

## Commodity Spotlight



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### Broccoli: Super Food for All Seasons

U.S. presidents may not all have cared for broccoli, but it appears that many Americans have come to enjoy it. After stagnating sales in the early 1990's, broccoli has again caught the interest of American consumers. The industry boasts farm revenue averaging \$484 million (1996-98), up 24 percent from the previous 3 years. The sharp gain in revenue reflects higher prices caused by rising demand for broccoli and its value-added products.

In the 1980's, broccoli enjoyed a surge in popularity fueled largely by increased health consciousness of consumers.

Today, the resurgence of broccoli demand appears to be based on both health-related issues and matters of convenience. The introduction of pre-cut and packaged value-added products provides more convenience for consumers, and highly publicized medical research linking compounds in broccoli with strong anti-cancer activity in the body has added a powerful incentive to consumption.

According to the recently released 1997 Census of Agriculture, U.S. broccoli acreage is concentrated on relatively few farms—6 percent of growers harvest 80 percent of the crop. About 63 percent of U.S. broccoli area is on farms that harvest

500 or more acres of broccoli—up from the 53 percent reported in the preceding census in 1992. The concentration of acreage on large farms since 1992 likely reflects the rise of the value-added sector in broccoli, where grower/processors require large volumes to operate fresh-processing plants year round. The 1997 census found increasing concentration as well among farms raising lettuce and carrots, which are also experiencing rapid growth in the value-added arena.

#### *California Leads in U.S. Broccoli Production*

Broccoli is grown in nearly every state, including Alaska and Hawaii. California harvests 82 percent of the acreage, although it is home to just 22 percent of the farms growing broccoli. California's share of broccoli acreage was up only slightly from 1992. Arizona is the second-largest producer with 8 percent of the acreage (up from 5 percent in 1992) and less than 2 percent of the farms. Oregon, Maine, and Washington round out the top five producing states, with another 6-7 percent of U.S. acreage. Several states noted in the 1992 census as important producers reported dramatically reduced broccoli acreage in 1997, including Texas and North Carolina (down 80 and 73

percent). Low shipping-point prices early in the decade likely discouraged higher production at that time.

Although broccoli is produced in several areas of California, the state's acreage is concentrated in Monterey, Santa Barbara, and Imperial Counties (48, 24, and 6 percent). In Monterey's fertile Salinas Valley, broccoli acreage increased 10 percent between 1992 and 1997, and at \$225 million broccoli is second only to lettuce in the valley's agricultural production value. Monterey County provides a substantial amount of value-added produce items such as bagged salads and pre-cut broccoli florets.

In Santa Barbara's Santa Maria Valley, broccoli acreage jumped 72 percent between 1992 and 1997, vaulting ahead of strawberries as the county's leading agricultural commodity. Some of this increase is likely due to the introduction of value-added fresh broccoli products by several area firms. Both the Salinas and the Santa Maria Valleys also have firms producing frozen broccoli products.

The Imperial Valley and Arizona's nearby Yuma Valley have also seen acreage increases since 1992. These two desert areas harvest broccoli from late fall to early spring, while the coastal Salinas and Santa Maria Valleys produce virtually year-round. However, the peak production period in the desert valleys, December and January, when they account for the largest share of U.S. broccoli shipments, coincides with the lowest output period of the coastal valleys.

The 1997 Census of Agriculture reported nearly 3,900 acres of broccoli in Oregon. The state's Willamette Valley accounts for two-thirds of the broccoli acreage and serves both fresh and processed markets—two large vegetable freezing firms are located in the valley.

No current acreage or production data are available for Maine's broccoli industry, although the state's broccoli acreage is likely up from the 3,219 acres reported in the 1992 census. Potatoes still account for the largest share of Maine's agricultural industry. Most broccoli is produced by a few former potato growers in Aroostook County in far northern Maine, where most

of the state's potatoes are also produced. From late July through early November, Maine ships broccoli to eastern metropolitan areas such as Boston, New York, and Philadelphia. Maine growers can compete with California shippers on the east coast because of their transportation cost advantage.

