Employment in the Kern County Oil and Agriculture Sectors

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August 2019

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Kern County Oil Sector

Oil Sector Introduction

The oil sector, along with the natural gas sector, is a major part of the Kern County economy, employing thousands of workers and generating billions of dollars in economic output.

Oil and gas employment statistics are available from the California Employment Development Department (EDD). The EDD has two sources of data that are relevant to oil and gas employment: The Quarterly Census of Employment and Wages (QCEW) and the Current Employment Statistics program (CES).

Data from the QCEW is particularly helpful for understanding oil employment in Kern County. This program collects tax information from businesses across California, and uses this tax information to record the number of employees at each firm. It covers 97 percent of all organizations across the state, giving it the ability to produce detailed, comprehensive data on the labor market.

The QCEW groups companies into 1,057 industry sectors from the North American Industry Classification System (NAICS). Four of these sectors are pertinent to field operations for oil and gas activity:

- Crude Petroleum Extraction (NAICS Sector 211120)
- Natural Gas Extraction (NAICS Sector 211130)
- Drilling Oil and Gas Wells (NAICS Sector 213111)
- Support Activities for Oil and Gas Operations (NAICS Sector 213112)

According to the NAICS system, these industries are defined as follows:

Crude Petroleum Extraction

This industry comprises establishments primarily engaged in (1) the exploration, development, and/or the production of petroleum from wells in which the hydrocarbons will initially flow or can be produced using normal or enhanced drilling and extraction techniques or (2) the production of crude petroleum from surface shales or tar sands or from reservoirs in which the hydrocarbons are semisolids. Establishments in this industry operate oil wells on their own account or for others on a contract or fee basis.

Natural Gas Extraction

This industry comprises establishments primarily engaged in (1) the exploration, development, and/or the production of natural gas from wells in which the hydrocarbons will initially flow or can be produced using normal or enhanced drilling and extraction techniques or (2) the recovery of liquid hydrocarbons from oil and gas field gases. Establishments primarily engaged in sulfur recovery from natural gas are included in this industry.

Drilling Oil and Gas Wells

This U.S. industry comprises establishments primarily engaged in drilling oil and gas wells for others on a contract or fee basis. This industry includes contractors that specialize in spudding in, drilling in, redrilling, and directional drilling.

Support Activities for Oil and Gas Operations

This U.S. industry comprises establishments primarily engaged in performing support activities on a contract or fee basis for oil and gas operations (except site preparation and related construction activities). Services included are exploration (except geophysical surveying and mapping); excavating slush pits and cellars, well surveying; running, cutting, and pulling casings, tubes, and rods; cementing wells, shooting wells; perforating well casings; acidizing and chemically treating wells; and cleaning out, bailing, and swabbing wells.

Oil and Gas Employment

QCEW data is available from the first quarter of 2001 to the fourth quarter of 2018. At the end of 2018, there were 7,836 employees in Kern County's oil and gas industries.

Oil and Gas Sectors / Kern County 2018 Q4

Industry Sector	NAICS Code	Employment
Crude Petroleum Extraction	211120	697
Natural Gas Extraction	211130	953
Drilling Oil and Gas Wells	213111	2,032
Support Activities for Oil and Gas Operation:	213112	4,154
Total, all Sectors		7,836

Source: California Employment Development Department

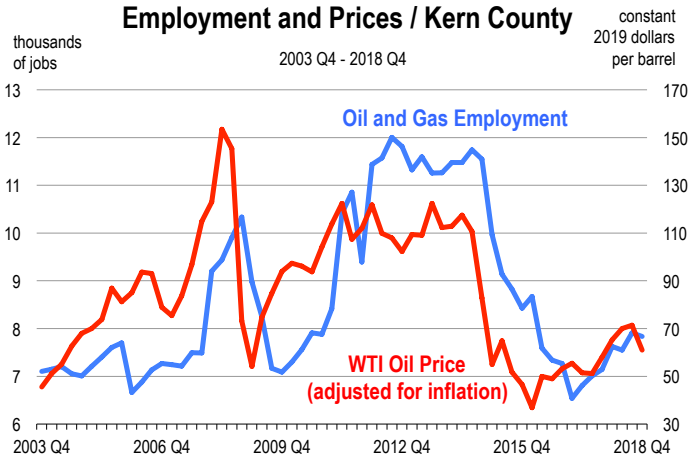
Kern County Oil Sector

To estimate oil and gas employment for the first half of 2019, our firm used data from the Current Employment Statistics program, in addition to information on oil prices.

The CES is a survey of 616,000 organizations across the U.S., representing 6 percent of all private, non-profit, and government organizations. The survey is conducted each month, and is used to estimate employment by NAICS sector for all counties across the U.S., including Kern County. CES data is available from January 1990 to June 2019.

Because CES data is based on a survey that covers only 6 percent of organizations, it contains less detail than the QCEW data. For Kern County, the CES reports information for 59 industry categories, and does not isolate employment for the oil and gas industries. The most relevant CES category is Mining, which is a grouping of the following sectors:

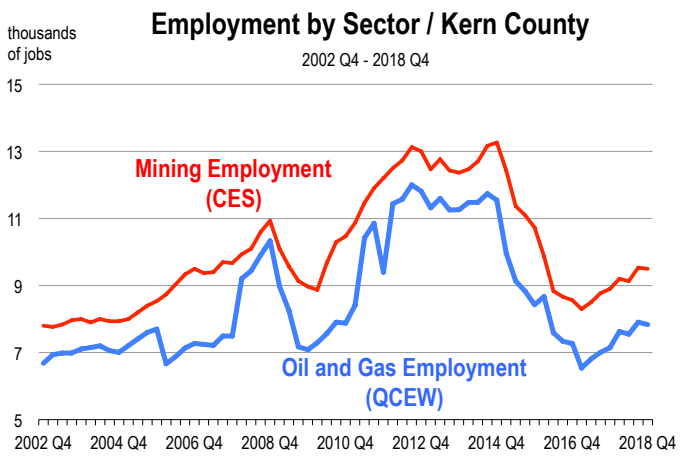
- Crude Petroleum Extraction (NAICS Sector 211120)
- Natural Gas Extraction (NAICS Sector 211130)
- Metal Ore Mining (NAICS Sector 2122)
- Nonmetallic Mineral Mining and Quarrying (NAICS Sector 2123)
- Drilling Oil and Gas Wells (NAICS Sector 213111)
- Support Activities for Oil and Gas Operations (NAICS 213112)
- Support Activities for Metal Mining (SAICS Sector 213114)
- Support Activities for Nonmetallic Minerals (Except Fuels) Mining (NAICS Sector 213115)



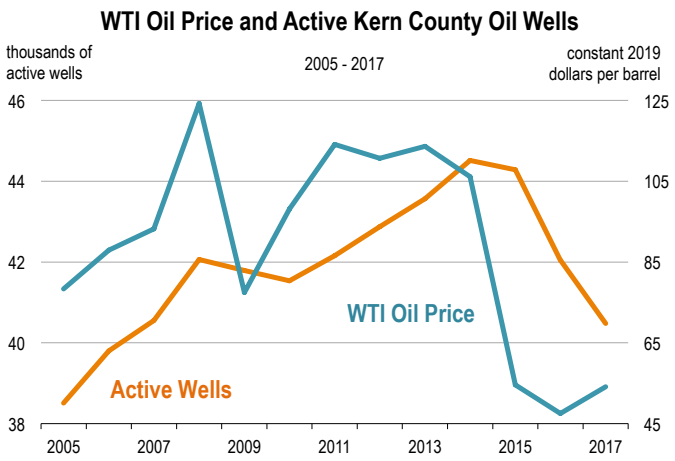
Sources: EDD, EIA, California Economic Forecast

In Kern County, the oil and gas industries contain the majority of all employment in the broader mining sector, accounting for anywhere from 75 percent to 95 percent of mining jobs in any given year. The difference is primarily related to employment in gold and silver mining (with approximately 200 employees at the Soledad Mountain mine), and borax mining (including approximately 1,000 employees at the Rio Tinto mine). Aside from oil, natural gas, borax, and gold/silver, there are virtually no other jobs in the CES mining sector.

In Kern County, oil and gas employment is highly correlated with global oil prices. Kern County oil firms increase their employee headcounts when prices are rising, and decrease their headcounts when prices are falling. Changes in employment largely occur because high oil prices incentivize firms to activate more of their existing wells, and to drill new wells. Low prices incentivize the opposite.

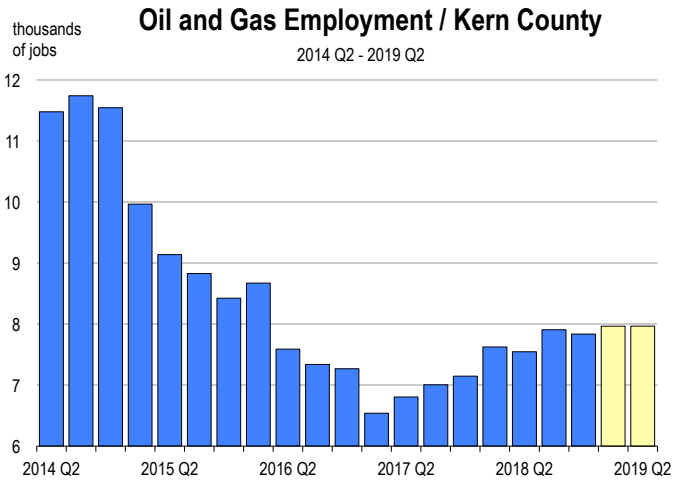


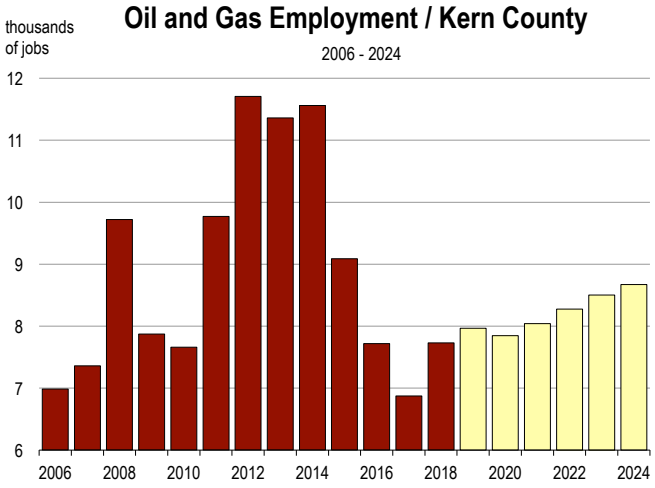
Source: EDD



Sources: EIA and California Department of Conservation

Kern County Oil Sector





Therefore, in order to estimate oil and gas employment for the first half of 2019, we conducted a regression analysis of oil and gas employment, oil prices, and employment in the broader mining sector.[1]

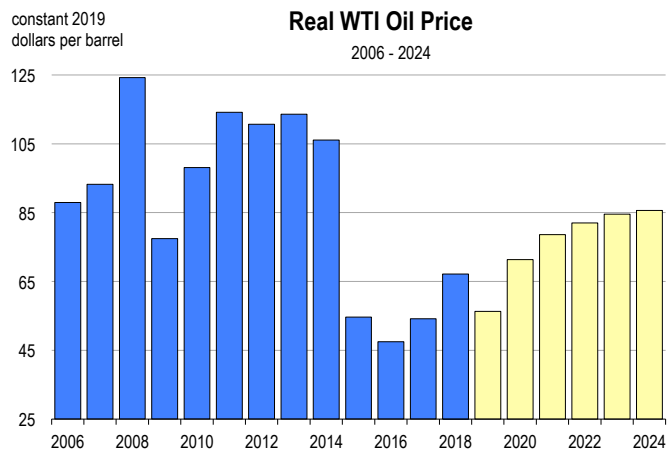
According to regression analysis, changes to inflation-adjusted oil prices can explain 80 to 90 percent of the changes to oil and gas employment. Most of the job losses that were observed between 2014 and 2017 were the result of sharply declining oil prices.

