

# **Economics of the California Cut Flower Industry and Potential Impacts of Legal Cannabis**

**A Report Prepared for the California Association of Flower Growers and Shippers**



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## **Executive Summary**

Legal cannabis has been a part of the California agricultural landscape since November 1996 when the passage of Proposition 215 opened the door for cannabis cultivation for medical purposes in California. Since the fall of 2015, policy changes brought on by the California legislature, governor and voters have changed the landscape of legal cultivation in California. [We emphasize that changes to legal situation under California law does not change the fact that production, distribution and possession of cannabis remains illegal under federal law.]

Legal and taxed regulation of the production, distribution and marketing of cannabis for adult use and medical use within California is scheduled for January 2018. The total cannabis production in California is substantial, but the best estimates indicate that about 80% of production is shipped out of California and therefore will not participate in the legalization, taxation, and regulation of cannabis used within California. Nonetheless, a significant change is on the horizon. This change is raising questions about how cannabis will compete with other agricultural industries and perhaps provide opportunities. One industry with such questions is the California cut flower industry.

California is the largest cut flower producing state in the United States, accounting for about 80 percent of the country's production. About 95 percent of the cut flowers produced in California come from the Central and Southern Coast, with a majority of production done in greenhouse facilities. The impacts that the cut flower industry have on the California and regional economies are substantial.

Using a combination of public data and data provided by cut flower industry stakeholders, we find that the cut flower industry makes sizable contributions to the California economies and especially to regional economies in the Central and South Coast regions.

- In 2015, the direct value of output from sales of California cut flowers was about \$356 million or \$786 million when we include further ripples through the economy due to indirect impacts caused by input purchases and induced effects caused by further purchases from cut flower income.
- The California cut flower industry paid direct labor income that totaled \$145 million in 2015. Total labor income generated in the state from cut flower production and sales totaled \$300 million.
- The California cut flower industry contributed to employment in the state through 2,610 direct industry jobs. Total number of jobs supported by the cut flower industry activity within the state, when including indirect and induced effects, was 5,393.
- In summary, the California cut flower industry contributed \$154 million to California's GDP through direct value added and a contribution to the state economy of \$397 million.

The California cut flower industry is concentrated in six coastal counties (San Diego, Ventura, Santa Barbara, San Luis Obispo, Monterey, and Santa Cruz). Most of the direct economic activity in the industry is in those counties.

Changes in legal cannabis production in the counties that also grow cut flowers is most likely to be noticeable for greenhouse facilities, hired labor and management expertise. The magnitude of the impact will be determined in part by is the scale of the growth in legal cannabis production and the resources it is likely to command. The size of production of legal cannabis in California after January 2018 is subject to much uncertainty. Similarly, it is uncertain how much of that cannabis is likely to be produced in greenhouse facilities. For our assessments, we

assume that the volume of cannabis expected to be grown using mixed-light greenhouses is no more than 700,000 pounds. This estimate is likely at the high end of the range given estimates that much of California consumption will continue to be cultivated outside the legal system, outdoor and indoor production is likely to remain substantial, and most projections of cannabis consumption in California is below 3 million pounds.

Given estimates of about two ounces per square foot of greenhouse space, 700,000 pounds of cannabis flower output would use about 5.6 million square feet. Data indicate about 100 million square feet of California greenhouse use for cut flowers and another 100 million square feet of greenhouse space used for other crops in recent years. Thus, cannabis would use between 3 and 6 percent of the current greenhouse space used in California. Since greenhouse space can be expanded, this does not seem likely to be a major factor, after some initial adjustment. Moreover, competition for space within the major cut flower growing region of California will depend significantly on restrictions and taxes placed on cannabis cultivation by county regulations, which are currently being drafted.

Cultivation of cannabis is labor intensive. Using recent data on labor use in greenhouse cultivation, about 9,400 workers would likely be used to cultivate the 700,000 pounds of greenhouse cannabis. Given the size of the farm labor market (and the broader labor market in the region), 9,400 workers is a small share of the total labor pool. Farm labor markets are relatively tight now given low unemployment, but a significant part of the cannabis cultivation labor force will likely be drawn from the non-farm work force.

The biggest potential impact may be on demand for expertise in management of intensive greenhouse cultivation businesses. Reports from current managers say that cannabis is a

challenging plant to grow successfully. Managers with experience and knowledge of growing a variety of plants in a greenhouse setting and managing that operation will be especially valued.



## 1. Introduction

This report examines the California cut flower industry and the economic implications of legal, taxed, licensed and regulated cannabis production for medical and adult use in California.

Section 2 of this report explains that cannabis became legal for medical use in California more than 20 years ago and the law and regulation has evolved rapidly in the past few years after little change in the previous almost two decades<sup>1</sup>. Section 2 also summarizes recent estimates of cannabis production and consumption in 2016, and documents that the bulk of California-produced cannabis is shipped out of California and another significant quantity is sold illegally in California. The three main types of cannabis cultivation, outdoor, indoor and mixed-light greenhouse, have different yields per crop area and different use of labor and other inputs per unit of output. These differences are also reflected where cannabis is grown in the state. With passage of recent legislation, cannabis regulation and taxation is nearing implementation in January 2018. We present current assessments of proposed and actual state and local taxes on the cultivation of cannabis for the legal market.

Section 3 describes the California cut flower industry. We use public data at the national, state and county level, to show that most cut flowers consumed in the United States are imported, but most U.S. production occurs in California. Within California, production occurs in the Central and South Coast regions. A series of charts show how revenues have changed over the recent past. Following this description, we use primary data collected from members of The California Association of Flower Growers and Shippers as input to our models that detail the contributions of the \$350 million cut flower industry to the California and regional economic activity and jobs.

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<sup>1</sup> We emphasize at the outset that we refer in this report to the status of cannabis production and distribution under California state laws and regulations. As of August 2017, production, distribution and consumption of cannabis remains illegal under U.S. federal law.

Section 4 shows the potential competition for resources or opportunities caused by further legalization, taxation and regulation of cannabis in California. We show that expansion of legal cannabis is likely to use a small share of the limited resources and create limited opportunities in relation to cut flowers in California. We focus on competition for labor and greenhouse space.

## **2. Legal Cannabis in California**

Cannabis has been legal to produce and consume under California state law since November 1996. That was when California voters passed Proposition 215, the California Compassionate Use Act (CCUA) making California the first state in the United States to authorize the legal possession and consumption of cannabis products for medical treatment purposes (Table 2.1).

Under the CCUA, as it evolved with definitions and interpretations, qualified users and caregivers who possessed or cultivated cannabis as recommended by a physician were exempt from state and local criminal laws which would otherwise prohibit possession or cultivation of cannabis. The act also provided physicians who recommended use of cannabis for medical treatment protection from punishment. Sales of medical cannabis products under the CCUA were subject to state and local sales taxes and regulation of the medical cannabis market was primarily under local, county, and municipal jurisdictions.

In October 2015, the state of California enacted the Medical Cannabis Regulation and Safety Act (MCRSA), which shifted a large share of the regulating, licensing, and taxing of medical cannabis products to the State of California. The new regulation and licensing of medical cannabis cultivation, manufacture of cannabis products and testing, and distribution and retailing were to go into effect on January 1, 2018.

On November 8, 2016, California voters approved Proposition 64, the Adult Use of Marijuana Act (AUMA), legalizing under state law the commercial cultivation, manufacture, and sale of cannabis products for recreational purposes. In June 2017, the Medicinal and Adult Use Cannabis Regulation and Safety Act (MAUCRSA) combined the institutional frameworks for regulating, licensing, and taxing medical and adult use cannabis in California.

## **2.1 California Cannabis Market**

Using data from growers and market experts, the projected volume of 2016 California production was estimated to be about 13.5 million pounds of utilized cannabis (flowers and leaf trim) annually (Table 2.2). The North Coast of California accounts for about 31 percent of total statewide production. The Intermountain Region contributes an additional 30 percent of total production in California (Figure 2.1). In comparison, the Central and Southern Coast area of California, where most cut flowers are grown, accounts for about 15 percent of statewide cannabis production volume.

We estimate that in 2016, the legal medicinal market accounted for about 583,000 pounds or 4 percent of California's production. Another 13 percent, or 1.75 million pounds of cannabis was acquired in California but outside the medical market. The remaining 11 million plus pounds of California production was sold out of state.

## **2.2 Cannabis Production in California**

There are three main categories of cannabis cultivation: outdoor production under natural sunlight, greenhouse production using a combination of artificial lighting and sunlight, and indoor production using artificial grow lamps.

### **2.2.1 Outdoor Cultivation**

Outdoor cultivation is especially suited for areas with open land. Outdoor cannabis production has been the primary cultivation method in the Emerald Triangle counties of Humboldt, Mendocino, and Trinity (MacEwan et. al, ERA Economics, 2017). Outdoor production occurs in other counties across the state as well. The practices and growing conditions vary based on location. Like most outdoor commodity production, the outdoor

cultivation of cannabis is limited to one annual season with one harvest. The season starts with planting around February and runs through harvest in October and November. Due to the nine-month growing season cannabis plants cultivated outdoors grow large relative to greenhouse or indoor cultivated plants. Producers can grow outdoor cannabis directly in soil or in pots that allow the plants to be moved if necessary. Plants are sometimes grown within temporary plastic-covered hoophouse structures to reduce mold and mildew if the site experiences unexpected precipitation.

Outdoor yields of marketable material per plant are larger than indoor and mixed-light production. Average yields for outdoor production are about .365 ounces per square foot (MacEwan et. al, ERA Economics, 2017).

The largest production cost for outdoor cultivation of cannabis is labor. Outdoor cultivators pay an hourly rate between \$15 and \$30 for fulltime employees (MacEwan et. al, ERA Economics, 2017). Trimmers are hired seasonally at harvest to trim leaves from the cannabis flowers. Depending upon the skill of the trimmer it can take between four to twelve hours to trim a pound of flowers.

### 2.2.2 Indoor Cultivation

Indoor production allows for a controlled environment, which can produce consistent results from one harvest to the next. Growing indoors allows for control of artificial light and length and frequency of dark periods. In addition, indoor producers can control grow mediums, moisture, temperature, and harvest cycles to find the optimal mix of conditions for each cannabis strain. The primary source of additional costs for indoor production is energy required to run the artificial light and other mechanized systems. In addition, producing indoors increases the risk of mold, mildew, pests, and diseases. Just as indoor settings create a controlled, ideal

environment for the plants to grow, it also creates a prime atmosphere for pests and parasites to infest the grow room.

The confined nature of an indoor canopy space limits the plant spacing for indoor cultivation relative to that of outdoors or greenhouse cultivation. Plants use between one and fifteen square feet. Closer spacing limits plant size and yield from a few ounces up to two pounds, averaging around a half pound per plant, with multiple plant harvests per year. By controlling the light and dark periods of the plants, cultivators can have four to six harvests per year.

The year-round continuous cultivation for an indoor growing operation requires additional full time rather than seasonal labor compared to outdoor cultivation.

### 2.2.3 Greenhouse Cultivation

Like indoor cultivation, greenhouse, or what is often called “mixed-light” cultivation, allows for year-round production with various cycles of growth and harvest occurring simultaneously. The natural light passing through the enclosed structures raises the temperature inside greenhouse facilities and generates enough heat for the plants to produce in the late winter and early spring. This heat, in conjunction with artificial light, enables more regulated crop cycles. Greenhouse cultivators can generate three to four harvests per year with annual yields per square foot between 1.3 to 2.2 ounces according to industry sources. Like indoor production, greenhouse cannabis cultivation requires year-round labor to maintain plants, harvest crops, and trim leaves from cannabis flowers.

