

The Measure of California Agriculture



University of California Agricultural Issues Center

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Preface

The Measure of California Agriculture (MOCA) has been an important periodic publication of the University of California Agricultural Issues Center (AIC) for two decades. We hope that *MOCA* is useful for growers, policy makers, agribusiness, environmental interests, consumers, academics, students and others interested in California agriculture and its role in the economy and the broader physical and social environment.

For *MOCA*, the AIC staff assembles the most pertinent data from a variety of sources to describe agriculture in California and to place agricultural issues in perspective. Although principally an outreach document, *MOCA* draws on recent research including that conducted by AIC and our university colleagues.

MOCA is an ongoing project and we frequently update the summary data for publication in our *MOCA Highlights* that is made available on the AIC home page <aic.ucdavis.edu> and in a convenient brochure format that includes information about AIC. In addition to frequent updates to the *MOCA Highlights*, we expect a substantial update of many of the tables and charts presented here to be available in 2010.

The AIC staff primarily involved in assembling data, writing and editing for the latest *MOCA* include Jonathan Barker, Gary Beall, Jose Bervejillo, Hayley Boriss, Henrich Brunke, Antoine Champetier de Ribes, Marcia Kreith, William Matthews, Kurt Richter, John Thomas Rosen-Molina, Omid Rowhani, Daniel Sumner and Laurie Treacher.

Introduction

The Measure of California Agriculture (MOCA) documents the breadth and complexity of California agriculture and its links with the physical, economic and social environment in California and beyond. *MOCA* compiles information from many sources including our own research and provides interpretation of complex patterns in the data. *MOCA* yields insights into the circumstances faced by producers and consumers, and it illuminates forces shaping California agriculture. Highlights are described below.

Chapter 1 deals with the land and people that comprise California agriculture. It provides an overview of land use patterns including conversion of farmland to urban uses, land ownership, and size distributions of farms in California. It also describes the legal organization of agricultural production and the demographics of agricultural producers in the state.

Of the state's roughly 100 million acres, agriculture uses slightly more than one-quarter of which about 40 percent is cropland. The average size of a farm in California is about 350 acres. Most farms are much smaller. The largest operations in terms of land area are livestock operations that concentrate on livestock grazing. Relatively few large farms occupy large acreage. Large crop farms and dairies generate a large share of farm sales, with the top ten percent of farms accounting for about 86 percent of total sales value. Farm operators are predominantly middle aged or older and U.S. natives. Only 18 percent of operators are less than 45 years old and about a quarter more than 65 years old.

Chapter 2 concerns demand for and supply of California farm output. After detailing aspects of demand for California's agricultural output, the chapter describes agricultural production of leading farm commodities. The geographic distribution of production is described for regions and counties. Chapter 2 includes an overview of California organic agriculture based on data reported and analyzed in AIC publications.

U.S. food expenditures away-from-home continue to grow and account for about 43 percent of total food expenditures. Consistent with principles of comparative advantage, California ships most of its production to other states and to foreign destinations, while much of the demand for food consumed in California, especially for meats and grains, is met through shipments into the state from other parts of the United States and from abroad.

California is a large producer of many fruit, vegetable and tree nut products and accounts for more than 70 percent of U.S. sales for at least 25 crops. The leading five commodities by cash receipts are dairy products, nursery products, grapes, almonds and cattle, which together account for almost half of the state's total 2007 cash receipts of nearly \$32 billion. Organic agriculture continues to grow and registered nearly \$330 million in gross sales, which was about one percent of the state's total agricultural sales.

Chapter 3 gives an account of the inputs used by farmers including capital, labor, pesticides, energy and water. The chapter describes productivity growth and investments in agricultural research and development.

California farms average more than \$2 million in assets per farm, mostly in the form of real estate. Average value of machinery and equipment is only about \$87 thousand per farm. The hired farm work force is predominantly foreign born (70 percent) and young, with an average age of 33 years.

Undocumented immigrants supply more than half of the hired labor for California agriculture. Relatively low wages, seasonal and inconsistent employment mean that many of these workers are very poor by California standards.

Agricultural usage of pesticides represents only about one-quarter of all pesticides sold in California, with the rest accounted for by residential, and other urban and rural non-farm use. Grapes (wine, table and raisin), almonds and processing tomatoes use the most pesticides by weight. Energy expenditures in recent years have risen considerably for California farmers, driven by higher petroleum prices.

In a normal water year, agriculture accounts for about 41 percent of applied water usage in California and surface supplies account for 68 percent of the total use by agriculture, the urban sector, and instream environmental flows combined.

Advances in technology and research and development have contributed to significant productivity gains. Productivity growth has occurred for many crops and livestock products. Increases in milk per cow, bales of cotton per acre and tons of almonds per acre are leading examples. For some commodities, improvements in farm practices and technology are not reflected in higher yields but in improved product quality (wine grapes), more output per unit of water or smaller environmental consequences.

Chapter 4 covers cooperatives, marketing channels, international trade, exotic pests and diseases, government support policy and risk management. Cooperatives play a role in marketing for California producers, especially for fruits and tree nuts. For other commodities, farmers establish contracts with or without predetermined prices with processors.

California exports to almost 150 countries and accounts for more than 90 percent of U.S. exports for some commodities such as wine, almonds and walnuts. Agricultural exports were valued at more than \$8 billion in 2004, or about 24 percent of the state's total agricultural output. California farm export value expanded rapidly in the past few years and accounted for about 30 percent of farm sales in 2007. Top export destinations include Canada and the European Union, but Mexico and the Asian Pacific Rim are also important destinations. Almonds, wine and dairy products are the top three export products.

About \$450 million, including \$161.6 million in federal emergency funds, was spent by the state and federal governments to control invasive agricultural pests and diseases in California during 2003, including an outbreak of Exotic Newcastle Disease on poultry farms.

Since most important California commodities are not subject to regular government subsidies, California receives a small share of direct payments from the federal government relative to farm sales. Government subsidy is also provided through input subsidies and trade barriers. Because of its protection from imports and its size, the California dairy industry accounts for about half of all farm subsidy equivalent received by California agriculture.

Results of analysis presented in **Chapter 5** show that California farms and closely related processing industries account for 7.3 percent of the state's private sector labor force (including part-time workers) and generate 5.6 percent of the state labor income.

We find that a \$1 billion increase in the value added from agricultural production results in a total increase of \$1.9 billion to the Gross State Product. For every \$1 billion in farm sales, there are 18,000 jobs created in the state, about 11,000 in the farm sector itself plus about 7,000 among other employers. Farming, processing and closely related activities are especially significant to the economy of the Central Valley where, including ripple effects, agriculture generates 24.2 percent of the private sector employment and 18.5 percent of the private sector labor income. Excluding ripple effects, agriculture directly accounts for 12.6 percent of jobs and 8.4 percent of labor income in the Central Valley.

MOCA provides the reader with an objective overview of California agriculture. However, the complexity of California agriculture is difficult to summarize with only a few statistics. For more depth the reader is encouraged to consult the original sources for further information on the subject. We have provided complete citations for all tables and figures and additional citations to documents used in discussion of the data.

The Measure of California Agriculture

CHAPTER I

University of California Agricultural Issues Center

California Farms and Farmers

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More than one-quarter of California's landmass is used for agriculture. Just over half of the 27.6 million acres of agricultural land is pasture and range and about 40 percent is cropland. Most California farms are small in terms of cash receipts and total sales and are family or individually operated, but most sales derive from farms with cash receipts higher than one-half million dollars. California has a greater share of female farm operators and farmers with Hispanic, Asian and Pacific Islander backgrounds than the United States as a whole. As the state's population has grown, agricultural land has been converted to residential, industrial and commercial uses, yet agriculture remains a vibrant industry.

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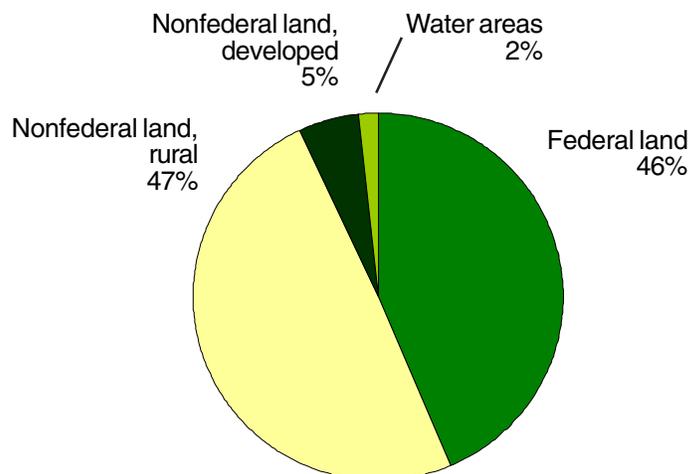
Land use

California total land area amounts to 101.5 million acres. In 2002, the state's 79,600 farms occupied about 27 percent of that total. Approximately 48 percent of the state's land was federal land and water areas, and the rest was nonfederal rural and nonfederal developed land. Federal land includes mostly national forests, national parks and wildlife areas. Other areas are covered by swamps, bare rock deserts, rural transportation areas, defense and industrial areas, farmsteads, and farm roads and lanes.

Nonfederal land use in California is mostly rural (Figure 1.1). Of a total of nearly 53 million nonfederal acres, 37 percent is pasture and rangeland, 26 percent forestland and 18 percent cropland (Figure 1.2). The U.S. Department of Agriculture Natural Resources Conservation Service (USDA/NRCS) defines "developed land" as the area devoted to residential, commercial or industrial use. Part of this area may still be "rural" or idle, if there are no buildings on it. Figures 1.1 and 1.2 show *National Resources Inventory* data, which was available on total land use in California for 1997, while Figures 1.3 and 1.4 show national data that is available for 2002.

Compared to California, 76 percent of the total land in the 48 contiguous states (1.9 billion acres) is nonfederal land, most of which is in rural areas (Figure 1.3). Pasture and rangeland account for 35 percent of the nonfederal land in the 48 contiguous states (Figure 1.4). Forests occupy 27 percent and crops 25 percent. Developed areas account for 7 percent.

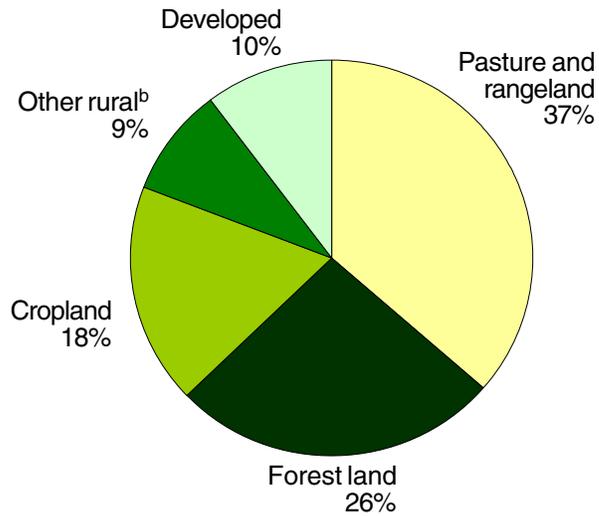
FIGURE 1.1
Federal and nonfederal land use in California, 1997^a



Source: USDA Natural Resources Conservation Service, *National Resources Inventory, 1997* (2000 revision). www.ca.nrcs.usda.gov/technical/nri/NRIresults.html

^a1997 figures were revised in 2000.

FIGURE 1.2
Nonfederal land use in California, 1997^a

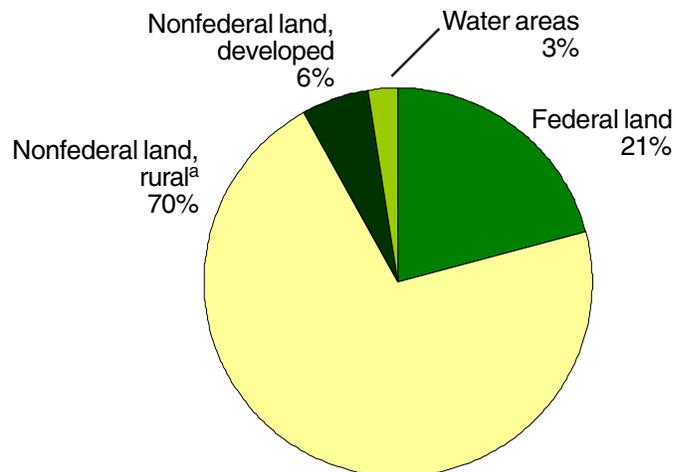


Source: USDA Natural Resources Conservation Service, *National Resources Inventory, 1997* (2000 revision). www.ca.nrcs.usda.gov/technical/nri/NRIresults.html

^a1997 figures were revised in 2000.

^bIncludes Conservation Reserve Program.

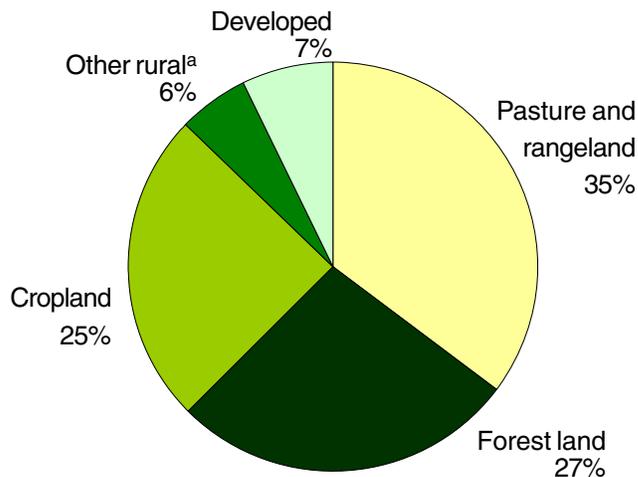
FIGURE 1.3
Federal and nonfederal land use, 48 contiguous states, 2002



Source: USDA Natural Resources Conservation Service, *National Resources Inventory, 2002*. www.nrcs.usda.gov/technical/land/nri02/index.html

^a Includes Conservation Reserve Program.

FIGURE 1.4
Nonfederal land use, 48 contiguous states, 2002



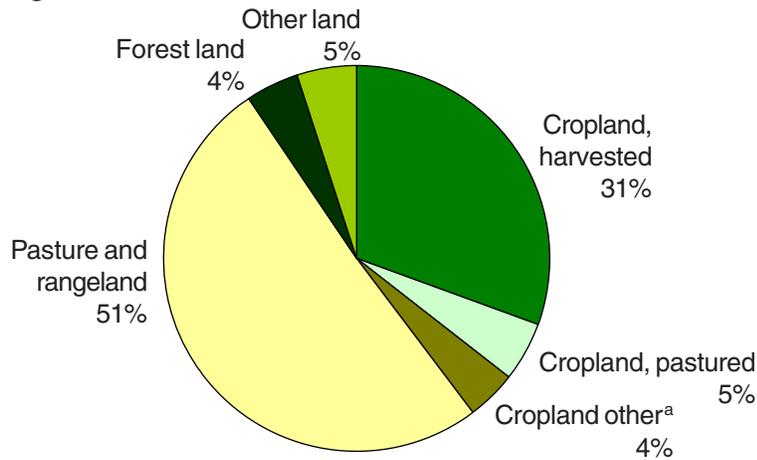
Source: USDA Natural Resources Conservation Service, *National Resources Inventory*, 2002.
www.nrcs.usda.gov/technical/land/nri02/index.html

^aIncludes Conservation Reserve Program.

The 2002 *Census of Agriculture* reports 27.6 million acres of agricultural land in California, 51 percent of which is pasture and rangeland (Table 1.1, Table 1.2 and Figure 1.5). Harvested cropland occupies 31 percent, while pastured cropland and other cropland together account for 9 percent. Total agricultural land in the state decreased by about 4 percent compared to the 1997 *Census of Agriculture*.

For the United States as a whole, pasture and rangeland account for 42 percent of total agricultural land, while all croplands account for 46 percent (Figure 1.6). Agricultural land decreased 2 percent between 1997 and 2002.

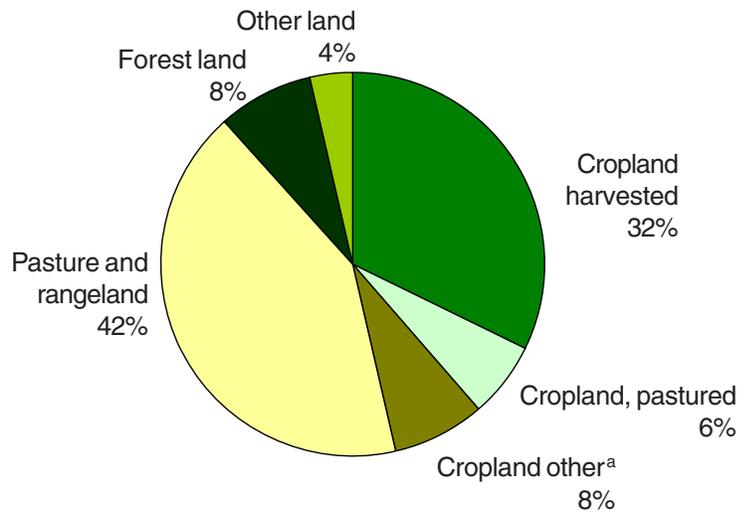
FIGURE 1.5
Agricultural land use, California, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.
www.nass.usda.gov/Census_of_Agriculture/index.asp

^aIncludes cover crops, failed crops, summer fallow and idle fields.

FIGURE 1.6
Agricultural land use, United States, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.
www.nass.usda.gov/Census_of_Agriculture/index.asp

^aIncludes cover crops, failed crops, summer fallow and idle fields.

TABLE 1.1
Agricultural land use, California and United States, 1964-2002

	Pasture & rangeland ^a	Total cropland ^b	Harvested cropland	Other land ^c	Woodland & woodland pasture ^d	Total agricultural land
1,000 acres						
California						
1964	20,450	11,815	7,846	1,343	3,403	37,011
1982	17,980	11,257	8,765	1,437	1,483	32,157
1992	16,191	10,479	7,761	1,158	1,150	28,978
1997 ^e	15,022	11,063	8,676	1,498	1,213	28,796
2002	13,988	10,994	8,466	1,416	1,191	27,589
United States						
1964	490,307	434,322	286,892	39,671	145,976	1,110,276
1982	418,264	445,362	326,306	36,082	87,088	986,796
1992	410,835	435,366	295,937	25,369	73,962	945,532
1997 ^e	398,279	445,325	318,937	34,340	76,854	954,798
2002	395,279	434,165	302,697	32,957	75,878	938,279

Source: U.S. Department of Commerce Census Bureau, *Census of Agriculture* (1964-1992); USDA National Agricultural Statistics Service, *Census of Agriculture* (1997-2002).

^aOther than cropland and woodland pastured.

^bIncluding that used for pastures and other cropland.

^cHouses and barns, roads and wastelands.

^dExcluding cropland pasture.

^eFigures from 1997 were adjusted for coverage in 2002 and are not directly comparable with previous years.

TABLE 1.2
Agricultural land use, California and United States, 1964-2002

	Pasture & rangeland ^a	Total cropland ^b	Harvested cropland	Other land ^c	Woodland & woodland pasture ^d
	Percent				
California					
1964	55.3	31.9	21.2	3.6	9.2
1982	55.9	35.0	27.3	4.5	4.6
1992	55.9	36.2	26.8	4.0	4.0
1997 ^e	52.2	38.4	30.1	5.2	4.2
2002	50.7	39.8	30.7	5.1	4.3
United States					
1964	44.2	39.1	25.8	3.6	13.1
1982	42.4	45.1	33.1	3.7	8.8
1992	43.5	46.0	31.3	2.7	7.8
1997 ^e	41.7	46.6	33.4	3.6	8.0
2002	42.1	46.3	32.3	3.5	8.1

Source: U.S. Department of Commerce Census Bureau, *Census of Agriculture* (1964-1992); USDA National Agricultural Statistics Service, *Census of Agriculture* (1997-2002).

^aOther than cropland and woodland pastured.

^bIncluding that used for pastures and other cropland.

^cHouses and barns, roads and wastelands.

^dExcluding cropland pasture.

^eFigures from 1997 were adjusted for coverage in 2002 and are not directly comparable with previous years.

Every five years, farm operators are asked to provide information to the *Census of Agriculture*. During the past four decades, the area of California cropland allocated to orchards, vineyards, vegetables and melons has consistently increased (Table 1.3). The area allocated to the main field crops such as cotton, wheat and rice increased from the 1960s to the 1980s, but it has been decreasing since, particularly for cotton and wheat, with rice acreage moving more erratically. The acreage in barley and “other crops” has been decreasing since 1964. Within the latter group are crops such as dry beans, potatoes and sugarbeets (Table 1.3).

TABLE 1.3
California harvested cropland, 1964-2002

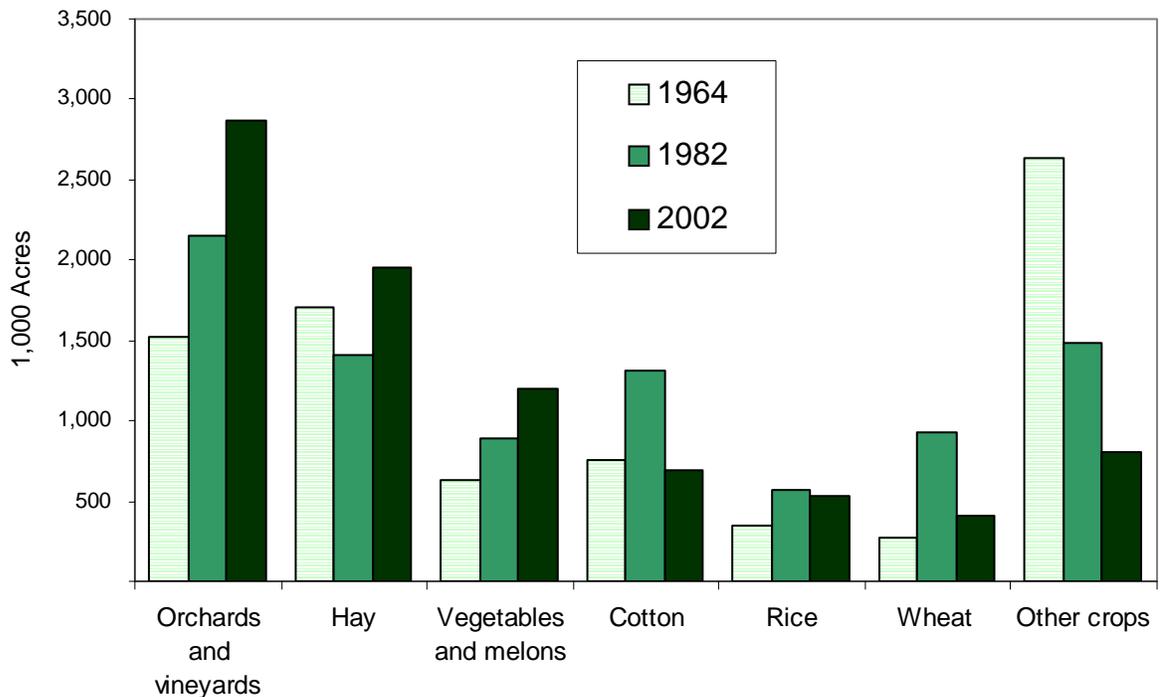
	1964	1982	1992	2002
	1,000 acres			
Orchards and vineyards	1,520	2,158	2,246	2,872
Hay, all types ^a	1,702	1,416	1,531	1,953
Vegetables and melons	626	895	1,017	1,197
Cotton	759	1,313	1,066	695
Rice	343	567	401	531
Wheat for grain	267	929	569	410
Barley for grain	1,319	583	204	75
Other crops ^b	1,310	904	727	733
Total harvested cropland	7,846	8,765	7,761	8,466

Source: U.S. Department of Commerce Census Bureau, *Census of Agriculture* (1964-1992); USDA National Agricultural Statistics Service, *Census of Agriculture* (1997-2002).

^a Hay includes alfalfa, small grain, wild grass silage and green chop varieties.

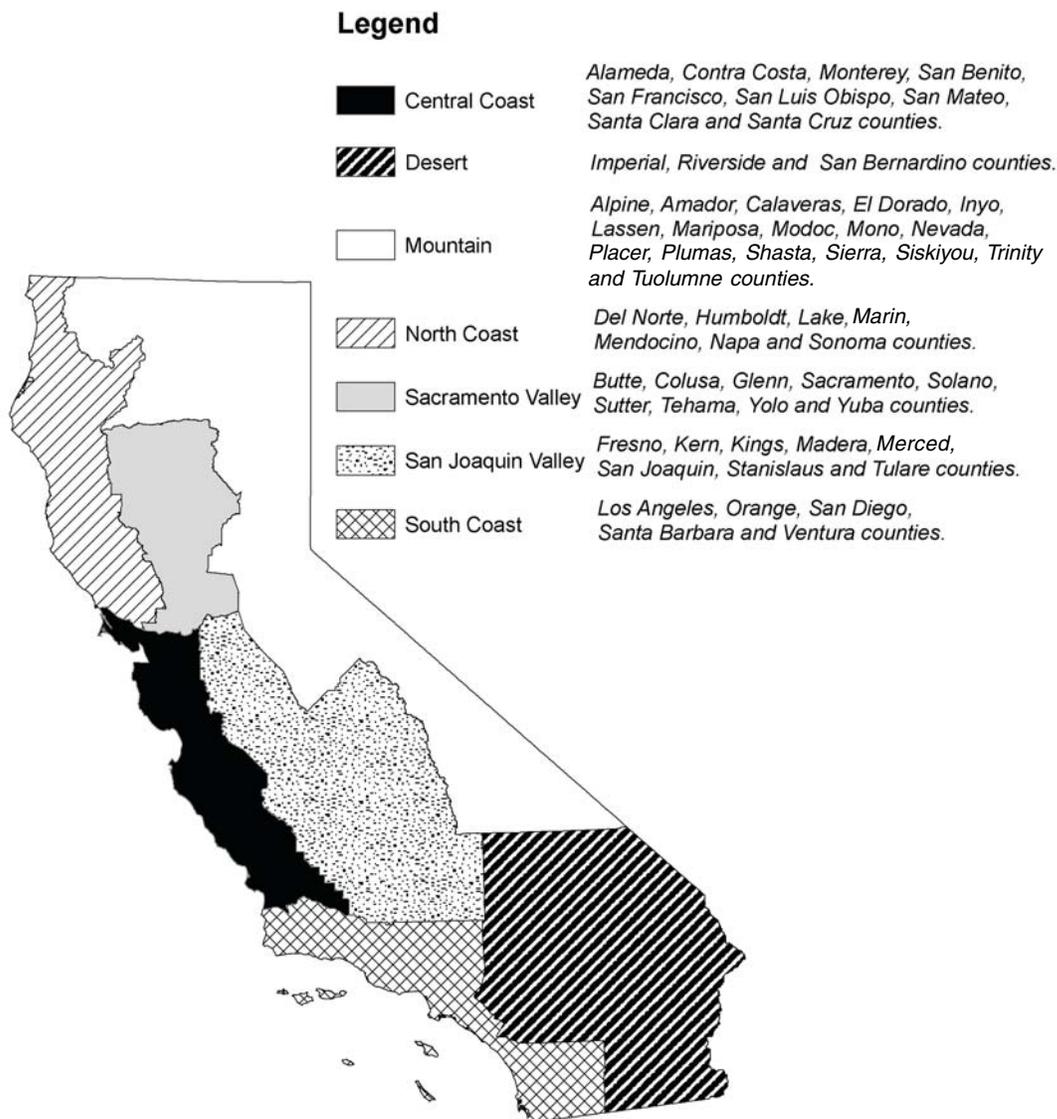
^b Residual obtained by subtracting all reported crops from total harvested cropland. Dry beans, potatoes and sugarbeets are in this group.

FIGURE 1.7
California harvested cropland, 1964, 1982, 2002



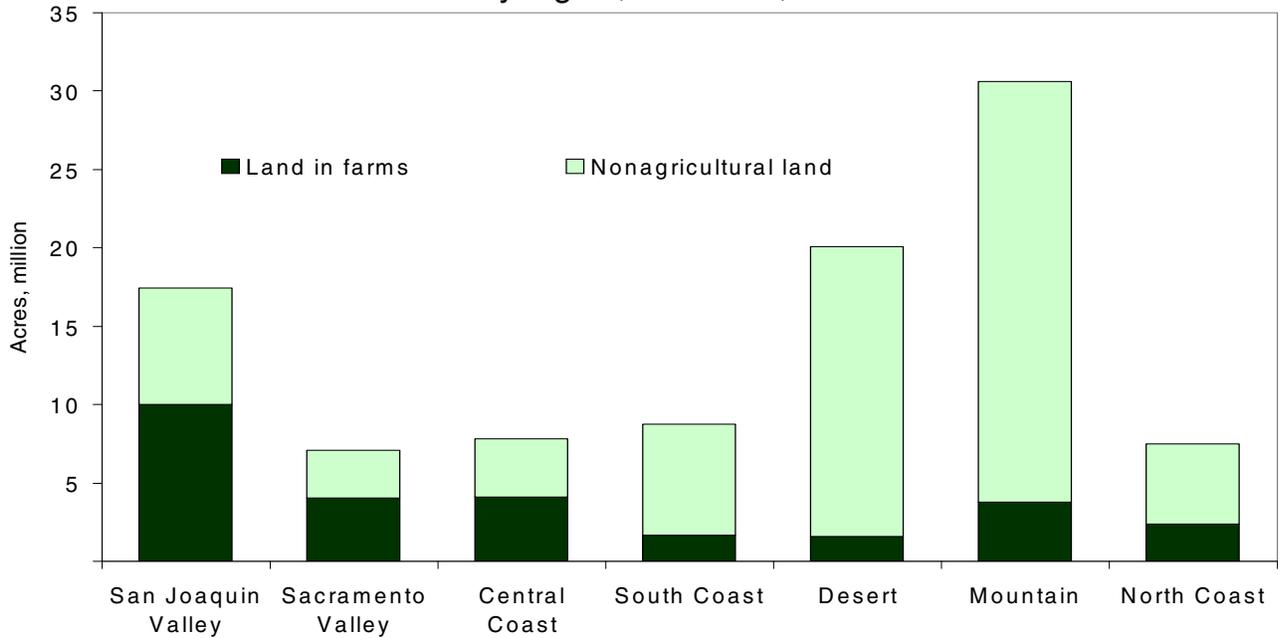
Source: Table 1.3 (above).

FIGURE 1.8
California production regions



Two-thirds of the agricultural land in California is concentrated in the Central Valley (San Joaquin and Sacramento valleys) and the Central Coast (Figure 1.8). Geographically, the Mountain and Desert are the largest regions of the state, but in those regions the majority of the land is not arable (Figure 1.9). Of the agricultural land in the Central Valley and Desert regions more than 50 percent is used as cropland. In the Coastal and Mountain regions, pastures and rangelands are more important than cropland (Figure 1.10).

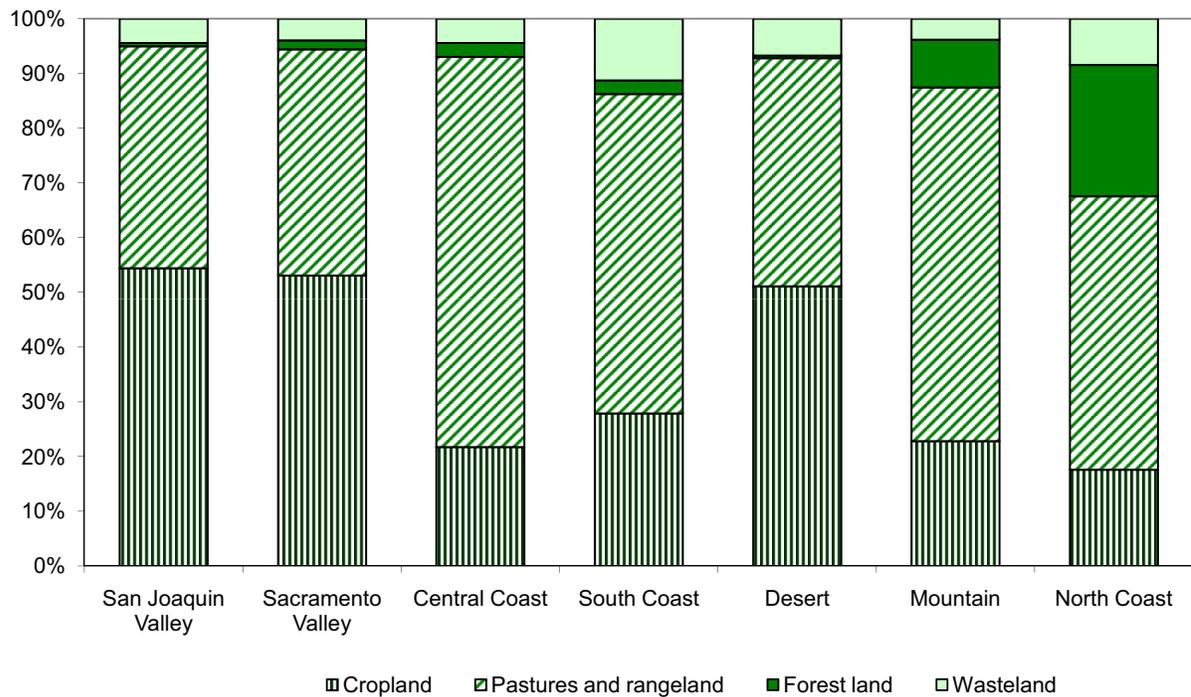
FIGURE 1.9
Total land and land in farms by region, California, 2002^a



Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

^aLand in farms as defined by the *Census of Agriculture* comprises agricultural land used for crops, pasture or grazing. It also includes woodland and wasteland not actually under cultivation or used for pasture or grazing, provided it is part of the farm operator's total operation.

FIGURE 1.10
Total agricultural land use by region, California, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

Farmland conversion

Conversion of agricultural land to urban uses is an ongoing public policy issue in the United States and in California. Data from the California Department of Conservation indicate that between 1988 and 2002, about 734,000 acres of land have been converted into urban and built-up uses (Table 1.4). This quantity is equivalent to 2.4 percent of the total agricultural land that the *Census of Agriculture* reported was available in the state in 1987 (30.6 million acres).

Of the total acres converted from 2000 to 2002, 59,144 acres were former cropland and 35,126 were grazing land. In addition, conversion occurred with 89,973 acres of “other land” comprised of idled farmland that previously had been removed from agricultural activities in anticipation of development.

The two-year rate at which agricultural land is converted into urban and built-up areas decreased at the beginning of the 1990s but has been increasing since 1994-96. The Central Valley (San Joaquin and Sacramento valleys), which according to the 2002 census contains over half of the state’s agricultural land, has seen a lower proportion of its cropland and grazing land converted than the rest of the state. The Valley accounts for 69 percent of California’s cropland, but according to the Department of Conservation accounted for 42 percent of the statewide cropland conversion between 1988 and 2002. Similarly, with 41 percent of the state’s total grazing land, the Central Valley recorded only 22.5 percent of the statewide grazing land converted during that 14 year period.

Farmland conversion depends largely on population growth. California’s population increased by 75 percent between 1970 and 2002, or approximately 1.8 percent per year. The population growth in the Central Valley was more than 100 percent during that same period. For the year 2050, the California Department of Finance projects a total state population of 54.8 million, about 56 percent higher than in 2002. The Central Valley’s population is projected to increase faster than the state’s population. Accordingly, the Central Valley is projected to grow from today’s 16 percent of total state population in 2002 to 23 percent in 2050 (California Department of Finance).

TABLE 1.4

Acres converted to urban and built-up areas, 1988-2002

California	Cropland ^a	Grazing land	Other land ^b	Total converted
1988-90	40,003	20,863	57,364	118,230
1990-92	39,141	14,729	45,394	99,264
1992-94	23,453	10,464	20,390	54,307
1994-96	25,954	13,303	19,185	58,442
1996-98	37,585	17,057	34,919	89,997
1998-00	46,859	24,403	57,816	129,161
2000-02	59,144	35,126	89,973	184,243
Cumulative Total	272,139	135,945	325,041	733,644
Central Valley^c				
1988-90	10,119	5,590	11,908	27,617
1990-92	23,390	3,530	9,997	36,917
1992-94	9,333	2,491	4,028	15,852
1994-96	10,735	2,844	4,323	17,902
1996-98	20,126	5,932	10,091	36,309
1998-00	18,111	4,715	10,458	33,284
2000-02	22,641	5,513	17,183	45,337
Cumulative Total	114,455	30,615	67,988	213,218
Sacramento Valley^d				
1988-90	4,772	3,783	6,535	15,090
1990-92	6,450	3,088	3,421	12,959
1992-94	2,516	1,122	1,935	5,573
1994-96	2,868	2,312	2,186	7,366
1996-98	3,377	3,212	3,640	10,342
1998-00	7,038	3,704	4,810	15,552
2000-02	5,482	3,820	7,566	16,868
Cumulative Total	32,503	21,041	30,093	83,750
San Joaquin Valley^e				
1988-90	5,347	1,807	5,373	12,527
1990-92	16,940	442	6,576	23,958
1992-94	6,817	1,369	2,093	10,279
1994-96	7,867	532	2,137	10,536
1996-98	16,749	2,720	6,451	25,967
1998-00	11,073	1,011	5,648	17,732
2000-02	17,159	1,693	9,617	28,469
Cumulative Total	81,952	9,574	37,895	129,468

Source: California Department of Conservation, Division of Land Resource Protection, Farmland Mapping and Monitoring Program. www.conserv.ca.gov/dlrp/fmmp/stats_reports/index.htm

^aAll agricultural land that is not classified as grazing land.

^bIncludes idle land previously removed from agricultural production.

^cCentral Valley is the sum of Sacramento and San Joaquin valleys.

^dCounties of Butte, Colusa, Glenn, Sacramento, Shasta, Solano, Sutter, Tehama, Yolo and Yuba.

^eCounties of Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare.

Land in farms and land ownership

As has been the national trend for decades, the number of farms and the total land in farms in California has continued to decrease. At the same time, the average number of acres per farm in California has increased by about 6 percent between 1997 and 2002. Table 1.5 should be read with caution. The definition of “farm” has changed several times, and with each change some of the smallest farms have been removed from the census. The 2002 *Census of Agriculture* introduced yet another change in the way the survey was conducted, resulting in better coverage. However, this change makes it difficult to compare the most recent records with those before 1997. General long-term trends, however, remain in place.

TABLE 1.5
Number of farms and land in farms, California and United States, 1945-2002^a

	California			United States		
	Number of farms	Land in farms (1,000 acres)	Average size (acres)	Number of farms	Land in farms (1,000 acres)	Average size (acres)
1945	138,917	35,054	252	5,859,169 ^b	1,141,615 ^b	195
1964	80,852	37,011	458	3,154,857	1,110,187	352
1987	83,217	30,598	368	2,087,759	964,471	462
1997 ^c	87,991	28,796	327	2,215,876	954,753	431
2002	79,631	27,589	346	2,128,982	938,279	441

Source: U.S. Department of Commerce Census Bureau, *Census of Agriculture* (1945-1987); USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

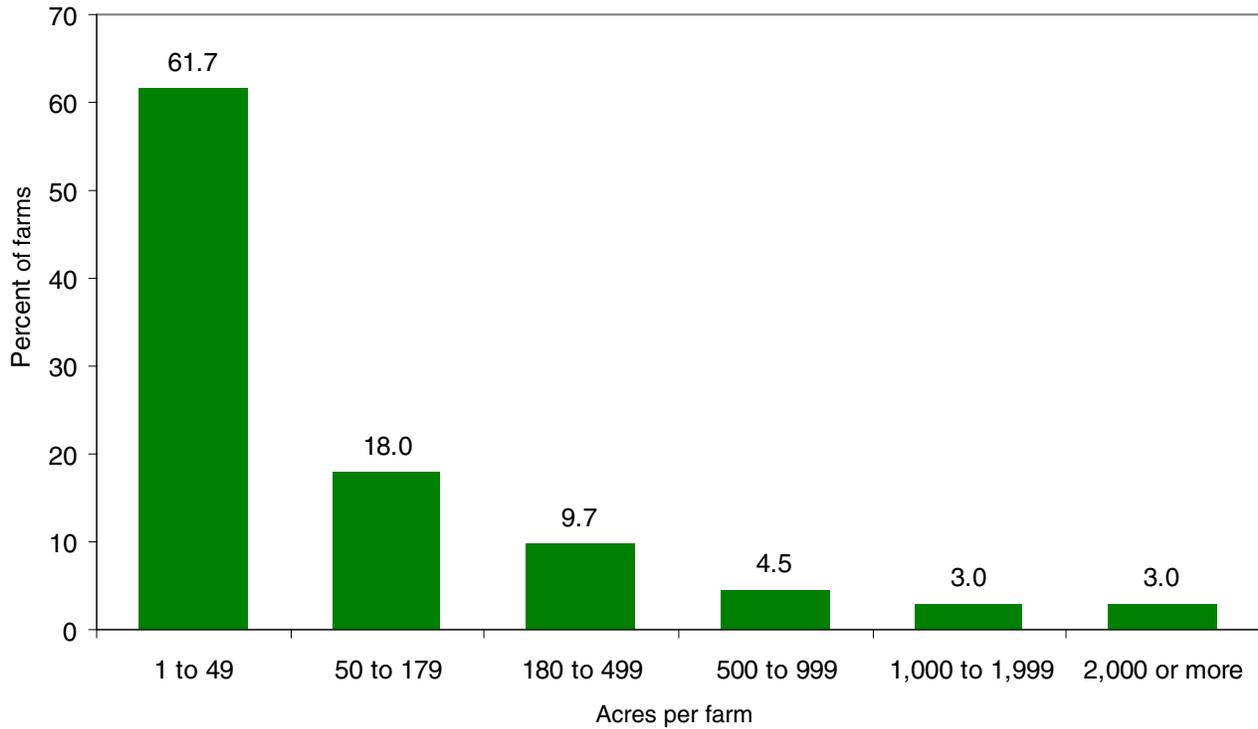
^a A farm as defined by USDA is a place that generated or normally would have generated at least \$1,000 in agricultural sales, or for 1997 and 2002, a place that received \$1,000 in federal payments.

^b Excludes Hawaii and Alaska.

^c Figures from 1997 were adjusted for coverage in 2002 and are not directly comparable with previous years.

In 2002, almost 62 percent of counted California farms were smaller than 50 acres. The largest farms, with 2,000 acres or more acres each, represented only 3 percent of the state's 79,631 farms (Figure 1.11). The average farm in the Central Valley has 352 acres, which is similar to the state average of 346 acres. Farms in the Central Coast and Mountain regions are larger than the state average, with 537 and 472 acres per farm respectively. Farms in the South and North Coast and in the Desert are on average smaller than in the other regions of the state, especially in the South Coast where farms averaged 154 acres.

FIGURE 1.11
California farms by acres per farm, 2002

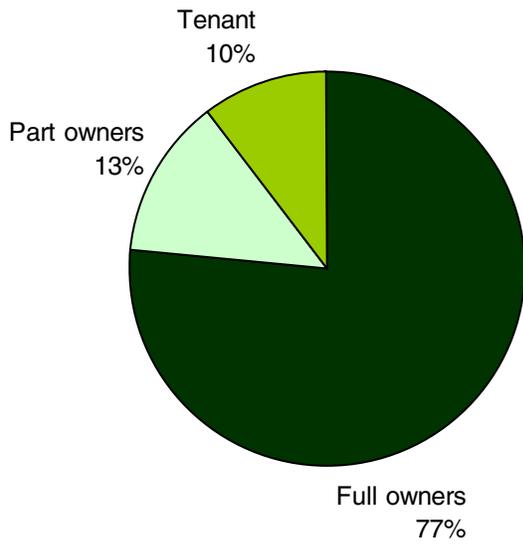


Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

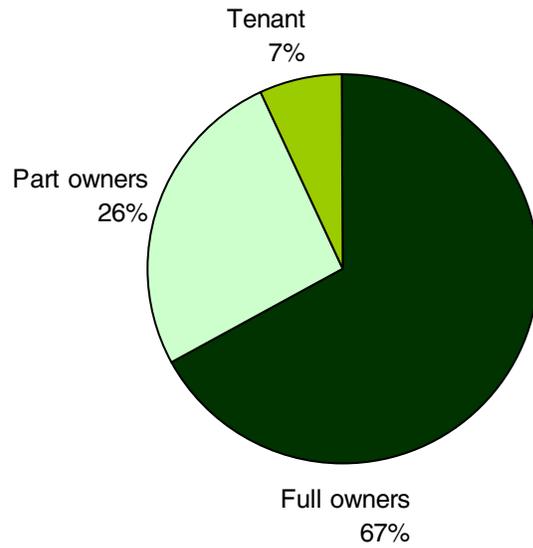
A greater portion California farmers (76.5%) are full owners (Figure 1.12) of their farms than in the United States as a whole (67.1%). Full ownership in California has been above two-thirds of the farms since 1940. Over 90 percent of the farms in California (91.5%) and the United States (94.3%) have no more than 2 operators per farm (Table 1.6).

FIGURE 1.12
 Land ownership and farm operators, California and United States, 2002

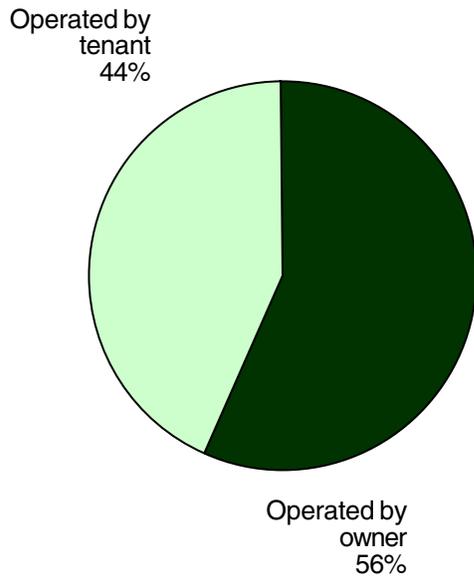
Share of farms, California



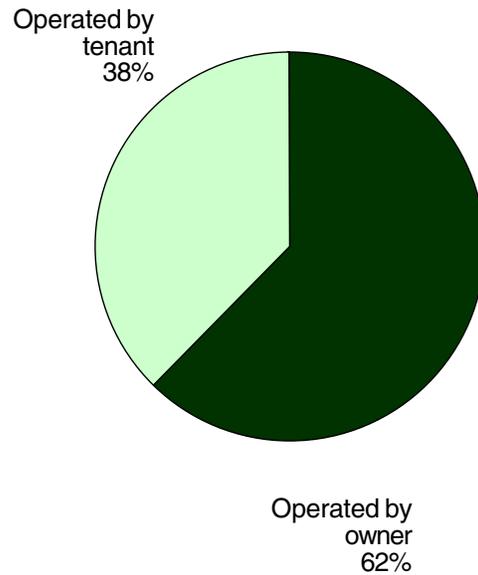
Share of farms, U.S.



Land in farms, California



Land in farms, U.S.



Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

TABLE 1.6

Farms by number of operators per farm, California and United States, 2002

Operators per farm	California		United States	
	Number of farms	Percent	Number of farms	Percent
1	44,967	56.5	1,325,855	62.3
2	28,058	35.2	681,435	32.0
3	4,385	5.5	84,917	4.0
4	1,335	1.7	24,819	1.2
5 and more	886	1.1	11,956	0.6

Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

Size distribution by total sales

A large share of California farms account for a small portion of state agricultural sales, and a small share of farms account for the majority of sales. Nearly 37,000 California farms (46 %) account for 0.3 percent of all agricultural sales (Table 1.7). Conversely, 10 percent of the farms, each with more than half a million dollars in sales, account for 86 percent of total sales (Figure 1.13). A similar picture can be seen for the whole United States. The major difference, however, is that the group of California farms selling over \$500,000 has average sales that are considerably higher than U.S. farms in the same sales class (\$2.7 million versus \$1.8 million).

