Commodity Spotlight

Garlic: Flavor of the Ages

The famous French chef, X. Marcel Boulestin (1878-1943), is reputed to have said, "It is not really an exaggeration to say that peace and happiness begin, geographically, where garlic is used in cooking." Garlic has a long and colorful history, with references in the Bible, in ancient Chinese writings, and in literary works by such luminaries as Shakespeare, Dante, and Sir Francis Bacon. Although used primarily today as a food flavoring agent and condiment, garlic has a history as a remedy for a wide variety of conditions and diseases.

Thought to have originated in central Asia around Siberia, garlic was revered by both the ancient Egyptians and the Chinese. In the U.S., garlic is grown for its strong-scented, pungent bulbs, although in some countries, the green tops are used in a manner similar to scallions

Garlic *(Allium sativum)* is a member of the Amaryllis (lily) family and is related to onions, shallots, chives, and leeks. In the U.S., garlic consumption has soared, especially in the 1990's. Per capita garlic use was a record-high 3.1 pounds in 1999, three times the level of 1989. To satisfy this burgeoning demand, U.S. garlic production occupied more than 64 square miles (41,000 acres) in 1999, up from 25 square miles (16,000 acres) in 1989, and imports rose to more than 20 percent of domestic use in the 1990's. The number of farms reporting garlic acreage between 1987 and 1997 jumped 150 percent to 1,121. At the farm level, the U.S. garlic crop is valued at about $200 million.

Garlic Production Is Concentrated

Garlic production is concentrated both internationally and domestically. With 13 billion pounds annually, China is the leading producer, accounting for 66 percent of world output. The majority comes from the Shandong Province—a prime agricultural area located southeast of Beijing. South Korea and India are second and third with 5 percent each, and the U.S. ranks fourth with 3 percent of world production.

According to the 1997 Census of Agriculture, California harvests 84 percent of U.S. commercial garlic acreage. Most of the domestic garlic that enters the fresh and dehydrated product markets is grown in California. Only four other states harvest more than 100 acres of garlic—Nevada, Oregon, Washington, and New York. Nevada and Oregon, producing largely seed garlic under contract with California firms, each account for about 7 percent of U.S. acreage, with smaller amounts scattered throughout 30 other states. As the garlic market has expanded, so too has acreage in these three contiguous states. Between 1992 and 1997, garlic area increased 50 percent in California, 295 percent in Nevada, and 153 percent in Oregon.

Three California counties provide the majority of garlic production—Fresno (82 percent of the crop), Kern (11 percent), and Monterey (5 percent). The community of Gilroy in Santa Clara County is billed as garlic capital of the world because a significant volume of California's fresh-market garlic is shipped from there.

U.S. garlic production doubled over each of the last two decades. No other vegetable, including high flyers like onions, broccoli, and carrots, has exhibited such strong sustained growth. Since the 1950's, California has been the only state for which USDA's National Agricultural Statistics Service has estimated garlic production. In 1999, California's garlic crop jumped 20 percent to a record 660 million pounds, recovering from a 2-percent decline in 1998. Shippers and processors had intended to increase production in 1998, but unusually cool, wet California weather triggered the most severe outbreak of garlic rust disease in many years, cutting yields by 15 percent.

Garlic falls into three broad product segments—fresh-market, dehydrating, and seed stock—with each differentiated by the way the crop is grown, handled, and used. About a fourth of all U.S. garlic is

Elephant garlic, a vegetable that appears to be gaining in popularity, is not true garlic, but a type of leek that is a close relative of garlic and onions. Much larger than true garlic, elephant garlic tends to have a milder flavor, which makes it well-suited for roasting and spreading on crackers and breads. In California, area devoted to elephant garlic is said to be small relative to regular garlic, and USDA combines the acreages in its estimates. Another vegetable, garlic chives (also called ku chai and Chinese chives), also imparts the classic garlic flavor and can be used fresh or in cooking.

sold as fresh-market produce. The remainder is sold as various dehydrated products or for certified seed. Under average market conditions, there is little overlap among these three markets, although some lower grade fresh-market garlic is occasionally sold to dehydrators. Changes in relative market prices and stock levels can prompt some shifting of sales between the segments, particularly between fresh and processing markets.

