

CHAPTER 4

From Field to Table



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Planting a Raisin Vineyard

A raisin vineyard is a long-term investment. Not only is it hard work, but it takes 3 years for a new vine to bear fruit that is commercially viable. If the vines are well-tended, they can produce fruit for 100 years or more. The type of grape bears consideration as well. There are many varieties, but most raisin growers still prefer the Thompson Seedless type, which constitutes 95 percent of the Fresno area raisin crops.

CHOOSING THE RIGHT LOCATION

Climate, soil, and water are the main considerations when planting a vineyard. The San Joaquin Valley has optimum weather, contains well-drained sandy loam soil, and enjoys hot, dry Septembers that allow grapes to reach optimal sweetness. The Coast Ranges to the west create a basin of fog in the winter, allowing fruit crops to rest in dormancy, saving their energy for vigorous spring growth.



PREPARING THE SITE

Before grapes are planted, the ground is leveled to insure proper irrigation. Leveling occurs while the soil is dry. Wet soil would compact, making root and water penetration difficult. Most raisin vineyards are planted in rows that run from East to West to optimize sun exposure in the middle of the rows and to maximize the sun's drying potential at harvest.



PLANTING AND PRUNING

Traditionally, vineyards are planted with dormant rootings or cuttings. Vines are rarely trained in the first year, but allowed to grow for maximum leaf area, which facilitates root system development and carbohydrate production through photosynthesis.



TRAINING

Training grapevines up the stake and across a trellis is a key component of viticulture. Careful management of the vine canopy ensures proper balance between shade and sun. There must be enough foliage for adequate photosynthesis. Too much foliage can over-shade plants, slowing down the ripening process, and it can also cause some vine diseases.



CONVENTIONAL TRELLIS

The first trellis system simply tied canes upright to a stake in the ground. In the 1890s, growers began stretching horizontal wires between stakes to support the new shoots. A cross arm was added to widen the trellis in the 1940s, which let in more sun and thus improved size and sugar content.



OVERHEAD TRELLIS

Many trellis systems have been developed to improve production of different grape varieties, and to allow specialized harvesting equipment to move through the vines. The overhead trellis system trains vines up onto wires stretched 6½ feet overhead. Grapes hang from the canopy for easy access during harvest.



OPEN GABLE TRELLIS

The open gable trellis connects trellis wires between rows of 6-foot high V-shaped supports. The unique V shape lets in plenty of sunlight and focuses, or traps, the heat. This greatly improves photosynthesis, ripening, and drying. Workers can easily walk under this type of trellis and access fruit and canes for hand operations.



THE MIGHTY VALLEY

Anyone who drives along California Highway 99 will pass through perfect raisin-growing country. In the San Joaquin Valley, annual production is more than 350,000 tons, which accounts for much of the world's raisin supply. This is thanks to the area's natural resources and dedicated growers.

The Cycle of Grape Growing

The cycle of grape growing begins each winter when the grapevines are dormant. During December and January, the vines are pruned to regulate the next summer's production. The major growth stages thereafter are budbreak, bloom (or flowering), berry set, veraison (berry softening and initiation of color development), fruit maturity (summer/early fall harvest), and then the cycle beginning again with dormancy (late fall/winter rest).



APRIL

Budbreak occurs in March when miniature shoots begin to appear. In April, tender bunches form on the shoots. By routinely counting the bunches each year, growers are provided with the first estimate of the potential size of the summer crop.



MAY

In May, the bunches are in bloom. There is a tiny flower for every grape on the bunch. Fortunately, grapes are hermaphroditic and can pollinate themselves, without the need for bees. Once pollinated, a small seed trace forms and the grape begins to grow around it. Irrigation becomes critical at this time to keep the crop growing. By the end of May, berry set begins.



JUNE

In June, the grapes continue to grow toward maturity. In addition to irrigation and disease prevention, growers monitor for potential insect infestations. Growers must be able to identify the pest, the damage it does, and determine if there are sufficient beneficial insects to control the problem. Armed with this information, the grower can make the best decision for the crop and the environment.



JULY

Irrigation is most critical in July, as the temperature on many days exceeds 100°F (38°C). Proper irrigation will prevent vine stress and maximize the size of the crop. The week of July 4th is the beginning of the grapes developing fruit sugar, lowering acid, and becoming soft. This stage is called *veraison*. *Veraison* is the French term for ripening.