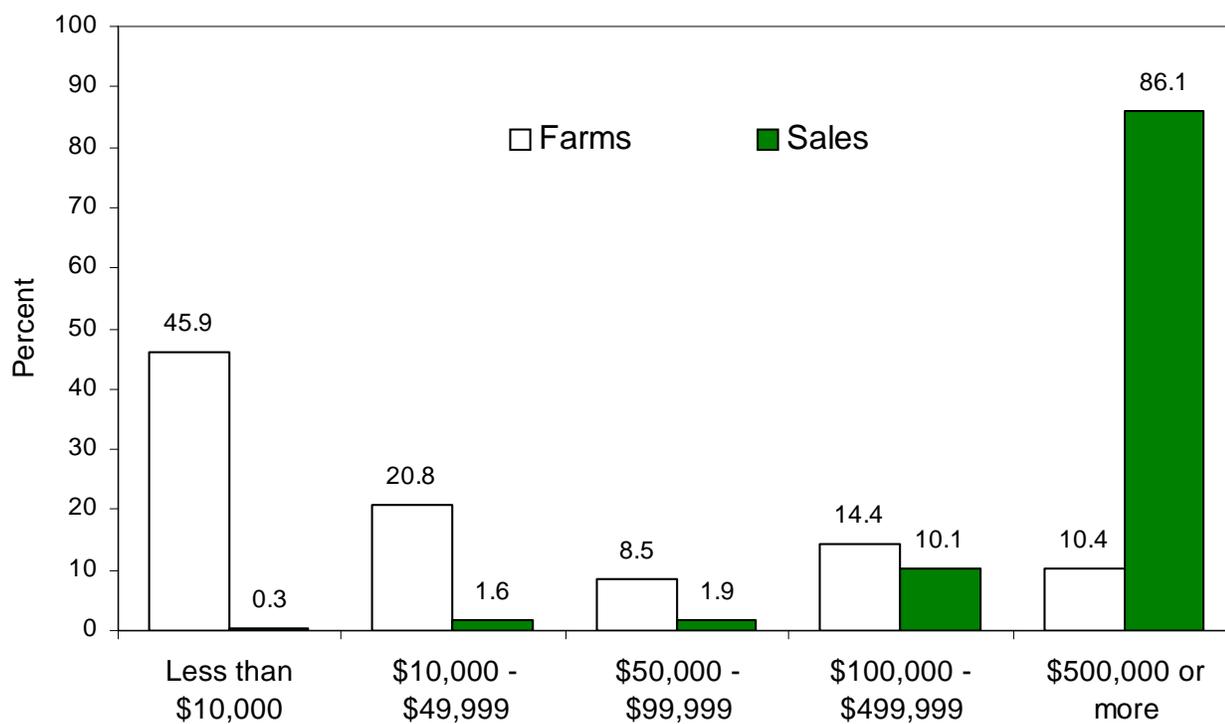
The size distribution by sales class and acres per farm varies with the nature of the commodities produced. See the section “Production by principal commodity group,” in Chapter 2, for a more detailed description.

TABLE 1.7
Number of farms and market value of sales by total sales class, 2002

Market value of agricultural products sold	California			United States		
	Number of farms	Sales value (\$1,000)	Average sales per farm (\$)	Number of farms	Sales value (\$1,000)	Average sales per farm (\$)
Less than \$10,000	36,602	85,149	2,326	1,262,285	2,825,097	2,238
\$10,000 - \$24,999	9,442	151,466	16,042	256,579	4,067,428	15,853
\$25,000 - \$49,999	7,168	251,402	35,073	158,270	5,593,748	35,343
\$50,000 - \$99,999	6,772	478,765	70,698	140,584	10,024,295	71,305
\$100,000 - \$499,999	11,462	2,601,575	226,974	240,696	53,931,713	224,066
\$500,000 or more	8,263	22,168,817	2,682,902	70,812	124,204,073	1,753,998
All	79,709	25,737,174	322,889	2,129,226	200,646,354	94,234

Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.

FIGURE 1.13
Percent of farms and sales value by total sales class, California, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.

Legal organization

Individuals or families control 81 percent of California's farms, a lower percentage compared to the United States as a whole (90 %). This type of legal organization accounts for 54 percent of the agricultural area and 33 percent of total sales in the state (Table 1.8).

In California, corporations account for 16 percent of the agricultural area and 38 percent of total sales. These firms are also larger in terms of the average value of land and buildings compared to individually owned or family farms (Table 1.8).

TABLE 1.8
Legal organization of farms, California and United States, 2002^a

California							
		Individual or family	Partner- ship	Corporation		Other ^a	All farms
				Family held	Not family held		
Farms	(percent)	80.9	11.2	5.4	1.0	1.5	100
Average area	(acres)	229	842	845	1,024	722	346
Total area	(percent)	53.5	27.3	13.2	3.0	3.1	100
Average sales	(\$1,000)	131.8	803.1	1,761.0	2,802.7	395.2	325
Total sales	(percent)	32.8	27.6	29.2	8.6	1.8	100
Average value of land and buildings	(\$1,000)	1,206.8	830.3	2,366.5	3,539.6	4,721.8	2,027

United States							
		Individual or family	Partner- ship	Corporation		Other ^a	All farms
				Family held	Not family held		
Farms	(percent)	89.7	6.1	3.1	0.3	0.8	100
Average area	(acres)	326	1,130	1,485	1,315	3,845	441
Total area	(percent)	66.3	15.6	10.4	0.9	7.0	100
Average sales	(\$1,000)	57.0	294.9	670.3	1,832.4	152.1	97
Total sales	(percent)	52.5	18.5	21.4	5.6	1.3	100
Average value of land and buildings	(\$1,000)	438.0	1,209.0	1,719.7	2,142.0	1,366.4	538

Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

^aIncludes cooperative, estate or trust, institutional, etc.

Farmer demographics

Over the past 15 years the number of farm operators under 44 years of age has been decreasing steadily (Table 1.9). In 1987, 28 percent of California's farmers were younger than 44; that number fell to 18 percent in 2002. Older age groups have remained about the same or have increased since 1987. However, reported distribution of operators by age group could be misleading if family farms remain in the name of the oldest member, even when this person is no longer the primary decision maker in the farm business. It is also likely that farming is an attractive part time activity for those who retire from other occupations.

TABLE 1.9

Farm operators by age group, California and United States, 1987-2002^a

California								
Age (years)	<25	25-34	35-44	45-54	55-59	60-64	65-69	>69
Number of operators								
1987	539	6,327	16,613	19,368	10,336	10,636	8,619	10,779
1992	417	4,288	14,232	19,223	8,818	9,279	8,222	13,190
1997	466	4,255	15,301	23,473	10,597	9,194	8,376	16,329
2002	364	2,299	11,470	22,904	10,870	9,528	7,219	14,977
Percent								
1987	0.6	7.6	20.0	23.3	12.4	12.8	10.4	13.0
1992	0.5	5.5	18.3	24.7	11.4	11.9	10.6	17.0
1997	0.5	4.8	17.4	26.7	12.0	10.4	9.5	18.6
2002	0.5	2.9	14.4	28.8	13.7	12.0	9.1	18.8
United States								
Age (years)	<25	25-34	35-44	45-54	55-59	60-64	65-69	>69
Number of operators								
1987	35,851	242,688	411,153	454,910	247,908	247,908	191,435	255,906
1992	27,906	178,826	381,746	429,333	213,315	216,524	188,165	289,485
1997	23,771	154,839	444,003	552,170	251,956	229,264	201,873	358,000
2002	16,962	106,097	366,306	572,664	268,712	240,411	197,476	360,354
Percent								
1987	1.7	11.6	19.7	21.8	11.9	11.9	9.2	12.3
1992	1.4	9.3	19.8	22.3	11.1	11.2	9.8	15.0
1997	1.1	7.0	20.0	24.9	11.4	10.3	9.1	16.2
2002	0.8	5.0	17.2	26.9	12.6	11.3	9.3	16.9

Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002.

^a1997 figures were revised in 2002.

About half of the 80,000 farmers in California reported in 2002 that they had not been employed off the farm during the previous year (Table 1.10). That same year more than 26,000 farm operators (one-third of the total) reported having worked off the farm for more than 200 days. The proportion of farm operators not employed off the farm increased 10 percentage points between 1987 and 2002, while those reporting working more than 200 days off the farm decreased by 6 percentage points.

TABLE 1.10

Reported number of farm operators by number of days employed off the farm, California and United States, 1987-2002^a

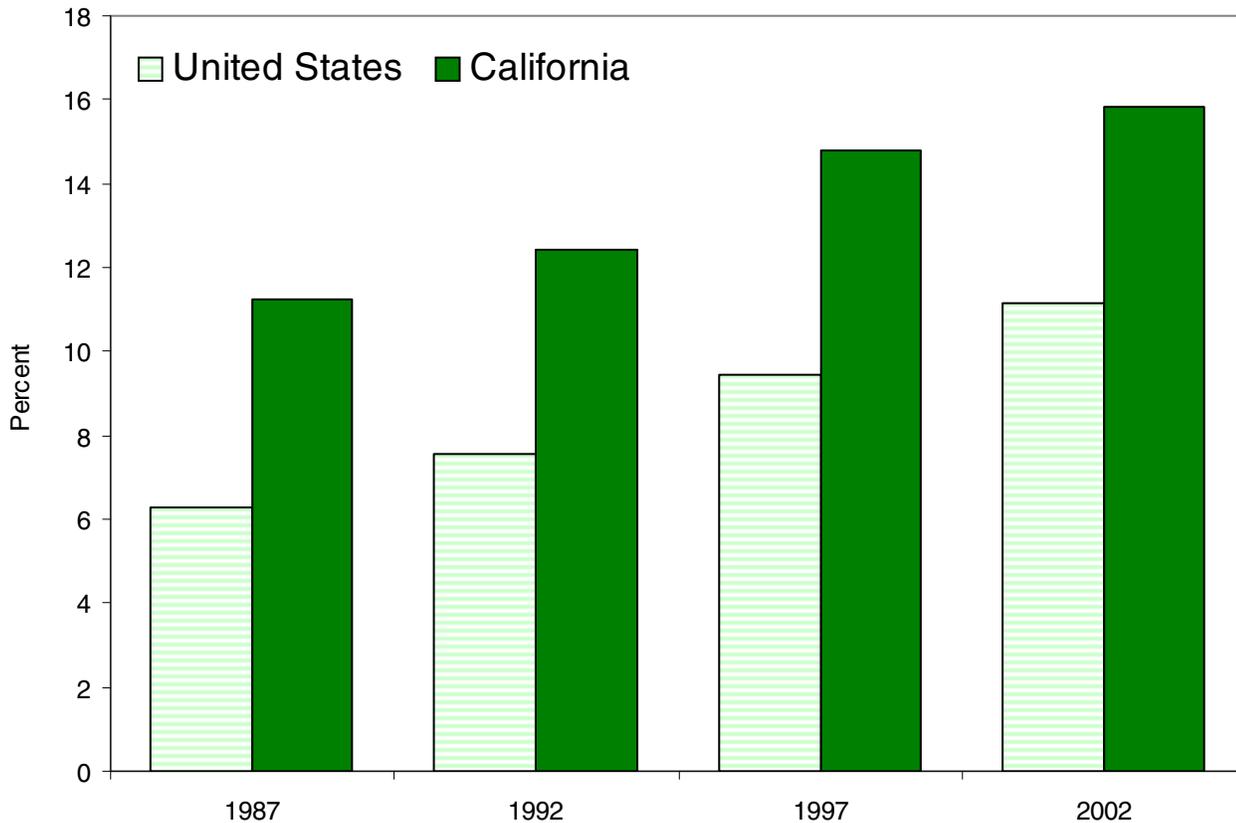
California						
Days	None	Any	1-49	50-99	100-199	≥ 200
Number of operators						
1987	32,051	47,085	4,991	2,832	8,314	30,948
1992	32,118	41,278	4,478	2,500	7,619	26,681
1997	35,359	47,362	5,045	2,939	7,109	30,644
2002	40,223	39,408	5,037	2,813	5,521	26,037
Percent						
1987	41	59	6	4	11	39
1992	44	56	6	3	10	36
1997	43	57	6	4	9	37
2002	51	49	6	4	7	33
United States						
	None	Any	1-49	50-99	100-199	≥ 200
Number of operators						
1987	844,476	1,115,560	135,116	64,915	178,323	737,206
1992	801,881	992,773	110,437	54,743	162,023	665,570
1997	832,585	1,254,537	120,650	65,346	167,922	870,945
2002	962,200	1,166,782	122,248	66,306	145,580	832,348
Percent						
1987	43.1	56.9	6.9	3.3	9.1	37.6
1992	44.7	55.3	6.2	3.1	9.0	37.1
1997	39.9	60.1	5.8	3.1	8.0	41.7
2002	45.2	54.8	5.7	3.1	6.8	39.1

Source: U.S. Census Bureau, *Census of Agriculture*, 1987-1992; USDA National Agricultural Statistics Service, *Census of Agriculture*, 1997-2002.

^a1997 figures were revised in 2002.

FIGURE 1.14

Females as a percent of principal farm operators, United States and California, 1987-2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 1992, 1997, 2002.

The number of women with farm operator responsibilities reported in the census has been increasing for several years in both California and the nation as a whole, although California has always recorded a higher ratio of female to male operators than the rest of the country. At the same time as the total number of operators has decreased in California and the United States, the proportion of women operators has increased. Women farm operators in California accounted for nearly 16 percent of total principal operators in 2002, up from 11 percent in 1987 (Figure 1.14).

In 2002 the National Agricultural Statistical Service (NASS) implemented several activities to improve coverage of minority farm operators in their census reports. These activities included but were not limited to (1) obtaining mailing lists from organizations likely to contain names and addresses of minority farm operators, and (2) conducting pre-census promotional activities that targeted women, American Indian, African American and Spanish, Hispanic, or Latino origin farm operators. This factor may have led to increased minority figures in 2002 relative to previous years.

TABLE 1.11

Principal farm operators by race, California and United States, 2002

All principal operators						
	White	Black or African American	American Indian or Alaskan native	Asian or Pacific Islander ^a	More than one race ^b	Total
California	74,044	278	977	3,780	552	79,631
United States	2,067,379	29,090	15,494	9,358	7,661	2,128,982

Principal operators of Spanish, Hispanic or Latino origin						
	White	Black or African American	American Indian or Alaskan native	Asian or Pacific Islander ^a	More than one race ^b	Total
California	6,940	29	303	342	97	7,711
United States	46,878	890	1,606	737	481	50,592

Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.

^aIncludes Hawaiian native.

^bThose reporting more than one race are not included in individual race categories.

Ethnicity cannot be compared accurately across censuses. In 2002, for the first time, respondents were given the option of marking more than one race. Only one option had been presented in the past, so many respondents who opted for two different race groups in 2002 may have chosen one race group in a previous census, even the group called “other,” which was no longer an option in 2002. In addition, ethnicity characteristics were not adjusted for the newly expanded coverage. Thus, recent agricultural censuses are not directly comparable with unadjusted 1997 data and earlier censuses.

Operators reporting Spanish, Hispanic or Latino ethnicity can be found in all race groups. For the 2002 *Census of Agriculture*, 7,711 principal operators in California reported Spanish, Hispanic or Latino ethnicity—10 percent of all California principal operators (Table 1.11). In the United States as a whole, only 2 percent of principal operators reported being of Spanish, Hispanic, or Latino origin.

The Measure of California Agriculture

CHAPTER 2

University of California Agricultural Issues Center

Demand and Supply

- 2-3.....Commodity demand
- 2-6.....Leading commodities and cash receipts
- 2-11.....Production by principal commodity group
- 2-15.....Regional and county-level production
- 2-25.....Organic agriculture

California participates in national and international agricultural markets. Californians consume food that is produced in the state, as well as food that is imported from other states and countries. Measured by cash receipts, agriculture in California is the largest among the states, and produces a variety of animals and animal products, fruit, tree nuts, vegetables, field crops, and nursery and floriculture products. California agricultural commissioners' data indicates the Central Valley (composed of the Sacramento and San Joaquin valleys) accounts for more than half of the state's gross value of agricultural production.

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Commodity demand

Primary information on California per capita consumption of major foods is not available. However, we can access statistics for the whole U.S. per capita consumption of most foods (Table 2.1). Since 1971, the largest per capita consumption increases have been in fresh fruits (about 26 percent), fresh vegetables (32 percent), and tree nuts (55 percent). Per capita consumption of meats has been more or less stable in the last 30 years, with consistent increased substitution of chicken for red meats.

In 1970, food expenditures by U.S. families and individuals accounted for nearly 14 percent of total disposable income (Figure 2.1). That share fell to about 10 percent in 2004.

Expenditures for food consumed away from home became more important in the last three decades (Figure 2.2). In 1970, \$95.9 billion (inflation adjusted) was spent on food away from home. This represented 26 percent of total U.S. food expenditures. By 2004 expenditures away from home increased to about 43 percent (i.e. \$324.9 billion). We would expect to see a similar pattern for California.

Although California is the nation's largest agricultural producer in terms of cash receipts, many foods are imported from other states or countries. Almost all of the pork, much of the beef, and much of the grain used for bakery, pasta, and livestock feed come from Midwestern states. Tropical products such as bananas and mangoes come from Central and South America. During the local off-season, California imports products that it produces in other months, such as winter tomatoes from Florida and Mexico.

TABLE 2.1

United States per capita consumption of major foods, 1971-2003

	Red meats ^a	Chicken ^a	Eggs	Dairy ^b	Fresh fruits	Fresh vegetables ^c	Tree nuts	Coffee ^d	Wine ^e
	pounds							gallons	
1971	136.1	27.4	39.7	557.9	100.6	148.0	1.89	9.9	1.48
1976	133.4	28.6	34.6	539.7	101.7	148.1	1.91	9.4	1.73
1981	125.1	33.7	34.0	540.6	103.8	145.1	1.92	7.5	2.20
1986	122.2	36.9	32.6	591.5	117.6	158.6	2.21	7.8	2.44
1991	111.5	44.1	30.0	563.7	112.9	170.8	2.15	7.8	1.84
1996	111.0	48.8	30.1	566.2	126.5	186.5	2.03	6.6	1.86
2001	111.4	54.0	32.5	586.5	125.7	194.5	2.62	7.2	1.97
2002	114.0	56.8	32.8	585.3	126.9	193.5	2.86	7.1	2.07
2003	111.9	57.5	32.7	593.9	126.7	195.6	2.93	7.3	2.16

Source: USDA Economic Research Service. <http://www.ers.usda.gov/Data/FoodConsumption/>

^a Retail, boneless.

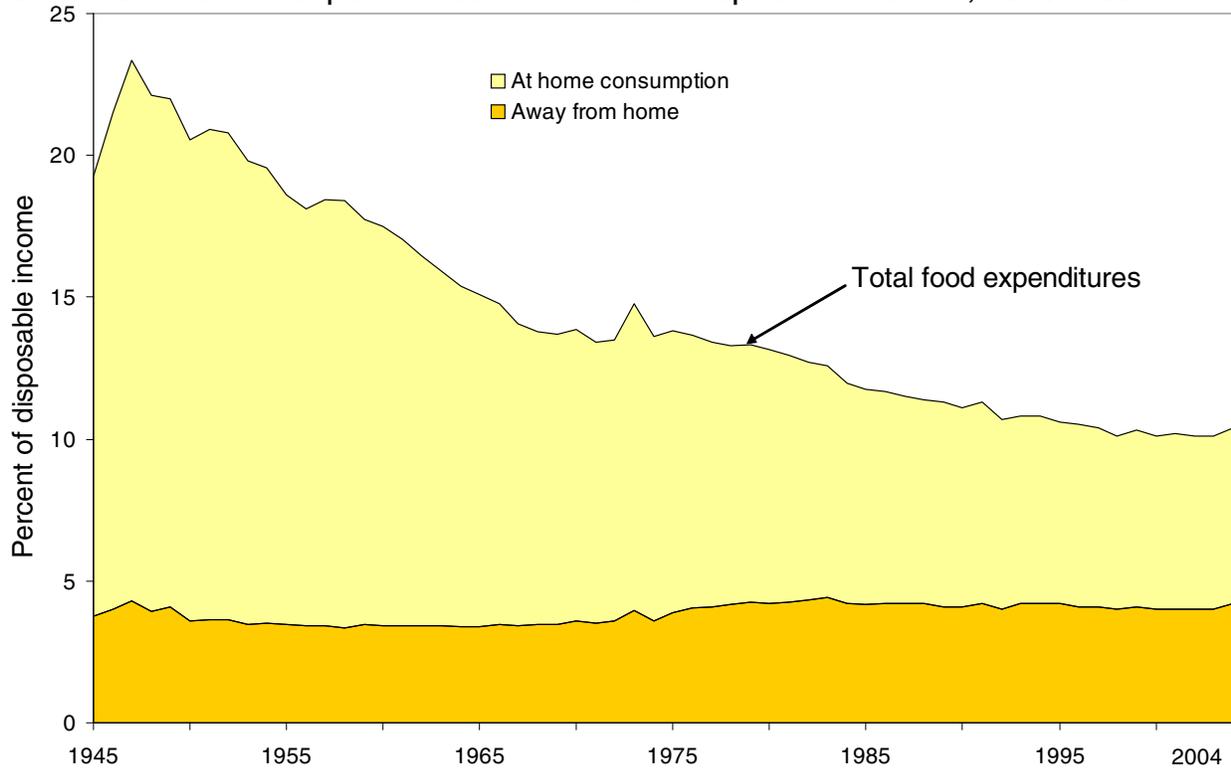
^b All dairy products, milk equivalent, milkfat basis.

^c Includes potatoes and sweet potatoes.

^d Includes instant and regular coffee.

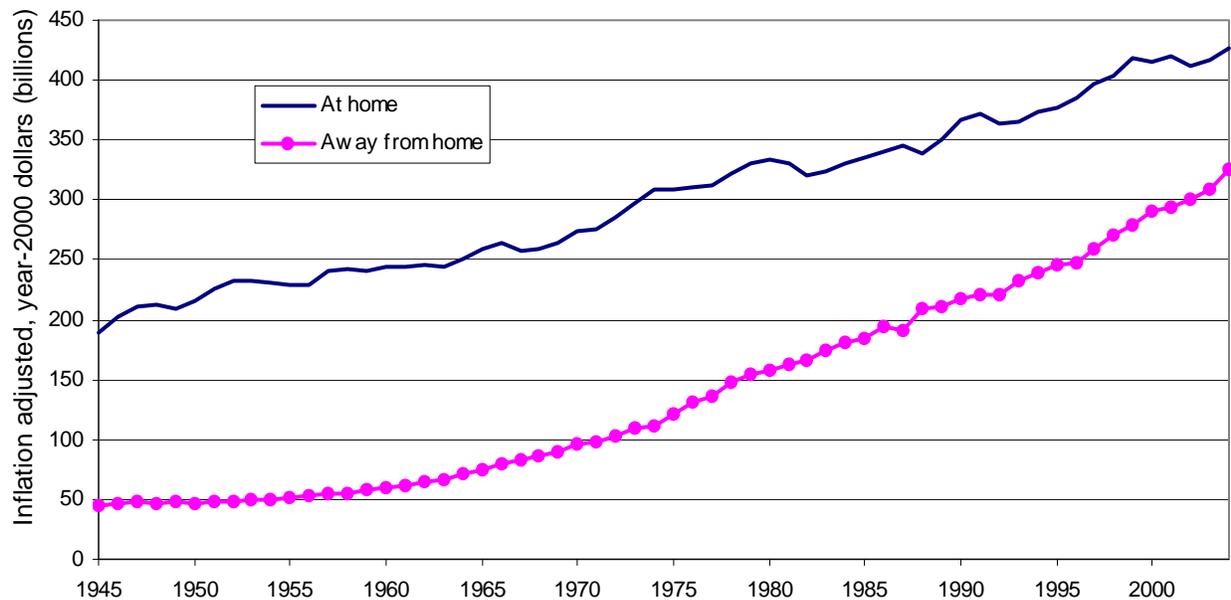
^e Beginning 1983, includes wine coolers.

FIGURE 2.1
 United States food expenditures as a share of disposable income, 1945–2004



Source: Economic Research Service, USDA.
<http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/Table7.htm>

FIGURE 2.2
 United States food expenditures, at home and away from home, 1945–2004, in inflation-adjusted year-2000 dollars^a

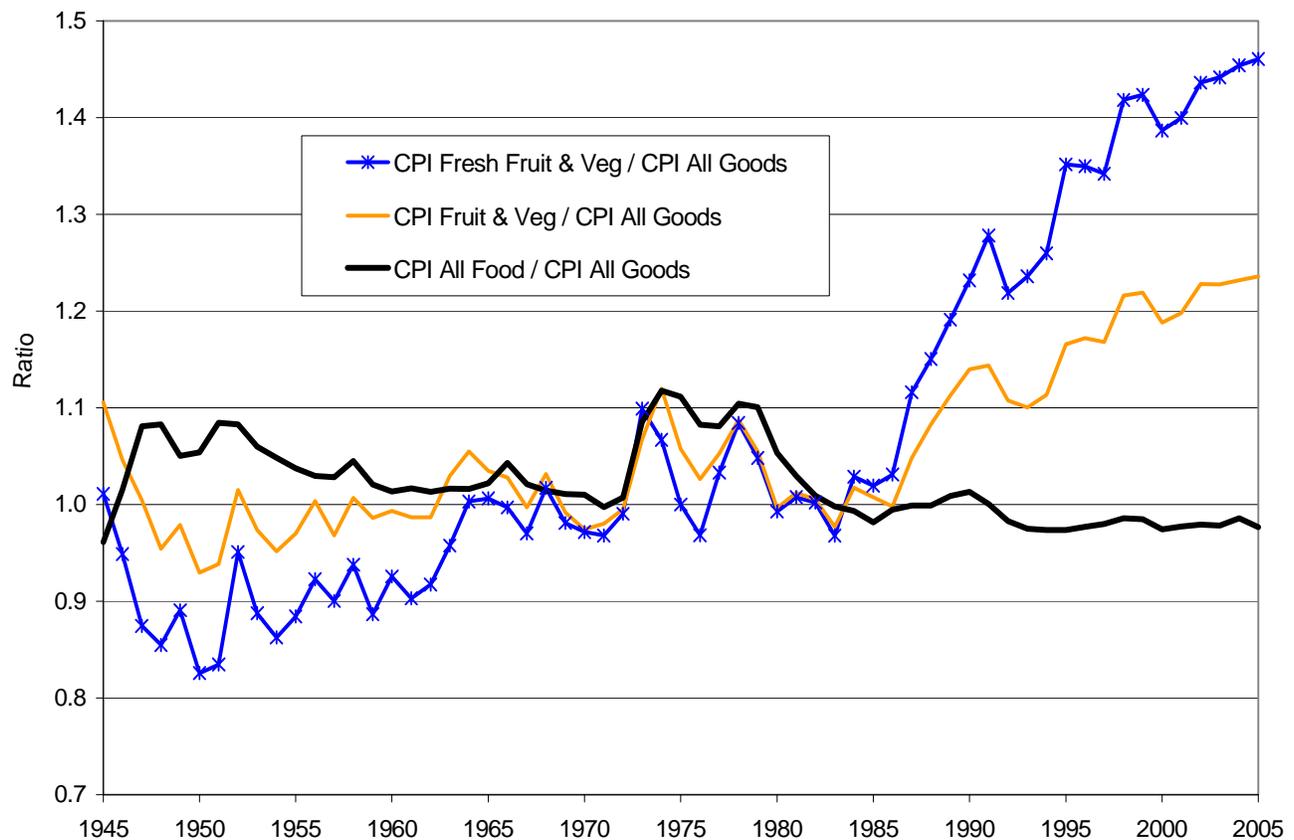


Source: Economic Research Service, USDA.
<http://www.ers.usda.gov/Briefing/CPIFoodAndExpenditures/Data/Table7.htm>

^a The inflation adjustment used by the U.S. Department of Commerce, Bureau of Economic Analysis, GDP deflator

The price of food relative to all goods purchased by consumers has remained relatively stable since 1984 when adjusted for inflation. In contrast, the inflation adjusted price of fruits and vegetables relative to the price of all goods has risen markedly, especially for fresh fruits and vegetables (Figure 2.3).

FIGURE 2.3
United States retail food and fruit and vegetable price indices relative to price indices of all consumer goods, 1945–2005



Sources: USDA Economic Research Service. <http://ers.usda.gov/data/foodconsumption/>; Bureau of Labor Statistics, U.S. Department of Labor, Consumer Price Index, <http://data.bls.gov/PDQ/outside.jsp?survey=cu>

Leading commodities and cash receipts

Compared to other states, California's agriculture is very diverse, with the total output of the top 25 commodities accounting for 82 percent of the state's farm cash receipts. Dairy, greenhouse/nursery products and grapes have been the state's leading products for many years, with a combined 36 percent of total cash receipts in 2004 (Table 2.2 and Figure 2.4). By commodity group, fruits and tree nuts make up the largest share of cash receipts (Figure 2.5).

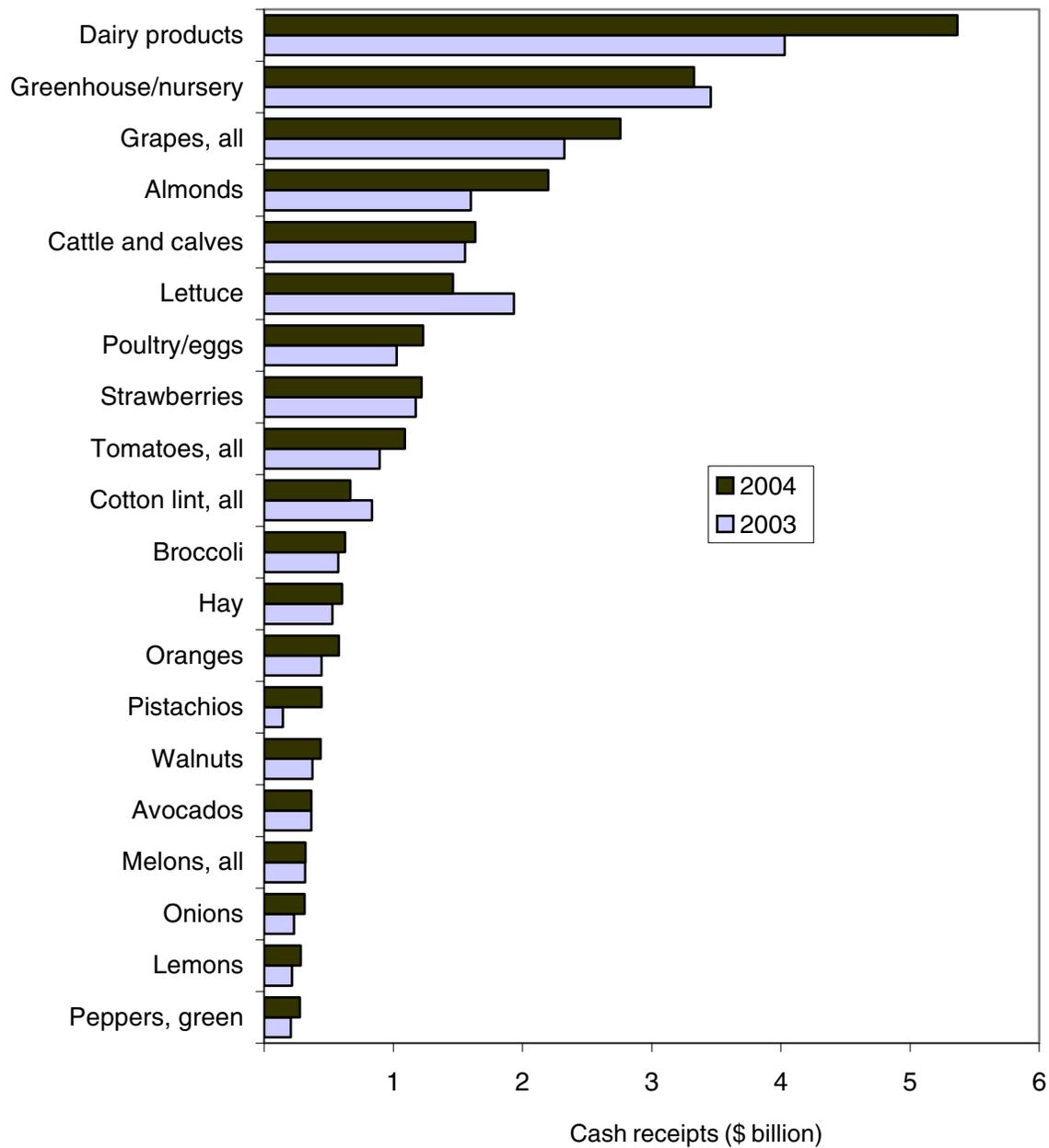
TABLE 2.2

Leading California commodities by cash receipts, 2004

Rank		Value of receipts	Share of California receipts	California share of U.S. value
		(\$1,000)	(percent)	
1	Dairy products	5,365,992	16.9	19.6
2	Greenhouse/nursery	3,328,147	10.5	21.2
3	Grapes	2,758,467	8.7	91.5
4	Almonds	2,200,055	6.9	100.0
5	Cattle and calves	1,633,740	5.1	3.5
6	Lettuce	1,462,331	4.6	70.7
7	Poultry/eggs	1,230,065	3.9	4.2
8	Strawberries	1,218,860	3.8	82.8
9	Tomatoes, processing	669,973	2.1	93.1
10	Cotton lint, all	666,510	2.1	14.3
11	Broccoli	625,721	2.0	92.5
12	Hay	603,344	1.9	13.7
13	Oranges	577,326	1.8	36.8
14	Pistachios	444,160	1.4	100.0
15	Walnuts	438,750	1.4	100.0
16	Tomatoes, fresh	420,616	1.3	31.3
17	Avocados	365,371	1.1	96.3
18	Melons, watermelons, etc.	319,027	1.0	45.3
19	Onions	313,534	1.0	30.6
20	Lemons	284,413	0.9	88.9
21	Peppers, green, fresh	277,120	0.9	48.1
22	Celery	265,081	0.8	93.4
23	Peaches	251,254	0.8	54.4
24	Potatoes	217,782	0.7	9.2
25	Spinach, fresh	199,920	0.6	76.6
	Top 25	26,137,559	82.1	
	All commodities	31,835,183	100.0	13.2

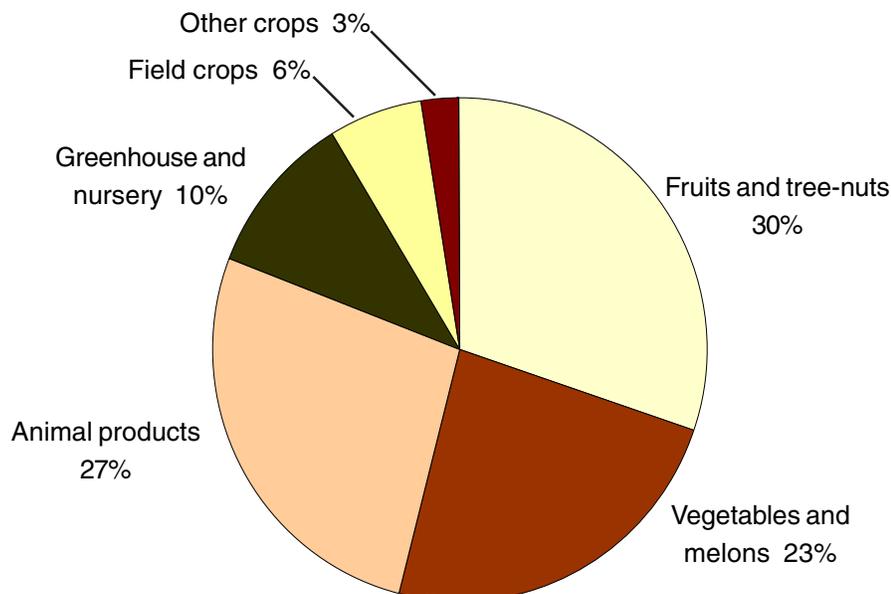
Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

FIGURE 2.4
Value of leading California commodities, 2003–2004



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

FIGURE 2.5
Cash receipts by commodity group, California, 2004



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

TABLE 2.3
Crops for which California is the sole or major U.S. producer:
California's share of national cash receipts, 2004

99 percent or greater	70 to 98 percent	
Almonds	Apricots	Avocados
Artichokes	Broccoli	Cauliflower
Dates	Celery	Cotton, American pima
Figs	Garlic	Grapes
Kiwifruit	Lemons	Lettuce
Nectarines	Plums	Prunes
Olives	Raspberries	Spinach
Peaches, clingstone	Strawberries	Tomatoes, processing
Pistachios		
Walnuts		

Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

California accounts for virtually the entire U.S. production of almonds, pistachios and walnuts, and it produces a very large portion of the grapes, avocados, celery and plums. California produces more than 70 percent of the U.S. production of a number of different commodities (Table 2.3).

The California share of national cash receipts from farm marketings has increased from 9.5 percent in 1965 to 13.2 percent in 2004 (Table 2.4). The leading state in farm revenue since 1948, California cash receipts were 93 percent higher than Texas, the second ranking state (Figure 2.6). California also leads in net farm income, with a value 74 percent higher than Texas (Figure 2.7).

TABLE 2.4

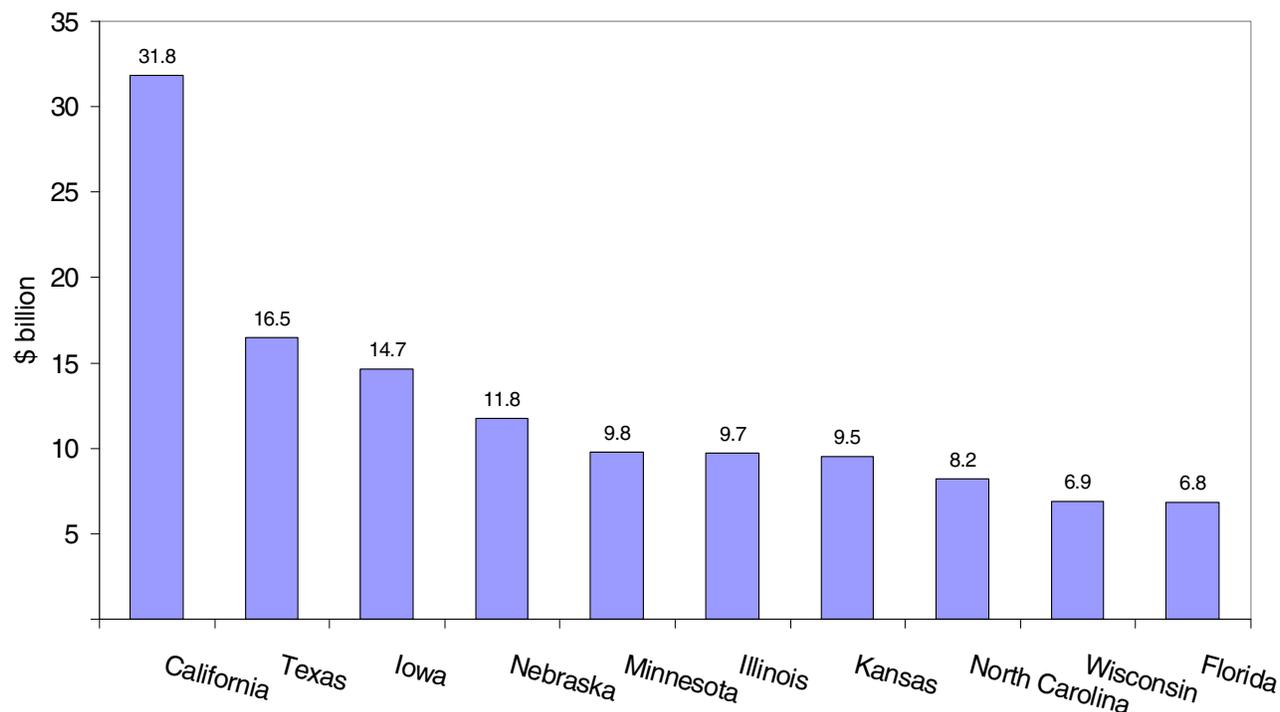
Cash receipts from farm marketings, United States and California, selected years, year-2000 inflation-adjusted dollars.

	California	U.S.	California share of U.S.
	constant year-2000 dollars (million)		percent
1965	16,516	174,682	9.5
1975	22,300	233,846	9.5
1985	20,517	206,537	9.9
1995	24,587	204,377	12.0
2004	29,180	221,123	13.2

Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

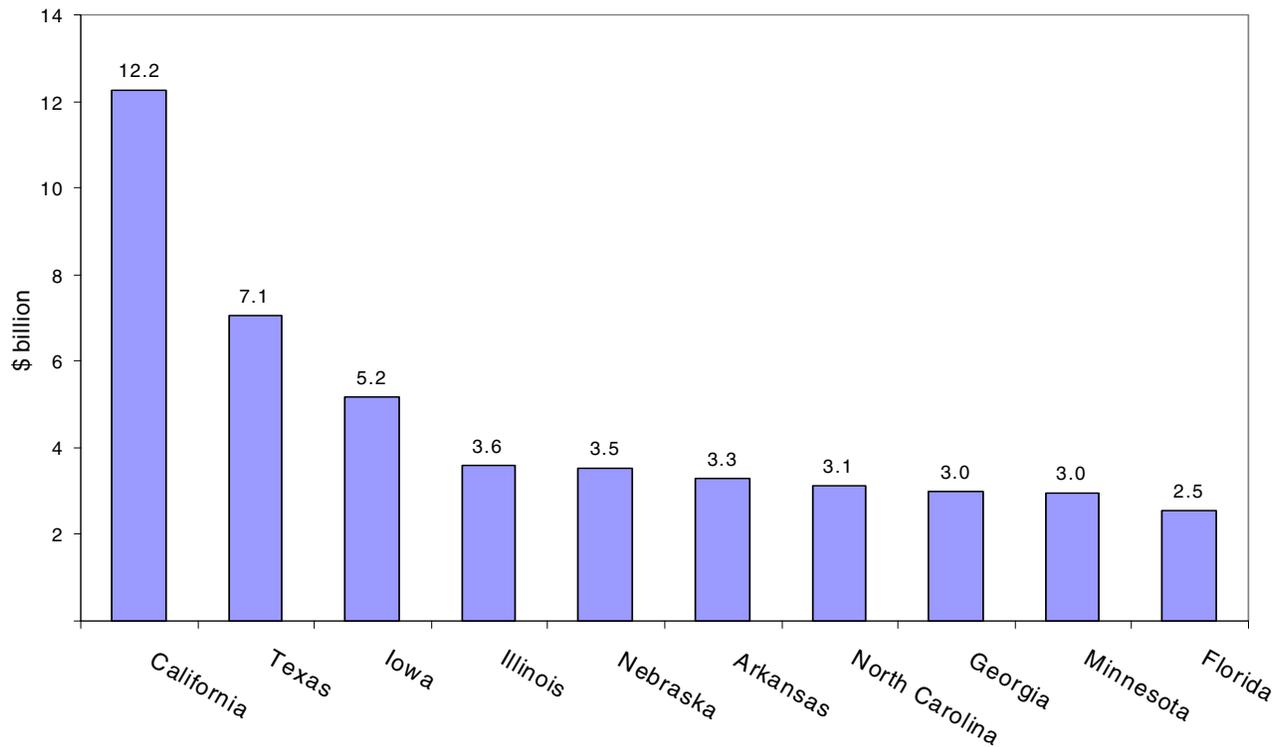
FIGURE 2.6

Top 10 states by cash receipts from farm marketings, 2004



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

FIGURE 2.7
Top 10 states by net farm cash income, 2004



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

Production by principal commodity group

The 2002 *Census of Agriculture* categorizes each farm according to the North American Industry Classification System principal commodity groups. Total farm sales are classified by principal commodity and aggregated by total sales of all commodities on that farm. As reported in the census, the principal commodity of a farm is the one that accounts for the largest share of the farm's sales, not necessarily the majority. Principal commodities are aggregated at different levels.

TABLE 2.5

Number of farms, land and sales by principal commodity, California and United States, 2002^a

California	Farms	Land in farms (acres)	Acres per farm	Total sales (\$million)	Average sales per farm (\$)
Total	79,631	27,589,027	346	25,737	323,205
Field crops (oilseeds, grains, cotton)	7,538	4,585,324	608	2,291	303,896
Vegetable and melon farming	2,898	1,861,367	642	4,915	1,696,067
Fruit and tree nut farming	36,574	4,800,419	131	8,557	233,977
Greenhouse, nursery, and floriculture	4,388	219,286	50	3,319	756,378
Beef cattle, including feedlots	11,812	12,870,237	1,090	1,323	112,000
Dairy cattle and milk production	2,361	968,070	410	4,064	1,721,146
All other animals	14,060	2,284,324	162	1,268	90,196

United States	Farms	Land in farms (acres)	Acres per farm	Total sales (\$million)	Average sales per farm (\$)
Total	2,128,982	938,279,056	441	207,192	97,320
Field crops (oilseeds, grains, cotton)	791,955	360,546,218	455	56,585	71,449
Vegetable and melon farming	34,624	11,215,546	324	13,246	382,581
Fruit and tree nut farming	95,680	11,525,130	120	13,556	141,680
Greenhouse, nursery, and floriculture	64,366	4,819,149	75	15,076	234,219
Beef cattle, incl. feedlots	719,903	445,806,364	619	43,571	60,523
Dairy cattle and milk production	72,537	27,351,777	377	23,443	323,182
All other animals	349,917	77,014,872	220	41,707	119,190

Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002. http://www.nass.usda.gov/Census_of_Agriculture/index.asp

^a Farms classified according to North American Industry Classification System. For a farm to be classified under a certain commodity group, that commodity must account for the largest portion of the farm sales. The value of total sales includes all commodities produced on the farm.

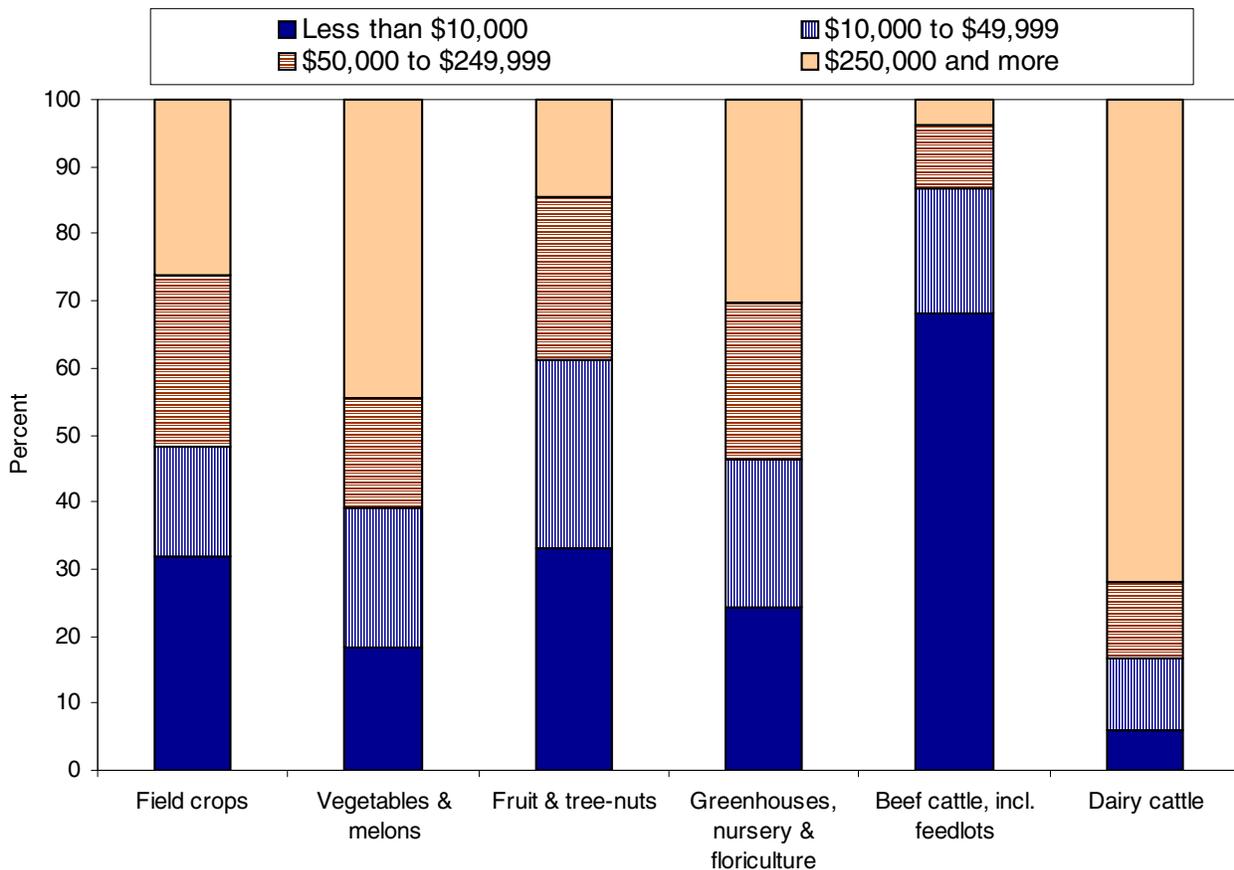
With only 3.7 percent of the nation’s farms, California has 38 percent of the U.S. farms that produce fruits and tree nuts as their principal commodity. It has 8.4 percent of the U.S. farms with vegetables as the principal commodity, and 6.8 percent of the U.S. farms that produce mainly greenhouse and nursery products (Table 2.5). Conversely, California has a negligible number of farms where the principal commodity is either oilseeds or grains, and none of the 37,000 U.S. tobacco farms.