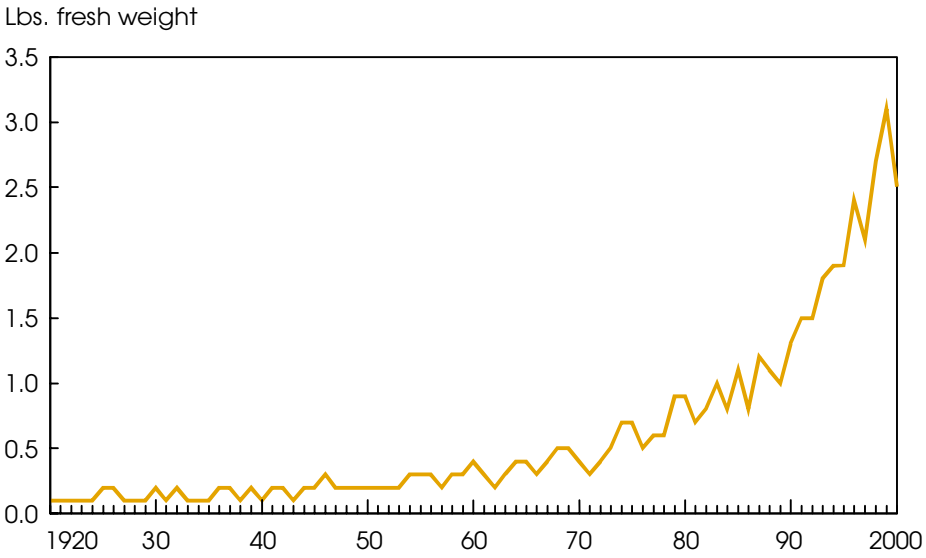
While seed and dehydrating garlic are mechanically harvested, fresh-market garlic is hand-harvested. Fresh product is carefully handled to preserve appearance (including sizing, grading, and storing) and is shipped and sold in the same manner as fresh produce. Fresh garlic can be marketed for up to 3 months from the time of harvest with standard warehouse storage, up to 6 months if kept in cold storage, and up to a year under controlled-atmosphere storage. Fresh garlic is used to manufacture crushed, chopped, peeled, and pureed garlic products.

Depending on variety and location, most garlic in California is planted during the fall (October-November) and harvested in summer (June-August). Virtually all major commercial garlic is grown under contract. The garlic industry is fairly concentrated in both the fresh and dehydration markets. Several large shippers account for the majority of fresh-market volume, while three or four firms process nearly all of the dehydrated product.

Demand Soars

Garlic was introduced into North America sometime in the 1700's, but adoption was slow to catch on. In 1919, when the first estimates were made, per capita garlic use was less than 0.05 pounds, edging up during the 1920's to average about 0.12 pounds. Garlic use rose 25 percent in the 1930's and continued to accelerate to a 2-pound average in the 1990's, a 115-percent leap over the 1980's. One theory for the steady rise in garlic's culinary stature throughout the mid-1900's is that soldiers and world travelers experiencing garlic-enhanced foods in places such as southern Europe, North Africa, and Asia brought a taste for it back to the U.S.

U.S. Per Capita Garlic Consumption Accelerates in 1990's



Includes fresh and processing uses. 2000 forecast.
Economic Research Service, USDA

The trend in garlic use is unique among vegetables in that demand has not only increased steadily over many decades but has grown at an increasing rate. Also, despite impressive growth for vegetables such as broccoli, bell peppers, and carrots, no vegetable has experienced stronger growth in demand over the past 10 years. The strong surge in use during the 1990's likely reflects several factors:

- rising popularity of ethnic foods and restaurants;
- persistent health messages circulating in the press about garlic;
- demand from the health supplements industry; and
- the never-ending quest by consumers for new taste experiences.

These demand factors reflect a broadening view of garlic as a "functional food"—one that imparts both the usual taste and nutritional attributes of food, plus certain perceived health-enhancing benefits (broccoli is another example of such a food). Used primarily in cooking to flavor a wide variety of foods, garlic provides vitamin C, potassium, phosphorous, selenium, several amino acids, and a variety of sulfur compounds, including allicin—a naturally occurring compound whose promising health effects are now being studied at several major universities.

For centuries garlic was valued as a medicinal herb by such cultures as the Chinese and the Egyptians. Adding to the recent surge in U.S. demand for garlic (especially in the 1990's) has been a large and growing body of nutritional and medical research, which points to a wide variety of actual and potential health benefits ascribed to garlic. This research has spawned renewed interest in garlic as a health-enhancing supplement. Although this use is said to be small relative to food use, it has been rising. Various garlic powder pills and garlic oil pills are now commonly available.

During the 1990's, U.S. imports furnished about 23 percent of all garlic used domestically (fresh and processed), up from 17 percent in the 1980's. While the domestic market is primary to U.S. garlic marketers, the export market has also been slowly gaining in importance over the past two decades. During the 1990's, the U.S. exported 12 percent of its total garlic supply—up slightly from the 1980's share and double the share of the 1970's.

