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## Commodity Profile: Strawberries

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### Overview

The Roman poets Virgil and Ovid make mention of the strawberry in the first century, while gardeners in England are known to have cultivated strawberry plants from Virginia in the 16th century. Although the California industry was launched at the turn of the 20th century by a variety derived from a Massachusetts seedling, most contemporary commercial strawberries are hybrids of the large and aromatic *Fragaria chiloensis*, a native to the cooler regions of the Pacific slope from Alaska to the tip of Chile (Wilhelm and Sagen).

In 1843 growers in Ohio were the first to ship strawberries using refrigeration and by 1890 it was a regular practice for this highly perishable fruit. This development led to increased markets and increased popularity of strawberries. Since the early 20th century the University of California has played a major role in the development of the strawberry industry, breeding cultivars and developing cultural systems (Alston, Pardey and Carter). Today, strawberries are the fourth highest ranked U.S. fruit in terms of value of production behind grapes, oranges, and apples.

The U.S. strawberry industry is mostly located in the southern and coastal areas in California, with the largest quantity of production occurring in Ventura and Monterey counties because strawberry production is suited best for moderate climates with warm days and low humidity (ERS 2005). Florida and Oregon are the second and third largest producing states respectively, but account for a much smaller share of acreage and production and have much lower yields than California producers. Notably, all of Florida's production is for the fresh market (U.S. Department of State (State Dept.)) and it is the major producer of the winter strawberries in the United States. April and May are the peak shipping months for strawberries, but because of Florida's winter production, U.S. strawberries are marketed year-round. In addition, the adoption of new varieties and integrated production practices, including the annual replanting of nursery grown

transplants to minimize disease, enables the California industry's longer marketing season from January through November. Production moves seasonally from San Diego northward to the Watsonville-Salinas area. In contrast, Oregon's production is mainly for the processing market. In areas with long growing seasons, commercial producers typically rotate their strawberry crop with vegetable crops—broccoli, celery, lettuce, radish, leeks, and artichokes in California and cucurbits and solanaceous crops in Florida (State Dept.).

In 2006, 61 percent of California strawberry acreage was planted in University of California developed varieties, down from 88 percent in 1991. This reflects an increase in proprietary varieties patented by the private sector (California Strawberry Commission).

While the industry is mainly comprised of small farm operations, the larger farms are responsible for the majority of production. The 2002 Census of Agriculture reports strawberry farm operations have become larger with the number of farms decreasing between 1997 and 2002 as acreage remained constant and actually increased in California. In 2002 just 4 percent of farms with 50 acres or more accounted for 60 percent of U.S. harvested strawberry acreage (ERS 2005). According to Carter et al. in 2003 there were about 400 California growers and 60 shippers, the five or six largest shippers marketing over three-quarters of the annual harvest.

### **Demand**

Over the last two decades, strawberries have experienced one of the highest rates of consumption growth of all fruit and vegetables. Strawberries are the fifth highest consumed fresh fruit in the United States, behind bananas, apples, oranges and grapes (ERS 2005). Expanded domestic supply and increased availability, as the industry transitioned from seasonal to year-round production, stimulated consumption. New information on health benefits of strawberry consumption because of their antioxidants, folate, potassium, vitamin C and fiber content also stimulated their consumption.

Per capita consumption of strawberries has increased steadily since 1970 from 2.9 pounds to 6.1 pounds today, rising most significantly in the last 2 decades (Figure 1). In the 1970s, fresh consumption accounted for 60 percent of total consumption until it increased in the mid 1980s. By 2003 fresh consumption accounted for more than 80 percent of total consumption. Per capita consumption of frozen strawberries has not increased at the rate of fresh consumption, remaining at just over 1 pound per capita for most of the last 30 years. Consumption of frozen strawberries peaked in 2001 at 1.6 pounds, the same year that supply of fresh market strawberries and per capita consumption of fresh strawberries decreased from 4.9 to 4.2 pounds per capita.

### **Marketing**

Increasingly, a substantial portion of the California fresh strawberry harvest is presold through an option called a precommitment between shippers and retailers. This enables retailers to commit to newspaper advertisements prior to the harvest. Typically the

contracts set a maximum price but are not legally binding and allow renegotiation for price at time of delivery. The extreme perishability gives retailers an edge (Carter, et al.).

California varieties are suitable for both fresh and processing markets. The fresh berry harvest starts in the South Coast and proceeds north. Later in the season when fresh berry prices are lower due to oversupply or smaller berry size, the crop is sold for processing.

With the exception of Florida, the eastern U.S. strawberry industry primarily consists of small family farms that turn to alternative marketing channels such as “U-pick” operations, roadside stands, and farmers markets (Dept. of State).

### **Supply**

The United States is the world’s largest producer of strawberries, accounting for 28 percent of world supply in 2004 (Figure 2). In 1991, it produced 21 percent. At a distant second, Spain accounted for 8 percent, followed by Russia, Korea, Japan and Poland accounting for 5 to 6 percent each (Food and Agricultural Organization of the United Nations (FAO)).

Total harvested acreage of U.S. strawberries remained relatively stable with intermittent periods of increase throughout much of the 1980s and 1990s (Figure 3). Increases were notable in the early 1980s when acreage increased from 37,000 in 1981 to 43,000 in 1983, and the early 1990s when acreage increased from 46,000 in 1991 to 51,000 in 1993. In the early years of the new millennium, U.S. acreage exceeded the 1993 record, increasing from 46,000 in 2001 to 52,000 in 2004 (National Agricultural Statistics Service (NASS)).