## 2.3 Taxes and Regulations on Cannabis Cultivation

The Medical Cannabis Regulation and Safety Act (MCRSA), the Adult Use of Marijuana Act (AUMA), as amended and superseded by the Medicinal and Adult Use of Cannabis Regulation and Safety Act (MAUCRSA) gives the state authority to tax and regulate medical and adult use cannabis in California.

In addition to allowing the state to tax and regulate the legal cannabis industry, MAUCRSA also provides for county and municipal governments around California to permit, tax, and regulate the legal cannabis industry. If the cannabis industry is allowed in a jurisdiction, local governments can set the restrictions or limitations on cannabis production and other commerce and the local taxes and fees.

Local and county taxation and regulations are subject to change before January 2018. However, a summary of currently applied or planned taxes and regulations is informative. We constructed a snapshot of the situation as of August 2017.

The MAUCRSA sets a state level cultivation tax of \$9.25 per ounce, or \$148 per pound, of cannabis flowers (Table 2.3). Using a range of yields from greenhouse growth of cannabis provided by industry sources, the range of cultivation tax per square foot of greenhouse production goes from \$12.22/ft<sup>2</sup> for low yielding strains to \$20.38/ft<sup>2</sup> for higher yielding strains, with an average state cultivation tax rate of \$18.50 /ft<sup>2</sup> (Table 2.3)

Local taxes on greenhouse cultivation of cannabis, as of August, 2017, average about \$120 per pound. Using the range of yields per square foot of greenhouse space, it is estimated that local taxes add between \$9.90 and \$16.50 per square foot to the state level taxes.

Combining both the state and average local cultivation taxes, commercial greenhouse cannabis

cultivation per square foot is estimated to range from about \$22.12/ft<sup>2</sup> for low yielding strains up to \$36.88/ft<sup>2</sup> for higher yielding strains (Table 2.3).

The six main cut flower-producing counties in California are in the process of setting local rules and taxes for cannabis production (Table 2.4). Because outdoor and greenhouse cannabis production would occur in rural areas it will most likely be governed by county ordinances. The information in Table 2.4 was solicited from each counties' planning department and county codes.

Of the six counties listed, only San Diego County has passed an ordinance to ban commercial cultivation of cannabis. Four of the remaining five counties, Monterey, San Luis Obispo, Santa Cruz and Santa Barbara currently allow some legal cannabis cultivation for the medical market and are in the process of developing regulations and setting tax rates for adult use cannabis cultivation. Ventura County does not currently allow any cannabis cultivation, but is drafting regulations to allow cultivation for the medical market. There is no immediate plan to allow adult use cultivation in Ventura County.

Each of the five counties that have enacted or are drafting regulations to permit legal cannabis cultivation for the medical market specify restrictions within their specific ordinances on the scope and method of cannabis cultivation allowed (Table 2.5). Some restrictions are vital to the economics of greenhouse production. Important restrictions in place or under consideration include, limits on greenhouse area per license, limits on the number of licenses issued by the county, and construction limits for new greenhouses. Canopy size limits per license are explicit in ordinances from Monterey, Santa Cruz and Santa Barbara Counties and in pending regulations from Ventura County. Each of these counties restrict production area per license to 22,000 square feet, or just over a half acre. In San Luis Obispo County, the number of



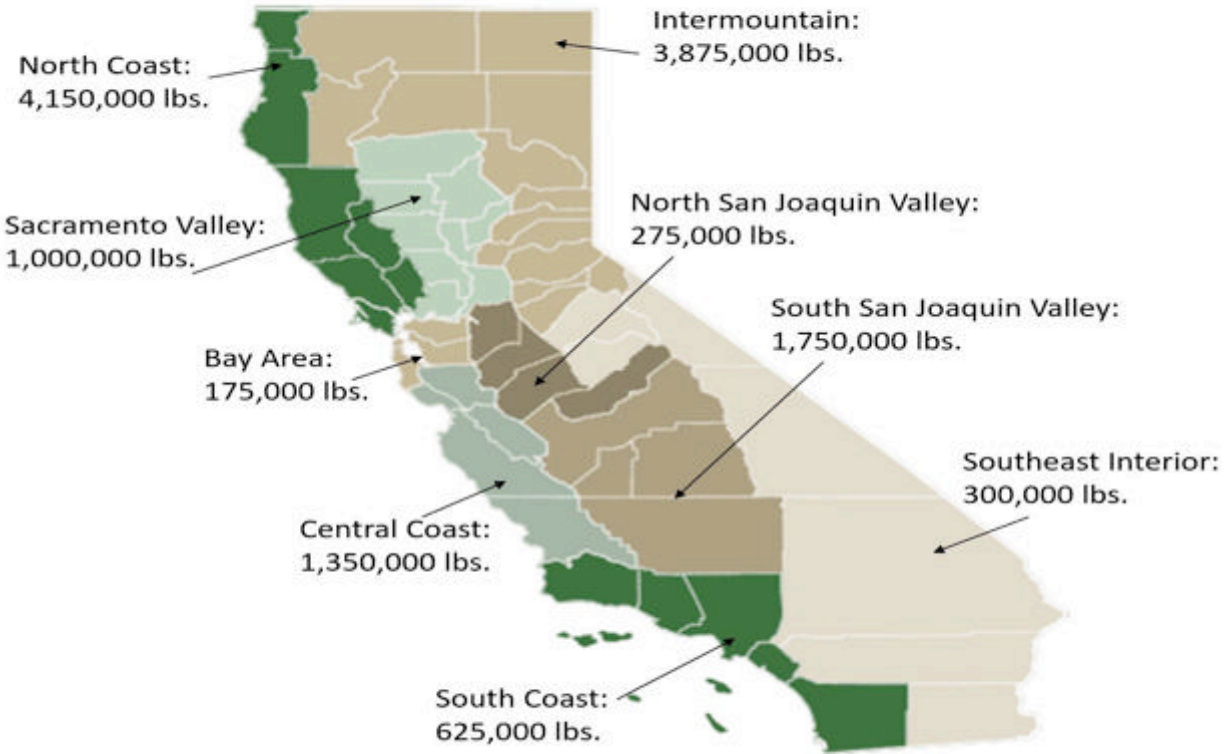
total licenses available in the county is limited to 100. Combined with the size limits per license this would equate to about 50 acres of production allowed at any one time within the county. In Ventura County, total cannabis canopy size in the county is not to exceed 100,000 square feet, which when combined with canopy size limits per license holder would equate to five cultivation licenses for the whole county (Table 2.5). In addition, Ventura County draft regulations only allow for indoor cultivation under artificial lighting.

Three of the five counties, San Luis Obispo, Santa Barbara and Ventura, which have regulations in place or are drafting regulations, have yet to announce cultivation taxes as of August 2017. Monterey County has set cultivation taxes at \$15/ft<sup>2</sup> of canopy size permitted per year. With the current restriction of 22,000 square feet of maximum canopy this equates to a county tax of \$330,000 annually. This tax rate is scheduled to increase by \$5.00/ft<sup>2</sup> per year in 2020 and 2021 to a maximum of \$25/ft<sup>2</sup>. From 2022, onward the tax increases annually at a rate matching San Francisco Bay Area inflation (Table 2.6). In contrast, the Santa Cruz County cultivation tax is equal to 7 percent of the gross revenues earned by commercial growers. Using the average yield of 2 ounces per square foot and a wholesale price of \$1,500 per pound of cannabis, the cultivation tax of 7 percent gross revenue equates to \$13.12/ft<sup>2</sup>.

Some municipal governments have set cultivation tax rates for cultivation within city boundaries. In Monterey County, five municipalities have established cultivation tax rates (Table 2.7). San Luis Obispo, Santa Barbara, and Ventura Counties each have one municipality that has established tax rates for cultivation, while Santa Cruz County has two established municipal-level rates. For Santa Cruz and Monterey Counties, the municipal rates match or exceed county rates.

Overall the tax and regulation environment adds substantially to anticipated costs of cultivation, distribution and retailing of legal cannabis in California now and especially beginning in 2018.

**Figure 2.1 Map of Estimated California Cannabis Production by Region**



Source: MacEwan et. al, ERA Economics (2017)

**Table 2.1 History of Legal Cannabis in California**

<b>Date</b>	<b>Legal Event</b>	<b>Features</b>
November 5, 1996	Californians approved Proposition 215, the California Compassionate Use Act	First medical cannabis law in U.S. Allows patients with a doctor's recommendation to possess and cultivate marijuana for personal medical use. The law evolved to allow a system of cultivation and distribution through medical dispensaries. Sale of medical cannabis products were subject to California sales tax.
October 9, 2015	The Medical Cannabis Regulation and Safety Act.	Tasks state agencies to regulate, license and tax the cultivation, manufacture, distribution, testing, transport and sales of medical cannabis products in California. Regulations are to take effect on January 1, 2018
November 8, 2016	Californians pass Proposition 64, The Adult Use of Marijuana Act	Authorizes the legal possession of one ounce of cannabis for individuals over 21. Specifies the regulation, taxation and licensing of commercial cultivation, manufacture and sale of adult use cannabis in California.
June 27, 2017	Medicinal and Adult Use Cannabis Regulation and Safety Act.	Combines regulation, licensing and taxation of medical and adult use cannabis markets under one law. Exempts medical cannabis from state sales tax but other taxes and regulations apply.

Source: Authors' summaries

**Table 2.2 Estimated Quantities of Cannabis Produced and Consumed in California in 2016 by Market Segment**

<b>Market Segment</b>	<b>Volume of Cannabis (in million pounds)</b>	<b>Share of California production</b>
California medical market consumption	0.58	4.3%
Other California consumption	1.75	13.0%
Total California consumption	2.33	17.3%
Shipments of California production out of state	11.17	82.7%
Total cannabis produced in California	13.50	100%

Source: Authors' estimates based on information in the Standardized Regulatory Impact Assessments by MacEwan et. al, ERA Economics (2017) and UC AIC (2017).

**Table 2.3 State and Average Local Level Cannabis Greenhouse Cultivation Taxation Summary as of August 2017**

Taxing of Cannabis Cultivation	Value
State cultivation tax per ounce of cannabis produced	\$9.25
Ounces produced per square foot	
Low yield	1.32
Average yield	2.00
High Yield	2.20
State cannabis cultivation tax per square foot	
Low yield	\$12.22
Average yield	\$18.50
High Yield	\$20.38
Local cultivation tax per pound (state average)	\$120.00
Average local cultivation tax per square foot	
Low yield	\$9.90
Average yield	\$15.00
High Yield	\$16.50
Total cultivation tax per square foot of cannabis growth	
Low yield	\$22.12
Average yield	\$33.50
High Yield	\$36.88

Source: State tax rate comes from MAUCRSA, yield per square foot comes from industry sources, state cannabis cultivation tax per square foot is a estimated by authors, local cultivation tax rate is estimated by AIC staff using data provided by CannaRegs.

