



Volume 21, Issue 2

CSU Bakersfield

Kern Economic Journal

Winner of the Award for Merit from California Association
for Local Economic Development

2019 Second Quarter



Featured Article:



The Table Grape
Industry: Labor Supply
Challenges



Pistachio Production
and Temperature in Kern
County



SCHOOL OF
BUSINESS AND PUBLIC
ADMINISTRATION

We wish to gratefully acknowledge the Journal Sponsors:



KERN ECONOMIC JOURNAL is a quarterly publication (February, May, August, November) of California State University, Bakersfield. Its purpose is to track local trends and analyze regional, national, and global issues that affect the economic well-being of Kern County. The journal provides useful information and data that can help the community make informed economic decisions. Sources of funding for this journal include university contributions and sponsorship and subscription fees.

Editorial and analytical articles on important local, regional, national, and international issues and trends are invited for consideration of publication in the journal. Articles (not exceeding 800 words in length) must be submitted to the Managing Editor in electronic copy. Individual authors are responsible for the views and research results.

Editorial Board

Dr. Nyakundi M. Michieka, Assistant Professor of Economics, CSUB - Publisher and Managing Editor
Dr. Richard S. Gearhart, Assistant Professor of Economics, CSUB - Publisher and Managing Editor

Contact Information

Dr. Nyakundi M. Michieka, nmichieka@csub.edu, 661-654-2465
Dr. Richard S. Gearhart, rgearhart1@csub.edu, 661-654-3962

To become a sponsor, please contact the Managing Editor for sponsorship form and benefits.

Kern Economic Journal



Inside this Issue:

Economy at a Glance! 4

Tracking Kern's Economy

Labor Market 6

Housing Market 8

Stock Market 10

Inflation 11

Commodity Prices 12

Featured Article

The Table Grape Industry: Labor Supply Challenges 14

Pistachio Production and Temperature in Kern County 16

Economy at a Glance!

2019 Second Quarter
by Dr. Nyakundi M. Michieka and
Dr. Richard S. Gearhart III

National Economy¹

The U.S. economy grew at an annual rate of 2.1 percent in the second quarter of 2019, compared to 3.1 percent in the first quarter of 2019. The Bureau of Economic Analysis (BEA) reported that the increase in GDP reflected positive contributions from personal consumption expenditures, federal government spending, and state and local government spending. These movements were offset by negative contributions from private inventory investment, exports, nonresidential fixed investment and residential fixed investment. Imports increased during this period. Current-dollar GDP increased by \$239.1 billion or 4.6 percent to \$21.34 trillion.

Current dollar personal income increased \$244.2 billion in the second quarter of 2019 compared with an increase of \$269.8 billion in the first quarter of 2019. Real disposable personal income, which is adjusted for inflation and taxes, increased by 2.5 percent in the second quarter, compared with an increase of 4.4 percent in the first quarter. Personal saving was \$1.32 trillion in the second quarter compared to \$1.37 trillion in the first quarter. The BEA derives the personal saving rate by calculating personal saving as a percentage of disposable personal income. The personal saving rate in the second quarter was 8.1 percent, up from 8.5 percent in the first quarter.

The Conference Board's Index of Leading Economic Indicators – a measure of future economic activity – increased 0.5 percent in July to 112.2 following a 0.1 percent decline in May. This is the first increase of the U.S. LEI following two consecutive declines.

The University of Michigan's Consumer Sentiment Index increased from 94.5 in March 2019 to 98.4 in June 2019. The value for the second quarter of 2019 was 98.4 compared to 98.3 in the second quarter of 2019.

¹ U.S. economic numbers were obtained from the Bureau of Economic Analysis "U.S. Economy at a Glance". This is found at <http://www.bea.gov/newsreleases/glance.htm>. The information for the Index of Leading Economic Indicators is found at <https://www.conference-board.org/data/bcicountry.cfm?cid=1>. The University of Michigan Consumer Sentiment Index is found at <http://www.sca.isr.umich.edu/tables.html>.

State Economy²

In California, the unemployment rate dropped to 4.2 percent compared to 4.3 percent in March 2019. Among counties, San Mateo (2.2 percent), San Francisco (2.3 percent), Santa Clara (2.6 percent), Orange (3 percent), San Luis Obispo (3 percent), Sonoma (2.8 percent), San Diego (3.3 percent), and Sacramento (3.9 percent) had unemployment rates below the state average. In contrast, Los Angeles (4.6 percent), San Joaquin (5.9 percent), Fresno (7 percent), Kings (7.9 percent), and Kern (8 percent) had unemployment rates above the state average.

The state's civilian labor force lost 96,767 members, where 95,467 less employees had paying jobs (employed) and 1,300 less were left jobless (unemployed). While nonfarm industries hired 102,733 more workers, farming enterprises employed 800 more workers. The mining and logging sector hired 267 less workers while construction and manufacturing sectors hired 22,267 and 2,400 more workers, respectively, while the service sector added 78,333 workers. Other sectors adding jobs include professional and business services (14,100), and educational and health services (28,500). Retail trade saw 4,900 less workers.