California acreage has continued to increase consistently during the last three and a half decades, increasing by 200 percent from 11,000 acres in 1980 to 33,000 in 2004. Meanwhile, Florida acreage has increased by 40 percent, from 5,000 acres in 1982 to 7,000 in 2004. In 2004 California accounted for 64 percent of total acreage compared to 1980 when its percentage was 30 percent of the total. Florida, the major U.S. producer of winter strawberries and the second largest overall producer, accounted for 14 percent of total U.S. strawberry acreage in 2004. As California and Florida strawberry acreages have increased, acreage in smaller producing states, namely Oregon (2,000 harvested acres in 2004), has decreased.

An increasing amount of strawberries are being produced destined for fresh-market uses. Fresh market production has accounted for roughly 75 percent of total production (Figure 4). However, fresh-market production has increased at a faster rate than production intended for the frozen market. In 2004, 5.1 million hundredweights of frozen strawberries were produced compared to 16.0 million hundredweights of fresh-market strawberries. Much of the fresh-market production increase is due to expanding California acreage in combination with an increased U.S. average yield since California yields are higher than other states (Figure 5). U.S. average yields doubled, from 20,000

pounds per acre in 1980 to more than 40,000 pounds per acre in 2004. California average yields in 2004 were estimated at just under 60,000 pounds per acre, a slight decrease from the 2003 high for California of 64,000 pounds per acre. Meanwhile, Florida yields averaged 23,000 pounds per acre in 2004, also a decrease from a high of 35,000 pounds per acre in 2000. By 2004 California per yields had increased 25 percent since 1980 and were more than four times that of Oregon and more than twice Florida.

With the increase in production of fresh market strawberries, the value of production increased as well. The total value of U.S. strawberry production was valued at \$1.5 billion in 2004. Fresh-market strawberry production alone totaled \$1.33 billion, while the value of processing strawberries was \$136 million (Figure 6). California production in 2004 was valued at \$1.22 billion, or nearly 83 percent of the U.S. total. Florida's contribution, mainly of winter strawberries, accounted for 11.9 percent (\$178 million) of the nearly \$1.5 billion U.S. total. Other significant spring production states were North Carolina and Oregon, each worth \$15.8 million in 2004.

### **Exports**

Although the United States is the largest producer of strawberries in the world, the majority of U. S. strawberries produced are consumed domestically. Thus, in 2004 Spain was the largest exporter in the world. In terms of value, Spain accounted for 45 percent of world strawberry exports and the United States ranked second with 17 percent. Belgium, Mexico, and France rounded out the top five world exporters, each contributing less than 10 percent of the total (Figure 7).

Poland is the leading exporter of frozen strawberries in terms of quantity, with 60-70 percent of its production destined for frozen product uses. However, in 2003, China's exports of frozen strawberries increased dramatically, coming closer to matching Polish export quantity (FAS 2004).

U.S. strawberry trade mainly takes place in North America with the majority of U.S. exports going to Canada and the majority of U.S. imports entering from Mexico. The United States was a net exporter of strawberries, fresh and frozen, by more than \$50 million in 2004. However, both imports and exports have continued to rise over the last decade and a half (Figure 8).

The value of total U.S. strawberry exports has grown from \$90.2 million in 1990 to \$218.7 million in 2004 (Figure 9). The leading export destination in 2004 was Canada, followed by Japan and third, Mexico. Fresh strawberry exports accounted for 88 percent of the total, while frozen and preserved exports accounted for the remaining 12 percent. Exports increased substantially in the early 21st century, mostly due to increased exports to Canada. In 1996 Canada accounted for 47 percent of total exports, with Japan accounting for 38 percent and Mexico for 3 percent. By 2004, Canada accounted for 71 percent of total U.S. strawberry exports, followed by Japan with 18 percent, and Mexico with 5 percent (Figure 9).

## **Imports**

Total U.S. imports of strawberries amounted to \$135.4 million in 2004, following a steady increase from \$36 million in 1989 (Figure 10). More than half (53 percent) of 2004 imports were fresh strawberries, with an additional 42 percent frozen and 5 percent either prepared or preserved. Mexico was the leading exporter to the United States, accounting for 81 percent of all U.S. imports. Conspicuously in 1997, fresh strawberry imports from Mexico fell sharply due to freezing weather and financial constraints in Mexico (Foreign Agricultural Service (FAS)). Of Mexican imports in 2004, 64 percent were fresh, 35 percent frozen, and 2 percent prepared or preserved strawberries. Chile is the second largest source of U.S. strawberry imports, with imports from Chile increasing more noticeably since 2001. In 2004, Chile accounted for 7 percent of total U.S. imports, with 98 percent of all shipments being fresh strawberries. China was the third largest exporter to the United States in 2004, accounting for 5 percent of total shipments, the majority of which were prepared or preserved (Figure 10).