Compared to the United States as a whole, the average California farm records higher sales, especially farms where the principal commodities are field crops, vegetables or dairy cattle and milk.

Almost two-thirds of California farms produce some plant crop as the main product, while the main product of the other third is of animal origin. More than 36,000 farms or 46 percent of all farms produce fruit or nuts as the principal commodity. These farms account for one-third of all the state’s farm cash receipts. Dairies and beef cattle producers account for 21 percent of the state’s farm cash receipts, and farms producing vegetables and melons account for 19 percent. Beef cattle producers account for 47 percent of California’s farm acreage.

FIGURE 2.8

Farms according to sales per farm by principal commodity group, California, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*, Table 56.

Fewer than 10 percent of the state's farms produce field crops, according to the principal commodity classification system (Table 2.5). Total sales from these farms account for 9 percent of the farm cash receipts in the state, and the average sales per farm is very close to the state average for all crops. A third of these farms growing field crops have sales of less than \$10,000 each, whereas 26 percent sell more than \$250,000 each (Figure 2.8).

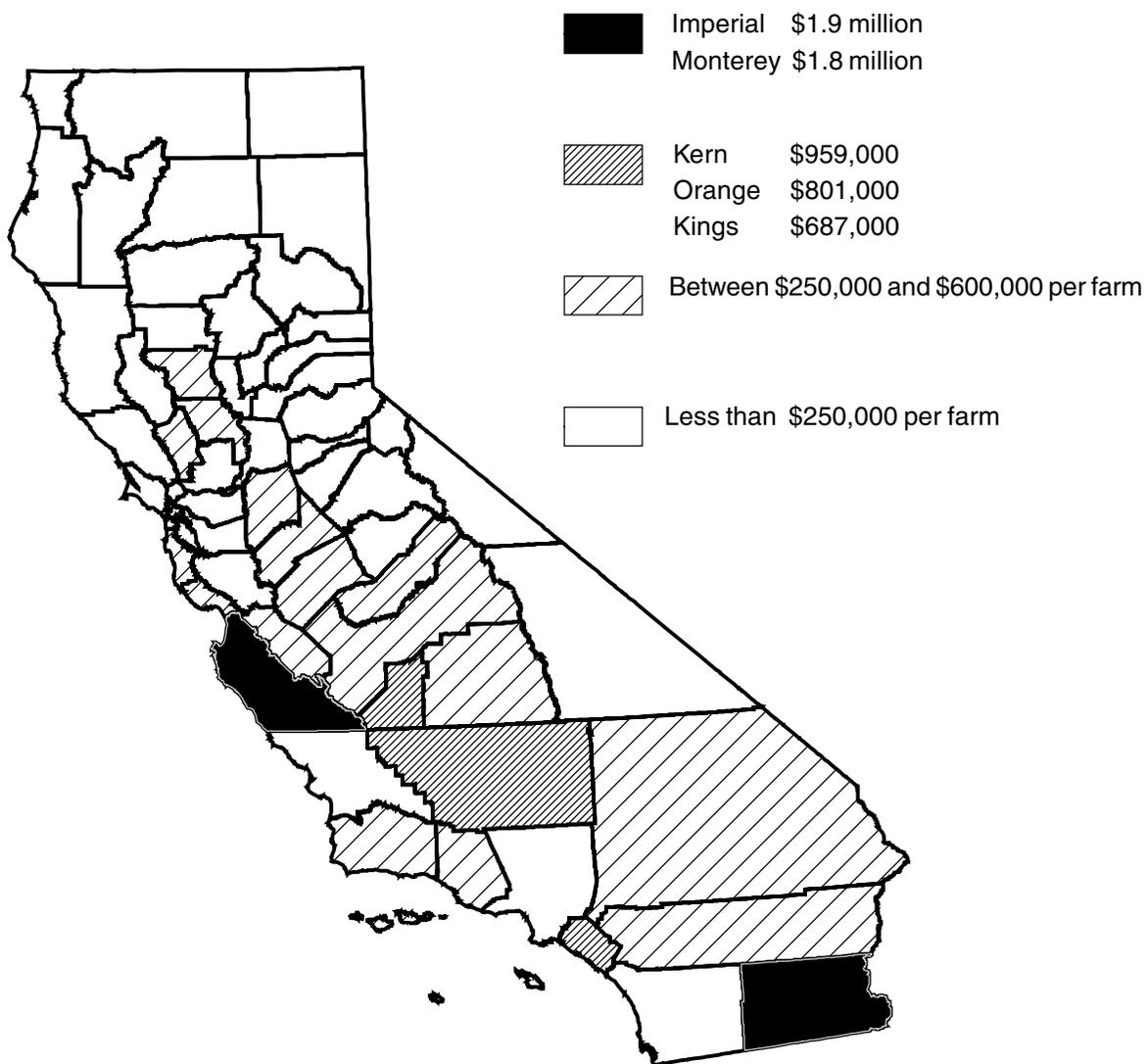
Fewer than 4 percent of the state's farms comprise the vegetable and melons farming group (Table 2.5). Total sales from these farms approach \$5 billion, one-fifth of the state's total sales. Eighteen percent of the farms with vegetables and melons as the principal commodity group sell less than \$10,000 each, while 44 percent have sales above \$250,000 (Figure 2.8).

Farms with fruits and tree nuts as the principal commodity group have 33 percent of the state's total farm sales. One-third of these farms have sales under \$10,000 each, and only 14 percent record sales higher than \$250,000.

Farms with greenhouse and nursery production as the principal activity account for 13 percent of the state's sales. The distribution of the different sales categories among this group of farms is relatively even, with 24 percent of farms selling less than \$10,000 and 30 percent selling above \$250,000.

The beef and dairy cattle and milk production groups present an interesting contrast. Not considering "other animals," beef cattle operations are the state's smallest farms in terms of average sales and dairies are the largest. Among beef cattle producers, 68 percent have sales under \$10,000, whereas only 6 percent of the dairies are in that category. Conversely, only 4 percent of the beef cattle farms record sales above \$250,000, compared to 72 percent of the dairies.

FIGURE 2.9
Average production value per farm by county



NOTE: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

Source: U.C. Agricultural Issues Center based on *Census of Agriculture*, 2002. http://www.nass.usda.gov/Census_of_Agriculture/index.asp

Average production value per farm is greatest in Imperial and Monterey counties (Figure 2.9).

The *U.S. Census of Agriculture*, however, does not track commodity-specific data at the county level as do county Agricultural Commissioners' reports. For that reason the following county-level section is based on the *2004 County Agricultural Commissioners' Data*.

Regional and county-level production

California can be divided into seven production regions (previously described in Chapter 1 and depicted in Figure 1.8). The San Joaquin Valley, the leading agricultural area in the state, produces a broad array of fruits, vegetables, livestock, tree nuts, field crops and dairy products. The Sacramento Valley is known for its horticultural and field crops, particularly processed tomatoes and rice. The Central Coast is a major horticultural region containing the main vegetable production area. The South Coast also grows a number of horticultural crops, including citrus, and is a major producer of nursery and floriculture products. The Desert region produces winter vegetables, field crops, and horticultural specialties. The Mountain region holds California's vast forest and rangeland resources. The North Coast is a diverse region containing California's premier wine production areas to the south and the timber industry to the north.

California's 17-county Central Valley—the Sacramento and San Joaquin valleys—accounts for 60.3 percent of the state gross value of agricultural production according to data from county Agricultural Commissioners' reports. Gross production value refers to all farm production that has been sold through any marketing channel or consumed on the farm. Fresno has been the number one county since the 1950s and in 2004 was responsible for one-eighth of the state's agricultural production value (Table 2.6).

In 2004, 13 counties produced over \$1 billion each in gross agricultural value, and 4 counties recorded sales between \$500 million and \$1 billion. Seventeen counties, each with more than \$500 million in sales, accounted for 84 percent of the agricultural production value of the state (Figure 2.10). Of the 58 counties in California, 36 produced a gross agricultural value greater than \$100 million.

The top 6 counties—Fresno, Tulare, Monterey, Kern, Merced and Stanislaus—account for 52 percent of California's total value of agricultural production. With the exception of Monterey County, all of the top producing counties list dairy, along with either almond or grape production, among their top 5 products.

In 2004, 9 of the 10 lowest producing counties, ranked by value, list cattle stockers and feeders or cattle and calves as their top grossing agricultural commodity.

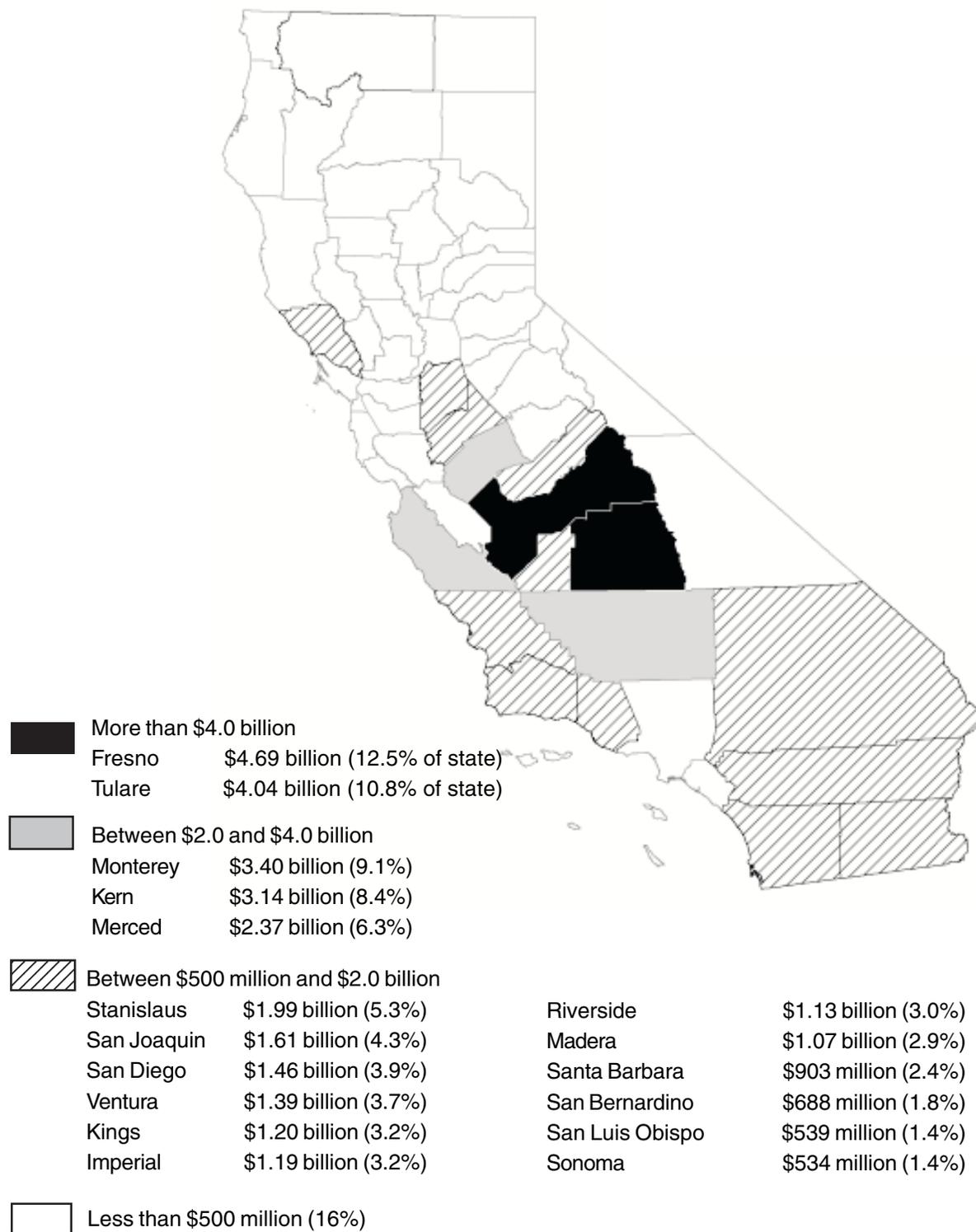
TABLE 2.6
Agricultural production value by county, 2004

Rank	County	Production value ^a (\$million)	Percent of state total
1	Fresno	4,690	12.5
2	Tulare	4,040	10.8
3	Monterey	3,398	9.1
4	Kern	3,142	8.4
5	Merced	2,366	6.3
6	Stanislaus	1,978	5.3
7	San Joaquin	1,613	4.3
8	San Diego	1,462	3.9
9	Ventura	1,387	3.7
10	Kings	1,197	3.2
11	Imperial	1,187	3.2
12	Riverside	1,131	3.0
13	Madera	1,070	2.9
14	Santa Barbara	903	2.4
15	San Bernardino	688	1.8
16	San Luis Obispo	539	1.4
17	Sonoma	534	1.4
18	Santa Cruz	448	1.2
19	Butte	358	1.0
20	Napa	357	1.0
21	Colusa	352	0.9
22	Glenn	348	0.9
23	Yolo	338	0.9
24	Sacramento	326	0.9
25	Los Angeles	300	0.8
26	Sutter	300	0.8
27	Orange	294	0.8
28	Humboldt	289	0.8
29	San Benito	266	0.7
30	Santa Clara	258	0.7
31	Solano	205	0.5
32	San Mateo	182	0.5
33	Siskiyou	182	0.5
34	Mendocino	148	0.4
35	Tehama	146	0.4
36	Yuba	135	0.4
37	Contra Costa	95	0.3
	All others	833	2.2
	Total	37,485	100.0

Source: Agricultural Statistics Service, *Summary of County Agricultural Commissioners' Reports, 2003-2004*.
http://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/200410cavtb00.pdf

^aIncluding timber.

FIGURE 2.10
Agricultural production value by county, California 2004



Source: U.C. Agricultural Issues Center based on Table 2.6, derived from Agricultural Statistics Service, *Summary of County Agricultural Commissioners' reports, 2003-2004*.
http://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/200410cavtb00.pdf.

The San Joaquin Valley is the number one region for most of the commodity groups (Table 2.7). The combined farm sales of the 8 counties that form the San Joaquin Valley would rank at the national level after the state of Texas and before the state of Iowa. This region produces about half of the total value of agricultural production in California. It ranks first in value of fruit and tree nut production with 52.7 percent, first in livestock products with 74.4 percent, and first in field crops with 60.9 percent. The area also ranks second for vegetables and melons with 31.1 percent, just behind the Central Coast region.

The South Coast is the principal region for greenhouse production (51.2%) and second for fruit and tree nut production. The Central Coast is first in vegetable and melon production (43.9%) and second in greenhouse production. The Desert region accounts for 12.8 percent of the livestock production value, second after the San Joaquin Valley (74.4%). The Sacramento Valley is second, after San Joaquin Valley, in field crop production value, with 21.1 percent of the state total.

TABLE 2.7
Gross production value by commodity group and production region,
California, 2004^a

	Field crops	Fruit & nut crops	Livestock products	Nursery, forestry & flowers	Vegetables & melons	All commodities
Percent of California agricultural gross production value						
Central Coast ^b	1.7	13.8	1.7	21.8	43.9	16.5
Desert ^c	9.5	5.3	12.8	7.3	9.1	9.4
Mountain ^d	4.8	0.2	2.3	1.3	0.7	1.8
North Coast ^e	0.9	0.8	3.5	2.6	0.2	1.7
Sacramento Valley ^f	21.1	3.9	3.9	2.8	3.6	6.1
San Joaquin Valley ^g	60.9	52.7	74.4	12.9	31.1	50.8
South Coast ^h	1.0	23.3	1.4	51.2	11.5	13.8

Source: U.C. Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

http://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/200410cactb00.pdf

^a Regions are per map in Figure 1.8.

^b Central Coast is Alameda, Contra Costa, Monterey, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Clara and Santa Cruz counties.

^c Desert is Imperial, Riverside and San Bernadino counties.

^d Mountain is Alpine, Amador, Calaveras, El Dorado, Inyo, Lassen, Mariposa, Modoc, Mono, Nevada, Placer, Plumas, Shasta, Sierra, Siskiyou, Trinity and Tuolumne counties.

^e North Coast is Del Norte, Humboldt, Lake, Marin, Mendocino, Napa and Sonoma counties.

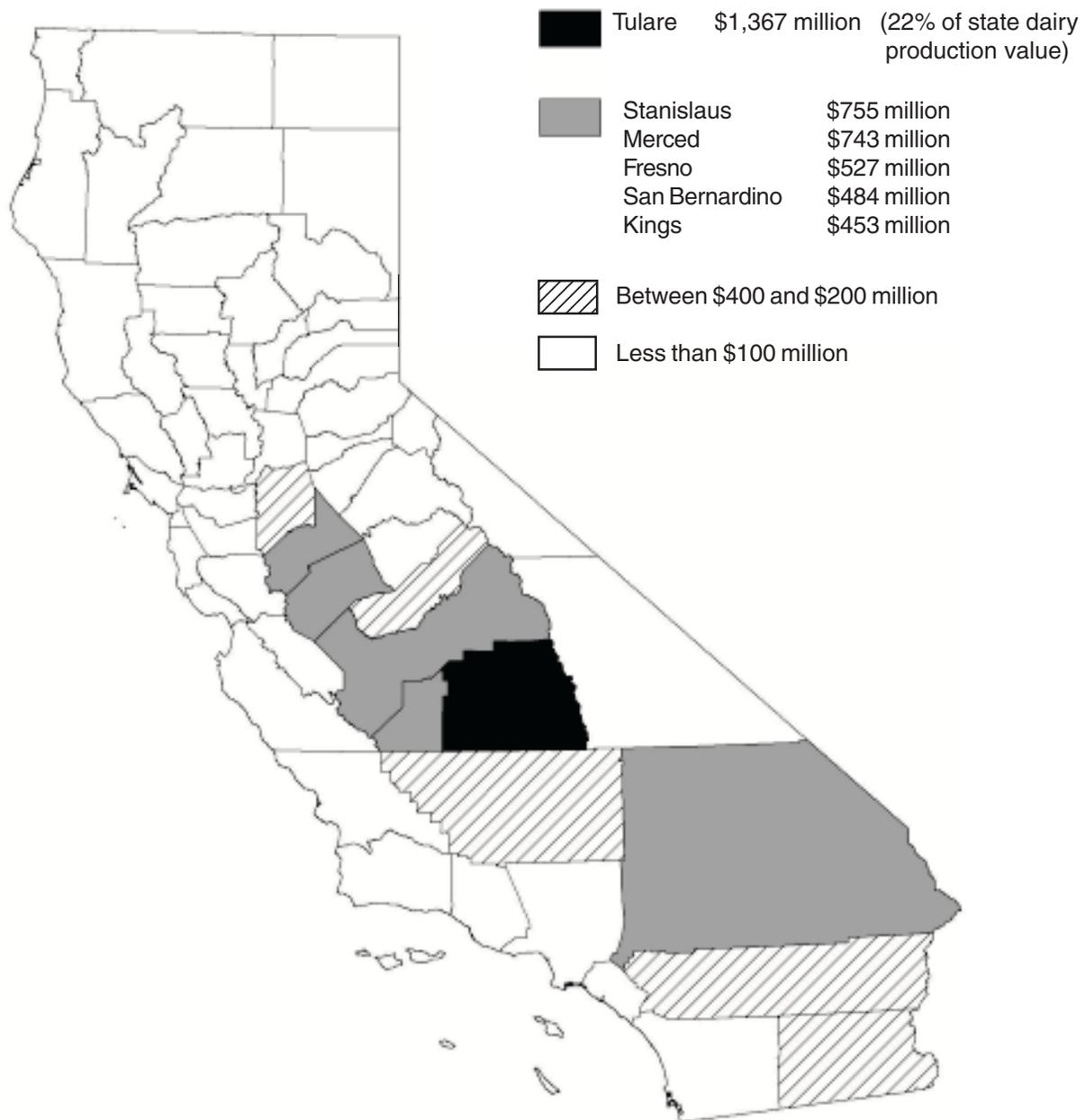
^f Sacramento Valley is Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Tehama, Yolo and Yuba counties.

^g San Joaquin Valley is Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare counties.

^h South Coast is Los Angeles, Orange, San Diego, Santa Barbara and Ventura counties.

Principal commodities vary across regions and counties. Tulare County is the leader in livestock and dairy production. Monterey County leads in vegetable production, while Fresno County is first in field crops and grape production, and San Diego County leads in greenhouse production. Kern County leads in value of tree nut production. Figures 2.11 - 2.16 display value of production for leading California counties for each major commodity group.

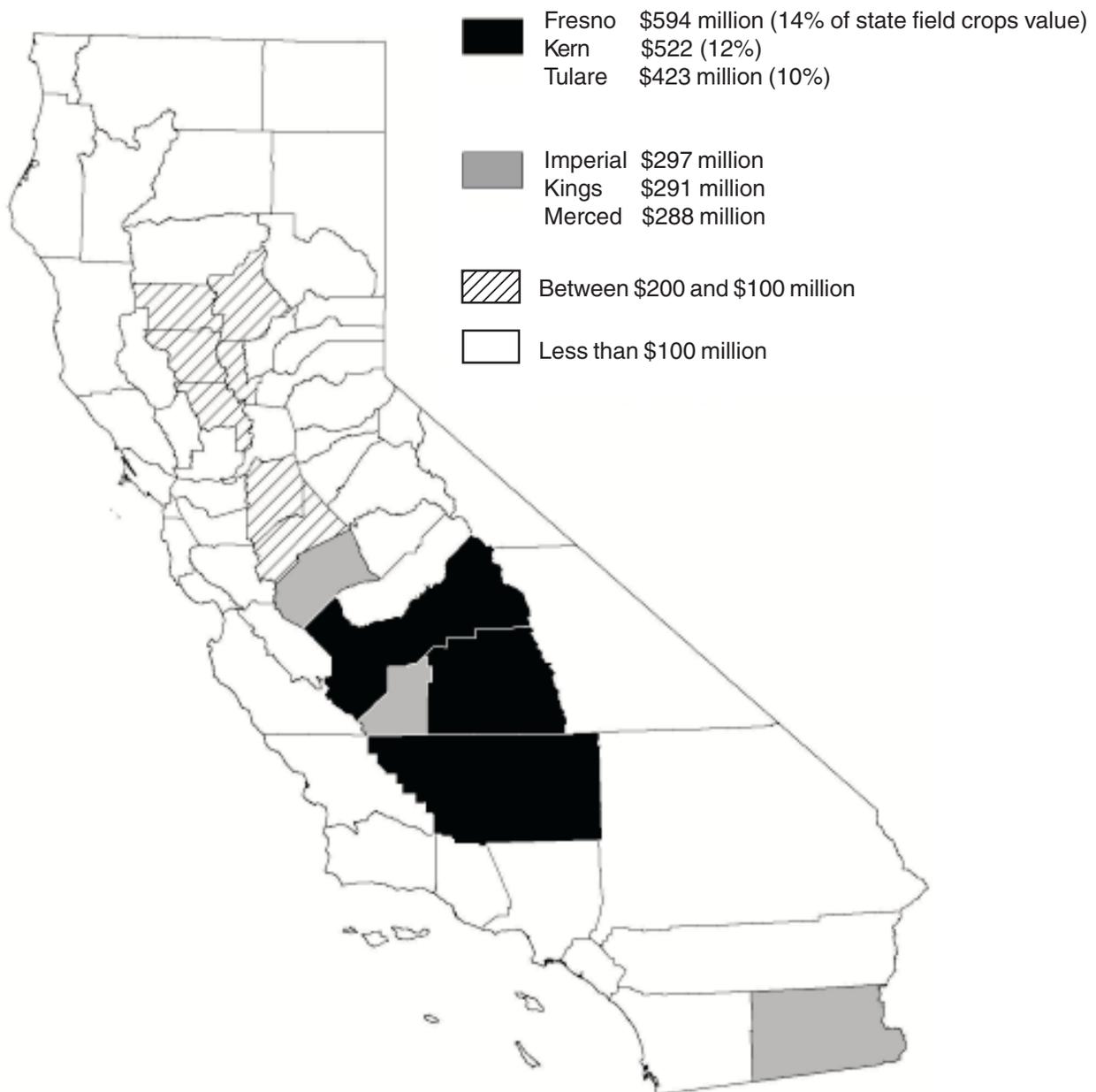
FIGURE 2.11
Dairy production value by county, 2004



Source: U.C. Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

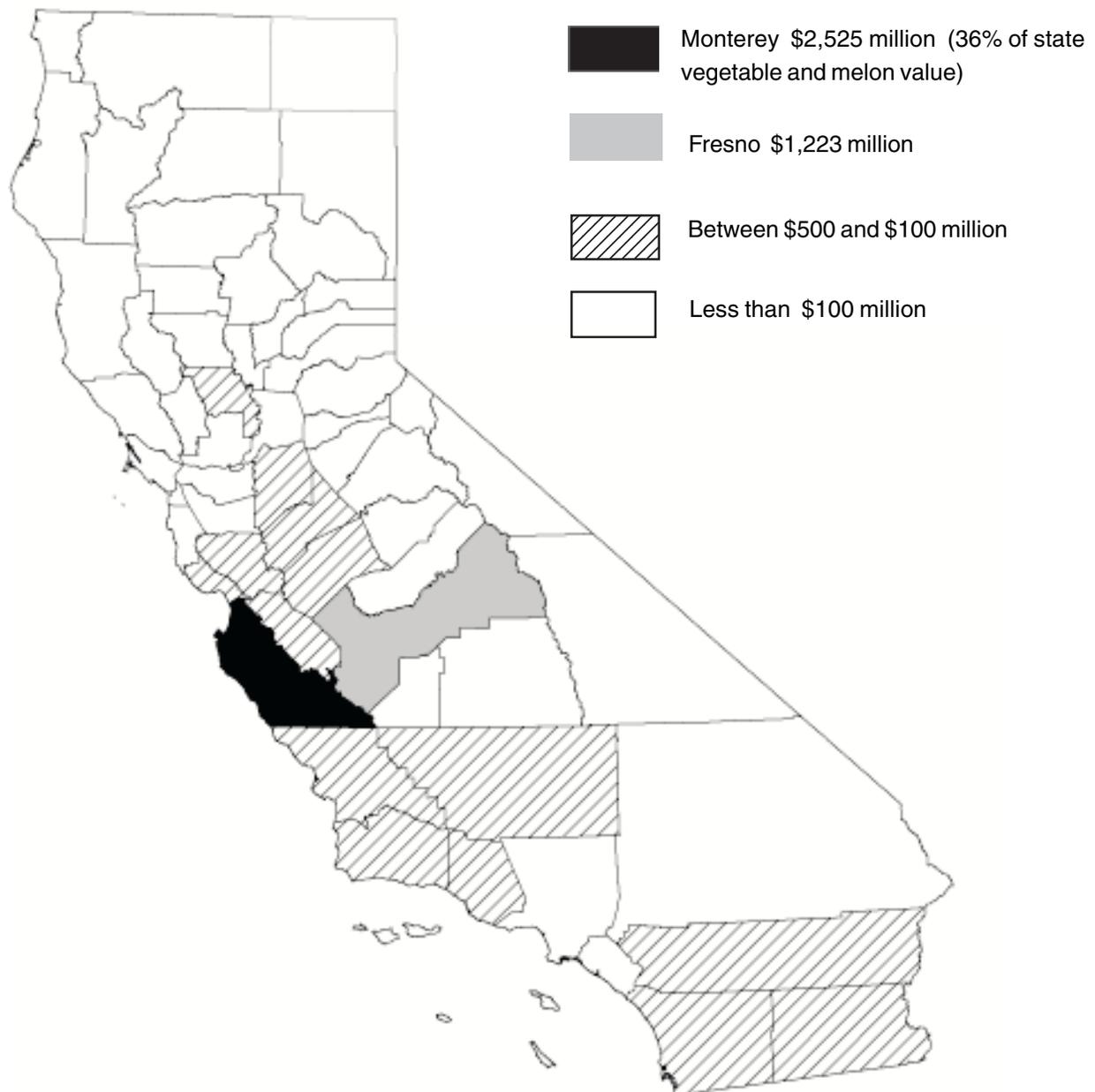
FIGURE 2.12
Field crops production value by county, 2004



Source: U.C. Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

FIGURE 2.13
Vegetable and melon production value by county, 2004

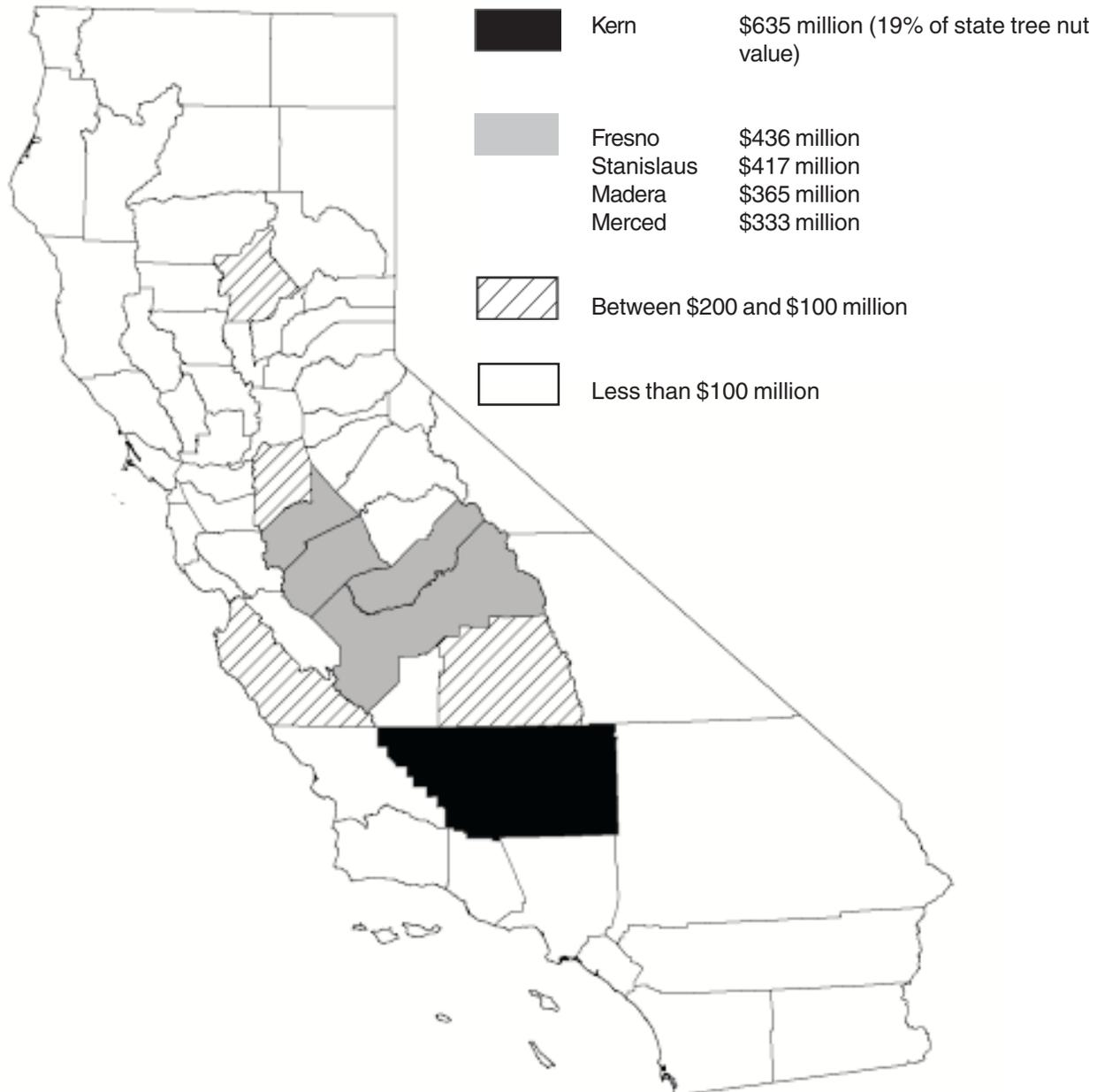


Source: U.C. Agricultural Issues Center based on California Agricultural Statistics Service, 2004 *County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

FIGURE 2.14

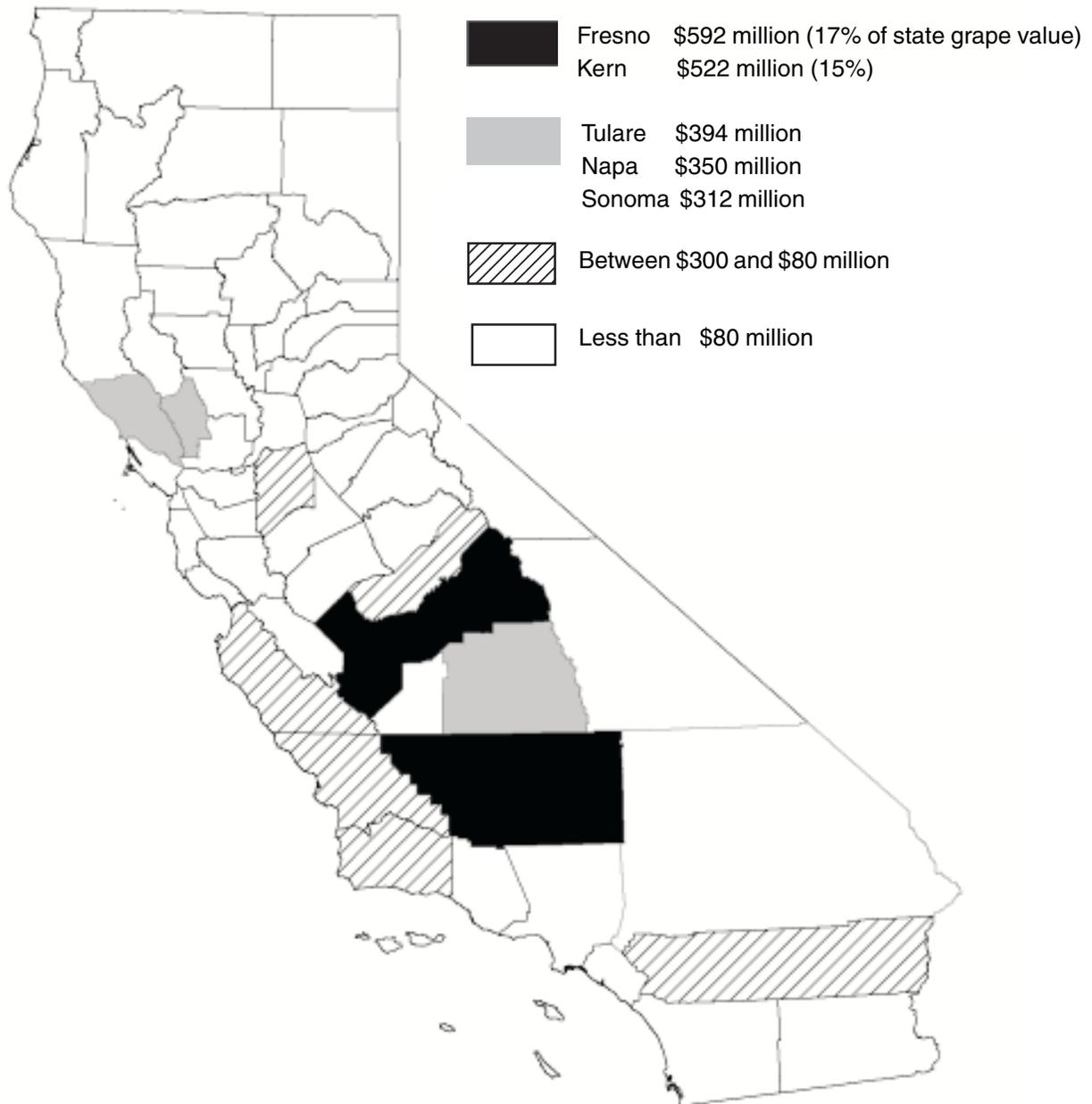
Tree nut production value by county, 2004



Source: U.C. Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

FIGURE 2.15
Grape production value by county, 2004

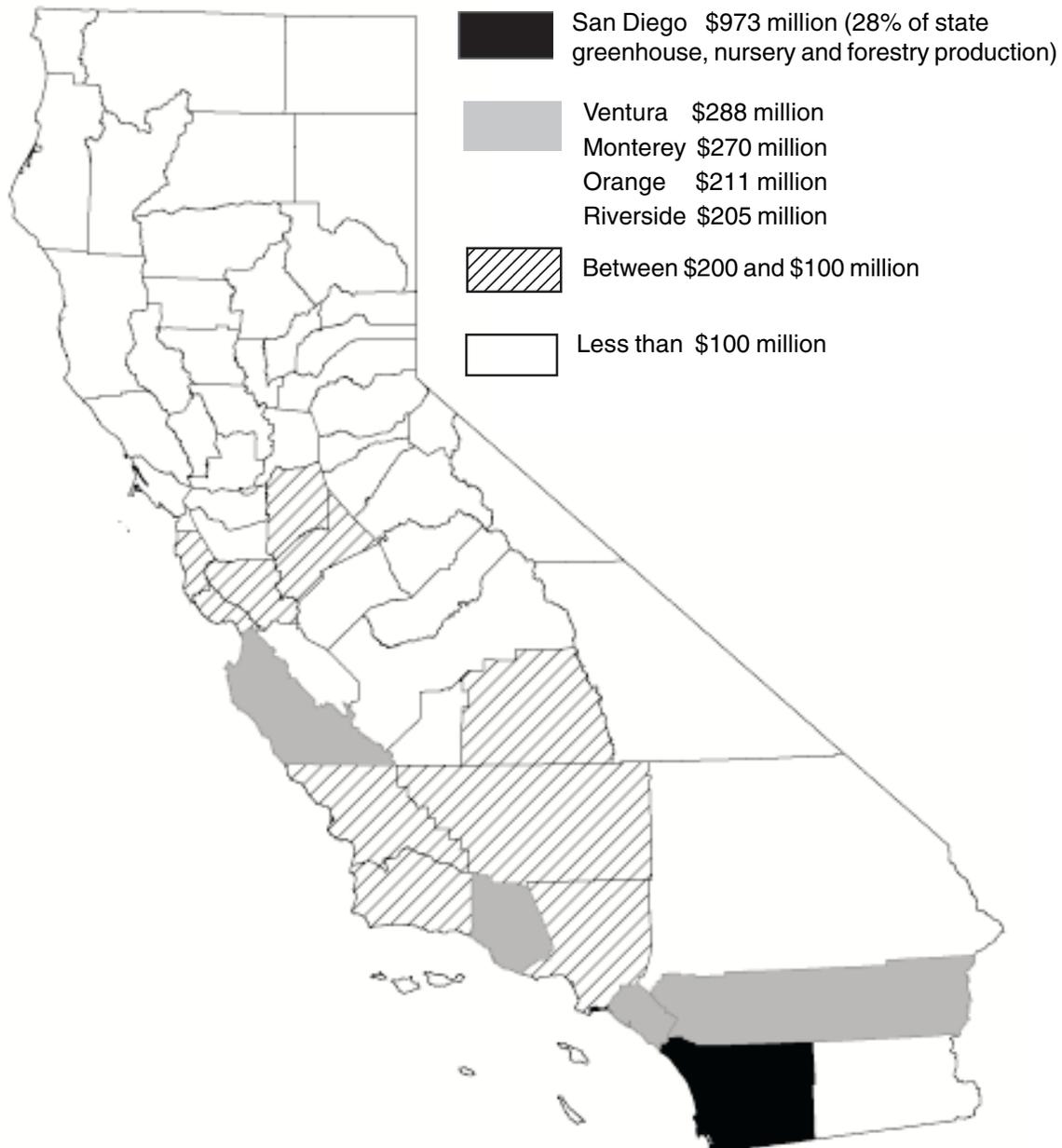


Source: Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

FIGURE 2.16

Greenhouse, nursery and forestry production value by county, 2004



Source: Agricultural Issues Center based on California Agricultural Statistics Service, *2004 County Agricultural Commissioners' Data*, October 2005.

Note: Revenue categories are formed to maximize the difference between categories and minimize the difference within.

Organic agriculture

Gross sales of organic agricultural farm products more than doubled between 1997 and 2003. Organic sales plateaued between 1999 and 2001 and resumed rapid growth from 2001 to 2003. The number of organic registrants peaked in 2001, but acres in organic production and gross sales continued to increase (Table 2.8).

TABLE 2.8
California organic agriculture, 1997 - 2003

	Number of Farms	Acres	Sales (\$1,000)
1997	1,533	67,826	158,288
1998	1,757	85,131	182,713
1999	1,741	125,720	204,324
2000	1,903	148,552	200,836
2001	1,925	167,460	207,221
2002	1,847	164,503	250,005
2003	1,757	173,821	329,824

Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>;
Klonsky, Karen, Laura Tourte, Robin Kozloff, Benjamin Shouse. *A Statistical Picture of California's Organic Agriculture, 1995 - 1998*. Agricultural Issues Center, University of California, 2002. <http://aic.ucdavis.edu/research/misc/Organic1995-98.pdf>.

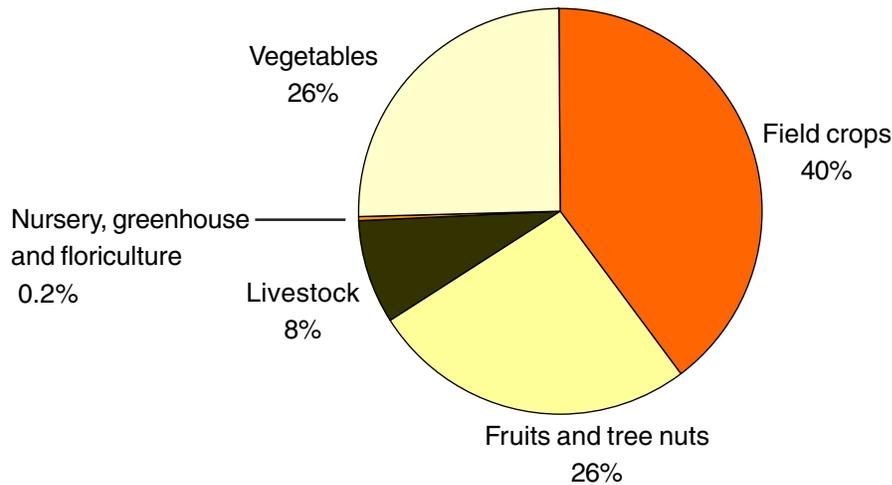
In 2003, 1,757 registered organic growers in California reported almost \$330 million in gross sales from slightly less than 174 thousand acres. Their combined gross sales represented about 1 percent of the state's total agricultural sales. Total gross sales that year had more than doubled since 1997. Farmers using organic techniques produced almost 200 different commodities in 2003. Vegetable crops, with 46.9 percent of the state organic sales, and fruit and nut crops with 35.6 percent account for the majority of California's organic production (Table 2.9).

TABLE 2.9
California organic farmers' cash receipts by commodity group, 2003

	Sales of organic production (\$1,000)	Share of California organic sales (percent)
Vegetable crops	154,827	46.9
Fruit & nut crops	117,468	35.6
Livestock, dairy, poultry, & apiary	34,450	10.4
Field crops	14,987	4.5
Nursery, greenhouse & floriculture	8,090	2.5
Total	329,824	100

Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

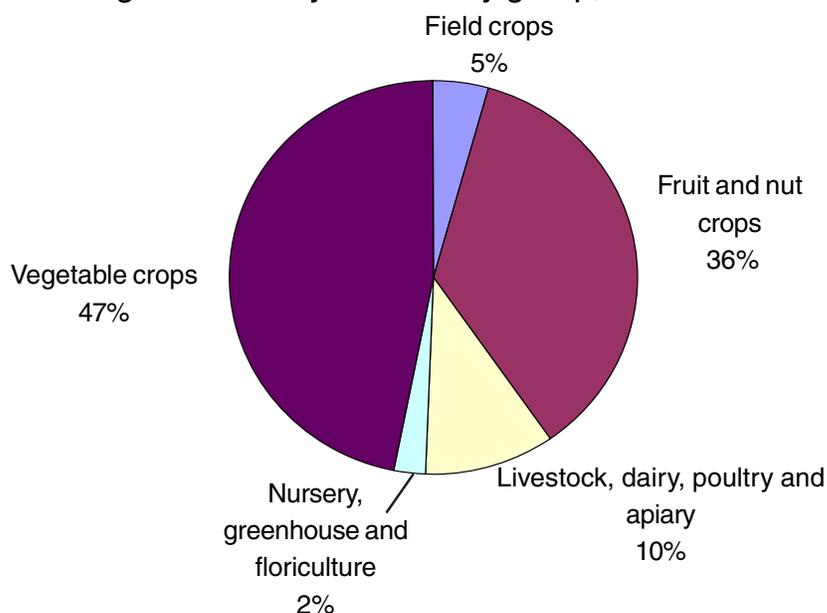
FIGURE 2.17
California organic acres by commodity group, 2003



Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

Among the 1,757 registered California organic producers reporting to the state in 2004, some grew more than one commodity group. Over 90 percent of the organic acreage (Figure 2.17) was allocated to field crops (40%), fruit and nut crops (26%), and vegetable crops (26%). The vast majority of organic sales in 2003 (Figure 2.18) consisted of vegetable crops (47%) and fruits and tree nuts (36%).

FIGURE 2.18
California organic sales by commodity group, 2003



Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

The organic industry in California is comprised of a large number of small producers and a small number of very large producers who dominate sales. Sixty-nine percent of them report sales of less than \$50,000, whereas 4 percent report sales of over \$1 million. In 2003, 72 percent of the organic sales receipts were generated by producers with gross sales in excess of \$500,000 (Table 2.10).

TABLE 2.10

Percent of registered organic growers and total sales by sales class, 1998-2003

Sales Class \$ per year	1998		1999		2000		2001		2002		2003	
	Growers (percent)	Sales (percent)										
0 - 4,999	42	1	40	1	39	1	39	1	38	<1	36	<1
5,000 - 9,999	16	1	14	1	15	1	15	1	11	1	9	<1
10,000 - 49,999	20	5	22	5	20	5	21	5	22	4	24	3
50,000 - 99,999	8	6	7	5	9	7	8	6	11	6	10	4
100,000 - 249,999	6	9	7	10	7	11	7	11	8	10	10	9
250,000 - 499,999	5	16	4	13	4	15	4	15	5	13	6	11
500,000 - 999,999	2	13	2	13	3	18	3	24	3	16	3	12
1,000,000 & above	2	49	2	52	1	41	2	36	3	49	4	60
All	100	100	100	100	100	100	100	100	100	100	100	100

Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

Organic sales have been dominated by vegetable crops and fruit and nut crops since 1998, the first year with reliable records. More recently, there has been some growth in organic animal production. In fact, looking at single organic commodities, organic milk is the third most important in sales throughout the state, behind lettuce and grapes (Tables 2.11 and 2.12).