Local Economy

The local economy saw a decrease in the labor force, from 392,667 in the first quarter of 2019 to 388,033 in the second quarter of 2019. The fourth (2018) to first (2019) quarter witnessed a growth in salaries of 4,633. A large part of the decrease in this quarters' estimates, appear to be seasonal, as the number of farm workers increased by 10,733 while non-farm employment rose by 3,233 – mostly coming from the goods producing (2,667) sector. Mining, logging and construction went up by 167, while food manufacturing saw a modest increase of 67 workers. A total of 63,667 workers were hired in the farming sector compared to the 52,933 in the first quarter.

Service sector employees increased from 231,167 to 231,167. Much of the increase in service providing

² The California economic numbers were obtained from the Bureau of Labor Statistics "Local Area Unemployment Statistics Map". This is found at <https://data.bls.gov/map/Map-ToolServlet?survey=la&map=county&seasonal=u>.



employment came from leisure and hospitality (1,133 workers) where contributions from the food services and drinking places drove the increase in employment. Professional and business services witnessed an increase in workers by 867 while retail trade hired 133 less employees.

Salaries and wages in Kern County rose from 3,775,281 (thousand) in the third quarter of 2018 to 4,012,794 (or 6.33 percent) in the fourth quarter of 2018. Compared to four quarters ago, salaries were higher 273,495 (thousand dollars), or 7.31 percent.

The unemployment rate varied between 2.5 percent in Ridgecrest to 26.5 percent in Delano. All cities in Kern County showed a decrease in the unemployment rate with McFarland recording the highest drop of 5.03 percent and Ridgecrest recording a modest decrease of 0.47 percent. In Bakersfield, the rate of unemployment was 5.97 percent in the first quarter of 2019 and 4.87 percent in the second quarter of 2019. Kern County's unemployment rate dropped from 9.47 percent to 7.87 percent.

In the second quarter of 2019, the median home price in Bakersfield was 236,833 compared to 232,417 in the first quarter. This median price is similar to that recorded in the fourth quarter of 2017. Home prices

are \$4,147 higher than four quarters ago. Within the region, median home prices in Taft are the lowest at 109,833 compared to 271,250 in Tehachapi.

The weighted price index for the five publicly traded companies doing business in Kern County (Sierra Bancorp, Tejon Ranch Company, Chevron Corporation U.S., Granite Construction, and Wells Fargo Company) rose by 5.5 percentage points from 106.2 to 111.7. The index is 12.4 percentage points lower than what it was four quarters ago.

All companies gained/lost as follows: Chevron (increased 1-percent quarter-over-quarter), Tejon Ranch (decreased 5.7-percent quarter-over-quarter), Granite Construction (increased 11.7-percent quarter-over-quarter), Wells Fargo (decreased 2.1-percent quarter-over-quarter) and Sierra Bancorp (increased 11.6-percent quarter-over-quarter).

The average retail price of gasoline increased by \$0.56 to \$3.89. Gas prices are 10.8 percent higher than they were four quarters ago when they averaged \$3.51 a gallon. Prices this quarter are the highest they have been since 2013.2. The unit price of California's Class III milk rose from the first quarter of 2019 decreasing from \$14.30 to \$16.20. The Index of Farm Price Parity rose to 83 percent from 81 percent in the first quarter.

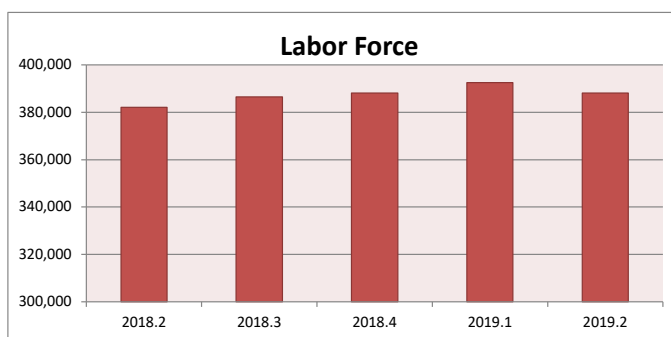
Tracking Kern's Economy¹

by Dr. Nyakundi M. Michieka and
Dr. Richard S. Gearhart III

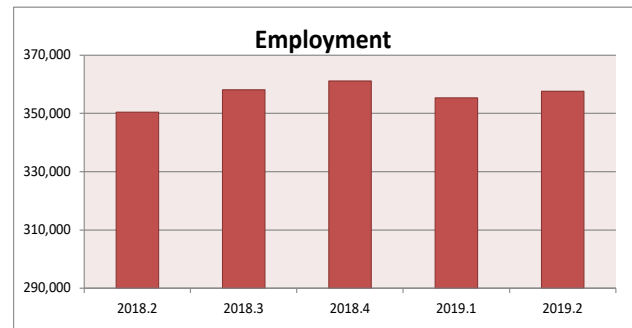
Labor Market

We adjust published data in three ways. First, we average monthly data to calculate quarterly data. Second, we recalculate quarterly data to take into account workers employed in the “informal” market (i.e., self-employed labor and those who work outside their county of residence). Finally, we adjust quarterly data for the effects of seasonal variations.