## **Prices**

Grower prices for U.S. strawberries have been variable over the years. However, prices for processing strawberries are generally lower than those of the fresh market (Figure 11). In 2004 fresh market prices for strawberries were \$72.2 per hundredweight (in inflation-adjusted year-2000 dollars) while processing strawberries were valued at \$24.1 per hundredweight. Prices for fresh market strawberries peaked in 1998 at \$76.8, the highest level since the 1980s. Typically, prices follow a seasonal trend, with lowest prices seen from April to June, during peak production, and peak prices in January and February when domestic supplies are lowest.

## **Current Issues**

The widespread practice of using methyl bromide as a preplant soil fumigant against weeds, nematodes and pathogens for strawberry production and in strawberry nurseries continued to be allowed in 2006 under critical use exemptions to the Montreal Protocol on Substances that Deplete the Ozone Layer (and the U.S. Clean Air Act Amendments of 1990 which implements the Montreal Protocol.) Except for critical use exemptions, methyl bromide production and net imports were totally phased out in 2005 (State Dept.). Based on lack of technical or economically feasible alternatives, in January 2006, the U.S. Department of State submitted its fourth annual nomination (this time for 2008) for methyl bromide critical use exemptions to the Ozone Secretariat of the United Nations Environment Programme for review and authorization.

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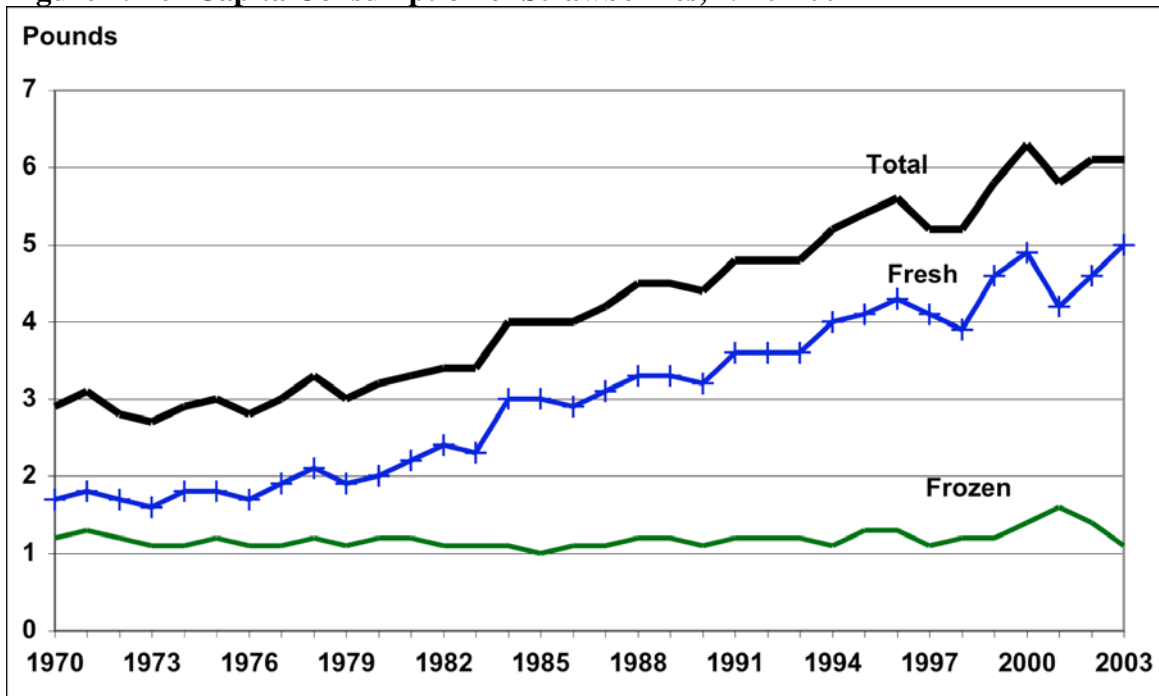
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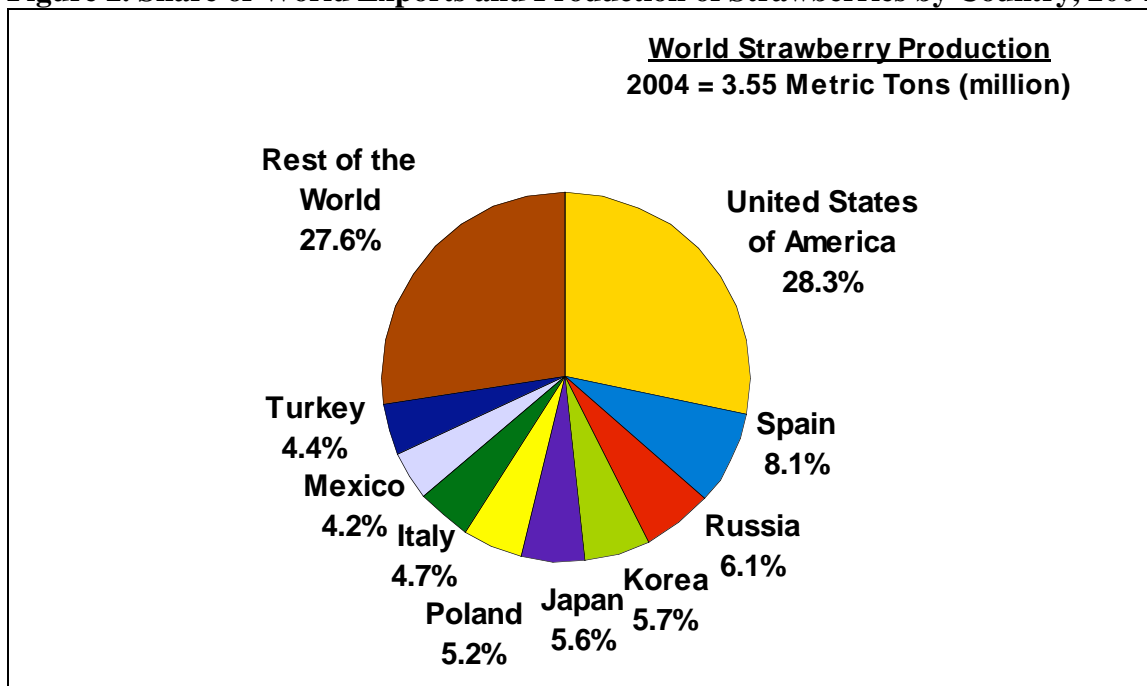
**FIGURES**