**Table 2.4 State of Legal Cannabis Cultivation in Unincorporated Areas of the Six Major Flower Producing Counties in California as of August 2017**

County	Current Status of Legal Cannabis Cultivation	
	<u>Medical Cannabis</u>	<u>Adult Use Cannabis</u>
Monterey	Allowed	Developing regulations to allow in January 2018
San Diego	Passed ordinance to not allow	Passed ordinance to not allow
San Luis Obispo	Allowed	Developing regulations to allow in January 2018
Santa Barbara	Allowed	Developing regulations to allow in January 2018
Santa Cruz	Allowed	Developing regulations to allow in January 2018
Ventura	Developing regulations	Passed temporary ordinance to not allow. No timeline for regulations to be developed.

Source: Current status of legal cannabis cultivation by county comes from information provided by the various county planning offices websites and county codes.

**Table 2.5 Restrictions on Cannabis Cultivation in Unincorporated Areas of the Six Major Flower Producing Counties Where Legal Cannabis Cultivation is Allowed or Pending as of August 2017**

County	Cultivation Restrictions
Monterey	<ul style="list-style-type: none"> <li>• Greenhouse cannabis canopy size cannot exceed 22,000 square feet</li> <li>• Cannabis cultivation may only occur indoors or in mixed-light greenhouse.</li> <li>• New construction of greenhouse or indoor facility for purpose of cannabis cultivation is allowed</li> <li>• Must use indoor or greenhouse facility that was permitted or legally established prior to January 1, 2016.</li> <li>• Greenhouse or industrial building may be improved for cannabis cultivation provided the footprint of existing greenhouse or industrial building does not change.</li> </ul>
San Diego	<ul style="list-style-type: none"> <li>• Cultivation Not Permitted</li> </ul>
San Luis Obispo	<ul style="list-style-type: none"> <li>• Limited to 100 permitted cannabis cultivation operations within the county at any one time</li> <li>• No limit on greenhouse canopy size</li> <li>• Outdoor cultivation allowed</li> <li>• Indoor and greenhouse cultivation must use renewable energy source to offset 50% of energy demand for cultivation.</li> </ul>
Santa Barbara	<ul style="list-style-type: none"> <li>• Greenhouse cannabis canopy size cannot exceed 22,000 square feet</li> <li>• Outdoor cultivation allowed</li> </ul>
Santa Cruz	<ul style="list-style-type: none"> <li>• Greenhouse cannabis canopy size cannot exceed 22,000 square feet</li> <li>• New construction of greenhouse or indoor facility in costal zones for purpose of cannabis cultivation is allowed</li> </ul>
Ventura	<ul style="list-style-type: none"> <li>• Total cannabis canopy size within county may not exceed 100,000 square feet at any one time</li> <li>• Canopy size per license may not exceed 22,000 square feet</li> <li>• Only indoor cultivation allowed. No greenhouse or outdoor cultivation allowed</li> </ul>

Source: Current status of legal cannabis cultivation by county comes from information provided by the various county planning offices websites and county codes.



**Table 2.6 Taxes on Legal Cannabis Cultivation in Unincorporated Areas of the Six Major Flower Producing Counties Where Legal Cannabis Cultivation is Allowed or Pending as of August 2017**

County	Taxes on Greenhouse Cultivation of Cannabis
Monterey	<ul style="list-style-type: none"> <li>• Jan 2017 to June 2020: \$15/ft<sup>2</sup> of cannabis canopy permitted per year</li> <li>• July 2020: Tax rate shall increase \$5.00/ft<sup>2</sup> per year to a maximum of \$25/ft<sup>2</sup></li> <li>• July 2022: Tax shall increase annually by equal percentage of increase in Consumer Price Index for San Francisco Bay Area.</li> </ul>
San Diego	Cultivation not permitted
San Luis Obispo	Tax rate not yet determined
Santa Barbara	Tax rate not yet determined
Santa Cruz	7 percent of gross revenue earned from cannabis business
Ventura	Tax rate not yet determined

Source: Current status of legal cannabis cultivation by county comes from information provided by the various county planning offices websites and county codes.

**Table 2.7 Taxes on Legal Cannabis Cultivation in Municipalities within the Six Major Flower Producing Counties Where Legal Cannabis Cultivation is Allowed or Pending as of August 2017**

County and Municipality	Taxes on Greenhouse Cultivation of Cannabis
Monterey Gonzales Greenfield King City Salinas Seaside	 \$15 /ft <sup>2</sup> \$25 /ft <sup>2</sup> \$18 /ft <sup>2</sup> \$15 /ft <sup>2</sup> 10 % of gross revenue
San Diego	Cultivation not permitted
San Luis Obispo Grover Beach	 \$25 /ft <sup>2</sup>
Santa Barbara City of Santa Barbara	 20% of gross revenue
Santa Cruz City of Santa Cruz Watsonville	 7% of gross revenue \$20 /ft <sup>2</sup>
Ventura Fillmore	 \$20 /ft <sup>2</sup>

Source: Data on municipal level taxes comes from CannaRegs

### **3. The California Cut Flower Industry, Data and Analysis**

This section describes the economic position of the California cut flower industry and its role in supplying flowers to the U.S. market. We also describe where cut flower production takes place in California and trends in cut flower production. Finally, using data provided by a survey of firms within the California cut flower industry, we analyze the economic impact of the cut flower industry on state and regional economies.

#### **3.1 The U.S. and California Cut Flower Market**

From 2004 to 2015 the U.S. cut flower wholesale value has grown from \$1.12 billion to about \$1.36 billion in 2015 (Figure 3.1). Cut flower sales over this period grew an average of about 2 percent per year. Most of the gains in sales occurred after the global economic recession from 2009 to 2013 when wholesale value of cut flower sales grew 23 percent in four years (Figure 3.1).

Most of the cut flowers sold in the United States are imported and most of the growth in U.S. cut flower market over the past decade has come from increased sales of imported cut flowers. In 2004, value of imports was about \$706 million and by 2015 the value of cut flower imports had grown to \$988 million, an increase of about 40 percent (Figure 3.1). While cut flower imports were increasing, the value of U.S. production remained relatively flat. In 2004 U.S. production accounted for 37 percent of cut flowers sold in the U.S. and by 2015 U.S. producers' share had dropped to 27 percent (Figure 3.2).

Most of the cut flowers imported to the U.S. market in 2015 came from Colombia, with Ecuador being the other large source of imports (Figure 3.3). Colombia and Ecuador combined accounted for about 82 percent of cut flowers imported into the United States in 2015 and about 60 percent of sales of cut flowers in the U.S. market.

Since 2004, California has accounted for an average of 76 percent of U.S. cut flower production (Figure 3.4), with California production around \$300 million annually. According to industry sources, almost all cut flowers produced in California are sold in the Western United States, with a significant share of sales within California.

### **3.2 The California Cut Flower Industry**

This section examines the California cut flower industry including production and preparing cut flowers for the wholesale market.

#### **3.2.1 State Production**

The USDA reports farm revenue earned from cut flower production in California in its annual Floriculture Crops Summary (Table 3.1). The wholesale value of some cut flowers produced in California reported by the USDA for 2015 was just over \$238 million. The USDA withholds information to avoid disclosure of information about individual operations, and therefore, the actual value of wholesale production greater than \$238 million. The California Department of Food and Agriculture reports the USDA data in the annual Agricultural Statistics Review (CDFA ASR) for the 2015-2016 crop year (CDFA, 2016). While the values in Table 3.1, including the \$238 million total, are listed in the Annual Statistical Review, the introduction to the Floriculture section of the Review states that the 2015 wholesale value of cut flower production in California in 2015 was \$294 million (CDFA, 2015, pg. 52). The reported total reflects the additional value of production of varieties of flowers not reported by the USDA.

A second source of data about the California cut flower industry is from the annual crop reports issued by the California County Agricultural Commissioners. This source of data provides information on the value of production and area of cut flowers in each reporting county.

Complete data for the 2015 crop year is the most recent available although some counties have reported data for 2016. Eleven counties reported commercial production of cut flowers within the county for 2015 (Table 3.2).

Cut flower production in these 11 counties totaled over \$355 million in 2015. This total is about \$117 million more than the USDA California figure and \$61 million more than the total in the CDFA Review. For this report, we will rely on the County Agricultural Commissioners' annual crop reports. The detailed nature of the information provided in these reports provides a measure from the main areas of cut flower production.

### 3.2.2 Regional Production

Although cut flower production is reported in eleven counties in California, almost all commercial production of cut flowers occurs in the top six counties of Monterey, San Diego, San Luis Obispo (SLO), Santa Barbara, Santa Cruz, and Ventura. In 2015, production of cut flowers in these six counties accounted for \$337 million or 95 percent of total cut flower production in California.

Cut flower revenues have been steady or declining in five of the top six counties (Figure 3.5). From 2010 to 2015, Santa Barbara County revenue was between \$107 and \$105 million. In 2016 production was \$75 million (Santa Barbara County Crop Report, July 2017). Monterey County also reported a sharp decline in cut flower production from 2015 to 2016 (Monterey County Crop Report, July 2017). The remaining four counties have yet to release their crop estimates for 2016.

San Diego County and Santa Cruz County have shown gradual declines in wholesale values of cut flower production since 2010. San Diego County reported revenue of \$77 million in 2010, which rose to about \$82 million in 2012 before falling to \$71 million in 2015. Santa

Cruz County revenue fell from \$77 million in 2010 to \$50 million in 2015. San Luis Obispo showed a slight upward trend in revenue. In 2010 SLO County had sales of \$23 million which grew to \$28 million by 2015 (Figure 3.5).

In the annual county crop reports some counties separate production area between outdoor acres and greenhouse square feet, but most counties report only one number that is a combination of both greenhouse and outdoor production. The total combined area in California for cut flower production in 2015 was 7,200 acres (Table 3.3). The top six cut flower producing counties in California utilized 6,700 acres, or about 93 percent of total cut flower production acreage in the state. San Diego County has the greatest amount of cut flower production space with 3,805 acres harvested in 2015. The next five counties in order of production area are Santa Barbara, Ventura, Monterey, Santa Cruz, and San Luis Obispo.

From 2010 to 2015 the amount of production area dedicated to cut flower production has had a similar steady to declining trend as in revenues (Figure 3.6). San Diego County has maintained production area between 3,800 and 3,900 acres from 2010 to 2015. Cut flower production area in Santa Barbara County has decreased by about 24 percent since 2010. In 2010, production area was reported at just over 1,500 acres and by 2016 the production area had decreased to around 1,160 acres in total. Three of the remaining four counties saw similar declines in production space with the exception being San Luis Obispo whose producers maintained between 200 and 220 acres of production between 2010 and 2015.

### **3.3 California Cut Flower Industry Impact on California Statewide and Regional Economies**

In this section, we examine how the cut flower industry contributes to the California economy and regional economies within California. We center the analysis on California farms

that supply cut flowers to the wholesale market. Other related industries provide materials or services to the cut flower industry and closely aligned wholesale and retail firms sell cut flower products.

We use an input-output model and data to quantify relationships across the economy and to specify how the cut flower industry relates to other industries in California. Box 3.1 provides definitions of economic effects and multipliers based on the IMPLAN (2016) model information. To measure the total economic contribution of the California cut flower industry we designed and used a survey to collect information from a sample of firms that engage in growing of cut flowers in California. Table 3.4 aggregates and summarizes the data collected from participating firms. This data was applied to the input-output model to estimate the impact multipliers and contributions of the cut flower industry to the California and regional economies. The results of this modeling are presented in Table 3.5 through Table 3.7.