TABLE 2.11
California organic agriculture by commodity group, 1998-2003

	Field crops	Fruit & nut crops	Livestock, dairy, poultry & apiary	Nursery, greenhouse & floriculture	Vegetable crops	Total
Number of Growers ^a						
1998	194	1,254	28	133	592	1,757
1999	210	1,236	43	173	589	1,741
2000	245	1,365	57	186	643	1,903
2001	263	1,402	54	190	616	1,925
2002	261	1,332	65	194	585	1,847
2003	251	1,274	75	174	525	1,757

^aRow totals do not equal the sum of the columns because of growers in multiple commodity groups.

Number of Acres						
1998	25,814	28,701	1,088	533	28,995	85,131
1999	44,320	34,284	2,049	591	44,476	125,720
2000	56,121	36,626	4,754	765	50,286	148,552
2001	55,372	39,967	6,234	605	65,284	167,460
2002	61,653	47,423	5,919	551	48,957	164,503
2003	68,974	45,576	14,404	376	44,488	173,821

Sales (\$1,000)						
1998	13,653	67,646	4,868	2,743	93,803	182,713
1999	11,675	76,578	9,381	4,454	102,236	204,325
2000	18,364	71,474	12,121	4,752	94,125	200,836
2001	15,575	85,974	12,056	7,010	86,606	207,222
2002	13,544	98,399	11,725	7,147	119,190	250,006
2003	14,987	117,469	34,451	8,091	154,828	329,825

Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

TABLE 2.12
 Top 20 California organic products by sales revenue, 2003

Rank	Product	Sales (\$1,000)
1	Lettuce, all	42,148
2	Grapes, all	33,930
3	Dairy	23,393
4	Carrots	18,664
5	Strawberries	17,509
6	Tomatoes, all	11,433
7	Spinach	10,887
8	Chickens, meat	10,225
9	Rice	9,219
10	Sweet potatoes	7,297
11	Almonds	6,416
12	Broccoli	6,353
13	Dates	6,068
14	Celery and celeriac	6,005
15	Peaches, all	5,554
16	Raspberries	5,467
17	Oranges, all	5,082
18	Walnuts	4,281
19	Mustard	4,233
20	Avocados	4,211
Top 20 total products		238,375

Source: Klonsky, Karen and Kurt Richter. *Statistical Review of California's Agriculture, 1998 - 2003*. Agricultural Issues Center, University of California, 2005. <http://aic.ucdavis.edu/research/StatisticalReview98-03f8.pdf>

The Measure of California Agriculture

CHAPTER 3

University of California Agricultural Issues Center

Inputs to Farm Production

3-3.....	Farm expenditures
3-5.....	Capital
3-11.....	Labor
3-15.....	Pesticides
3-21.....	Energy
3-24.....	Water
3-33.....	Productivity growth
3-36.....	Research and development

Farm expenditures increased in inflation adjusted terms by 19 percent between 1994 and 2007. Petroleum fuel and oil, seed, feed and contract labor experienced the greatest percentage cost increases. Statewide, the largest expenditures in 2007 went to purchase feed and compensate hired labor. In 2003, California accounted for 7 percent of the nation's farm assets. The value of land and buildings per farm has been more than double the national average throughout the past 25 years. Compared to other states, California agriculture is labor intensive, and most hired farm workers are young, male, undocumented immigrants. Measured by weight of active ingredients, agriculture's use of pesticides accounted for only one-quarter of all pesticides sold in California in 2003. Energy costs for agriculture, as measured by fuel, oil and electricity costs were about 10 percent of total 2007 input costs. In 2000, a normal water-year, agriculture accounted for 41 percent of all applied water use in the state. In 2001, a dry year, agriculture's share of applied water increased to 52 percent. Agricultural productivity has increased substantially since the late 1940s. Recent growth in yields has been high for almonds, vegetables, and per cow milk production. Expenditures (inflation adjusted) on agricultural research and development by the University of California Cooperative Extension and Agricultural Experiment Station have increased by 22 percent since the early 1990s. However, from 2003 to 2007, these expenditures decreased more than 10 percent.

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Farm expenditures

Total expenditures by California farms increased 19 percent in real terms after adjusting for inflation between 1994 and 2007 (Table 3.1). Expenditures increased by 20 percent between 1994 and 1999 but have remained relatively steady since 1999 with a less than 1 percent decrease from 1999 to 2007.

Some expenditures show a significant increase from 1999 to 2007, while others have decreased in real terms. The largest increase in expenditures was for petroleum fuel and oil which rose 93 percent from 1999 to 2007. In 1999 petroleum fuel and oil accounted for 2.4 percent of total farm expenditures, but in 2007 they accounted for 4.6 percent. Also experiencing greater than 15 percent increases since 1999 were expenditures related to purchased feed (27%), contract labor (22%), fertilizer and lime (18%) and property taxes and other fees (16%). These increases were offset by large decreases in expenditures for machine hire and customwork (-49%), net rent received by nonoperator landlords (-29%), and employee compensation (-16%).

TABLE 3.1
Farm expenditures, 1994 - 2007, in year-2000 inflation adjusted dollars

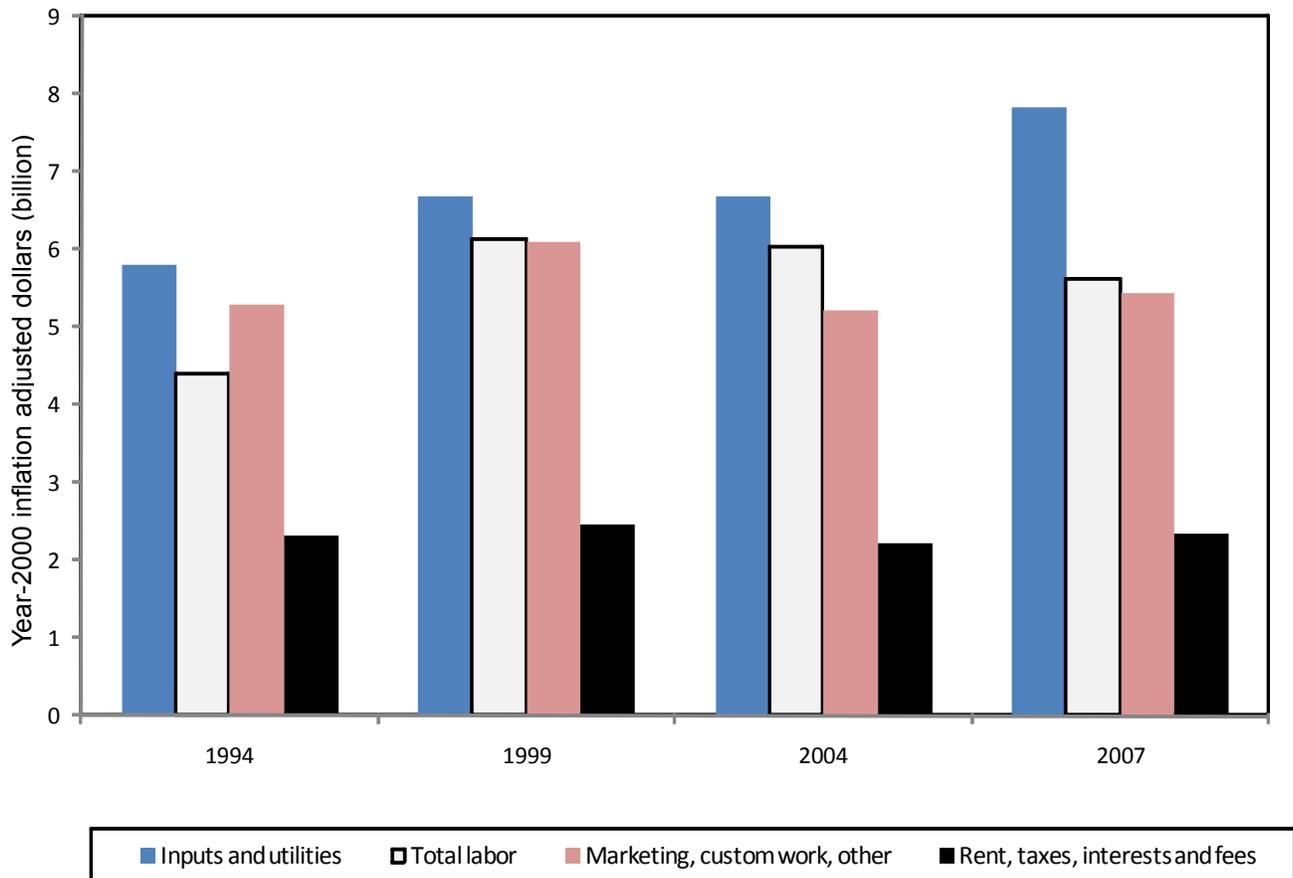
	1994	1999	2004	2007	% change 1994-2007
Year-2000 inflation adjusted dollars (million)					
Inputs and utilities					
Feed purchased	2,157	2,464	2,540	3,121	45
Livestock and poultry purchased	615	573	651	567	-8
Seed purchased	459	733	777	768	67
Fertilizers and lime	736	763	758	901	23
Pesticides	872	1,030	868	960	10
Petroleum fuel and oils	411	501	584	967	135
Electricity	563	610	506	534	-5
Total labor					
Contract labor	1,003	1,187	1,366	1,444	44
Employee compensation (total hired labor)	3,377	4,940	4,658	4,155	23
Marketing, custom work, other					
Repair and maintenance of capital items	750	892	943	938	25
Machine hire and customwork	828	1,004	633	508	-39
Marketing, storage, and transportation	1,722	1,671	1,308	1,763	2
Miscellaneous expenses	1,980	2,521	2,346	2,236	13
Rent, taxes interests and fees					
Net rent received by nonoperator landlords	508	454	541	322	-37
Real estate and nonreal estate interest	1,261	1,356	1,080	1,260	0
Property taxes, motor vehicle registration and licensing	558	653	598	755	35
Total farm expenditures	17,802	21,351	20,156	21,200	19

Sources: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

Bureau of Economic Analysis GDP implicit price deflator, year-2000=100. <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=1993&LastYear=2008>

In 2007, the largest expenditures were for hired labor and purchased feed (Figure 3.1). Employee compensation accounted for almost 20 percent of total expenditures. Purchased feed made up 15 percent of total farm expenditures, while expenditures on petroleum fuel and oils were under 5 percent. Although the cost of farming has increased since 2004, the share of each expenditure category has remained relatively stable.

FIGURE 3.1
California farm expenditures, grouped items, 1994 - 2007 in year-2000 inflation adjusted dollars



Source: Table 3.1.

Capital

With less than 4 percent of the farms, California accounts for 7 percent of the nation's farm assets, 10.1 percent of its debt, and 6.5 percent of its equity. In California, the share of real estate in farm assets is higher than in the nation, whereas the share of crops or machinery is lower. In 2003, the average debt to equity ratio in California was 26% and the debt to assets ratio was 20.6% (Table 3.2). The ratios of farm debt to assets and debt to equity have been higher in California than for the United States since the mid-1960s (Figures 3.2 and 3.3).

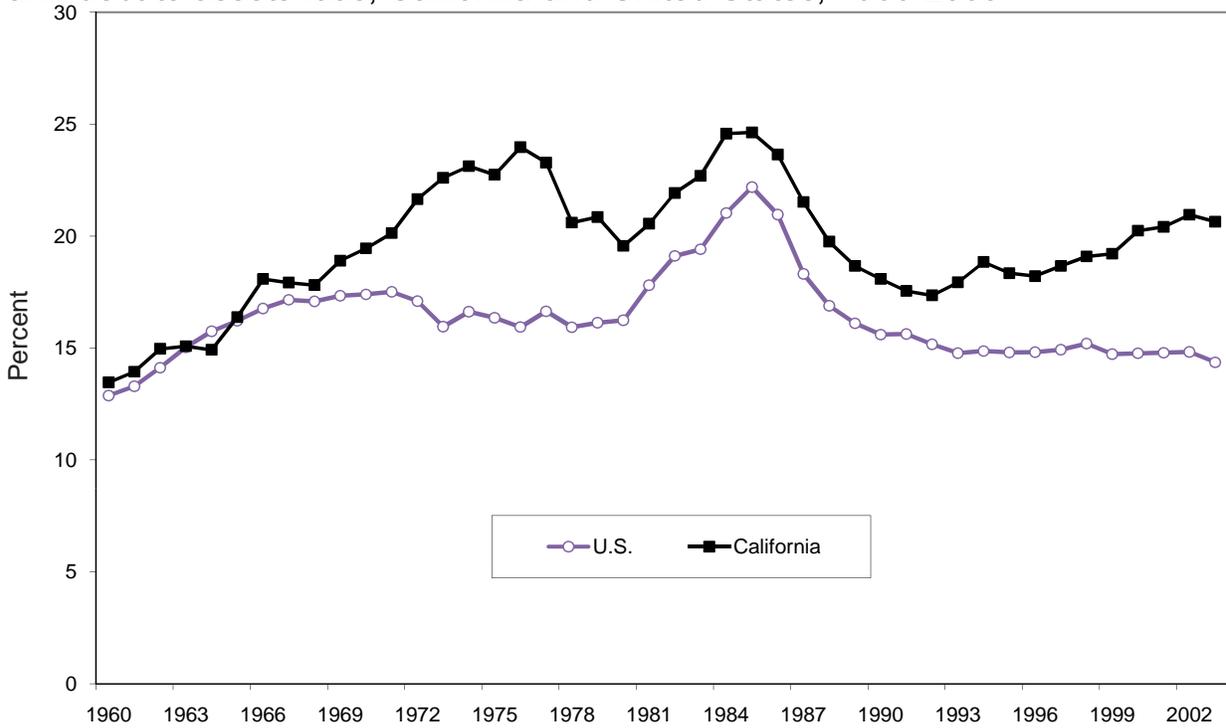
TABLE 3.2
Farm balance sheets, California and United States, 2003

	California	United States
	(\$ million)	
Assets		
Real estate	82,682	1,111,777
Non real estate	13,996	266,980
Livestock & poultry	5,653	78,540
Machinery & motor vehicles	4,561	95,944
Crops	405	24,429
Purchased inputs	319	5,627
Financial assets	3,057	62,440
Total	96,678	1,378,757
Debt		
Real estate	12,287	107,981
Non real estate	7,668	90,017
Total	19,955	197,998
Equity (assets minus debt)	76,722	1,180,759
Debt to equity ratio (%)	26.0	16.8
Debt to assets ratio (%)	20.6	14.4

Source: USDA Economic Research Service, Farm Balance Data, available at <http://www.ers.usda.gov/Data/farmbalancesheet/fbsdmu.htm>

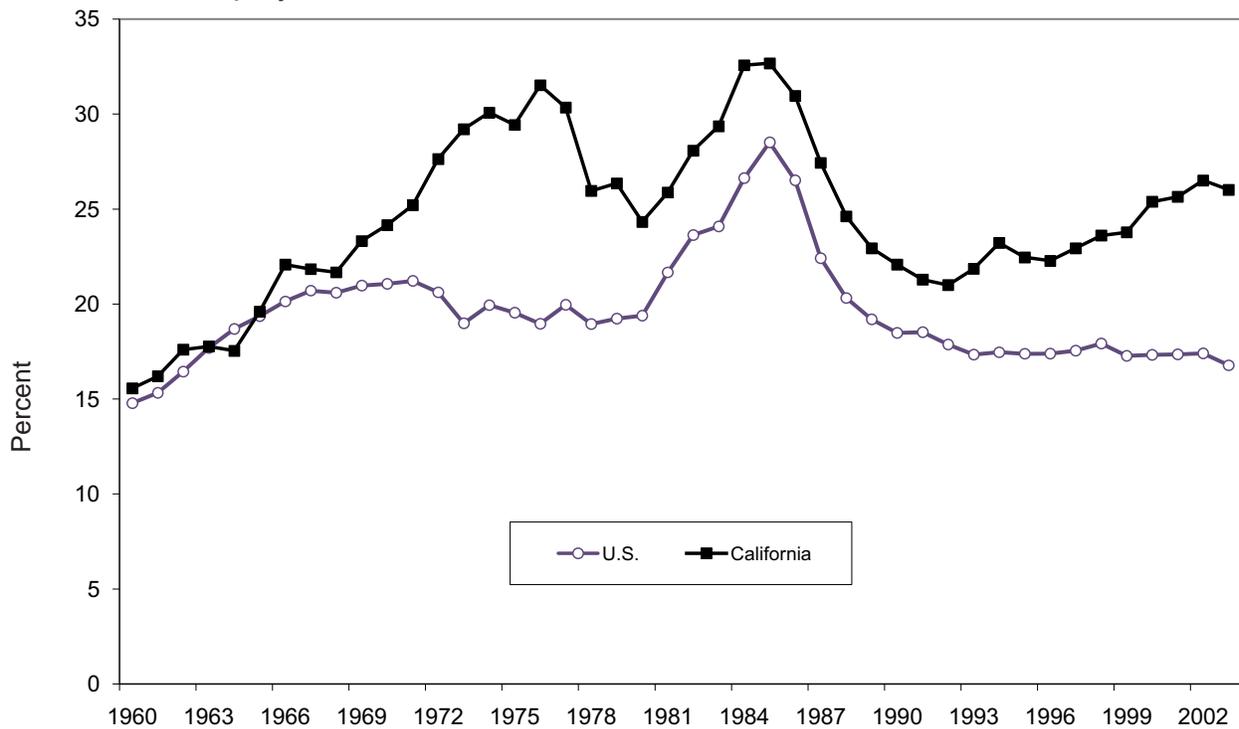
The 2007 *Census of Agriculture* presents data on the value of land and buildings. As in other cases, long term comparisons of changes in the value of land and buildings are affected by the fact that in 2002 the census included an adjustment for coverage. This adjustment was applied also to 1997 data but not to previous years. For decades, the estimated per acre value of California farmland has been higher than in the nation as a whole, and in 2007 it was well over three times as high. The average per farm value of land and buildings in California was more than 2.5 times the national average (Table 3.3).

FIGURE 3.2
Farm debt to assets ratio, California and United States, 1960-2003



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmBalanceSheet/fbsdmu.htm>

FIGURE 3.3
Farm debt to equity ratio, California and United States, 1960-2003



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmBalanceSheet/fbsdmu.htm>

TABLE 3.3
Value of land and buildings, California and United States, 1982-2007

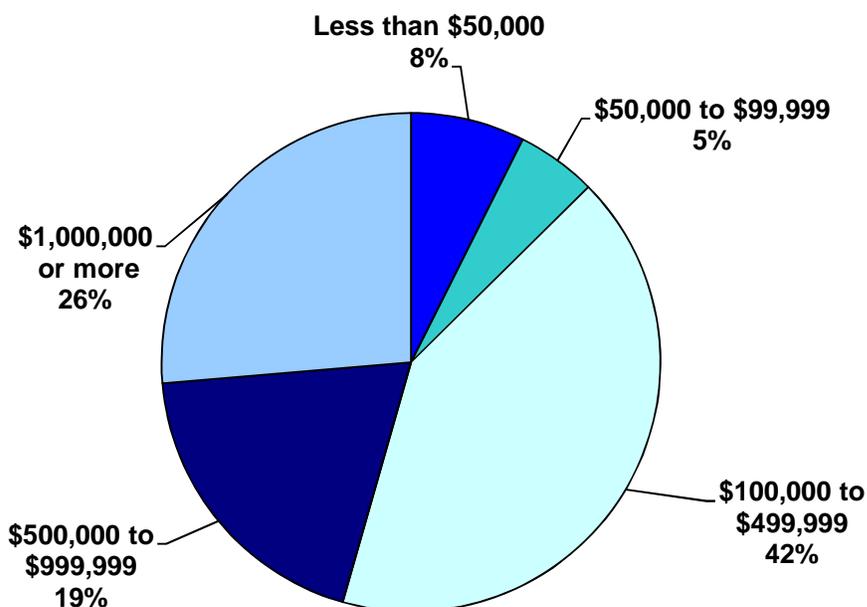
Census year	California			United States		
	Total value (\$ million)	Average value per farm (\$)	Average value per acre (\$)	Total value (\$ million)	Average value per farm (\$)	Average value per acre (\$)
1982	61,565	746,577	1,918	775,084	345,869	784
1987	48,571	583,668	1,575	604,170	289,387	627
1992	63,693	820,063	2,213	687,432	357,056	727
1997	69,765	941,170	2,605	859,855	449,748	933
1997 ^a	73,827	839,126	2,643	921,581	416,007	967
2002 ^a	96,129	1,206,822	3,526	1,144,906	537,833	1,213
2007	162,533	2,005,768	6,408	1,744,295	791,138	1,892

Sources: U.S. Department of Commerce Census Bureau, *Census of Agriculture* (1982-1992); USDA National Agricultural Statistics Service, *Census of Agriculture* (1997-2007). <http://www.nass.usda.gov>

^aFigures from 1997 were adjusted for coverage in 2002, and are not directly comparable with previous years.

In 2002, 61 percent of the nearly 80 thousand farms in the state controlled land and buildings with estimated market values between \$100,000 and \$1 million, while another 26 percent had land and buildings worth more than \$1 million. Fewer than 13 percent of the state's farms had land and buildings that were worth less than \$100,000 (Figure 3.4).

FIGURE 3.4
Farms by value of land and buildings, California, 2002



Source: USDA National Agricultural Statistics Service, *Census of Agriculture*, 2002. <http://www.nass.usda.gov>

The 10 counties with highest value of farm land and buildings in 2002 accounted for 50 percent of the state's total value in farm land and buildings and included the top 7 counties ranked by production value (Table 3.4). Fresno County, which is the number one county in gross production value, is also number one in total value of land and buildings, with a value of almost \$7 billion. The second highest county is Sonoma, with nearly \$6 billion worth of capital in land and buildings. Sonoma County ranks sixteenth in terms of gross production value.

TABLE 3.4
Value of land and buildings in highest valued counties compared to value of production, California, 2002

County	Rank in value of land and buildings	Value of land and buildings	Rank in production value	Value of production
		\$1,000		\$1,000
Fresno	1	6,940,069	1	2,759,421
Sonoma	2	5,898,546	16	571,710
Tulare	3	5,438,039	2	2,338,577
San Joaquin	4	4,846,928	7	1,222,454
Kern	5	4,747,991	4	2,058,705
Stanislaus	6	4,535,821	6	1,228,607
Merced	7	4,035,945	5	1,409,254
Napa	8	3,978,442	17	429,011
Monterey	9	3,921,432	3	2,190,121
San Diego	10	3,894,471	11	950,761
California total		96,129,402		25,737,173

Source: Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.
http://www.nass.usda.gov/Census/Create_Census_US_CNTY.jsp

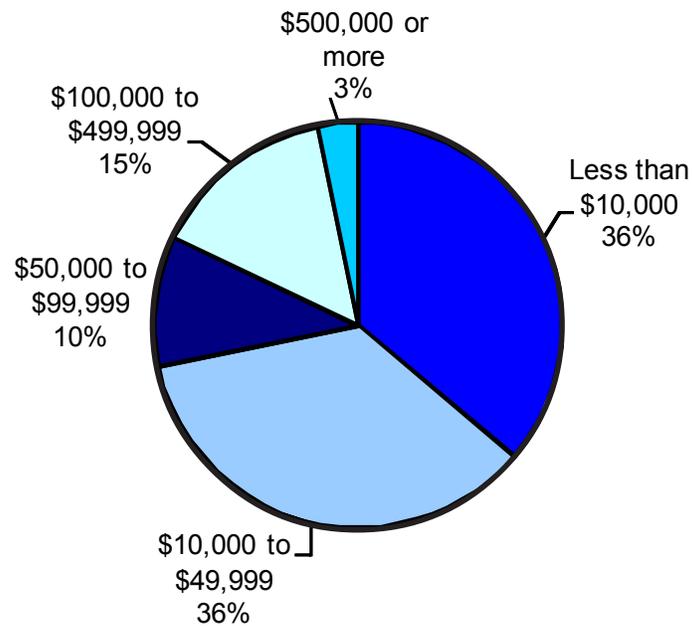
The value of land and buildings per farm and per acre of land give two different perspectives. Monterey County has the highest average value of land and buildings per farm, while San Francisco County has the highest average per acre value of land and buildings (Table 3.5). The production of grapes, greenhouse, and nursery products is associated with high values of fixed assets. The South Coast and Central Coast regions concentrate a large portion of greenhouse and nursery products (Figure 1.8 and Table 2.7), while in the North Coast counties of Napa and Sonoma grape production accounts for a significant amount of the output.

TABLE 3.5
Average value of California farm land and buildings, 10 highest-valued counties, 2002

		Average value of land and buildings				
		Per acre (\$)		Per farm (\$1,000)		
Rank	County			Rank	County	
1	San Francisco	32,239		1	Monterey	3,222
2	Napa	19,350		2	Imperial	2,932
3	Los Angeles	15,544		3	Napa	2,734
4	Sonoma	11,058		4	Inyo	2,541
5	Orange	10,661		5	Kern	2,214
6	Santa Cruz	9,335		6	Kings	2,013
7	Ventura	8,839		7	Marin	2,012
8	Contra Costa	8,044		8	Orange	2,012
9	San Diego	7,635		9	Santa Barbara	1,893
10	San Joaquin	6,673		10	Colusa	1,885
	State Average	3,526			State Average	1,206

Sources: USDA National Agricultural Statistical Service, *Census of Agriculture, 2002*; <http://www.nass.usda.gov> County data available at http://www.nass.usda.gov/Census/Create_Census_US_CNTY.jsp

FIGURE 3.5
California farms by value of machinery and equipment, 2002



Source: USDA, National Agricultural Statistics Service, *Census of Agriculture, 2002*. <http://www.nass.usda.gov>

More than two-thirds of California farms have machinery and equipment valued at less than \$50,000. The value of machinery and equipment on roughly one-third of the farms is less than \$10,000 while another one-third have \$10,000 to \$49,999 in machinery and equipment. Only 3 percent of the farms own machinery and equipment worth more than \$500,000 (Figure 3.5).

Total number of tractors in California increased 24 percent from 1997 to 2002, although the portion over 100 horsepower remained relatively constant at about 15 percent. In contrast, grain and bean combines as well as cotton pickers decreased in absolute number (Table 3.6).

Monterey County has the greatest value in machinery per farm, with nearly \$300,000 worth, although this high value does not imply the largest and/or the newest tractors. Colusa County records 42 percent of its tractors as being of more than 100 horsepower, whereas Orange County, which does not show up in Table 3.7, has the largest proportion of new tractors (27%).

TABLE 3.6

Machinery and equipment, California, 1997 and 2002

	1997	2002	% change
Number of tractors	148,955	184,981	24
Tractors with more than 100 hp	20,311	31,127	53
Tractors less than 4 years old	21,568	27,969	30
Combines	3,026	2,540	-16
Cotton pickers	4,187	1,964	-53

Source: USDA, National Agricultural Statistics Service, *Census of Agriculture, 2002*.

TABLE 3.7

Top 10 California counties ranked by value of machinery, 2002

County	Machinery value ^a dollars per farm	Number of tractors	More than 100 hp (%)	Less than 4 years old (%)
1 Monterey	297,363	5,772	21	22
2 Imperial	272,927	2,804	34	21
3 Colusa	207,602	2,842	42	19
4 Kern	199,100	7,806	29	21
5 Kings	169,495	4,168	38	16
6 Yolo	138,011	3,563	32	13
7 Mono	134,726	169	35	8
8 Nevada	125,634	428	5	17
9 Sutter	124,531	3,816	25	15
10 Santa Barbara	121,461	4,044	12	13
California	86,808	184,981	17	15

Source: USDA National Agricultural Statistics Service, *Census of Agriculture, 2002*.

^a Only farms with tractors.

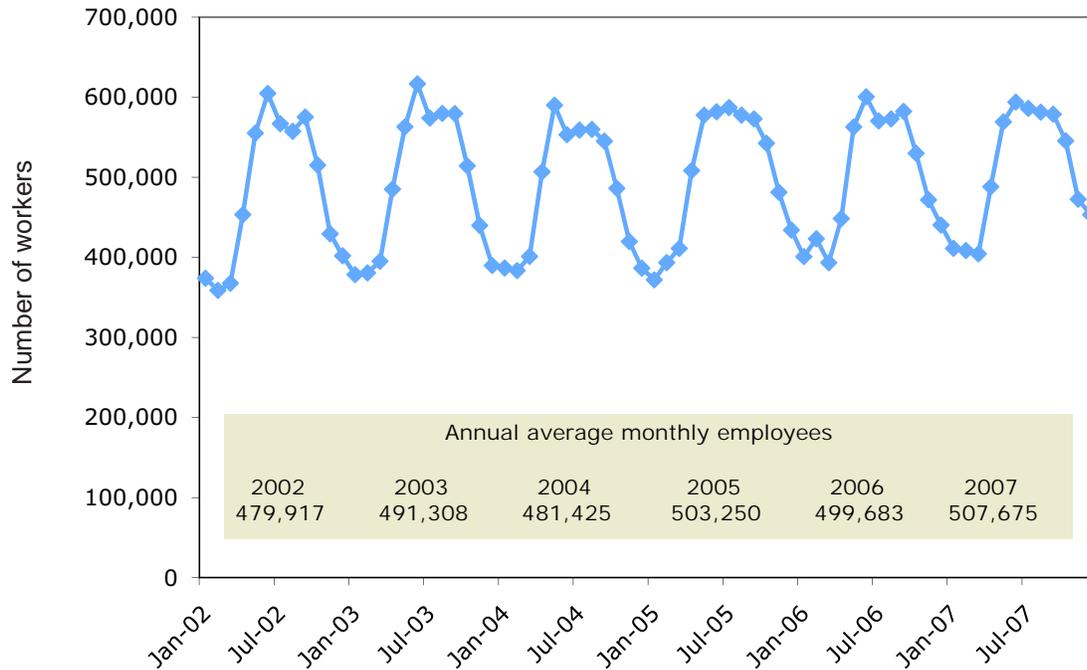
Labor

The *2002 Census of Agriculture* reports there are about 535,000 hired workers in California agriculture. The California Employment Development Department, which tracks monthly fluctuations in the labor market, reported a monthly average of 479,917 agricultural workers for 2002 (including those in support activities and management), with a minimum of 358,700 in February 2002 and a maximum of 604,600 in June. The agricultural labor market is seasonal. In 2007, the monthly average number of workers in agriculture was 507,675 (Figure 3.6).

Farm workers represent between 2 and 2.5 percent of the state's labor force (the variation corresponds to the seasonality of agricultural employment). The Central Valley accounts for 55 percent of all of the farm workers in the state and 47 percent of their payroll (Table 3.8).

Agricultural salaries have been traditionally below the level of salaries in other industries (Table 3.9). In 2003 average salaries in the manufacturing sector were 2.7 times higher than in the

FIGURE 3.6
Hired farm workers by month, California, 2002 - 2007^{a,b}



Source: California Employment Development Department <http://www.labormarketinfo.edd.ca.gov/?pageid=158>

^aStarting with 2002, EDD data is based on the North American Industry Classification System (NAICS).

^bIncludes plant and animal production, related support activities and farm labor and management. Does not include food service workers.

agricultural sector. Average salaries in the professional and technical services were 3.4 times those in agriculture. Hourly earnings for all agricultural production and service jobs increased from an average of \$6.25 in June 1991 to \$8.51 in June 2003 (Table 3.10).

Compared with other states where agriculture is a relatively important industry, such as Texas and Iowa, California farms are very labor intensive, particularly due to the harvesting of vegetables and fruits (Table 3.11).

TABLE 3.8
Hired farm workers and payroll by region, California, 2002

	Sacramento Valley	San Joaquin Valley	Central Valley ^a	California
Farms with hired workers	4,098	14,135	18,233	34,342
Total hired workers	49,811	243,079	292,890	535,256
Workers hired 150 days or more	16,548	77,683	94,231	201,852
Workers hired less than 150 days	33,263	165,396	198,659	333,404
Payroll (\$1,000)	343,692	1,679,350	2,023,042	4,317,078

Source: USDA, National Agricultural Statistics Service, *Census of Agriculture*, 2002.

^a Central Valley is Sacramento Valley and San Joaquin Valley together.

TABLE 3.9
Annual salaries of private workers by industry, California, 2001-2003

	2001	2002	2003
Agriculture ^a	18,697	19,701	19,891
Construction	41,908	42,436	42,523
Manufacturing	51,213	50,871	53,713
Retail trade	27,638	27,847	28,256
Professional & tech. serv.	67,699	66,596	67,571

Source: U.S. Department of Labor Bureau of Labor Statistics. *Quarterly Census of Employment and Wages*.
<http://data.bls.gov>

^a Agriculture includes farm production, forestry, fishing, hunting and support services such as soil preparation, planting, harvesting, and management on a contract or fee basis.

TABLE 3.10
Average hourly earnings, California agriculture, selected years

	Production		Agricultural services ^a	Total ag production and services
	Crops	Livestock		
	(dollars per hour)			
June 1991	6.25	7.11	6.06	6.25
June 1995	6.61	7.36	6.42	6.59
June 2000	7.94	7.88	8.37	8.06
June 2001	8.17	8.07	8.45	8.23
June 2002	8.34	8.34	8.62	8.43
June 2003	8.42	8.42	8.68	8.51

Source: California Employment Development Department. <http://www.labormarketinfo.edd.ca.gov>

^a Agricultural services include soil preparation, planting, harvesting, preparation for market, cotton ginning, support for animal production, farm labor contractors, and farm management services.

TABLE 3.11
Number of farm workers in California, Texas and Iowa, 2002^a

	Total hired workers	Farms with hired workers	Workers per farm	Migrant hired workers
California	535,256	34,342	15.59	8,787
Texas	166,117	49,206	3.38	2,159
Iowa	82,991	28,135	2.95	101
United States	3,036,470	554,434	5.48	40,848

Source: USDA, National Agricultural Statistics Service, *Census of Agriculture*, 2002.

^a Hired workers include paid family members. Migrant is defined as a hired worker whose employment requires travel that prevents him/her to return to his/her place of permanent residence the same day.

The California agricultural labor force is almost entirely foreign born, mostly Mexican. A study of Central Valley farm workers in 2001 by Alvarado and Luna shows that 91 percent were born in Mexico, and most have very limited English skills. The mean age is 33 years, and 76 percent are males (Table 3.12). The study does not report on legal status, but Martin and Mason¹ estimated in 2004 that by the end of the 1990s more than 50 percent of the farm workers were unauthorized to work in the United States.

TABLE 3.12

Characteristics of California's Central Valley farm workers, 2001

	Percent
Born in Mexico	91
Born in other countries	4
Very limited English	87
Male	76
Mean age	33
Married or common law	63
Mean number of years in the U.S.	11.2

Source: Alvarado, Andrew J. and Rosa Luna. *The Central San Joaquin Valley Farm Labor Work Force 2001*. Center for Agricultural Business, California Agricultural Technology Institute CATI, Publication #020202. Fresno, 2002.

The National Agricultural Workers' Survey (Department of Labor) shows that, although California has a higher percentage of Mexican-born workers than any other state, the number has increased faster in the rest of the United States during the last decade. The percentage of foreign born rural workers increased from 60 to 80 in the entire United States, while in California the number remained stable around 93 to 96 percent (Martin and Mason, 2004).

¹Martin, Philip and Bert Mason. "Hired workers on California farms" in *California Agriculture, Dimensions and Issues, 2003*. Jerry Siebert, editor. University of California Giannini Foundation of Agricultural Economics. 2004.

Pesticides

The California Department of Pesticide Regulation (DPR) estimated that total *sales* of all pesticides in 2003 were about 661.5 million pounds of active ingredient, about 6 percent below the 1999 statewide record of 707 million pounds.¹ In 1990, California became the first state to require reporting of all agricultural use of pesticides (insecticides, herbicides, fungicides, defoliants, rodenticides, antimicrobials, etc.). In contrast, with the exception of applications by licensed pest control applicators, much of the nonagricultural use such as municipal water treatment, chlorine for swimming pools, and home and garden pesticides is not reported.

In 2003, 158.7 million pounds of pesticide active ingredients were reported as *used* in production agriculture, with another 1.8 million for postharvest fumigation (Figure 3.7). Agriculture's use represented about one-quarter of all pesticide sold in California, but more than 90 percent of commercially applied, and therefore, officially reported pesticide use.

As measured by pounds of active ingredients applied, pesticide use reported for production agriculture and postharvest fumigation in California increased 26 percent from 1992 to 1998 and then declined 30 percent to 140.3 million pounds in 2001. However by 2003 it had increased another 14 percent to 160.6 million pounds, roughly the same as in 1992 (Figure 3.7). The decline in 2001 may be attributable to weather conditions.

According to the DPR sulfur, a natural fungicide used in organic and conventional production, petroleum oils (an insecticide), metam-sodium (a fungicide) and methyl bromide (a fumigant) account for the largest uses, measured by weight in 2003.

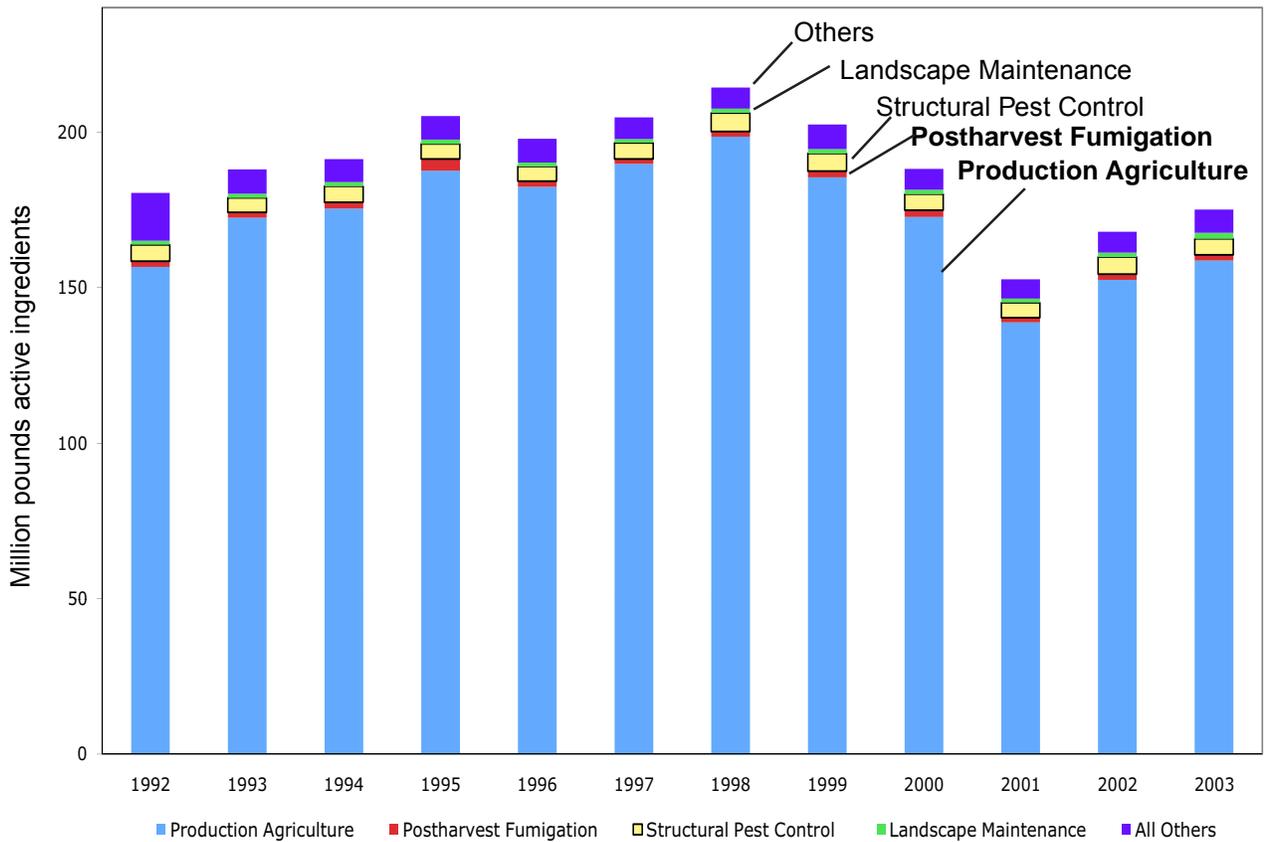
On a per acre basis, pesticide use in agriculture between 1991 and 1999 increased from 14 to 20 pounds active ingredient, or more than 40 percent (Mullen et al. 2003).² However, weight per se is not necessarily a measure of toxicity, environmental persistence, or frequency of use.

The DPR publishes regularly the amount of active ingredients applied in agriculture and the cumulative acres treated. It also summarizes pesticide use on commodities treated with more than 2 million pounds of active ingredients or cumulatively treated on more than 5 million acres. Grape crops collectively receive the largest amount of chemicals. They accounted for 45 percent of the weight of pesticide active ingredients used in production agriculture in 2003. Also by weight of active ingredient, almond production is the second highest pesticide user (Table 3.13). Over the 4-year span from 1999 to 2003, the weight of active ingredients declined in the production of grapes, almonds, processing tomatoes, oranges, cotton and alfalfa, but increased with rice, strawberries, and peaches and nectarines. As with carrots and agricultural production as a whole, pesticide use on each of these crops, except for rice, was lowest in 2001, which was a dry year. Weather can influence pesticide use by affecting changes in crop acreage planted and pest populations.

¹California Department of Pesticide Regulation, <http://cdpr.ca.gov/docs/mill/nopdsold.htm>

²Mullen, John D., Julian M. Alston, Daniel A. Sumner, Marcia T. Kreith, Nicolai V. Kuminoff. *Returns to University of California Pest Management Research and Extension*. University of California Agricultural Issues Center. 2003. ANR Publication 3482.

FIGURE 3.7
Commercial pesticide application, California 1992-2003



Sources: California Department of Pesticide Regulation. Summary of Pesticide Use Report Data, 2002, Indexed by Chemical. http://www.cdpr.ca.gov/docs/pur/pur02rep/02_pur.htm
 California Department of Pesticide Regulation. Summary of Pesticide Use Report Data, 2003, Indexed by Chemical. http://www.cdpr.ca.gov/docs/pur/pur03rep/03_pur.htm

Note: "Other uses" includes pest control on rights of way, mosquito abatement, vertebrate pest control, fumigation of nonfood and nonfeed materials, pesticide use in research, and regulatory pest control uses.

TABLE 3.13

Quantity of pesticides applied to top pesticide using crops in California as measured by weight, 1999-2003

	1999	2000	2001	2002	2003	Crop's share of 2003 CA ag production pesticide use ^a (by weight)	Percent change in pesticide use 1999- 2003
	pounds of active ingredients (millions)					percent	
Winegrapes	30.7	27.6	22.8	24.1	23.5	14.8	-23.5
Table & raisin grapes	29.5	26.8	19.6	22.2	21.5	13.6	-27.0
Almonds	14.9	11.6	10.2	11.9	13.4	8.4	-10.0
Proc tomatoes	12.8	10.7	7.9	10.6	10.9	6.9	-14.2
Strawberries	8.8	7.7	7.9	8.2	9.2	5.8	3.7
Carrots	8.6	7.6	6.5	7.8	8.6	5.4	-0.1
Oranges	8.8	8.6	6.3	6.9	7.2	4.6	-17.6
Cotton	8.5	9.4	8.1	7.2	7.1	4.5	-16.2
Rice	4.9	7.1	5.9	6.0	6.5	4.1	31.2
Peaches & nectarines	6.0	6.8	6.0	6.5	6.5	4.1	8.9
Lemons ^b	n.a.	n.a.	3.3	3.3	3.1	2.0	—
Alfalfa	3.7	3.3	2.9	3.0	2.9	1.8	-22.0
Subtotal	137.2	127.1	107.5	117.8	120.5	75.9	-12.2
Total CA prod. ag	185.5	172.7	138.8	152.5	158.7	100.0	-14.4
All reported <i>commercial</i> uses	202.4	188.2	152.7	167.9	175.1	100.0	-13.5

Source: California Department of Pesticide Regulation. Summary of Pesticide Use Report Data, 2003, Indexed by Commodity. http://www.cdpr.ca.gov/docs/pur/pur03rep/03_pur.htm except for lemons, which is from www.cdpr.ca.gov/docs/pur/purpurmain.htm

^aProduction agriculture, not including postharvest fumigation.

^bLemons from top 100 sites summaries at www.cdpr.ca.gov/docs/pur/purpurmain.htm only available starting 2001.

The four top pesticide using counties (in terms of pounds of applied active ingredients) are in the San Joaquin Valley—Fresno, Kern, Tulare and San Joaquin counties (Table 3.15). DPR also summarizes the “cumulative acres” treated because many pesticide products are applied more than once on the same crop during the season. One acre treated 3 times in a year is reported as 3 acres cumulative. Similarly, if one acre is treated by one pesticide product that contains 3 active ingredients it is reported as 3 cumulative acres. Cotton consistently has recorded the largest cumulative area treated, followed by grapes, almonds and alfalfa (Table 3.14).

TABLE 3.14

Top pesticide using crops, cumulative acres treated, 1999-2003^{a,b}

	1999	2000	2001	2002	2003	Percent change 1999-2003
Cumulative acres treated (1,000)						
Cotton	10,178.5	11,708.7	9,676.6	8,352.7	10,529.0	3.4
Winegrapes	7,209.5	6,995.3	6,450.6	6,662.1	6,641.7	-7.9
Almonds	7,436.4	7,215.0	5,049.6	5,423.3	6,353.6	-14.6
Table & raisin grapes	9,458.0	8,145.6	5,670.9	5,902.6	5,952.5	-37.1
Alfalfa	5,361.4	5,187.7	4,446.5	4,468.9	4,863.4	-9.3
Proc tomatoes	2,762.5	2,404.3	1,897.3	2,032.8	2,659.0	-3.7
Rice	1,639.2	2,164.7	1,738.4	2,062.1	2,229.2	36.0
Oranges	2,039.2	2,181.6	1,727.1	1,911.2	2,068.0	1.4
Peaches & nectarines	1,700.7	1,687.8	1,609.6	1,582.8	1,513.2	-11.0
Strawberries	899.1	1,018.1	874.2	981.8	1,266.0	40.8
Carrots	489.3	412.3	359.4	427.1	446.6	-8.7
Lemons ^c	n.a.	n.a.	369.2	352.2	428.0	—
Subtotal	49,173.7	49,121.1	39,869.2	40,159.4	44,950.2	-9.5

Source: California Department of Pesticide Regulation. Summary of Pesticide Use Report Data, 2003, Indexed by Commodity. http://www.cdpr.ca.gov/docs/pur/pur03rep/03_pur.htm except for lemons, which is from www.cdpr.ca.gov/docs/pur/purpurmain.htm

^aArea reported is referred to as “cumulative acres” because many products are applied more than once on the same crop during the season. For example, one acre treated 3 times in a year is reported as 3 acres cumulative. Similarly, if one acre is treated by one pesticide product that contains 3 active ingredients, it is reported as 3 acres.

^bProduction agriculture, not including postharvest fumigation.

^cLemons from top 100 sites summaries at www.cdpr.ca.gov/docs/pur/purpurmain.htm starting 2001 only.

TABLE 3.15

Top 10 counties by quantity of reported applied pesticides, 2003

	Quantity of active ingredient (1,000 lb)	Percent of state total
Fresno	27,256	15.6
Kern	22,905	13.1
Tulare	13,304	7.6
San Joaquin	10,203	5.8
Monterey	9,329	5.3
Madera	8,615	4.9
Merced	6,840	3.9
Imperial	6,809	3.9
Ventura	6,644	3.8
Stanislaus	5,574	3.2
Subtotal	117,479	67.1
Total all counties ^a	175,127	

Source: California Department of Pesticide Regulation. 2003 Pesticide Use Report. Summary of Pesticide Use Report Data, 2003, Indexed by Commodity. http://www.cdpr.ca.gov/docs/pur/pur03rep/03_pur.htm except for lemons, which is from www.cdpr.ca.gov/docs/pur/purpurmain.htm

^a Non-agricultural commercial applications in addition to all production agriculture applications.