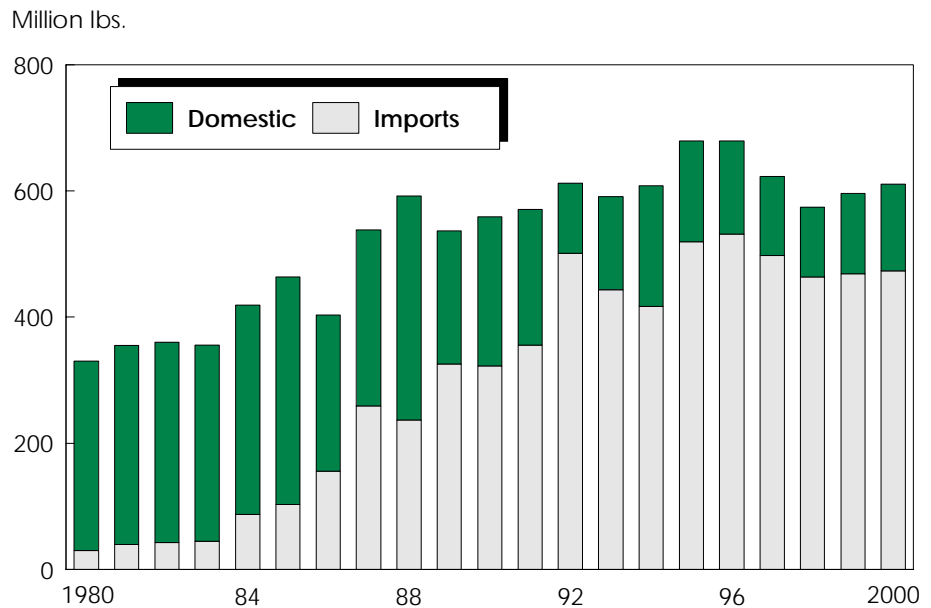
### **Fresh & Processing Markets Influenced by Trade**

Most broccoli produced domestically is sold fresh or frozen, with fresh-market production accounting for 94 percent of the U.S. crop. Fresh-market broccoli also includes value-added fresh-cut and prepared products such as bagged florets and broccoli coleslaw. Although broccoli is generally not canned, limited quantities of dried and dehydrated broccoli are used in soups.

Domestic production of broccoli for freezing has declined during the 1990's, and relatively few U.S. firms now pack frozen broccoli. Domestic freezers get the majority of their raw product under contract with growers who plant specifically for requirements set by the processors—such as varieties and volume schedules. However, broccoli is generally considered a dual-use vegetable, meaning varieties suitable for the fresh market can sometimes be utilized for processed products. Thus, processors may also purchase additional volume on the open market from fresh-market growers, usually when fresh-market prices are low.

Trade plays an important role in U.S. broccoli markets, although the role differs for fresh and frozen products. About 18 percent of U.S. fresh-market broccoli supplies are exported, and 5 percent of fresh-market broccoli consumption in the U.S. is from imports. Canada, Japan, and Hong Kong import the largest shares of U.S. product, taking 56, 35, and 5 percent of U.S. fresh broccoli exports. All of the fresh broccoli imported by Canada and Mexico and 90 percent of the market in Japan are supplied by U.S. product. U.S. imports of fresh-market broccoli come primarily from Mexico. The bulk arrives during fall and winter, with smaller quantities coming during spring and summer.

### **Imports Account for the Bulk of U.S. Frozen Broccoli Consumption**



Fresh equivalent. 1999 and 2000 forecast.

Economic Research Service, USDA

U.S. fresh-market exports and imports have both been trending upward in the past two decades. Export volume during the 1990's has risen 73 percent, while imports have more than tripled, with all the growth in imports occurring since 1994. The most opportune time for Mexican exports to the U.S. is January through May, when Mexican production is greatest, but this market window is limited by a high tariff—25 percent in 1994—being phased out slowly over 15 years. Given the well-supplied U.S. market, NAFTA offered little additional economic incentive for Mexican broccoli exporters following implementation of the agreement on January 1, 1994. However, the steep *peso* devaluation that began in December 1994 altered this balance and likely provided much of the impetus for the increased fresh-market broccoli exports to the U.S. seen since 1995.