### 3.3.1 California Economy

Table 3.5 provides multipliers that determine how output from the cut flower industry affects the statewide economy of California. The table lists impacts in terms of (1) Value of Output, gross sales revenue, (2) Value added, contribution to GDP of the state or region, with no double counting, (3) Labor income, earnings of employees, management and owner-operators, and (4) Employment, number of workers including reported family labor, management, and employees. The first column in the table lists the multipliers for each of the parameters from a one-unit increase in direct effects. These multipliers determine how direct effects cause additional impacts as income or employment ripples through the economy.

Direct multipliers are, by definition 1.00. So, for example, each dollar of direct output causes \$1.00 in direct output to be added to the economy. The indirect output multiplier can be

interpreted as the number of dollars of output generated in supporting industries from a one dollar increase in direct output by the cut flower industry. For example, in Table 3.5 the indirect value of output multiplier for cut flowers is \$0.63 meaning that every dollar of expanded output by cut flower growers results in \$0.63 of additional output generated by supporting industries that provide materials and services purchased by growers. “Indirect” output multipliers are higher in industries that require more purchased inputs from supporting industries such as transport services, materials for packaging, and equipment. The “induced” effects multiplier measures the output in the rest of the economy linked to an increase in direct output through consumption activities of employees and owners within the sector. The total effects multiplier is the sum of direct, indirect and induced effects multipliers. It measures additional statewide economic output from an increase in output by the cut flower industry. The California cut flower industry produces an additional \$1.21 in economic output for every \$1.00 of direct output increase for a total addition of \$2.21 to the California economy, similar to other agricultural industries.

The measure of an industries’ contribution to economic production is a measure of additional value created from assembling various non-labor inputs. As defined in Box 3.1, value added is the measure of “new” value generated during the process of combining purchased inputs into a marketable product. This “new” value is represented by salaries and wages, proprietor income, profit, and indirect business taxes. The direct value-added multiplier measures the amount of each additional dollar of output value that is allocated to cut flower production and not to purchases from outside the industry or segment. This portion of output value is what the cut flower industry contributes to California’s GDP, which is also measured on a value-added basis. Value added avoids any double counting of value of inputs purchased by the cut flower industry



from other industries. For cut flower growers, \$0.43 of every \$1.00 of additional output from cut flower production ends up as on-farm salaries and wages, proprietor income, business profit, and sales taxes. Every \$1.00 increase in cut flower production adds an additional \$0.34 to the economy from the increased wages, salaries, profits, and taxes that result in support industries. Also, the spending of wages, salaries, and profits adds an additional \$0.35 in induced value-added effects on the economy. Or, put alternatively, for every \$1.00 of value added generated by the California cut flower industry, another \$1.58 is added to the California GDP through indirect and induced effects.

Labor income is a measure of direct output that is paid in salaries, wages, and benefits to employees and owners within the industry. Labor income is a part of the measure of value-added for the industry. For the California cut flower industry \$0.41 of every \$1.00 of direct output value is paid as labor income. In addition, for every \$1.00 of labor income generated within the cut flower industry, another \$1.07 in labor income is added from indirect and induced effects.

The employment multiplier can be interpreted as the number of jobs added to the economy for each direct job in the cut flower industry. Indirect and induced employment numbers indicate that for every job added directly by the cut flower industry 1.07 additional jobs are supported in the economy. The extra jobs come from purchasing additional inputs from suppliers and spending of labor income within the economy which spurs further job creation.

We apply these multipliers to data on production, value of output, and employment in the cut flower industry in order to estimate the contributions the industry makes to California's economy. These results are reported in the second column of Table 3.5. As reported above, estimates of direct output for the California cut flower industry were calculated using data found

in the county agricultural commissions' annual crop reports from 11 counties: Los Angeles, Monterey, Riverside, San Diego, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, and Ventura.

Column 2 of Table 3.5 shows that in 2015, the California cut flower industry produced about \$356 million in direct output (revenue) and generated \$154 million in direct value added for the economy. The cut flower industry paid out \$145 million in wages, salaries and benefits and supported over 2,600 jobs directly. Thus, there were about \$0.43 of value added and \$0.41 of labor income per dollar of value of output. These direct effects also indicate about 7.34 jobs per million dollars of value of output ( $2,610/355.6$ ). In addition, the activity of the cut flower industry in 2015 was a catalyst for increased output from supporting industries and other parts of the economy. Including the indirect and induced effects, about \$786 million in economic output can be attributed to the cut flower industry. About \$300 million in labor income was generated and \$397 million in value was added to the economy. A total of 5,393 jobs were supported directly, indirectly, or were induced by economic activity in the cut flower industry.

### 3.3.2 Central and South Coast Regional Economies

As documented in Section 3.2, cut flower production in Monterey, San Diego, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura Counties accounts for about 95 percent of the state value of cut flower production. We next analyze the regional economic impacts of the cut flower industry. This analysis is performed for two different areas.

First, we consider economic impacts on the Central Coast of California including Monterey, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura Counties as a single economic region. The impact multipliers for the Central Coast region are listed in Table 3.6. Indirect and induced multipliers show slightly smaller impacts when compared to the statewide

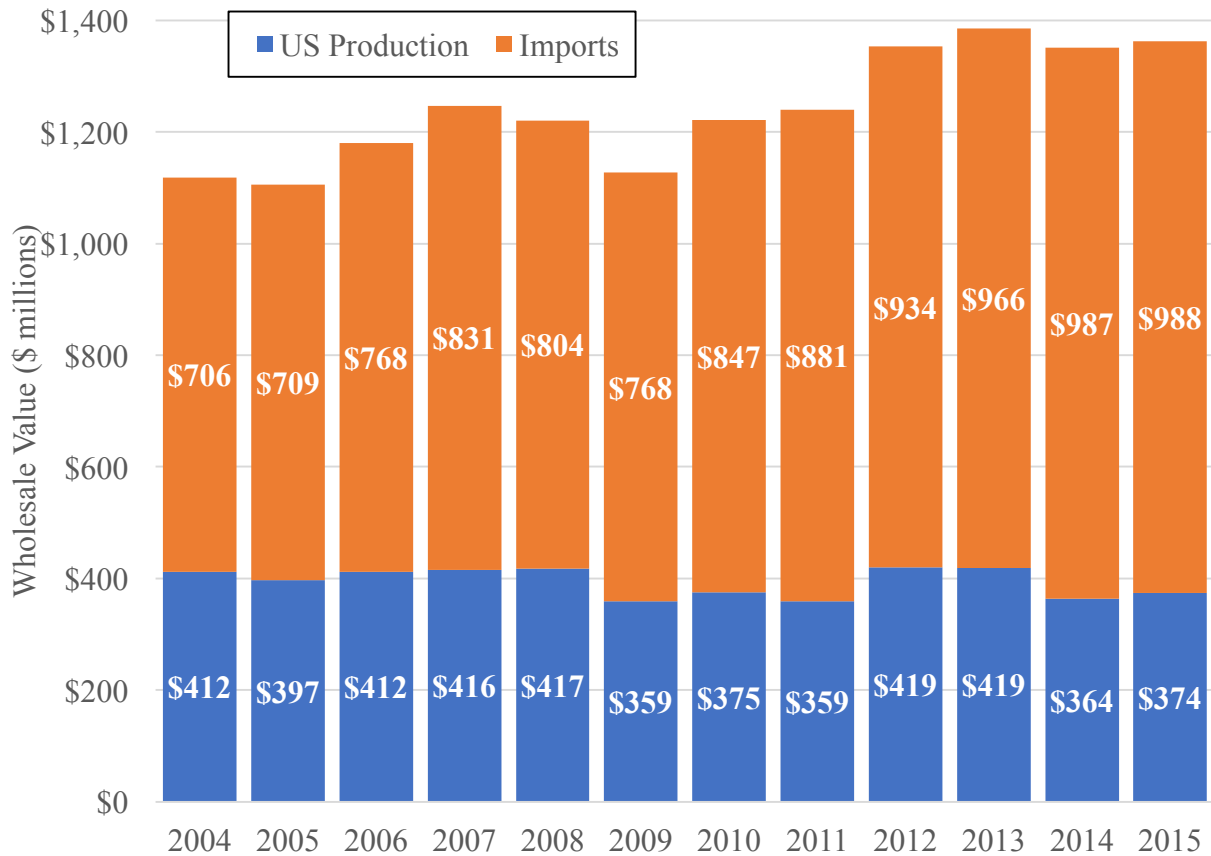
multipliers. This is an indication that the cut flower industry relies on input providers in other parts of California, not just in these five counties.

For the Central Coast region, direct output in 2015 was just over \$266 million, or about 75 percent of total statewide output (column 2 of Table 3.6). The cut flower industry within the five-county region contributed about \$117 million in value added and \$108 in labor income to the region. This labor income generates an additional \$57 million in value added from induced effects. In total, the cut flower industry on California's Central Coast supports over 3,300 jobs within the region (Table 3.7).

Second, we examine the regional economic impacts in San Diego County (Table 3.7). In 2015, cut flowers in San Diego County had direct output of about \$70.5 million and generated a total of about \$119 million in output in the county (Table 3.7). Direct value added to the San Diego County economy from cut flower production was \$31.6 million and, including indirect and induced impacts the contribution equaled almost \$61 million. Direct labor income was \$28.8 million and total labor income effect was \$47.1 million. Output generated by the cut flower industry in San Diego County generated 517 jobs directly and supported 882 jobs within the county, when indirect and induced effects are included (Table 3.7).

Overall these data support the results that the cut flower industry is a significant contributor to the California economy and especially in the Central and South Coast regions where it is mainly located.