**Figure 1. Per Capita Consumption of Strawberries, 1970-2004**



Source: USDA Economic Research Service, Per Capita Data System

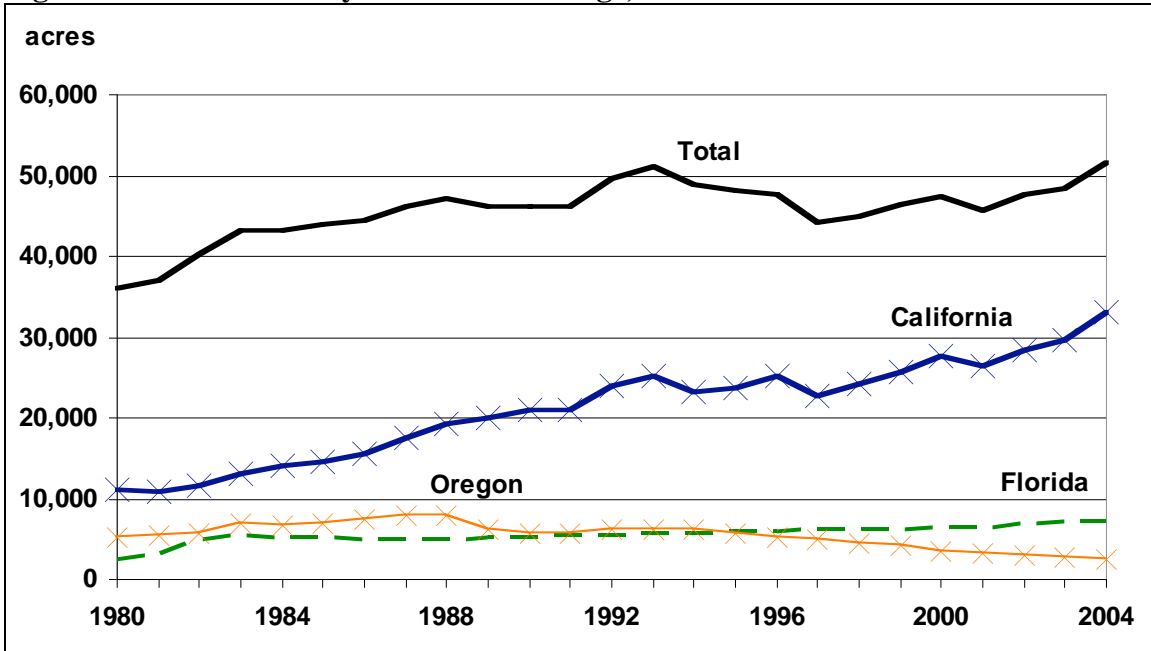
**Figure 2. Share of World Exports and Production of Strawberries by Country, 2004**