Although there are no government data for frozen broccoli exports, U.S. shipments are likely small (less than 5 million pounds) and move primarily into Europe, Japan, and Canada. In 1989, Statistics Canada reported just 86,000 pounds, valued at \$41,000, of U.S. frozen broccoli imports.

U.S. frozen broccoli imports have been rising for the past two decades. Imports come primarily from Mexico—85 percent of the total—with Guatemala providing most of the remainder. Mexican frozen broccoli imports to the U.S. face a 15-percent base tariff under NAFTA, being phased out over 10 years, while Guatemalan imports enter duty free under the Caribbean Basin Initiative. Imports of frozen broccoli, primarily from Mexico, rose eight-fold from 1980 to 1987, from supplying 9 percent to nearly half of U.S. demand. Today, imports account for a hefty 80 percent of the frozen broccoli consumed in this nation.

Why does the U.S. rely on imports in the frozen broccoli market? Processing costs are the key. Trimming broccoli by hand is said to yield the highest quality product, but labor is the largest cost associated with producing frozen broccoli florets. Lower labor rates have drawn broccoli marketers to Mexico, as they have many other industries attempting to cut costs over the past 2 decades. Based on this cost incentive, American firms have created an export-oriented frozen broccoli industry in central Mexico, reflected in the rapid rise in frozen broccoli imports.

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### Market Price Trends Up . . .

Prices for fresh broccoli (unadjusted for inflation) averaged a record-high \$30.80 per cwt (f.o.b. shipping point) during the 1998 season, up 51 percent from 1989. In the frozen market, the majority of broccoli is grown under contract. As a result, processing prices tend to be more stable than those in the fresh market and have changed little over the past 15 years. Average prices paid by processors at the processing plant door for raw broccoli were \$19.40 per cwt in 1998, up just 6 percent from \$18.25 per cwt in 1989.

With renewed demand in the 1990's, f.o.b. prices for fresh-market broccoli have recently resumed the steady upward trend exhibited during the 1970's and early 1980's. During the mid- to late-1980's, broccoli prices trended downward, reflecting excess production caused by growers' overreaction to increasing demand. Production expanded briefly into several southern and eastern states during the 1980's but is now largely centered in the western states. As prices declined, many of these new broccoli growers found the crop unprofitable and consequently moved from broccoli to other crops.

Despite the upward trend in the 1990's, monthly fresh-market broccoli prices have continued to fluctuate widely around mean prices, as they did in the 1980's. Seasonal price patterns tend to be weak, since broccoli is produced year round in the U.S. and imports of fresh-market broccoli are limited. A weak, 2-year cyclical pattern appeared in the first half of the 1990's, but that pattern has not been evident over the last 3 years. The widest bands of price irregularity occur during March and November when temporary supply disruptions occur, primarily because of the shift from one seasonal growing region to another in California.

In 1998, the U.S. retail price for fresh-market broccoli averaged \$1.10 per pound, up 12 percent from a year earlier. Largely reflecting renewed demand, the retail price for fresh-market broccoli has risen 27 percent since 1995. The marketing price spread—the difference between farm and retail price—for fresh-market broccoli is very similar to that of carrots,

### Cole Facts

When two Italian brothers planted a trial crop of broccoli near San Jose, California in 1923, they were sowing the seeds of the commercial broccoli industry in the U.S. Broccoli is believed to have originated in Mediterranean Europe, and wild broccoli can be found today along Europe's Mediterranean and Atlantic coasts. The seeds initially planted in California over 60 years ago came from Messina, Italy.