DPR also tracks use of chemicals with potential hazard to human health or the environment (carcinogens, reproductive toxins, cholinesterase inhibitors, toxic air contaminants and potential groundwater contaminants). With the exception of carcinogens, use (by weight) decreased in all categories from 1998 to 2003 (Table 3.16). The proportion of reduced risk and biopesticides in the total weight of applied pesticides rose from less than one percent in 1994 to 1.2 percent in 2003.

Overall, the use of reproductive toxins by agricultural and other reportable uses decreased between 1994 and 2003 and the trend continued to decline through 2007. In 2003 the soil fumigant, methyl bromide accounted for 31 percent of the weight of all reproductive toxins applied, down from 52 percent in 1994. While methyl bromide accounted for 8.7 percent of all reported pesticide use in the state in 1994, by 2003 it was responsible for only 4.1 percent and in 2007, 3.7 percent (Table 3.17). This reduction is in part the result of the federally mandated phasedown since 1991 as a greenhouse gas. During this same period, use of metam-sodium, an alternative to methyl bromide, increased from 5.8 percent of all pesticide use to 8.4 in 2003, but by 2007 had decreased to 5.7 percent. Metam-sodium is listed by the state as a reproductive toxin and a carcinogen. Since 1999, metam-sodium use has exceeded that of methyl bromide.

TABLE 3.16

Commercial pesticide use in California categorized by hazard: quantity applied and acres treated, 1994 - 2003^{a,b}

	1994	1998	2003	1994	1998	2003
	Pounds of active ingredients			Cumulative acres treated		
	1,000			1,000		
Reproductive toxins ^c	31,815	30,403	24,123	4,212	4,107	2,381
Carcinogens ^d	18,900	26,696	28,047	4,424	6,726	3,803
Cholinesterase inhibitors ^e	16,046	13,057	7,891	12,051	9,941	6,396
Groundwater protection ^f	2,445	2,714	2,285	1,219	1,769	1,547
DPR's toxic air contaminants ^g	35,171	39,821	35,857	4,656	5,143	3,541
Oil pesticides ^h	26,303	29,037	26,686	2,288	2,144	2,125
U.S. EPA reduced risk pesticides ⁱ	<1	301	1,062	0	1,408	5,589
Biopesticides ^j	785	1,432	1,038	1,903	2,990	2,328

Source: California Department of Pesticide Regulation (DPR). Summary of Pesticide Use Report Data, 2003, by Chemical. http://www.cdpr.ca.gov/docs/pur/pur03rep/03_pur.htm

Note: home and garden use and most industrial and institutional uses are not included, with exception of commercial applications.

^aSome pesticides are categorized in more than one category.

^b"Cumulative acres" because many pesticides are applied more than once on the same crop during the season or the area is treated by one product containing multiple active ingredients.

^cPesticides on State's Proposition 65 list of chemicals "known to cause reproductive toxicity" (PUR tables 3A and 3B).

^dU.S. EPA B2 carcinogens or on State's Proposition 65 list of chemicals "known to cause cancer." (PUR tables 4A and 4B).

^eCholinesterase inhibiting pesticides (organophosphates and carbamates). (PUR tables 5A and 5B).

^fPesticides on DPR's groundwater protection list (PUR tables 6A and 6B) and norflurazon.

(Footnotes continue on next page.)

TABLE 3.16 continued

^gPesticides listed on DPR's toxic air contaminants list (PUR tables 7A and 7B).

^hOil pesticides (PUR tables 8A and 8B). While oil pesticides and other petroleum distillates as a broad group are on U.S. EPA's list of B2 carcinogens or the State's Proposition 65 list of chemicals "known to cause cancer," highly refined oil pesticides also serve as alternatives to high-toxicity chemicals.

ⁱPesticides given reduced risk status during registration by U.S. EPA (PUR tables 9A and 9B).

^jIncludes microorganisms and compounds naturally occurring, or essentially identical to naturally occurring compounds that are not toxic to the target pest (e.g. pheromones). (PUR tables 10A and 10B).

TABLE 3.17

Reported annual use of methyl bromide and metam-sodium, California, 1997-2007^a

	Average 1997-1999	Average 2000-2002	2003	2004	2005	2006	2007
Pounds of active ingredients (1,000)							
Metam-sodium	15,598	13,608	14,823	14,698	12,991	11,422	9,897
Methyl bromide	15,461	8,178	7,289	7,106	6,505	6,541	6,438
All chemical applications	209,357	170,696	176,477	180,508	195,312	187,868	172,163

Source: California Department of Pesticide Regulation (DPR). Summary of Pesticide Use Report Data, 2007. Indexed by Commodity. http://www.cdpr.ca.gov/docs/pur/pur07rep/07_pur.htm

^aNon-agricultural commercial application in addition to all production agriculture applications.

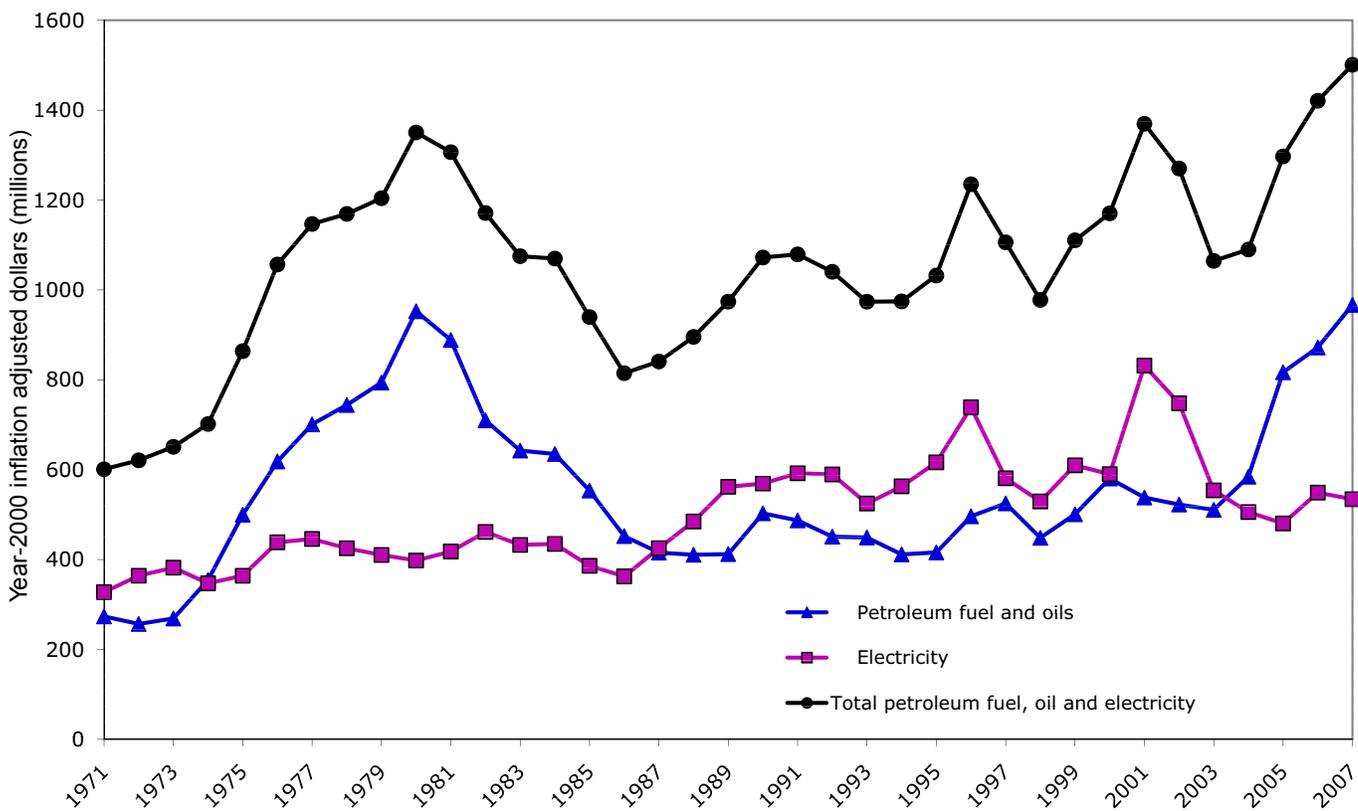
Energy

Energy expenditures by California agricultural producers have been increasing. Between 1987 and 2003, annual expenditures on electricity exceeded those for petroleum products, but in the years since 2003 petroleum expenditures have exceeded those for electricity. In 2007 farm producers spent almost \$1.16 billion (nominal dollars) on petroleum fuels and oils and \$640 million on electricity, accounting for a 59 percent increase in total energy expenditures over the previous four years.

Converting nominal expenditures into constant year-2000 inflation adjusted dollars, Figure 3.8 shows that for much of the 1990s, with the exception of spikes in 1996 and 2001, electricity expenditures have been relatively stable around \$600 million. In contrast, over the 2003 to 2007 period expenditures on petroleum products increased from \$510.6 million to \$966.6 million in constant dollars (an 89% increase in real terms).

FIGURE 3.8

Fuel, oil and electricity expenditures for California agriculture, 1971-2007, in year-2000 inflation adjusted dollars

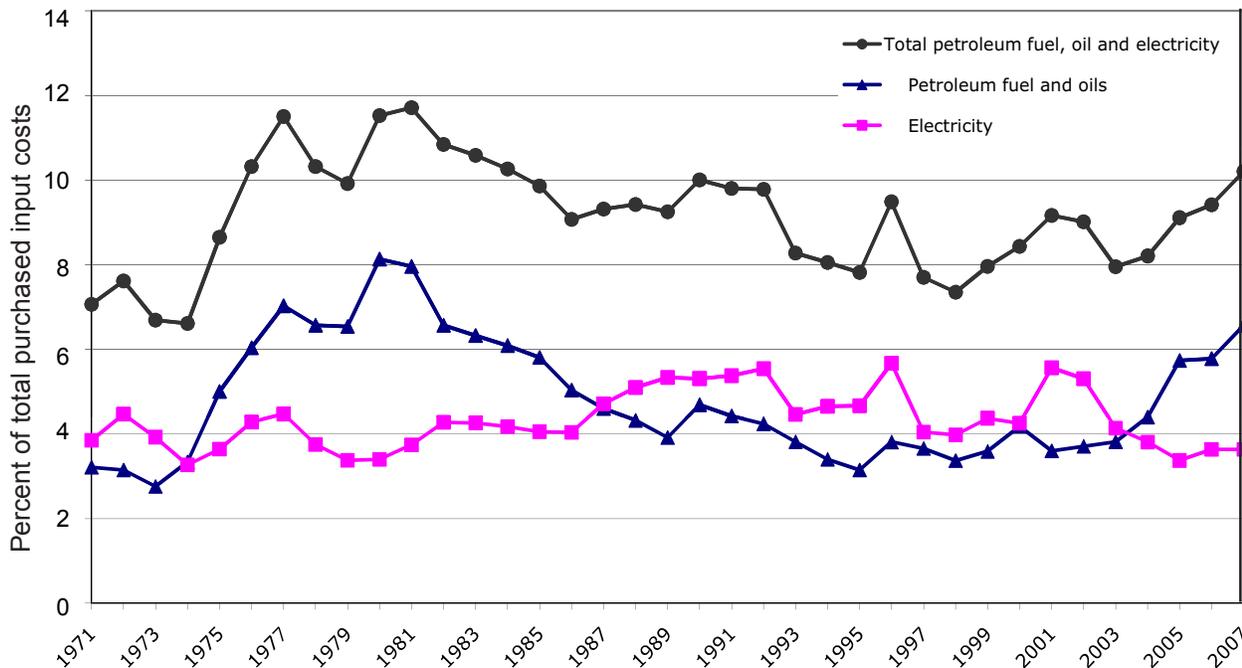


Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>
 Bureau of Economic Analysis GDP price deflator, year-2000 =100. <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=1960&LastYear=2008>

In 2007, energy expenditures as a share of total farm input costs (exclusive of rent, taxes and hired labor compensation) was about 10.2 percent, similar to the share in 1990 (Figure 3.9). Beginning in the late 1970s and early 1980s the share of direct energy costs trended downward from nearly 12 percent to a twenty-year low in 1998 of 7.4 percent. Since 1998 a larger proportion of California farms' direct costs have been attributed to energy use, in part, reflecting the increase in expenditures for petroleum fuels and oils. (USDA data on direct farm expenditures on energy includes on-farm water pumping costs, but does not include energy costs incurred off the farm by state and federal water projects or by local water districts and that are included as the cost of water.)

University of California cost and return studies show that the production expenditure share for fuels and lubricants varies from crop to crop, and the size and type of operation. In 2005, the fuel and lubricant costs required to grow alfalfa in the San Joaquin Valley consumed 0.8 percent of total farm production costs. It was a relatively more important expense for cotton production, with 8.4 percent of farm production expenditures going to fuel and lubricant costs (Table 3.18).

FIGURE 3.9
California farm energy cost^a as percentage of total input cost,^b 1971-2007



Source: USDA Economic Research Service. <http://www.ers.usda.gov/data/FarmIncome/finfidmu.htm>

^aUSDA data on direct farm expenditures on energy includes on-farm water pumping costs, but does not include energy costs incurred off the farm by state and federal water projects or by local water districts.

^bProducer inputs include purchased feed, livestock, poultry and seed, fertilizers and lime; pesticides; petroleum fuel and oils; electricity; repair and maintenance of capital items; machine hire and custom work; marketing, storage, and transportation expenses; contract labor; and miscellaneous expenses. Rent, taxes, interest and hired labor compensation are not included.

TABLE 3.18

Fuel costs for production of selected commodities as percentage of operating costs^a

Crop	Region and Type	Year of report Base year	Fuels and lube as percent of operating costs	
			With base year fuel prices ^b	With 2005 fuel prices ^c
Alfalfa ^d	San Joaquin Valley 300 acres operation	2003	0.4	0.8
Winegrapes ^e	North Coast Sonoma County	2004	2.4	3.6
Raisins ^f	San Joaquin Valley dried-on-vine	2003	3.3	5.2
Tomatoes, process ^d	San Joaquin Valley Fresno County	2002	4.9	7.0
Rice ^g	Sacramento Valley	2004	6.3	9.1
Cotton, Pima	San Joaquin Valley	2003	5.9	8.4

Source: UC Agricultural Issues Center, based on Cost and Return Studies, Department of Agricultural and Resource Economics, University of California, Davis. Available at <http://coststudies.ucdavis.edu>. The references of the studies used here are (in order): AF-SJ-03-2, GR-NC-04, GR-SJ-03-1, TM-VS-02-1, CT-SJ-03-4, and RI-SV-04.

^a Operating costs do not include establishment costs. Fuels include gas, diesel, and lube.

^b The cost of operations that are contracted out are usually paid as fees by producers and therefore cannot be broken down in fuel and other costs. Accordingly, the percentage costs reported only reflect costs directly incurred by producers.

^c 2005 fuel prices are from 2005 cost and return studies that are available for other crops. Gas and diesel average prices were \$2.05 and \$1.51 per gallon respectively. We assume that the quantity of fuel and operational costs other than fuel remain that of the base year, which may lead to overstating the increase in fuel costs.

^d Cost of fuel for harvesting not included.

^e Chardonnay, hand harvested.

^f Open gable trellis system.

^g Fuel costs for hauling and drying not included.

Water

California receives about 200 million acre-feet (maf)¹ of precipitation and water imports from Colorado, Oregon, and Mexico in a normal, i.e. average year. Roughly 50 to 60 percent of this evaporates, is used by native vegetation and cropland where it precipitates, or it flows to Oregon, Nevada, or saline waters. The remaining 40 percent of average runoff (approximately 80 maf) supplies the state's water budget. This "dedicated supply" travels through California's complex water distribution system to environmental, agricultural and urban uses, and often is stored in surface and groundwater reservoirs and reused multiple times. Groundwater is an additional important source. In a normal water year, groundwater supplies about one-third of the total *applied* water use of California's urban and agricultural sectors, and more than one-third in a dry year according to the California Department of Water Resources.

Water supplies and use vary significantly from year to year. The range of water use between wet and dry years can be significantly different than in an average year, especially during multi-year drought periods. In the 2005 California Water Plan Update (Bulletin 160), the California Department of Water Resources reports surface water balance summaries for wet (as measured in 1998), dry (2001) and average or normal California (2000) years. Statewide water use in a normal year is higher than the total surface supplies (Table 3.19). Groundwater supplies make up some of the difference (Table 3.20).

TABLE 3.19

California surface water balance for wet, normal and dry years

	1998 Wet year (171% of normal)	2000 Normal year (97% of normal)	2001 Dry year (72% of normal)
million acre-feet			
Total supply (precipitation & imports)	336.9	194.7	145.5
Total uses, outflows & evaporation	331.5	200.4	159.9
Net storage changes in state	5.5	-5.7	-14.3

Source: California Department of Water Resources. *California Water Plan Update 2005*, Bulletin 160-2005, Volume 1, Chapter 3, Table 3-1, page 3.9. <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol1/v1ch03.pdf>

In a normal precipitation year, about 48 percent of the applied surface and groundwater use goes to environmental purposes and 41 percent for agricultural, while the rest (11%) is used by urban areas (Table 3.21). These shares vary depending on annual precipitation, with environmental uses receiving a much higher share in a wet year (63%) than in a dry year (35%). Less than 4 percent of the water used for the environment is diverted to managed wetlands; the vast majority of the water dedicated for the environment stays in the river systems.

¹One acre-foot is the volume of water that covers one acre to a depth of one foot and equals 43,560 cubic feet or 325,851 gallons.

TABLE 3.20

Applied use of dedicated surface and groundwater supplies, California

	1998 Wet year (171 % of normal)	2000 Normal year (97 % of normal)	2001 Dry year (72 % of normal)
	MAF	MAF	MAF
Surface water			
Surface water deliveries and required environmental instream flow	69.0	55.7	38.2
Groundwater			
Net withdrawal	4.4	7.8	11.0
Deep percolation of surface and groundwater	5.6	7.0	6.7
Reuse/Recycle			
Reuse surface supplies	15.1	11.5	8.5
Recycled water	0.3	0.3	0.3
Total dedicated supplies	94.5	82.5	64.8

Source: California Department of Water Resources. *California Water Plan Update 2005*, Bulletin 160-2005, Volume 3, Chapter 1, Table 1-3, page 1.14. <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol3/v3ch01.pdf>

MAF = million acre-feet

TABLE 3.21

Applied water use and distribution (includes reuse) of dedicated surface and groundwater supplies, California

	1998 Wet year (171% of normal)		2000 Normal year (97% of normal)		2001 Dry year (72 % of normal)	
	MAF	Share	MAF	Share	MAF	Share
Urban uses	7.8	8%	8.9	11%	8.6	13%
Agricultural uses	27.3	29%	34.2	41%	33.7	52%
Environmental water uses ^a	59.4	63%	39.4	48%	22.5	35%
Total dedicated use and outflow	94.5	100%	82.5	100%	64.8	100%

Sources: California Department of Water Resources. *California Water Plan Update 2005*, Bulletin 160-2005, Volume 1, Chapter 3, Table 3-1, page 3.9. <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol1/v1ch03.pdf>
Volume 3, Chapter 1, Table 1-3, page 1.14. <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol3/v3ch01.pdf>

MAF = million acre-feet

^aEnvironmental water includes instream flows, wild and scenic flows, required delta outflow, and managed wetlands water use. Some environmental water is reused by agricultural and urban water users.

FIGURE 3.10
California water distribution infrastructure, 2005

Major water projects

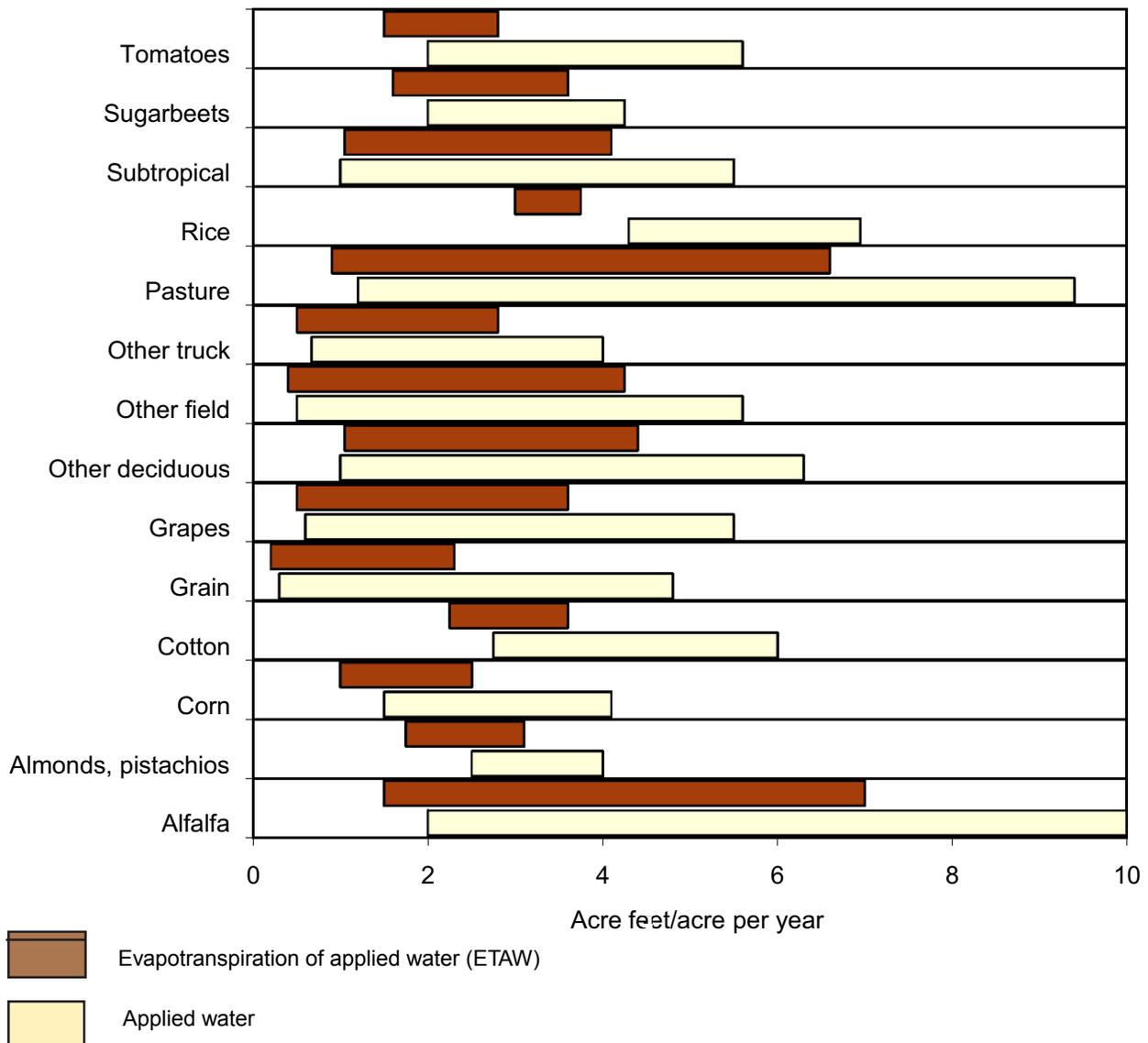


Source: California Department of Water Resources. *California Water Plan Update 2005*, Bulletin 160-2005, Volume 1, Chapter 3, Figure 3.2, page 3-3. <http://www.waterplan.water.ca.gov/previous/cwpu2005/index.cfm>

Geographically, California’s annual precipitation is distributed unevenly. Over 70 percent of the average natural runoff prior to diversion or storage occurs north of the Sacramento-San Joaquin Delta, but about 75 percent of the state’s applied water use is south of Sacramento.¹ California uses a combination of federal, state and local water projects to capture, store, transport and import surface water to meet use around the state. The largest water projects are the federal Central Valley Project (CVP) and the California State Water Project (SWP) (Figure 3.10).

FIGURE 3.11

Applied water and evapotranspiration of applied water, by crop, California, 1995



Source: California Department of Water Resources, *The California Water Plan Update*, Bulletin 160-98, Volume 1, Chapter 4, Figure 4-5.

¹ California Department of Water Resources, personal communications.

The amount of water applied to a particular crop depends on many factors including plant evapotranspiration, soil properties, irrigation efficiency and weather. Plant intake is the primary purpose of water application, but water is also applied to crops for other cultural purposes such as frost control, facilitating cultivation and leaching of salts out of the crop root zone. There is a wide range in water application rates among crops and hydrologic regions. For example, depending on the hydrologic region, anywhere between 2 and 10 acre-feet per acre are applied to alfalfa annually (Figure 3.11).

Only a portion of the applied water is actually used by the crop (Figure 3.11). The remainder percolates through the soil and recharges groundwater, flows downstream to other uses, or is irrecoverably lost to saline water bodies. In addition, rainfall may be available to meet the evapotranspiration (ET) requirements of the crop. Crop water use is measured as evapotranspiration of applied water (ETAW). This ratio is an indication of irrigation efficiency and can vary significantly for a given crop (Figure 3.11 and Table 3.22).

For urban areas, the amount of water used per acre varies according to land use, population density and water use efficiency. In some areas, agriculture may use less water per acre than nearby urban development, while in other areas the opposite may be true.

TABLE 3.22

Per acre evapotranspiration rate of applied water (ETAW), California, 1998, 2000, 2001 average^a

Three-year average ETAW, 1998, 2000, 2001
acre-feet per acre

Safflower	0.7
Barley, wheat, oats	0.8
Other truck crops ^b	1.3
Grapes, table, raisin, wine	1.3
Cucurbits ^c	1.5
Dry bean	1.6
Fresh mkt. tomatoes	1.6
Potatoes	1.6
Other field crops ^d	1.8
Corn	1.9
Processing tomatoes	2.0
Cotton	2.2
Onions and garlic	2.3
Subtropical crops ^e	2.3
Sugarbeets	2.5
Other deciduous ^f	2.5
Almonds and pistachios	2.5
Pasture	2.7
Rice	3.0
Alfalfa	3.4

Source: California Department of Water Resources
<http://www.landwateruse.water.ca.gov/annualdata/agwateruse/years.cfm?use=3>

^aDWR classifies 1998 as a wet year, 2000 a normal year and 2001 a dry year.

^bOther truck crops includes bush berries, strawberries, artichokes, asparagus, fresh snap beans, carrots, celery, lettuce, greens, pepper, spinach, broccoli, Brussels sprouts, cabbage, cauliflower, Christmas tree farms, flowers, greenhouse and nursery.

^cCucurbits includes melons, cucumbers, pumpkins and squash.

^dOther field crops includes flax, hops, grain sorghum, sudan, sorghum/sudan hybrids, castor beans, sunflowers, millet and sugarcane.

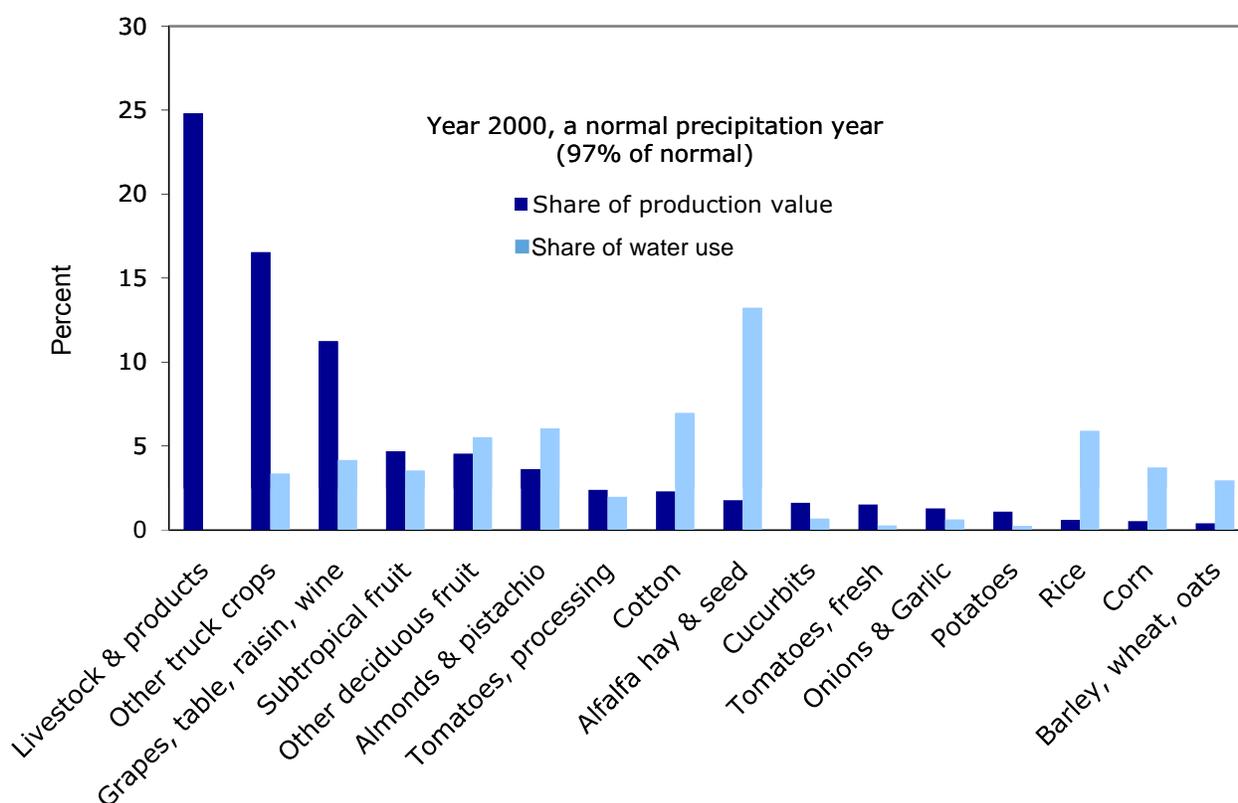
^eSubtropical crops includes grapefruit, lemons, oranges, dates, avocados, olives, kiwis, jojoba and eucalyptus.

^fOther deciduous fruit includes apples, apricots, cherries, peaches, nectarines, pears, plums, prunes, figs, and walnuts.

Availability of irrigation water and its cost are two crucial input variables facing producers. Figure 3.12 compares the relative importance of the top-valued California commodities or groups of commodities with respect to their contribution to the state's total value of agricultural production in 2000 and, with the exception of livestock operations, their role as a water user. Livestock production, the top-valued commodity group (dairy, meat animals and poultry eggs) with one-quarter of total state production value in 2000, depends heavily on California-grown alfalfa, irrigated pasture, and rangeland forage, as well as grain products grown out of state, often rainfed. In 2000, which was a “normal” precipitation year—neither very wet nor very dry—15 commodity categories (shown in Figure 3.12), not including livestock, were directly responsible for 54 percent of the total production value that year and almost 60 percent of the applied irrigation water.

FIGURE 3.12

Share of California production value and water use by major commodities, 2000^a



Sources: U.C. Agricultural Issues Center based on agricultural water use data from California Department of Water Resources: *Normalized* values from Bulletins 160-66, -70, -74, -83, -87 for 1960, 1967, 1972, 1980, and 1985 respectively. For *actual* data, Bulletin 160-05 for 1998, 2000 and 2001 and DWR California Land and Water Use Database Water Portfolios for 1999 and 2002. Also, for *actual* data DWR Annual Reports for 1988, 1989, 1990, 1991, 1992, 1993, 1994, and 1995. USDA Economic Research Service cash receipt data available at <http://www.ers.usda.gov/Data/FarmIncome/FinfidmuXls.htm> and Bureau of Economic Analysis, GDP implicit price deflator, year 2000=100. <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=1960&LastYear=2008>

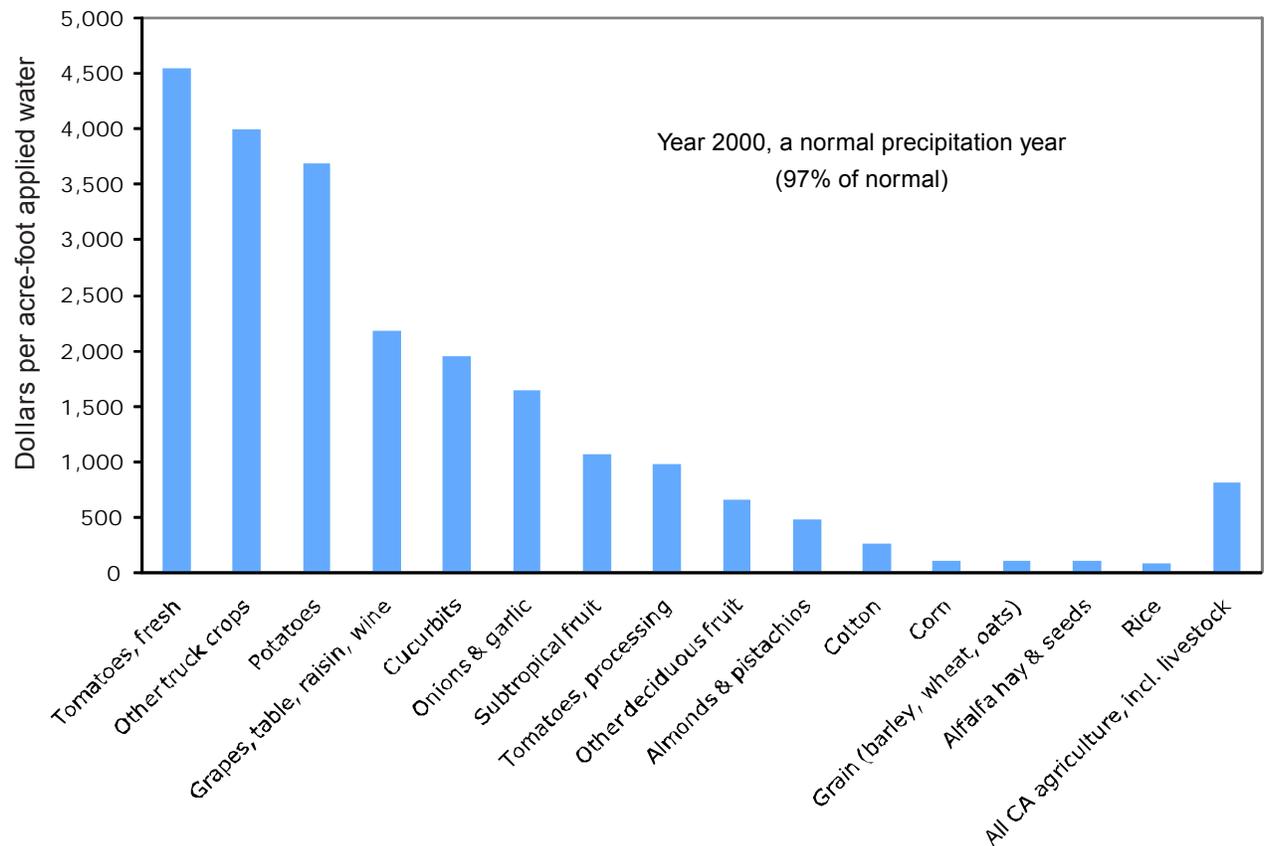
^aThe California Department of Water Resources classifies 2000 as a normal water year (97 % of normal precipitation).

FIGURE 3.12 CONTINUED

Note: Livestock products include dairy products, meat animals, and poultry eggs. Other truck crops include bush berries, strawberries, artichokes, asparagus, fresh snap beans, carrots, celery, lettuce, greens, pepper, spinach, broccoli, Brussels sprouts, cabbage, cauliflower, Christmas tree farms, flowers, greenhouse and nursery. Subtropical fruit includes grapefruit, lemons, oranges, dates, avocados, olives, and kiwis. Other deciduous fruit include apples, apricots cherries, peaches, nectarines, pears, plums, prunes, figs, and walnuts. Cucurbits include melons, cucumbers, pumpkins and squash.

Alfalfa hay and seed production utilized about 13 percent of all water applied to agriculture, but directly contributed slightly less than 2 percent to the overall value of agricultural production. Cotton, deciduous fruit trees and rice show a pattern similar to alfalfa with respect to relative shares of total irrigation water and production value. In contrast, the diverse truck crop group and grapes grown for wine, raisin and table use are responsible for a relatively higher share of the total agricultural production value in the state compared to their share of total statewide irrigation water (Figure 3.13).

FIGURE 3.13
Production value per acre-foot of irrigation water for California commodities in 2000



Source: U.C. Agricultural Issues Center based on agricultural water use data from California Department of Water Resources Bulletin 160-05 and USDA Economic Research Service cash receipt data available at <http://www.ers.usda.gov/Data/FarmIncome/FinfidmuXls.htm>

Note: The California Department of Water Resources classifies 2000 as a normal water year (97 % of normal precipitation).

In a normal precipitation year, about \$810 in agricultural cash receipts are generated in California for each acre-foot of irrigation water applied. In 2000, tomatoes destined for the fresh market yielded \$4,500 per acre-foot of applied water, while processing tomatoes yielded \$980. Grape receipts were nearly \$2,200 per acre-foot of irrigation water. However, cash receipts per acre-foot of water do not reflect the cost of water inputs alone, as can be seen with the 2000 statewide receipts that totaled \$2.8 billion for grapes, \$603 million for processing tomatoes and \$380 million for fresh tomatoes. Less irrigation water is required in a wet year and production value per acre-foot of applied water can increase as it did in 1998 with slightly over \$1000 in production value per acre-foot (see Figure 3.14 in the Productivity Growth section).

Depending on source, irrigation water rates range widely, from essentially free for landowners with riparian rights or groundwater to as much as \$600 per acre-foot for the purchase of project-developed surface water delivered over great distances (Table 3.23). Costs of electricity or diesel for pumping may be significant. Jurisdiction and historic contracts may also affect costs.

TABLE 3.23
Range of rates paid by farmers for surface water deliveries, by DWR hydrologic region, 2000

Hydrologic region	Unit cost range (\$/AF)
North Coast	4 - 13
Sacramento River	2 - 37
San Joaquin River	4 - 80
Tulare Lake Region	15 - 118
Central Coast	392 - 607
South Coast	394 - 548
Colorado River	7 - 17

Source: California Department of Water Resources. *California Water Plan Update 2005*, Bulletin 160-2005, Volume 4, <http://www.waterplan.water.ca.gov/docs/cwpu2005/vol4/vol4-background-selectedwaterprices.pdf>

TABLE 3.24
Percentage of irrigated land (excluding rice) under different irrigation systems, 1972-2001

Method of Irrigation	1972	1980	1988	1991	1994	1995	2001
Gravity	80.5	76.5	70.3	66.9	61.7	60.6	49.6
Sprinkler	18.1	19.7	23.7	17.3	25	25.2	15.7
Drip	0.3	2.4	4.9	15.2	12.6	13.2	32.9
Other	1.1	1.3	1.0	0.6	0.8	1.0	1.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: M.Orang, R. Snyder and S. Matyac. California Department of Water Resource, California Water Plan Update 2005, Bulletin 160-2005, Volume 4. <http://www.waterplan.water.ca.gov/docs/cdwpu2005/vol4/vol4-data-surveyofirrigationmethods.pdf>

Note: 1991-2001 based on a survey of 5.6% of the irrigated land in the state, excluding rice, all of which is flooded.

DWR reports roughly 9.5 million acres were irrigated at the turn of the millenium. Not counting flooded rice fields, two-thirds of the acreage in the state was irrigated either by gravity-driven surface methods or sprinkler systems. By 2001, one-third of the acres utilized drip systems (Table 3.24). Over the same period that orchard and vineyard acreage shifted to drip irrigation away from gravity and sprinkler systems, there has been a large increase in vegetable crop acreage adopting sprinklers. Alfalfa made up the largest share of irrigated crop area in the state, followed by grapes and grain (barley, wheat and oats) (Table 3.25).

TABLE 3.25

California irrigated acreage, average 1998, 2000 and 2001^a

	Average irrigated crop area, 1998, 2000 and 2001	Commodity's share of total irrigated crop area in state
	acres (1,000)	percent
Alfalfa	1,129.1	12.0
Grapes, table, raisin, wine	878.8	9.3
Barley, wheat, oats	866.3	9.2
Cotton	861.8	9.2
Pasture	828.3	8.8
Other truck ^b	786.4	8.4
Almonds and pistachios	681.9	7.2
Corn	639.4	6.8
Other deciduous fruit ^c	633.3	6.7
Rice	541.8	5.8
Subtropical crops ^d	434.9	4.6
Processing tomatoes	291.2	3.1
Other field crops ^e	192.1	2.0
Cucurbits ^e	138.8	1.5
Safflower	122.0	1.3
Dry beans	114.1	1.2
Onions and garlic	86.5	0.9
Sugarbeets	85.3	0.9
Fresh mkt. tomatoes	48.1	0.5
Potatoes	45.5	0.5
All crops in state	9,405.8	100.0

Source: California Department of Water Resources. <http://www.landwateruse.water.ca.gov/annualdata/landuse/years.cfm>

^aDWR classifies 1998 as a wet year, 2000 a normal year and 2001 a dry year.

^bOther truck crops includes bush berries, strawberries, artichokes, asparagus, fresh snap beans, carrots, celery, lettuce, greens, pepper, spinach, broccoli, Brussels sprouts, cabbage, cauliflower, Christmas tree farms, flowers, greenhouse and nursery.

^cOther deciduous fruit includes apples, apricots, cherries, peaches, nectarines, pears, plums, prunes, figs, and walnuts.

^dSubtropical crops includes grapefruit, lemons, oranges, dates, avocados, olives, kiwis, jojoba and eucalyptus.

^eCucurbits includes melons, cucumbers, pumpkins and squash.

Productivity growth

Comparing average yields for the period 1981-1983 to average yields in 2001-2003, we find substantial growth in California dairy and major crops. As shown in Table 3.26, growth in agricultural yields in California has been relatively high for some products, such as almonds (86%) and milk (36%), but it has been negative for others, such as oranges (-14%). In almost all of these cases, other producer states in the nation recorded higher percentage increases in yields than California. However, California had higher yields in the base period (1981-83) and with the exception of broccoli, oranges and cauliflower, yields remain above those in other states. Winegrapes experienced their highest rates of yield growth in the 1970s (Table 3.27).

Productivity growth cannot be measured entirely by changes in yield, as seen in the case of California grapes where the decrease in yields is associated with an increase in higher priced varieties, thus in unit prices. Changes in yield may also reflect changes in a multitude of inputs—water, agricultural chemicals, labor, weather, plant variety, etc.

Another partial measure of productivity growth is the value of agricultural production per acre-foot of irrigation water applied to fields (Figure 3.14). This growth reflects an increase in the production of higher value crops such as fruits, vegetables and dairy, and for the production of animal products it reflects the import of out of state grains; it does not, however, provide any indication about efficiency of water use in California production of specific plant crops or the price of water.

TABLE 3.26

Three-year average yields for representative commodities, California and other states, 1981-83 and 2001-03

Commodity	Units	1981-83		2001-03		% Change	
		CA	Other states	CA	Other states	CA	Other states
Milk	lbs/cow	15,478	12,081	21,058	17,947	36	49
Grapes, all	tons/acre	8.06	5.10	7.56	5.20	-6	2
Lettuce, head	cwt/acre	322 ^a	247 ^a	370	358	15	45
Almonds, shelled	lbs/acre	981	n.a.	1,820	0	86	0
Strawberries	cwt/acre	512	85	568	129	11	52
Tomatoes, process.	tons/acre	25	18	34	28	35	58
Cotton, all	lbs/acre	1,052	428	1,348	580	28	36
Broccoli	cwt/acre	95	80	143	158	51	96
Oranges ^b	boxes/acre	339	262	290	369	-14	41
Tomatoes, fresh	cwt/acre	260	194	295	292	13	51
Walnuts, English	tons/acre	1.24	n.a.	1.46	n.a.	18	—
Rice	lbs/acre	6,819	4,263	7,957	6,262	17	47
Celery	cwt/acre	606	364	698	448	15	23
Cauliflower	cwt/acre	100	117	155	186	55	59
Onions	cwt/acre	333	305	411	405	23	33

Sources: USDA National Agricultural Statistics Service, *Crop Production Annual Summary*, *Milk Production*, and *Vegetables Annual Summary*. USDA Economic Research Service. *Fruit and Tree Nuts Yearbook: Report*, various years.

n.a. = not available.

^a 1986-88 instead of 1981 to 1983.

^b For oranges, "Other states" means Florida only.

TABLE 3.27

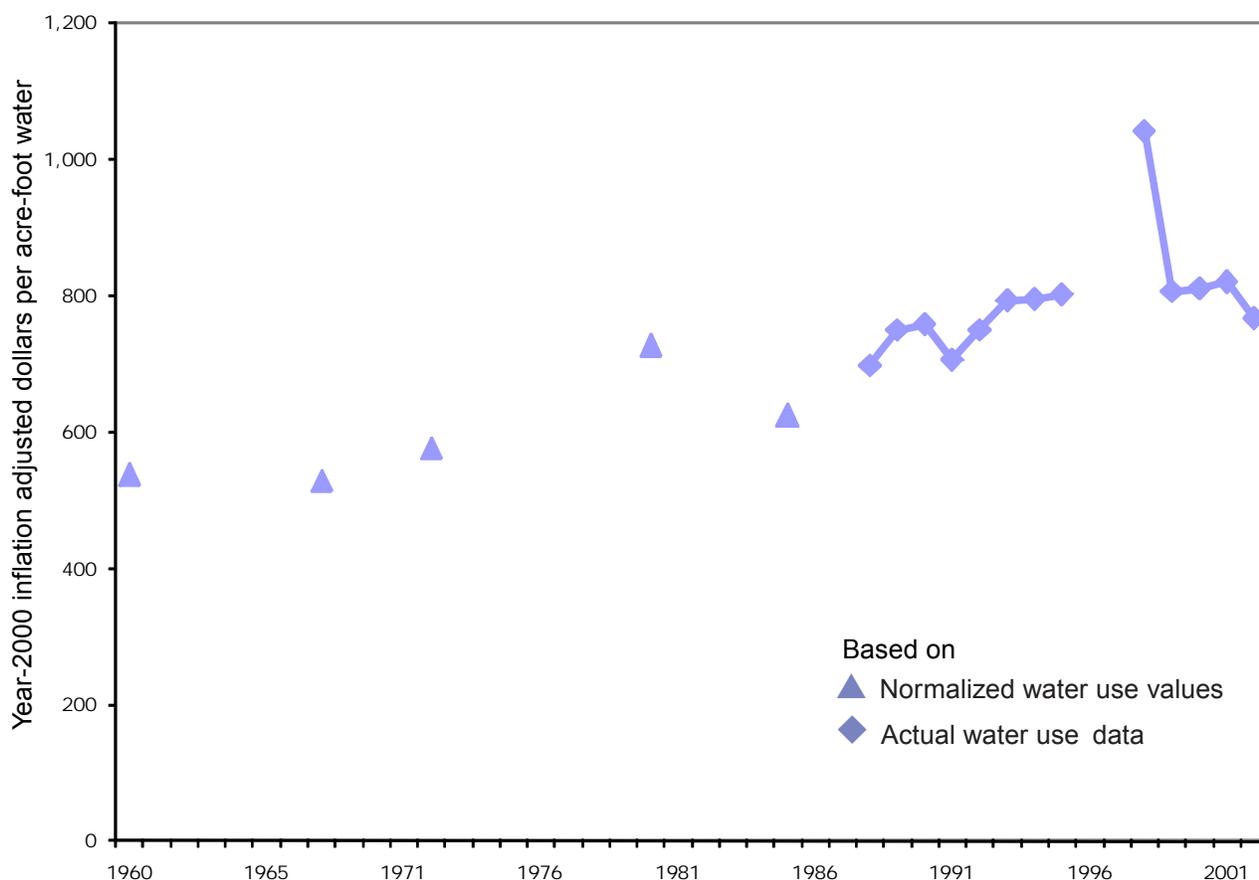
Average yield and average annual yield growth rates of California winegrape production, 1920 - 2005

Period	Average yield		Average annual yield growth percent
	Beginning period	Ending period	
	tons per acre		
1920 - 1930	3.43	2.59	-2.45
1930 - 1940	2.59	2.93	1.31
1940 - 1950	2.93	3.10	0.58
1950 - 1960	3.10	4.33	3.97
1960 - 1970	4.33	4.03	-0.69
1970 - 1980	4.03	6.89	7.10
1980 - 1990	6.89	7.54	0.94
1990 - 2000	7.54	7.34	-0.27
1990 - 2005	7.54	6.75	-0.70
1920 - 2005	3.43	6.75	1.14

Sources: USDA National Agricultural Statistics Service/California Department of Food and Agriculture, *California Grape Acreage Report*, http://www.nass.usda.gov/Statistics_by_State/California/Publications/Grape_Acreage/Reports/index.asp, and *California Grape Crush Report*, http://www.nass.usda.gov/Statistics_by_State/California/Publications/Grape_Crush/Final/index.asp, various years.