**Figure 3.1 Annual Wholesale Value of U.S. Cut Flower Sales from U.S. Producers and Imports, 2004 to 2015**



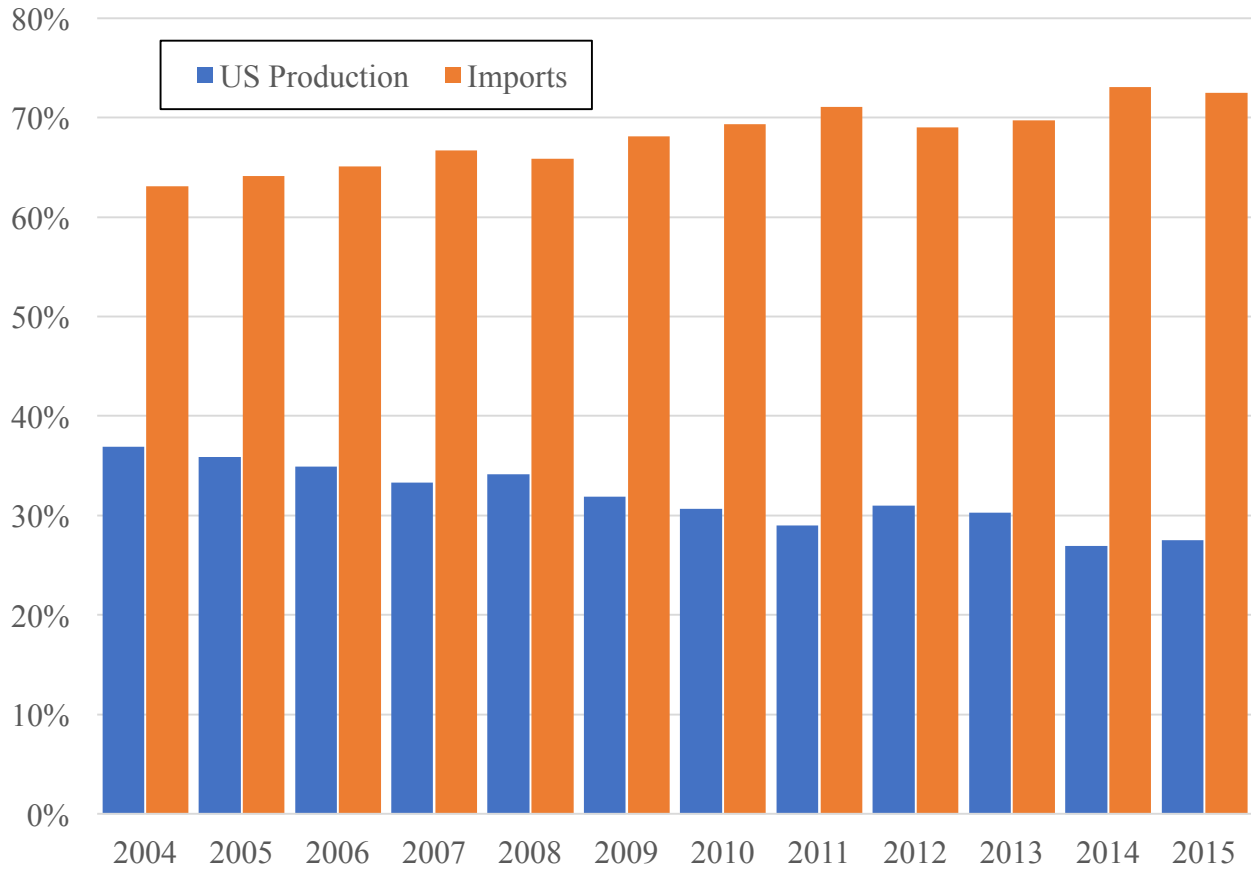
Source:

Value of U.S. production data comes from USDA NASS Floriculture Crops Annual Summary, multiple years

(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1072>).

Value of U.S. imports of cut flowers comes from U.S. Department of Commerce online trade database (<https://dataweb.usitc.gov>)

**Figure 3.2 Share of Domestic Production and Imports to Annual U.S. Cut Flower Market, 2004 to 2015**



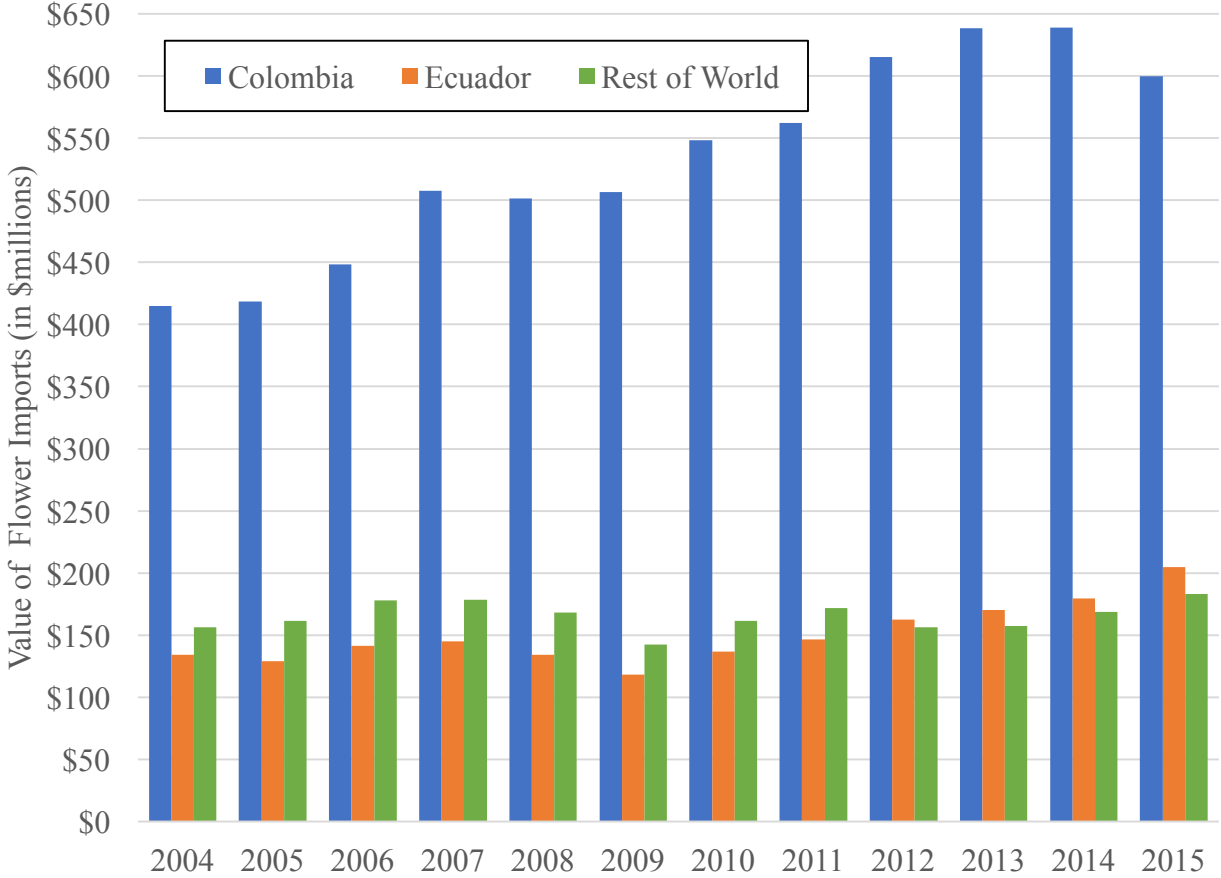
Source:

Value of U.S. production data comes from USDA NASS Floriculture Crops Annual Summary, multiple years

(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1072>).

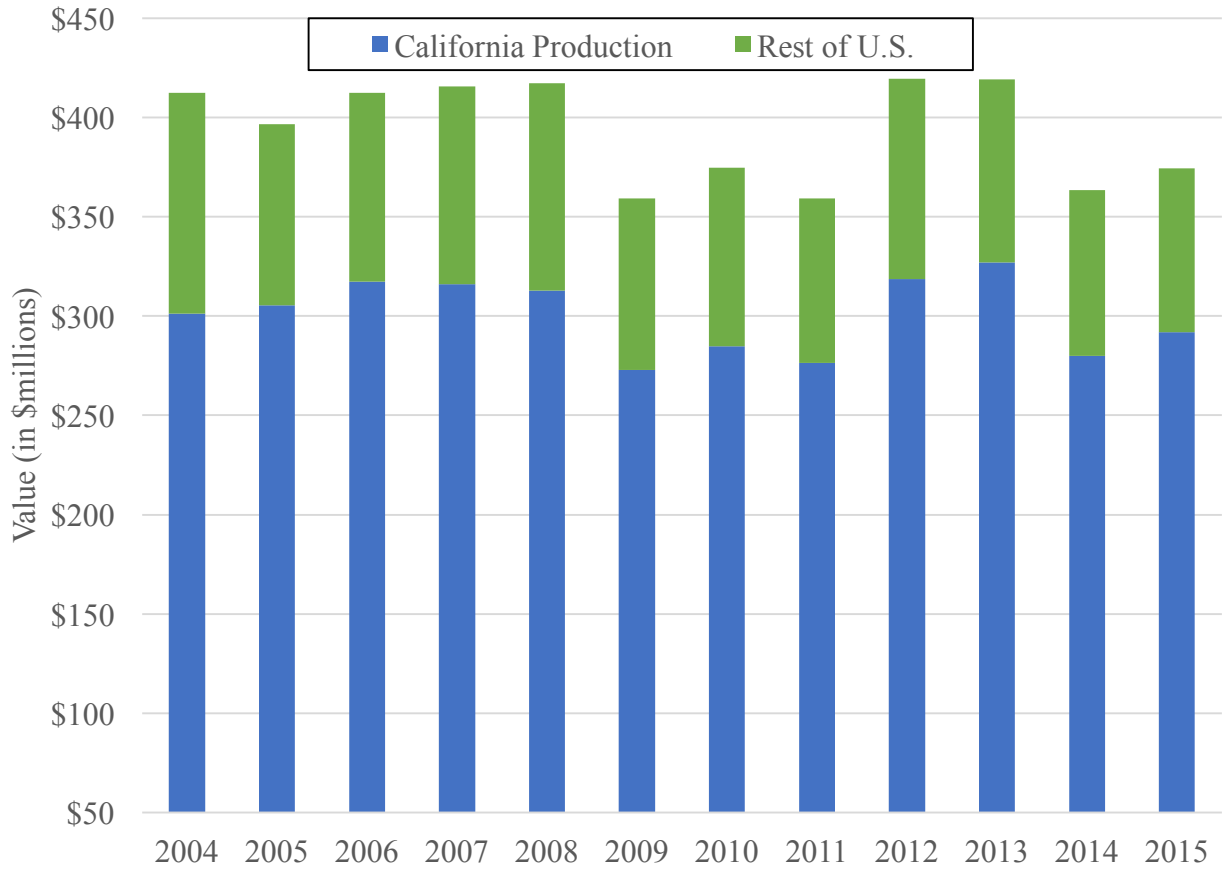
Value of U.S. imports of cut flowers comes from U.S. Department of Commerce online trade database (<https://dataweb.usitc.gov>)

**Figure 3.3 Annual Value of U.S. Imports of Cut Flowers by Country of Origin, 2004 to 2015**



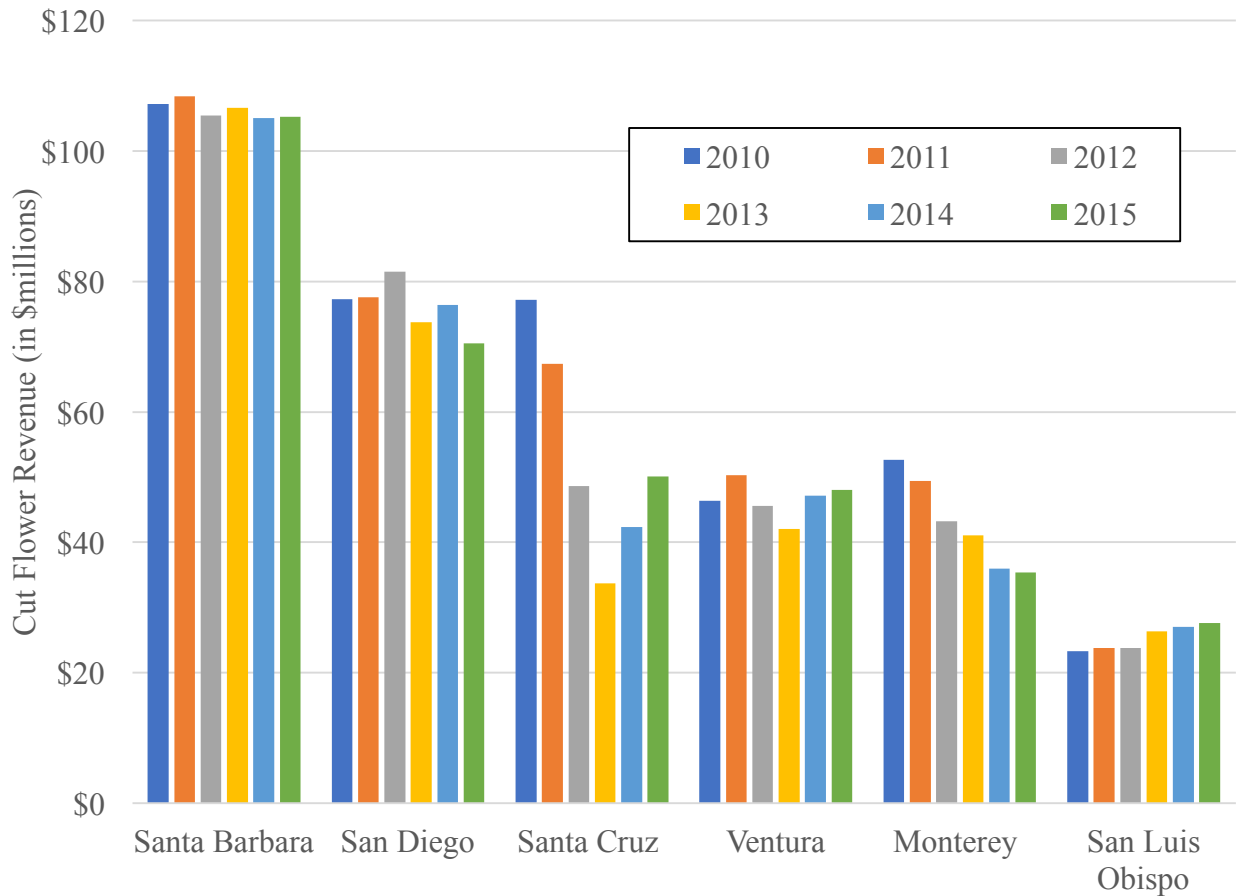
Source: Value of U.S. imports of cut flowers comes from U.S. Department of Commerce online trade database (<https://dataweb.usitc.gov>)