The type of broccoli most familiar to U.S. consumers is sprouting (or Italian) broccoli rather than heading broccoli, which is similar to cauliflower. Broccoli, along with cauliflower, cabbage, brussels sprouts, kohlrabi, kale, and turnip, belongs to the *Cruciferae* (mustard) family. The name "broccoli" derives from the Italian *brocco*, meaning "arm branch." Members of the broccoli family are also sometimes referred to as "cole crops." The word "cole" is thought to be a derivative of the Latin for stem or stalk of a plant. The ancient Greeks referred to the cole crops as *Kaulion*, meaning "stem," and in some European countries broccoli is called *calabrese*.

Broccoli, a biennial crop cultivated as an annual, is classified as a cool-season crop and produces the highest quality where mean monthly temperatures average 60 to 65 °F. In the past, most fresh and processing varieties were direct seeded, with a small amount of the crop transplanted in order to be ready for early market windows. Now, in part to assure better stands (and yields), an increasing amount—currently about one-fourth of the crop—is produced from greenhouse-grown transplants.

Fresh-market broccoli is largely packed in the field, generally in 23-pound cartons holding 14-18 bunches, which are cooled before transport to market, and then sold in bulk or pre-packaged. Traditional retail bulk displays of broccoli crowns—bunched stems banded together—and loose stems are most prevalent. However, rising consumer interest in value-added products such as spears (florets with attached stalk) and pre-cut and bagged florets have helped expand consumer interest. Broccoli for most of these value-added products is harvested and trucked to a packing plant for final cutting, trimming, and packaging.

Fresh broccoli has long been a mainstay of well-stocked salad bars. Many consumers also enjoy broccoli in raw form as an appetizer with a vegetable dip. However, broccoli is more commonly used as a side dish or entrée component (e.g., stir-fried with meat). Popular variations include steamed broccoli covered with melted cheese and chicken-broccoli stir-fry.

Broccoli for processing is hand harvested, dumped into large bulk containers, and trucked to a processing plant, where it is washed, cut, and trimmed. Frozen broccoli is marketed primarily as spears, cuts (1-inch pieces), and chopped product (pieces smaller than 1 inch). These are often frozen by the traditional "wet-pack" method, in which broccoli is first blanched and then frozen in sealed containers.

Another popular method of freezing is called individually quick frozen (IQF). IQF is a process in which broccoli is cut and blanched, the pieces frozen separately as they travel along a conveyer line, and the frozen pieces packed into plastic polybags found in supermarket freezer cases. Alternatively, processors may initially pack IQF products in bulk storage containers for later custom packing. Frozen food processors also pack broccoli in products such as vegetable blends (with cauliflower and carrots, for example), boil-in-bag pouches with cheese sauces, and meal entrees.

celery, and lettuce. On average, grower/shippers in these industries received 25-30 percent of the retail value for bulk commodity, with the remaining 70 percent

going to marketing costs such as transportation, retail labor, and other selling costs.

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## ... Along with Per Capita Use