Annual garlic prices gained an average 2.7 percent (90 cents per cwt) a year between 1970 and 1996. The season-

To Your Health

For thousands of years, garlic has been recognized for both its culinary qualities and a variety of medicinal properties. Garlic cloves, for example, were reportedly applied to the feet of smallpox victims as "treatment" for the disease. In today's more science-oriented world, research has shown garlic to have a host of positive health effects, including antiseptic qualities that have been credited to sulfur compounds in the cloves. The Chinese have long used garlic to reduce blood pressure and treat cardiovascular disease—a few of the many medicinal effects under study in the U.S.

Despite a flurry of research on garlic in the 1990's, much remains to be learned. Scientific and medical research continues worldwide on the health properties of various forms of garlic and garlic supplements. Health benefits ascribed to garlic and garlic supplements include:

- antibiotic/antifungal effects;
- antiseptic properties useful in fighting infections and dysentery-causing amoebas;
- antioxidant effects, protecting cells from free-radical damage and cancer;
- cholesterol reduction, lowering LDL and increasing HDL;
- natural anticoagulant properties, preventing blood clots and strokes; and
- anti-hypertensive effects, reducing blood pressure.

Documented medical research studies supporting the presence of these health benefits are numerous. A 1993 study at Pennsylvania State University found that garlic reduces triglycerides and cholesterol in livers and blood of laboratory rats. The Mayo Clinic reports that garlic is an effective blood thinner, reducing platelet-clotting action. The clinic also states that garlic may reduce hypertension and help fight infection. Further, in a study involving more than 100,000 people, research released this year at the University of North Carolina found that eating one clove of raw or cooked garlic each day may reduce colon and stomach cancer. Allylic sulfides (found in garlic and onions) are considered by many researchers to be among the most potent of all nutrients from plants and may prevent some cancers and coronary disease.

Further research is underway in institutions such as the Mayo Clinic, the Harvard Medical School, and the Cornell University Medical Center (which has a toll-free garlic hotline). In addition, the National Cancer Institute is funding research at Queen's University in Ontario on garlic's ability to shield lungs against chemical toxicants and potential carcinogens.

Whole raw garlic in its natural state produces very little odor. The familiar smell of garlic is produced when garlic cloves are chopped, sliced, or crushed. This action releases an enzyme that reacts with another compound to form allicin, the active sulfur-containing molecule that produces the classic garlic aroma.

Although it is uncertain how allicin and other garlic compounds work in the body, it is apparently one of many biologically active compounds that may one day be proven to provide a host of beneficial health effects. Some of these health-enhancing features of garlic may have been "known" for centuries, but only recently has modern science begun addressing the subject, slowly adding credence to long-held folklore.

average price declined about 20 percent in 1998 and 1999 after peaking at $47.90 per cwt in 1997 with reduced production and increasing demand. During the 1990's, few vegetable prices were able to keep pace with inflation, despite stronger demand and lower price inflation in the economy, with most declining 13 to 24 percent. After adjusting for inflation, constant-dollar garlic prices have increased or remained steady for 8 of the past 11 years and actually increased 18 percent during the 1990's, in contrast to a 10-percent decline in the 1980's. This spring, however, nominal wholesale garlic prices were as much as one-third lower than a year earlier, following the record-large 1999 crop.

Segmenting the Garlic Market

On any given day, 18 percent of Americans consume at least one food containing garlic, according to data derived from USDA's 1994-96 Continuing Survey of Food Intakes by Individuals. This is relatively high compared with such popular foods as french fries (13 percent), catsup (16 percent), and fresh-market tomatoes (28 percent). This level of daily consumption, which may be even higher today than during the survey period, reflects the breadth of foods for which garlic is used as a seasoning—meat dishes, sauces, stews, soups, casseroles, dressings, catsup, pickles, salsas, oils, breads, etc. In some of these foods, of course, garlic is a minor ingredient and may not be readily apparent.

Dehydrated garlic accounts for about three-fourths of the garlic consumed in this country, and is an ingredient in a wide variety of processed foods. Other forms of garlic include whole bulk garlic, garlic in oil, garlic puree, garlic in vinegar, dehydrated garlic powder, garlic salt, garlic bread, chopped garlic, garlic juice and concentrate, garlic dill mustard, garlic dressing, garlic spread, garlic toast, and garlic braids (garlic cloves with tops braided into strips).

The majority of garlic, like most foods, is consumed at home (56 percent). This partly reflects the increasing use of garlic by food manufacturers, rather than simply its use in home cooking. In the away-from-home market, fast food accounts for 19 percent of garlic consumption, with standard "white table cloth" restaurants accounting for another 15 percent. Many ethnic restaurants (e.g., Italian, Chinese, Lebanese, Korean, and Indian) provide consumers a healthy dose of garlic in their cuisine.