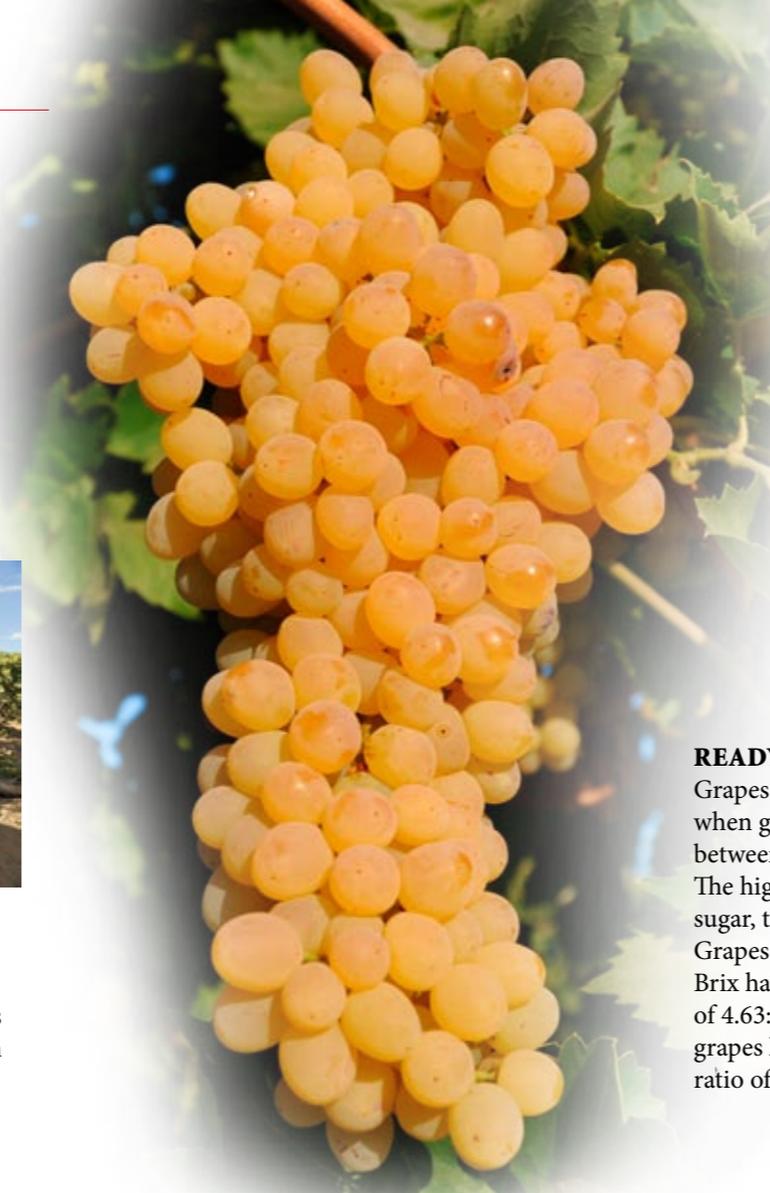


AUGUST

At the beginning of August, growers stop irrigating the vines to dry the soil in preparation for harvest. From the last week in August to the first week in September, Thompson Seedless grapes are plump, ripe, and ready for harvest. Generally, it takes 4½ pounds of grapes to make 1 pound of raisins. After the first frost, usually in November, the leaves turn orange and brittle and fall to the ground, telling the grower his vineyard is ready for pruning and the start of a new season.

Hand Harvesting

The traditional and primary practice of using field labor to hand harvest grapes into natural sun-dried raisins is much the same today as it was 100 years ago. Irrigation is stopped in August to dry the soil. Before harvest, growers terrace the soil to make it smooth, firm, and sloping south to maximize sun exposure. When grapes reach the peak of sweetness, they are hand cut from the vine and spread onto individual paper trays (generally 24 x 36 inches, 0.6 x 0.9 meters). Temperatures on the trays can reach 120 to 140°F (50 to 62°C).



THOMPSON TRADITION

Since the 1920s, most grapes planted for hand harvesting are of the Thompson Seedless variety, because of their sweet flavor and lack of seeds. Thompsons replaced the Muscat variety, which became less preferred by consumers because of its seeds.



1. PICKING THE BUNCHES

Hand laborers cut each bunch from the vine using a curve-tipped knife. The grape bunch is held while being cut from the stem. Hand harvesting minimizes grape damage.



2. GRAPE PANS

The freshly cut grape bunches are then placed into plastic grape pans that hold between 18 and 22 pounds of grapes when full. A full grape pan will fill one paper tray.



3. SPREADING THE GRAPES TO DRY

The picker places the grape bunches onto the paper tray and spreads them evenly to cover the entire tray. The paper trays are placed side by side facing south to maximize drying time and sun exposure. Most vineyard rows are either 1/8 mile or 1/4 mile long.



4. SOLAR DRYING

Many people are surprised to learn that Thompson Seedless grapes are green or amber green at harvest. The southern San Joaquin Valley is an ideal area to dry grapes into dark brown raisins because of its long, hot, and dry summers, which continue into early fall.



5. SUN-DRIED

The grapes will lie on the trays for 17 to 21 days and turn into raisins. When the raisins are almost dry, the paper tray is rolled into a roll. This roll acts like a solar oven, both finishing the drying process and allowing the raisin moisture to equalize. The drying is complete when the raisins reach 10 to 14 percent moisture.

READY FOR PICKING

Grapes are harvested when grape sugars reach between 18° to 22° Brix. The higher the grape sugar, the higher the yield. Grapes harvested at 18° Brix have a drying ratio of 4.63:1, while 22° Brix grapes have a drying ratio of 3.74:1.

FINISHED HARVESTING

In this photo circa 1960, a worker picks the rolls from the field and empties these into wooden "sweat boxes." These smaller sweatboxes have been replaced with wooden bins which typically hold 1,000 pounds (500 kg) of raisins.