FIGURE 3.14

Agricultural cash receipts per acre-foot of applied water, California 1960-2002, in inflation adjusted year-2000 dollars



Sources: U.C. Agricultural Issues Center based on agricultural water use data from California Department of Water Resources: *Normalized* values from Bulletins 160-66, -70, -74, -83, -87 for 1960, 1967, 1972, 1980, and 1985, respectively. For *actual* data, Bulletin 160-05 for 1998, 2000 and 2001 and DWR California Land and Water Use Database Water Portfolios for 1999 and 2002. Also, for *actual* data DWR Annual Reports for 1988, 1989, 1990, 1991, 1992, 1993, 1994, and 1995. USDA Economic Research Service cash receipt data available at <http://www.ers.usda.gov/Data/FarmIncome/FinfidmuXls.htm> and Bureau of Economic Analysis, GDP implicit price deflator, year 2000=100. <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=1960&LastYear=2008>

Note: In the earlier years the California Department of Water Resources reported “normalized water use” data that had been adjusted to account for unusual events such as dry weather conditions, government price support programs, rationing programs, etc. Normalized values shown above for 1960 through 1985 are not comparable to the actual water use data for 1988 through 2002, although both show an increase in productivity. Applied water data is not available for 1996 and 1997.

Research and development

In 2001, U.S. agricultural experiment stations (mainly associated with land grant universities) collectively spent \$2.3 billion on agricultural research. California Experiment Station expenditures of the University of California Division of Agriculture and Natural Resources (U.C. ANR) accounted for about 10 percent of those resources. ANR includes scientists affiliated with the U.C. Berkeley College of Natural Resources; U.C. Davis College of Agricultural and Environmental Sciences, College of Biological Sciences, and School of Veterinary Medicine; U.C. Riverside College of Natural and Agricultural Sciences; and statewide ANR special programs and centers.

ANR's two major organizational units are the California Agricultural Experimental Station (AES) and Cooperative Extension (CE). Together they account for approximately 90 percent of ANR expenditures. The AES is a multi-campus research organization with a staff of approximately 750 academics distributed in more than 50 departments. Cooperative Extension constitutes the ANR's main outreach program, with about 350 specialists and advisors dispersed throughout the state in 2007.

Over the 15 year 1993 - 2007 period, total ANR expenditures for CE and the AES annually averaged \$284.7 million (Table 3.28), or \$276.8 million in year-2000 inflation adjusted dollars (Table 3.29). In these real terms, annual expenditures increased 35.4 percent during the 10-year period from 1993 to 2003, in contrast to the 13.8 percent overall increase from 1997 to 2007. Conspicuously, this changed in 2004 when annual expenditures decreased by 5.7 percent from the year before. Over the latest 4 year period (2003-2007) combined CE and AES expenditures have shrunk 10.2 percent. Prior to 2003 CE's growth in funding was less than that of the AES, and subsequent reductions proportionately greater (Figure 3.15). Currently, funding for the AES is almost three times that of CE.

TABLE 3.28
Annual Expenditures for California Cooperative Extension and Agricultural Experiment Station, 1993-2007 (nominal dollars)

	U.C. Cooperative Extension	U.C. Agricultural Experiment Station	Total
U.C. fiscal year ^a	Nominal dollars (thousands)		
1993	64,434	144,881	209,315
1994	63,072	152,831	215,903
1995	67,228	160,667	227,895
1996	69,079	165,392	234,471
1997	69,553	172,054	241,607
1998 ^b	n.a.	n.a.	n.a.
1999	74,289	176,806	251,095
2000	78,075	200,315	278,390
2001	88,395	219,728	308,123
2002	92,033	240,592	332,625
2003	97,154	244,069	341,223
2004	85,763	245,268	331,031
2005	85,478	245,963	331,441
2006	89,660	247,682	337,342
2007	93,021	252,167	345,188

Sources: Expenditure data from U.C. Division of Agriculture and Natural Resources, *Annual Reports of Expenditures, Cooperative Extension Expenditures by Fund Source, 1992-2007* and *Agricultural Experiment Station Expenditures by Fund Source, 1992-2007*.

^a University of California fiscal year is July 1-June 30, eg. fiscal year 1993 is July 1, 1992 through June 30, 1993.

^b Not available.

TABLE 3.29

Annual Expenditures for California Cooperative Extension and Agricultural Experiment Station in year-2000 inflation adjusted dollars, 1993-2007

	U.C. Cooperative Extension	U.C. Agricultural Experiment Station	Total
U.C. fiscal year ^a	Year-2000 dollars (thousands)		
1993	72,905	163,928	236,833
1994	69,879	169,325	239,204
1995	72,990	174,437	247,427
1996	73,604	176,226	249,831
1997	72,896	180,324	253,220
1998 ^b	n.a.	n.a.	n.a.
1999	75,907	180,658	256,565
2000	78,075	200,315	278,390
2001	86,324	214,580	300,904
2002	88,334	230,923	319,258
2003	91,307	229,380	320,686
2004	78,350	224,067	302,416
2005	75,621	217,601	293,222
2006	76,845	212,282	289,127
2007	77,637	210,462	288,098

Sources: Expenditure data from U.C. Division of Agriculture and Natural Resources. *Annual Reports of Expenditures, Cooperative Extension Expenditures by Fund Source, 1992-2007* and *Agricultural Experiment Station Expenditures by Fund Source, 1992-2007*.

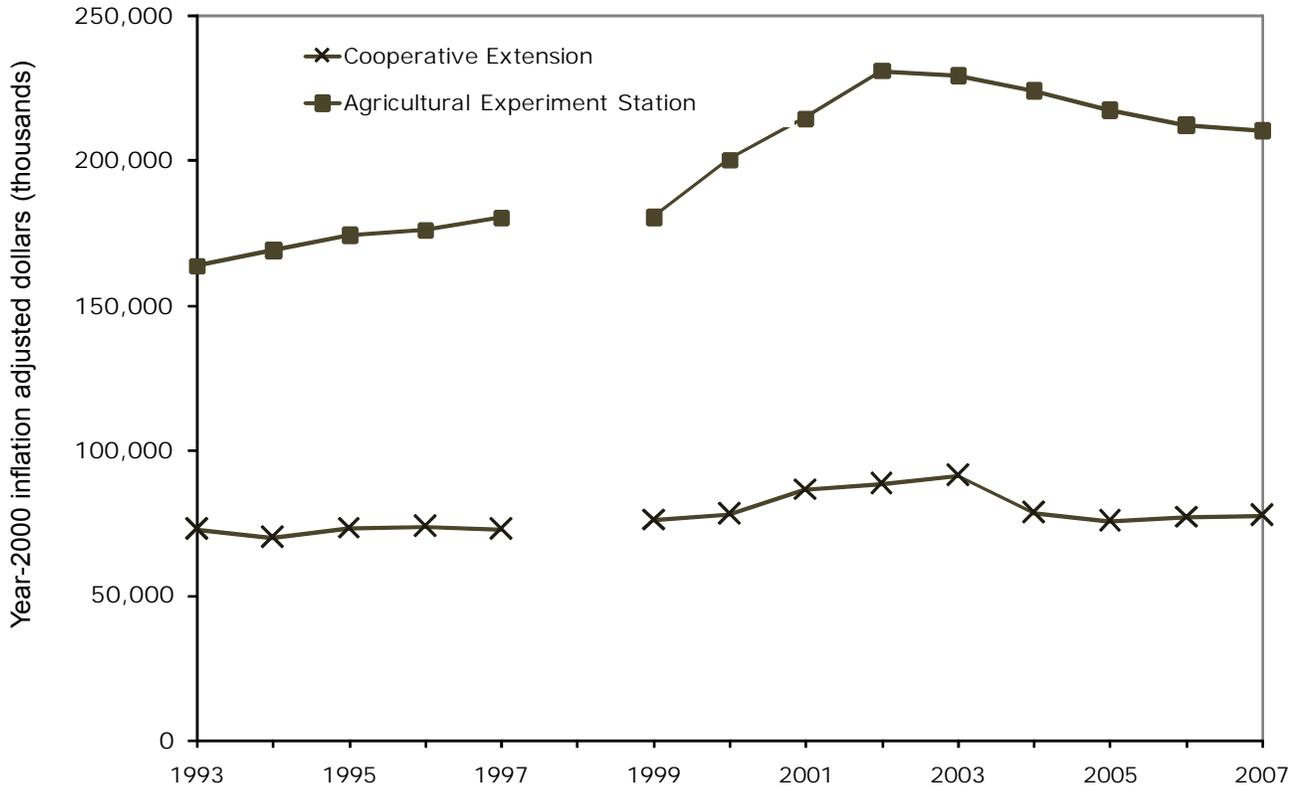
Annual implicit price deflator for gross domestic product (GDP) from Bureau of Economic Analysis, U.S. Department of Commerce. Year 2000=100. November 25, 2008 revision.

<http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=1992&LastYear=2008>

^a University of California fiscal year is July 1-June 30, eg. fiscal year 1993 is July 1, 1992 through June 30, 1993.

^b Not available.

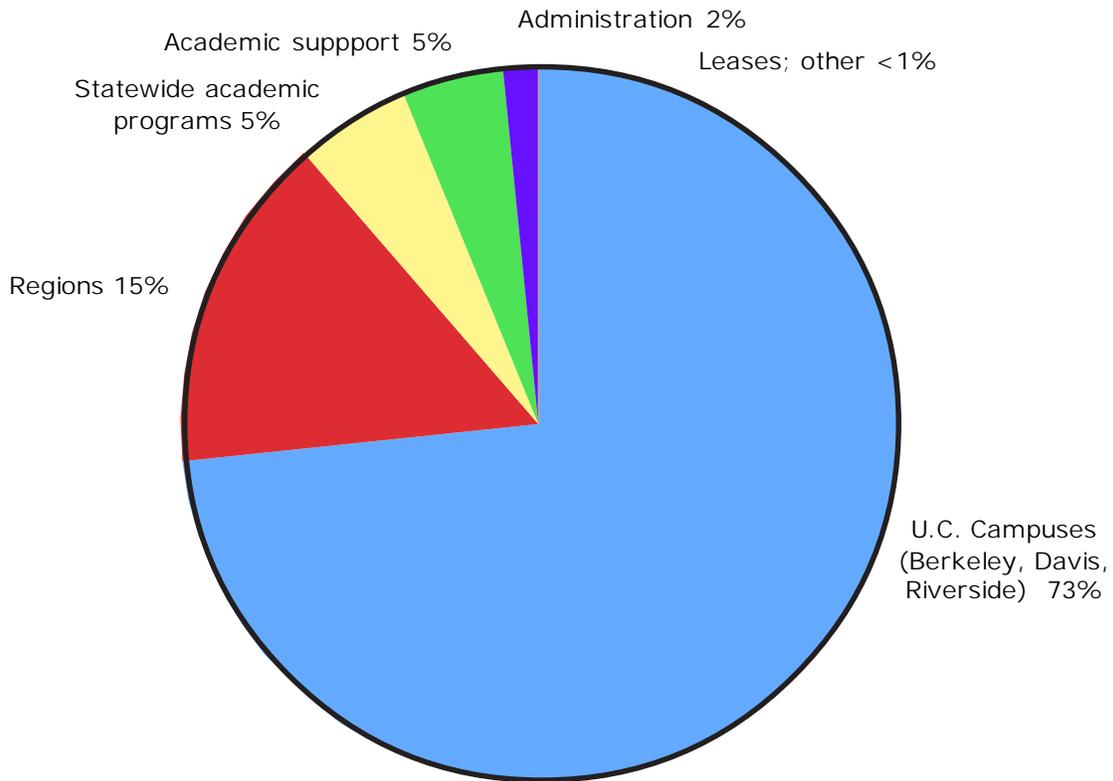
FIGURE 3.15
 Annual Expenditures for California Cooperative Extension and Agricultural Experiment Station in year-2000 inflation adjusted dollars, 1993-2007



Source: Table 3.29

Three University of California campuses (Berkeley, Davis and Riverside), accounted for 73 percent of the 2006-2007 annual ANR expenditures, while regionally based units accounted for 15.3 percent of total expenses and statewide academic programs and centers such as the U.C. Agricultural Issues Center, Water Resources Center, Kearney Agricultural Center Academic Unit, Sustainable Agricultural Research and Education Program and others shared 5 percent (Figure 3.16).

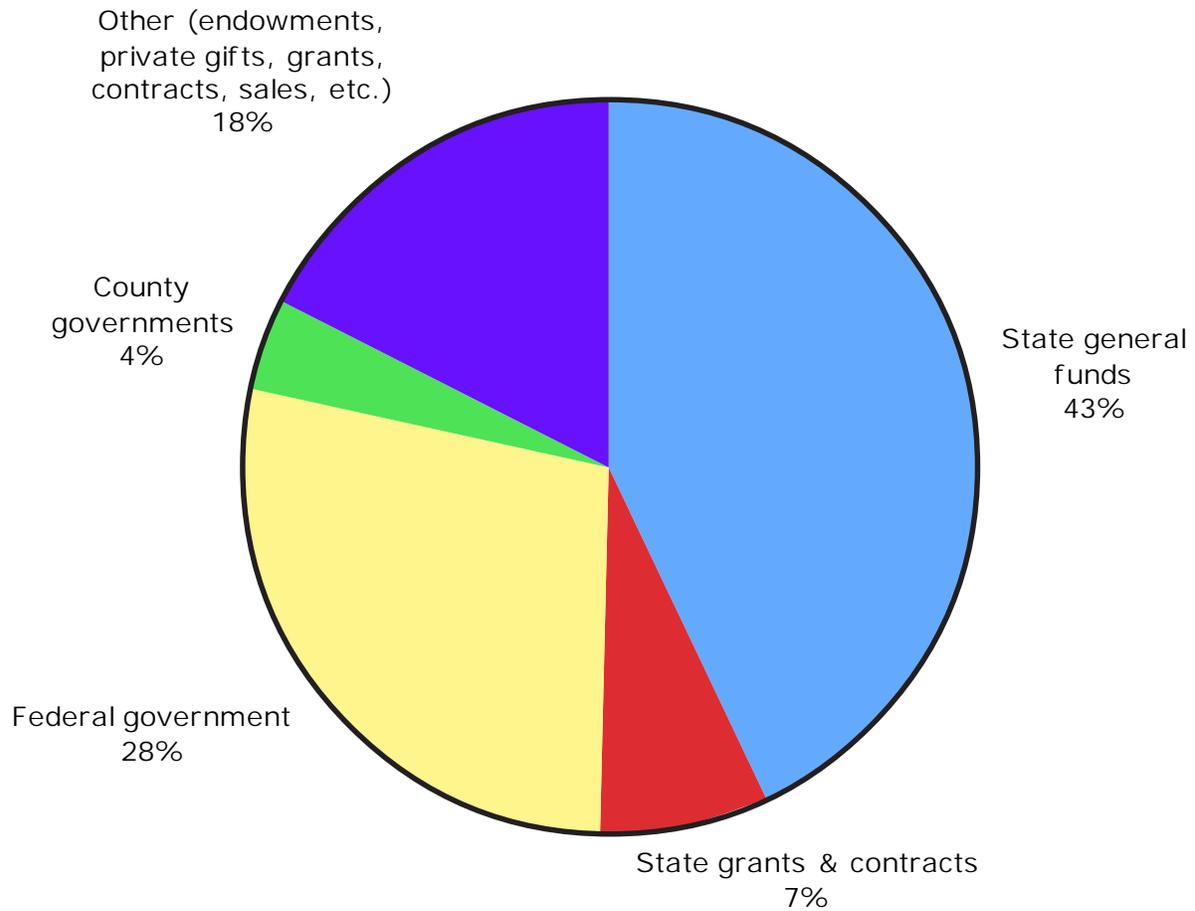
FIGURE 3.16
 Distribution of University of California Division of Agriculture and Natural Resources expenditures, fiscal year 2006-2007^a



Source: U.C. Division of Agriculture and Natural Resources. *Annual Reports of Expenditures. Expenditures by Fund Source, 2006 - 2007.*

^aUniversity of California fiscal year 2006 - 2007 is July 1, 2006 to June 30, 2007.

FIGURE 3.17

University of California Division of Agriculture and Natural Resources expenditure sources, fiscal year 2006-2007^a

Source: U.C. Division of Agriculture and Natural Resources. *Annual Reports of Expenditures. Expenditures by Fund Source, 2006 - 2007.*

^aUniversity of California fiscal year 2006 - 2007 is July 1, 2006 to June 30, 2007.

In 2006-2007, 78.4 percent of total U.C. ANR expenditures were funded from state and federal government sources; 17.5 percent came from endowments, private gifts, grants, contracts and sales, etc., and 4.1 percent from county governments (Figure 3.17).

Historically, the largest source of funding for the ANR has been the State General Fund. In 2002 it provided one-half of the Division's funding, while federal funds provided one-quarter. Over the subsequent 5 years, ANR funding from State General Funds declined nearly 22 percent in real terms. In 2007, the State General Fund supported 43 percent of ANR expenditures, the Federal government 28 percent. Despite increases in funding from other sources, an 8.5 percent overall decrease in funding has occurred (Table 3.30).

TABLE 3.30

University of California Division of Agriculture and Natural Resources funding sources, 2002-2007, in year-2000 inflation adjusted dollars^a

U.C. fiscal year ^b	2002	2003	2004	2005	2006	2007	5-year change
Expenditure source	Year-2000 inflation adjusted dollars (thousands)						percent
State general funds	165,098	160,861	129,129	127,623	127,586	129,232	-21.7
State grants & contracts	15,197	18,620	21,073	22,257	20,779	22,159	45.8
Federal government	81,639	84,582	94,685	88,250	88,274	84,220	3.2
County government	11,997	12,448	11,998	11,472	11,896	12,377	3.2
Endow. & similar funds	4,859	5,223	7,659	8,482	8,512	7,439	34.7
Private gifts, grants & contracts	41,036	43,116	40,940	38,643	37,555	34,700	-15.4
Sales, services, & other	8,649	7,707	10,666	10,708	8,381	10,396	20.2
Total	328,476	332,557	316,150	307,435	302,982	300,522	-8.5

Sources: U.C. Division of Agriculture and Natural Resources. *Annual Reports of Expenditures. Expenditures by Fund Source, 2001 - 2002 through 2006 - 2007.*

^aAnnual implicit price deflator for gross domestic product (GDP) from Bureau of Economic Analysis, U.S. Department of Commerce. Year 2000=100. November 25, 2008 revision.

<http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=13&Freq=Qtr&FirstYear=2006&LastYear=2008>

^bUniversity of California fiscal year is July 1-June 30, eg. fiscal year 2002 is July 1, 2001 through June 30, 2002.

The Measure of California Agriculture

CHAPTER 4

University of California Agricultural Issues Center

Marketing, Trade, Policy and Risk Management

- 4-3.....Cooperatives
- 4-7.....Marketing channels
- 4-9.....International exports
- 4-14.....Exotic pests and diseases
- 4-20.....Government support
- 4-24.....Risk management

California farmers market their commodities in many ways. Some sell directly to the consumer while others sell to shippers, handlers, processors or retailers. Cooperatives also play a role in bargaining, marketing and processing many commodities. About 21 percent of the state's agricultural production is exported, mainly to the European Union, Canada and East Asia. In addition, many agricultural products are shipped into California from other U.S. states and countries. Concerns about the spread of non-native agricultural pests and diseases follow naturally from interaction with other regions, through trade or travel or even migration of wildlife. These concerns have led to government programs to enforce border controls and other measures to reduce potential losses from these threats. Government also provides other support to agriculture; such support includes direct farm subsidies and other public services as well as assistance to deal with financial and other risks inherent in agriculture.

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Cooperatives

Cooperatives are owned and operated by the farmers who use them for their mutual benefit. They are created to strengthen bargaining power, manage risk, reduce costs, purchase inputs, market products, and more. Membership of the nation's farmers in cooperatives also has consistently declined over the past 40 years, as has been the situation in California, with the exception of an increase reported in 1991. In 2001, 49,553 California members accounted for 1.6 percent of the total memberships in U.S. agricultural cooperatives (Table 4.1). The number of farmer-owned cooperatives, some headquartered in California has gradually declined since the 1950s. Many California producers are members of cooperatives headquartered in other states. In 2002, 164 marketing, service and farm supply cooperatives were headquartered in California (Table 4.2).

Net business revenue for California's farm cooperatives declined by 15 percent between 1995 and 2001 according to USDA Rural Business Cooperative Service. When adjusted for inflation (to year-2000 dollars) the decline is 23 percent. This decline in the net business revenue of California-based cooperatives understates the importance of national cooperatives to California producers, especially dairy cooperatives. This is because many California farmers are members of cooperatives in other states. Over the same 6 year period from 1995 to 2001, inflation-adjusted net business revenue for all agricultural cooperatives in the United States declined by 1 percent.

TABLE 4.1

Memberships in farmer cooperatives, California and United States, 1965-2002^a

Memberships held by farmers in		
Year	California ^b	United States ^b
1965	89,720	6,826,275
1975	85,285	5,906,379
1985	70,958	4,783,319
1989	64,462	4,133,542
1991	70,538	4,058,570
1993	65,485	4,023,264
1995	59,551	3,767,295
1997	56,715	3,424,168
1999	53,604	3,173,323
2001	49,553	3,033,907
2002	n.a.	2,793,550

^a Includes marketing, farm supply, and related service cooperatives.

^b Voting members. Includes membership in out-of-state cooperatives.

n.a. = Not available.

Sources: USDA National Agricultural Statistics Service, *Agricultural Statistics*, various years.

TABLE 4.2
Location and revenue of farmer cooperatives, California and United States,
1965-2002^a

Year	Headquartered in		Net Business Revenue ^b	
	California	U.S.	Calif. headquartered	All U.S. cooperatives
	Number of Cooperatives		\$1,000 (in year-2000 dollars)	
1965	356	8,329	7,983,182	69,263,409
1975	277	7,535	10,321,675	105,392,109
1985	233	5,625	8,277,559	94,100,286
1989	202	4,799	9,481,162	91,816,611
1991	194	4,494	9,490,824	90,754,653
1993	200	4,244	9,446,879	93,767,303
1995	190	4,006	9,652,945	101,858,688
1997	185	3,791	9,546,538	111,798,293
1999	183	3,466	7,993,974	101,222,307
2001	171	3,229	7,395,257	100,849,154
2002	164	3,140	n.a.	92,861,742

^a Includes marketing, farm supply, and related service cooperatives.

^b The value at the first level at which cooperatives transact business for farmers. Excludes operational expenses and farm supplies to out-of-state destinations, if any.

n.a. = Not available.

Sources: USDA National Agricultural Statistics Service, *Agricultural Statistics*, various years; Price Index: Bureau of Economic Analysis

Marketing cooperatives accounted for most of the California membership in 2001, and most of the revenue of cooperatives headquartered in California. They account for 60 percent of the California farm cooperatives and 90 percent of the net business revenue of cooperatives headquartered in the state. Sixty-three percent of California farm cooperative members belong to marketing cooperatives throughout the United States, including California. More than two-thirds of the California marketing cooperatives deal with fruits, vegetables, tree nuts and dairy products (Table 4.3). These 72 cooperatives account for 80 percent of the total net business revenue of California agricultural cooperatives in 2001 (Figure 4.1).

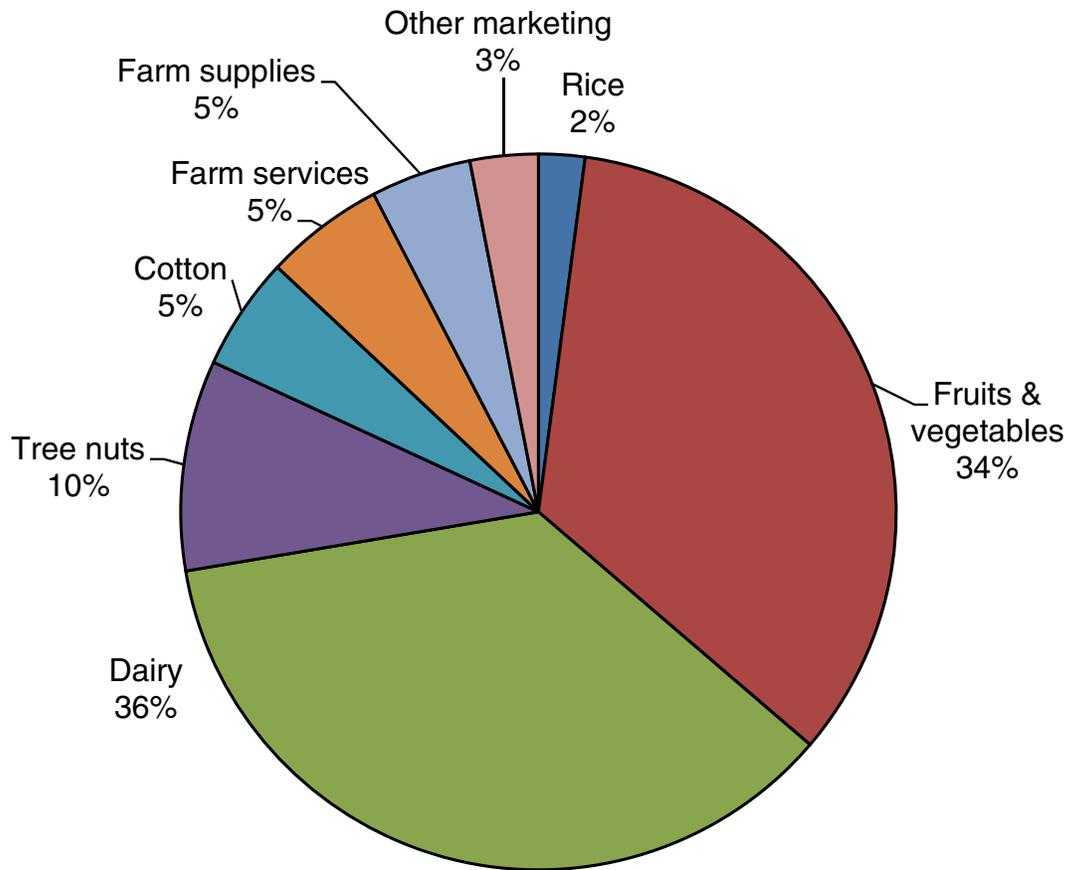
TABLE 4.3
Types of farmer cooperatives, California and United States, 2001

Type and commodity	Headquartered in		Membership in U.S. cooperatives by	
	California	U.S.	California farmers ^a	All U.S. Farmers ^a
Marketing				
Fruits & vegetables	59	220	16,629	37,782
Other	17	1,107	4,277	909,385
Dairy	6	204	1,438	91,033
Nuts	7	18	5,648	40,075
Rice	4	15	1,034	13,924
Beans & peas, dry edible	3	9	673	2,734
Cotton	3	14	1,317	45,946
Poultry	4	19	78	19,121
Total marketing cooperatives	103	1,606	31,094	1,160,000
Service cooperatives	48	389	3,887	128,136
Farm supply cooperatives	20	1,234	14,572	1,745,771
Total cooperatives	171	3,229	49,553	3,033,907

Source: USDA Rural Business-Cooperative Service, Cooperative Programs Current Data, State Data 1993-2002.
<http://www.rurdev.usda.gov/rbs/coops/data.htm>

^a Voting members. Includes membership in out-of-state cooperatives.

FIGURE 4.1
California Farmer Cooperatives by Share of Net Business Revenue, 2001^a



Source: USDA Rural Business-Cooperative Service, Farmer Cooperative Statistics, 2001.
<http://www.rurdev.usda.gov/rbs/coops/data.htm>

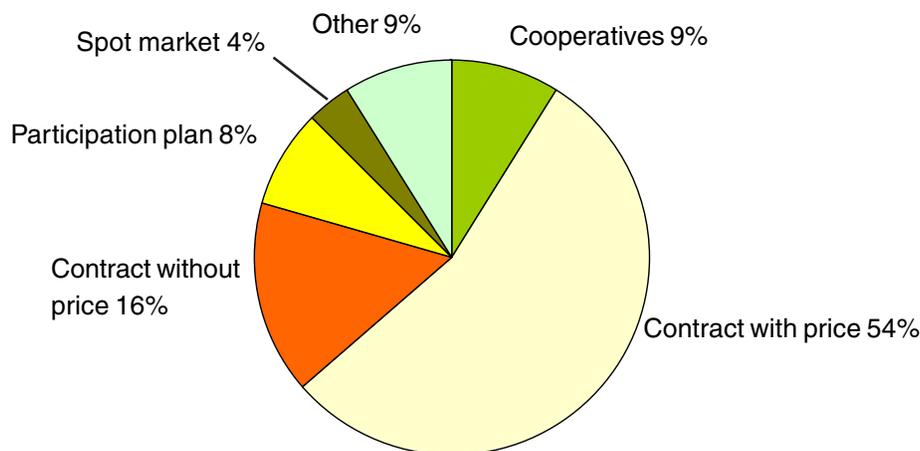
^a Dairy, fruits and vegetables, tree nuts and cotton are marketing cooperatives.

Marketing channels

In the spring of 2002, the Risk Management Agency of the United States Department of Agriculture, the California Office of the National Statistics Service, and the Department of Agricultural and Resource Economics at the University of California administered a comprehensive survey of California's horticulture producers.

The information in this section is based on the survey results representing more than one-third of California's specialty crop producers. Specialty crops also referred to as horticultural crops account for nearly 60 percent of the total farm revenue for the state. The high share of receipts from specialty crops illustrates one major difference between agriculture in California and most of the rest of the United States. California agriculture is far more tied to fruits, vegetables, tree nuts and ornamental crops than is agriculture in most other states, where grains and livestock tend to dominate receipts.

FIGURE 4.2
Vegetable crop marketing channels, 2002



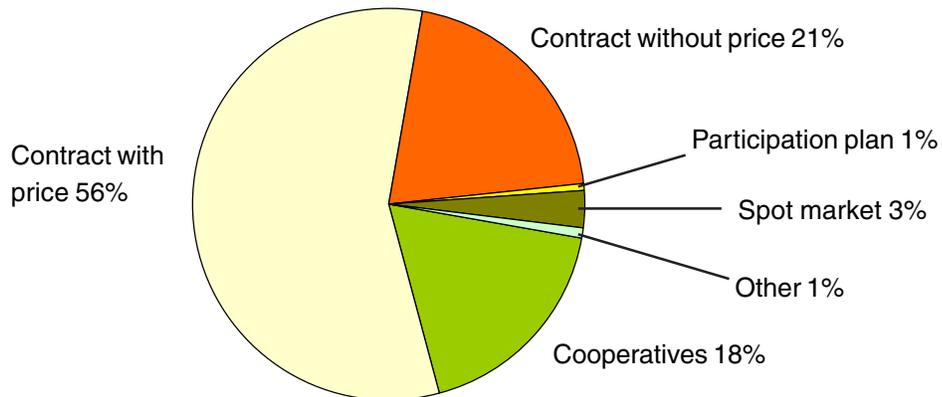
Source: Lee, Hyunok and Steven C. Blank. *A Statistical Profile of Horticultural Crop Farm Industries in California*. University of California Giannini Foundation of Agricultural Economics, 2004. http://giannini.ucop.edu/ResearchReports/Lee_Blankbook.pdf

California leads the nation in the use of marketing contracts. Seventy percent of the vegetable crop producers surveyed market their crops under contract. The majority, 54 percent of all producers, market their production with a contract with a predetermined price. Only 4 percent market in a spot market (Figure 4.2).

Seventy-six percent of California grapes are marketed under contracts and 18 percent through a cooperative. Contracts with predetermined prices cover the marketing of 56 percent of all grapes, while 21 percent market under contracts without price (Figure 4.3).

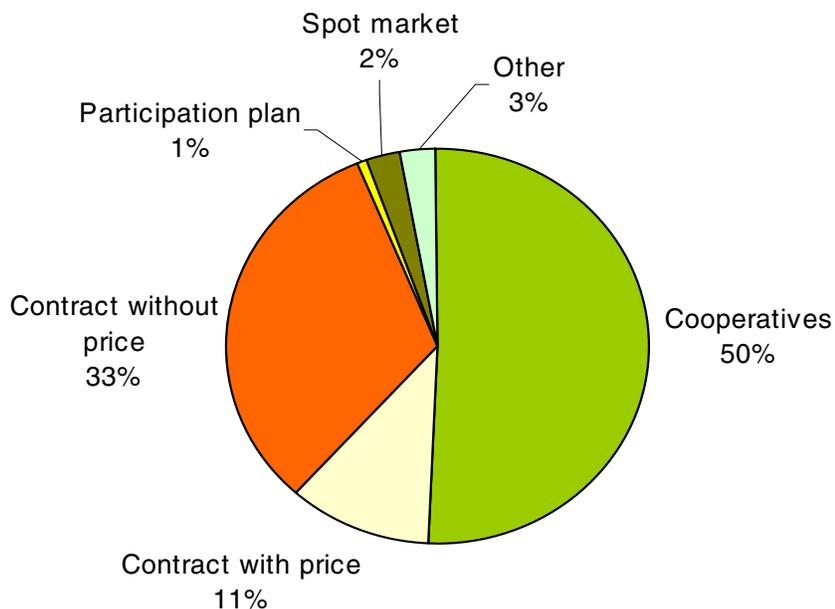
With nuts, 50 percent is moved through cooperatives while 44 percent is under a contract—33 percent of the nuts marketed are under contract without a predetermined price. Only 11 percent of the nuts are marketed under contracts with a predetermined price (Figure 4.4).

FIGURE 4.3
Grape marketing channels, 2002



Source: Lee, Hyunok and Steven C. Blank. *A Statistical Profile of Horticultural Crop Farm Industries in California*. University of California Giannini Foundation of Agricultural Economics, 2004. http://giannini.ucop.edu/ResearchReports/Lee_Blankbook.pdf

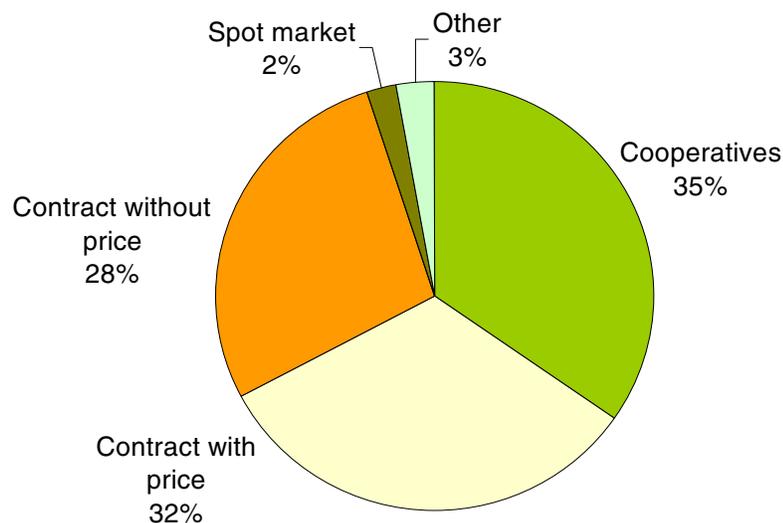
FIGURE 4.4
Tree nut marketing channels, 2002



Source: Lee, Hyunok and Steven C. Blank. *A Statistical Profile of Horticultural Crop Farm Industries in California*. University of California Giannini Foundation of Agricultural Economics, 2004. http://giannini.ucop.edu/ResearchReports/Lee_Blankbook.pdf

FIGURE 4.5

Marketing channels for fruits and tree crops other than nuts and grapes, 2002



Source: Lee, Hyunok and Steven C. Blank. *A Statistical Profile of Horticultural Crop Farm Industries in California*. University of California Giannini Foundation of Agricultural Economics, 2004. http://giannini.ucop.edu/ResearchReports/Lee_Blankbook.pdf

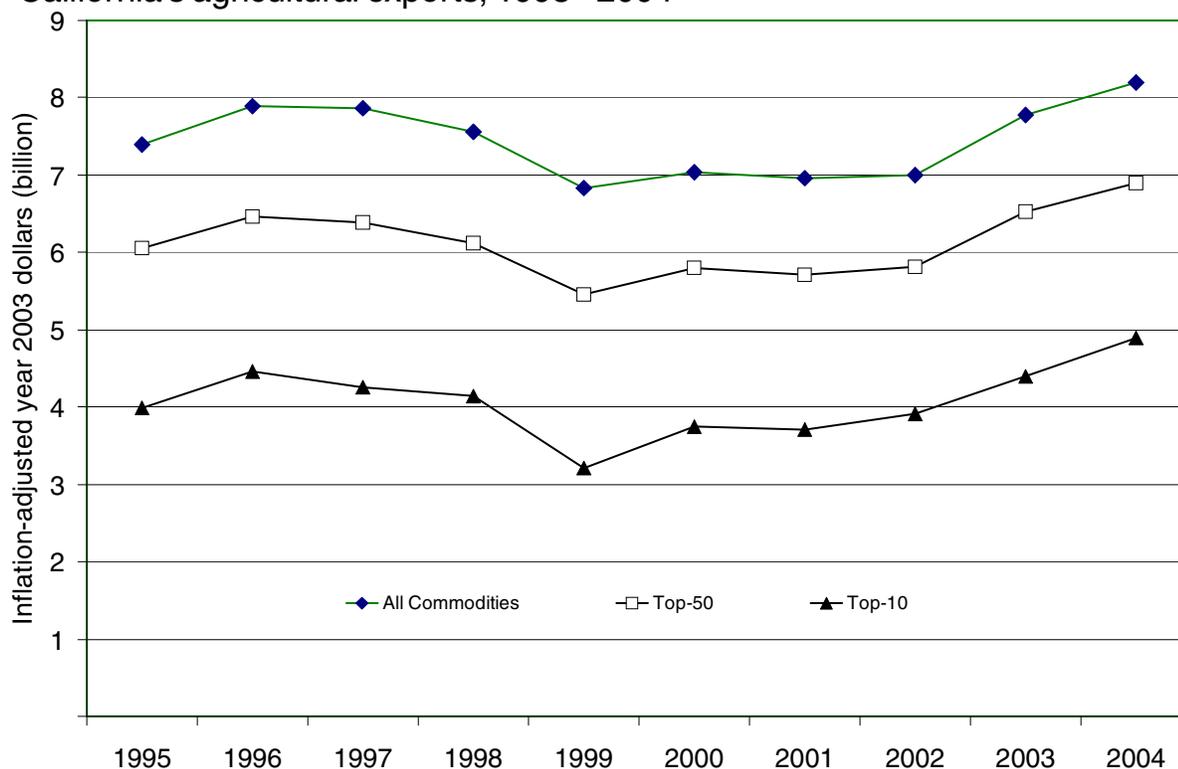
As with grapes and vegetables, the majority of fruit (60%) are marketed under contracts. Three marketing channels share almost even amounts of the volume: cooperatives, 35 percent; under contract with a predetermined price, 32 percent; and under contract without a predetermined price, 28 percent (Figure 4.5).

International exports

California is integrated in national and global markets, and international exports are an important part of its agribusiness. California agricultural exports surpassed \$8 billion in 2004, after increasing for a second consecutive year. California agricultural exports decreased in the late 1990s, remained relatively stable in the early part of the 21st century, and increased in 2003 and 2004 (Figure 4.6).

California's agricultural exports have accounted for about 12 to 13 percent of total U.S. agricultural export value. However, for several major commodities, California accounted for 100 percent of U.S. exports. These include exports of raisins, dried plums, olives, dates, kiwis, figs, almonds, walnuts, pistachios, garlic and artichokes. In addition, California accounts for more than 90 percent of U.S. exports of wine, table grapes, plums, apricots, broccoli and celery. In value terms, the share of the state's agricultural production exported to foreign countries increased from 18 percent in 2002 to 26 percent in 2004.

FIGURE 4.6
California's agricultural exports, 1995 - 2004



Source: AIC Issues Brief No. 30, 2005. <http://www.aic.ucdavis.edu/oa/briefs.html>

Almonds have been the leading export crop for California since 1999, and more than doubled in value between 2001 and 2004, increasing from \$685.6 million to \$1.3 billion. In 2004, the value of wine exports surpassed that of cotton when wine exports increased by 24 percent from the previous year and cotton exports fell by 7 percent. Behind almonds, wine and cotton, the fourth and fifth highest valued export commodities were table grapes and dairy products. Oranges, rice, processing tomatoes, walnuts and strawberries rounded out the top 10 export commodities for California in 2004 (Table 4.4). Notably, the value of beef and beef products for 2004 is much lower than that of preceding years as a result of trade restrictions following the discovery of BSE in the United States. In 2003, beef and beef products ranked ninth.

By value (Figure 4.7), fruits comprise the largest segment of California exports, accounting for 23 percent of the total. Tree nuts, led by almond exports, account for 22 percent. Fruits, vegetables, and tree nuts combined make up more than half of all California agricultural exports.

California exports agricultural products to almost 150 countries. Based on the Agricultural Issues Center's data for 43 major commodities, the 10 principal destinations account for 84 percent of all export value. The main four destinations—the European Union, Canada, Japan, and Mexico—account for approximately two-thirds of the total (Table 4.5). Canada had been the major market for California products for several years, but in 2003 the European Union became the top destination. The European Union is a major market for California wine and nuts, while the Canadian market is the top destination for vegetables, fruits, and flowers and nursery products.

TABLE 4.4
California agricultural commodity export values and rankings, 2003-2004

Rank 2004	Commodity	2002	2003	2004	Percent change 2004 / 2003
		Export value \$ million			
1	Almonds	829.0	1,081.2	1,369.7	27
2	Wine ^a	485.0	551.8	683.8	24
3	Cotton	510.7	676.4	629.3	-7
4	Table grapes ^a	367.2	386.3	453.9	17
5	Dairy	300.9	326.2	439.9	35
6	Oranges ^b	303.2	343.8	345.2	0
7	Rice	183.3	217.1	279.7	29
8	Tomatoes, processed ^a	214.9	238.7	250.3	5
9	Walnuts	183.9	213.9	240.5	12
10	Strawberries ^a	156.0	197.9	204.5	3
11	Raisins	151.9	164.7	195.1	18
12	Lettuce ^b	159.5	178.1	188.3	6
13	Pistachios	130.7	135.3	179.0	32
14	Prunes	127.9	133.6	130.1	-3
15	Peaches, nectarines ^b	106.7	125.7	123.3	-2
16	Hay ^a	105.9	106.7	106.6	0
17	Broccoli ^a	92.1	96.9	99.4	3
18	Beef and products	167.7	214.7	80.1	-63
19	Carrots ^a	71.3	76.3	78.4	3
20	Lemons ^b	84.5	75.5	77.0	2
21	Cherries	62.9	65.4	76.7	17
22	Tomatoes, fresh	48.7	54.0	67.7	25
23	Celery	42.3	42.8	49.8	16
24	Cauliflower	51.4	53.2	48.0	-10
25	Grapefruit ^b	34.2	48.1	43.0	-11
26	Onions ^a	33.8	46.3	40.7	-12
27	Flowers and nursery	36.8	37.8	40.6	7
28	Melons	40.0	39.4	39.3	0
29	Plums	54.9	58.5	37.6	-36
30	Grape juice	28.5	30.4	29.8	-2
31	Wheat ^a	26.9	38.6	26.6	-31
32	Peppers	19.5	21.9	26.4	20
33	Potatoes	30.2	28.3	24.1	-15
34	Pears	17.5	14.5	21.4	47
35	Garlic	23.2	22.3	21.2	-5

TABLE 4.4 (CONTINUED)
California agricultural commodity export values and rankings, 2003-2004

Rank 2004	Commodity	2002	2003	2004	Percent change 2004 / 2003
		Export value \$ million			
36	Asparagus ^a	17.4	26.7	18.0	-33
37	Apples	31.1	19.9	17.0	-15
38	Cottonseed byproducts	6.9	9.2	16.9	83
39	Olives	11.3	11.1	15.6	41
40	Turkey ^a	5.6	12.4	13.1	6
41	Apricots	17.5	15.5	12.7	-18
42	Dates	10.9	13.9	12.5	-10
43	Kiwi	7.6	8.8	10.6	21
44	Figs	7.1	8.0	9.2	15
45	Chickens	5.3	5.5	7.0	28
46	Dry beans	10.4	8.0	6.5	-19
47	Eggs	8.5	6.4	5.3	-17
48	Artichokes	3.1	2.9	4.2	42
49	Mushrooms	2.9	2.1	2.3	11
50	Avocados	1.5	1.5	2.2	52
Total 50 principal commodities		5,430.2	6,294.2	6,900.1	10
Total other products ^{a,c}		1,116.5	1,207.2	1,294.3	7
Total all agricultural exports		6,546.7	7,501.5	8,194.4	9

Source: AIC Issues Brief No. 30, 2005. <http://www.aic.ucdavis.edu/oa/briefs.html>

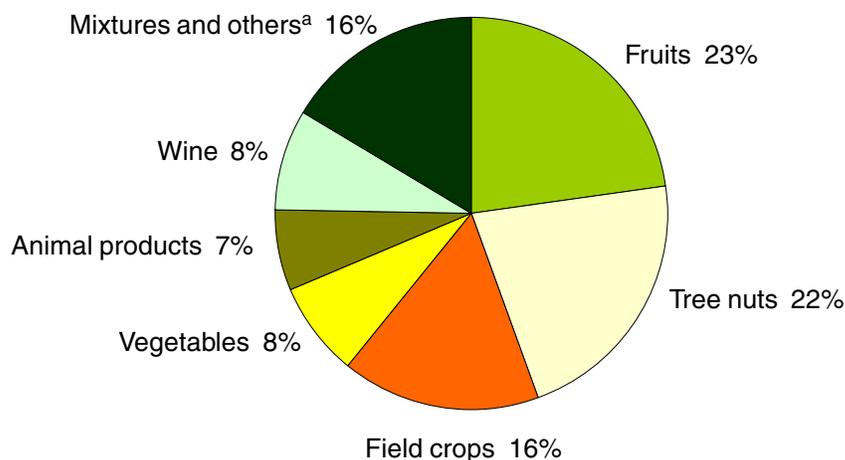
^a 2002 and 2003 figures were revised based on updated production data from the U.S. Department of Agriculture, National Agricultural Statistics Service.

^b 2002 and 2003 figures were revised based on updated Canadian import data.

^c "Other products" is composed of (a) highly processed products that are difficult to attribute to a specific commodity such as mixtures of fruits, nuts and vegetables and other processed foods, and (b) animal and plant products marketed in such small quantities that they are not included in the top 55 leading commodities.

FIGURE 4.7

Share of California agricultural exports by value of main commodity groups, 2004



Source: AIC Issues Brief No. 30, 2005. <http://www.aic.ucdavis.edu/oa/briefs.html>

^a Includes flowers and nursery and mixtures and other products.