Our regression model also concluded that, as of 2019 Q2, the Kern County oil and gas sector had 7,966 workers, an increase of 130 workers from the end of 2018. The results are statistically significant at the 95 percent confidence level.

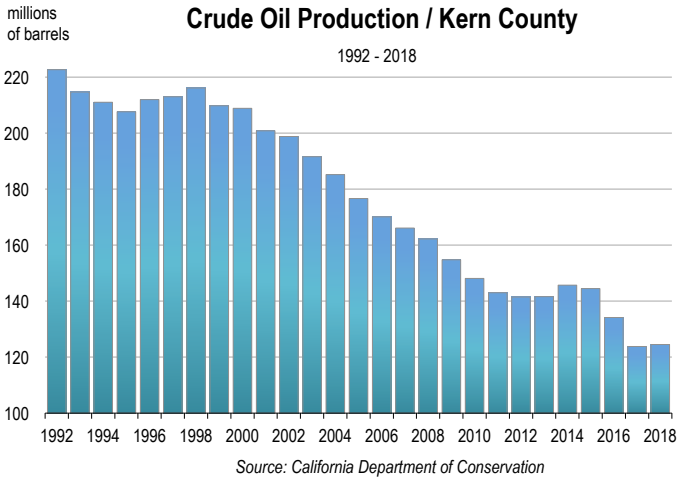
Future employment levels will also depend on changes to the price of oil. According to the U.S. Energy Information Administration, WTI oil prices are expected to rise from an average of $52.74 per barrel in 2019 to an average of $85.64 per barrel in 2024, adjusted for inflation.

Using a separate regression-based forecast model, our firm anticipates that employment in the Kern County oil and gas sector will increase between 2018 and 2024, rising from approximately 7,700 jobs to approximately 8,700 jobs.

The volume of oil produced is also important to the Kern County economy. Oil production in Kern County has been declining for years, falling to approximately 124.5 million barrels in 2018.



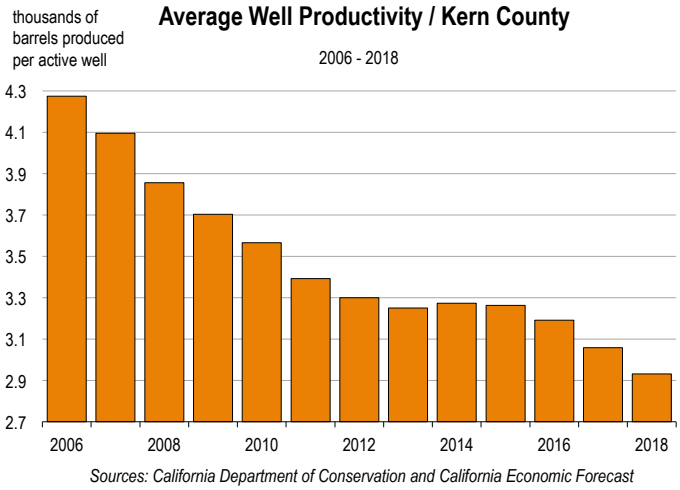
Source: U.S. Energy Information Administration

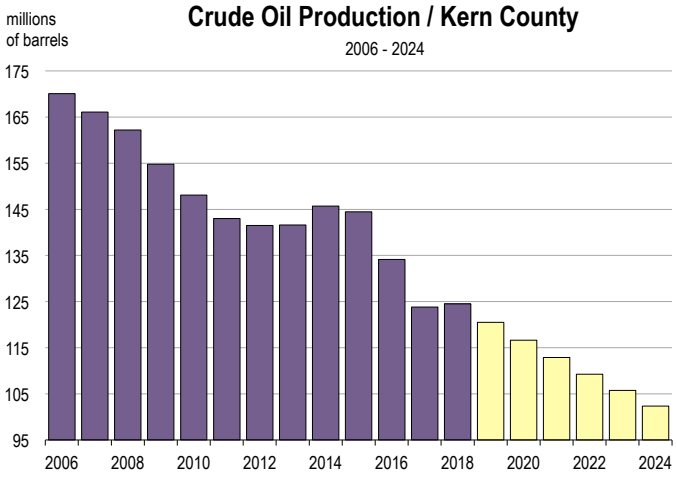


Source: California Department of Conservation

[1] See Appendix A for details.

Kern County Oil Sector





The supply of oil that remains in the county's oil fields is depleting, leading to reduced production from each active well. As of 2018, each active well produced only 2,900 barrels of oil, down from an average of almost 4,300 barrels in 2006.

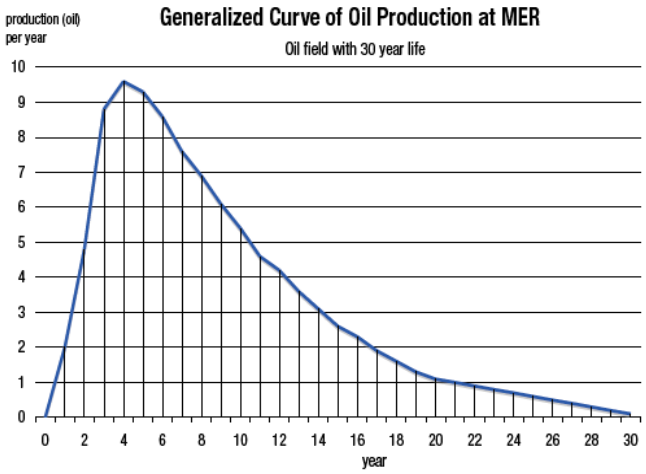
Production from oil fields typically diminishes over time.[2] In any given year, produciton is constrained by the maximum efficient rate, which is the maximum amount of oil that can be extracted without reducing the total lifetime production of the field.

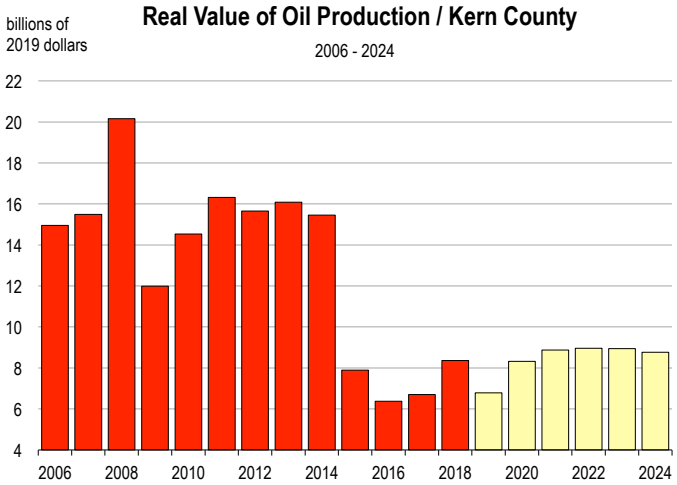
If the maximum efficient rate is exceeded, the natural pressure within the oil field will decrease, reducing the amount of oil that is ultimately available for extraction.

In a typical 30 year scenario of a field operating at the maximum efficient, production increases in the first 4 years, then declines as the remaining oil is extracted over the following 25+ years.

In 2018, approximately 124.5 million barrels were produced in Kern County. By 2024, production is expected to decline to 102 million barrels.

At these levels of projected production, along with expectations for oil prices, the total value of Kern County's oil output should remain similar to the values estimated for 2018, and within a range of $6.8 billion and $8.8 billion, adjusted for inflation.





[2] Marcello Colitti and Claudio Simeoni, Perspectives of Oil and Gas: The Road to Interdependence, Springer, ISBN: 0792340868, 1996

Kern County Oil Sector

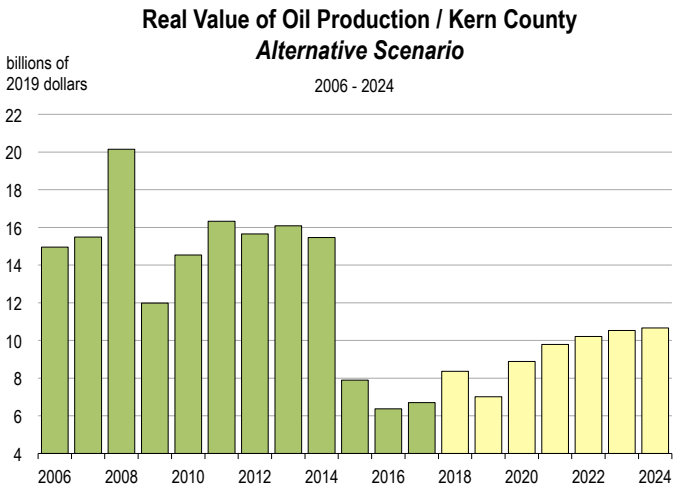
Alternative Scenario

Higher levels of oil extraction by employing newer technologies may be possible over the next several years. With enhanced secondary and/or tertiary recovery methods, it is possible that more oil can be extracted from existing oil fields.

Under a hypothetical scenario where new technology is introduced, and production will remain near 2018 levels (rather than declining, as assumed in our baseline scenario), the value of Kern County's oil output would rise meaningfully.

With production held constant at 2018 levels, and oil prices increasing at the rates forecast by the EIA, the total value of countywide oil production would reach $10.7 billion by 2024.

Over the entire 2018-2024 period, the oil industry would have generated an additional $6.4 billion in value. This could produce a number of benefits to the Kern County economy, including higher property tax collections, a higher level of income per capita, and greater levels of spending at Kern County businesses.



Kern County Agriculture Sector

Agriculture Sector Introduction

There are three primary data sources for analyzing agriculture employment: the Quarterly Census of Employment and Wages (QCEW), the Current Employment Statistics program (CES), and the American Community Survey (ACS).

The QCEW and the CES are administered by the California Employment Development Department (EDD), and the ACS is administered by the U.S. Census Bureau.

Each of these sources has strengths and weaknesses.

CES and QCEW Data

The CES provides very timely data, estimating farm employment in Kern County as recently as June 2019. However, it groups all agriculture employment into a single category, which prevents analysis by type of agricultural commodity.

The QCEW has employment data for more than 40 sectors within the agriculture industry, providing the opportunity to analyze employment by type of agricultural product. But this data is not released on a particularly timely schedule, and the most recent data is for the fourth quarter of 2018.

The CES and the QCEW also may overestimate, or underestimate, the number of agricultural workers in Kern County. These programs measure jobs, not people. They try to estimate the number of distinct jobs (including both full-time and part-time jobs) at agricultural companies that have a physical location in Kern County. It is highly probable that some of Kern County's farm workers have multiple jobs at multiple different companies.

At the same time, some agricultural workers may live in Kern County but work somewhere else (such as Tulare or Kings), or they may live in another place but work in Kern County. This type of cross-county commuting is common across California, although its impact on agriculture employment data is largely unknown.

ACS Data

The American Community Survey is a program that sends questionnaires to 2.1 million U.S. households every year, including 202,000 households in California. The questionnaires cover an incredibly wide range of topics, including employment by industry.

Because the ACS collects information from households, rather than businesses, it can be a useful way to analyze the number of residents who work in a specific industry. In short, the EDD estimates jobs, whereas the ACS counts people.

To this extent, the ACS has estimates of the number of Kern County residents that work in the agriculture sector from 2005-2017. Data for 2018 will be available in early 2020.

But there are weaknesses to this data source, and the primary weakness is its sample size. The survey reaches only 1.6 percent of households within Kern County, which means that the data has a relatively large margin of error.