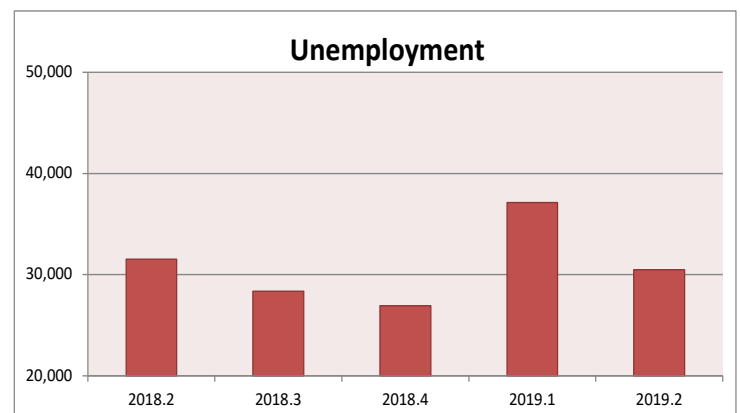
Labor Force - The civilian labor force decreased by 4,467 members from 392,500 in the first quarter of 2019 to 388,033 in the second quarter of 2019. The decrease in labor force is the largest first to second quarter change over the past five years. The labor force estimates are identical to those of the fourth quarter of 2018. Last year, Kern County experienced a growth in labor force over the same period (of 833). Decreased labor force participation rates can imply slower economic growth or increased dependency ratios, though this may not be the case in Kern County since it is a short-term reversion to first quarter estimates.



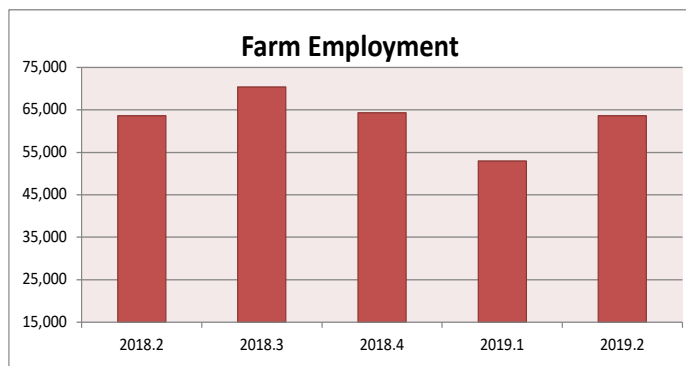
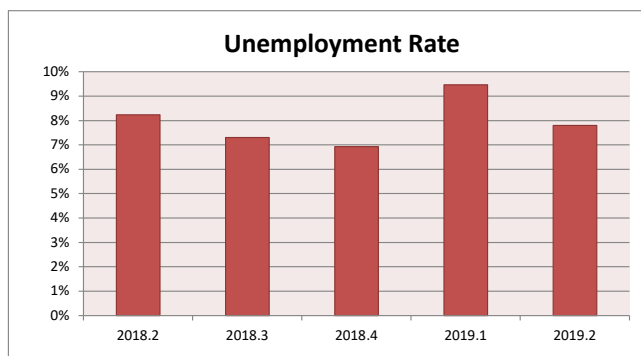
Employment –In the second quarter of 2019, Kern County hired 2,200 more workers as total employment increased from 355,367 in the first quarter of 2019 to 357,567 in the second quarter. This is a 2 percent increase in employment compared to the second quarter of 2018. The increase in employment between the first and second quarter of 2019 was the least in the last five years. First to second quarter increases in employment have averaged 6,000 employees since 2014.



Unemployment – In the meantime, 6,633 less workers were unemployed, as the number of jobless workers decreased from 37,133 to 30,500. The number of unemployed workers decreased by 3.2 percent compared to four quarters ago. In the second quarter of 2018, there were 31,533 unemployed workers compared to 30,500 today.



Unemployment Rate –Kern County's year-to-year unemployment rate dropped by 0.43 percentage points from 8.23 percent in the second quarter of 2018 to 7.8 percent in the second quarter of 2019. The unemployment rate in the second quarter of 2019 was 1.67 percent lower than that in the first quarter of 2019 (9.47 percent in the first quarter of 2019 and 7.8 percent in the second quarter of 2019). The unemployment rate continues to stay below ten percent. Kern County's unemployment rate is almost twice that of California (4.2 percent), while the nation's unemployment rate is 3.7 percent.