Source: Food and Agricultural Organization of the United Nations

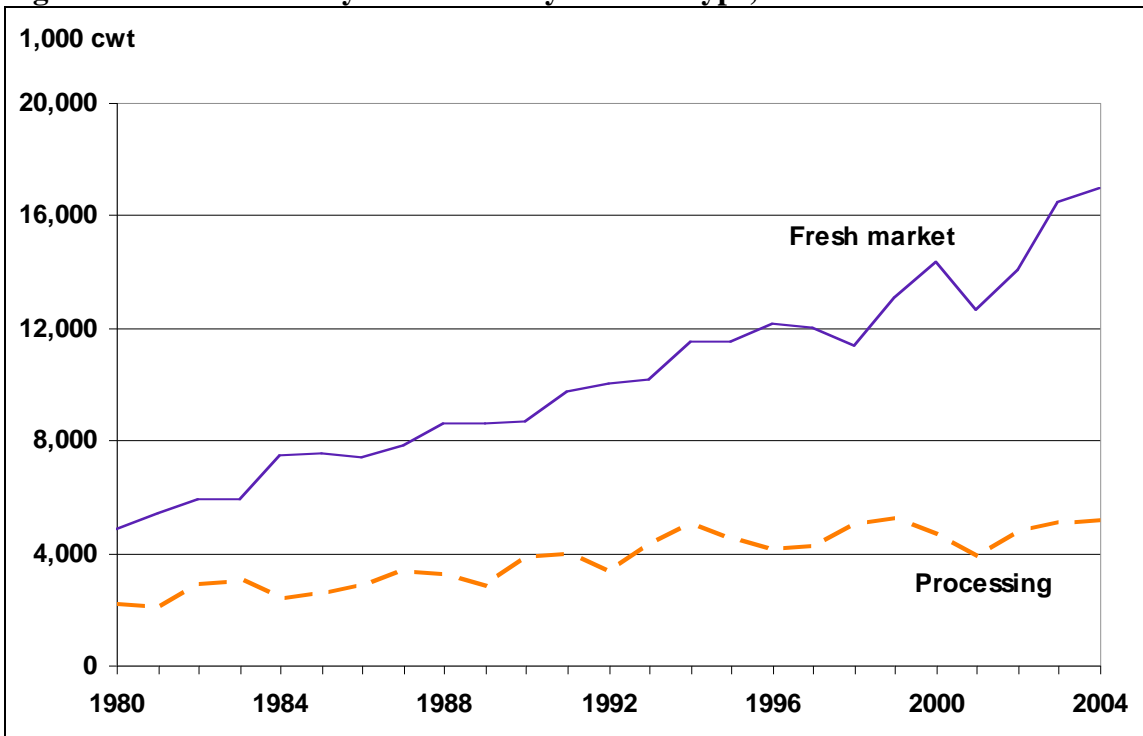


**Figure 3. U.S. Strawberry Harvested Acreage, 1980-2004**



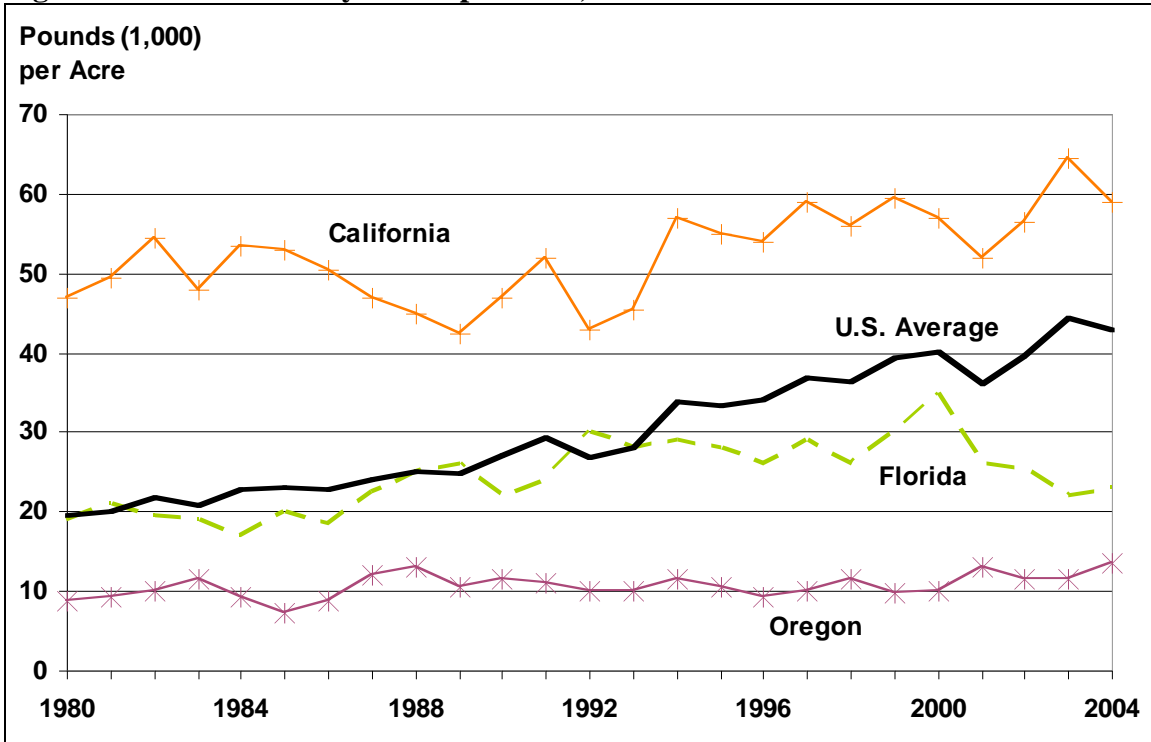
Source: USDA Economic Research Service, the U.S. Strawberry Industry, 1970-2004