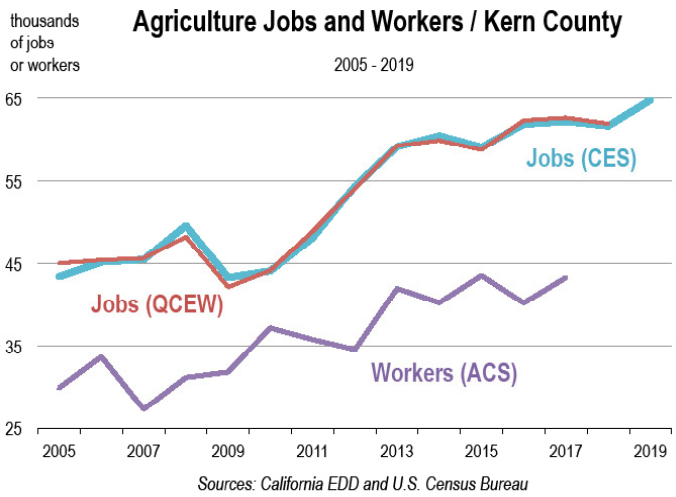
For example, the ACS estimates that there were 43,307 Kern County residents who worked in agriculture in 2017. But because the margin of error is so large, there could actually have been anywhere from 38,923 to 47,691 workers in 2017 – a difference of almost 8,800 jobs, which is much larger that the margins of error for the CES or QCEW.

Like the CES and QCEW, the ACS also misses commuters to the extent that some people live in Kern County (and would be counted in the Kern County survey) but actually work in a different county. And some people live in adjacent counties (and would be counted in the surveys for those places) but work in Kern.

In addition, the ACS is not very timely, as is has not yet released data for 2018 or any part of 2019, and has problems related to underreporting and undercounting of people.

Discrepancies Between Data Sources

In 2017, the most recent period that can be used to compare these sources, the CES reported that there were 62,238 agriculture jobs in Kern County, and the QCEW reported that there were 62,670 jobs. The ACS estimated that there were 43,307 Kern County residents who worked in the agriculture industry. Clearly there are large discrepancies between the CES/ QCEW and the ACS.



Sources: California EDD and U.S. Census Bureau

Kern County Agriculture Sector

Agriculture Jobs and Workers / Kern County
Comparison of Data Sources
2017

Data Source	Type of Estimate	2017 Estimate
Current Employment Statistics Program	Jobs	62,238
Quarterly Census of Employment and Wage	Jobs	62,670
American Community Survey	Workers	43,307

Sources: California Employment Development Department and U.S. Census Bureau

Accounting for Differences in Data Estimates

There are a number of reasons that could explain the gap between EDD agriculture jobs and ACS agriculture workers.

Multiple Job Holders

As mentioned above, some farm workers in Kern County might hold jobs at multiple agricultural companies, which could explain, in part, why there appear to be more jobs at local businesses than workers living in the county.

Cross County Commuting

Also mentioned previously, some farm workers may be commuting into Kern County from other areas, in which case they would be counted in the number of jobs at local firms, but not be counted among the number of workers who live in Kern County.

Undercounting of Workers

It's also possible that the ACS is undercounting workers. The ACS is a voluntary, self-reported survey, and some households may choose to underreport their participation in the labor market. If agriculture workers are choosing not to report their employment status, the survey may undercount them.

Differences in Survey Methodology

Comparing data from different surveys can be complicated. The ACS, QCEW, and CES all use different methodologies, collect data from entirely different places (i.e. households and businesses), and use different techniques for contacting their target audiences (phone calls, mail-in forms, extraction of information from tax records).

The EDD surveys are mandatory, and can be verified through government records, while the ACS surveys are voluntary and cannot be verified for accuracy.

Because of these differences, it is entirely possible that comparing EDD farm jobs to ACS farm workers is simply not advisable.

Research on Multiple Job Holders in Agriculture

Information on multiple job holders in agriculture is limited. Researchers at the Census Bureau have determined that across the U.S., approximately 7.7 percent of all workers in all industries held two jobs in 2013, and an additional 0.6 percent of workers held three to five jobs.[3]

A study by the U.S. Bureau of Labor Statistics gives different estimates and suggests that, over time, the share of people with multiple jobs has declined.[4] This report shows that in 1995, almost 7 percent of workers held multiple jobs, but by 2013 only five percent of workers held more than one job.

The same BLS report calculates that the agriculture sector had approximately the same share of multiple job holders as the broader labor market – 7 percent in 1995 an 5 percent in 2013.

A recent study from George State University looked into the share of multiple job holders across different regions of the U.S., and estimates that 3.68 percent of all workers in Kern County hold more than one job.[5] Results were similar for several nearby areas, including San Joaquin County (4.10 percent), Riverside and San Bernardino Counties (3.99 percent), and Tulare County (3.80 percent).

Evidence on Cross-County Commuting

There is virtually no credible research on cross-county commuting for agriculture workers, but some simple data analyses can provide information on the likelihood of cross-county commuting among agricultural workers in Kern County.

The ACS provides data on cross-county commuting for all workers in Kern County, and this data suggests that Kern County is commute-neutral, meaning that it neither gains nor loses a significant number of workers from commute patterns.

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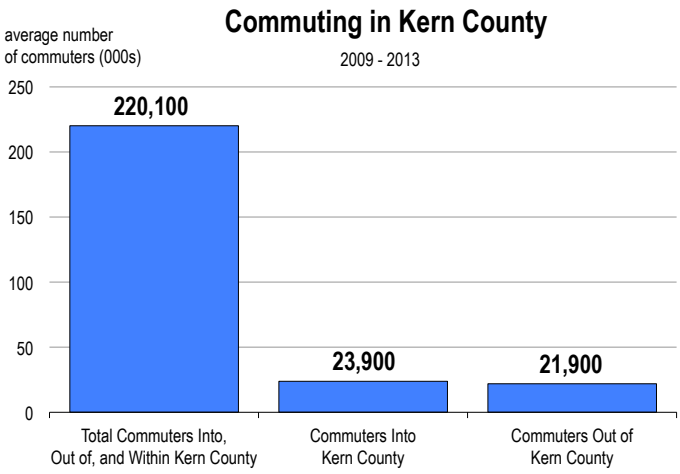
[3] https://www.census.gov/content/dam/Census/library/publications/2019/demo/P70BR-163.pdf

[4] https://www.bls.gov/opub/mlr/2015/article/multiple-jobholding-over-the-past-two-decades.htm

[5] http://www2.gsu.edu/~ecobth/MJH_Cross-MSA_final_May2017.pdf

Kern County Agriculture Sector



Source: American Community Survey

Over the 2009-2013 period (the most recently available data), an average of 21,900 workers commuted from Kern County to other places, representing 10 percent of the workforce that made any kind of commute during that period. During the same time period, an average of 23,900 workers commuted into Kern County, representing 11 percent of everyone who travelled to work in any way.

Given the substantial margins of error for ACS data (as explained earlier in this report), the difference between in-commuters and out-commuters is not statistically significant, and it can be assumed that relatively equal numbers of workers commute into and out of Kern County.

The ACS also provides data on the method of commuting for Kern County workers, and this data is broken down by industry. According to this information, there are some unique characteristics of agricultural commuters. Specifically, a much larger share of agricultural workers commute by carpool, compared to the broader Kern County job market. Between 2013 and 2017 (the most recently available data), more than 23 percent of agricultural workers carpooled, compared to just 13 percent of workers across all industries.

Method of Commuting to Work
Kern County
2013-2017

Method of Commuting	Share of All Workers (%)	Share of Agriculture Workers (%)
Drive Alone	79.2	69.5
Carpool	12.8	23.4
Total, Commuter-Owned Vehicles	**92.1**	**92.9**
Public Transportation	0.9	0.2
Walk	1.2	0.8
Taxi, Motorcycle, Bicycle	2.7	5.1
Work at Home	3.2	1.0
Total, Other	**7.9**	**7.1**

Source: American Community Survey

This difference is due entirely to the fact that fewer agricultural workers drive their own cars, by themselves. Agricultural workers do not commute by other methods at meaningfully different rates than the broader pool of workers (public transportation, walking, bicycling, etc.).

Because they travel by worker-owned car at similar rates to the rest of the county, and by other means at similar rates, it can reasonably be assumed that they have similar rates of cross-county commuting, and that Kern County neither gains nor loses a substantial number of agriculture workers to commute patterns. Therefore, estimates of total agriculture workers do not need to be adjusted for commuting patterns.

Research on the Undercounting of Workers

There has been substantial research regarding the topic of undercounting by the Census. There are reports that surveys from the Census Bureau undercount a number of demographic groups, including recent immigrants,[6] young children,[7] and other populations.

For the topic of farm workers in Kern County, the group most likely to be undercounted is undocumented immigrants.

Some organizations estimate that there are as many as 25,000 undocumented immigrants in Kern County who work in agriculture, and that agriculture is the largest employer of undocumented immigrants in the county by a wide margin.[8]

Unfortunately there are few quantitative studies that can be used to estimate any possible undercount in Kern County.

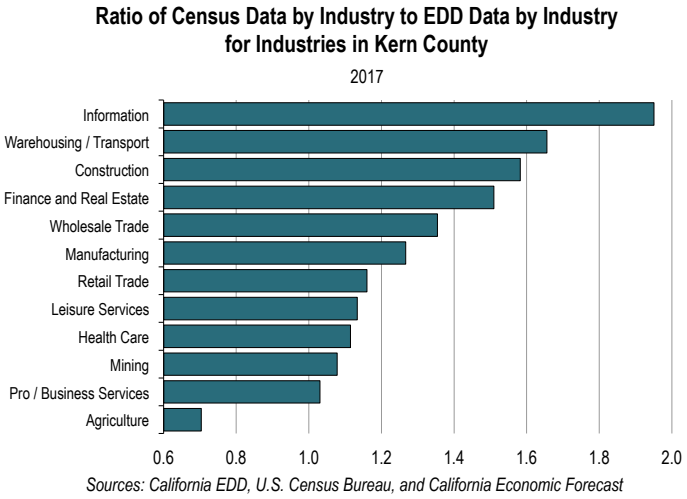
However, there may be some evidence in the labor market data. If undocumented immigrants in Kern County were underreporting their employment status at higher rates than other demographic groups, the ratio of ACS workers to EDD jobs would be lower in those industries than in industries with fewer undocumented immigrants.

[6] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3783022/

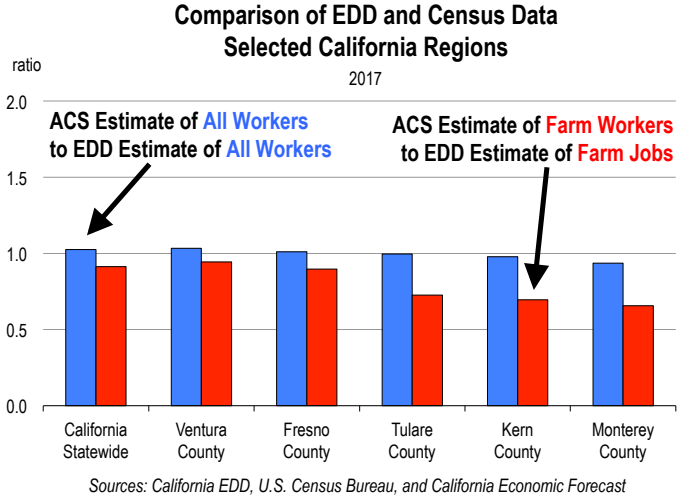
[7] https://www.census.gov/programs-surveys/decennial-census/2020-census/research-testing/undercount-of-young-children.html

[8] https://www.migrationpolicy.org/data/unauthorized-immigrant-population/county/6029

Kern County Agriculture Sector



Sources: California EDD, U.S. Census Bureau, and California Economic Forecast



Sources: California EDD, U.S. Census Bureau, and California Economic Forecast

This is certainly true for agriculture. The ACS data indicates that there are only 0.7 agriculture workers for every EDD job, which is the lowest ratio of all industries in Kern County. But in other sectors with prominent numbers of undocumented immigrants – leisure services, retail trade, and construction – the ACS reports that there are actually more workers than jobs, suggesting that underreporting is not a major issue for these industries.

So the evidence pointing towards the under-reporting of undocumented immigrants is weak at best, except for the Farm Sector.

Evidence on Differences in Survey Methodology

Discrepancies between survey methodologies can be performed by analyzing a cross section of survey data. For the data used in this report, the best strategy is to compare the ACS and EDD survey results across industries and across regions of California.

To start, our firm compared data that should theoretically be identical between the two surveys: the number of employed residents age 16 and over.

