in the United States since the Food Security Act of 1985, total outlays for fiscal year 1987 declined to $72.6 million, the lowest level since 1983. For FY's 1980-87, the total government expenditures to operate the honey price support program were $425.5 million (table 4). However, in FY 1988, total expenditures jumped to $100.1 million, the highest level since the honey price support program was initiated. The major reason for this increase was unusually high initial loan outlays. The 1987 honey crop was the largest in 5 years and a record 218 million pounds of honey were used as loan

collateral. Most of the 1987 crop would normally have been under loan before the start of FY 1988. However, because of a law restricting outstanding honey loans to $250,000 less the gain received from redeeming loans at the market loan rate, larger honey producers who had already gained $250,000 could not put any more honey under loan. On December 23, 1987, the Omnibus Budget Reconciliation Act lifted the $250,000 limit on outstanding honey loans. Those honey producers who had to keep their honey out of the loan program in FY 1987 because of that limit could then put their remaining 1987 crop under loan (loan availability for 1987-crop honey was April 1, 1987, to March 31, 1988). This extra amount in loan disbursements, plus the normal disbursements for the large 1988 crop, which began April 1988, combined to create a large budget outlay for FY 1988.

After a record government expenditure for the honey price support program in 1988, net government expenditures declined sharply to around $17 million by 1992. With the market loan option, producers have chosen to repay their price support loans at the market loan rate or receive a deficiency payment, which is calculated as the difference between the loan rate and the market loan rate.

Market Competitiveness

Government support prices for honey began to rise sharply in the early 1980's under parity and were substantially above world and domestic prices. This encouraged the consumption of imported honey at the expense of domestically produced honey, which was forfeited to the CCC. However, with the institution of the market loan option in July 1986, honey users gained access to high-quality domestic honey at prices comparable to imported honey. Now with the availability of Chinese honey at prices below those of domestic honey, U.S. honey producers are finding it more difficult to compete in the domestic and foreign honey markets.

Imports Increase

Monthly imports of honey dropped from year-earlier levels beginning in August 1986. Total imports for 1986 were 120 million pounds, about 42 percent of domestic use, compared with 138.2 million pounds in 1985, about 54 percent of total domestic use (table 3). This reversed a 5-year trend of increasing imports. In 1987, honey imports were 58.3 million pounds, only 18 percent of total domestic use. However, with the availability of low-priced Chinese honey beginning about 1991, imports began to increase sharply from 30 percent of total domestic use in 1991 to over 40 percent in 1993.

Exports Decline

Monthly exports of honey also rose from year-earlier levels beginning in August 1986. Total exports for 1986 were 9.2 million pounds, compared with 6.5 million pounds in 1985. This was the highest level of honey exports since 1973. Exports continued to rise, up to 14 million pounds in 1988 (table 3). From 1989 to 1992, total U.S. honey exports declined to 9.6-12.4 million pounds. U.S. honey exports in 1993 are forecast to be down even more to 8.8 million pounds due to increased competition with China and increased marketing efforts by Germany and Australia.

CCC Honey Stocks

Large forfeitures of honey to the Government in the mid-1980's caused a massive buildup in stocks. Stock levels at 38.7 million pounds on January 1, 1983, surged to 108.3 million pounds, about 72 percent of 1985 crop production, on January 1, 1986. Since these forfeited stocks could not be sold from inventory, they were donated at the rate of 6-10 million pounds a month. The main outlets for donations were the USDA domestic food assistance programs as well as food assistance programs serving public and private welfare agencies, charitable institutions, child-care centers, summer camps, Indian reservations, and emergency and disaster relief organizations.

After institution of the market loan option in July 1986, which encouraged redemptions of honey loan collateral, CCC stocks began to fall. By January 1, 1988, honey stocks had fallen to 20.8 million pounds, 9 percent of 1987 crop production. The CCC announced plans to terminate honey donations to domestic food programs in March 1988. Honey from inventory continued to be supplied to the School Lunch Program and the Bureau of Prisons at the rate of 1-1.5 million pounds a month.

Beginning in September 1988, honey stocks, which were at 16.2 million pounds, began to increase again. Stocks were 28.9 million pounds by November 1988. Stocks steadily increased until they reached 44 million pounds on February 1, 1989.

Several factors were responsible for the buildup of stocks. The 1987 honey crop was 227 million pounds, the largest since 1982's 230 million pounds. A large amount of honey was used as loan collateral and, in some instances, when these loans matured, honey producers found that packers or processors were unable or reluctant to purchase their honey. Processors already had full warehouses or were afraid

prices would fall because of the large supply (thereby lowering the value of their inventories).

In November 1988, with honey stocks increasing, CCC announced plans to make 20 million pounds of honey available to the Temporary Emergency Food Assistance Program (TEFAP) and other domestic food assistance programs. The announcement stated that 4 million pounds of honey would be distributed monthly for a 5-month period beginning February 1989. Inventory projections indicated that TEFAP donations could be extended beyond June 1989. In April 1989, an additional 12 million pounds of honey were made available to extend honey distributions through September 1989.

Indirect Benefits

The value of honeybees in pollinating many food and fiber crops is well established. Without a honey price support program, there may be a decline in the number of honeybee colonies, particularly those available to provide pollination services to fruit and vegetable producers. Of most concern will be pollination of those agricultural crops that require large concentrations of bees for a commercial crop. These crops are concentrated in a few geographic locations unlikely to contain a sufficient number of wild bees, other pollinating insects, or honeybees managed by local beekeepers to provide adequate pollination. Also, while some farmers maintain honeybee colonies to pollinate their crops, it is unlikely that large producers of field crops would have the expertise, labor, capital investment, or bee pasture needed to maintain large numbers of honeybee colonies.

Industry and Policy Issues

The beekeeping industry faces a number of problems, issues, and challenges that may significantly alter honeybee populations and affect both honey production and pollination services. The migration of the Africanized honeybee; the increase in colonies infested with mites; the rising levels of honey imports; continued honeybee exposure to highly toxic chemicals in forage areas; and recent changes in the honey price support program are all adding to the cost of beekeeping.

Africanized Honeybee

The much-publicized Africanized honeybee, *Apis mellifera scutellata*, migrated into the United States from Mexico in October 1990 near Hidalgo, Texas. After being released in Brazil in 1956, swarms of Africanized honeybees have spread through most of South and Central America during their northward march at a rate of 100-300 miles per year. The Africanized honeybees have now colonized the lower one-third of Texas. Also, the bees have moved from the Mexican States of Sonora and Chihuahua into New Mexico and Arizona, where they are now firmly established.