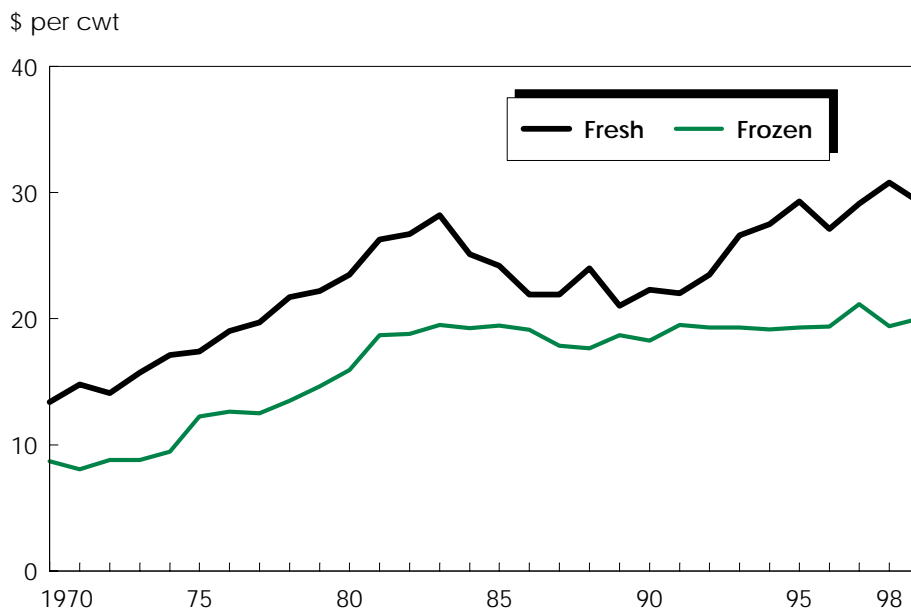
Americans consumed 2 billion pounds of broccoli in 1998. On a per capita basis, this works out to about 8 pounds, which is 34 percent higher than in 1990 and nearly 3 times the 1980 level. From the early 1970's, the trend in per capita broccoli use gradually moved upward until reaching a peak in 1989. This peak occurred during a time of strong economic prosperity in the nation. The economic slowdown of the early 1990's, however, witnessed a sudden drop in fresh-market broccoli use. Consumption of other vegetables and fruits, including iceberg lettuce, cauliflower, cantaloupe, and several others, showed similar use patterns during that period. Use of frozen broccoli, however, remained relatively stable during the late 1980's and early 1990's.

After reaching a low-point for this decade in 1991, fresh-market broccoli use picked up strongly and now sits at an all-time high of 5.6 pounds per person—81 percent higher than in 1991 and more than 3 times the 1980-82 average. Frozen broccoli use, on a fresh-equivalent basis, reached a record-high 2.6 pounds per capita in 1996 but has since returned to the 2.2 pounds per capita level of the early 1990's. This decline likely reflects weather and pest-related production problems in Mexico during the past 2 years, rather than a change in consumer behavior.

What caused the resurgence in fresh-market demand? The keys are likely the introduction of several value-added broccoli products plus a heightened awareness of the association of broccoli with good health.

The health aura which broccoli has enjoyed for many years has strengthened over time as medical and nutritional research continue to explore the linkages between diet and health. Annual private surveys of produce consumers routinely inquire about specific perceptions of fresh vegetables, and broccoli is regularly identified as the vegetable eaten most often for health reasons, including cancer prevention. In addition, consumers often specify high fiber content as the reason to purchase broccoli. Broccoli, carrots, and sweet potatoes are routinely identified by

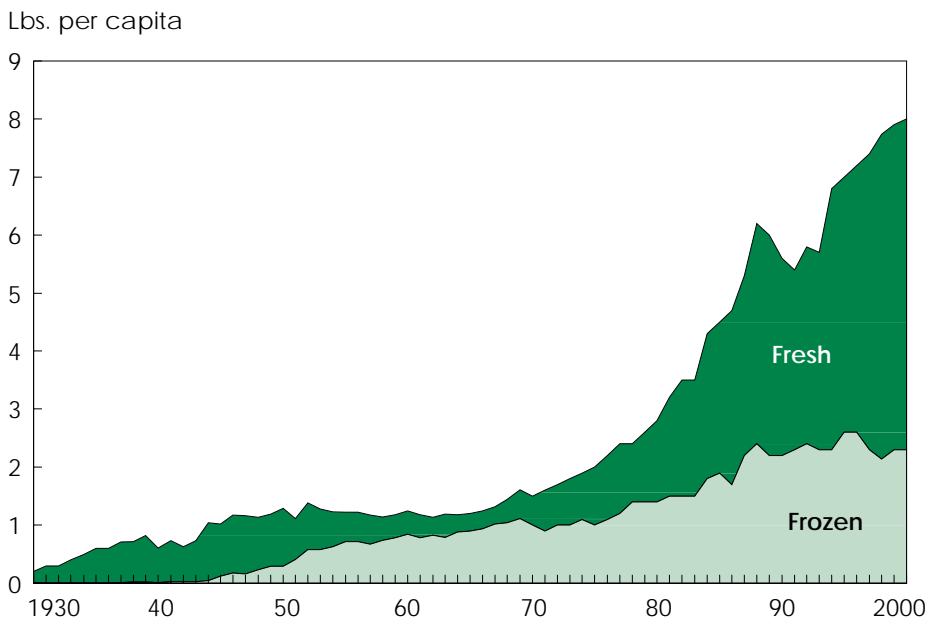
**U.S. Fresh-Market Broccoli Prices Have Rebounded in the 1990's**



Season-average farm price. 1999 forecast.