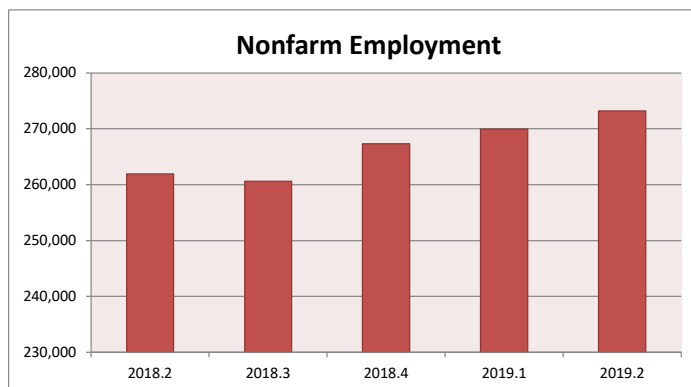


The rate of unemployment varied considerably across cities, ranging from 2.5 percent in Ridgecrest to 26.5 percent in Delano. All cities in Kern County showed a decrease in the unemployment rate. The biggest decrease in unemployment occurred in McFarland going from 15.37 percent to 10.33 percent. In Bakersfield, the rate of unemployment was 4.87 percent in the second quarter of 2019 compared to 5.97 percent in the first quarter.

Nonfarm Employment – Local nonfarm industries employed 3,267 more workers in the second quarter of 2019. The number of nonfarm workers increased from 297,367 to 273,233. Nonfarm industries hired 11,300 more workers compared to four quarters ago. The change in nonfarm workers that occurred between 2019.1 and 2019.2 is the largest witnessed over the last five years.

Unemployment Rate of Cities			
Location	Unemployment Rate (%)	Location	Unemployment Rate (%)
KERN COUNTY	7.87%	McFarland	10.33%
Arvin	7.63%	Mojave	14.93%
Bakersfield	4.87%	Oildale	11.47%
California City	17.13%	Ridgecrest	2.50%
Delano	26.50%	Rosamond	9.53%
Edwards	7.30%	Shafter	9.20%
Frazier Park	8.63%	Taft	3.57%
Lake Isabella	9.53%	Tehachapi	4.73%
Lamont	6.17%	Wasco	13.97%

Note: City-level data are not adjusted for seasonality and “informal” market workers.

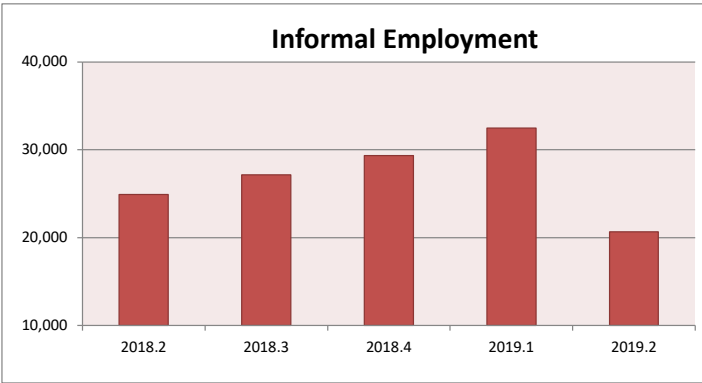


Farm Employment – In the second quarter of 2019, Kern County hired 10,733 more farm workers. As a result, farm employment increased from 52,933 in the first quarter of 2019 to 63,667 in the second quarter of 2019. Nonetheless, the year-over-year number of farm workers hired in the farm sector did not change compared to last year. Over the last five years, the first-to-second quarter increase in the number of farm workers continues to hover around the 10,000 mark.

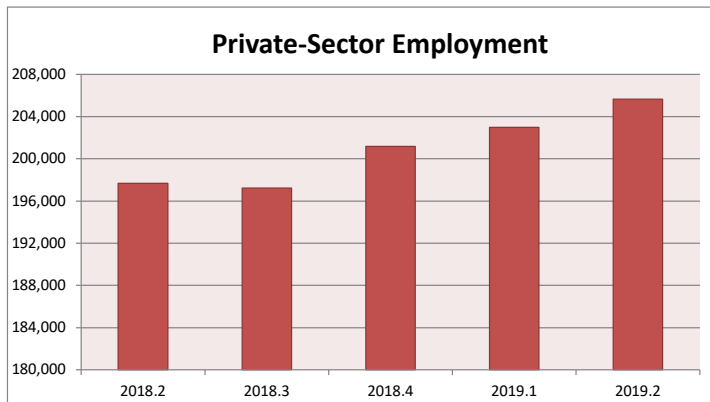
In Bakersfield, much of the increase in nonfarm employment came from a few sectors: private service providing added (3,067 workers), mining, logging and construction added (167), transportation, warehousing and utilities (233 workers), local government excluding education (133), county (133), construction (167), educational and health services (367 workers), health care and social assistance (400). These increases were offset by declining employment in general merchandise stores (200) and retail trade (133).

Informal Employment - Informal employment is the difference between total employment and industry employment. It accounts for self-employed workers and workers employed outside their county of residence. In the second quarter of 2019, the number of informal

workers decreased by 11,800 workers compared to the first quarter. Compared to the second quarter of 2018, there are 4,233 less informal workers. The number of residents who have sought to create their own jobs continues to slow down. There are currently 20,667 informal workers in Kern County (lowest number in 10 years).