Extensive preparations by the USDA and State agencies, universities, and beekeeper organizations mitigated the public's response to the Africanized honeybee's arrival. The initial response was to satisfy media requirements for correct, dependable, and specific information about the first nest discovery. A second level of public re-education concerning honeybees was begun and continues even now. School children, State and national parks workers, municipality officials, pest control operators, agricultural workers, beekeepers, and home/land owners are some groups that have been targeted for Africanized honeybee information and advice. Individual States bear the primary burden of education and control.

Where the Africanized honeybee has become established, sideliner and hobby beekeepers, who own and manage about 1.5 million colonies nationwide, are suffering dwindling numbers. However, it appears that intensive management can keep a colony free of Africanized characteristics such as excessive swarming and aggressiveness. Commercial honey producers and pollinators are coping reasonably well by continually requeening with bee stock known to be free of Africanized honeybee traits. However, in large operations (1,000 or more hives), this procedure is a considerable expense in an industry already facing a tight profit margin.

The Africanized honeybee saga continues to develop. Discovery of the bee in California appears imminent. As of 1994, one human death has been attributed to the Africanized honeybee and both humans and animals have suffered innumerable stings. For the most part, the media still documents these occurrences. Continued education and research will be necessary to keep the Africanized honeybee issue manageable as the bee continues to colonize new areas of the United States.

Diseases and Parasites

Beekeepers have long dealt with several persistent bacterial and fungal maladies that affect honeybees. Though an expensive nuisance, most common bee

diseases, such as chalkbrood, caused by the fungus, *Ascosphaera apis*; American foulbrood (AFB), caused by the bacterium, *Bacillus larvae*; and Nosema, caused by the protozoan, *Nosema apis*, have practical control recommendations. However, in recent years, beekeepers and apicultural scientists have been trying to cope with two predaceous mites that have become greater problems for both managed and feral bee nests. Both mites were introduced into U.S. bee populations during the late 1980's and have now spread throughout the United States, Mexico, and many parts of Canada. Together, these diseases and parasites are costing beekeepers millions of dollars for treatment, colony replacement, and lost honey production.

The tracheal mite, *Acarapis woodi*, an internal parasite found in 1984, is microscopic and lives within the breathing apparatus of honeybees. The mite is extremely difficult to treat with control agents in this protected location. As of 1994, there are few good control materials and diligent research is underway at universities and USDA laboratories to provide practical control recommendations.

The newest parasite found on U.S. honeybees in 1987 is the Varroa mite, *Varroa jacobsoni*. Experience has shown that colonies afflicted with Varroa mites die—if not from the mites directly, then from secondary infections caused by the weakness. Whereas tracheal mites are very small, Varroa mites are very large by mite standards and easily visible with the unaided eye. Considered by some beekeepers to be prohibitively expensive, a commercially available fluvalinate compound is effective in controlling, albeit not eradicating, the Varroa mite.

Mites have been cited as the reason that feral honeybee populations have declined precipitously in many States. In managed honeybee colonies, the added costs of management and treatment have severely squeezed the thin profit margin in commercial beekeeping.

Herbicides and Pesticides

The widespread use of certain highly toxic chemicals to control plant and animal pests threatens honeybee colonies and costs beekeepers millions of dollars each year. Although honeybees are seldom the target organism, they suffer because of their biology and behavior. Quick-acting poisons kill field bees (foragers) before they can return to the hive. With less toxic compounds, the bees may return to die in the hive or crawl from the entrance and die nearby. Some chemicals are microencapsulated, approximating the size of natural pollen grains, and are carried to the hive and fed to other bees and brood.

About one-third of the beekeepers responding to the Cornell University survey reported losses of honeybees from pesticides in 1988. These beekeepers indicated about 37 percent of their colonies were affected, 80 percent of which incurred 50 percent or more loss. Only 2 percent of the beekeepers reporting losses from pesticides received any form of reimbursement.

Imports

Imported honey is garnering a larger share of the honey consumed in the United States. During the 1950's and 1960's, average U.S. honey production exceeded domestic consumption. Since that time, consumption has exceeded production by an average of 33.9 million pounds in the 1970's, 70.6 million pounds in the 1980's, and 85 million pounds thus far in the 1990's. The recent surge of imports, mainly from China, to an estimated 133.6 million pounds in 1993 is putting downward pressure on domestic honey prices. The share of U.S. honey consumption supplied by imports from China increased from 8.5 percent in 1990 to 23.9 percent in 1993, displacing domestic honey production. Consequently, U.S. honey producers expressed to the Clinton Administration and the Congress their great concern with the impact of increased Chinese imports.

In October 1993, the Clinton Administration requested the International Trade Commission (ITC) to conduct a section 406 investigation on imports of lower priced honey from China. Under section 406 of the Trade Act of 1974, the President has the authority to impose import relief measures on products from communist countries when the ITC determines such imports disrupt the domestic market. Market disruption is defined to exist whenever imports of a like or directly competitive article are increasing so rapidly that they are a significant cause of material injury or threat of injury to the domestic industry.

Accordingly, effective October 6, 1993, the Commission instituted Investigation No. TA-406-13 and on January 7, 1994, delivered its determination, findings, and recommendations to the President. The Commission determined that the U.S. honey market was disrupted by imports from China and recommended some form of tariff-rate quota to remedy the threatened honey market.

On April 21, 1994, President Clinton issued a decision memorandum to Congress which stated that import relief for honey was not in the national

economic interest of the United States. However, the President instructed the U.S. Trade Representative, in consultation with appropriate agencies, to monitor imports of honey from China.

Availability of Adequate Pollination Services

Growers of fruits and vegetables, as well as other naturalists, have observed the decline in feral honeybee populations. Ironically, while the indispensability of honeybee pollination is being touted, Africanized honeybees, predaceous mites, depressed honey prices, and general industry malaise are reducing the number of colonies available for crop pollination.

Large agricultural producers can continue to import bees from other States to augment honeybee populations. However, part-time and backyard growers who frequently depend on wild honeybee populations for pollination may have problems renting colonies. Other insects, such as bumblebees or leaf cutter bees, are adept pollinators, but management of their populations is uncertain at best.