Economic Research Service, USDA

**Broccoli Consumption in the U.S. Has Increased Sharply Since 1980**



1999 and 2000 forecast.

Economic Research Service, USDA

consumers as the three vegetables with the greatest nutritional benefits.

USDA's nutrition information confirms that consumer perceptions of broccoli's nutritional value are correct. Broccoli's fiber content is one of the highest among

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vegetables, and 100 grams of broccoli contains 75 percent more vitamin C than an equal amount of oranges.

One medium stalk (148 kg) provides 200 percent of the daily recommended intake of vitamin C, 16 percent of recommended dietary fiber, and 10 percent of recommended vitamin A in the form of beta-carotene. Broccoli also contains folate, potassium, and several other minerals, providing 6 percent of daily calcium and 4 percent of daily iron needs. Reports on the link between broccoli and the compound sulphoraphane, a potent anti-cancer chemical, have been in the news since researchers at Johns Hopkins University began releasing study results in 1992.

Private surveys of produce consumers in the early 1990's found that almost a fifth of consumers considered broccoli to be among the most time-consuming produce items to cut, trim, and prepare. The emergence of value-added broccoli products in

the early 1990's responds directly to these consumer concerns. Valued-added products such as bagged pre-cut florets, diced broccoli pieces, and stir-fry mixes have undoubtedly played a role in the resurgence of broccoli demand by making it more accessible and attractive to time-pressed consumers. Innovative products like broccoli coleslaw (with shredded broccoli, red cabbage, and carrots) and baby broccoli hybrids may also be helping to expand total broccoli use. In a 1999 survey, 84 percent of broccoli consumers said they had purchased pre-cut broccoli florets in the past year.

The increase in broccoli consumption is good news for both growers and consumers. Broccoli demand is expected to continue to trend higher, which will help grower prices and incomes. In addition, as new value-added products are introduced and the potential health benefits of broccoli become better understood through medical and nutritional research, consumers will also reap the benefits. **AO**

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### April Releases—USDA's Agricultural Statistics Board

The following reports are issued electronically at 3 pm (ET) unless otherwise indicated.

#### April

- 1 Dairy Products  
Dairy Products Prices  
(8:30 am)
- 5 Egg Products  
Poultry Slaughter  
Basic Formula Milk Price  
(Wisconsin State Report)  
Crop Progress (4 pm)
- 6 Agricultural Land Values
- 7 Broiler Hatchery
- 8 Vegetables
- 9 Crop Production (8:30 am)  
Dairy Products Prices (8:30 am)
- 12 Crop Progress (4 pm)
- 14 Broiler Hatchery  
Potato Stocks
- 15 Milk Production  
Turkey Hatchery
- 16 Dairy Products Prices (8:30 am)  
Cattle on Feed
- 19 Hatchery Production—Annual  
Crop Progress (4 pm)
- 20 Cold Storage
- 21 Broiler Hatchery
- 22 Catfish Processing  
Dairy Products—Annual
- 23 Dairy Products Prices (8:30 am)  
Chickens and Eggs  
Livestock Slaughter  
NASS Facts Newsletter (4 pm)
- 26 Crop Progress (4 pm)
- 27 Floriculture Crops
- 28 Broiler Hatchery
- 29 Catfish Production  
Poultry Production and Value
- 30 Dairy Products Prices (8:30 am)  
Agricultural Prices  
Peanut Stocks and Processing

In the  
Commodity Spotlight  
next month  
**Aquaculture**