**Figure 3.4 Annual Wholesale Value of U.S. Production of Cut Flowers for California and Rest of the Country, 2004 to 2015**



Source: U.S. and California production data comes from USDA NASS Floriculture Crops Annual Summary (<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1072>), and California Department of Food and Agriculture Annual Crop Report, multiple years (Value of U.S. production data comes from USDA NASS Floriculture Crops Annual Summary, multiple years (<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1072>)).

**Figure 3.5 Cut Flower Revenues for Top Six Producing Counties, 2010 to 2015**



Source: County Agricultural Commissioner Reports, multiple editions

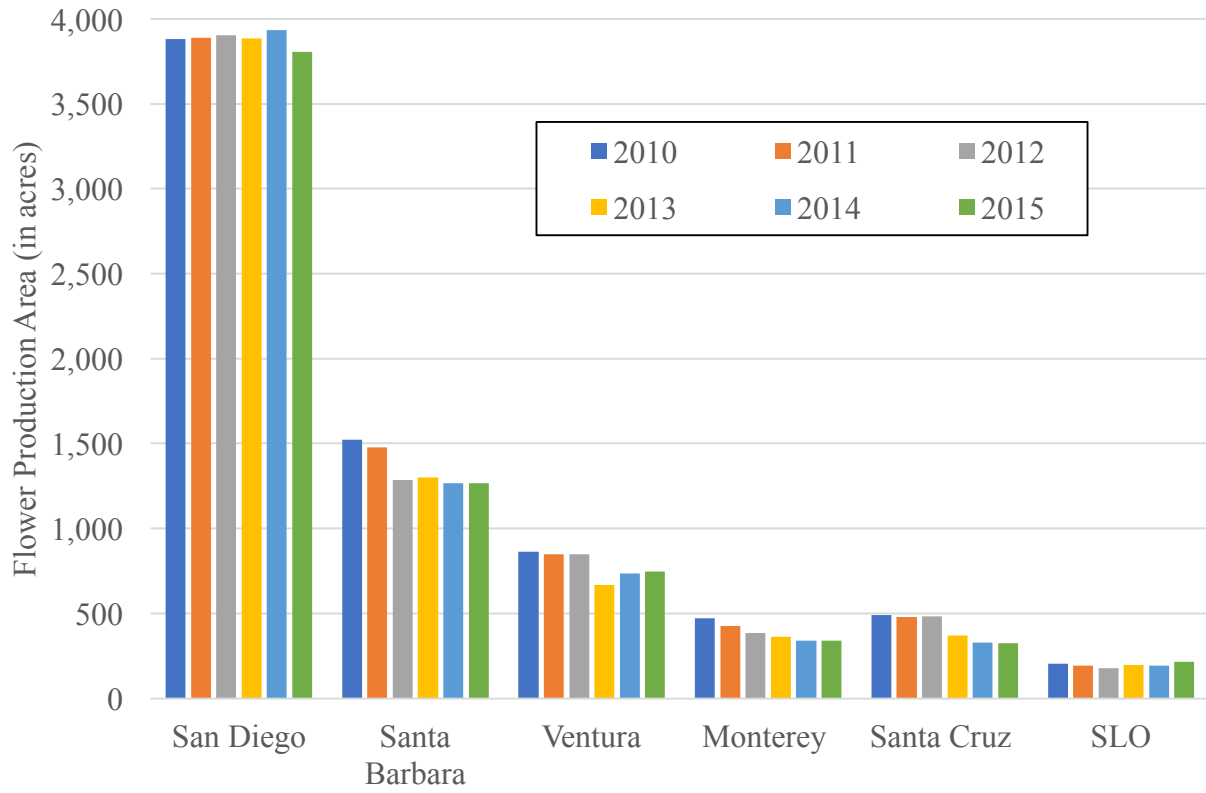
([https://www.nass.usda.gov/Statistics\\_by\\_State/California/Publications/AgComm/Detail/](https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/Detail/)).

Note: Crop reports for 2016 are yet to be released in all but Santa Barbara and Monterey Counties.

Note: In 2016 Santa Barbara County reported cut flower revenues of \$74.9 million and Monterey County reported cut flower revenues of \$27.2 million.



**Figure 3.6 Cut Flower Production Acres for the Top Six Producing Counties, 2010 to 2016**



Source: County Agricultural Commissioner Reports, multiple editions  
[\(https://www.nass.usda.gov/Statistics\\_by\\_State/California/Publications/AgComm/Detail/\)](https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/Detail/).  
 Note: Crop reports for 2016 are yet to be released in all but Santa Barbara and Monterey Counties.

### BOX 3.1

#### **Using the IMPLAN Input-Output Model to Measure Economy-wide Impacts and Contributions**

Input-output models link the magnitude of changes in an industry or segment of the economy to the associated changes in all the other industries and segments throughout the economy. For example, an expansion of demand for California flowers causes more employment and other economic activity in flower production and handling and these activities cause increased demand for materials and services from outside the industry such as packaging, and trucking. Moreover, income generated by this economic expansion will be spent on other services from groceries to new cars to school teachers. The IMPLAN input-output model and the associated data on economic linkages in the economy provide the tools and information to quantify these impacts as “multiplier effects” without leaving out impacts or double counting. Impacts are generally classified as direct, indirect and induced effects.

**Direct Effects:** Direct effects are impacts directly within the affected industry. For example, hiring 10 workers to water flowers has a direct employment effect of 10 jobs.

**Indirect Effects:** Indirect effects are the changes in industries outside the directly affected industry through purchases from supporting industries of input goods and services. For example, employment of 10 waterers may entail purchase of 10 water hoses and these hose suppliers have purchases of their own that ripple further.

**Induced Effects:** Induced effects are economic ripples that result from added consumption generated by the added income spent by those with income from the direct and indirect effects. For example, flower growers, processors and their employees spend their incomes at local grocery stores or barbershops and these local firms have workers of their own.

The sum of direct, indirect and induced impacts tells us the complete impact or contribution of the flower industry on the whole of the California economy. We report the contributions using three economic measures.

**Value of Output:** The value of direct output or service contribution of an industry or segment. For example, the direct value of flower grower output is simply the market value of flowers produced.

**Value Added:** Value added is the measure of salaries and wages, proprietor income and profit minus business taxes. It is that proportion of value of output contributed by labor and capital within the sector. An industry’s value added is the economic contribution of a sector above the cost of goods and services purchased from other sectors. Value added for flowers is the industry’s contribution to the size of the California economy.

**Employment:** Employment is defined as the number of jobs including part-time or seasonal employment. It is not converted to full-time equivalent (FTE) employment.

**Table 3.1 Wholesale Value of California Cut Flower Production as Reported in USDA Floriculture Crops Summary**

Flower	2014	2015
	\$1,000	
Alstroemeria	1,366	1,197
Carnations	239	239
Chrysanthemums	11,438	11,498
Delphinium	5,430	5,093
Gerbera Daisies	32,560	32,108
Gladioli	D	D
Iris	D	D
Lilies	55,937	56,255
Lisianthus	3,479	3,899
Orchids	14,546	6,132
Roses	16,489	16,476
Snapdragons	9,644	12,413
Tulips	D	D
Other Cut Flowers	76,663	92,799
<b>Total Revenue</b>	<b>227,791</b>	<b>238,109</b>

Source: USDA NASS Floriculture Crops Summary, 2016

(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1072>).

D = Data withheld to avoid disclosure of individual operations.

Note: Wholesale values presented in Table 2.1 are not equal to values presented in Table 2.2. USDA NASS reported values for California do not include those values withheld to avoid disclosure of individual operations.

**Table 3.2 Wholesale Value of Cut Flower Production by County in California as Reported in County Agricultural Commissioners' Annual Crop Reports**

County	2014	2015
	In \$1,000	
Los Angeles	2,895	853
Monterey	35,965	35,334
Riverside	1,369	1,706
San Diego	76,441	70,509
San Luis Obispo	27,043	27,629
San Mateo	9,503	8,984
Santa Barbara	105,094	105,286
Santa Clara	2,650	1,661
Santa Cruz	42,320	50,093
Sonoma	4,188	4,548
Ventura	47,109	48,007
Sum of Others	3,173	1,016
<b>Total Revenue</b>	357,750	355,626

Source: County Agricultural Commissioner Reports, multiple editions

([https://www.nass.usda.gov/Statistics\\_by\\_State/California/Publications/AgComm/Detail/](https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/Detail/)).

Note: Wholesale values presented in Table 2.2 are not equal to values presented in Table 2.1.

USDA NASS reported values for California do not include those values withheld to avoid disclosure of individual operations.

**Table 3.3 Production Area for Cut Flowers in Top Six Counties in California, 2014 and 2015**

County	2014	2015
	<i>in acres</i>	
San Diego	3,932	3,805
Santa Barbara	1,265	1,265
Ventura	736	745
Monterey	341	338
Santa Cruz	329	323
SLO	193	216
Sum of Others	533	508
<b>Total Acres</b>	7,328	7,200

Source: County Agricultural Commissioner Reports, multiple editions  
 ([https://www.nass.usda.gov/Statistics\\_by\\_State/California/Publications/AgComm/Detail/](https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/Detail/)).

**Table 3.4 Number and Aggregate Economic Activity of CalFlower Member Firms that Provided Survey Responses**

<b>Measurement</b>	<b>Value</b>
Number of responding CalFlower grower-members	11
Number of people employed	1,056
Total compensation to people employed (in \$million)	\$38.7
Inputs and services purchased from economy (in \$million)	\$48.4
Taxes and fees paid (in \$million)	\$0.813
Revenues generated (in \$million)	\$101

Source: Aggregate information provided by respondents to the Economic Contributions of California Cut Flower Industry Survey.