We made these comparisons for Kern County, two neighboring counties, and two heavily agricultural counties along the coast. We also made this comparison for the whole state of California.

For the entire state, the ACS estimates of total employed residents are 3 percent higher than EDD estimates. The ACS was also 3 percent higher for Ventura County and 1 percent higher for Fresno County. Estimates were virtually identical for Tulare County, and the ACS was lower by 2 percent for Kern County and 6 percent for Monterey County.

We then made the same comparison for ACS estimates of farm workers and EDD estimates of farm jobs.

Three primary observations became apparent:

- In all regions, ACS farm worker counts were lower than EDD job counts
- Areas with higher ACS/EDD ratios for all workers also had high ratios for the farm sector
- Areas with lower ACS/EDD ratios for all workers also had lower ratios for the farm sector

Because these patterns are consistent across several regions of California, there is compelling evidence that survey methodology is responsible for part of the discrepancy between Kern County agriculture data sources.

Estimating the Number of Farm Workers in Kern County

Given the results of research and analysis on the data sources described above, it is reasonable to assume:

- Some Kern County farm workers hold more than one job
- Cross-county commuting is not a major factor in explaining the data gap
- A non-quantifiable number of farm workers may be undercounted by the ACS
- Survey methodology is responsible for part of the data gap

Kern County Agriculture Sector

Total Agriculture Workers Adjusted for Multiple Job Holders / Kern County 2019

Origional Data Source	Total Farm Jobs in 2019	Estimated Number of Multiple Job Holders	Estimated Farm Workers in 2019
Current Employment Statistics Program	64,783	2,326	62,457

Sources: California Employment Development Department and California Economic Forecast

Research on multiple job holders indicates that 3 to 4 percent of all Kern County workers have two jobs, and that less than 0.6 percent of workers hold 3 to 5 jobs. It also suggests that the share of multiple job holders in the agriculture sector is similar to the broader labor market. Therefore, we can reasonably adjust agriculture employment data to account for multiple job holders.

For the purposes of simplicity, we will assume that 3.5 percent of workers hold 2 jobs in Kern County, and 0.3 percent of workers hold 3 to 5 jobs, with an average of 4 jobs (using slightly different assumptions leads to virtually no change in the total estimate of multiple job holders).

But should we apply these estimated to data from the ACS or EDD? The California Economic Forecast recommends using EDD data because it is based on a non-voluntary survey, is based on a larger sample size than the ACS, and can be verified with tax records.

The number of multiple job holders in Kern County can be calculated by applying the following equation to the most recent estimate of total jobs in the county (i.e. 2019 data from the Current Employment Statistic program):

$$(2 - 1) * (X * 0.035) – (4 – 1) * (X * 0.003) = Y$$

Where X is the CES estimate of agriculture jobs and Y is the number of multiple job holders

This calculation suggests that there are 2,326 multiple job holders in 2019, leaving a total of 62,457 farm workers in the county.

Kern County Agricultural Production

The Kern County Department of Agriculture and Measurement Standards produces data on crop, livestock, and dairy activity. Data is available from 1930 to 2017, and includes:

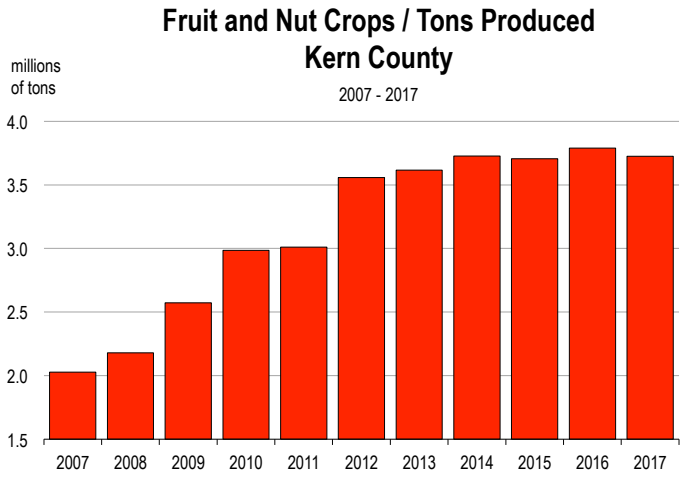
- The amount of each commodity produced (e.g. tons of grapes, head of cattle)
- The average price received by farmers for each commodity
- The total value (i.e. average price multiplied by quantity produced) for each commodity
- The number of acres harvested of most fruit, vegetable, and field crops
- The number of non-harvested acres of most fruit, vegetable, and field crops

Using these data sources, the California Economic Forecast examined agricultural employment by type of commodity at the most detailed level possible. Employment trends were examined for every major crop category except egg production, because reliable labor market data for egg production does not exist.

Fruit and Nut Crops

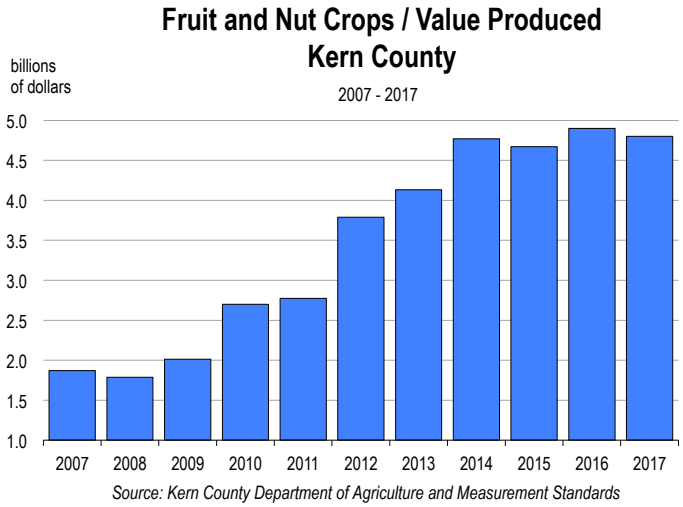
Fruit and nut crops account for the majority of Kern County's agricultural output. In 2017, the region produced $3.7 million tons of fruit and nut crops, valued at $4.8 billion and spread across 572,200 acres, of which 93 percent of these acres actively bore commodities in 2017.

There were 51,000 workers at fruit and nut farms in 2017, indicating that there were 9.0 workers for every 100 acres. Even as employment in this sector has expanded, fewer jobs are now located on each acre of farmland. Over the last decade, there have been as many as 11.4 workers per acre in the fruit and nut industry.

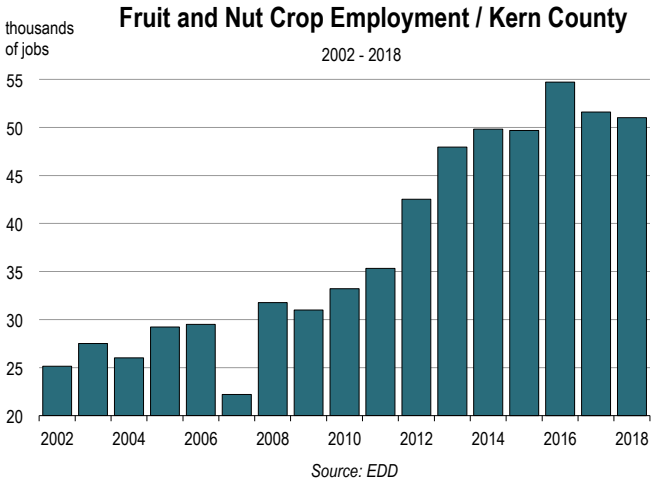


Source: Kern County Department of Agriculture and Measurement Standards

Kern County Agriculture Sector

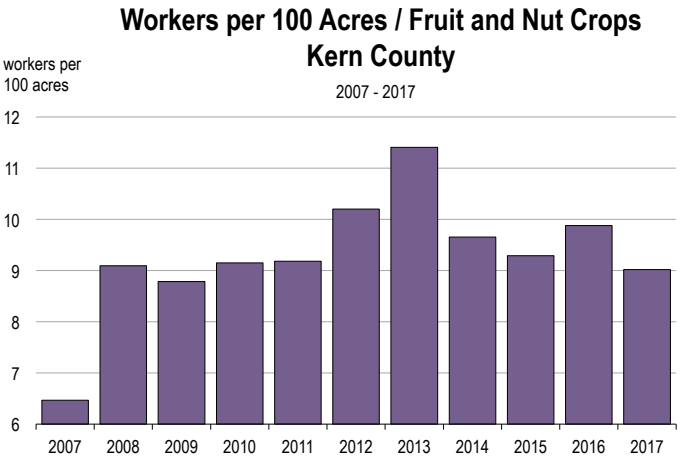


Source: Kern County Department of Agriculture and Measurement Standards

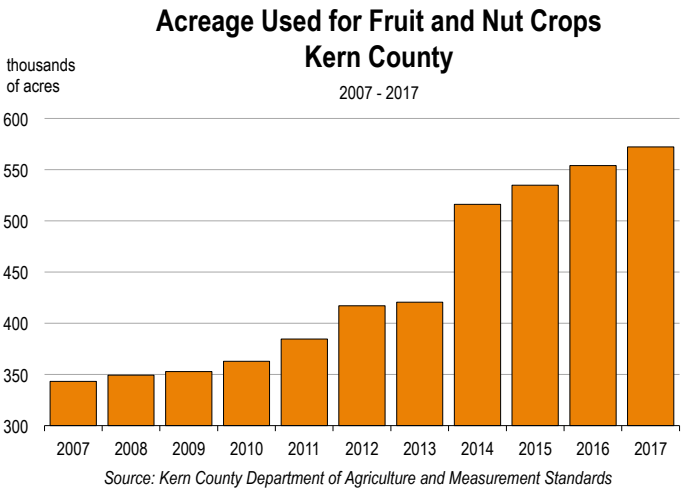


Source: EDD

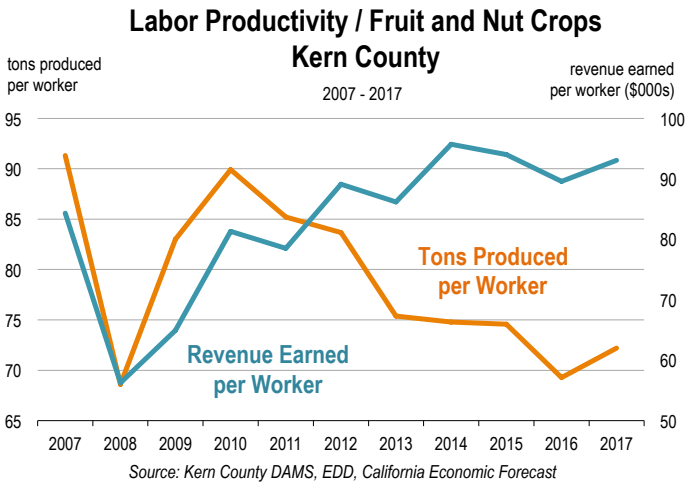
Labor productivity has declined by some measures, but increased by others. Each worker is now responsible for 72.2 tons of fruits and nuts, which is down from 89.9 tons in 2010. But because Kern County fruits and nuts have become more valuable, each worker now accounts for $93,100 in revenue, which is much higher than the low point of last decade, which was recorded at $56,300 in 2008.