TABLE 4.5

Percent of California export value shipped to major markets, by commodity group, 2004^a

	EU-25	Canada	Japan	Mexico	China/ H.Kong	Korea	Rest of the world
Animal products ^b	0.9	1.7	7.7	45.6	7.1	3.7	33.3
Field crops ^c	2.6	13.0	23.8	7.7	15.1	5.7	32.1
Flowers and nursery	19.1	39.6	5.9	26.1	1.7	0.3	7.3
Fruits ^d	9.9	32.8	14.5	5.0	7.9	6.3	23.6
Tree nuts	56.4	6.7	8.3	1.7	3.3	2.2	21.4
Vegetables ^e	2.3	69.0	12.0	7.7	0.8	0.3	7.9
Wine	65.2	14.9	8.2	0.8	1.3	1.0	8.6
All commodity groups	24.9	21.5	13.3	7.7	6.7	3.8	22.2

Source: AIC Issues Brief No. 30, 2005. <http://www.aic.ucdavis.edu/oa/briefs.html>

^a Based on 43 individual commodity groups for which reliable data were available. They account for 99 percent of the exports of the 50 leading commodities.

^b Only beef and dairy products.

^c Excluding wheat.

^d Excluding apples and avocados.

^e Excluding mushrooms.

Exotic pests and diseases

A pest can be any plant, animal, virus or disease pathogen whose introduction and establishment in a region causes negative consequences. A pest is commonly considered “exotic” wherever it is non-indigenous or beyond its range or natural zone of potential dispersal. Exotic pests and diseases can impact the natural and urban environment, can be costly to agriculture and other industries, and can even affect human health and safety. To prevent that, the United States and California have developed exotic pest and disease exclusion measures to monitor national and international travelers and shipments that may accidentally or intentionally carry exotic pests or diseases. Should those precautions fail, additional measures may be taken to prevent establishment or spread of introduced pests and diseases.

Exotic pests and diseases can have a number of economic effects on agriculture. They can decrease crop yields and quality, lead to livestock depopulation and negatively affect water resources. In addition, infestations often result in costs for chemical, biological or physical control.

Exotic pests and diseases may arrive through many pathways including the importation of infected plants or animals, natural migration of infected animals, on equipment or vehicles, and on the bodies and possessions of travelers. Some pests, such as citrus canker in Florida, have been introduced to other parts of the United States but have not been found in California. Other pests have been prevented from entering the United States or have been eradicated. For example, foot-and-mouth disease was eradicated from the United States in 1929.

In 1881, California instituted the nation’s first system of plant inspection at points of entry to the state. The California Department of Food and Agriculture (CDFA) monitors incoming vehicles at major highway entrances. Inspection of private vehicles entering the state was curtailed in 2003 due to budget constraints. This accounts for the recent reduction in inspections (Table 4.6).

Commercial shipments of plants and animals entering California via Arizona, Nevada and Oregon doubled in the seven years from 1997 to 2003 (Table 4.7). CDFFA reported monitoring 366,266 commercial plant shipments at the 16 California border agricultural inspection stations in 2003. Of these, 1,646 were rejected and another 30,952 were sent under “Warning-Hold Inspection Notices” to the destination county Agricultural Commissioners for final disposition.

The U. S. Department of Homeland Security (DHS) is responsible for agricultural pest and disease exclusion and enforcement at international borders and ports (sea and air). Many U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) quarantine and inspection employees were transferred to the DHS upon its creation in 2003. The CDFFA is also an active participant together with APHIS in activities designed to detect and exclude exotic pests and disease entry, and if necessary, for control.

TABLE 4.6

Vehicles monitored by CDFA at California border agricultural inspection stations, 1989-2003^a

Calendar year	Total vehicles	Automobiles	Commercial trucks	Recreational vehicles	Buses
	(thousands)				
1989	25,340	21,669	2,989	644	39
1991	26,881	22,803	3,521	522	35
1994	27,878	23,617	3,725	510	26
1997	30,222	24,914	4,660	525	34
1998	30,571	24,969	4,970	596	35
1999	31,292	25,111	5,453	693	35
2000	33,711				
2001	33,832				
2002	33,355				
2003 ^b	26,068				

Sources: California Department of Food and Agriculture, Plant Health and Pest Prevention Service. Annual Reports, 1990-2000 and personal communications.

^a Vehicles monitored by CDFA at the 16 California border agricultural inspection stations (not international borders).

^b Note: 2003 drop in totals due to the curtailing of private vehicle inspection on July 1, 2003.

TABLE 4.7

Incoming commercial shipments of plants and animals recorded at California interstate pest exclusion border stations, 1997-2003^a

Calendar year	1997	1998	1999	2000	2001	2002	2003
	(thousands)						
Total plant shipments	n.a.	305	364	372	378	369	366
Total animal shipments	n.a. ^b	18	27	29	31	33	28
Individual animals							
Horses	12	8	15	18	20	20	14
Goats	48	50	71	67	68	64	67
Rabbits	76	27	93	107	97	119	139
Sheep	557	357	494	472	427	455	560
Cattle & calves	577	521	784	758	797	878	857
Fish (live)	723	186	255	1,042	123	704	1,059
Swine	1,598	1,683	2,050	2,071	2,187	2,202	2,199
Poultry birds (live)	4,670	1,946	6,745	6,248	9,521	8,612	10,341
Miscellaneous ^c	0.5	0.9	3.2	1.1	0.4	0.4	0.5
Poultry eggs (fertile), dozens	9,691	17,156	23,970	23,285	24,447	23,626	22,898
Total individual animals, excluding fertile poultry eggs and fish	7,539	4,592	10,255	9,741	13,117	12,350	14,177

Source: California Department of Food and Agriculture personal communication (10/2004).

^a Recorded at interstate borders, not international entrances.

^b Not available.

^c Llamas, alpacas, camelidae, bison, ostrich, etc.

As national and international commerce and travel increase, so do the chances of exotic pests being introduced to the state. California and the United States operate a number of programs designed to exclude, eradicate or contain the spread of exotic pests and diseases. Some pest and disease exclusion programs are funded jointly by state and federal government, while others are specific to the state or federal level.

According to information obtained by the Center, roughly \$450 million, including emergency funds, were spent by the state and federal government on the control of exotic pests and diseases of plants and animals in California during 2003.^{1,2} That year, the state spent \$128.4 million and the U.S. government spent \$321.1 million on controls. By far the largest share (44%) of government expenditures on the control of exotic pests and diseases in California in 2003 was attributable to programs containing Pierce's disease, which affects many plants, and eradicating exotic Newcastle disease, which affects poultry and other birds. Total government expenditure on pest and disease control was equivalent to about 1.4 percent of the value of cash receipts for all of California agriculture.

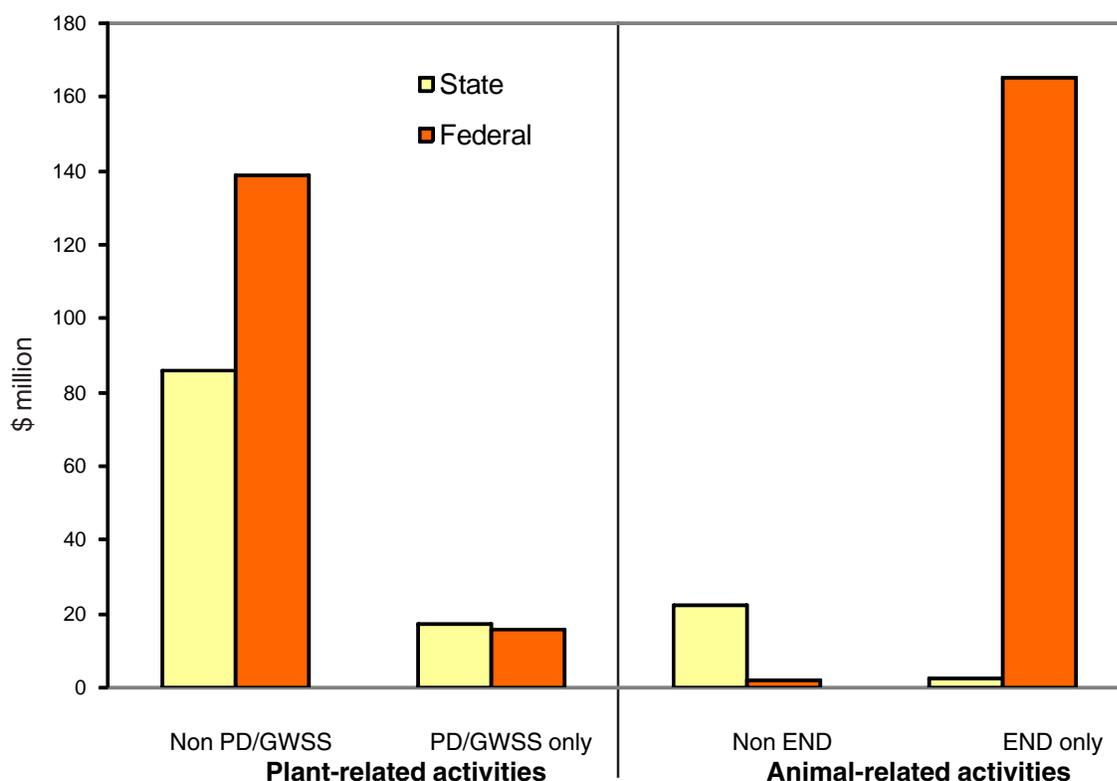
¹ This is a rough but reasonable approximation because state expenditures for the July 1, 2002 - June 30, 2003 have been combined with expenditures by the federal government over the October 1, 2002 - September 30, 2003 period. All expenses for exotic Newcastle disease eradication occurred during these respective budget years.

² Does not include funding on research.

Not counting the state's substantial expenditures to eradicate exotic Newcastle disease and contain Pierce's disease between July 1, 2002 and June 30, 2003, CDFA spent \$22.3 million to control exotic pests and diseases of animals and \$85.9 million to control plant pests and diseases (Figure 4.8). The federal government (U.S. Department of Agriculture APHIS) spent another \$1.8 million in California on the control of exotic pests and diseases of animals and \$138.7 million (APHIS and Department of Homeland Security) on the control of plant pests and diseases during federal fiscal year 2003—this does not include the \$165 million for the emergency eradication of exotic Newcastle disease and \$15.6 million for suppression of Pierce's disease.³

FIGURE 4.8

Pest control expenditures in California by government level and activity, 2003^a



Source: UC Agricultural Issues Center, based on information from the California Department of Food and Agriculture and USDA Animal and Plant Health Inspection Service.

PD = Pierce's disease, GWSS = glassy-winged sharpshooter, END = exotic Newcastle disease.

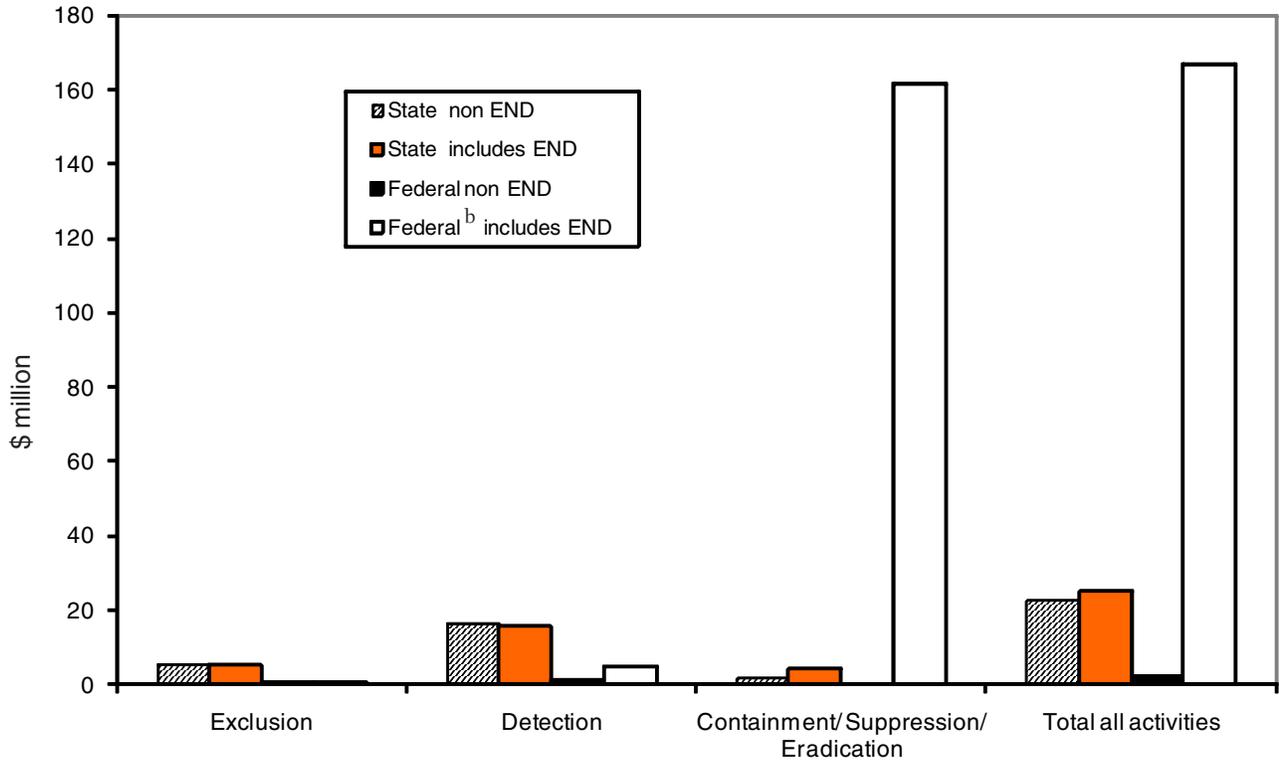
^a State fiscal year July 1, 2002 - June 30, 2003; federal fiscal year October 1, 2002 - September 30, 2003.

Of the \$22.3 million in state monies spent to control pests and diseases of animals (not counting the exotic Newcastle disease eradication activities), exclusion activities required \$5.2 million, detection \$15.9 million, and containment/suppression/eradication activities \$1.6 million (Figure 4.9). Of the total \$1.8 million federal monies, almost \$0.7 million was budgeted for exclusion, \$1.2 million for detection and none for containment, suppression or eradication.

³ The federal fiscal year is October 1, 2002 - September 30, 2003; state fiscal year is July 1, 2002 - June 30, 2003.

FIGURE 4.9

Animal pest and disease control activities in California by the state and federal government, 2003 expenditures^a



Source: UC Agricultural Issues Center, based on information from the California Department of Food and Agriculture and USDA Animal and Plant Health Inspection Service.

END = exotic Newcastle disease.

^a State fiscal year July 1, 2002 - June 30, 2003; federal fiscal year October 1, 2002 - September 30, 2003.

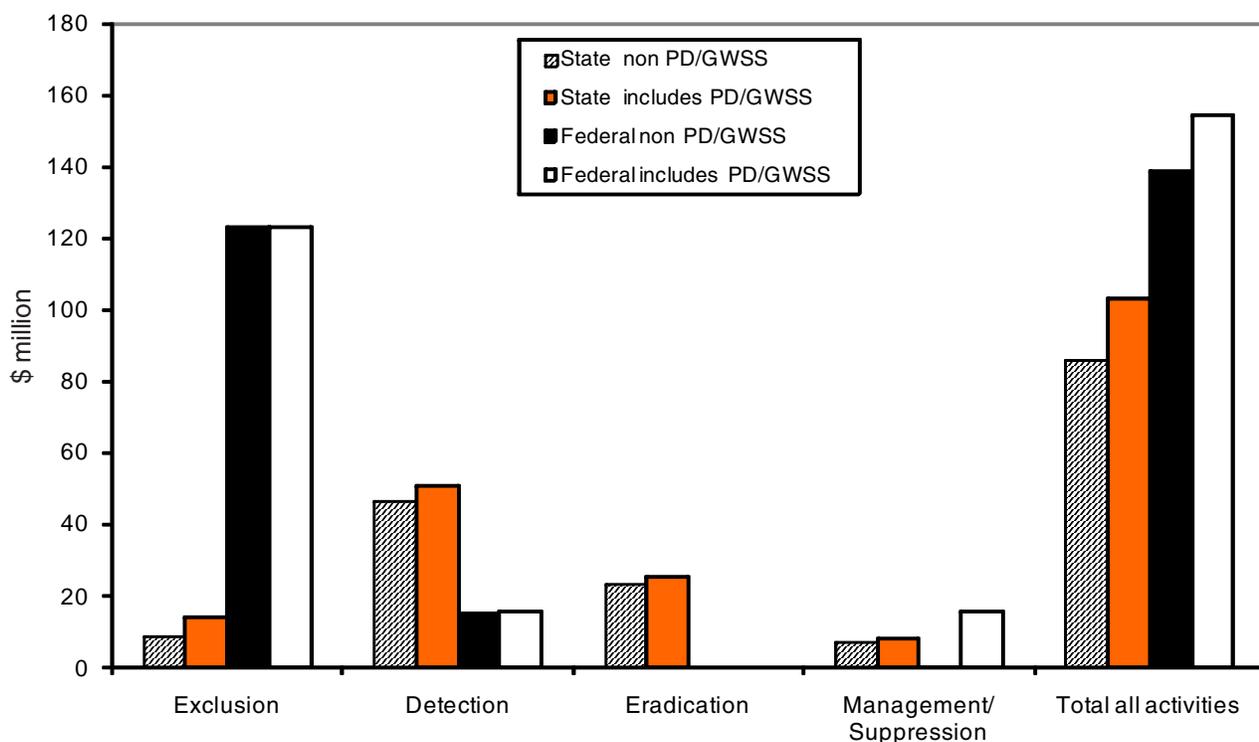
^b Includes END eradication (emergency and regular funds).

Again excluding Pierce's disease eradication and suppression costs, \$8.6 million of the state's \$85.9 million expenditures on plant pest and disease control (Figure 4.10) were focused on exclusion activities, \$46.7 million on detection, \$23.3 million on eradication and \$7.1 million on suppression activities. The federal expenditure of \$138.8 million on plant pests and diseases consisted of \$123.3 million for exclusion, \$15.4 million on detection, and less than \$0.2 million on management and suppression activities.

Because the glassy-winged sharpshooter can rapidly spread Pierce's disease, which kills grapevines and adversely affects 460 other plant species, the discovery of a single glassy-winged sharpshooter in 2000 led to major government efforts to contain that plant disease and eradicate or contain its insect vector. The state spent \$17.4 million on the Pierce's Disease Program between July 1, 2002 and June 30, 2003, not counting industry assessments for research. This represented 17 percent of CDFA expenditures for control of plant pests and diseases.

FIGURE 4.10

Plant pest and disease control activities in California by the state and federal government, 2003 expenditures^a



Source: UC Agricultural Issues Center, based on information from the California Department of Food and Agriculture and USDA Animal and Plant Health Inspection Service.

PD = Pierce's Disease, GWSS = Glassy-Winged Sharpshooter.

^a Includes border inspections of animal products and byproducts by APHIS PPQ. State fiscal year July 1, 2002 - June 30, 2003; federal fiscal year October 1, 2002 - September 30, 2003.

U.S. Department of Agriculture-APHIS spent \$15.6 million for Pierce's disease and glassy-winged sharpshooter control in California between October 1, 2002 and September 30, 2003—10 percent of the federal expenditures in California to control exotic plant pests and diseases.

The successful eradication of exotic Newcastle disease (END), which threatened California poultry, consumed \$3.4 million USDA-APHIS Veterinary Service funds plus \$161.6 million in federal emergency funds during 2003. END eradication accounted for 99 percent of all federal expenditures used to control pests and diseases of agricultural animals in California during the federal fiscal year and the depopulation of more than 3 million poultry birds.⁴ In addition, CDFA spent \$2.7 million on END, almost 11 percent of its 2002/2003 budget, to control exotic pests and diseases of animals. END is a fatal viral disease that affects all bird species. Totally eliminated in California by September 2003, END was first detected October 1, 2002 in Southern California backyard poultry. The method of control: quarantines combined with depopulation and extensive surveillance and laboratory detection.

⁴ California Department of Food and Agriculture news release, September 16, 2003. CDFA03-060: California Free of Exotic Newcastle Disease.

Government support

Although California accounts for about 13.2 percent of national cash receipts from agriculture, it receives only about 3 to 4 percent of the direct government payments to agriculture depending on the year (Table 4.8). One reason for the low share is that California's fruit, tree nut and vegetable crops are not commonly provided with such payments.

TABLE 4.8

Direct federal government payments to farmers, 1960-2004

Year	Payments		Payments
	in U.S.	in California	in California
	(\$ million)		(as % of United States)
1960	702	22	3.1
1970	3,717	132	3.5
1980	1,286	14	1.1
1990	9,298	252	2.7
1995	7,279	240	3.3
2000	22,896	667	2.9
2001	20,727	587	2.8
2002	11,236	462	4.1
2003	17,209	815	4.7
2004	13,304	507	3.8

Source: USDA Economic Research Service, www.ers.usda.gov/data/FarmIncomeFinFidMux/s.htm

A more complete way to measure the effect of government subsidies on agricultural commodities is to use the “producer support estimate” (PSE), which is designed to capture the total benefits to recipients of government policies and supports. The PSE is a widely applied summary measure of agricultural policy that attempts to measure the monetary value of explicit or implicit income transfers to agriculture. When calculated as a ratio of total transfer to total industry revenue (value of production plus government payments), the PSE ratio is a rough indicator that may be compared across commodities, time, and national or other geographic boundaries. A PSE for a commodity includes the value of direct payments, input assistance such as crop insurance and subsidized water, marketing orders and other support (e.g. support assistance and trade barriers). In California, government assistance contributes an important part of the revenue for producers of dairy products and several field crops (Table 4.9 and Figure 4.11).

Annual producer support in California for the 1999-2001 period averaged \$2.9 billion. Of the total, slightly over \$2.3 billion was shared by four industries: dairy, cotton, rice and vegetables other than tomatoes and lettuce. The total amount of support to these industries reflects the magnitude of their total production value and their ratio of PSE support to the value of production. With 54 percent of the total government support to producers in California, dairy producers received far more assistance than producers of any other commodity as the dairy industry is very large and dairy trade barrier benefits are significant. Cotton and rice farmers in California also received large shares of the total support (cotton 14% and rice 9% of total PSE, Figure 4.12).

The 1999-2001 state average PSE ratio—government support expressed as a percent of crop production value including support—is about 10.7 percent. Horticultural crops have PSE ratios ranging from 2.3 percent for strawberries, lettuce, and nursery and flowers to 4.9 percent for many fruits. With a PSE ratio of 63.9 percent, sugarbeets have the largest subsidy ratio, followed by rice (60.5%) and cotton (40.5%).

TABLE 4.9
Producer support estimate (PSE) by commodity^a

Commodities	Value of production plus government payments	Producer support estimate (PSE)	Ratio of PSE to value of production plus government payments
	(\$1,000)		(percent)
Dairy	4,705,171	1,571,330	33.4
Cattle/calves	1,351,500	33,691	2.5
Poultry ^b	980,110	23,081	2.4
Other livestock/poultry	384,478	10,141	2.6
Sugarbeets	53,306	34,047	63.9
Rice	456,194	275,851	60.5
Cotton	987,875	400,399	40.5
Wheat	142,475	42,071	29.5
Feed grains ^c	120,914	29,392	24.3
Hay, all	1,020,510	34,252	3.4
Other field crops	1,018,197	30,279	3.0
Almonds	753,720	27,997	3.7
Other tree nuts ^d	482,016	15,609	3.2
Grapes, rest ^e	2,249,650	68,582	3.0
Raisins	401,256	11,090	2.8
Citrus ^f	736,564	19,037	2.6
Strawberries	832,515	19,444	2.3
Other fruit	1,401,503	68,526	4.9
Tomatoes, processed	654,156	24,011	3.7
Tomatoes, fresh	290,081	7,049	2.4
Lettuce, all	1,331,292	30,272	2.3
Other vegetables	4,149,622	101,858	2.5
Nursery/flowers	3,096,506	70,512	2.3
Total	27,599,611	2,948,522	10.7

Source: Sumner, Daniel A. and Henrich Brunke. "Commodity Policy and California Agriculture" in *California Agriculture, Dimensions and Issues, 2003*. Jerry Siebert, editor. University of California Giannini Foundation of Agricultural Economics, 2004. <http://aic.ucdavis.edu/pub/CalAgBookchap6.pdf>

^a The producer support estimates are generally an average of the period 1999-2001, except for government payments. For federal government payments, we used the federal fiscal year 2001 through 2003 for production flexibility contract payments (replaced in 2002 Farm Bill by a direct payment program) and market loss assistance payments (replaced in 2002 Farm Bill by a counter cyclical payment program). We used data from crop years 2000 through 2002 for loan deficiency payment and marketing loan gains.

^b Poultry includes broilers, eggs and turkeys.

^c Feed grains includes corn, barley and oats.

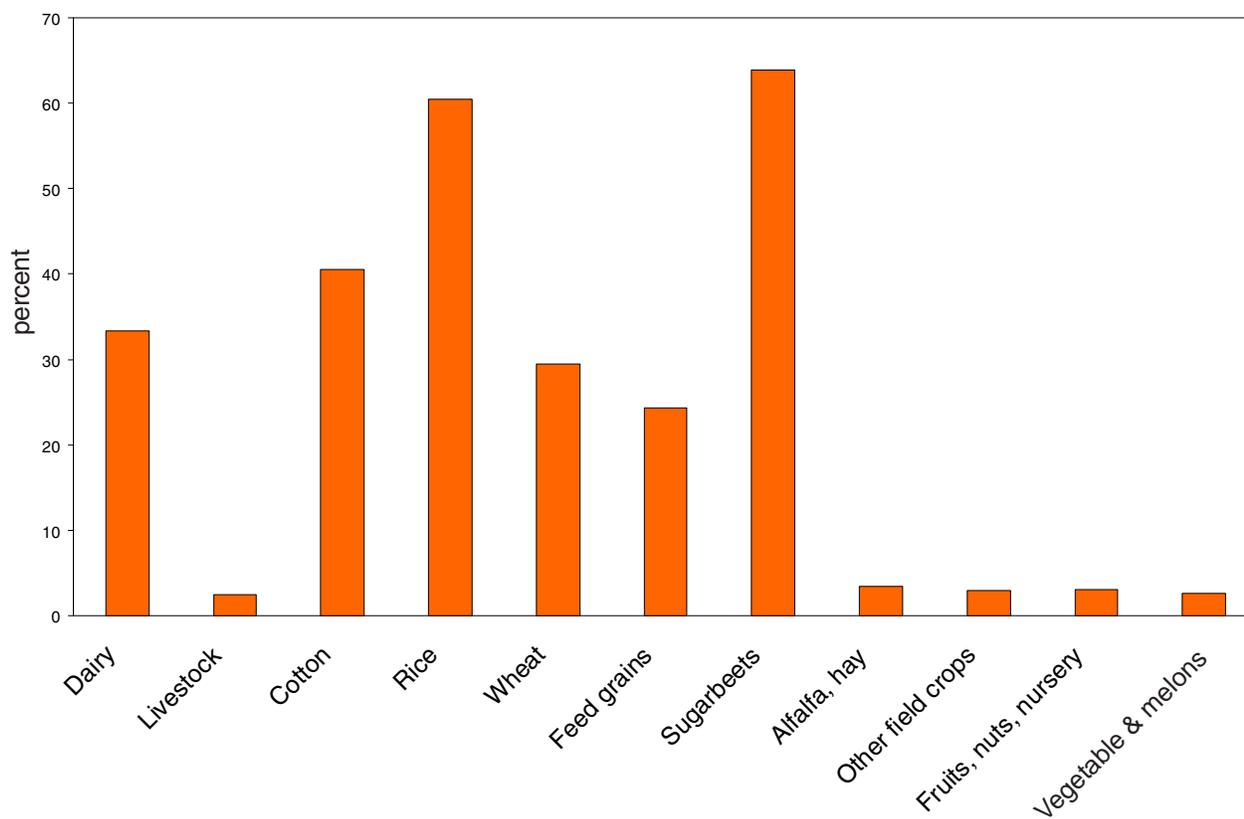
^d Other tree nuts include walnut and pistachios.

^e Grapes, rest includes table and wine grapes.

^f Citrus includes oranges and lemons.

FIGURE 4.11

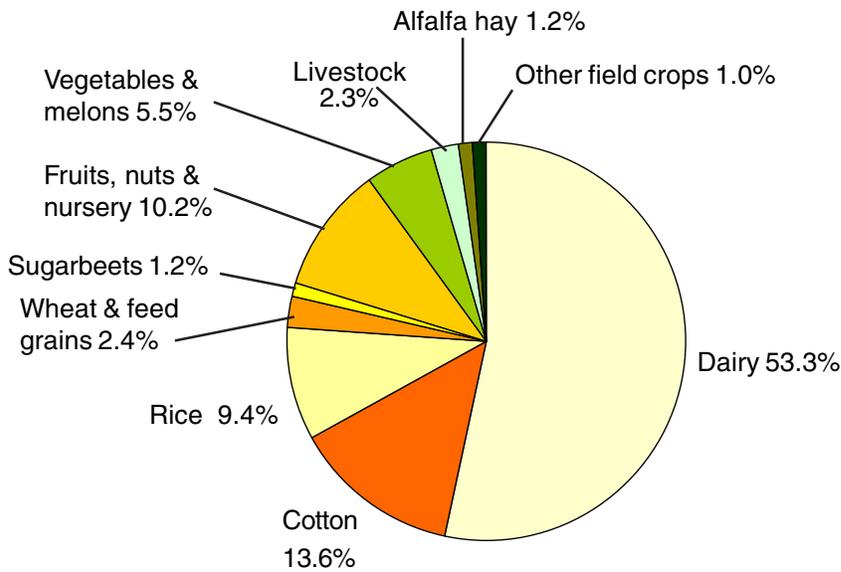
Ratio of producer support estimate (PSE) to value of production plus government payments, by commodity or commodity group, 1999-2001



Source: Sumner, Daniel A. and Henrich Brunke. "Commodity Policy and California Agriculture" in *California Agriculture, Dimensions and Issues, 2003*. Jerry Siebert, editor. University of California Giannini Foundation of Agricultural Economics, 2004. <http://aic.ucdavis.edu/pub/CalAgBookchap6.pdf>

Import barriers, government payments and input assistance account for three-quarters of the estimated producer support in California. Import barriers contributed 41 percent to the total average annual support and government payments accounted for 26 percent (Figure 4.13). Eighty-two million dollars of the \$304 million in input assistance went into water subsidies. Important recipients of the water subsidies were hay, cotton and rice, each of which received about \$12 million in such support annually.

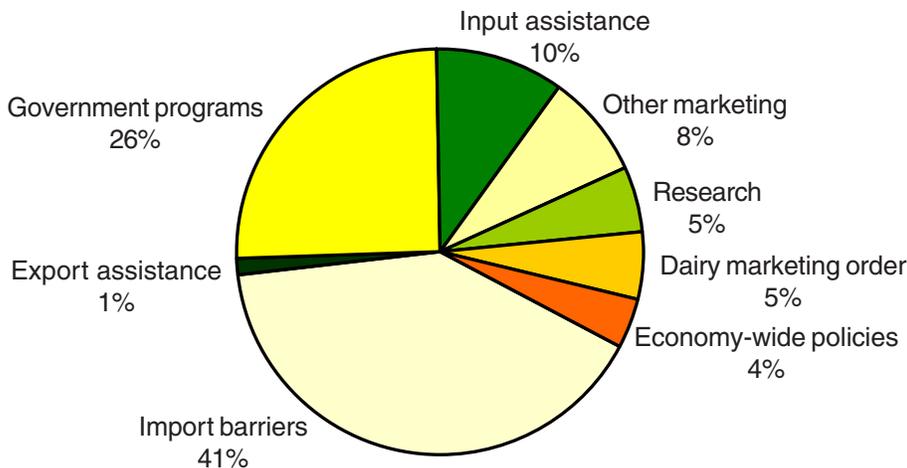
FIGURE 4.12
Share of agricultural support by commodity, California



Source: Sumner, Daniel A. and Henrich Brunke. "Commodity Policy and California Agriculture" in *California Agriculture, Dimensions and Issues, 2003*. Jerry Siebert, editor. University of California Giannini Foundation of Agricultural Economics, 2004. <http://aic.ucdavis.edu/pub/CalAgBookchap6.pdf>

Note: see numbered footnotes to Table 4.9.

FIGURE 4.13
Share of agricultural support by program, California, 1999-2001



Source: Sumner, Daniel A. and Henrich Brunke. "Commodity Policy and California Agriculture" in *California Agriculture, Dimensions and Issues, 2003*. Jerry Siebert, editor. University of California Giannini Foundation of Agricultural Economics, 2004. <http://aic.ucdavis.edu/pub/CalAgBookchap6.pdf>

Note: see numbered footnotes to Table 4.9.

Risk management

Farmers face production, financial, price and institutional risks and uncertainties. Tools available to deal with risks differ based on the commodity produced. These include crop insurance, government programs, contracts, liquidity, enterprise and market channel diversification, vertical integration, trading of futures and options in commodity markets and others.

Several federal crop insurance programs are available to California farmers. The Catastrophic Coverage Program (CAT) is available for many policy types and is fully subsidized by the federal government (after \$100 administrative fee per crop per county). Farmers can also choose from higher levels of insurance that are partially paid by the government. Some policies are more general while others are designed for producers of a specific crop, such as avocado revenue coverage.

Since 1999, the total number of insurance policies sold has remained relatively constant, the number of catastrophic insurance plans sold has decreased, and buy-up policy sales have increased (Table 4.10). The loss ratio (total indemnity/total premium) has decreased markedly between 1998 and 2003.

TABLE 4.10

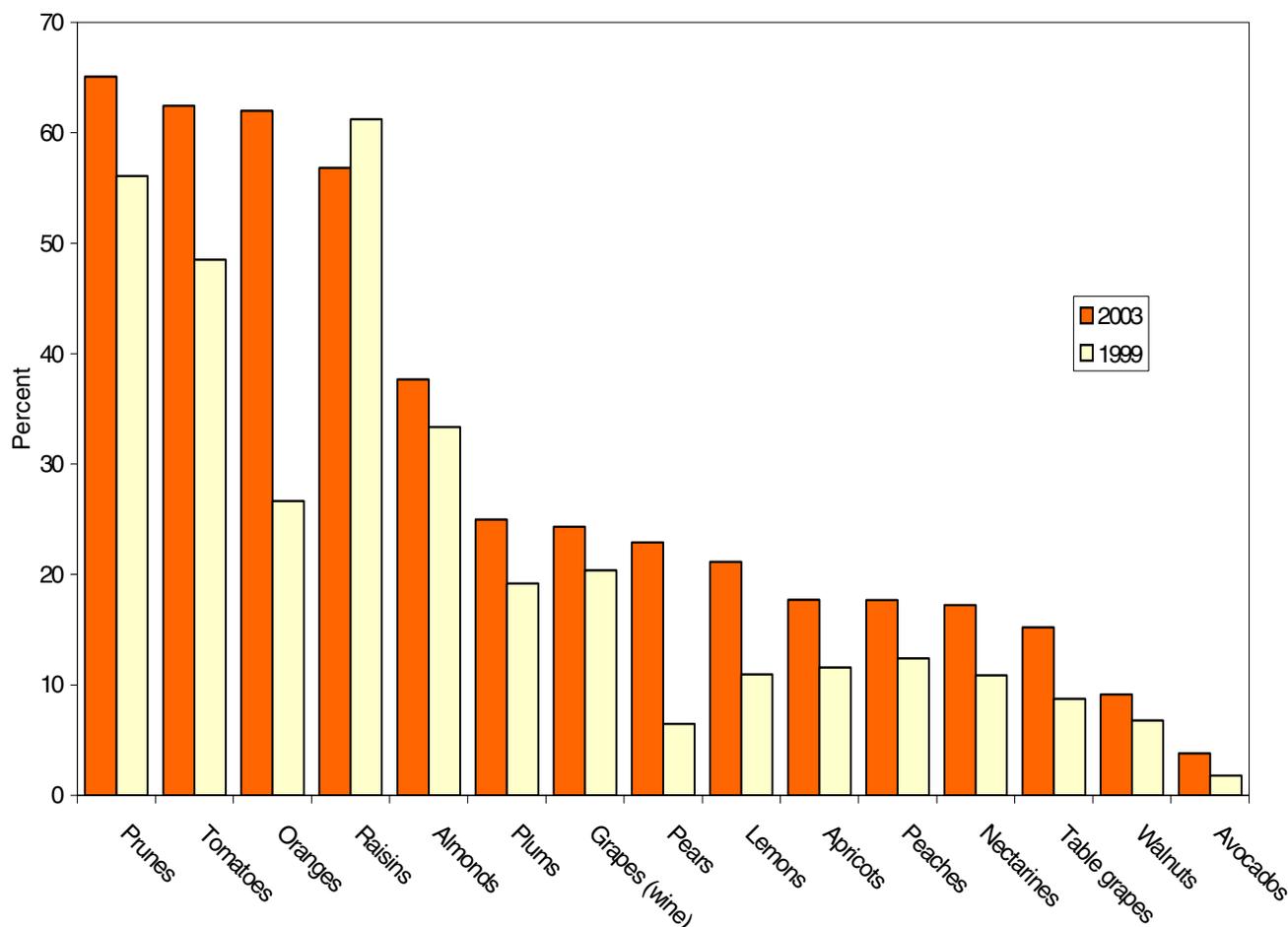
Use of federal crop insurance by California farmers, 1998-2003

Year	Total policies sold	Catastrophic policies	Buy-up policies	Net acres insured	Total liability (\$1,000)	Total premium (\$1,000)	Total indemnity (\$1,000)	Loss ratio
1998	33,379	23,462	9,917	3,526,388	2,124,396	109,882	118,272	1.08
1999	37,994	25,002	12,992	4,023,277	2,494,656	130,826	133,134	1.02
2000	35,947	21,814	14,133	4,278,811	2,796,254	143,340	392,360	0.64
2001	36,313	20,235	16,078	4,011,464	2,692,201	142,630	118,202	0.83
2002	35,223	18,618	16,605	3,919,529	2,833,052	146,274	78,489	0.54
2003	34,119	17,917	16,202	3,997,235	2,956,385	150,660	78,332	0.52

Source: USDA Risk Management Agency, <http://www3.rma.usda.gov/apps/sob/>

FIGURE 4.14

Percent of California harvested fruit, tree nut, and vegetable acreage with buy-up insurance, 1999 and 2003



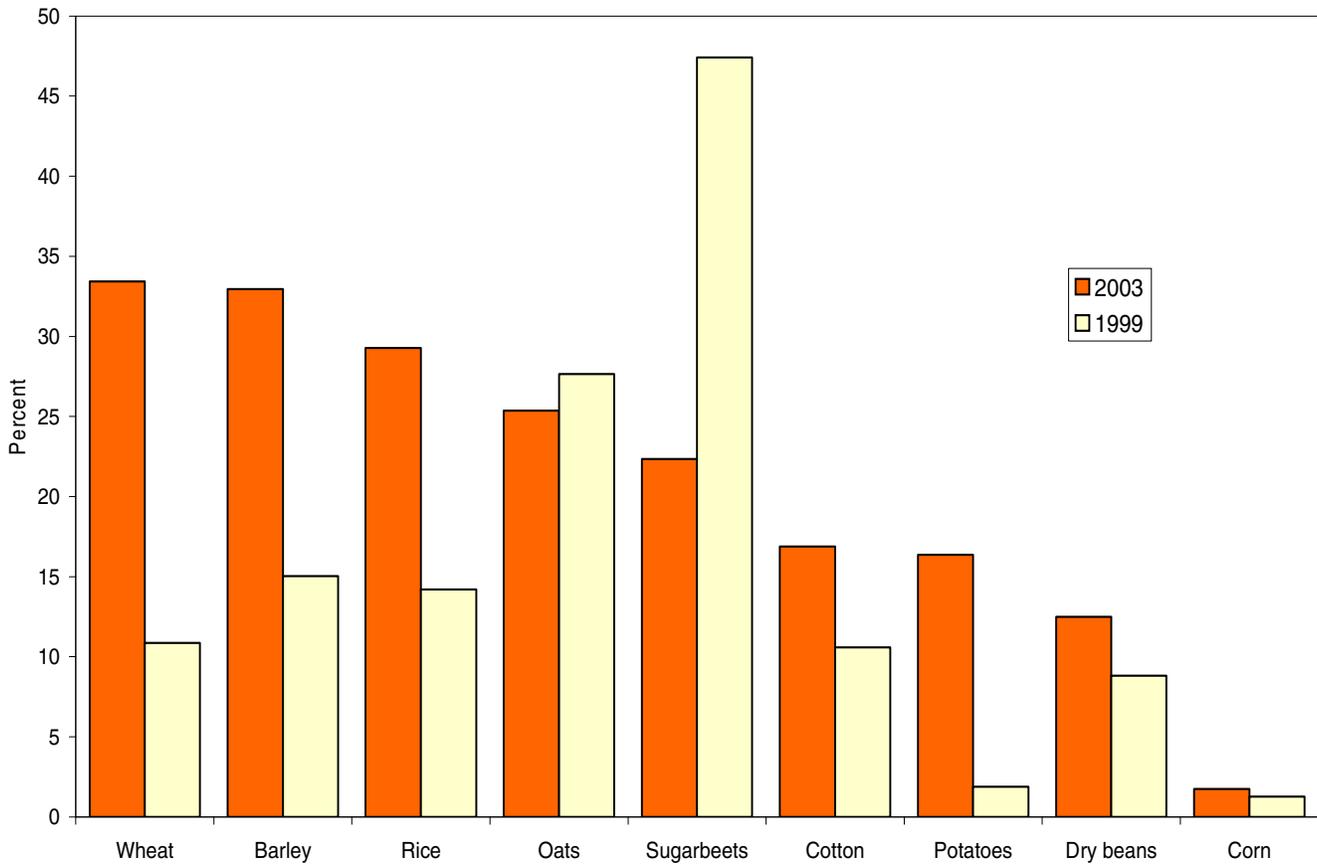
Source: USDA Risk Management Agency, <http://www3.rma.usda.gov/apps/sob/>

The Agricultural Risk and Protection Act of 2000 led to higher insurance subsidy levels, higher levels of coverage and availability of insurance for additional crops. As a result, the number of producers purchasing buy-up coverage has increased in California and in the nation (Figures 4.14 and 4.15).

The subsidy resulting from crop insurance in 2001 was substantial to a number of California crops including cotton, all grapes, almonds, prunes, apples and wheat. However, most other fruits, vegetables, and field crops received little subsidy from the crop insurance program.

FIGURE 4.15

Percent of California harvested field crop acreage with buy-up insurance, 1999 and 2003.



Sources: USDA Risk Management Agency, <http://www3.rma.usda.gov/apps/sob>; California Agricultural Statistics Service.

The Measure of California Agriculture

CHAPTER 5

University of California Agricultural Issues Center

Agriculture's role in the economy

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5-7.....	The direct plus indirect effects of agriculture
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5-12.....	Agriculture and regional economies
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California farmers constitute an essential part of the state economy. As early chapters document, farm production is itself large and dynamic. Furthermore, farm production is closely linked to many other industries: the production of farm inputs, the processing of food and beverages, the textile industry, transportation and financial services. Including multiplier effects, California farm and closely related processing industries employ 7.3 percent of the state's private sector labor force and account for 5.6 percent of the state labor income. Every dollar of value added—labor and property income and indirect business taxes—in farming and agricultural related industries generates an additional \$1.27 in the state economy. For every 100 jobs in agriculture, including the food industry, there are 94 additional jobs created throughout the state. California agriculture is also large on a global scale. Depending on the method applied to measure the value of agriculture here and elsewhere, California ranks between 5th and 9th in the world, ahead of such countries as Canada, Mexico, Germany and Spain.

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The contribution of agriculture to the California gross state product

California farms have a significant direct effect on the state's economy. According to the U.S. Bureau of Economic Analysis, California's gross state product (GSP), the value added by all industries in the state, was \$1,438 billion in 2003. At \$21 billion (Table 5.1), agriculture (farming), forestry, fishing, hunting, and support services accounted for 1.45 percent of the California GSP.

Determining the share and role of agriculture in California's economy depends in part on how agriculture is defined. Many industries are related to farm production in general, but the degree of linkage varies. From a very broad perspective, about 90,000 commercial establishments (in addition to farms) in California are related to agricultural production (Table 5.2). Within this group, some industries such as food and beverage manufacturing, are closely linked to local farming, but others, such as restaurants, may be only weakly related to local farm production. While food retailing depends on food production, it does not usually depend much on local production. Food produced in California is sold worldwide and food retailing occurs even in places where local food production is minor.

With more than \$61 billion in sales, the California food, beverage and tobacco manufacturing industry employs nearly 200,000 workers. There are 4,661 establishments in the state that process farm products to produce foods, beverages and tobacco. The bakery and tortilla manufacturing group has the largest number of establishments (39%) and employees (22%), but the beverage industry is the largest in sales (24%) (Table 5.3). Wineries account for most of the beverage sales value (fluid milk processing is included with dairy products).

California food, beverage and tobacco manufacturing establishments account for 15 percent of these U.S. establishments and 11 percent of U.S. sales (Table 5.4). California's shares of U.S. sales in the fruit and vegetable preserving, dairy products, bakeries and tortilla, and beverage production subsectors are all larger than the state's share of the agricultural and beverage processing sector as a whole.

TABLE 5.1
California gross state product by industry, 2003

	Compen- sation to employees ^a	Taxes on production & imports ^b	Gross operating surplus ^c	Value added ^d
(\$ million)				
Agriculture ^e	9,304	-1,698	13,228	20,835
Crop and animal production (farms)	4,701	-1,834	11,192	14,059
Mining and utilities	7,412	5,285	21,666	34,365
Manufacturing and construction	152,307	6,438	66,615	225,361
Food and beverages manufacturing	9,601	3,056	4,168	16,824
Wholesale trade	41,127	21,411	19,370	81,908
Retail trade	55,315	22,613	26,529	104,458
Transportation and warehousing ^f	21,544	854	11,350	33,748
Information, finance and insurance	99,168	6,651	80,121	185,939
Real estate, rental, and leasing	13,408	20,165	190,290	223,864
Professional and management services	97,573	1,300	40,029	138,903
Administrative and waste services	30,270	859	11,056	42,185
Educational services	9,674	155	407	10,236
Health care and social assistance	62,096	1,154	21,525	84,775
Arts, entertainment, and recreation	12,199	503	5,966	18,668
Accommodation and food services	23,286	3,876	9,895	37,057
Other services, except government	22,584	2,451	10,473	35,508
Subtotal private industries	657,269	92,018	528,522	1,277,809
Government	147,740	-2,289	14,875	160,326
Total gross state product ^g	805,009	89,728	543,397	1,438,134

Source: U.S. Department of Commerce, Bureau of Economic Analysis, www.bea.gov/bea/regional/gsp

^a Compensation of employees is the sum of employee wages and salaries and supplements to wages and salaries. Wages and salaries are measured on an accrual, or “when earned” basis, which may be different from the measure of wages and salaries on a disbursement, or “when paid” basis. Wages and salaries and supplements of federal military and civilian government employees stationed abroad are excluded from the measure of GSP.

^b Taxes on production and imports consist of tax liabilities, such as general sales and property taxes that are chargeable to business expense in the calculation of profit-type incomes. Also included are special assessments. This figure is the sum of state and local taxes — which are primarily nonpersonal property taxes, licenses, and sales and gross receipts taxes — and federal excise taxes on goods and services. Negative values for agriculture are taxes net of direct government subsidy.

^c Gross operating surplus is a value derived as a residual for most industries after subtracting total intermediate inputs, compensation of employees, and taxes on production and imports less subsidies from total industry output. Gross operating surplus includes consumption of fixed capital (CFC), proprietors’ income, corporate profits, and business current transfer payments (net). Prior to 2003, it was referred to as other value added or property-type income.

^d Value added is equal to the sum of compensation to employees, taxes on production of inputs, and gross operating surplus.

^e Agriculture includes farm production, forestry, fishing, hunting, and support services such as soil preparation, planting, harvesting, and management, on a contract or fee basis.