Mechanical Harvesting

California industry efforts for mechanical raisin harvesting and field drying began in earnest in the early 1970s. However, widespread use of these techniques did not occur until the 1990s. Today, 25 percent of California's annual sun-dried raisin crop is mechanically harvested onto continuous paper trays in the field.



1. HARVEST CANE CUTTING

Harvest cane cutting is the process of cutting the cane by hand between the bunch and the vine at least 10 days prior to harvesting. Cutting the canes allows the capstem on the berries to dry and become brittle. After 10 days of drying, the berries require less force to remove, which improves the entire harvesting process and makes a better raisin.

2. MACHINE HARVESTING

Two machines move together down parallel rows in the vineyard. The mechanical harvester and the tray layer work together in sequence to harvest grapes from the vine and lay these evenly onto a long, continuous roll of paper.



3. OVER THE ROW CONVEYOR

When the grapes are shaken from the vine by the machine harvester, they are conveyed over the vine row to the tray layer and placed in the tray layer hopper.



4. PAPER TRAY LAYER

The tray layer hopper spreads the grapes evenly, one or two grapes thick, onto a continuous paper tray for even and faster drying. The continuous paper tray typically runs the entire length of the row, usually a quarter mile or longer (approximately 430 meters).



5. SUNSHINE

The drying time for raisins mechanically harvested onto a continuous tray is 7 to 10 days. This is approximately 10 days faster than hand harvested raisins and is the result of drying individual grapes instead of grape bunches.

6. PICKUP

When the grapes have dried into raisins, a machine picks up the raisins from the continuous tray, transfers the raisins into bins in the next row, and shreds the paper tray so it can be incorporated into the soil.

7. HARVEST COMPLETE

A tractor pulling a bin trailer loaded with bins travels at the same speed as the machine harvester and completes the harvest. Once in the bin, the raisins travel on to the processing and packaging plant.



Dried-on-the-Vine Harvesting

Raisins dry much slower on the vine than on paper trays laid on the ground. Dried-on-the-vine research began in Australia in the late 1950s and early 1960s. The most significant development of this early research was the practice of cutting the canes upon fruit maturity, before taking the grapes off the vine. With the advent of earlier ripening raisin grape types, Fiesta, DOVine, and Selma Pete, California growers expanded early experimental production to become a viable part of the raisin industry by the first years of the 21st century.



HARVEST CANE CUTTING

Cutting the canes by hand between the bunch and the vine initiates the drying process. Once the canes are cut, the bunches will become raisins in 6 to 8 weeks.



OPEN GABLE TRELLIS

An open gable trellis is a large V-shaped structure supported on top of a metal stake. The V-shaped structures are connected by wires which run the length of the row. The rows are 11 to 12 feet apart, which leaves an opening between the trellis structures. This system allows for ample sunlight and makes it easier for workers to perform their work.



OPEN GABLE HARVEST

With earlier ripening grape varieties, canes are cut by hand by mid-August, allowing the bunches to then begin to dry. When the bunches have dried into raisins, they can be harvested with a wine grape harvester that has been modified to place the raisins in bins instead of gondolas.



OVERHEAD TRELLIS

The overhead trellis system is made up of a series of wires that run both directions about 6½ feet off the ground. The fruit grows in one row and the canes, which will produce next year's crop, grow in the next row. This pattern is repeated across the entire field. Workers have easy access to perform their work. Because of the expansive leaf foliage and increased photosynthesis, this system produces the highest yields per acre.



OVERHEAD TRELLIS HARVESTING

Canes are cut by hand by mid-August, allowing the bunches to dry. When the bunches have dried into raisins, they can be harvested by machine harvesters that drive under the vines and vibrate them off into bins. While this is done, vacuums remove dried leaves from the raisins.

DOV SUCCESS

After years of effort, growers and industry partners have successfully developed an entirely new drying method and new varieties to enhance them. DOV production has become a significant contributor to the California raisin industry. With higher yields, lower costs, and lower labor needs, DOV truly is a raisin technique for the future.



Sustainable Farming & Processing



Raisins are the natural product of grapes and sunshine, and have been produced using sustainable methods long before “green” became a popular buzzword. Sun-Maid’s organic raisins are just the beginning of the company’s efforts to promote sustainable farming and processing.



PRODUCED WITH SOLAR ENERGY

During the summer months, the San Joaquin Valley’s hot summer days help ripen the grapes. When it’s time for drying the grapes into raisins, both the sun and the heated soil work together like an oven to transform the grapes into raisins. Solar energy dries about 2.5 billion pounds of fresh grapes, which saves the equivalent of 600 trillion British thermal units (BTU) of natural gas each year. With 548,000 miles of grapevines in California, that’s enough to circle the Earth 22 times.



RECYCLED PAPER

Raisins are dried by the sun in the vineyard atop large sheets of paper called paper trays. After harvest, the paper trays are collected and recycled.



WATER WISE

At the Sun-Maid plant, water used in the raisin-cleaning process is reused to irrigate forage for cattle.



EVERYTHING PUT TO USE

Even capstems and stems removed during raisin processing are sold for cattle feed.