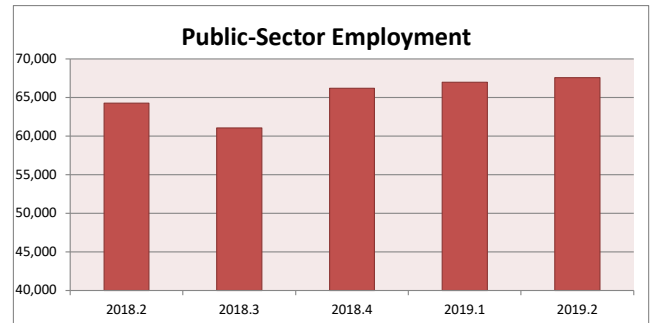


Private-Sector Employment - Nonfarm employment is comprised of private-sector employment and public-sector employment. In the first quarter of 2019, private companies hired 202,967 workers while the second quarter numbers increased at an average of 205,667 workers. The private sector hired 8,000 more workers this quarter than four quarters ago. The increase in the number of workers is similar to that of 2014.

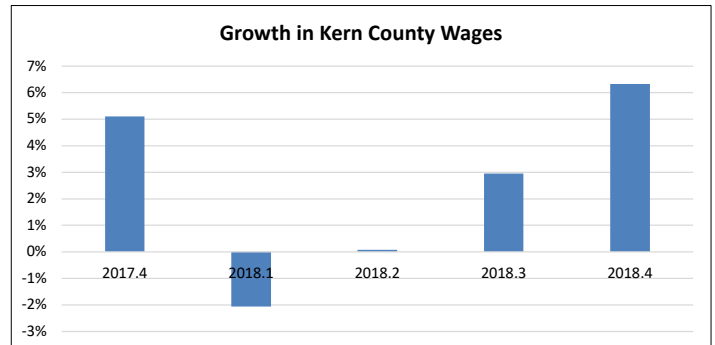


Public-Sector Employment - The public sector consists of federal, state, and local government agencies. The local government labor market includes county and city agencies and public education. In the second quarter of 2019, government agencies hired 567 more workers as their employment increased from 67,000 to 67,567–

a 0.85 percent increase. The year to year increase in employment was 5.13 percent.

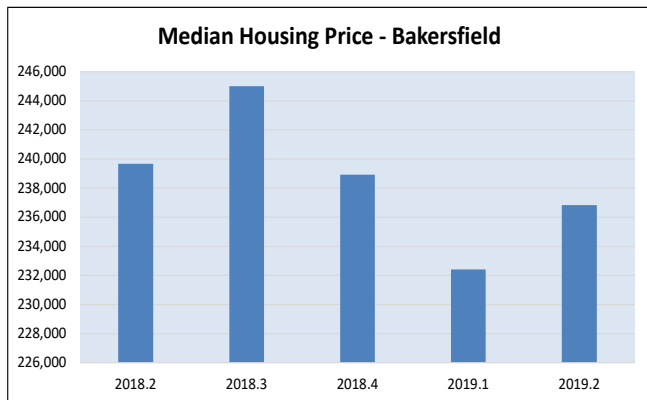


Growth in Salaries and Wages - Salaries and wages in Kern County increased from 3,775,281 (thousand) in the third quarter of 2018 to 4,012,794 (or 6.33 percent) in the fourth quarter of 2018. Compared to four quarters ago, salaries were higher 273,495 (thousand dollars) or 7.31 percent. The positive growth in salaries in the third quarter of 2018 is similar to that of 2013. Between 2012 and 2018, third quarter growth rates have averaged 4.64 percent.



Housing Market

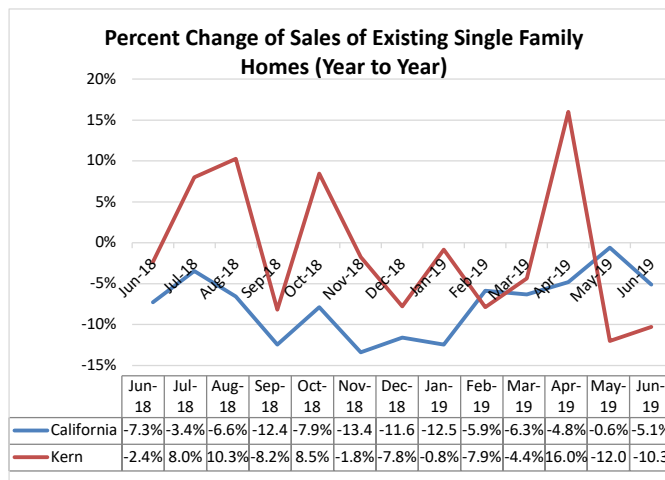
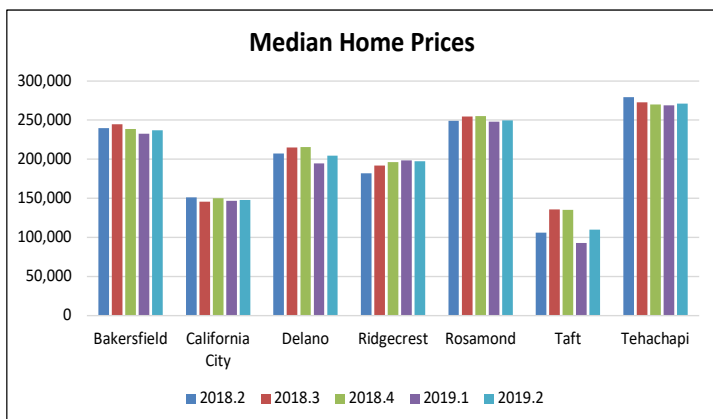
Housing Price - In the second quarter of 2019, Bakersfield’s housing prices increased by \$4,417 (1.9 percent) compared to the first quarter of 2019. The median home price averaged 236,833 in the second quarter compared to 232,417 in the first quarter. This rise in home prices (1st to 2nd quarter) is much higher than that which occurred last year 583.33. Price are \$2,833 lower than four quarters ago.