Source: Kern County DAMS, EDD, California Economic Forecast

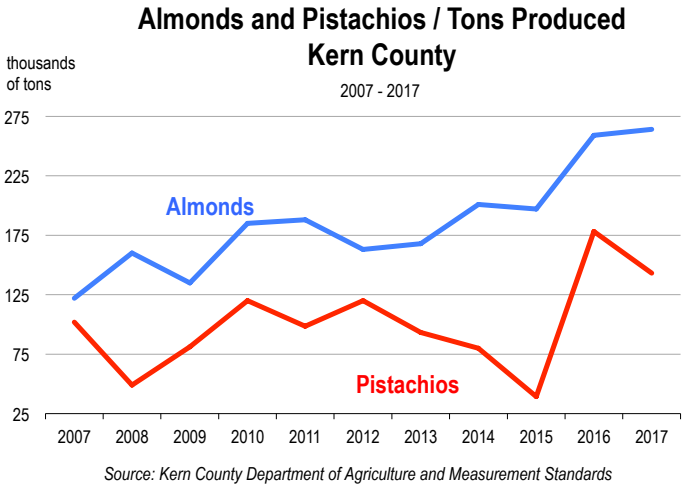


Source: Kern County Department of Agriculture and Measurement Standards



Source: Kern County DAMS, EDD, California Economic Forecast

Kern County Agriculture Sector



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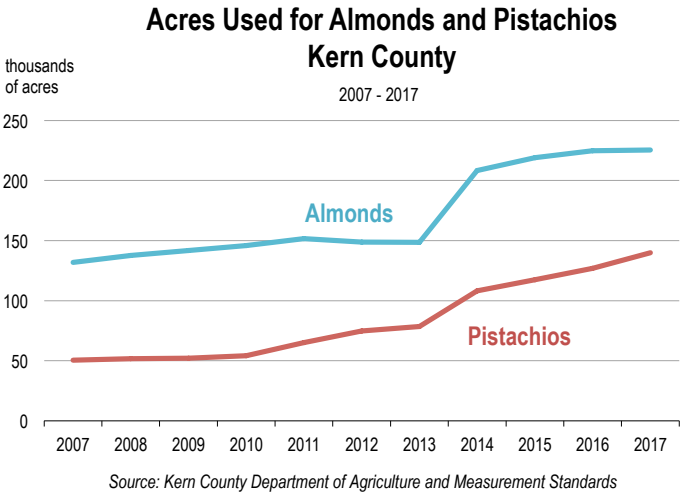


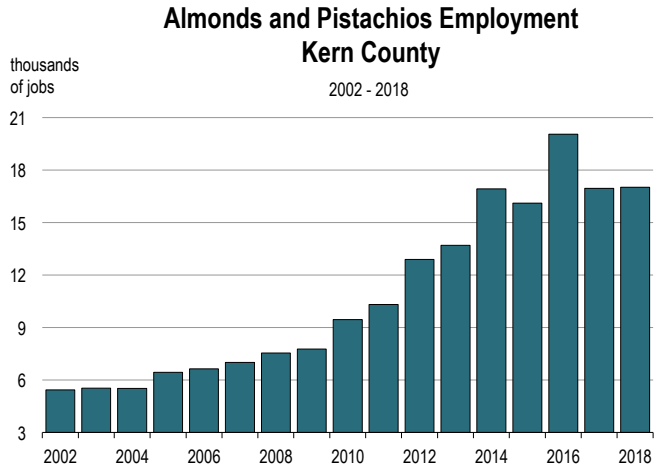
Source: Kern County Department of Agriculture and Measurement Standards

Almonds and Pistachios

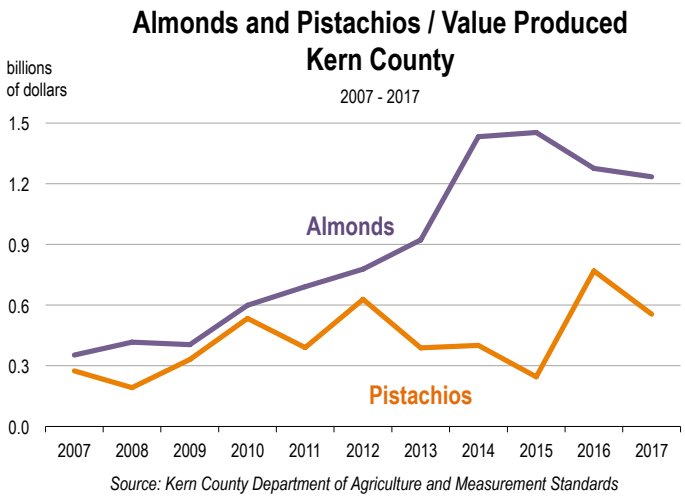
Within the category of fruit and nut crops, almonds and pistachios account for about a third of all production value. In 2017, more than 407,000 tons of almonds and pistachios were harvested, which were valued at a total of $1.8 billion.

Approximately 225,500 acres were devoted to growing almonds, and 140,000 acres were used to grow pistachios, for a total of 365,500 acres between both commodities.

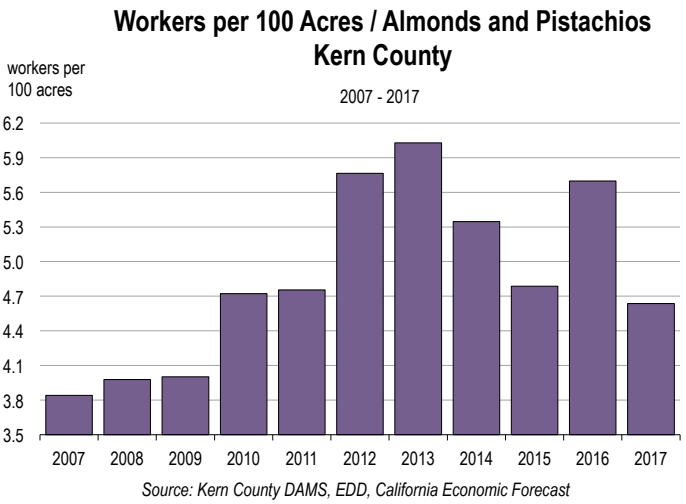
There were almost 17,000 workers at almond and pistachio farms in 2017, meaning that each 100 acres of land supported 4.6 jobs. Labor productivity at these farms has generally decreased since



Source: EDD

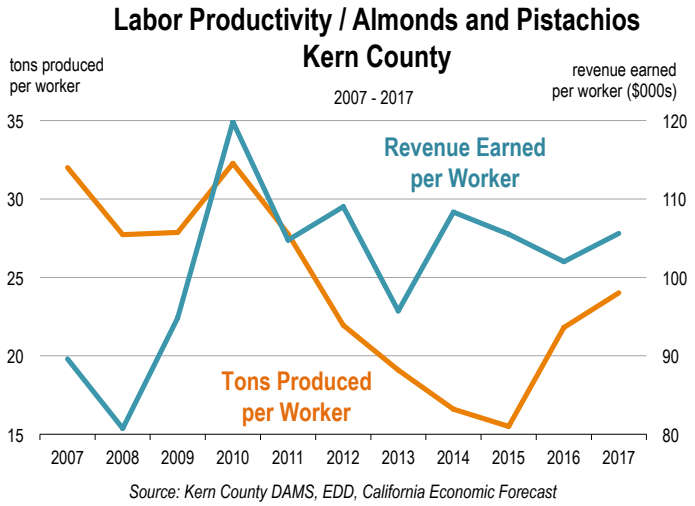


Source: Kern County Department of Agriculture and Measurement Standards

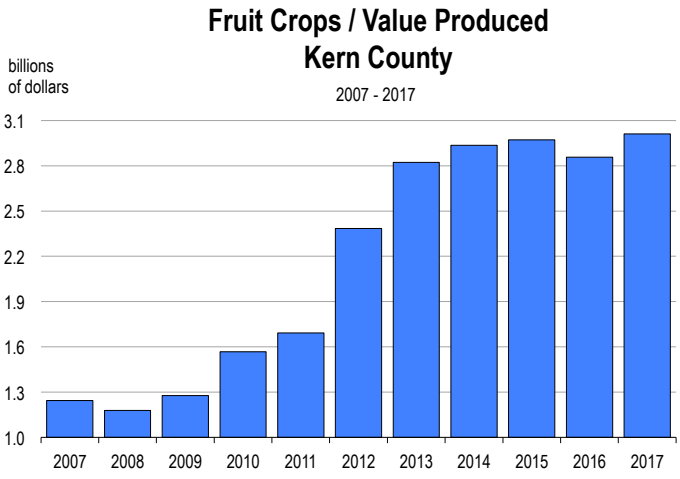


Source: Kern County DAMS, EDD, California Economic Forecast

Kern County Agriculture Sector



Source: Kern County DAMS, EDD, California Economic Forecast

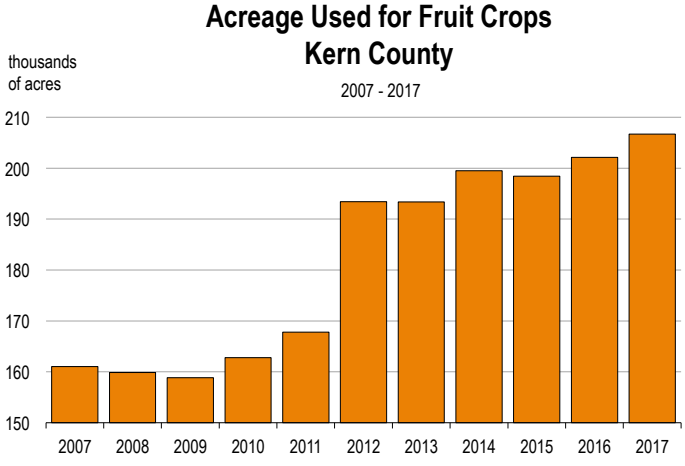


Source: Kern County Department of Agriculture and Measurement Standards

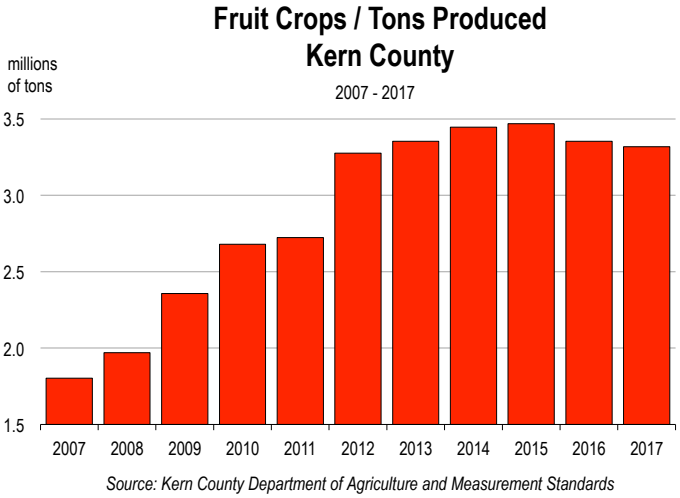
2010, with the average worker now producing just 24 tons of nuts and generating $105,600 dollars in revenue.

Fruit Crops

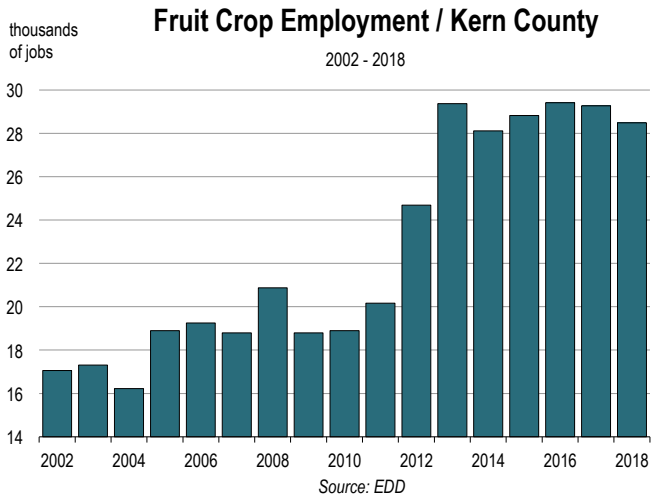
Kern County's primary fruit crops are grapes, cherries, pomegranates, tomatoes, blueberries, and a variety of citrus fruits. In 2017, the total value of fruit produced was recorded at $3.0 billion. Grapes accounted for approximately 60 percent of this value, while citrus accounted for slightly more than 30 percent. Cherries, pomegranates, tomatoes, and blueberries represented most of the remaining 10 percent.