SUSTAINABLE PACKAGING

Raisin packages are shipped in corrugated cartons made from trees grown in sustainable forests, marked with the Sustainable Forestry Initiative label. Recycled material is used in outer packaging and all inks are water-based.

PUTTING THE GRAPE TO GOOD USE

At Sun-Maid’s distillery facility (below), raisins are turned into high-proof alcohol utilized in brandy and white wine. Effluent water from the still is sent to a methane digester at the distillery facility (right). The digester generates energy—a sustainable replacement for natural gas—which is used to operate the distillery’s boiler.



Hazards of Raisin Growing

Even in the world's most ideal raisin-producing region, Mother Nature continues to dictate success or disaster. Raisin growers must mitigate hazards including ill-timed weather and severe temperatures in order to produce naturally sun-dried raisins. Because the majority of California raisins are sun-dried on paper trays laid out on the terraced soil beside the vines, rain during the drying phase represents the biggest threat to the raisin crop.



FROST

A severe spring freeze on March 27 and 28 spelled disaster for the 1972 raisin crop, resulting in the smallest raisin crop in 75 years.

RAIN

In 1976, disastrous September rains destroyed nearly half of the industry's crop. Again, in September 1978, nearly 70 percent of the drying raisins were lost to rain.

Ripening Schedule							AUGUST
SUN	MON	TUE	WED	THU	FRI	SAT	
			1	2	3	4	
			Selma Pete				
5	6	7	8	9	10	11	
Selma Pete			DOVine and Zante Currant				
12	13	14	15	16	17	18	
DOVine and Zante Currant					Fiesta		
19	20	21	22	23	24	25	
Fiesta				Thompson Seedless			
26	27	28	29	30	31	1	
Thompson Seedless							

RIPENING SCHEDULE

Thompson Seedless grapes ripen late in the season, putting growers at greater risk of rain damage. The development of varieties including Fiesta, DOVine, and Selma Pete—which ripen earlier in the month—has helped growers to complete harvest earlier.

DRYING CALENDAR

The California raisin harvest usually begins in the first part of September. During ideal hot and dry climate conditions, Thompson Seedless grapes dry into raisins in 17 to 21 days.

Drying Calendar							SEPTEMBER
SUN	MON	TUE	WED	THU	FRI	SAT	
2	3	4	5	6	7	8	
9	10	11	12	13	14	15	
							Trays Turned
16	17	18	19	20	21	22	
23	24	25	26	27	28	29	
							30



SPRING

Spring frosts below 31°F (-0.6°C) can damage the grapevine's young shoots and flower clusters. Hail in springtime can also damage shoots and clusters.



SUMMER

Cool temperatures or moist conditions can delay maturity of the crop. Excessive heat can also burn the vine and the clusters, causing damage.



FALL

Rain during harvest can cause damage to the raisins. Long periods of rainy weather can cause crop loss in the field.

Sun-Maid Experts

It takes people with a wide variety of skills and expertise to bring raisins from the vineyard to the packing house and consumer. The process begins with Sun-Maid growers, whose experience growing grapes and drying them into raisins is the first step toward making the World's Favorite Raisin™. After the raisins have been delivered to Sun-Maid's facility from the growers, they are stored safely until they are ready to be packaged. Inside the plant, machine operators oversee the inspection, processing, and packaging of all Sun-Maid products.



GRAPE SUGAR

Sun-Maid grower Jeff Bortolussi uses a refractometer to check grape sugar levels prior to harvest. Growers monitor their grapes and the weather conditions closely to choose the best time to harvest.



HEALTHY VINES

In his dried-on-the-vine overhead vineyard, Sun-Maid grower Steve Kister uses a hand lens to inspect a grape leaf. Kister converted his vineyard operations to an overhead trellis system, increasing his productivity per acre and enabling the use of mechanical harvesting methods.

RAISIN STACK

Each year, growers deliver 100,000 tons of raisins to Sun-Maid's Kingsburg headquarters. Once the raisins have been inspected, they are stored in 1,000-pound wooden bins. The skilled crew stacks and covers the bins. The raisins remain in storage until they are ready to be processed and packaged.



GROWERS' FIELD DAY

Field days and seminars are key to keeping Sun-Maid growers up to date with all phases of raisin production.



QUALITY CHECKS

A Sun-Maid laboratory technician continually tests samples from the production line for quality.



DOWN THE LINE

A packaging supervisor inspects finished cartons, which are about to be packed into cases.

GOLDEN STANDARD

Boxes of golden raisins travel down the line after being filled. Sun-Maid operates the largest raisin packaging facility in the world and has led the industry in specialized equipment for processing raisins.



California's Raisin Pioneers

The story of the Sun-Maid grower begins with immigration, as California pioneers settled and shaped a land full of opportunities. Germans from Russia, Japanese-Americans, Italians, Danes, Swedes, Mexicans, Yugoslavs, Sikhs, and Portuguese are among the many ethnic groups that have been part of the California raisin industry's international melting pot.