Location	Median Price	Median Price	Price Change (\$)	% Price Change
	2018.2	2019.2	2018.2 - 2019.2	2018.2 - 2019.2
Bakersfield	239,667	236,833	-2,833	-1.18%
California City	151,333	148,083	-3,250	-2.15%
Delano	207,167	204,667	-2,500	-1.21%
Ridgecrest	182,000	197,333	15,333	8.42%
Rosamond	249,333	249,650	317	0.13%
Taft	106,167	109,833	3,667	3.45%
Tehachapi	279,167	271,250	-7,917	-2.84%

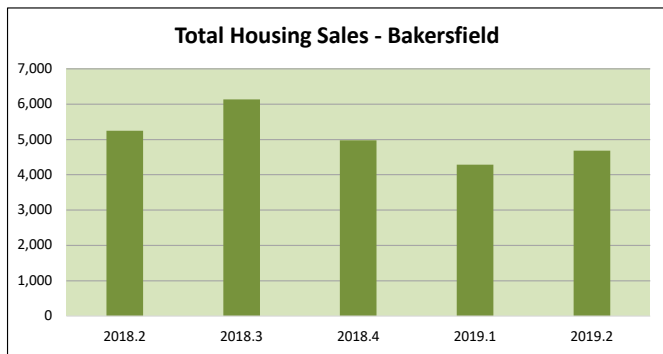
Regional Housing Prices - The changes in housing demand felt in Bakersfield are likely to spillover to the surrounding towns as individuals who are on the margin of buying or selling are likely not located in the Bakersfield MSA directly. The only first-to-second quarter decrease in home prices occurred in Ridgecrest (0.59%). Prices increases occurred in California City (1.02%), Delano (5.05%), Rosamond (0.67%), Taft (18.31%) and Tehachapi (0.87%).

Growth in Housing Sales – We compare growth in sales of existing single family homes in Kern County with growth of sales in California. Positive values indicate that more homes were purchased this year compared to last year. In June 2019, sales of single family homes in Kern County were 5.1 percent less than they were in the previous year, while sales were 10.3 percent lower in California. Average growth in home sales in California between June 2018 and June 2019 were -1 percent while the number was -7.5 percent in Kern County. Overall, growth in sales in Kern County averaged 6.5 percent points lower than California.

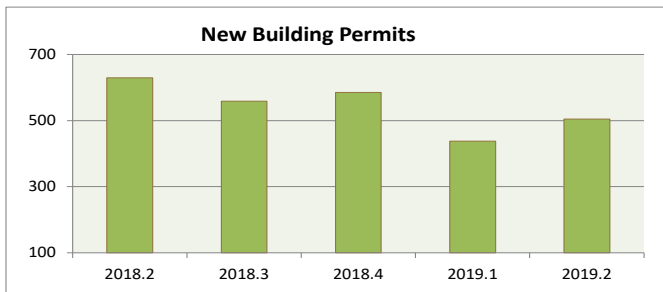


Housing prices varied across Kern County. Within the previous four quarters (2018.02 to 2019.02), the median sales price increased in Ridgecrest, Rosamond and Taft while Bakersfield, California City, Delano and Tehachapi saw prices fall. Ridgecrest recorded the largest single digit increases in prices of 8.42 percent. The average change in home prices in the region was 0.66 percent.