**Table 3.5 The Statewide Impact Multipliers and Economic Contribution by the California Cut Flower Industry**

<i>Multiplier</i>	<i>Magnitude of Impact</i>	
	<u><i>Multipliers</i></u>	<u><i>Contribution in \$1,000,000</i></u>
<b>Value of Output</b>		
Direct Effect	\$1.00	\$355.6
Indirect Effect	\$0.63	\$222.5
Induced Effect	\$0.58	\$207.5
Total Effect	\$2.21	\$785.7
<b>Value Added</b>		
Direct Effect	\$1.00	\$153.9
Indirect Effect	\$0.78	\$119.5
Induced Effect	\$0.80	\$123.5
Total Effect	\$2.58	\$396.9
<b>Labor Income</b>		
Direct Effect	\$1.00	\$145.0
Indirect Effect	\$0.58	\$84.5
Induced Effect	\$0.49	\$70.6
Total Effect	\$2.07	\$300.0
<b>Employment</b>		<u><i>Contribution in Number of Jobs</i></u>
Direct Effect	1.00	2,610
Indirect Effect	0.57	1,482
Induced Effect	0.50	1,302
Total Effect	2.07	5,393

Source: Multipliers were generated in IMPLAN using revenue and costs data provided by industry respondents to project questionnaire.

**Table 3.6 The California Central Coast Impact Multipliers and Economic Contribution by the California Cut Flower Industry**

<i>Multiplier</i>	<i>Magnitude of Impact</i>	
	<u><i>Multipliers</i></u>	<u><i>Contribution in \$1,000,000</i></u>
<b>Value of Output</b>		
Direct Effect	\$1.00	\$266.3
Indirect Effect	\$0.33	\$87.7
Induced Effect	\$0.36	\$95.5
Total Effect	\$1.69	\$449.5
<b>Value Added</b>		
Direct Effect	\$1.00	\$117.3
Indirect Effect	\$0.44	\$51.8
Induced Effect	\$0.49	\$57.0
Total Effect	\$1.93	\$226.2
<b>Labor Income</b>		
Direct Effect	\$1.00	\$108.6
Indirect Effect	\$0.33	\$36.1
Induced Effect	\$0.29	\$31.6
Total Effect	\$1.62	\$176.3
<b>Employment</b>		<u><i>Contribution in Number of Jobs</i></u>
Direct Effect	1.00	1,954
Indirect Effect	0.34	664
Induced Effect	0.36	713
Total Effect	1.70	3,332

Source: Multipliers were generated in IMPLAN using revenue and costs data provided by industry respondents to project questionnaire.

California Central Coast includes the counties of Monterey, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura.



**Table 3.7: The San Diego County Impact Multipliers and Economic Contribution by the California Cut Flower Industry**

<i>Multiplier</i>	<i>Magnitude of Impact</i>	
	<u>Multipliers</u>	<u>Contribution in \$1,000,000</u>
<b>Value of Output</b>		
Direct Effect	\$1.00	\$70.5
Indirect Effect	\$0.30	\$21.5
Induced Effect	\$0.38	\$27.0
Total Effect	\$1.69	\$118.9
<b>Value Added</b>		
Direct Effect	\$1.00	\$31.6
Indirect Effect	\$0.40	\$12.8
Induced Effect	\$0.52	\$16.3
Total Effect	\$1.92	\$60.7
<b>Labor Income</b>		
Direct Effect	\$1.00	\$28.8
Indirect Effect	\$0.32	\$9.2
Induced Effect	\$0.32	\$9.1
Total Effect	\$1.64	\$47.1
<b>Employment</b>		<u>Contribution in Number of Jobs</u>
Direct Effect	1.00	517
Indirect Effect	0.34	176
Induced Effect	0.36	189
Total Effect	1.70	882

Source: Multipliers were generated in IMPLAN using revenue and costs data provided by industry respondents to project questionnaire.

#### **4. Implications of Legal Cannabis Cultivation on the Cut Flower Industry**

This section will discuss the implications for the California cut flower industry of changes in the legal situations for cannabis cultivation in California. The primary focus of this analysis is the potential competition for production inputs between the two industries and potential opportunities for the cut flower industry. That portion of legal cannabis that is grown in greenhouse production facilities and in the Central and South coast is the most likely to compete with California cut flower producers for resources.

Increased competition for scarce production resources increases costs of production of industries. Direct resource competition between the cut flower industry and cannabis cultivators will be primarily for greenhouse production space and farm labor, including managerial expertise. Although cannabis and cut flower producers use inputs such as energy, financial capital, and farm machinery, these are not specialized and neither industry uses much relative to the size of the available supply.

##### **4.1 Competition for Greenhouse Space**

Competition for greenhouse space depends on the quantity of legal cannabis that is expected to be grown using greenhouse facilities. In November 2016, it was estimated that about 24 percent of cannabis grown in California, approximately 2.2 million pounds, was produced using mixed-light greenhouse cultivation. Most California cannabis, 60 percent, was grown outdoors and the remaining 16 percent grown indoors under artificial light (MacEwan et. al, ERA Economics, 2017). Projecting the volume of legal cannabis grown in greenhouses in California under the new laws, taxes, licensing and regulations that start in 2018 is especially challenging.

Based on estimates for 2016, we estimate that cannabis consumption in California is likely to remain below 2.8 million pounds in 2018. Of that, the legal cannabis market is likely to grow perhaps 25 percent, but projections from all sources indicate that illegal cannabis will remain significant, given that it is a market with long established producers and consumers and that taxation of legal cannabis is scheduled to be at least 30 to 40 percent of the retail price. We find that a complex variety of factors contribute to the magnitude of California cannabis consumption, the share of that consumption that is in the legal segment, and the share of that legal cannabis that is grown in greenhouses in the Central and South Coast regions. Considering these factors, we calculate that the volume of greenhouse production for the legal market in California is unlikely to exceed 700,000 pounds annually.

The next calculation required is the amount of greenhouse space required to produce 700,000 pounds of cannabis, which depends upon cannabis output per square foot of space. Industry sources currently cultivating medical cannabis in greenhouses say that yields depend on the variety or strain of cannabis and cultivation practices. The range of reported annual yields is between 1.3 ounces of cannabis per square foot to 2.2 ounces per square foot with common middle yields of 2.0 ounces per square foot (Table 4.1). The total space needed for 700,000 pounds ranges from 8.6 million square feet for low yields to 5.1 million square feet for high yields. New greenhouse facilities are projecting extremely high yields of 7.5 ounces per square foot (Roberts, 2017). If such greenhouses and such high yields become common 700,000 pounds would require only about 1.5 million square feet.

To assess competitive pressure on the cut flower industry we compare these greenhouse area demands to the supply of greenhouse space used for crops in California. The 2012 USDA Census of Agriculture estimates that greenhouse space used for California crops was about 202

million square feet (Table 4.2) (USDA 2012). This total takes into account greenhouse space used for floriculture, greenhouse vegetables, horticultural crops and propagative nursery products. Another source, the California Department of Food and Agriculture (CDFA) estimates that greenhouse production of floriculture crops, including cut flowers used about 105 million square feet of non-temporary covered growing space. When including temporary shade cover, CDFA estimates 142 million square feet of protected growing space used for floriculture production (CDFA 2016). Table 4.2 summarizes these measures of greenhouse and other protected space used by relevant parts of California agriculture in recent years.

Next, we use the data in table 4.1 and 4.2 to estimate the share of total greenhouse space used by likely cannabis production in 2018 (Table 4.3). The top row of table 4.3 represents the share of projected cannabis use of non-temporary greenhouse space to produce 700,000 pounds over the amount of space used to produce floriculture in California under the tree yield estimates. The range is between about 8.2 percent and 4.8 percent with the central figure of 5.3 percent and with the central yield of 2 ounces per square foot per year. The shares are even lower in the second two rows, reflecting the very small share of greenhouse space likely used to grow legal cannabis.

Moreover, these estimates are share of recent greenhouse space. New greenhouse space may be readily developed that is specialized to the cannabis industry. Indeed, new greenhouses designed for cannabis production have been developed already (Roberts, 2017). The cannabis share of existing space is low and with new greenhouse space coming into production we see no regional limits or higher costs imposed on the cut flower industry from this competition from cannabis.

## 4.2 Competition for Labor

Greenhouse labor is the second major resource to consider. Column 2 of Table 4.4 uses data about labor use per farm in 2016 to estimate potential use of labor to produce legal cannabis in greenhouses. For greenhouse production, the average farm produced 238 pounds of cannabis (MacEwan et. al, ERA Economics, 2017). With wholesale prices at \$1.500 per pound, this output generates \$357,000 in gross revenue for the farm. With medium yields of two ounces per square foot, this farm would use about 1,900 square feet of greenhouse space. This operation uses a total of about 6,400 hours of labor per year with 2,300 hours of labor per year dedicated to trimming. Average number of worker hours per pound is 26.9 hours (Table 4.4).

There are several reasons to think well managed legal cannabis systems may use less labor per pound than the approximate 27 hours per pound. We expect legal operations using hired labor would operate with more than 1,900 square feet, which is a very small greenhouse of less than 40 feet wide by 50 feet long. Second, in the current market environment much time is devoted to marketing and transport of very small quantities of cannabis. Third, the current cash-based employment system implies extremely informal relationships between hired labor and the firm. Finally, productivity improvement and capital investment in the legal system will increase productivity of management time as well as hired hourly workers.

Table 4.5 uses the estimate of 26.8 hours per pound to calculate the likely labor used to produce 700,000 pounds of cannabis. The total is about 18.8 million hours of labor or about 9,400 full time equivalent workers at 2,000 hours each. We compare this number with the relevant labor force in cut flower industry and the Central and South Coast regions. From table 3.5, we estimate that direct farm labor on cut flower operations is about 2,600 jobs and, including multiplier effects, the total is about 5,400 jobs. Thus, the cannabis number is much larger than

workers in the cut flower industry. This relationship would be expected, given the much larger revenue generated by cannabis.

The relevant employee labor pool for cannabis labor demand is not cut flower greenhouse workers but rather all relatively low-skilled hourly wage workers in the region. One part of the relevant labor force is agricultural workers in the relevant region. The California Employment Development Department (2017) data allows us to estimate that there were about 138,000 agricultural workers in 2016 in the California Employment Development Department regions that include the six major cut flower producing counties. Based on California Agricultural Commissioners data, the six major cut flower counties produce about 91 percent of the agricultural value in the entire region to which these agricultural worker numbers apply and we therefore estimate that the agricultural labor force in the six counties is about 125,000 workers. Of this total, the cannabis workforce would be about 7.5 percent, which is significant. The rest of the relevant workforce is much larger than the numbers employed in agriculture. For example, based on 2016 data from the California Employment Development Department (2017), in the metropolitan region of Ventura County there are about 25,400 agricultural workers, about 14,600 construction workers and about 31,200 working in the accommodation and food service industries. Many of these workers may also consider cannabis jobs.

Of course, cannabis is already produced in the regions that grow cut flowers, so the 9,400 jobs does not reflect new employment demand. Given a shift in production and an increase in efficiencies, it is not clear if there would be any net expansion in cannabis labor use in the regions.