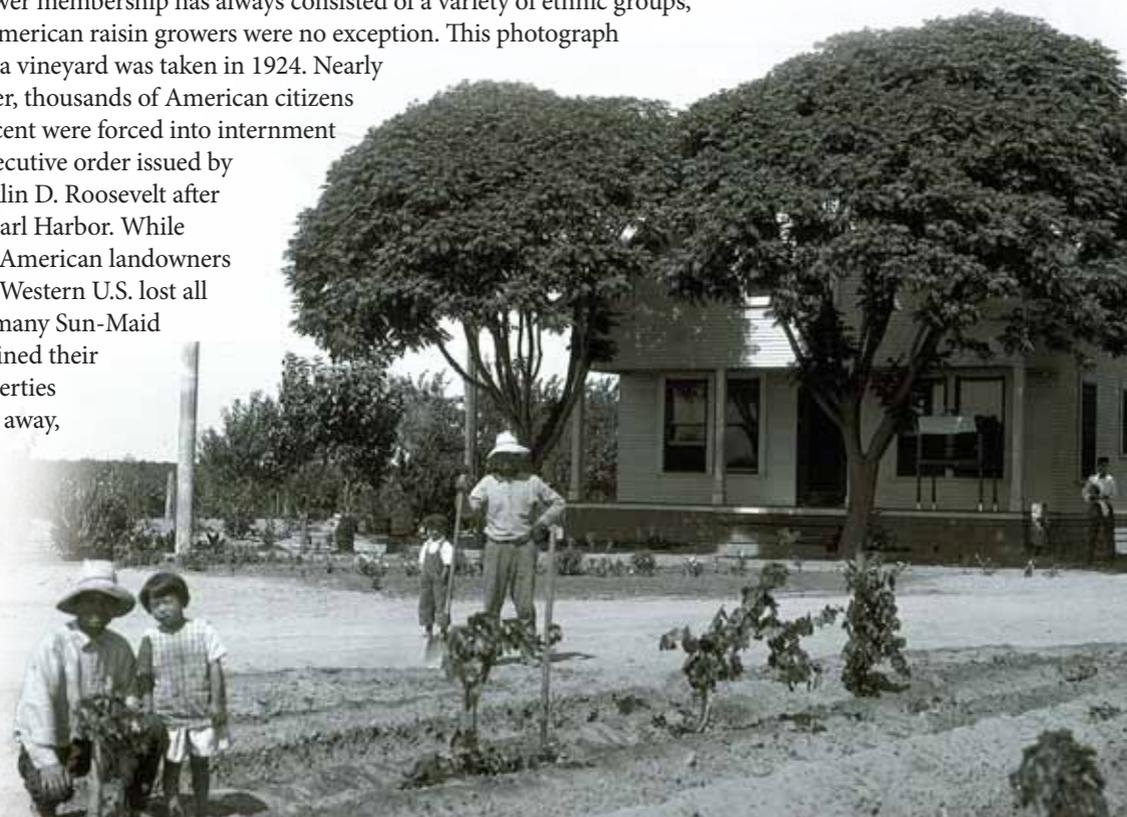
Most closely associated with raisins are the Armenians, who helped to originate the crop in Persia between 120 and 900 A.D. and are still among the world's greatest viticulturists. They began arriving in Fresno County in the 1890s, and quickly became known within the dried-fruit industry as growers and, eventually, packers.

Like so many people who carved out new lives here, the Armenians loved the land. One Tulare County community they established was named Yetttem—an Armenian word for paradise or Garden of Eden.



JAPANESE-AMERICAN GROWERS

Sun-Maid's grower membership has always consisted of a variety of ethnic groups, and Japanese-American raisin growers were no exception. This photograph of the Nakamura vineyard was taken in 1924. Nearly two decades later, thousands of American citizens of Japanese descent were forced into internment following an executive order issued by President Franklin D. Roosevelt after the attack on Pearl Harbor. While many Japanese-American landowners throughout the Western U.S. lost all their property, many Sun-Maid growers maintained their neighbors' properties while they were away, illustrating the principles of cooperation at the heart of the organization.



COMING TO AMERICA

New York's Statue of Liberty greeted many immigrants who arrived in the United States through Ellis Island between 1892 and 1954. Helping connect the east side of the country with the west was the world's first transcontinental railroad, built between 1863 and 1869. The "Pacific Railroad," as it was initially known, opened up new markets for products that could be shipped across country and brought immigrants west. When California became a state in 1850, its first census recorded a population of only 92,597.

Today, California has the greatest population of any state in the United States with over 37 million people.



FOUR GENERATIONS OF FARMING

(Left) Sun-Maid grower Jon Marthedal, pictured with his son, Eric, is a third-generation California raisin grower, continuing the tradition his farming ancestors began in Denmark dating back to the 1500s. Marthedal's grandfather came to Fresno County in 1903, and began growing diversified crops including grapes, cotton, and corn.