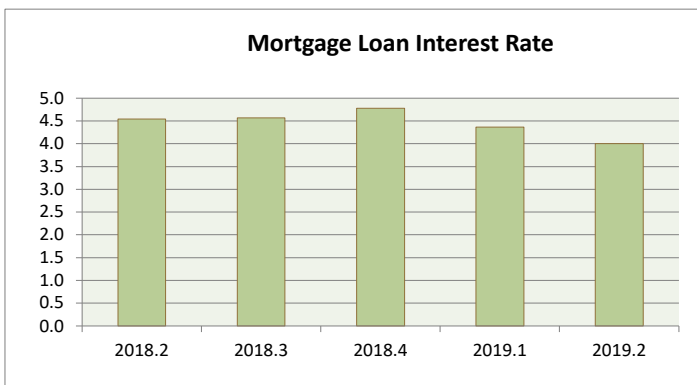
Housing Sales – In Bakersfield, quarter to quarter sales of residential units increased by 395 units, from 4,288 in the first quarter of 2019 to 4,683 in the second quarter of 2019. An average of 568 less homes were sold in the second quarter of 2019 compared to the second quarter of 2018. This drop in housing demand mirrors national trends.



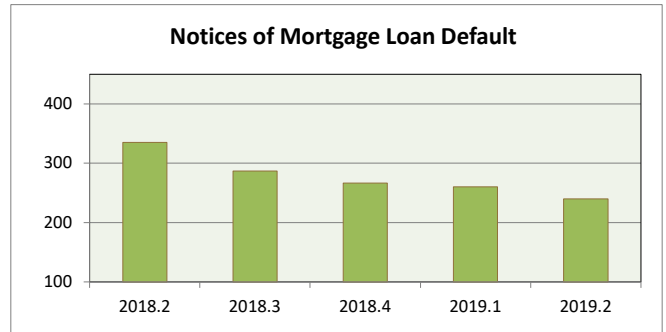
New Building Permits –In the second quarter of 2019, Kern County issued 67 more permits for construction of new privately-owned dwelling units compared to the first quarter of 2019. A total of 505 permits were issued this quarter compared to 438 in the first quarter of 2019. This increase in permitting indicates a rise in construction plans in Kern County. The 5-year average of permits issued in the second quarter is 570.



Mortgage Interest Rate – In the second quarter of 2019, the interest rate on thirty-year conventional mortgage loans decreased to 4 percent from 4.37 percent. The mortgage interest rate is similar to that in the second quarter of 2017. The five year average mortgage loan interest rate (in the second quarter) is also 4 percent.

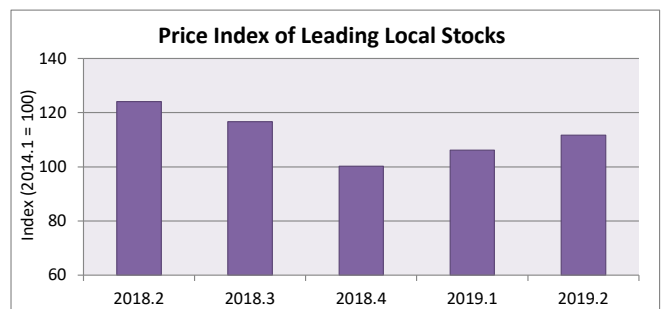


Housing Foreclosure Activity –The downtick in foreclosure activity continued as the number of new foreclosures decreased by 20 foreclosures from 260 in the first quarter of 2019 to 240 in the second quarter of 2019. This number is also 95 units lower than four quarters ago. These foreclosure estimates are the lowest witnessed in ten years.

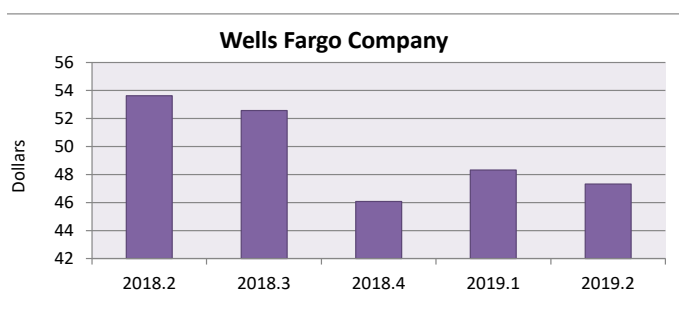
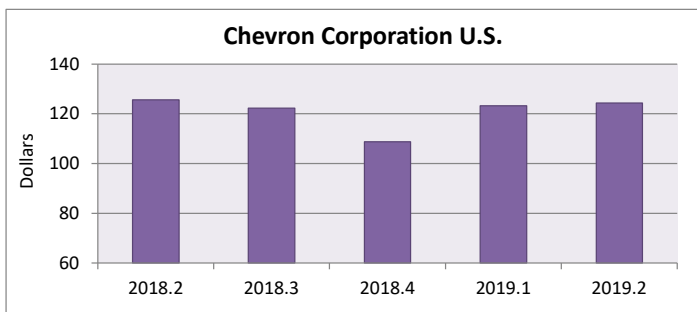


Stock Market

In the second quarter of 2019, the composite price index (2014.1=100) of the five publicly traded companies doing business in Kern County increased by 5.2 percentage points from 106.2 to 111.7. The index is 12.36 percentage points lower than what it was four quarters ago. Average “close” prices were measured for five local market-movers: Chevron Corporation U.S., Tejon Ranch Company, Granite Construction, Wells Fargo Company, and Sierra Bancorp.