**Figure 4. U.S. Strawberry Production by Market Type, 1980-2004**



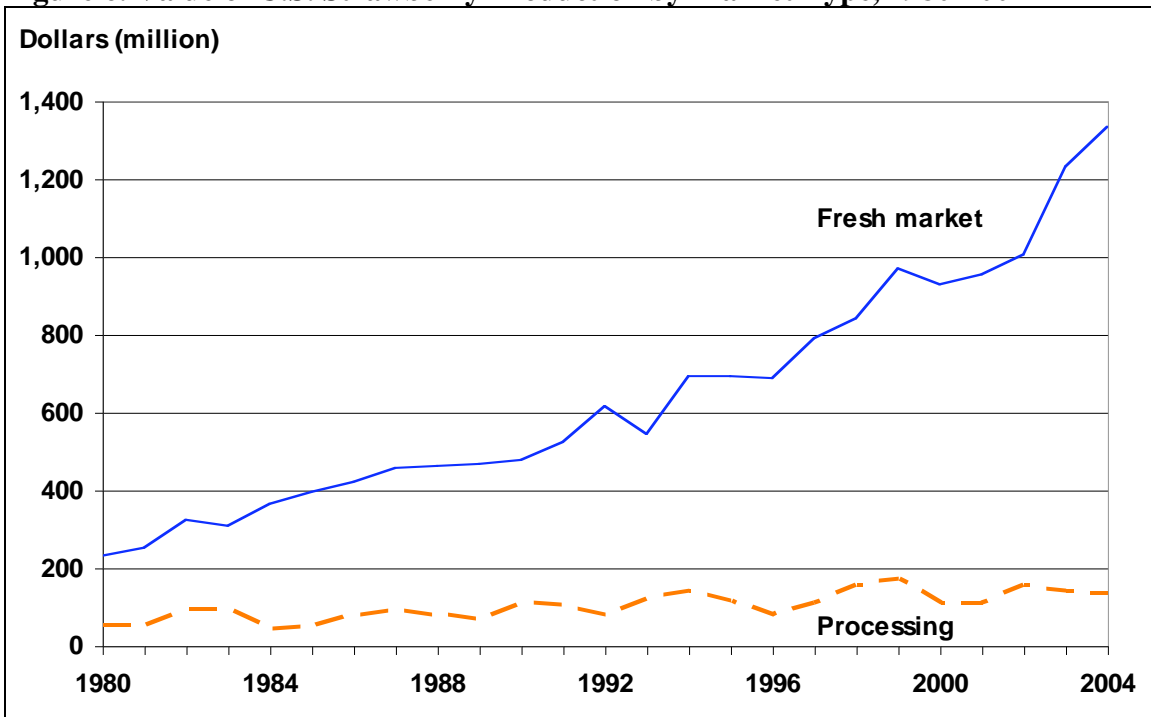
Source: USDA Economic Research Service, the U.S. Strawberry Industry, 1970-2004

**Figure 5. U.S. Strawberry Yields per Acre, 1980-2004**



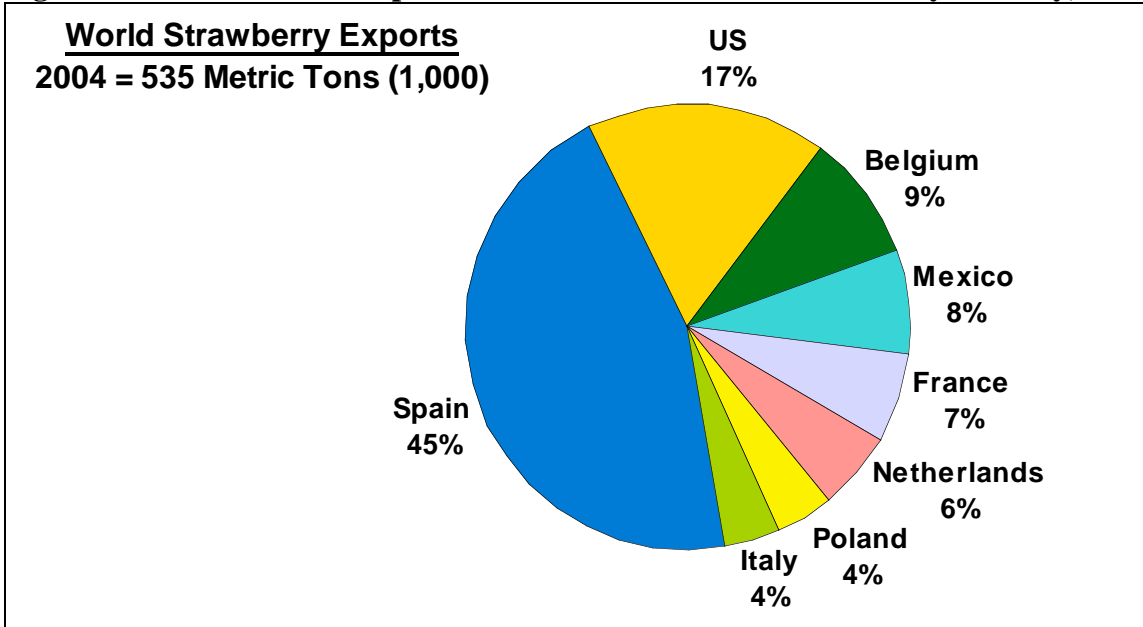
Source: USDA Economic Research Service, *The U.S. Strawberry Industry, 1970-2004*