^f Not including U.S. Postal Service.

^g Gross state product (GSP) is the sum of value added by labor and capital in all industries located in the state.

TABLE 5.2
California's agriculture-related industries, 2002

	Establishments	Sales (\$ million)	Payroll (\$ million)	Employees
Food, beverages and tobacco mfg.	4,661	61,615	6,515	196,508
Textile mills	491	1,753	361	13,170
Wood product mfg.	1,337	6,061	1,142	39,490
Paper mfg.	560	8,587	1,226	29,379
Pesticide, fertilizer and other chemical mfg.	96	668	77	2,020
Farm machinery and equipment mfg.	104	284	60	1,729
Food product machinery mfg.	73	238	69	1,616
Grocery and related product wholesale	5,397	69,228	4,033	108,585
Farm products raw materials wholesale	320	2,884	93	2,498
Alcoholic beverage wholesale	511	12,071	942	18,843
Grocery stores, supermarkets and convenience stores	9,928	55,956	6,407	263,645
Specialty food stores	2,981	2,008	287	17,886
Beer, wine and liquor stores	3,236	2,279	163	10,156
Full-service restaurants	23,277	18,580	6,045	440,944
Limited-service eating places	29,983	18,633	4,771	428,313
Special food services	3,050	2,771	834	50,538
Drinking places (alcoholic beverages)	3,769	1,372	327	30,996
Total agriculture-related industries	89,774	264,988	33,353	1,656,316
Total California, not including farming, government, railroad and employed sectors ^a	820,997	N/A	510,841	12,856,426

Source: U.S. Department of Commerce, Census Bureau, Economic Census, 2002,
http://www.census.gov/econ/census02/data/ca/CA000_31.HTM and County Business Patterns.

^a This total is from the Census Bureau County Business Patterns.

TABLE 5.3

California food, beverage and tobacco manufacturing industry, 2002

	Establishments	Sales	Payroll ^a	Employees
		(\$ million)	(\$ million)	
Manufacturing industry				
Animal feed ^b	147	3,077	177	4,069
Grain and oilseed milling	98	2,838	182	4,042
Sugar and confectionery products	220	2,410	346	10,054
Fruit & vegetable preserving & specialty food	336	10,391	1,148	38,409
Dairy products	211	9,078	624	14,802
Animal slaughtering and processing	279	4,359	524	21,019
Seafood product preparation and packaging	57	824	93	3,465
Bakeries and tortilla	1,814	6,004	1,272	43,527
Other food ^c	653	7,580	798	25,380
Beverages	844	15,042	1,349	31,717
Tobacco	2	12	1	24
Total food, beverages and tobacco	4,661	61,615	6,515	196,508

Source: U.S. Department of Commerce, Census Bureau, Economic Census, 2002,
http://www.census.gov/econ/census02/data/ca/CA003_31.HTM

^a Annual payroll.

^b Includes pet and agricultural animal feed.

^c Includes snack food, coffee, tea, syrup, condiments and spice manufacturing.

TABLE 5.4

California share of the U.S. food, beverage and tobacco manufacturing industry, 2002

Manufacturing industry description	Establishments	Sales	Payroll	Employees
	(percent)			
Animal feed ^a	8.1	11.0	10.1	8.7
Grain and oilseed milling	11.5	6.0	7.4	7.3
Sugar and confectionery products	12.0	9.5	12.6	12.6
Fruit & vegetable preserving & specialty food	19.3	19.5	21.4	21.7
Dairy products	12.6	13.8	12.9	11.5
Animal slaughtering and processing	7.0	3.6	4.1	4.2
Seafood product preparation and packaging	7.6	9.4	8.8	8.4
Bakeries and tortilla	15.9	12.4	13.8	14.1
Other food ^b	17.0	13.1	14.9	15.7
Beverages	29.1	23.1	24.6	23.3
Tobacco	1.8	<0.1	0.1	0.1
Total California share of food, beverages and tobacco	15.1	11.0	12.4	11.8

Source: U.S. Department of Commerce, Census Bureau, Economic Census, 2002.
http://www.census.gov/econ/census02/data/ca/CA003_31.HTM

^a Includes pet and agricultural animal feed.

^b Includes snack food, coffee, tea, syrup, condiment and spice manufacturing.

The direct plus indirect effects of agriculture

Agriculture creates significant ripple effects (i.e. multipliers) throughout California's economy. Each dollar earned within agriculture fuels a more vigorous economy by stimulating additional activity in the form of jobs, labor income and value added.

The Agricultural Issues Center utilized IMPLAN Pro[®] version 2.0 software and accompanying 2002 dataset to determine multiplier effects. IMPLAN utilizes a model developed by the USDA Forest Service¹ designed to model the interrelationships between the economic sectors in the state and regional economies. The model employs input-output tables to show transactions among sectors. For any given industry, the model enables quantification of outputs (value of production), jobs, labor income and value added both before and after taking into account the ripple effects on the entire economy. These ripple effects are expressed as a dollar value and as an industry multiplier. Industry multipliers are typically a ratio close to 2. For the agricultural production and processing industry there is a value added multiplier of 2.27. Thus for every dollar of value added in that sector, there is an additional \$1.27 added to the state economy. Ripple effects may also be measured in terms of jobs added to the economy.

Ripple, or multiplier effects are composed of three types of effects—direct, indirect and induced. Direct effects measure the direct outputs of a particular industry and thus are determined directly by that industry's inputs. Indirect effects are the secondary inter-industry effects that one industry has on another. For example, increases in fertilizer purchase by the vegetables, fruits and nuts subgroup indirectly results in the production of additional fertilizer as well as usage of additional natural gas to produce the fertilizer and increased production and transport of the gas.² These direct and indirect effects result in changes in population and income, which in turn affect household consumption. Induced effects are the changes in household consumption of goods and services measured in employment, income and value added.

The industry multipliers are essentially the ratio of total effects to direct effects for each industry. For example, in Table 5.5.A, the direct effect from agricultural production and processing was 744,920 jobs, and the total effect (direct, indirect and induced) was 1,445,357 jobs. In Table 5.5.B, these values are given as a share of the state economy. In Table 5.5.C, the employment multiplier was 1.94 (or additional 0.94 jobs created for every job in agricultural production and processing). Here we can see that the multiplier of 1.94 can be derived by dividing the total effect (1,445,357) by the direct effect (744,920).

¹ IMPLAN (Impact Analysis for PLANning) developed by the U.S. Department of Agriculture Forest Service, together with the Federal Emergency Management Agency and U.S. Department of Interior Bureau of Land Management. IMPLAN's secondary database is derived from published sources including the U.S. Department of Commerce, Bureau of Economic Analysis, U.S. Department of Labor Bureau of Labor Statistics and U.S. Department of Agriculture.

² Our analysis is limited by the data available for use with IMPLAN, including their industry aggregations.

There is an important caveat when interpreting the multiplier effects of particular industries. The total effects (direct, indirect and induced) and industry multipliers for aggregated subgroups are not equivalent to the sums of the individual subgroups. Agricultural activities are related in many ways, so when regional economic impacts of one industry are measured, effects associated with the production of other industries are also incorporated. Thus one industry's output becomes another industry's input. To avoid double counting, each industry must be separately analyzed to determine a unique "net effect" on the regional economy. This is why the total economic effect of farming is not the sum of the effects of each of the subgroups—field crops, vegetables, fruits, dairy, etc.

Multiplier effects differ by commodity because the production of some commodities may be related to more input and processing industries located within the state or region than others. Multipliers may also differ by region due to geographic dispersion of industries related to agriculture, differences in aggregate size of agriculture and type of commodities produced in that region. In addition, state multiplier effects do not reflect interactions with industries located out of state. Some industries may have a greater impact at the state level, while other industries may have broader geographic impacts, which are not included in the IMPLAN analysis for California.

Agriculture and the state economy

In 2002, California's multifaceted economy sold goods and services worth almost \$2.28 trillion, provided 19.8 million jobs, paid nearly \$915 billion in labor income (including employee compensation and proprietary income) and created \$1.39 trillion of value added (Table 5.5.A). Considering direct effects only, the agriculture production and processing industry combined accounted for 4.3 percent of the state output, 3.8 percent of the jobs, 2.5 percent of labor income, and 2.9 percent of value added in the state (Table 5.5.B).

When taking into account direct, indirect and induced effects, the measured share of agricultural production and processing increased to 7.3 percent of the 20 million jobs in the state, 5.6 percent of the state labor income, and 6.5 percent of the state value added. The total effects from agricultural production alone accounted for 4.2 percent of state employment, 2.5 percent of labor income and 2.7 percent of value added in the state economy.

Farming directly accounted for 1.2 percent (i.e. \$28.4 billion) of the state output. The highest valued subgroup within farming—vegetables, fruits and nuts—was worth \$15 billion in 2002, or 0.7 percent of the state output. The direct, indirect and induced effects of farming accounted for 2.6 percent (nearly 514 thousand jobs) of employment in California, 1.6 percent (\$14.3 billion) of labor income, and 2 percent (\$27.2 billion) of value added.

Vegetables, fruits and tree nuts accounted for 1.5 percent of state employment, 1 percent of labor income and 1.2 percent of value added after including indirect and induced effects. Similarly, the beef and dairy industry, the second largest group within farming, accounted

for \$1.8 billion in labor income and 105 thousand jobs, or 0.5 percent of state employment. The state and regional multipliers for the beef and dairy subgroup, which are presented in this chapter, are much higher than those for other industries. Two main factors contributed to this unusual result. First, by their nature, the beef and dairy industries, in contrast to many other agricultural industries, have a higher portion of purchased inputs (feed, animals) relative to direct labor income and value added. Second, the direct effect estimates were biased down for California because the IMPLAN database uses national parameters that reflect a large share of activity from very small, part time cattle farms contributing little or no value added. This makes estimations of total (direct, indirect and induced) effects seem higher in comparison to the direct effect estimations, and thus the multipliers are higher. For California, the beef and dairy multiplier was 7.39 for total labor income and 7.30 for total value added, when most other multipliers are closer to 2.³

Agriculture support activities comprise a number of activities closely related to agricultural production. Some are conducted on the farm, some are not. All of these support activities are managed by a separate firm, not by the farm's operator. They are reported here as a separate group as is done by the U.S. Census Bureau North American Industry Classification System (NAICS). Agricultural support activities include, for example, soil preparation when this is contracted out, but does not include field preparations activities done by the farm's operator. It also includes packing and cooling of agricultural products when conducted by a non-farm firm. On-farm contract labor is particularly important for California, considering how labor intensive are many of the most important crops produced in the state. Contract labor constitutes a large part of the support activity group. Under 2002 business conditions, the value added directly attributable to agricultural support services was smaller than labor income, \$4,273 million compared to \$5,197 million, suggesting that in 2002, the sector had negative return to other inputs (Tables 5.5.A and B).

³ Unfortunately, given the built-in industry aggregation of IMPLAN categories, the beef and dairy industries could not be analyzed as two distinct industries.

TABLE 5.5
Economic impact of California's agricultural production and processing, 2002

A. CALIFORNIA: Direct and total effects^a

	Direct Effects				Total Effects ^{b, c}		
	Industry output (sales) ^d	Employment ^e	Labor income ^f	Value added ^g	Employment	Labor income	Value added
	(\$million)	(jobs)	(\$million)		(jobs)	(\$million)	
Agricultural production and processing	97,722	744,920	22,553	39,646	1,445,357	51,227	90,194
Agricultural processing ^h	60,726	201,812	9,895	19,979	670,829	27,904	51,678
Agricultural production	36,996	543,108	12,658	19,667	822,879	22,843	37,769
Forestry, fishing, hunting	1,913	13,040	448	800	30,590	1,043	1,692
Ag-support activities ⁱ	6,731	221,819	5,197	4,273	300,351	8,200	9,277
Farming	28,352	308,248	7,013	14,594	513,542	14,283	27,173
Grains, oilseeds, cotton	1,201	16,134	213	519	27,727	608	1,161
Vegetables, fruits, nuts	14,977	164,333	4,279	9,100	298,868	8,881	16,407
Greenhouse and nursery	3,237	39,437	1,613	2,772	60,156	2,389	4,125
Other crops	2,698	21,736	497	1,393	44,806	1,291	2,695
Beef, dairy cattle	5,039	54,227	245	450	105,183	1,809	3,285
Other animals	1,199	12,381	166	361	20,458	483	928
Total California economy	2,281,194	19,831,054	914,708	1,389,164			

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset.

^a Nominal dollars.

^b Total effects include direct, indirect and induced effects of the industry named a left.

^c Values that utilize multiplier effects cannot be aggregated to get totals.

^d Industry output: value of production (i.e. total sales) by the group of industries named at the left.

^e Employment: number of jobs directly employed by the corresponding industry.

^f Labor income: value of wages and salaries and other proprietary income paid by industry.

^g Value added equals sum of labor income (employee compensation and proprietor income), property income and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

^h This group includes animal feed, food and beverage industries.

ⁱ Agricultural support activities includes contract labor, fertilizer and pesticides manufacturing, soil preparation and harvesting services, packing and cooling, and cotton ginning.

TABLE 5.5 (continued)

B. CALIFORNIA: Direct and total effects as share of state economy

	Direct Effects				Total Effects		
	Industry output (sales)	Employ- ment	Labor income	Value added	Employ- ment	Labor income	Value added
	(percent)						
Agricultural production and processing	4.28	3.76	2.47	2.85	7.29	5.60	6.49
Agricultural processing	2.66	1.02	1.08	1.44	3.38	3.05	3.72
Agricultural production	1.62	2.74	1.38	1.42	4.15	2.50	2.72
Forestry, fishing, hunting	0.08	0.07	0.05	0.06	0.15	0.11	0.12
Ag-support activities	0.30	1.12	0.57	0.31	1.51	0.90	0.67
Farming	1.24	1.55	0.77	1.05	2.59	1.56	1.96
Grains, oilseeds, cotton	0.05	0.08	0.02	0.04	0.14	0.07	0.08
Vegetables, fruits, nuts	0.66	0.83	0.47	0.66	1.51	0.97	1.18
Greenhouse and nursery	0.14	0.20	0.18	0.20	0.30	0.26	0.30
Other crops	0.12	0.11	0.05	0.10	0.23	0.14	0.19
Beef and dairy cattle	0.22	0.27	0.03	0.03	0.53	0.20	0.24
Other animals	0.05	0.06	0.02	0.03	0.10	0.05	0.07

Source: Table 5.5.A.

C. CALIFORNIA: Industry multipliers

	Employment	Labor income	Value added
Agricultural production and processing	1.94	2.27	2.27
Agricultural processing	3.32	2.82	2.59
Agricultural production	1.52	1.80	1.92
Forestry, fishing, hunting	2.35	2.33	2.11
Agriculture support activities	1.35	1.58	2.17
Farming	1.67	2.04	1.86
Grains, oilseeds and cotton	1.72	2.85	2.24
Vegetables, fruits and nuts	1.82	2.08	1.80
Greenhouse and nursery	1.53	1.48	1.49
Other crops	2.06	2.60	1.93
Beef and dairy cattle	1.94	7.39	7.30
Other animals	1.65	2.90	2.57

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and accompanying 2002 dataset.

See notes under Table 5.5.A.

Agriculture and regional economies

The Central Valley region, which includes the San Joaquin Valley in the south and Sacramento Valley in the north, is the largest agricultural region in the state. With \$42 billion output in 2002, Central Valley agricultural production and processing accounted for 43 percent of California's total agricultural production and processing while the Central Coast region accounted for 14 percent (\$14 billion). In comparison to the Central Coast, the Central Valley has a smaller total economy, so agriculture in the region directly accounts for a much greater share of the Central Valley economy.

Just as state multiplier effects do not include input and processing industries located out of state, regional multiplier effects do not reflect out-of-region interactions. This explains, in part, differences in regional multipliers. Moreover, as with state estimates based on IMPLAN's multipliers, which have been adjusted to avoid double counting, we again caution that one cannot determine regional effects by aggregating subgroups.

Central Valley

In 2002, agriculture production and processing industries in the Central Valley⁴ region directly provided close to 368 thousand jobs, \$9.2 billion in labor income, and \$16 billion in value added (Table 5.6.A). In other words, 15.6 percent of total regional output was directly attributable to the agricultural production and processing industry in the Valley, 12.6 percent of regional employment, and 10 percent of value added (Table 5.6B). Vegetable, fruit, and nut production is the largest farming industry in the Central Valley followed by the beef and dairy industry.

The Central Valley agricultural processing industry accounts for about one-third of the state's agricultural processing output. But when looking at the regional economy, the agricultural processing industry has a larger total impact in the Central Valley region than its overall impact in the state economy. Considering direct, indirect and induced effects, the Central Valley agricultural processing industry accounts for almost 8 percent of the regional employment, 7 percent of the regional labor income, and 9 percent of the regional value added, in contrast to less than 4 percent for valued added in the state as a whole.

The Central Valley employment multiplier of the agricultural production and processing industry was 1.91, which means that for every job in this sector 0.91 additional jobs were created in the Central Valley (Table 5.6.C). Twenty-four percent of regional jobs—about 704 thousand—were directly and indirectly supported by the industry. For value added, the production and processing multiplier was 2.21 and in total generated 22.2 percent of the regional economy's value added. The total impact of vegetable, fruit and nut production alone was estimated at nearly 7 percent (194 thousand jobs) of the overall regional employment, almost 5 percent (\$5.2 billion) of the labor income, and 6 percent (\$9.6 billion) of the regional output. The entire farming subgroup, including vegetables, fruit and nuts, had an estimated value added multiplier of 1.9 and directly and indirectly was responsible for 9.2 percent of the regional value added and 10 percent (nearly 303 thousand) of the jobs.

⁴ The Central Valley consists of Butte, Colusa, Fresno, Glenn, Kern, Kings, Madera, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, Tehama, Tulare, Yolo and Yuba counties.

TABLE 5.6
Economic impact of Central Valley agricultural production and processing, 2002^a

A. CENTRAL VALLEY: Direct and total effects in the region^b

	Direct Effects				Total Effects ^{c, d}		
	Industry output (sales) ^e	Employment ^f	Labor income ^g	Value added ^h	Employment	Labor income	Value added
	(\$million)	(jobs)	(\$million)		(jobs)	(\$million)	
Agricultural production and processing	41,964	367,700	9,159	16,016	703,804	20,168	35,410
Agricultural processing ⁱ	20,503	65,029	2,854	5,595	228,777	7,935	14,526
Agricultural production	21,460	302,671	6,305	10,421	495,857	11,903	20,546
Forestry, fishing, hunting	1,018	4,383	182	383	17,395	540	895
Ag-support activities ^j	3,793	139,868	2,824	2,308	188,116	4,317	4,746
Farming	16,650	158,420	3,298	7,730	302,566	7,334	14,719
Grains, oilseeds, cotton	1,132	14,679	200	489	29,280	586	1,079
Vegetables, fruits, nuts	9,066	89,314	2,352	5,377	194,256	5,169	9,573
Greenhouse & nursery	541	4,374	214	463	7,501	309	626
Other crops	1,685	12,799	300	871	31,835	810	1,664
Beef and dairy cattle	3,550	33,120	148	317	80,696	1,333	2,472
Other animals	676	4,133	84	212	8,696	226	466
Total Central Valley economy	268,917	2,912,659	108,895	159,416			

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset.

^a The Central Valley comprises San Joaquin and Sacramento Valleys. San Joaquin Valley is Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare counties. Sacramento Valley is Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Tehama, Yolo and Yuba counties.

^b Nominal dollars.

^c Total effects include direct, indirect and induced effects of the industry named a left.

^d Values that utilize multiplier effects cannot be aggregated to get totals.

^e Industry output: value of production (i.e. total sales) by the group of industries named at the left.

^f Employment: number of jobs directly employed by the corresponding industry.

^g Labor income: value of wages and salaries and other proprietary income paid by industry.

^h Value added equals sum of labor income (employee compensation and proprietor income), property income and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

ⁱ This group includes animal feed, food and beverage industries.

^j Agricultural support activities includes contract labor, fertilizer and pesticides manufacturing, soil preparation and harvesting services, packing and cooling, and cotton ginning.

TABLE 5.6 (continued)

B. CENTRAL VALLEY: Direct and total effects as share of regional economy

	Direct Effects				Total Effects		
	Industry output (sales)	Employment	Labor income	Value added	Employment	Labor income	Value added
				(percent)			
Agricultural production and processing	15.60	12.62	8.41	10.05	24.16	18.52	22.21
Agricultural processing	7.62	2.23	2.62	3.51	7.85	7.29	9.11
Agricultural production	7.98	10.39	5.79	6.54	17.02	10.93	12.89
Forestry, fishing, hunting	0.38	0.15	0.17	0.24	0.60	0.50	0.56
Ag-support activities	1.41	4.80	2.59	1.45	6.46	3.96	2.98
Farming	6.19	5.44	3.03	4.85	10.39	6.74	9.23
Grains, oilseeds, cotton	0.42	0.50	0.18	0.31	1.01	0.54	0.68
Vegetables, fruits, nuts	3.37	3.07	2.16	3.37	6.67	4.75	6.01
Greenhouse & nursery	0.20	0.15	0.20	0.29	0.26	0.28	0.39
Other crops	0.63	0.44	0.28	0.55	1.09	0.74	1.04
Beef and dairy cattle	1.32	1.14	0.14	0.20	2.77	1.22	1.55
Other animals	0.25	0.14	0.08	0.13	0.30	0.21	0.29

Source: Table 5.6.A.

C. CENTRAL VALLEY: Industry multipliers

	Employment	Labor income	Value added
Agricultural production and processing	1.91	2.20	2.21
Agricultural processing	3.52	2.78	2.60
Agricultural production	1.64	1.89	1.97
Forestry, fishing, hunting	3.97	2.96	2.33
Agriculture support activities	1.34	1.53	2.06
Farming	1.91	2.22	1.90
Grains, oilseeds and cotton	1.99	2.94	2.21
Vegetables, fruits and nuts	2.17	2.20	1.78
Greenhouse and nursery	1.71	1.44	1.35
Other crops	2.49	2.70	1.91
Beef and dairy cattle	2.44	9.00	7.80
Other animals	2.10	2.69	2.19

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset. See notes under Table 5.6.A.

San Joaquin Valley

The San Joaquin Valley⁵ regional output—including agricultural and non-agricultural industries—was \$148 billion in 2002. The total number of jobs was about 1.6 million, and the regional value added was \$83 billion. In this region, the relative importance of agricultural production and processing output of the region is larger than for the state as a whole or the Central Valley. Agricultural production and processing output in this region accounted for 34.8 percent of the agricultural production and processing in the state. The San Joaquin Valley agricultural production and processing industry's direct value added of \$12.7 billion (Table 5.7A) accounted for 15.3 percent of the value added in the regional economy, a much larger share than the 2.9 percent generated by the agricultural industry in the state.

Considering direct effects only, farming accounted for 9.2 percent of regional output, 8 percent of regional employment, and 7.4 percent of regional value added. Within the farming subgroup, vegetable, fruit, and nut production accounted for 5 percent of regional output, 4.6 percent of employment, and 5.3 percent of value added (Table 5.7.B).

The share of the total direct, indirect and induced effects on the regional economy attributable to agricultural production and processing was larger for the San Joaquin Valley than for any other region. Agricultural production and processing industries in the San Joaquin Valley accounted for 37.8 percent of regional employment, almost 30 percent of regional labor income, and 34.2 percent of regional total value added. Agricultural production alone supported 427 thousand jobs (26.9 percent of the region's jobs), generated \$10 billion in labor income (18.1%) and \$16.8 billion in value added (20.3%). The farming subgroup accounted for 15.5 percent of employment, 10.6 percent of labor income, and 14 percent of value added. Within farming, the vegetable, fruit, and nut industry in the San Joaquin Valley accounted for 10.1 percent of regional employment, 7.6 percent of labor income, and 9.2 percent of value added.

The San Joaquin Valley employment multiplier of the agricultural production and processing industry was 1.92, which means that for every 100 agricultural production and processing jobs in the San Joaquin Valley, 92 additional jobs were created in the region. The value added multiplier was 2.23 and labor income was 2.19 (Table 5.7.C).

⁵The San Joaquin Valley consists of Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare counties.

TABLE 5.7

Economic impact of San Joaquin Valley agricultural production and processing, 2002^a**A. SAN JOAQUIN VALLEY: Direct and total effects in the region^b**

	Direct Effects				Total Effects ^{c, d}		
	Industry output (sales) ^e	Employment ^f	Labor income ^g	Value added ^h	Employment	Labor income	Value added
	(\$million)	(jobs)		(\$million)	(jobs)	(\$million)	
Agricultural production and processing	34,005	313,277	7,567	12,698	601,102	16,580	28,345
Agricultural processing ⁱ	16,045	51,672	2,169	4,111	178,659	5,973	10,732
Agricultural production	17,960	261,605	5,398	8,587	422,260	10,033	16,836
Forestry, fishing, hunting	888	3,444	156	328	15,154	467	763
Ag-support activities ^j	3,447	130,858	2,560	2,085	174,076	3,843	4,156
Farming	13,625	127,303	2,681	6,174	245,542	5,883	11,648
Grains, oilseeds, cotton	815	8,368	146	349	19,127	419	755
Vegetables, fruits, nuts	7,380	73,077	1,946	4,388	160,132	4,192	7,658
Greenhouse & nursery	420	3,275	166	359	5,652	235	478
Other crops	1,147	9,224	208	592	22,481	548	1,108
Beef and dairy cattle	3,247	30,013	138	290	73,985	1,191	2,178
Other animals	617	3,346	77	197	7,450	201	416
Total San Joaquin Valley economy	147,716	1,588,703	55,411	82,999			

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset.

^a The San Joaquin Valley is Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare counties.

^b Nominal dollars.

^c Total effects include direct, indirect and induced effects of the industry named a left.

^d Values that utilize multiplier effects cannot be aggregated to get totals.

^e Industry output: value of production (i.e. total sales) by the group of industries named at the left.

^f Employment: number of jobs directly employed by the corresponding industry.

^g Labor income: value of wages and salaries and other proprietary income paid by industry.

^h Value added equals sum of labor income (employee compensation and proprietor income), property income and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

ⁱ This group includes animal feed, food and beverage industries.

^j Agricultural support activities includes contract labor, fertilizer and pesticides manufacturing, soil preparation and harvesting services, packing and cooling, and cotton ginning.

TABLE 5.7 (continued)

B. SAN JOAQUIN VALLEY: Direct and total effects as share of regional economy

	Direct Effects				Total Effects		
	Industry output (sales)	Employment	Labor income	Value added	Employment	Labor income	Value added
				(percent)			
Agricultural production and processing	23.02	19.72	13.66	15.30	37.84	29.92	34.15
Agricultural processing	10.86	3.25	3.91	4.95	11.25	10.78	12.93
Agricultural production	12.16	16.47	9.74	10.35	26.89	18.11	20.28
Forestry, fishing, hunting	0.60	0.22	0.28	0.40	0.95	0.84	0.92
Ag-support activities	2.33	8.24	4.62	2.51	10.96	6.94	5.01
Farming	9.22	8.01	4.84	7.44	15.46	10.62	14.03
Grains, oilseeds, cotton	0.55	0.53	0.26	0.42	1.20	0.76	0.91
Vegetables, fruits, nuts	5.00	4.60	3.51	5.29	10.08	7.56	9.23
Greenhouse & nursery	0.28	0.21	0.30	0.43	0.36	0.42	0.58
Other crops	0.78	0.58	0.38	0.71	1.42	0.99	1.34
Beef and dairy cattle	2.20	1.89	0.25	0.35	4.66	2.15	2.62
Other animals	0.42	0.21	0.14	0.24	0.47	0.36	0.50

Source: Table 5.7.A.

C. SAN JOAQUIN VALLEY: Industry multipliers

	Employment	Labor income	Value
Agricultural production and processing	1.92	2.19	2.23
Agricultural processing	3.46	2.75	2.61
Agricultural production	1.63	1.86	1.96
Forestry, fishing, hunting	4.40	2.99	2.33
Agriculture support activities	1.33	1.50	1.99
Farming	1.93	2.19	1.89
Grains, oilseeds and cotton	2.29	2.87	2.16
Vegetables, fruits and nuts	2.19	2.15	1.75
Greenhouse and nursery	1.73	1.42	1.33
Other crops	2.44	2.64	1.87
Beef and dairy cattle	2.47	8.60	7.51
Other animals	2.23	2.60	2.11

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset. See notes under Table 5.7.A.

Sacramento Valley

The total economy of the Sacramento Valley⁶ is similar in size to the economy of the San Joaquin Valley. In 2002 the Sacramento Valley economy recorded \$121.1 billion in total output, 1.3 million jobs, and \$53 billion in labor income (Table 5.8.A). The regional value added was \$76.4 billion. Agricultural production and processing output was about \$8.0 billion, employment was more than 54 thousand jobs, labor income was near \$1.6 billion, and value added was about \$3.3 billion. Agricultural production alone directly supported 41 thousand jobs, \$907 million in labor income and \$1.8 billion in value added. The Sacramento Valley accounted for 8.1 percent of the total state output from agricultural production and processing.

Considering the multiplier effects, the agricultural production and processing industry accounted for 96 thousand direct, indirect and induced jobs (7.2% of the regional total), and \$6 billion in value added (7.8%)(Table 5.8.A and 5.8.B). For this industry the employment multiplier was 1.76, the labor multiplier was 1.92, and value added 1.80 (Table 5.8.C). Agricultural production alone supported nearly 63 thousand direct, indirect and induced jobs (4.7 percent of the regional employment), 1.6 billion in labor income (3% of the regional labor income), and \$3.1 billion in value added (4% of the regional economy, Table 5.8.B).

In 2002, due to direct, indirect and induced effects, agricultural processing in the region was responsible for 41 thousand jobs, \$1.6 billion in labor income and \$3.1 billion in value added in the region—4 percent of Sacramento Valley's value added. Like the San Joaquin Valley and Central Valley, vegetables, fruits and nuts was the largest farming subgroup. Vegetables, fruit and nut production in the Sacramento Valley generated 2.1 percent (over 27 thousand) of the jobs in the region, 1.4 percent (\$767 million) of labor income and 2.1 percent (\$1.6 billion) of the value added.

⁶ The Sacramento Valley consists of Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Tehama, Yolo and Yuba counties.

TABLE 5.8

Economic impact of Sacramento Valley agricultural production and processing, 2002^a

A. SACRAMENTO VALLEY: Direct and total effects in the region^b

	Direct Effects				Total Effects ^{c, d}		
	Industry output (sales) ^e	Employment ^f	Labor income ^g	Value added ^h	Employment	Labor income	Value added
	(\$million)	(jobs)	(\$million)		(jobs)	(\$million)	
Agricultural production and processing	7,958	54,422	1,592	3,318	95,517	3,056	5,977
Agricultural processing ⁱ	4,458	13,356	685	1,484	40,819	1,575	3,084
Agricultural production	3,501	41,066	907	1,834	62,769	1,581	3,114
Forestry, fishing, hunting	130	939	26	55	2,059	61	113
Ag-support activities ^j	346	9,010	264	224	12,435	379	420
Farming	3,025	31,117	617	1,555	49,852	1,199	2,603
Grains, oilseeds & cotton	317	6,311	54	140	8,569	127	265
Vegetables, fruits & nuts	1,687	16,238	406	990	27,394	767	1,585
Greenhouse & nursery	121	1,099	49	104	1,675	67	138
Other crops	538	3,575	92	279	7,037	204	474
Beef & dairy cattle	303	3,107	10	27	5,762	82	170
Other animals	59	787	7	15	1,079	16	33
Total Sacramento Valley economy	121,201	1,323,956	53,484	76,417			

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset.

^a The Sacramento Valley is Butte, Colusa, Glenn, Sacramento, Solano, Sutter, Tehama, Yolo and Yuba counties.

^b Nominal dollars.

^c Total effects include direct, indirect and induced effects of the industry named a left.

^d Values that utilize multiplier effects cannot be aggregated to get totals.

^e Industry output: value of production (i.e. total sales) by the group of industries named at the left.

^f Employment: number of jobs directly employed by the corresponding industry.

^g Labor income: value of wages and salaries and other proprietary income paid by industry.

^h Value added equals sum of labor income (employee compensation and proprietor income), property income and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

ⁱ This group includes animal feed, food and beverage industries.

^j Agricultural support activities includes contract labor, fertilizer and pesticides manufacturing, soil preparation and harvesting services, packing and cooling, and cotton ginning.

TABLE 5.8 (continued)

B. SACRAMENTO VALLEY: Direct and total effects as share of regional economy

	Direct Effects				Total Effects		
	Industry output (sales)	Employment	Labor income	Value added	Employment	Labor income	Value added
	(percent)						
Agricultural production and processing	6.57	4.11	2.98	4.34	7.21	5.71	7.82
Agricultural processing	3.68	1.01	1.28	1.94	3.08	2.94	4.04
Agricultural production	2.89	3.10	1.70	2.40	4.74	2.96	4.07
Forestry, fishing, hunting	0.11	0.07	0.05	0.07	0.16	0.11	0.15
Ag-support activities	0.29	0.68	0.49	0.29	0.94	0.71	0.55
Farming	2.50	2.35	1.15	2.03	3.77	2.24	3.41
Grains, oilseeds & cotton	0.26	0.48	0.10	0.18	0.65	0.24	0.35
Vegetables, fruits & nuts	1.39	1.23	0.76	1.29	2.07	1.43	2.07
Greenhouse & nursery	0.10	0.08	0.09	0.14	0.13	0.13	0.18
Other crops	0.44	0.27	0.17	0.37	0.53	0.38	0.62
Beef & dairy cattle	0.25	0.23	0.02	0.04	0.44	0.15	0.22
Other animals	0.05	0.06	0.01	0.02	0.08	0.03	0.04

Source: Table 5.8.A.

C. SACRAMENTO VALLEY: Industry multipliers

	Employment	Labor income	Value added
Agricultural production and processing	1.76	1.92	1.80
Agricultural processing	3.06	2.30	2.08
Agricultural production	1.53	1.74	1.70
Forestry, fishing, hunting	2.19	2.37	2.05
Agriculture support activities	1.38	1.44	1.88
Farming	1.60	1.94	1.67
Grains, oilseeds and cotton	1.36	2.34	1.89
Vegetables, fruits and nuts	1.69	1.89	1.60
Greenhouse and nursery	1.52	1.39	1.33
Other crops	1.97	2.22	1.70
Beef and dairy cattle	1.85	8.43	6.28
Other animals	1.37	2.44	2.18

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset. See notes under Table 5.8.A.

Central Coast

With \$14 billion in output, the agricultural production and processing industry in the Central Coast region⁷ accounted for 14 percent of the agricultural production and processing in the state in 2002. Because the overall Central Coast economy is very large—22 percent of the state economy—the regional agricultural production and processing industry contributed a smaller share of the regional output than in either the San Joaquin or Sacramento Valley regions even though the value of agriculture in the Central Coast is larger than that in the Sacramento Valley industry.

Because it includes the relatively urban counties of Alameda and San Mateo, Central Coast agricultural production and processing directly produced only about 2.8 percent (\$14 billion) of the regional output, 3 percent (almost 111 thousand jobs) of regional employment, and 2.2 percent (\$6.7 billion) of the regional value added (Tables 5.9.A and 5.9.B).

Based on IMPLAN estimates, Central Coast agricultural production and processing has an employment multiplier of 1.66, meaning for every 100 jobs in the industry 66 jobs additional jobs are created in the region (Table 5.9.C). This amounted to 184 thousand jobs, or 5 percent of regional employment as the direct, indirect and induced result of agricultural production and processing in the region.

The industry's total impact on labor income was estimated as \$7.2 million (3.5 percent of regional labor income), and the impact on regional value added was \$12.6 million (4 percent of the regional value added). Regional agricultural production alone supported 3.1 percent (112 thousand jobs) of total regional employment, 1.8 percent (\$3.7 billion) of labor income, and 2 percent (\$6 billion) of value added. Farming accounted for 1.8 percent of employment, 1.1 percent of labor income, and 1.4 percent of value added.

⁷ The Central Coast consists of Alameda, Contra Costa, Monterey, San Benito, San Luis Obispo, San Mateo, Santa Clara and Santa Cruz counties.

TABLE 5.9

Economic impact of Central Coast agricultural production and processing, 2002^a**A. CENTRAL COAST:** Direct and total effects in the region^b

	Direct Effects				Total Effects ^{c, d}		
	Industry output (sales) ^e	Employment ^f	Labor income ^g	Value added ^h	Employment	Labor income	Value added
	(\$million)	(jobs)	(\$million)		(jobs)	(\$million)	
Agricultural production and processing	14,028	110,686	3,894	6,728	183,606	7,213	12,594
Agricultural processing ⁱ	8,371	30,069	1,464	3,023	38,118	3,131	5,673
Agricultural production	5,657	80,617	2,430	3,705	112,098	3,728	6,019
Forestry, fishing, hunting	138	1,589	31	59	2,387	62	105
Ag-support activities ^j	1,217	34,052	1,032	852	45,274	1,507	1,653
Farming	4,301	44,976	1,368	2,794	66,628	2,244	4,318
Grains, oilseeds, cotton	7	241	1	3	293	3	6
Vegetables, fruits, nuts	3,095	30,316	892	1,971	50,423	1,689	3,241
Greenhouse & nursery	882	9,935	442	755	14,439	629	1,082
Other crops	51	547	11	27	881	24	49
Beef & dairy cattle	185	2,447	10	17	3,524	46	81
Other animals	81	1,490	13	21	1,817	26	45
Total Central Coast economy	506,351	3,666,203	206,648	303,956			

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset.

^a The Central Coast consists of Alameda, Contra Costa, Monterey, San Benito, Santa Clara, Santa Cruz, San Luis Obispo and San Mateo counties.

^b Nominal dollars.

^c Total effects include direct, indirect and induced effects of the industry named a left.

^d Values that utilize multiplier effects cannot be aggregated to get totals.

^e Industry output: value of production (i.e. total sales) by the group of industries named at the left.

^f Employment: number of jobs directly employed by the corresponding industry.

^g Labor income: value of wages and salaries and other proprietary income paid by industry.

^h Value added equals sum of labor income (employee compensation and proprietor income), property income and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

ⁱ This group includes animal feed, food and beverage industries.

^j Agricultural support activities includes contract labor, fertilizer and pesticides manufacturing, soil preparation and harvesting services, packing and cooling, and cotton ginning.

TABLE 5.9 (continued)

B. CENTRAL COAST: Direct and total effects as share of regional economy

	Direct Effects				Total Effects		
	Industry output (sales)	Employment	Labor income	Value added	Employment	Labor income	Value added
	(percent)						
Agricultural production and processing	2.77	3.02	1.88	2.21	5.01	3.49	4.14
Agricultural processing	1.65	0.82	0.71	0.99	1.04	1.52	1.87
Agricultural production	1.12	2.20	1.18	1.22	3.06	1.80	1.98
Forestry, fishing, hunting	0.03	0.04	0.01	0.02	0.07	0.03	0.03
Ag-support activities	0.24	0.93	0.50	0.28	1.23	0.73	0.54
Farming	0.85	1.23	0.66	0.92	1.82	1.09	1.42
Grains, oilseeds & cotton	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Vegetables, fruits & nuts	0.61	0.83	0.43	0.65	1.38	0.82	1.07
Greenhouse & nursery	0.17	0.27	0.21	0.25	0.39	0.30	0.36
Other crops	0.01	0.01	0.01	0.01	0.02	0.01	0.02
Beef & dairy cattle	0.04	0.07	0.00	0.01	0.10	0.02	0.03
Other animals	0.02	0.04	0.01	0.01	0.05	0.01	0.01

Source: Table 5.9.A

C. CENTRAL COAST: Industry multipliers

	Employment	Labor income	Value added
Agricultural production and processing	1.66	1.85	1.87
Agricultural processing	1.27	2.14	1.88
Agricultural production	1.39	1.53	1.62
Forestry, fishing, hunting	1.50	2.01	1.77
Agriculture support activities	1.33	1.46	1.94
Farming	1.48	1.64	1.55
Grains, oilseeds and cotton	1.21	2.55	2.06
Vegetables, fruits and nuts	1.66	1.89	1.64
Greenhouse and nursery	1.45	1.42	1.43
Other crops	1.61	2.27	1.83
Beef and dairy cattle	1.44	4.86	4.93
Other animals	1.22	2.08	2.12

Source: UC Agricultural Issues Center, using IMPLAN Pro V.2.0 software package and 2002 dataset. See notes under Table 5.9.A.

California agriculture in the global context

California is one of the top 10 economies in the world. California's overall economy is larger than that of Brazil, Russia, Canada or Mexico. California ranks 9th in the world using gross domestic product (GDP)—where the United States as a whole is number one with or without California—and exchange rates adjusted for purchasing power of currency in the local economy (Table 5.10). Using market exchange rates California moves to sixth, well ahead of China and India (which move well down in the ranking) and just ahead of Italy.

Common currency units are necessary to compare GDPs across countries or states. Using market exchange rates can be misleading. For example, if the value of the Mexican peso were to fall by half compared to the U.S. dollar in a particular year, the gross domestic product measured in dollars would also fall by half. However, the change in the exchange rate would result from financial markets' fluctuations. It does not necessarily mean that Mexican workers or businesses are much poorer, particularly if they buy mainly local goods and services. Incomes and prices measured in pesos would likely change little and consumers and businesses would be affected only for the goods with imported components. As an alternative to market exchange rates, column 3 in Table 5.10 presents GDP purchasing power parity (PPP) terms, which uses rates of currency conversion that eliminate the differences in domestic price levels among countries. For comparison, column 5 lists GDP using market exchange rates.

Purchasing power parity exchange rates are especially useful when official market exchange rates are manipulated by governments. Countries

TABLE 5.10

Gross domestic product (GDP)^a of the top-15 economies of the world, 2004

Country	GDP purchasing power parity exchange rates ^b		GDP market exchange rates ^c	
	Rank	(\$ billion)	Rank	(\$ billion)
United States ^d	1	11,249.2	1	11,649.8
China	2	6,353.8	8	1,412.3
Japan	3	3,517.8	2	4,296.2
India	4	2,889.8	13	579.7
Germany	5	2,256.0	3	2,406.3
France	6	1,619.6	5	1,762.2
United Kingdom	7	1,606.1	4	1,797.6
Italy	8	1,537.7	7	1,470.9
California	9	1,490.7	6	1,543.8
Brazil	10	1,390.6	16	492.3
Russia	11	1,290.0	17	432.8
Canada	12	977.3	9	869.9
Mexico	13	929.1	11	626.1
Spain	14	903.0	10	842.1
South Korea	15	836.9	12	605.4

Source: UC Agricultural Issues Center based on International Monetary Fund and Bureau of Economic Analysis, U.S. Department of Commerce.

^a GDP is the market value of goods and services produced by labor and property in the individual country.

^b GDP, based on purchasing power parity (PPP) exchange rates.

^c GDP, based on market exchange rates.

^d Includes California

with heavy government control of the economy sometimes enforce official exchange rates that make their own currency artificially strong or artificially weak. In such cases, a purchasing power parity exchange rate is likely to be the most realistic basis for an economic comparison. Countries such as Japan, with inflated prices, see their agricultural GDP decline markedly by using the purchasing power parity approach. Note that even using the PPP approach the agriculture value-added measures have not been adjusted to reflect local agricultural prices relative to world prices—a very difficult adjustment because of differentiated product quality.

Even given a choice of exchange rate basis, there are many potential approaches to comparing the size of agriculture across different economies. One of these is agricultural value added. The World Bank publishes estimates on agricultural value added for more than 200 countries. These figures are based on the International Standard Industrial Classification (ISIC) division 1-5, which includes the cultivation of crops and livestock production as well as forestry, hunting and fishing. Using purchasing power parity exchange rates California ranks 9th among countries sorted by agricultural value added (Table 5.11).

California ranks 5th (tied with Italy) when the measure of agricultural value added is based on market exchange rates. Using market exchanges, developing countries (China, India, Indonesia and Brazil) fall dramatically. Note that Italy, Indonesia, Brazil and California are similar and their rank may change from year to year with changes in exchange rates or relative prices of farm commodities.

TABLE 5.11
Top-15 countries by agricultural value added,^a
average 2001-2003

Country	GDP purchasing power parity exchange rates ^b		GDP market exchange rates ^c	
	Rank	(\$ billion)	Rank	(\$ billion)
China	1	191.0	3	42.5
United States ^d	2	148.6	1	153.9
India	3	110.6	8	22.2
Japan	4	58.2	2	71.1
France	5	35.5	4	38.6
Italy	6	29.7	5	28.4
Indonesia	7	28.5	14	8.1
Brazil	8	27.7	13	9.8
California ^e	9	27.6	5	28.4
Mexico	10	23.0	10	15.5
Turkey	11	22.4	12	11.6
Germany	12	21.8	7	23.3
Spain	13	20.6	9	19.2
South Korea	14	20.1	11	14.5

Source: UC Agricultural Issues Center based on World Bank.

^a Agricultural value added by cultivation of crops and livestock production and forestry, hunting and fishing.

^b GDP, based on purchasing power parity (PPP) exchange rates.

^c GDP, based on market exchange rates.

^d Includes California.

^e The World Bank reports a U.S. value of \$148 billion, which is much higher than the U.S. Bureau of Economic Analysis (BEA) figure of \$100 billion. We adjusted the California value added number of about \$19 billion estimated by the BEA by the same proportion to yield \$27.6 billion.

The World Bank data also provides the agriculture share of GDP. Developing countries have a large agriculture share. California agriculture share of GDP at 1.4 percent is below that of other developed countries such as Australia, France and Italy, and similar to Japan and far below the developing countries such as Brazil or China and India (Table 5.12).

Using data from members of the Organization for Economic Cooperation and Development (OECD) (developed countries), California ranks 6th in gross value of agricultural production based on market exchange rates (Table 5.13). These data aggregate the individual members of the EU, therefore no data is available for member states such as France or Italy. The agricultural production value of the combined 25 members of the European Union is almost ten times larger than the California's production value. The value of California agriculture is four times larger than that of New Zealand. Developing countries are not part of the OECD database.

TABLE 5.12

Agriculture's contribution^a to GDP, selected countries and California, average, 2001-2003

Country	Agriculture's share of GDP
	%
United Kingdom	1.0
Germany	1.2
Japan	1.4
California	1.4
United States	1.6
Canada	2.3
France	2.7
Italy	2.8
Australia	3.6
South Korea	3.8
Mexico	4.1
Russian Federation	6.0
Brazil	6.3
Argentina	8.0
New Zealand	9.0
China	15.5
India	23.6

Source: UC Agricultural Issues Center based on World Bank and, for California, California Department of Finance.

^a Industry cultivation of crops and livestock production and forestry, hunting and fishing.

TABLE 5.13

Value of agricultural production, selected countries and California, average, 2001-2003

Country	Production value ^a
	(\$ million)
EU- 25 ^b	270,440
USA ^c	193,522
Japan	71,984
Mexico	31,754
Russia	29,608
California	28,576
South Korea	25,804
Canada	21,735
Australia	19,967
Ukraine	10,165
New Zealand	6,994

Source: UC Agricultural Issues Center based on OECD and for California, Economic Research Service, USDA.

^a Market exchange rates used.

^b Includes all 25 members of the European Union: Austria, Belgium, Czech Republic, Cyprus, Denmark, Estonia, France, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovenia, Slovakia, Spain, Sweden, and the United Kingdom.

^c Includes California.

Conclusion

California agriculture plays a major role in California's large and diverse economy. Farm activity is just a part of this role because upstream and downstream linkages mean that inputs both to farming and the processing and marketing of farm products depend on farm production in California.

In this chapter we show that farming, forestry, fishing and hunting account for about 1.5 percent of the gross state product. When we include activity closely related to farming and indirect effects, the share rises to 6.5 percent of the state value added. The shares are larger in the Central Valley and especially the San Joaquin Valley.

California agriculture is large compared to the economic activity generated by agriculture in other countries. California agriculture ranks between 5th and 9th among countries of the world, depending which currency exchange rates are used.