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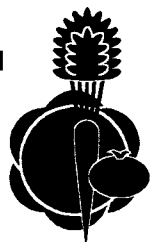
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## SNAP BEAN PRODUCTION IN CALIFORNIA

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### PRODUCTION AREAS AND SEASONS

Snap beans (*Phaseolus vulgaris*), also referred to as green beans or string beans, are produced in many areas of California. Primary production areas include the Central Valley (Tulare County), the southern desert (Riverside County), and the South Coast (Orange County). Snap beans are also produced in San Luis Obispo, Santa Clara, Contra Costa, San Bernardino, San Diego, and San Mateo Counties.

In California snap beans are available for fresh market and processing nine months of the year. In the southern desert the fall crop is planted from August to September and harvested from October until the first killing frost; the spring crop is planted in February and harvested from March to May. In the Central Valley snap beans are planted from April through May and again in August and harvested from late May to late July and from October to early December or until the first frost. The South Coast snap bean crop is planted from February through August and harvested from May to early December.

### SNAP BEAN ACREAGE AND VALUE

Year	Acreage	Average yield (tons/acre)	Gross value/acre
1996	6,500	4.5	\$4,158
1995	8,941	5.0	\$5,020
1994	7,500	3.5	\$4,004

*Source: California Agricultural Resource Directory 1996 (Sacramento: California Department of Food and Agriculture, 1997).*

### CLIMATIC REQUIREMENTS

Snap beans, a warm-season crop, are frost-sensitive plants. The optimal temperature for seed emergence is 77°F (25°C). The optimal temperature for plant growth is 65° to 85°F (18.3° to 29.4°C). Snap beans require 1,050 to 1,150 degree-days of heat with a base of 50°F (10°C). Most varieties mature in 50 to 60 days. Temperatures above 90°F (32.2°C) cause blossoms to drop and ovules to abort. Pods that remain become fibrous and poorly formed. Rains during flowering can also cause flower drop.

### VARIETIES AND PLANTING TECHNIQUES

**Varieties.** Snap bean pods can be flat or round (oval) in cross-section. The flat types, referred to as Kentucky Wonder types, include Magnum, Greencrop, and Calgreen. The round or oval types, referred to as Blue Lakes types, include Benchmark, Strike, and Landmark. Plant growth habit can be bush or pole-type. Bush types, which do not have to be trellised, are the common type grown in commercial production in California. Bush-type snap beans are short erect plants (determinate growth) that grow 1 to 2 feet (0.3 to 0.6 m) tall and have a somewhat uniform pod set. Yellow-podded or wax bean varieties are Goldrush and Slenderwax. A purple snap bean variety grown is Purple Queen. Yellow-podded and purple snap beans are grown on a limited acreage as specialty vegetables.

**Planting.** Snap bean seed are planted  $\frac{3}{4}$  to 1 inch (19 to 25.5 mm) deep and 2 inches (5 cm) apart in the row, with two rows planted on raised beds 36 to 40 inches (91 to 102 cm) wide. The seed should be in good contact with the soil. The planter should be operated at 2 to 3 mph (3.2 to 4.8 km/h) to avoid damaging the seed coat. Treated seed is usually used. The normal seeding rate is 75 to 90 pounds per acre (84 to 101 kg/ha). Seed size varies according to the variety and seed lot.

### SOILS

Snap beans are grown on many soil types in a pH range of 5.5 to 7.5. The optimal pH for snap beans is 6.0 to 6.5. Well-drained soils are preferred. Excessively wet soils encourage root diseases and nutrient problems. Snap beans do not tolerate salinity, and fields should be selected that are low in salinity. A 50 percent yield reduction can be expected with a soil salinity of 3.6 ECE (dS/m at 25°C).

### IRRIGATION

Snap beans grown in the southern desert are planted in dry soil and irrigated to initiate seed germination. The irrigation water should not be allowed to cover the bed because excess moisture encourages seed rots. In other

production areas the fields are preirrigated prior to planting and the seed is placed into moist soil (or mulch). The fields are generally furrow-irrigated throughout the season. Drip systems can also provide an excellent method of irrigating snap beans.

Snap beans have a semishallow root system, and the crop requires frequent irrigation. Avoid excessively saturating the soil, as this will retard growth and promote root and stem rots. Water stress during pod formation should be avoided.

### **FERTILIZATION**

Although snap beans are legumes that can fix atmospheric nitrogen when the seed is properly inoculated with a suitable strain of bacteria, commercial snap bean growers do not inoculate their crop, choosing instead to rely on chemical fertilization. Snap beans require less nitrogen than other vegetables. High rates of nitrogen (N) promote vine growth and delay fruit maturity. Snap beans often receive 60 to 120 pounds per acre (68 to 135 kg/ha) of N, 60 to 120 pounds per acre (68 to 135 kg/ha) of phosphate (P<sub>2</sub>O<sub>5</sub>) and 0 to 100 pounds per acre (0 to 112 kg/ha) of potassium (K), based on soil tests. The nitrogen applications should be split into one pre-plant and two side dressings, or it should be water-run at vining growth stage and at bloom.