FAMILY FARM

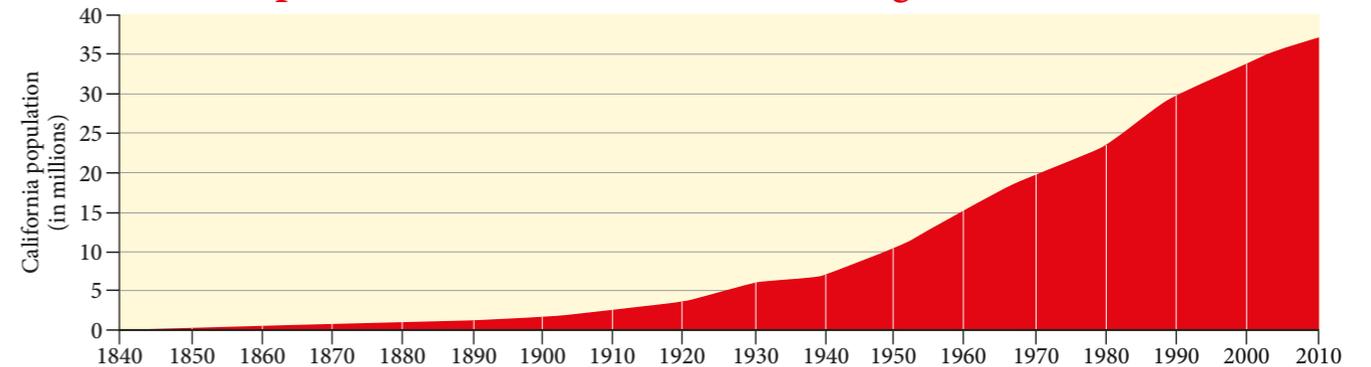
(Right) Jon Marthedal's mother is pictured with her brothers and sisters on the family farm. Jon Marthedal knew, after successfully growing his own raisins on a rented vineyard as a high school junior, that farming would also be his profession. He continues to grow raisins, tree fruit, and blueberries.



PASSING ON WISDOM & TRADITION

(Left) Eric Marthedal as a child with his grandfather, Harold Marthedal. Eric Marthedal now continues the farming tradition.

California Population Growth: Waves of Immigration



Gold Rush (1848-1869) Immigration mostly from East Coast, Midwest, and western Europe	Land Boom (1886-1888) Principally in Southern California, immigrants from within the U.S.	Rise of the Automobile and Agricultural Growth (1914-1929) Boom from the end of World War I to the beginning of the Great Depression	Manufacturing and Industry (1941-1945) Post-Depression boom spurred by World War II. Immigrants from within the U.S. and larger groups of African Americans and Latinos	Postwar Boom—Agriculture and Industry (1948-1970) Immigrants from within the U.S. and Latin America, Asia, and Western Europe	Economic Recovery and Recession (1982-1989) Influxes from Asia and Latin America	Melting Pot (2004) California achieves a statewide "minority majority," with no ethnic group constituting a majority
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Processing & Packaging

Natural seedless raisins are dried by the sun and travel from the field directly to Sun-Maid headquarters, where they are processed and packaged before being shipped to consumers around the world.

2



PROCESSING BEGINS

Bins of raisins are emptied onto the processing line. Specialized equipment removes the coarse vine stems from the raisins and cap stems are removed from the raisins by machines called cappers.

3



WATER BATH

Raisins are washed with water until they are thoroughly cleaned.

4



LASER SORTER

Laser sorters remove stems and other foreign materials with precision accuracy.

1



RAISINS ARRIVE

Raisins come to Sun-Maid's warehouses in their natural condition from the field.

5



TO THE PACKAGING LINES

From processing, raisins move to 25 packaging lines.

6



PACKAGES ARE FILLED

Raisins are filled into numerous sized packs, from ½ ounce/15 gram Mini-Snacks® to 1,000 pound/500kg totes.

7

DOWN THE LINE

Once filled and sealed, packages are conveyed to be placed into cases.

8



READY TO GO

Cases are assembled onto pallets and stored until shipped.

Distribution in the United States

Back in the early 20th century, Sun-Maid raisins traveled across the country by train shipments. At times these trains were loaded with thousands of tons of raisins and the rail cars featured signs proclaiming “Raisins Grown by 6,000 California Growers.”

In 1915, the “Sun-Maid Special” traveled to Chicago in record time to deliver raisins for the annual Raisin Day celebration when restaurants across the country featured raisin-themed dishes on their menus. These raisin trains helped to create a demand for raisins outside California,

where consumers previously had limited access to raisins.