Source: Kern County Department of Agriculture and Measurement Standards

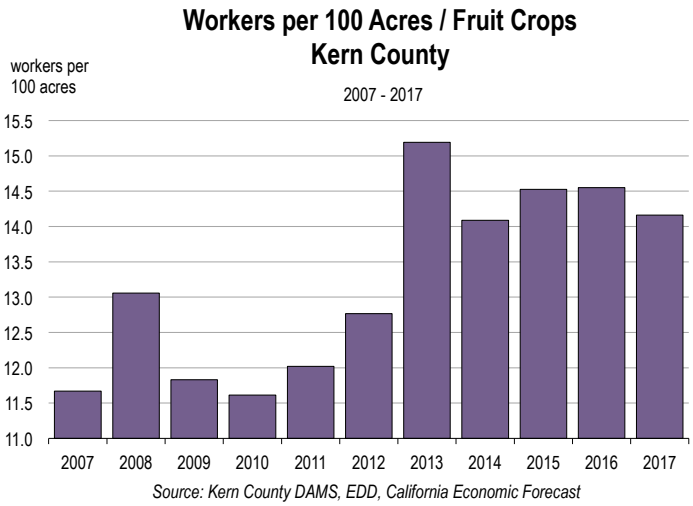


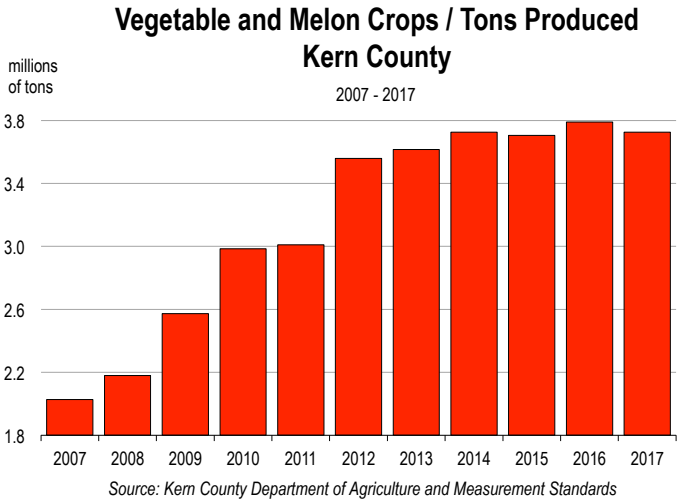
Source: Kern County Department of Agriculture and Measurement Standards



Source: EDD

Kern County Agriculture Sector





Almost 207,000 acres of farmland were devoted to fruit crops in 2017, and more than 3.3 million tons of fruit were produced. With 29,300 workers on Kern County fruit farms, each 100 acres of fruit farms supported 14.2 jobs.

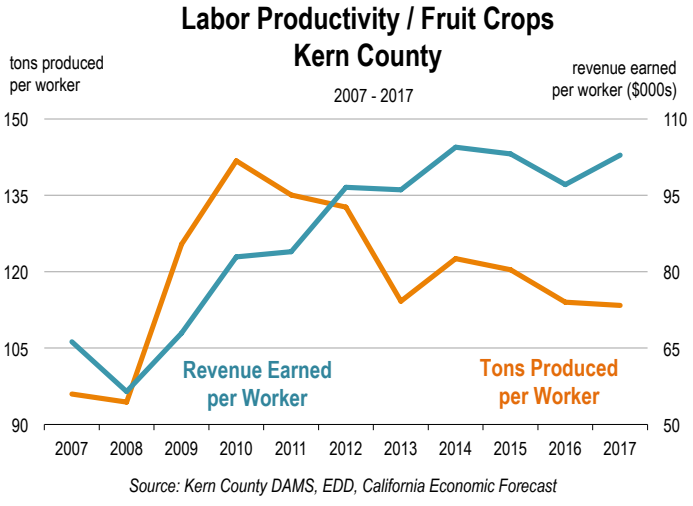
Kern County's fruit farms are producing a higher volume of commodities, but are also adding more workers. Because of this, each worker now accounts for 113 tons of product, compared to more than 140 tons earlier in 2010.

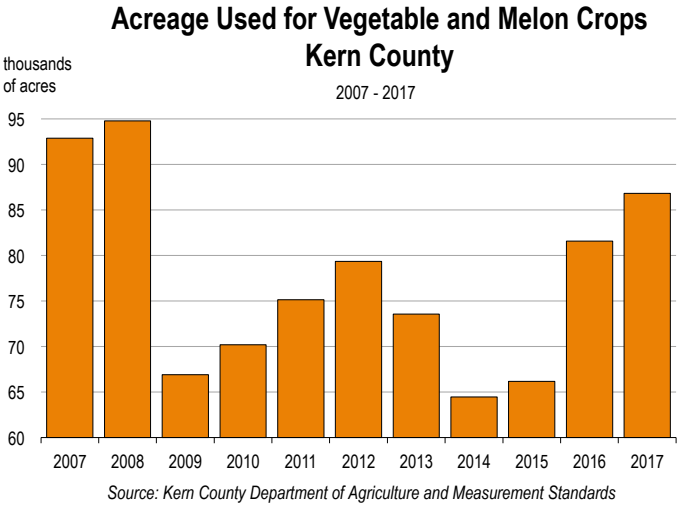
The average worker is now generating almost $103,000 in revenue. Revenue per worker has been largely unchanged since 2014, but increased quickly during the 2008-2012 period.

Vegetable and Melon Crops

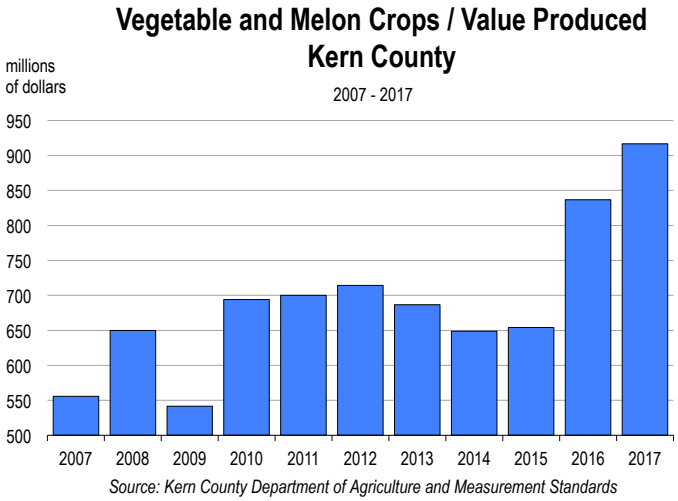
The principal vegetable and melon crops are garlic, potatoes, carrots, onions, and watermelon. Total vegetable and melon crops were valued at $917 million in 2017, and carrots accounted for approximately half of this value.

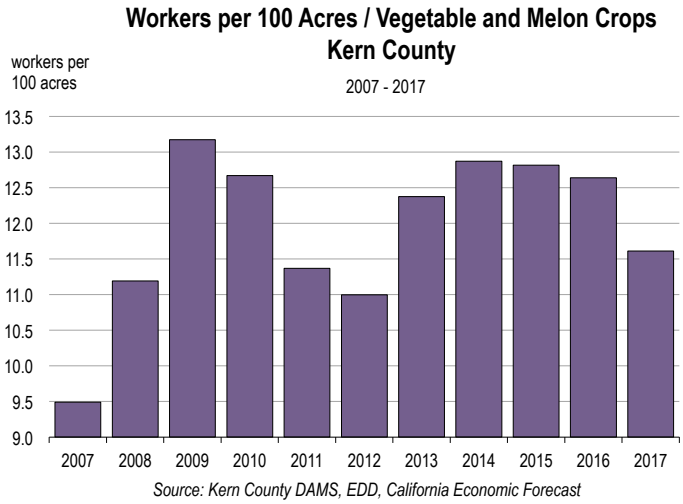
The total volume of vegetable and melon output has risen over the last decade, reaching 3.7 million tons in 2017. At the same time, the number of acres devoted to these crops has been volatile, declining from 95,000 acres in 2008 to just 66,000 by 2014, but then rebounding to 87,000 by 2017.





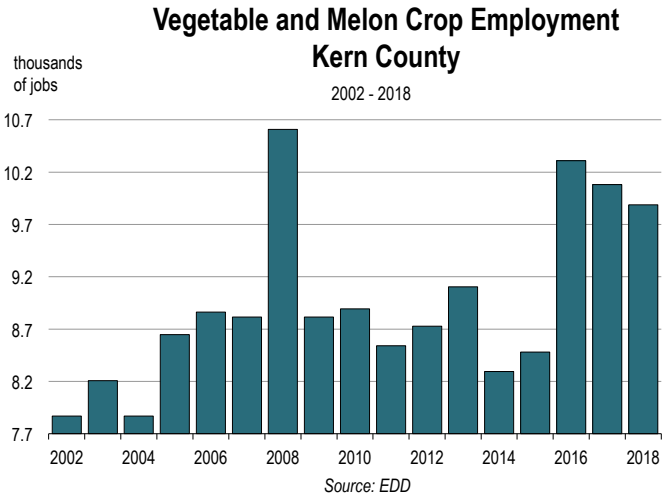
Kern County Agriculture Sector

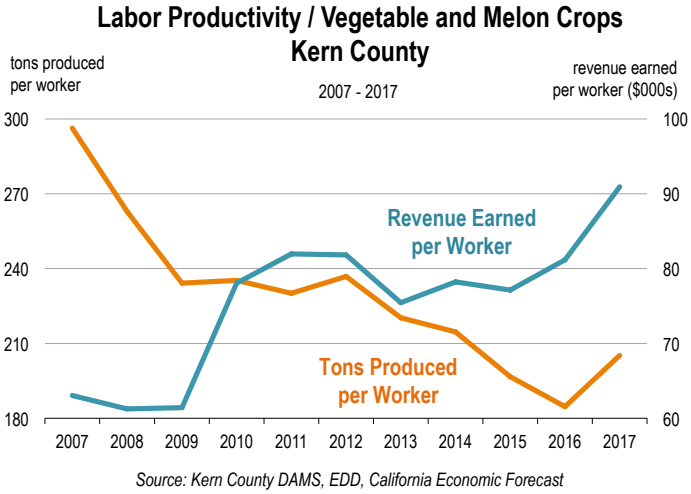




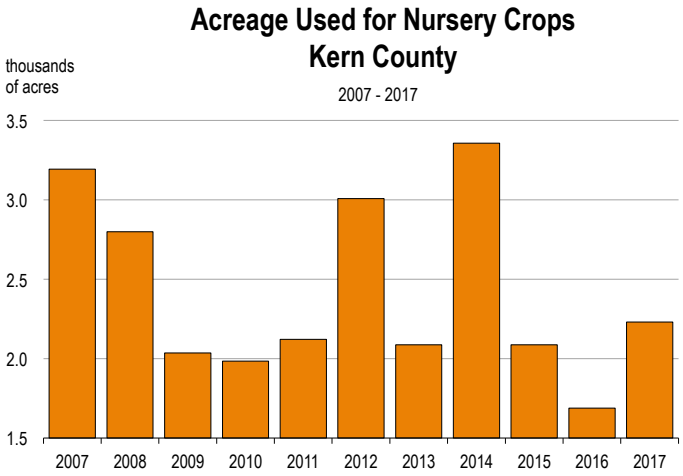
Every 100 acres of vegetable and melon farmland now supports 11.6 jobs. But just as employment levels and total acreage have gone through periods of rising and falling, so has the number of jobs on each acre.

The number of tons produced by the average worker has declined relatively steadily, and in 2017 each worker accounted for only 205 tons of output. But the value of this work has risen in recent years, climbing to $90,900 per worker.