Garlic is most favored by consumers in the western states (a 13-state region defined

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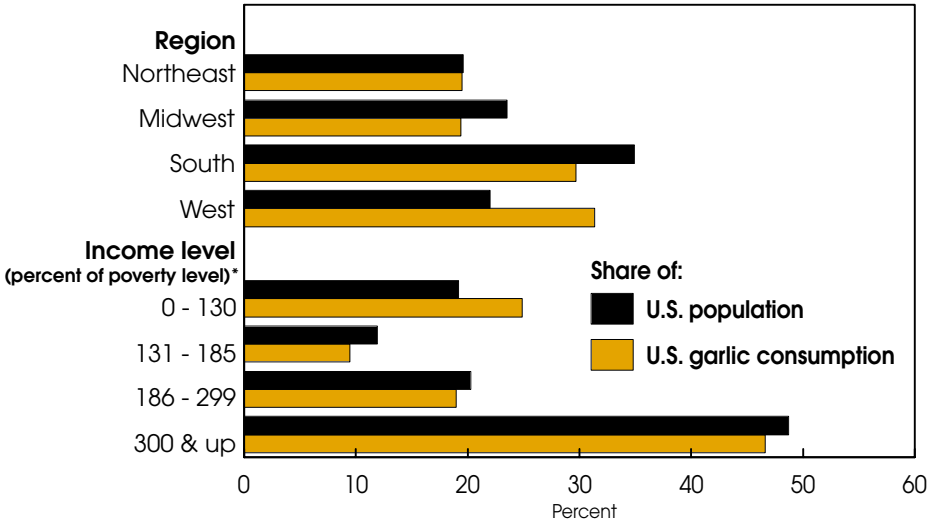
Garlic Consumption Share Exceeds Population Share in West And in Lowest Income Group



*130 percent of poverty level = cutoff point for food stamp eligibility. Poverty level varies by household size. For example, the poverty level for a three-person household was $12,158 in 1995.
Source: Derived from USDA's Continuing Survey of Food Intakes by Individuals, 1994-96.
Economic Research Service, USDA

by the Census Bureau). With 22 percent of the nation's population, this region accounts for 31 percent of all garlic consumption. While the Northeast region consumes garlic in proportion to its share of the nation's population (20 percent), the South and Midwest consume less than their share. Some of this may be explained by the fact that Hispanics (of Mexican origin) and Asians, two groups more numerous in the West than the Midwest, consume proportionally more garlic than non-Hispanic white and black consumers. Hispanics, who make up 11 percent of the U.S. population, account for 20 percent of all U.S. garlic consumption.

Low-income Americans appear to use garlic proportionally more than other income groups. Households with income less than 130 percent of the poverty level (the cutoff point for food stamp eligibility) represent 19 percent of the U.S. population but consume 25 percent of all garlic. This is the only defined income class that consumes proportionally more, although individuals in the higher income bracket (above 300 percent of the poverty level) come close, with 49 percent of the population consuming 47 percent of garlic.

Garlic appears to be more popular among men than women, with men consuming 62 percent of all garlic. Men aged 20-59 account for 27 percent of the population but consumed 41 percent of all garlic. Teenaged boys (and girls to a slight extent) also consumed proportionally more garlic (6 percent of the population, 11 percent of garlic consumption).

Garlic has proven itself as a popular food and nutrition item, and is gaining scientific credibility as a significant contributor to good health. Garlic and its benefits are solidly launched, and U.S. production and consumption are likely to continue to grow in the next few years. AO

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June Releases—USDA's Agricultural Statistics Board

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

June

1 Hops
2 Dairy Products Prices (8:30 am)
Dairy Products
Egg Products
Poultry Slaughter
5 Minn.-Wis.- Base Month Price - Final 1997-99
Crop Progress (4 pm)
6 Weather - Crop Summary
7 Broiler Hatchery
9 Crop Production (8:30 am)
Dairy Products Prices (8:30 am)
12 Crop Progress (4 pm)
13 Weather - Crop Summary
Turkey Hatchery
14 Broiler Hatchery
Potato Stocks
16 Dairy Products Prices (8:30 am)
Cattle on Feed
Milk Production
19 Crop Progress (4 pm)
20 Weather - Crop Summary
Cold Storage
21 Broiler Hatchery
22 Cherry Production (Tent.—8:30 am)
Catfish Processing
23 Dairy Products Prices (8:30 am)
Chickens & Eggs
Hogs & Pigs
Livestock Slaughter
26 Peanut Stocks & Processing
Crop Progress (4 pm)
27 Weather - Crop Summary
28 Broiler Hatchery
29 Agricultural Prices
30 Acreage (8:30 am)
Dairy Products Prices (8:30 am)
Grain Stocks (8:30 am)