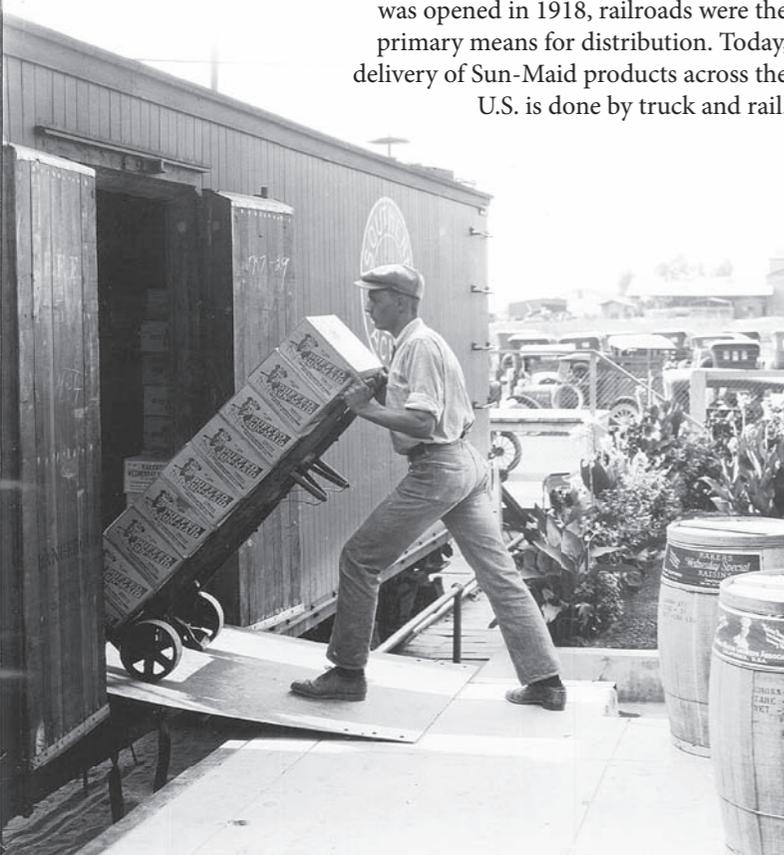
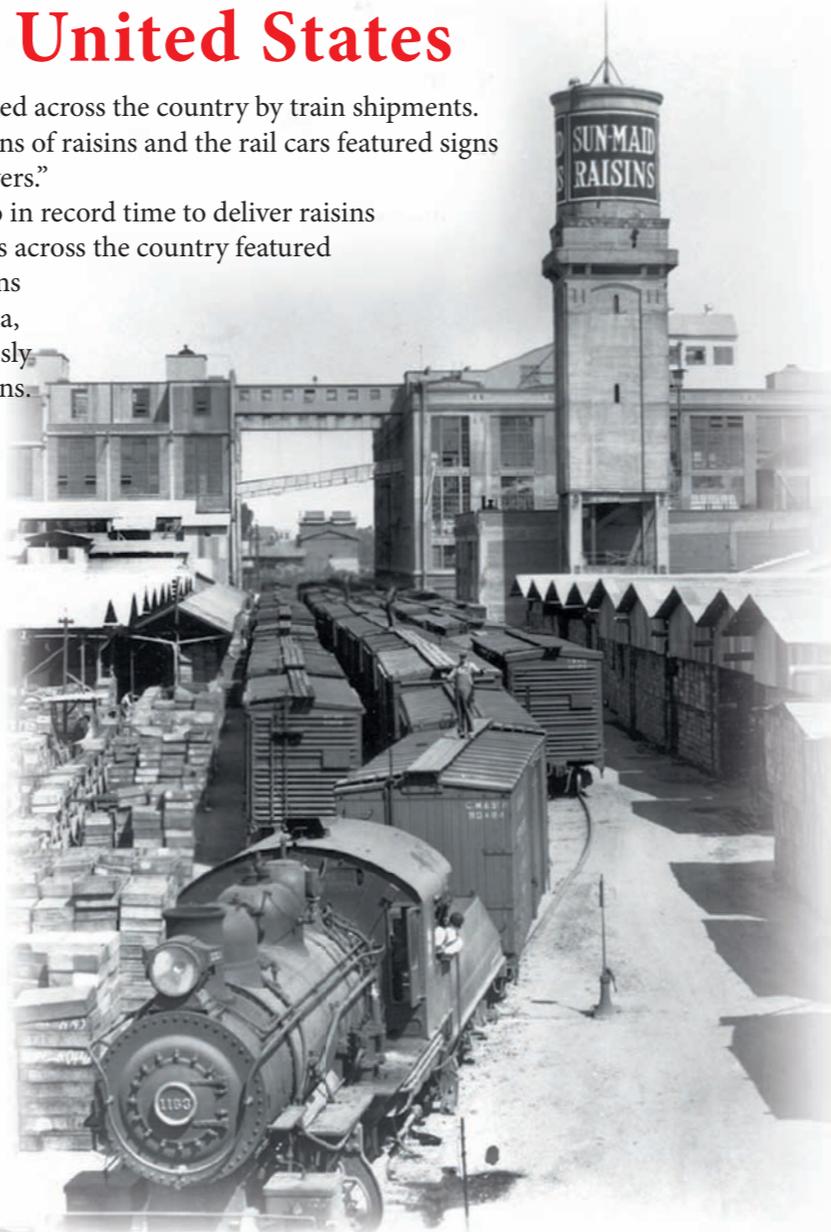
Today, people all over the U.S. can purchase raisins with ease, thanks to streamlined customer

and supply chain services. Coordinated efforts between customer service, transportation, warehouse administration, and demand planning departments deliver Sun-Maid’s entire line of dried fruit to store shelves and food manufacturers.