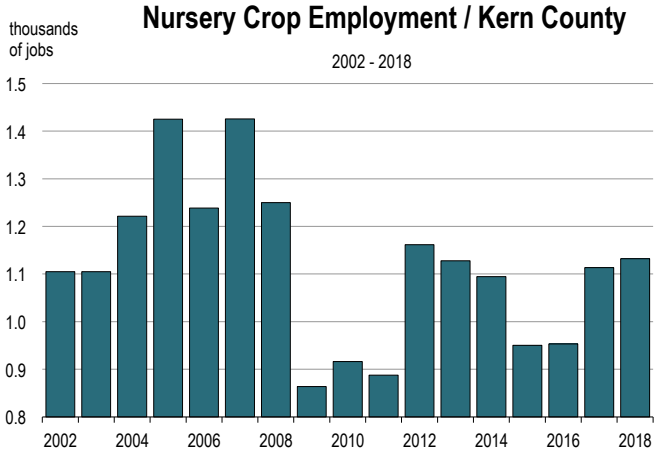




Kern County Agriculture Sector



Source: Kern County Department of Agriculture and Measurement Standards



Source: EDD

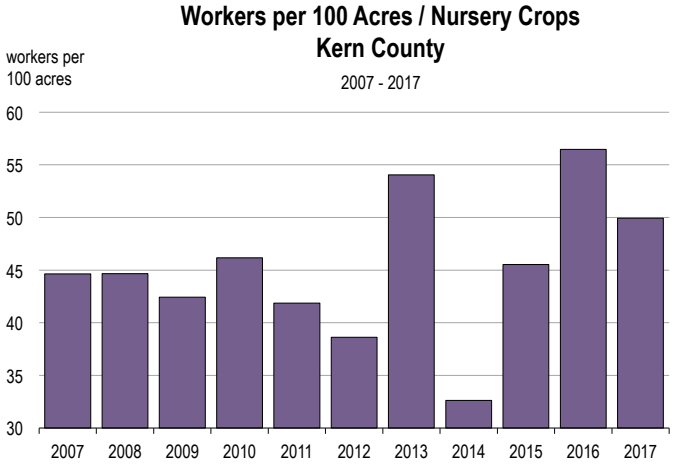
Nursery Crops

Nursery crops represent a very small portion of the Kern County agriculture sector. In 2017, only 2,200 acres were devoted to nursery crops, and the total nursery subsector was valued at just $113.7 million, meaning that nursery crops account for less than 2 percent of all countywide agriculture activity.

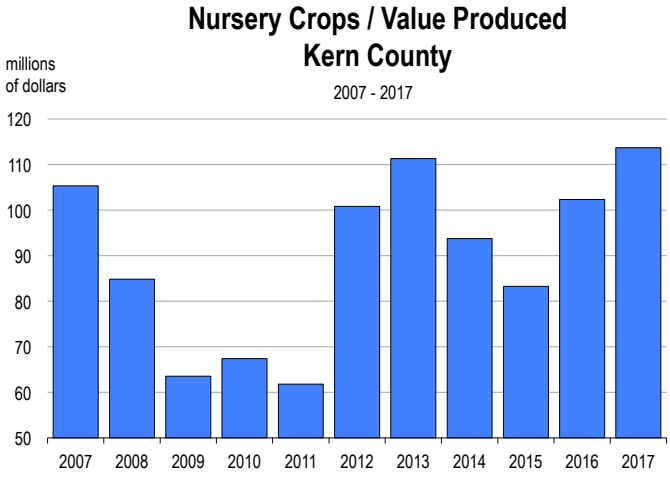
The most prominent nursery product is fruit and nut trees/vines. This crop category accounted for 58 percent of all nursery acres in 2017, and 73 percent of the value of total nursery output.

But each 100 acres of nursery space support 49.9 jobs, which is considerably higher than fruit and nut crops (11.0 jobs per 100 acres), Vegetable and melon crops (11.6 workers per 100 acres), and field crops (1.2 workers per 100 acres).

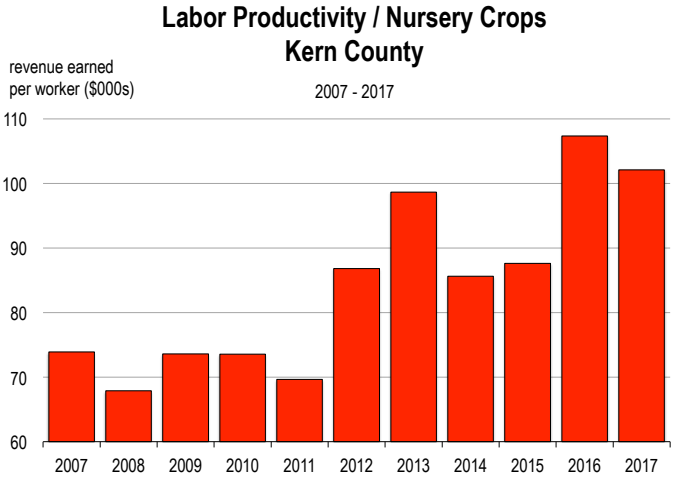
By dollar value, Kern County nurseries are becoming more productive. The average worker now generates more than $100,000 in revenue, compared to just $73,900 a decade ago.



Source: Kern County DAMS, EDD, California Economic Forecast

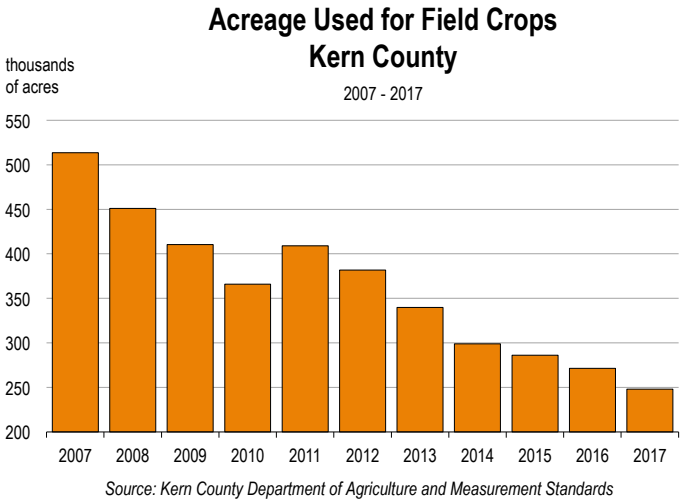


Source: Kern County Department of Agriculture and Measurement Standards

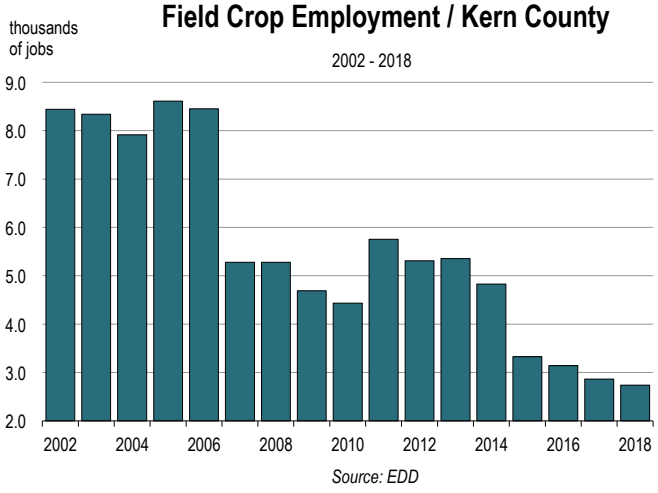


Source: Kern County DAMS, EDD, California Economic Forecast

Kern County Agriculture Sector



Source: Kern County Department of Agriculture and Measurement Standards



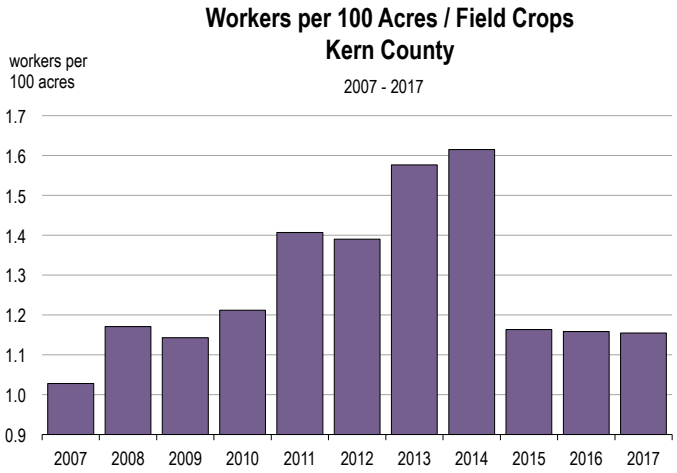
Source: EDD

Field Crops

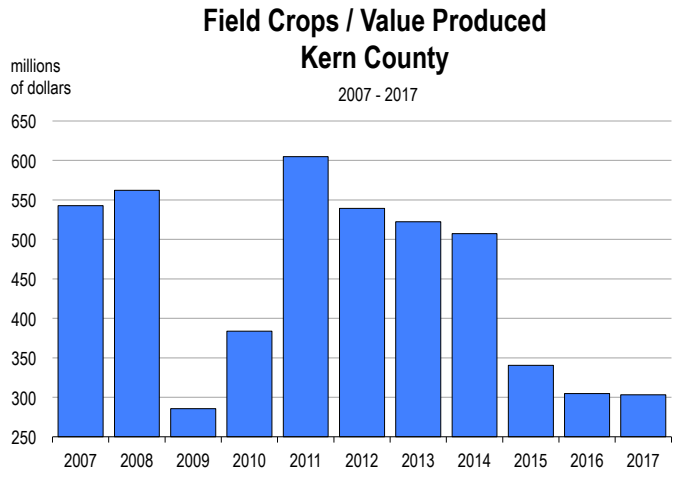
The principal field crops in Kern County are cotton, hay, and silage and forage. Total field crops were valued at $303 million in 2017, and these three commodities accounted for almost 80 percent of this value.

Just about every aspect of the field crop sector is declining. There are now only 2,700 field crop workers, which is lower than any year on record. Fewer acres are currently devoted to field crops than any point in the last decade, and the value of Kern County's field crop harvest has fallen to the levels last seen in 2009, and the bottom of the Great Recession.

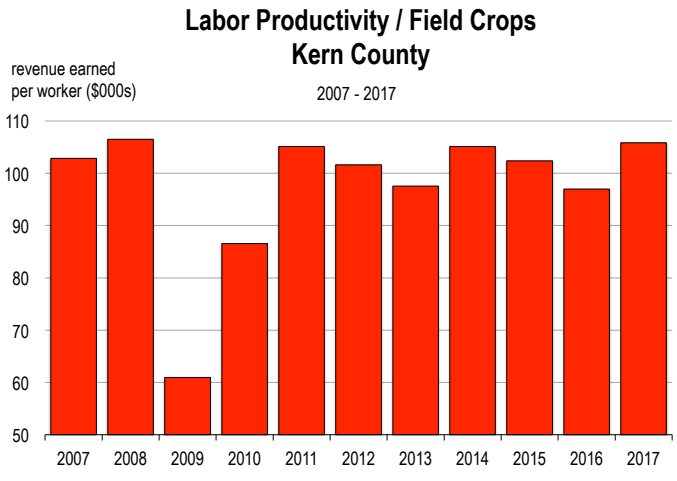
Field crop farms now employ approximately 1.2 workers per 100 acres, making it one of the least labor-intensive agricultural industries on a workers-per-acre basis.