The availability of honeybee colonies could be enhanced by several factors. If bee populations develop resistance to mite infestations quickly, the feral honeybee population could rebound. The economic incentive given to commercial beekeepers to increase colony numbers in existing operations could affect availability. Finally, sideliner and hobby beekeepers, who do not normally move their colonies for rental pollination, could be enticed into becoming bee colony suppliers.

Price Support Policy Options

Reducing the cost of farm programs, in general, and terminating the honey price support program in particular have been important issues during congressional debates on the past several farm bills. However, any congressional action on the honey price support program that reduces the availability of subsidies or terminates the program will reduce the incomes of over 5,000 U.S. beekeepers.

The fate of the honey price support program will likely be determined by the 1995 farm bill. Following are several options Congress could consider if honey is included in the 1995 farm bill and the administration maintains its goal of a zero-cost honey program.

Extend Provisions of Existing Honey Program

Sections 207 and 405A of the Agricultural Act of 1949 (7 U.S.C. 1446h), as amended by the Omnibus Budget Reconciliation Act (OBRA) of 1993 (P.L. 103-66), provides for a Honey Price Support Program for the 1994-98 honey crops. The program includes nonrecourse loans of 50 cents per pound for the 1994 and 1995 crops, 49 cents for the 1996 crop, 48 cents for the 1997 crop, and 47 cents for the 1998 crop. However, the Appropriations Acts for FY's 1994 and 1995 made the 1994 and 1995 crop-year loans recourse and provided zero dollars for subsidies and forfeitures. Program features include (1) a market loan repayment option whereby, at the Secretary of Agriculture's discretion, a producer may repay a price support loan at a lower rate; (2) loan deficiency payments that a producer may receive in lieu of a price support loan; and (3) limits on the amount of payments and loan forfeitures that a producer may collect on each crop. Since the loan rates are above the market price, market loans and loan deficiency payments are necessary to encourage redemption of loans and marketing of honey.

The provisions of the current program, as authorized in OBRA of 1993, could be extended in the 1995 farm bill to include the 1999 and 2000 honey crops. However, to achieve a zero-cost program, the existing program could be modified by making the loans recourse, that is exclude forfeitures; accelerating the decrease in loan rates to 40 cents per pound and payment limits to zero dollars by the crop year 2000; and reinstating marketing assessments. The progressively lower recourse loan rates and payment limits will result in very low government costs for subsidies and no forfeiture costs. While this program will force producers to depend more on the market and pollination fees for the majority of their income, it will provide some income protection in a sluggish and weak honey market. The marketing assessment and interest on recourse loans would most likely offset any expense to administer the program.

Adopt and Extend Provisions of Government Reform and Savings Act

The Government Reform and Savings Act (GRSA) of 1993, for the 1994 and 1995 honey crops, makes loans recourse and eliminates subsidies, reduces the loan rate to 44 cents per pound, and terminates the honey program effective for the 1996 crop. The provisions of the GRSA could be extended in the 1995 Farm Bill for the 1996-2000 honey crops by lowering the loan rate significantly below the market price, making the loans recourse to preclude storage and disposition costs of forfeited honey, and eliminating the market loan option and loan deficiency payments, which will reduce spending on subsidy payments to zero dollars. Also, the marketing

assessment could be reinstated to offset administrative costs of running a honey program.

These provisions would achieve the administration's goal of zero cost for a honey program. Also, while this program would not provide honey producers a source of income because the loans would be repaid with interest, it would provide a source of working capital.

Protect Program With Import Quotas

The beekeeping industry has maintained that a honey price support program would not be needed if honey imports were regulated to achieve a domestic honey price that provided beekeepers with a favorable return to their beekeeping operations. The industry further contends that increases in U.S. honey consumption generated by the promotional efforts of organizations like the National Honey Board are largely being supplied by imports. By controlling honey imports through a system of import quotas or tariff-rate quotas, the domestic market price for honey could be strengthened and, thus, eliminate the dependence of beekeepers on the honey program as a source of income. However, the administration maintains that import quotas are not in line with its goal of free trade of U.S. products in international markets.

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Glossary

Abdomen. The segmented posterior part of a bee containing the heart, honey stomach, intestines, reproductive organs, and sting.

Apis. Genus to which honeybees belong.

Apiarist. A person who keeps bees.

Apiary. Group of bee colonies.

Apiculture. The science of beekeeping.

Beehive. Domicile prepared for a colony of honeybees.

Beekeeper. (see *Apiarist*).

Beekeeping associations. Organizations of beekeepers at the local, regional, State, and/or national and international level that meet on a regular basis and have a mixture of educational and social activities.

Bee pasture. Vegetation visited by bees for nectar or pollen.

Beeswax. A secretion from glands on the underside of a bee's abdomen that is molded to form honeycomb upon which the colony lives.

Brood. The collective name for the egg, larvae, and pupae in a honeybee colony.

Brood chamber. The section of the hive in which brood is reared and food may be stored.

Cap. The covering of a cell with beeswax.

Cell. Single unit of space in a honeycomb in which honey is stored or honeybees can be raised.

Colony. Social community of several thousand worker bees, usually containing a queen with or without drones.

Comb. (see *Honeycomb*).

Commercial beekeeper. One who keeps bees on a full-time basis for income. The industry generally considers commercial beekeepers as maintaining 300 or more colonies.

Drone. The name given to a male honeybee.

Drone egg. Unimpregnated egg.

Extractor. A machine that rotates honeycombs at a speed sufficient to remove the honey from them.

Field bees. Worker bees 2-1/2 to 3 weeks old that collect food for the hive.

Food chamber. Hive body containing honey-filled combs on which bees are expected to live.

Foraging. The process of searching for and collecting nectar, pollen, water, and propolis by worker bees.

Frame. Wood case for holding honeycomb.

Hive. Any container in which bees are kept by a beekeeper.

Hobbyist beekeeper. One who keeps bees for pleasure or occasional income. The industry generally considers hobbyists as maintaining fewer than 25 bee colonies.

Honey. Sweet viscous fluid produced by honeybees from nectar obtained primarily from floral plants.

Honeybee. Any of several social bees of the genus *Apis*, family *Apidae*, order *Hymenoptera*, that produce honey.

Honeycomb. A group of hexagonal cells with three-faced bases that are built by honeybees from beeswax.

Honey flow. Period when bees are collecting nectar from plants in plentiful amounts.