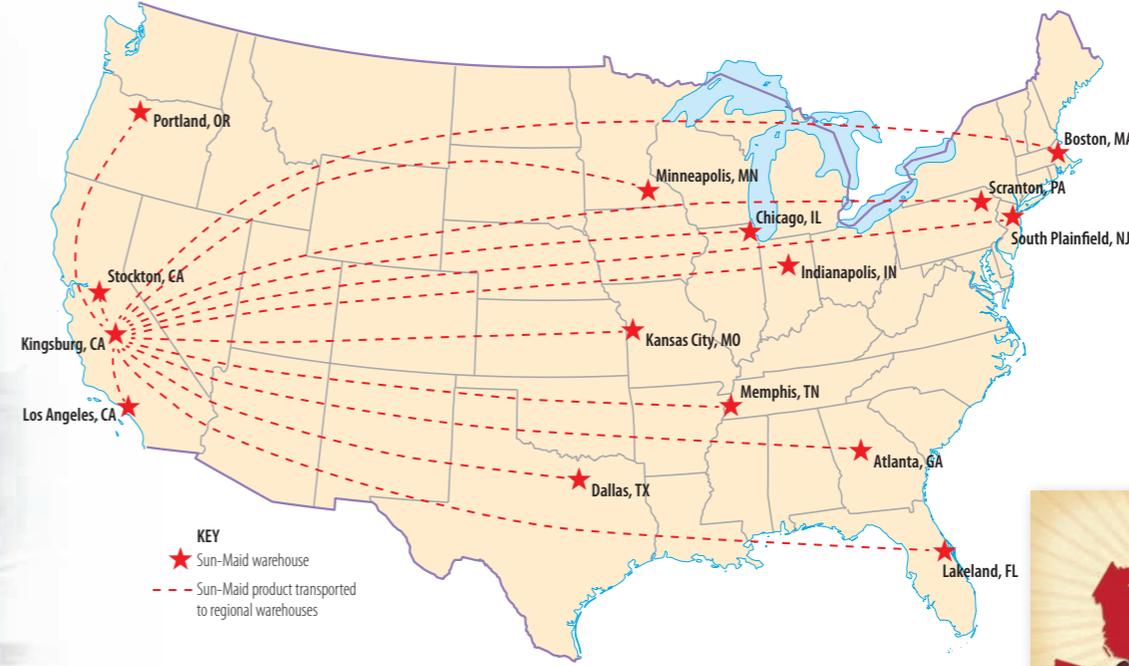
Sales are divided between retail, in which consumers purchase Sun-Maid products at stores, and bulk, in which food manufacturers purchase Sun-Maid products for use in their own food items.

RAISINS BY RAIL

When the Sun-Maid processing facility was opened in 1918, railroads were the primary means for distribution. Today, delivery of Sun-Maid products across the U.S. is done by truck and rail.



SOUTHERN PACIFIC
This 1925 photograph (left) shows boxes of raisins being loaded by hand directly from the Sun-Maid plant onto a Southern Pacific railcar.



LOCAL DELIVERY
Sun-Maid works with a number of regional warehousing and logistics firms to provide prompt local deliveries. One of these is Kane, of Scranton, Pennsylvania.



ALL IN THE FAMILY
Kane recently celebrated its 80th anniversary. The company has been family-owned for the past four generations. This photograph (above) is of the present Kane family management.

MAKING THEIR WAY
A network of warehouses enable Sun-Maid products to reach both retail and industrial customers, who buy dried fruits for use in products including cereals and baked goods.

INTERNATIONAL TRAVEL
Sun-Maid products travel from Kingsburg, California to their final destinations across the U.S., Canada, and to more than 50 countries throughout the world.



READY TO SHIP
Pallets of Sun-Maid products are stacked and ready for shipment.

Distribution Around the World

While the grapes for Sun-Maid's raisins all come from a 50-mile radius around Fresno, California, the finished products are sold in more than 50 countries around the world. Getting the packaged dried fruit to these destinations involves a coordinated effort between several departments at Sun-Maid, along with shippers, distributors, and brokers.

Most international orders are packed to order, which means they are stored until they are ready to be packaged and shipped. Pallets of dried fruit are loaded onto trailers, which are transported by truck to shipping ports in Oakland and Long Beach, California. Shipments to Europe are transported to Houston, Texas on trains and then shipped overseas in container ships.



INTERNATIONAL OPERATIONS
Shipping clerks coordinate the logistics of overseas raisin deliveries from Sun-Maid's Fresno plant, circa 1925.

SUN-MAID SHIPMENT
Sun-Maid products are ready to be transported from truck to ship in this 1963 photo.



ACROSS THE SEAS
Huge container ships transport Sun-Maid products from Oakland, California, to destinations across the globe.



AROUND THE WORLD WITH SUN-MAID
Sun-Maid products are sold in more than 50 countries worldwide, and the company is continually looking to expand the distribution of its raisins and dried fruits to make them more available to consumers.

DEVASTATING EARTHQUAKE & TSUNAMI

Sendai (Kyodo), March 2011—Japanese officials now estimate that the death toll may surpass

JAPAN EARTHQUAKE 2011
Natural disasters like the Japanese earthquake and tsunami of 2011 can interrupt and affect distribution.



TRANSPORT TO HAMBURG
Boxes of Sun-Maid raisins travel through Hamburg, Germany, in this photo from the early 1900s.