### **INTEGRATED PEST MANAGEMENT**

Herbicides, insecticides, and fungicides should always be used in compliance with label instructions.

**Weed management.** Selecting clean fields and planting into dry mulch will help reduce weed problems. Weeds should be identified for proper herbicide selection.

**Insect and nematode identification and control.** Many insects are pests of snap bean, and some pests migrate into snap beans from other crops. Seedcorn maggot (*Hylemya platura*), a pest of seedlings, can be controlled with seed treatment. Seedcorn maggot can be a problem in soils with large quantities of plant residues. Beet armyworm (*Spodoptera exigua*), variegated and black cutworms (*Peridroma saucia* and *Agrotis ipsilon*), cabbage looper (*Trichoplusa ni*), corn earworm (*Heliothis zea*), and armyworm (*Spodoptera* spp.) can damage foliage and pods. Silverleaf whitefly (*Bemisia argentifolii*) and leafminers (*Liriomyza* spp.) can, at times, develop populations of economic importance. Spider mites (*Tetranychus* spp.) can cause severe foliage injury and yield losses. Root knot nematode (*Meloidogyne* spp.) can severely limit yields, especially when beans are grown on light-textured soils. Crop rotations are recommended to suppress nematodes. A pest-scouting program, which is important for the detection and treatment of pests, should be established before planti-

ng and maintained up to harvest. Several materials are registered for use in California against these and other insect pests; consult your local farm advisor or a licensed pest control adviser for details.

**Disease identification and management.** Many soil-borne fungi attack snap beans. *Pythium* spp. and *Rhizoctonia* sp. can cause extensive damage to seedlings. *Rhizoctonia solani* forms a reddish-brown canker on the stem at or below the soil line. The cankers can girdle the stem and cause severe stunting or death even in mature plants. *Pythium* spp. causes a colorless to dark brown wet rot at the soil line. Young and old plants infected with *Pythium* usually wilt and die. Fungicide seed treatments can provide some measure of control. The fungus *Sclerotinia sclerotiorum* can cause a severe stem flower and pod rot. The rot is evident by a white, cottony fungus growth that causes a mushy, soft rot of effected tissues. Crop rotation and blossom sprays are used to suppress this disease. Powdery mildew (*Erysiphe polygoni*) and leaf rust (*Uromyces* sp.) infect the foliage and the pods. Curly top (leafhopper vectors) and mosaics (aphid vectors) caused by one or more of several legume viruses are common diseases of snap beans. Viruses may cause mottling, stunting, and distortion of foliage and pods. There is no control for these virus diseases.

### **HARVESTING AND HANDLING**

Snap bean pods should be harvested before reaching maturity, usually 2 to 3 weeks after blooming. Marketable pods are fleshy, tender, and green for only a short period; they will quickly become tough, fibrous, and overmature if not harvested on time. Pods of desirable length, shape, and width are selected, harvested, and graded. Harvesting can be done by hand or by machine. Hand-harvesting allows for multiple harvests of a field. Machine-harvesting, a one-time operation because the plants are destroyed in the process, usually follows after the first hand-harvest. Regardless of the harvest method used, minimal handling of the pods is desirable. Some growers have instituted field packing so that the snap beans can be quickly moved from field to cooler with a minimum of handling.

In California there is no universal snap bean carton in use. Growers in the southern desert use a 30-pound (net weight) waxed or unwaxed carton, depending on the grower or shipper requirement. Other areas market a 10-, 15-, 25-, or 30-pound wire-bound wooden or cardboard carton.

### **POSTHARVEST HANDLING**

Snap beans are highly perishable and should be cooled as quickly after harvest and packing as possible. Cartons may be hydrocooled if a waxed or wood carton

is used. Cartons should be allowed to drain and dry, otherwise this moisture will encourage decay pathogens including watery soft rot (*Sclerotinia* sp.), cottony leak (*Pythium butleri*), gray mold (*Botrytis cinerea*), and Rhizopus rot (*Rhizopus* spp.). Cartons may be cooled by forced air to reduce wilting and moisture loss. Snap beans should be held at 40° to 45°F (4.4° to 7.2°C) and at a relative humidity of 95 percent or higher. Under these conditions shelf life can be 7 to 10 days. Snap beans are chilling-sensitive and should not be held at temperatures below 40°F (4.4°C). Symptoms of chilling injury are surface pitting and russetting, and

after removal to warmer temperatures the beans rapidly decay. Chilled snap beans lose moisture rapidly. Snap beans are also ethylene-sensitive and should not be stored with products that generate ethylene gas.

#### **MARKETING**

Most snap beans are distributed through fresh produce terminals in Los Angeles and San Francisco or by direct sales to buyers from the eastern United States. Along the Central Coast many producers sell snap beans at farmers' markets.

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