Honey stomach. The area inside the bee abdomen between the esophagus and the true stomach.

Larva. Stage in the life of a bee between egg and pupa. A white legless grub that lies curled up on the bottom of the wax cell of the honeycomb.

Nectar. Sweet secretion, primarily a solution of dissolved sugars in varying proportions, produced in the nectaries of many flowering plants and the basic raw product of honey. The function of nectar is to attract bees so that the flowers may be cross-pollinated.

Nectaries. Special glands found primarily in flowers that secrete nectar.

Nurse bees. Young worker bees that feed the larvae.

Package bees. Bees produced for sale, supplied by the pound, and transported in a box with a wire screen on two opposite sides. The most popular size packages contain 2 or 3 pounds of adult bees, without brood or comb.

Pollen. Dustlike material produced in the male parts of flowering plants and necessary on the female parts of the flower for seed production.

Pollen basket. Area on the hindleg of a bee adapted for carrying a pellet of pollen.

Pollination. The transfer of pollen from the male parts of a flower to the female parts of the same flower or another flower of the same species.

Proboscis. The tongue of a bee.

Propolis. Resinous substance, orangey-brown to red in color, obtained by honeybees from certain trees and utilized to close small openings or cover objectionable objects within the hive.

Pupa. Stage in the life of a developing bee when the larval body is reorganized into that of the adult.

Queen. Sexually developed female bee, and under normal conditions, the mother of all the other bees in the colony.

Queen cell. The cell in which the queen develops. The queen cell is the largest cell built and hangs vertically in the hive, while the others are horizontal.

Royal jelly. Food secreted by worker bees and placed in queen cells for larval food.

Sideliner. One who keeps bees on a part-time basis. The industry generally considers sideliners as maintaining 25-299 bee colonies.

Skep. Beehive made of straw.

Smoker. Device used to blow smoke on bees to reduce stinging.

Super. Extra division of the hive above the brood nest area in which frames of honeycomb are placed, usually for honey storage.

Swarm. Natural division of a colony of bees.

Thorax. The middle part of a bee.

Tracheae. The breathing tubes of insects.

Wax glands. Glands on the underside of the bee abdomen from which wax is secreted after the bee has been gorged with food.

Wax moth. An insect whose larvae destroy wax combs.

Worker bee. The name given to a sexually underdeveloped female bee.

Worker egg. Fertilized bee egg.

Appendix table 1—Colonies of honeybees, honey and beeswax production, and yield per colony, price, and value, United States, 1945-93 crop years

Crop year	Colonies	Honey production				Beeswax production			
		Yield per colony	Quantity	Average price	Value[1]	Yield per colony	Quantity	Average price	Value[2]
	Thousands	*Pounds*	*Million pounds*	*Cents per pound*	*Million dollars*	*Pounds*	*Million pounds*	*Cents per pound*	*Million dollars*
1945	5,460	42.7	233.1	18.6	43.4	0.82	4.5	41.6	1.9
1946	5,787	36.9	213.8	24.4	52.2	0.76	4.4	44.3	2.0
1947	5,916	38.6	228.6	24.9	56.9	0.76	4.5	45.6	2.0
1948	5,724	36.0	206.3	17.9	36.9	0.70	4.0	41.7	1.7
1949	5,578	40.6	226.3	15.0	33.9	0.73	4.1	38.4	1.6
1950	5,612	41.5	233.0	15.3	35.6	0.77	4.3	42.8	1.8
1951	5,559	46.4	258.1	16.0	41.2	0.85	4.7	50.4	2.4
1952	5,493	49.5	272.0	16.2	44.1	0.87	4.8	43.1	2.1
1953	5,520	40.5	223.8	16.5	36.9	0.74	4.1	41.0	1.7
1954	5,451	39.7	216.4	17.0	36.9	0.73	4.0	44.1	1.8
1955	5,252	48.6	255.2	17.8	45.4	0.88	4.6	51.2	2.4
1956	5,195	41.2	214.0	19.0	40.7	0.79	4.1	54.6	2.2
1957	5,199	46.4	241.2	18.7	45.1	0.87	4.5	57.0	2.6
1958	5,152	50.6	260.5	17.4	45.3	0.91	4.7	46.0	2.2
1959	5,109	46.3	236.6	17.0	40.2	0.82	4.2	44.4	1.9
1960	5,005	48.5	242.8	17.9	43.5	0.88	4.4	44.0	1.9
1961	4,992	51.3	255.9	18.0	46.1	0.94	4.7	44.1	2.1
1962	4,900	50.9	249.6	17.4	43.4	0.98	4.8	44.1	2.1
1963	4,849	55.0	266.8	18.0	48.0	0.99	4.8	44.2	2.1
1964	4,840	51.9	251.2	18.6	46.7	0.97	4.7	44.3	2.1
1965	4,718	51.3	241.8	17.8	43.0	1.00	4.7	44.9	2.1
1966	4,646	52.0	241.6	17.4	42.0	0.99	4.6	46.5	2.1
1967	4,635	46.6	215.8	15.6	33.7	0.95	4.4	58.8	2.6
1968	4,539	42.2	191.4	16.9	32.3	0.84	3.8	61.6	2.3
1969	4,433	60.3	267.5	17.5	46.8	1.17	5.2	61.1	3.2
1970	4,285	51.7	221.7	17.4	38.6	1.03	4.4	60.2	2.6
1971	4,107	48.2	197.8	21.8	43.1	0.88	3.6	61.3	2.2
1972	4,085	52.8	215.6	30.2	65.1	0.98	4.0	62.1	2.5
1973	4,124	58.0	239.1	44.4	106.1	1.04	4.3	74.4	3.2
1974	4,210	44.6	187.9	51.0	95.8	0.83	3.5	114.0	4.0
1975	4,206	47.4	199.2	50.5	100.6	0.81	3.4	103.0	3.5
1976	4,269	46.4	198.0	49.9	98.8	0.79	3.4	112.0	3.8
1977	4,323	41.2	178.1	52.9	94.3	0.71	3.1	158.0	4.9
1978	4,090	56.6	231.5	54.6	126.5	0.96	3.9	174.0	6.8
1979	4,163	57.3	238.7	59.3	141.5	0.91	3.8	175.0	6.7
1980	4,141	48.2	199.8	61.5	122.8	0.94	3.9	183.0	7.1
1981	4,213	44.1	185.9	63.2	117.6	0.87	3.7	191.0	7.1
1982[3]	4,250	54.1	230.0	56.8	130.6	NA	NA	NA	NA
1983[3]	4,275	48.0	205.0	54.4	111.5	NA	NA	NA	NA
1984[3]	4,300	38.4	165.1	49.5	81.7	NA	NA	NA	NA
1985[3]	4,325	34.7	150.1	45.5	68.3	NA	NA	NA	NA
1986[4]	3,205	62.5	200.4	51.3	102.7	NA	NA	NA	NA
1987[4]	3,190	71.1	226.8	50.3	113.7	NA	NA	NA	NA
1988[4]	3,219	66.3	214.1	50.0	108.0	NA	NA	NA	NA
1989[4]	3,443	51.4	177.0	49.8	89.4	NA	NA	NA	NA
1990[4]	3,210	61.6	197.8	53.7	107.7	NA	NA	NA	NA
1991[4]	3,181	68.9	219.2	55.6	121.9	NA	NA	NA	NA
1992[4]	3,030	72.8	220.6	55.0	121.3	NA	NA	NA	NA
1993[4]	2,876	80.1	230.4	54.4	125.3	NA	NA	NA	NA