**Figure 6. Value of U.S. Strawberry Production by Market Type, 1980-2004**



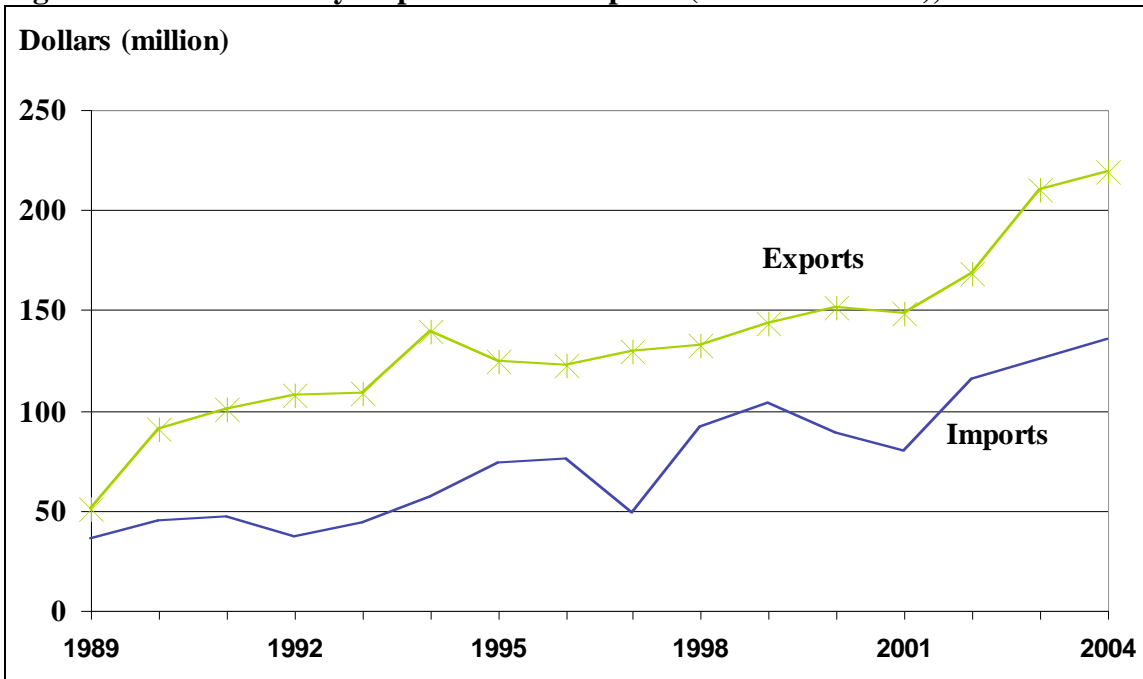
Source: USDA Economic Research Service, *The U.S. Strawberry Industry, 1970-2004*

**Figure 7. Share of World Exports and Production of Strawberries by Country, 2004**



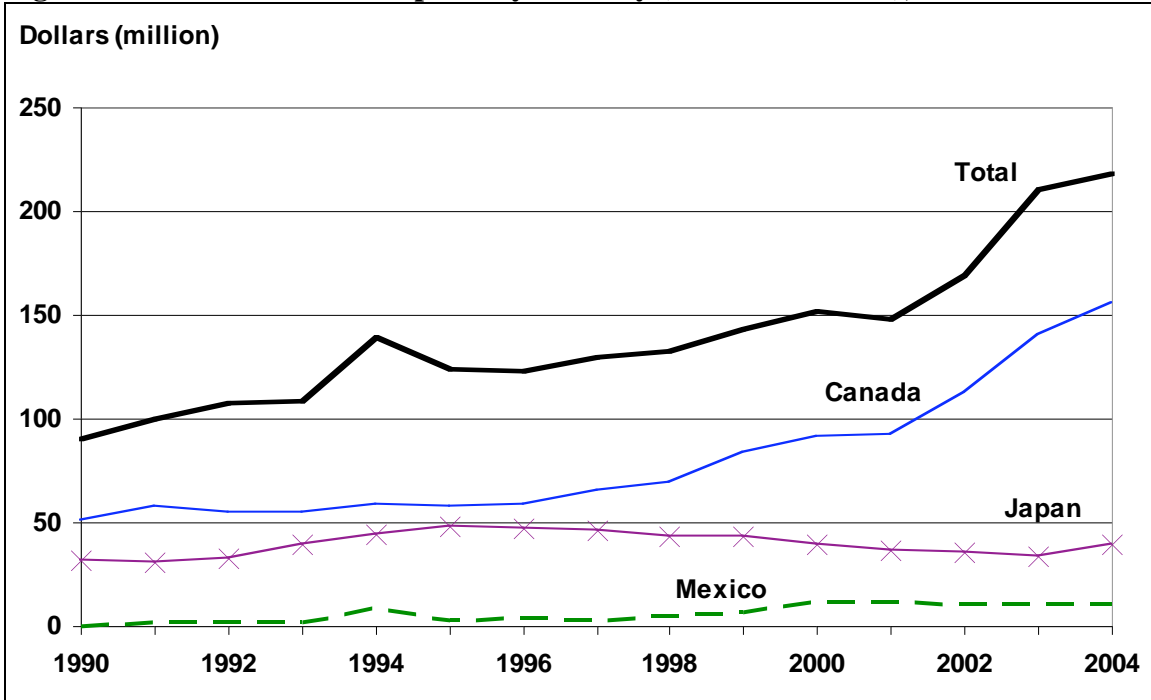
Source: Food and Agricultural Organization of the United Nations