Source: Kern County DAMS, EDD, California Economic Forecast

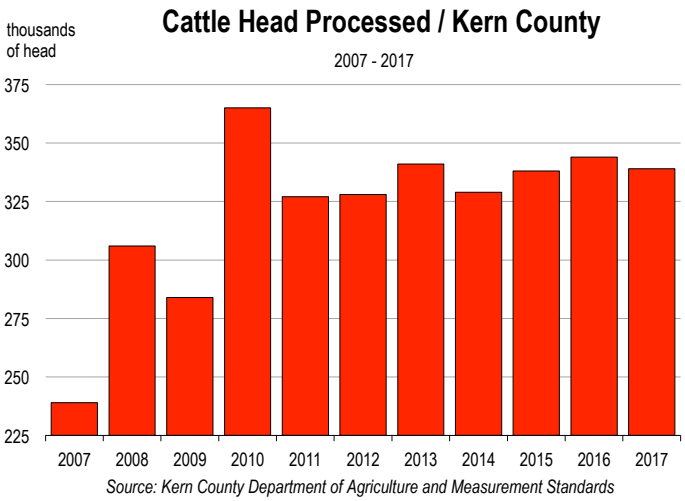


Source: Kern County Department of Agriculture and Measurement Standards



Source: Kern County DAMS, EDD, California Economic Forecast

Kern County Agriculture Sector



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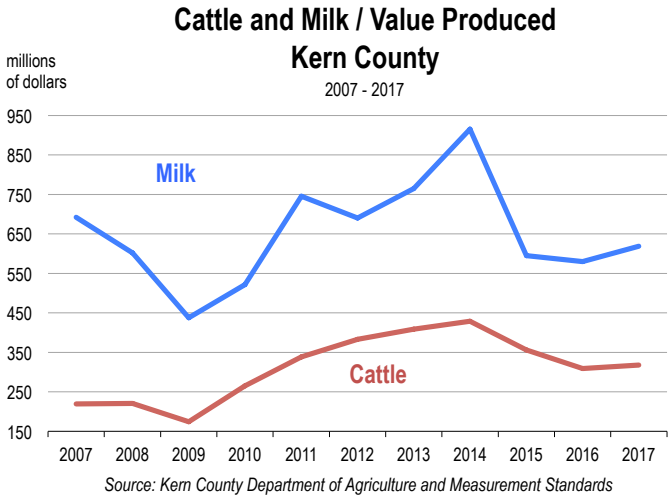


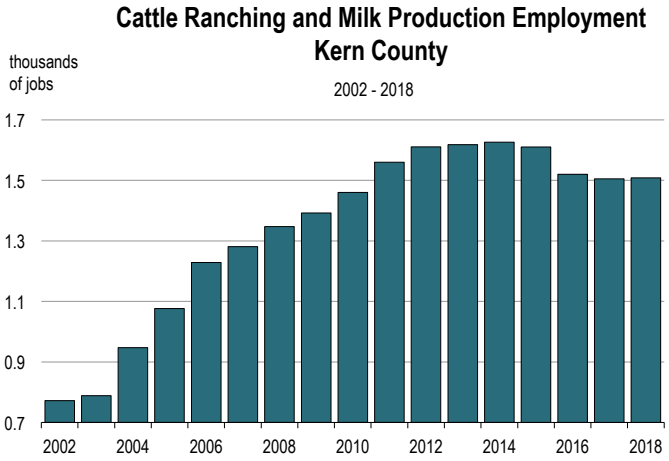
Source: Kern County Department of Agriculture and Measurement Standards

Cattle Ranching and Milk Production

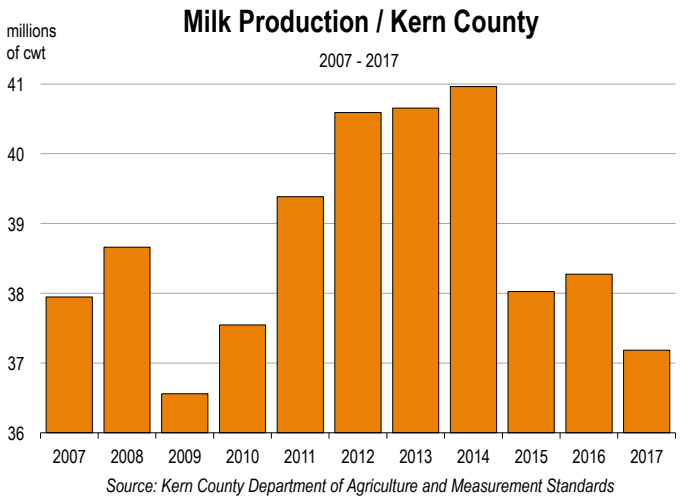
Milk production and cattle ranching represent large sources of income for the Kern County agriculture sector. Milk production was valued at $619 million in 2017, while cattle ranching generated $318 million in revenue.

Employment in these sectors has declined slightly in the last few years, falling to approximately 1,500 jobs in 2018.

Labor productivity is exceptionally high. The average worker is now responsible for generating $622,400 in revenue. Revenue per workers is not as high as it was during the 2011-2014 period, when prices for milk and cattle were very high, but productivity in these sectors are the highest in Kern County's agriculture industry, and by a large margin.



Source: EDD



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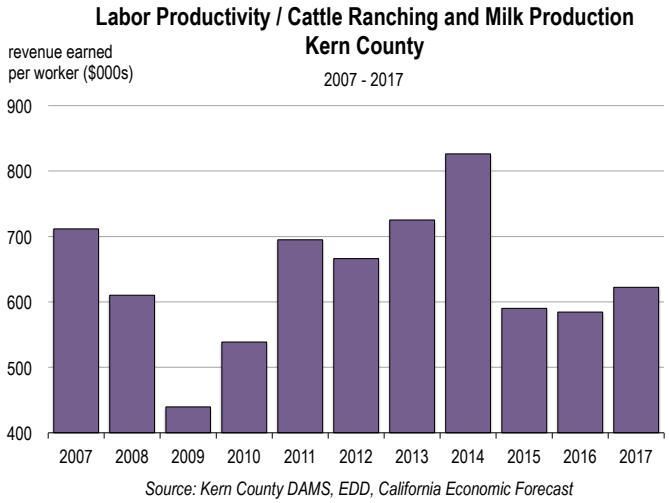
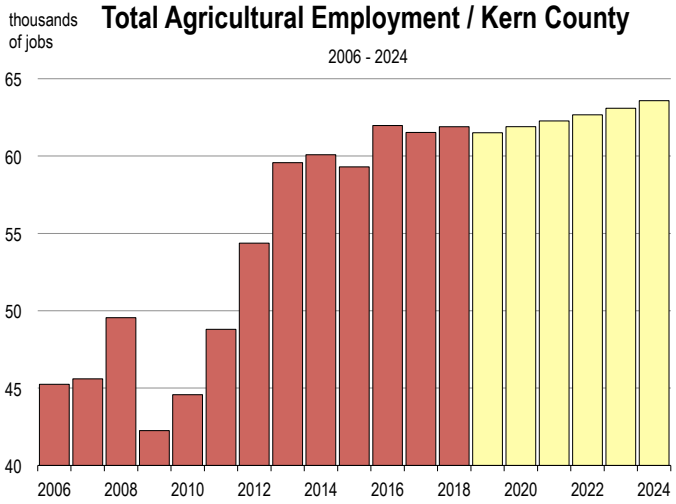
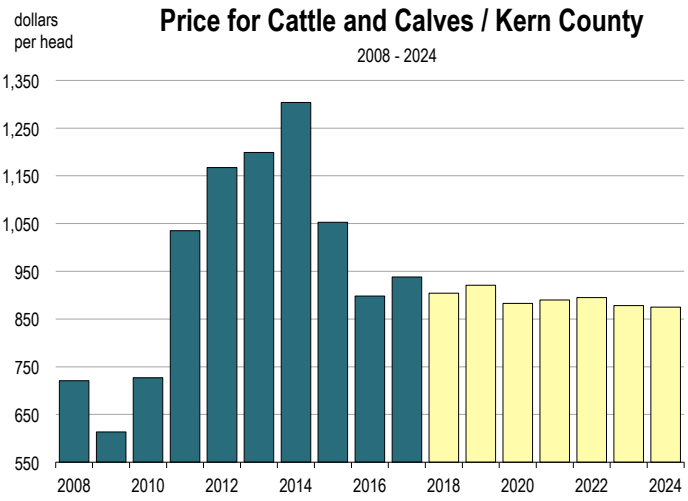


Source: Kern County DAMS, EDD, California Economic Forecast

Kern County Agriculture Sector



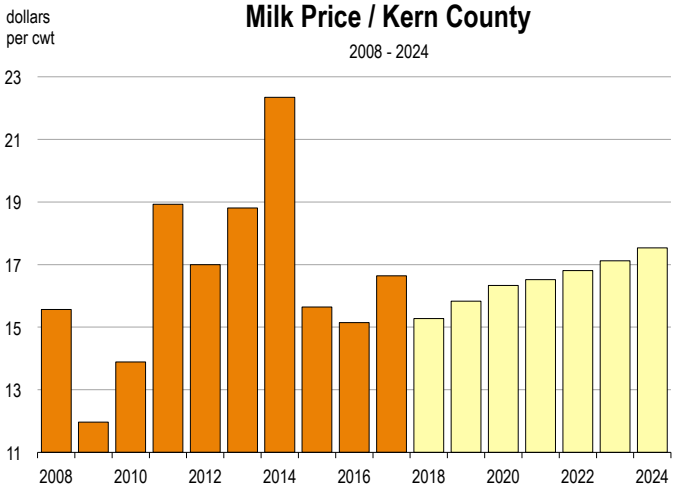


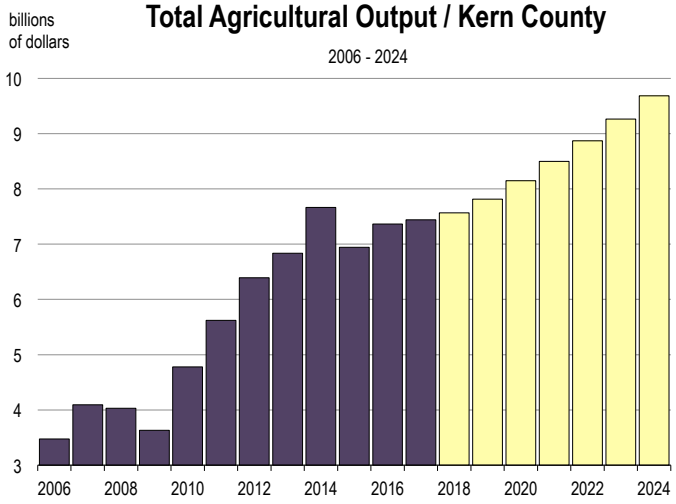
Forecast of Agriculture Output and Employment

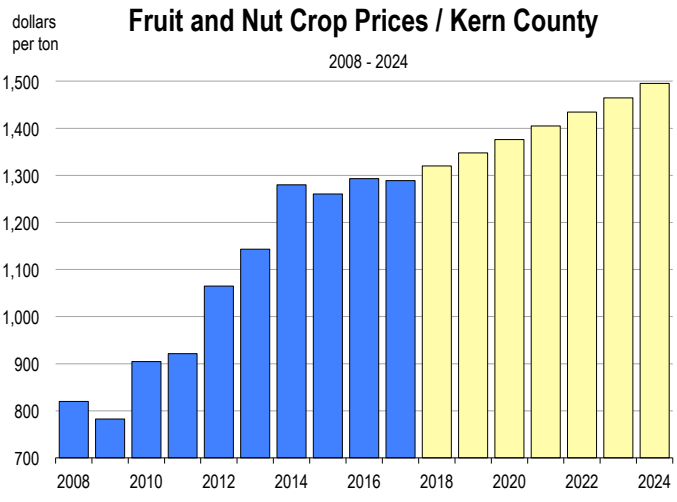
Agricultural employment in Kern County is expected to reach 65,500 jobs by 2024, an increase of 1,700 jobs from the current level (2019). Agricultural production values are also assumed to rise, with conservative estimates climbing to $9.7 billion.

This expansion of the farm sector will be supported by higher prices for Kern County's primary commodities.

Although the per head price for cattle may decline over the forecast period, milk prices are expected to rise by 5 percent, and the average price for fruit and nut crops is forecasted to increase by 16 percent.







Appendix A

Regression Analysis of Oil and Gas Employment

The regression model used to estimate oil and gas employment for the second quarter of 2019 is summarized below.

Equation Specification

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Dependent Variable				
QCEW Oil and Gas Employment				
Independent Variables				
Constant	-1303.57	448.93	-2.90	0.005
CES Mining Employment	0.98	0.04	22.38	0.000
(Real WTI Price)-(Real WTI Price with 10 quarter lag)	4.56	2.04	2.23	0.029

Appendix B

Data Sources

Employment Data

California Employment Development Department

- Current Employment Statistics program
- Quarterly Census of Employment and Wages

U.S. Census Bureau

- American Community Survey

Oil Production and Prices

U.S. Energy Information Administration

California Department of Conservation

Agricultural Output, Prices, and Acreage

Kern County Department of Agriculture and Measurement Standards

U.S. Department of Agriculture

Organization for Economic Cooperation and Development