NA = Not available. [1]Represents the quantity of honey produced multiplied by the price of all domestic honey for 1945-71 and 1982-85 and estimates by NASS, USDA, for 1972-81 and 1986-93. [2]Represents the quantity of beeswax produced multiplied by the average price of beeswax. [3]Data not reported by NASS, USDA. Estimated by ASCS, USDA. [4]NASS,USDA, reinstated annual reporting of honey data. Data now based on beekeepers with five or more colonies.

Sources: National Agricultural Statistics Service (NASS) and Agricultural Stabilization and Conservation Service (ASCS), USDA.

Appendix table 2—Colony numbers, yield per colony, and honey production, by State, 1986-93 crop years[1]

State	Number of colonies				Yield per colony				Honey production			
	1986	1987	1988	1989	1986	1987	1988	1989	1986	1987	1988	1989
	Thousands				*Pounds*				*Thousand pounds*			
Alabama	41	46	42	41	42	35	42	20	1,722	1,610	1,764	820
Arizona	77	73	73	78	50	47	49	45	3,850	3,431	3,577	3,510
Arkansas	21	29	34	34	64	69	67	61	1,344	2,001	2,278	2,074
California	520	500	520	560	52	33	40	34	27,040	16,500	20,800	19,040
Colorado	41	44	48	50	78	73	83	66	3,198	3,212	3,984	3,300
Connecticut	3	2	2	2	20	34	46	40	60	68	92	80
Delaware	1	1	1	1	25	29	26	10	25	29	26	10
Florida	290	240	240	250	75	79	105	60	21,750	18,960	25,200	15,000
Georgia	115	120	115	116	41	38	41	27	4,715	4,560	4,715	3,132
Hawaii	9	9	9	9	147	190	179	135	1,323	1,710	1,611	1,215
Idaho	100	105	112	140	45	60	53	54	4,500	6,300	5,936	7,560
Illinois	30	28	28	29	27	75	69	38	810	2,100	1,932	1,102
Indiana	27	25	29	28	23	58	65	35	621	1,450	1,885	980
Iowa	40	44	49	67	59	103	129	90	2,360	4,532	6,321	6,030
Kansas	47	46	42	37	85	51	69	46	3,995	2,346	2,898	1,702
Kentucky	15	14	12	12	15	25	40	29	225	350	480	348
Louisiana	35	35	38	35	58	75	90	85	2,030	2,625	3,420	2,975
Maine	9	9	14	17	17	46	26	24	153	414	364	408
Maryland	8	7	7	9	28	35	25	16	224	245	175	144
Massachusetts	10	11	15	8	15	15	18	23	150	165	270	184
Michigan	80	80	95	102	56	68	73	70	4,480	5,440	6,935	7,140
Minnesota	136	150	150	165	78	108	129	92	10,608	16,200	19,350	15,180
Mississippi	23	19	21	24	54	60	66	33	1,242	1,140	1,386	792
Missouri	30	30	30	33	53	65	80	62	1,590	1,950	2,400	2,046
Montana	110	95	105	100	64	102	48	63	7,040	9,690	5,040	6,300
Nebraska	100	120	113	119	76	92	96	62	7,600	11,040	10,848	7,378
Nevada	9	11	9	15	40	30	30	54	360	330	270	810
New Hampshire	1	1	1	1	14	32	34	35	14	32	34	35
New Jersey	16	25	30	25	30	34	31	23	480	850	930	575
New Mexico	19	19	21	23	63	50	57	50	1,197	950	1,197	1,150
New York	92	90	94	94	32	44	59	59	2,944	3,960	5,546	5,546
North Carolina	18	20	21	25	30	48	46	38	540	960	966	950
North Dakota	290	280	230	290	107	110	66	56	31,030	30,800	15,180	16,240
Ohio	59	55	50	53	26	50	48	20	1,534	2,750	2,400	1,060
Oklahoma	15	10	10	9	48	70	55	65	720	700	550	585
Oregon	59	55	60	63	43	42	52	39	2,537	2,310	3,120	2,457
Pennsylvania	50	48	45	41	32	39	46	39	1,600	1,872	2,070	1,599
Rhode Island	1	1	1	1	15	32	39	39	15	32	39	39
South Carolina	15	15	14	15	25	34	40	19	375	510	560	285
South Dakota	201	250	245	230	113	134	74	49	22,713	33,500	18,130	11,270
Tennessee	36	35	35	25	32	55	40	25	1,152	1,925	1,400	625
Texas	117	110	114	140	62	74	76	56	7,254	8,140	8,664	7,840
Utah	35	35	36	47	45	48	41	44	1,575	1,688	1,476	2,068
Vermont	7	7	7	6	17	46	51	61	119	322	357	366
Virginia	30	25	25	23	38	48	56	20	1,140	1,200	1,400	460
Washington	75	75	65	70	48	55	47	46	3,600	4,125	3,055	3,220
West Virginia	17	21	30	32	30	41	35	44	510	861	1,050	1,408
Wisconsin	85	83	93	108	50	97	99	74	4,250	8,051	9,207	7,992
Wyoming	40	37	39	41	52	78	73	47	2,080	2,886	2,847	1,927
Other States[2]												
United States[3]	3,205	3,190	3,219	3,443	62.5	71.1	66.3	51.4	200,394	226,822	214,135	176,957

See footnotes at end of table.