**Figure 8. U.S Strawberry Imports versus Exports (fresh and frozen), 1989-2004**



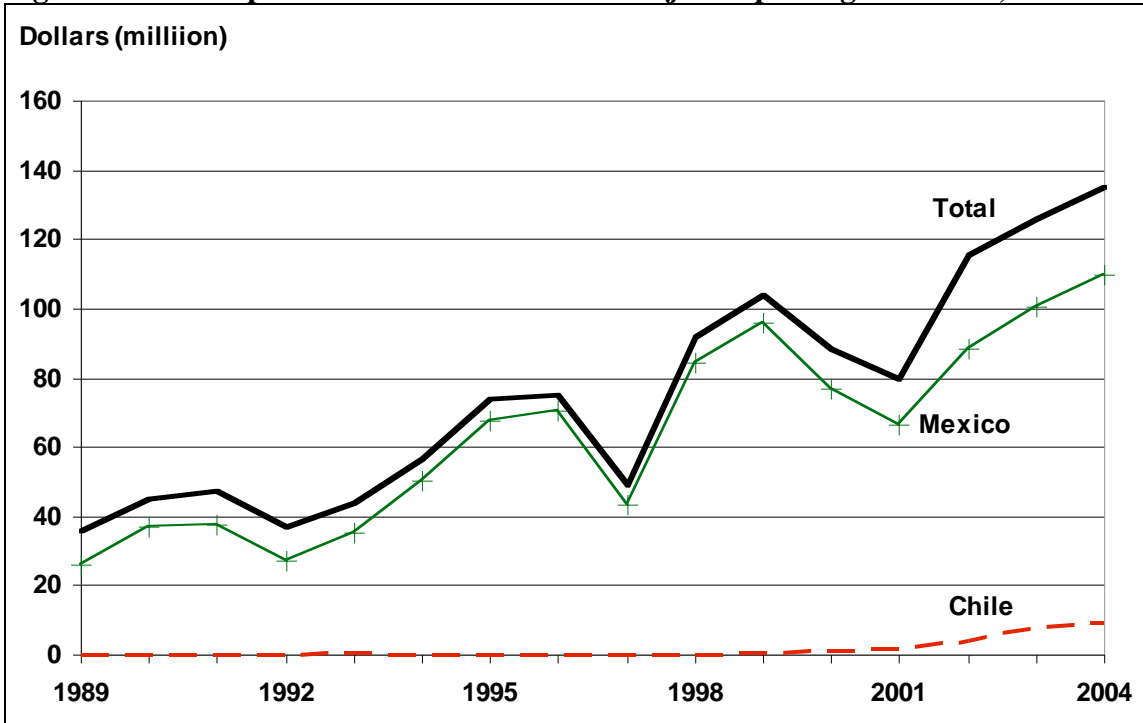
Source: USDA Foreign Agricultural Service

**Figure 9. U.S Strawberries Exports by Country (fresh and frozen), 1990-2004**



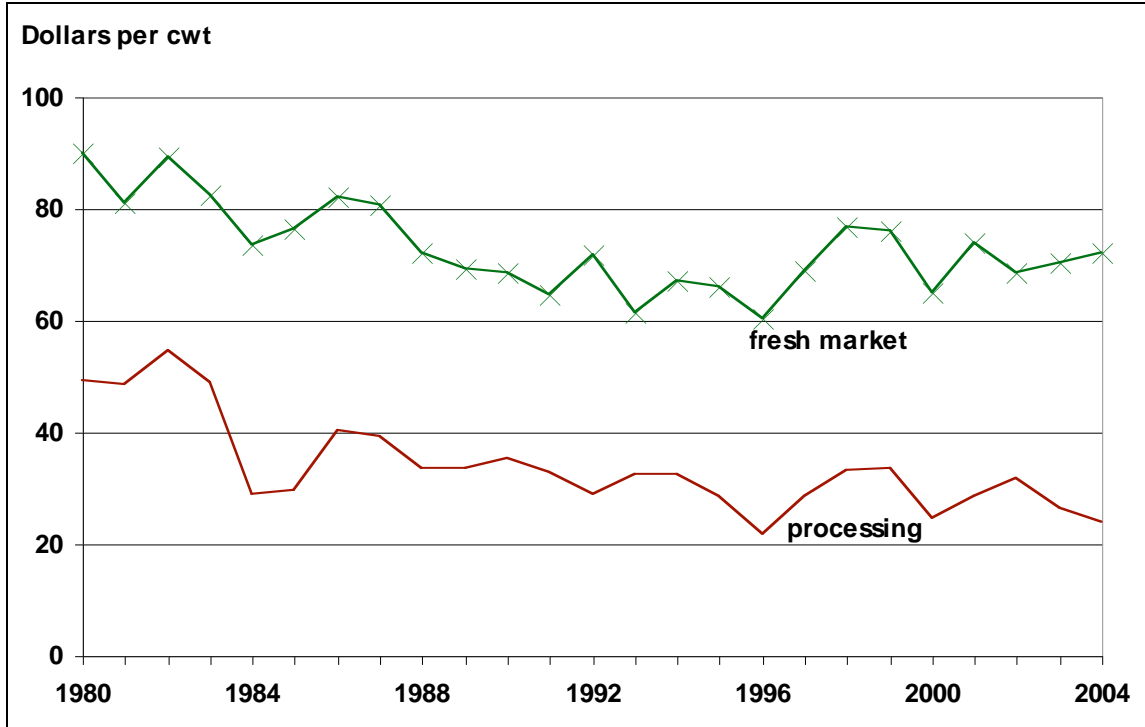
Source: USDA Foreign Agricultural Service

**Figure 10. U.S Imports of Strawberries from Major Exporting Countries, 1989-2004**



Source: USDA Foreign Agricultural Service

**Figure 11. U.S. Strawberry Grower Price (in year-2000 inflation-adjusted dollars), 1980-2004**



Source: USDA Economic Research Service, *The U.S. Strawberry Industry, 1970-2004*