**Table 4.1 Greenhouse Space for 700,000 Pounds of Cannabis**

<b>Parameter</b>	<b>Low Yield</b>	<b>Medium Yield</b>	<b>High Yield</b>
Cannabis Yield (oz/ft <sup>2</sup> )	1.3	2.0	2.2
Space needed to grow 700,000 pounds of cannabis (million ft <sup>2</sup> )	8.6	5.6	5.1

Source: Author estimates

Note: Estimates of the potential volume of cannabis relevant for competition for greenhouse space from authors' analysis. Cannabis yield numbers come from cannabis industry sources. Yield numbers can vary depending upon cannabis variety planted and cultivation factors.

**Table 4.2 Volume of Commercial Protected Growing Space in California**

<b>Greenhouse Space Measure</b>	<b>Space (in million ft<sup>2</sup>)</b>
All non-temporary covered growing space for floriculture in 2015	
(includes glass cover, fiberglass and other rigid greenhouse, film plastic greenhouse <b>does not</b> include temporary shade cover)	105
All floriculture covered growing space in 2015	
(includes glass cover, fiberglass and other rigid greenhouse, film plastic greenhouse <b>and</b> temporary shade cover)	142
All estimated growing space for commercial agriculture under glass or other protection in California	
(includes floriculture crops, greenhouse vegetables, propagative nursery crops, vegetable transplants and seeds and greenhouse fruits and berries)	202

Source: Volume of floriculture growing space in 2015 comes from CDFA Agricultural Statistics Review. Volume of total covered growing space for commercial agriculture in California comes from USDA NASS 2012 Agricultural Census.



**Table 4.3 Share of California Greenhouse Space Needed to 700,000 Pounds of Legal Market Cannabis Consumed in California**

<b>Parameter</b>	<b>Low Yield</b>	<b>Medium Yield</b>	<b>High Yield</b>
Share of non-temporary floriculture covered growing space (%)	8.2%	5.3%	4.8%
Share of all floriculture protected growing space (%)	6.1%	3.9%	3.6%
Share of all commercial agriculture covered growing space (%)	4.3%	2.8%	2.5%

Source: Authors' estimates using volume of floriculture growing space in 2015 from CDFA Agricultural Statistics Review and volume of total covered growing space for commercial agriculture in California from USDA NASS 2012 Agricultural Census.

**Table 4.4 Average Labor Use for Cannabis per farm by Cultivation Type in 2016**

<b>Production and Labor</b>	<b>Indoor</b>	<b>Greenhouse</b>
Average pounds produced annually	346	238
Total hours annually to trim cannabis flowers	3,400	2,300
Hours of employment (includes trimmers)	8,600	6,400
Hours of employment per pound produced	24.9	26.9

Source: MacEwan et. al, ERA Economics, 2017

**Table 4.5 Projected Labor Use for Greenhouse Cannabis Cultivation in California**

<b>Production and Labor</b>	<b>Greenhouse Cultivation</b>
Estimated volume of cannabis produced in 2018	700,000
Hours of employment per pound produced (from Table 4.4)	26.9
Total hours (in million)	18.8
Total number of full-time equivalent workers	9,415

Source: MacEwan et. al, ERA Economics, 2017

Note: One full-time equivalent worker is equal to 2,000 hours of labor.

## 5. Conclusions

Legal cannabis has been a part of California agriculture for the past 20 years. Recent legislation and upcoming licensing has raised public attention to cannabis production and distribution and is likely to expand legal cannabis production and sales. This higher profile has attracted attention from other agricultural industries, including cut flowers.

The California cut flower industry is a significant part of California agriculture, generating over \$350 million in direct value of output and about \$154 million in value added to the economy in 2015. The economy of California benefits from direct production and through the ripple effects caused by the cut flower industry. Including the indirect and induced effects, the cut flower industry contributes almost \$400 million in value added to the state's economy. About 5,400 jobs are supported by the economic activity generated from the cut flower industry.

The potential expansion of legal cannabis production in greenhouses in the Central and South Coast regions of California may compete for resources with the cut flower industry, especially greenhouse space and farm labor.

We calculate that if 700,000 pounds of legal cannabis were grown in greenhouses, that would use between 2.5 percent and 8.2 percent of the greenhouse space used in the relevant industries. These small shares indicate that, given a little time to adjust to any new demand, relatively little region-wide pressure on greenhouse space is likely.

Hired labor use to produce 700,000 pounds of cannabis is larger than the cut flower labor force, but much of that labor is already producing cannabis and the relevant labor market within which competition is likely is much larger than the cut flower labor force. Therefore, we see relatively little increase pressure from added labor demand.

Increased demand for management expertise to grow and market legal cannabis may create opportunities for some managerial workers in the cut flower industry. Reports from the industry suggest that cannabis is a challenging product to grow, thus talented and experienced cut flower growers may find an expanded demand for their services. Some with experience in cut flowers may investigate potential to use their expertise in cannabis. But again, we expect any such expanded demand in legal cannabis to be limited and relatively minor relative to the size of agriculture in the Central and South Coast regions.

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## **Appendix A: Flower Growers Questionnaire:**

### **Economic Contribution of the California Cut-Flower Industry:**

This questionnaire is being conducted by the University of California Agricultural Issues Center to help measure the economic contributions of the cut flower industry in California. The California Association of Flower Growers and Shippers provides support for this project. This questionnaire is being sent to a selection of flower growers in California. If you agree to participate, your identity will remain anonymous, and all information provided in your responses will be kept strictly confidential. Results of this study will be presented as averages or totals for the California cut flower industry. Your participation is voluntary; you do not have to answer any question that you do not wish to. If you have any questions about this questionnaire, you may contact Daniel A. Sumner (phone: 530-752-1668, e-mail: [dasumner@ucdavis.edu](mailto:dasumner@ucdavis.edu)), William A. Matthews (phone: 530-752-1520, e-mail: [wamatthews@ucdavis.edu](mailto:wamatthews@ucdavis.edu)) or Jonathan Barker (phone: 530-752-2320, e-mail: [Jbarker@ucdavis.edu](mailto:Jbarker@ucdavis.edu)).

#### **PLEASE NOTE:**

**In this questionnaire, we are asking for measures of your business operations as they pertain to CUT FLOWER GROWING.**

**Insert your answers in the shaded sections.**

**This questionnaire should take about 30 minutes to complete.**

**You may e-mail a completed electronic copy of your questionnaire to William Matthews ([wamatthews@ucdavis.edu](mailto:wamatthews@ucdavis.edu)) OR you may mail a hard copy of your completed questionnaire to the following address.**

**William Matthews  
Agricultural Issues Center  
252 Hunt Hall, UC Davis  
One Shields Avenue  
Davis, CA 95616-8514**

**I. CUT FLOWER GROWING EXPENSES**

**This section asks for information about expenses related to labor, non-labor inputs, contracted services and leased equipment, utilities and taxes and durable capital goods related to producing cut flowers. This information will be used to measure how cut flower production directly and indirectly affects other parts of the economy.**

**I.A. Labor and Labor Expenses related to cut flower production.**

**Number of Jobs Provided**

We want to measure how many jobs exist from cut flower production in California. Please provide the <b>number of individuals</b> that were engaged in your <u>cut flower business</u> for the 2016? (Please provide the number of people)	
Cut flower farm owner/operator	
Full-time <b>direct hired</b> farm managers	
Full-time <b>direct hired</b> non-management laborers	
Part-time and/or seasonal <b>direct hired</b> laborers	
Full-time <b>contracted</b> farm managers	
Part-time <b>contracted</b> non-management laborers	
Part-time and/or seasonal <b>contracted</b> laborers	

**Expenses on salaries, wages and benefits**

What were total expenses on salaries, wages and benefits for the people who worked in your <u>cut flower business</u> (include owner/operators, management, non-management, seasonal and part-time positions) in 2016? (Please provide dollar amounts)	
Total expenses on owner/operators, <b>direct hired</b> managers and <b>direct hired</b> laborers	
What were total expenses for contracted labor for your <u>cut flower business</u> in 2016? (Please provide dollar amounts)	
Total expenses for <b>contracted</b> managers and laborers	



**I.B. Non-Labor Expenses related to cut flower production.**

What did your business spend on inputs for flower production during the 2016 growing cycle?  
(Please provide dollar amounts)

<b><u>PURCHASED INPUTS FOR GROWING</u></b>	<u>Value (\$)</u>
Flower growing material (seeds and or cuttings from suppliers, breeders or propagators)	
Flower growing supplies (soil, pots, etc.)	
Agricultural Chemicals	
Fuel and lubricants for mobile equipment	
Electricity and natural gas	
Other (please specify):	
Other (please specify):	
Other (please specify):	

<b><u>CONTRACTED SERVICE OR LEASED EQUIPMENT FOR GROWING</u></b>	<u>Value (\$)</u>
Land preparation and planting services	
Pollination services	
Crop health services	
Irrigation services	
Equipment repair service	
Equipment lease	
Other (please specify):	
Other (please specify):	
Other (please specify):	

<b><u>OTHER PURCHASED INPUTS</u></b>	<u>Value (\$)</u>
Packaging and shipping materials	
Office supplies	
Other (please specify):	
Other (please specify):	
Other (please specify):	

<b><u>OTHER CONTRACTED SERVICES</u></b>	<b><u>Value (\$)</u></b>
Trucking and hauling services	
Legal services	
Accounting and tax preparation	
Banking services	
Property and liability insurance	
Other (please specify):	
Other (please specify):	
Other (please specify):	

<b><u>TAXES AND FEES</u></b>	<b><u>Value (\$)</u></b>
Property taxes	
Regulatory fees (this would include for example, CalFlower Association fees, phytosanitary fees, air quality permit fees, etc.)	
Other (please specify):	
Other (please specify):	
Other (please specify):	

**I.E. Capital Goods.**

What did your business spend on capital goods during the 2016 growing season? Please list any other capital good purchases in the blank spaces provided. (Please provide dollar amounts)

<b><u>PURCHASED CAPITAL GOODS</u></b>	<b><u>Value (\$)</u></b>
Capital equipment (Trucks, tractors, etc.)	Click to enter
Other (please specify):	Click to enter
Other (please specify):	Click to enter
Other (please specify):	Click to enter

**I.F. Land and Greenhouse Space Investments**

What did your business spend on land and/or acquisitions and construction or renovation of new greenhouse space during the 2016 growing season? (Please provide dollar amounts)

<b>LAND AND GREENHOUSE</b>	<u>Area</u>	<u>Value (\$)</u>
Purchase of Land	Click to enter	
Rent of Land	Click to enter	
Construction of New Greenhouse Space	Click to enter	
Renovation of Existing Greenhouse Space	Click to enter	
Rent of Greenhouse Space		

**II. CUT FLOWER GROWING VOLUME AND SALES**

**I.A. The information provided in this section pertains to the total area of cut flower production your business managed in the 2016 growing cycle, and revenue from 2016 cut flower sales. This information will be used to aggregate measures of cut flower production and value across all cut flower growers across California.**

How much indoor and outdoor growing space did your cut flower business utilize in the 2016 growing cycle?

<u>Square feet indoor space</u> Click here to enter text.	<u>Square feet outdoor space</u> Click here to enter text.
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How much revenue did your business earn during the 2016 growing cycle?

<b>REVENUES</b>	<u>Value (\$)</u>
Revenue from Outdoor Production	Click to enter
Revenue from Indoor Production	Click to enter
Other Sources of Revenue Please specify:	Click to enter
Total Revenue	Click to enter