Continued—

Appendix table 2—Colony numbers, yield per colony, and honey production, by State, 1986-93 crop years[1]—Continued

State	Number of colonies				Yield per colony				Honey production			
	1990	1991	1992	1993	1990	1991	1992	1993	1990	1991	1992	1993
	Thousands				*Pounds*				*Thousand pounds*			
Alabama	29	23	25	19	38	24	41	45	1,102	552	1,025	855
Arizona	67	75	70	55	48	50	54	77	3,216	3,750	3,780	4,235
Arkansas	42	47	45	50	84	79	65	73	3,528	3,713	2,925	3,650
California	480	520	470	500	42	63	67	90	20,160	32,760	31,490	45,000
Colorado	55	50	52	53	64	79	74	73	3,520	3,950	3,848	3,869
Connecticut	2	[2]	[2]	[2]	52	[2]	[2]	[2]	104	[2]	[2]	[2]
Delaware	1	[2]	[2]	[2]	11	[2]	[2]	[2]	11	[2]	[2]	[2]
Florida	220	225	220	200	95	83	104	113	20,900	18,675	22,880	22,600
Georgia	111	102	85	80	50	42	55	56	5,550	4,284	4,675	4,480
Hawaii	10	10	9	9	157	131	138	177	1,570	1,310	1,242	1,593
Idaho	140	140	135	133	40	46	51	71	5,600	6,440	6,885	9,443
Illinois	23	21	16	15	40	52	53	48	920	1,092	848	720
Indiana	22	21	15	12	47	50	31	66	1,034	1,050	465	792
Iowa	70	70	65	60	54	59	62	49	3,780	4,130	4,030	2,940
Kansas	36	35	28	23	67	52	58	57	2,412	1,820	1,624	1,311
Kentucky	8	7	4	4	44	25	30	60	352	175	120	240
Louisiana	38	40	45	47	89	70	107	86	3,382	2,800	4,815	4,042
Maine	20	13	15	15	24	42	22	36	480	546	330	540
Maryland	7	7	6	7	19	25	23	27	133	175	138	189
Massachusetts	15	[2]	[2]	[2]	13	[2]	[2]	[2]	195	[2]	[2]	[2]
Michigan	100	105	95	90	80	73	68	77	8,000	7,665	6,460	6,930
Minnesota	170	180	190	180	74	91	90	80	12,580	16,380	17,100	14,400
Mississippi	24	28	25	17	62	36	65	61	1,488	1,008	1,625	1,037
Missouri	30	28	25	24	63	65	77	78	1,890	1,820	1,925	1,872
Montana	98	86	87	87	81	92	110	98	7,938	7,912	9,570	8,526
Nebraska	118	108	96	83	56	67	75	70	6,608	7,236	7,200	5,810
Nevada	17	15	15	14	58	54	65	52	986	810	975	728
New Hampshire	1	[2]	[2]	[2]	54	[2]	[2]	[2]	54	[2]	[2]	[2]
New Jersey	15	11	8	9	21	31	22	28	315	341	176	252
New Mexico	29	20	18	18	71	77	68	64	2,059	1,540	1,224	1,152
New York	81	77	70	65	54	62	66	62	4,374	4,774	4,620	4,030
North Carolina	20	18	15	15	50	58	45	53	1,000	1,044	675	795
North Dakota	210	215	240	220	82	103	91	90	17,220	22,145	21,840	19,800
Ohio	42	48	43	35	51	61	33	66	2,142	2,928	1,419	2,310
Oklahoma	9	9	9	6	50	70	52	67	450	630	468	402
Oregon	61	56	52	53	42	46	49	67	2,562	2,576	2,548	3,551
Pennsylvania	41	40	30	28	28	45	41	40	1,148	1,800	1,230	1,120
Rhode Island	1	[2]	[2]	[2]	31	[2]	[2]	[2]	31	[2]	[2]	[2]
South Carolina	12	11	11	11	41	61	69	90	492	671	759	990
South Dakota	245	225	240	245	81	101	85	98	19,845	22,725	20,400	24,010
Tennessee	19	14	7	8	33	38	43	51	627	532	301	408
Texas	140	140	125	105	67	78	85	82	9,380	10,920	10,625	8,610
Utah	47	45	47	42	37	34	56	53	1,739	1,530	2,632	2,226
Vermont	6	6	6	6	65	75	63	82	390	450	378	492
Virginia	16	16	13	10	34	33	38	54	544	528	494	540
Washington	80	85	80	60	55	42	44	45	4,400	3,570	3,520	2,700
West Virginia	30	26	23	20	30	24	55	37	900	624	1,265	740
Wisconsin	112	110	105	100	75	67	66	82	8,400	7,370	6,930	8,200
Wyoming	40	41	41	34	57	52	70	55	2,280	2,132	2,870	1,870
Other States[2]		12	9	9		21	26	40		252	234	360
United States[3]	3,210	3,181	3,030	2,876	61.6	68.9	72.8	80.1	197,791	219,171	220,584	230,368

[1]Data based on beekeepers with five or more colonies.
[2]Not reported separately after 1990 to avoid disclosing data for individual operations.
[3]Total may not add due to rounding.

Source: National Agricultural Statistics Service, USDA.

Appendix table 3—World honey production, imports, and exports in selected countries, 1976-93

Year[1]	Russia[2]	China	United States	Mexico	Canada	Argentina	Brazil	Australia	Germany[3]	Japan	Total
						Million pounds					
Production:											
1976	414.5	121.3	198.0	105.5	56.0	61.7	26.5	47.2	48.5	13.4	1,092.6
1977	458.6	132.2	178.1	132.3	56.0	48.5	30.9	32.8	44.1	13.7	1,127.2
1978	394.6	165.3	231.5	119.0	67.5	77.2	35.3	40.3	33.1	18.7	1,182.5
1979	416.7	242.5	238.7	114.6	72.5	66.1	39.7	55.1	21.8	16.5	1,284.2
1980	403.4	178.6	199.8	132.3	64.4	72.8	44.1	43.0	29.8	13.7	1,181.9
1981	405.6	242.5	185.9	132.3	72.5	66.1	52.9	54.7	30.9	13.3	1,256.7
1982	410.1	299.8	230.0	99.2	67.3	72.8	55.1	49.4	39.7	16.2	1,339.6
1983	463.0	304.2	205.0	149.9	85.5	66.1	48.5	55.0	41.9	15.1	1,434.2
1984	425.5	308.6	165.1	132.3	95.5	77.2	55.1	61.7	35.3	15.0	1,371.3
1985	449.7	330.7	150.1	123.5	79.6	99.2	61.7	59.2	39.7	15.9	1,409.3
1986	463.0	352.7	200.4	119.0	75.0	79.4	59.5	55.3	35.3	12.2	1,451.8
1987	483.3	449.7	226.8	105.5	87.7	97.0	67.2	61.7	35.3	13.3	1,627.5
1988	535.7	343.9	214.1	101.7	81.8	101.4	66.1	60.9	39.7	10.7	1,556.0
1989	496.0	416.7	177.0	107.0	61.3	88.2	70.5	57.8	63.9	11.8	1,550.2
1990	520.8	425.5	197.8	112.4	70.8	103.6	66.1	60.8	50.7	10.7	1,619.2
1991	529.1	454.1	219.2	129.6	69.7	119.0	71.2	55.7	55.1	9.3	1,712.0
1992	103.6	449.7	220.6	107.7	65.3	134.5	61.7	55.1	54.4	8.4	1,261.0
1993	110.2	445.3	230.4	121.3	68.3	105.8	NA	NA	61.7	8.4	1,151.4
Imports:											
1976	0.0	0.0	66.4	0.0	4.0	0.0	0.0	0.0	110.4	52.4	233.2
1977	0.0	0.0	63.9	0.0	0.4	0.0	0.0	0.0	113.0	54.8	232.1
1978	0.0	0.0	56.0	0.0	0.5	0.0	0.0	0.0	127.1	53.9	237.5
1979	0.0	0.0	58.6	0.0	0.6	0.0	0.0	0.0	137.0	54.3	250.5
1980	0.0	0.0	49.0	0.0	0.6	0.0	0.0	0.0	144.6	44.3	238.5
1981	0.0	0.0	77.3	0.0	1.0	0.0	0.0	0.0	165.2	56.1	299.6
1982	0.0	0.0	92.0	0.0	0.5	0.0	0.0	0.0	168.5	62.1	323.1
1983	0.0	0.0	109.8	0.0	0.6	0.0	0.0	0.2	145.5	73.1	329.2
1984	0.0	0.0	128.7	0.0	0.4	0.0	1.0	0.3	163.1	73.1	366.6
1985	0.0	0.0	138.2	0.0	0.5	0.0	1.0	0.2	174.2	61.8	375.9
1986	0.0	0.0	120.0	0.0	0.6	0.0	1.3	0.0	191.8	80.1	393.8
1987	0.0	0.0	58.3	0.0	0.9	0.0	2.8	0.5	183.0	88.5	334.0
1988	0.0	0.0	55.9	[4]	1.0	0.0	2.1	0.9	186.2	83.0	329.1
1989	0.0	0.0	77.3	0.2	1.4	0.0	4.7	0.1	186.2	118.6	388.5
1990	0.0	0.0	77.0	[4]	1.2	0.0	6.0	0.1	174.1	146.5	404.9
1991	0.0	0.0	92.2	[4]	0.9	0.0	4.9	0.1	196.6	86.6	381.3
1992	0.0	[4]	114.6	[4]	1.4	0.0	0.9	0.2	196.7	71.0	384.8
1993	0.0	[4]	125.9	[4]	1.8	0.0	NA	NA	204.6	83.8	416.1
Exports:											
1976	15.9	44.2	4.7	105.5	10.5	65.5	2.0	25.3	4.4	0.0	278.0
1977	19.7	36.0	5.5	117.4	19.8	47.9	3.1	14.5	5.4	0.0	269.3
1978	22.4	42.2	8.0	99.4	14.7	79.1	8.2	9.4	8.4	0.0	291.8
1979	24.2	90.3	8.8	92.1	18.0	55.1	4.0	16.4	14.0	0.0	322.9
1980	27.6	102.4	8.5	86.9	24.0	43.3	2.5	25.2	18.3	0.0	338.7
1981	31.1	122.9	9.2	102.8	18.1	63.3	1.7	11.2	29.8	0.0	390.1
1982	30.2	145.6	8.5	88.2	21.5	65.9	0.5	28.3	29.1	0.0	417.8
1983	43.8	117.1	7.5	131.2	21.0	64.5	4/	23.9	19.8	0.0	428.8
1984	53.4	110.2	7.5	119.1	41.6	58.6	4/	38.4	22.0	0.0	450.8
1985	50.0	120.8	6.5	94.4	38.1	93.0	1.9	32.3	30.9	0.0	467.9
1986	45.4	177.7	9.2	127.8	26.1	68.2	4.3	26.2	35.3	0.0	520.2
1987	46.0	147.3	12.4	87.2	24.0	80.0	0.9	26.0	33.1	0.0	456.9
1988	38.4	102.5	14.0	86.3	31.3	91.4	0.5	29.9	33.1	0.0	427.4
1989	38.1	157.6	10.0	84.2	46.6	74.6	0.8	29.5	35.3	0.2	476.9
1990	37.7	194.0	12.4	96.4	17.1	87.5	[4]	27.0	35.3	[4]	507.4
1991	30.9	154.2	9.6	110.4	22.6	104.0	0.2	22.9	26.5	[4]	481.3
1992	2.9	202.3	10.4	81.3	24.5	121.6	0.2	22.3	29.2	[4]	494.7
1993	2.6	176.4	8.8	94.8	22.0	97.0	NA	NA	38.6	[4]	440.2

NA = Not available. [1]Calendar year for all except Australia, which begins in July of the indicated year. [2]Includes all the republics of the former Soviet Union prior to 1992, and only Russia since 1992. [3]Includes only West Germany prior to 1991. East Germany is included beginning in 1991. [4]Less than 100,000 pounds. Source: *World Honey Situation*, FAS, USDA.

Appendix table 4—U.S. honey imports, by country of origin, 1976-92 calendar years

Country of origin	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
								Million pounds									
Argentina	18.5	9.1	15.4	0.9	1.4	12.2	16.5	19.4	22.7	31.4	22.0	11.3	11.7	10.5	19.4	20.4	31.1
Australia	2.7	[1]	[1]	0.5	[1]	1.9	6.3	3.0	3.8	6.7	4.2	[1]	[1]	0.2	2.5	0.1	[1]
Brazil	2.0	2.2	8.8	4.7	1.8	1.8	0.7	[1]	[1]	1.4	4.1	0.9	0.3	0.4	0.2	0.0	0.0
Canada	5.5	15.1	8.8	9.5	17.4	11.2	14.6	15.4	34.4	32.1	19.4	14.2	11.4	27.4	7.6	14.2	16.8
China	0.6	0.6	0.7	18.0	17.5	19.0	17.5	19.3	12.1	22.6	36.5	19.4	19.8	24.9	25.5	44.8	60.1
Dominican Republic	0.7	0.8	1.3	1.3	1.0	1.2	1.7	1.0	1.7	1.6	1.5	0.5	0.5	0.4	0.4	0.2	0.5
El Salvador	0.6	1.0	0.3	0.7	[1]	1.1	1.1	1.2	1.5	1.8	3.0	0.3	0.2	0.1	0.2	0.3	0.0
Germany[2]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	0.3	0.4	0.3	2.3	0.8	0.3	0.3	0.2
Guatemala	0.7	1.2	0.2	0.6	[1]	0.8	1.4	1.8	1.3	1.5	1.1	0.7	0.4	0.4	0.5	0.3	0.3
Honduras	0.7	0.2	0.4	0.5	0.1	0.7	1.5	1.0	1.1	1.1	1.3	[1]	[3]	[3]	[3]	[3]	[3]
Hong Kong	0.0	[1]	[1]	0.3	0.2	0.4	[1]	[1]	0.1	0.6	0.6	[1]	0.2	0.3	0.3	[1]	0.2
Hungary	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	2.2	0.4	0.4	4.4	2.7	2.5	2.6	[1]
Japan	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	0.1	0.3	[1]	0.0	[1]	0.1	0.5	0.2
Mexico	31.0	32.7	18.3	20.3	8.4	24.9	27.6	44.1	46.1	33.7	23.2	9.1	3.2	6.5	16	7.9	4.7
Russia[4]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[1]	0.7	0.5	0.8	1.8	0.6	0.1	[1]
Switzerland	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	0.4	0.2	0.2	[1]	0.4	0.2	[1]	[1]
Other	3.4	1.0	1.8	1.3	1.2	2.1	3.1	3.6	3.9	0.7	1.1	0.5	0.7	0.5	0.5	0.5	0.5
Total volume	66.4	63.9	56.0	58.6	49.0	77.3	92.0	109.8[1]	28.7	138.2	120.0	58.3	55.9	77.3	77.0	92.2	114.6

[1]Less than 100,000 pounds.
[2]Includes only West Germany prior to 1991. East Germany is included beginning in 1991.
[3]Any imports are included in other category.
[4]Includes all the republics of the former Soviet Union prior to 1992, and only Russia since 1992.

Source: U.S. Department of Commerce, Bureau of the Census.

Appendix table 5—U.S. honey exports, by country of destination, 1976-92 calendar years

Country of origin	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
								Million pounds									
Belgium-Luxembourg	[1]	[1]	[1]	0.1	[1]	0.1	[1]	[1]	[1]	[1]	0.2	0.3	0.2	[1]	0.2	0.1	0.4
Canada	0.4	0.3	0.5	0.4	0.5	0.4	0.4	0.5	0.8	0.3	0.2	0.5	0.4	0.7	0.9	0.9	1.0
China	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	[1]	1.0
France	[2]	0.1	0.3	0.6	0.2	0.2	0.3	0.1	[1]	[1]	0.1	0.2	[1]	[1]	0.2	0.2	[1]
Germany[3]	1.1	1.6	1.8	1.6	1.8	2.1	2.1	1.0	0.6	0.8	3.2	4.8	4.5	1.7	3.1	1.6	0.4
Hong Kong	[2]	[2]	[1]	[1]	0.1	0.2	0.2	0.1	0.1	0.3	0.3	0.9	0.3	0.1	[1]	0.2	0.2
Japan	0.7	0.5	0.7	0.6	0.5	0.5	1.0	0.8	0.7	1.1	0.6	0.7	0.9	1.0	1.5	0.5	1.0
Mexico	[2]	[2]	[2]	[2]	[2]	[2]	[1]	[1]	[1]	0.2	0.0	0.0	0.4	0.3	[1]	[1]	0.0
Kuwait	[2]	[2]	0.1	[1]	0.2	0.4	0.2	0.4	0.6	0.6	0.5	0.5	0.5	0.6	0.3	0.2	0.3
Netherlands	0.7	0.5	1.4	1.6	1.0	1.4	1.3	0.7	1.0	0.4	1.5	0.4	0.9	0.2	0.9	0.2	0.6
Philippines	[2]	[2]	[2]	[1]	[1]	[1]	0.2	0.2	[1]	0.0	0.1	[1]	0.6	0.2	0.6	0.2	0.4
Saudi Arabia	0.2	1.0	1.4	1.5	2.1	1.5	1.5	2.2	1.7	1.2	1.2	2.1	3.0	2.6	2.4	2.4	1.5
Singapore	[1]	[1]	0.1	0.2	[1]	[1]	0.1	[1]	[1]	[1]	0.1	0.3	0.6	0.2	0.1	0.1	[1]
Sweden	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	0.1	0.2	0.1	[1]	0.1
United Arab Emirates	[1]	[1]	[1]	0.2	0.3	0.4	0.3	0.3	0.4	0.2	0.3	0.5	0.5	0.4	0.4	0.8	0.4
United Kingdom	0.3	0.1	0.3	0.4	0.3	0.2	0.2	0.2	0.5	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.1
Yemen	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7	1.0	1.8
Other	1.1	1.3	1.3	1.5	1.5	1.7	0.7	0.9	0.7	1.1	0.7	0.8	0.7	1.1	0.8	0.8	1.2
Total volume	4.7	5.5	8.0	8.8	8.5	9.2	8.5	7.5	7.5	6.5	9.2	12.4	14.1	9.9	12.4	9.6	10.4

[1]Less than 100,000 pounds.
[2]Any imports are included in other category.
[3]Includes only West Germany prior to 1991. East Germany is included beginning in 1991.

Source: U.S. Department of Commerce, Bureau of the Census.