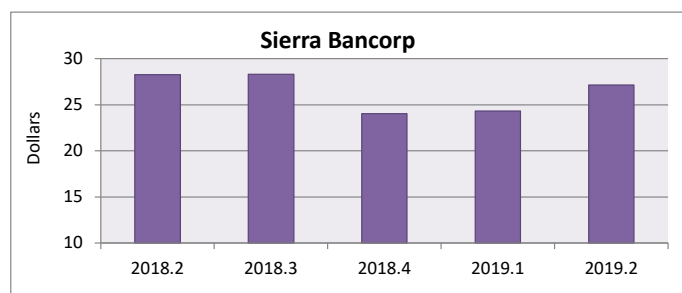
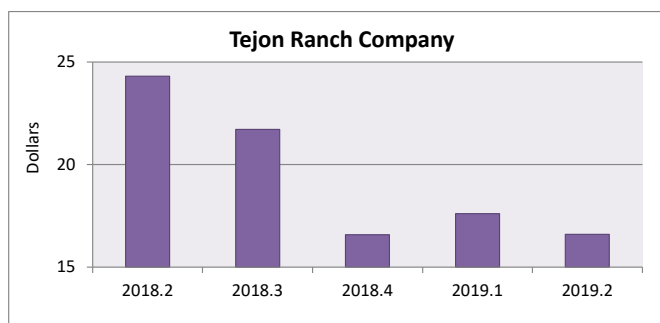


Chevron Corporation U.S.: Compared to the last quarter, CVX gained \$1.26 (or 1 percent) per share as its price increased from \$123.18 to \$124.44. Relative to the second quarter of 2019, CVX was down \$1.22 (or 1 percent).



Tejon Ranch Company: TRC lost \$1.01 (or 5.7 percent) per share as its stock price decreased from \$17.60 to \$16.59 between the first quarter and second quarter of 2019. Compared to last year, the TRC stock price is down \$7.71 (or 31.7 percent).

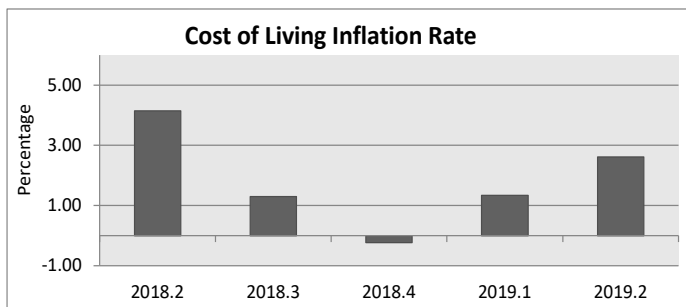
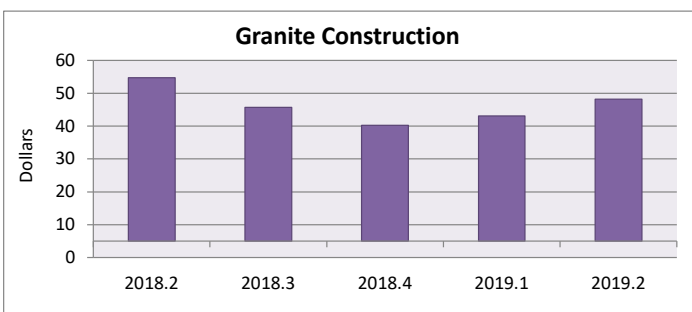
Sierra Bancorp: BSRR gained \$2.82 (or 11.6 percent) per share as its price increased from \$24.30 to \$27.12. Similar to the other companies, BSRR lost \$1.12 (or 4 percent) since the second quarter of 2019.



Granite Construction: GVA gained \$5.03 (or 11.7 percent) per share as its stock price increased from \$43.15 to \$48.18 between the first quarter of 2019 and the second quarter of 2019. Conversely, GVA lost \$6.52 (or 11.9 percent) over the last four quarters.

Inflation

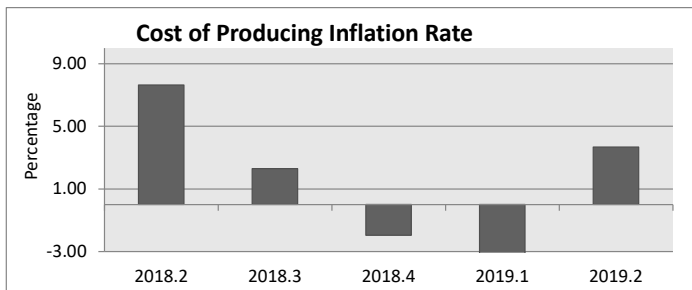
Cost of Living – In the second quarter of 2019, the Consumer Price Index for all urban areas (1982-84 = 100) did not change much. Inflation for the cost of living increased by 2.61 percent. These are numbers similar to those of the second quarter of 2017 (mortgage interest rates were also similar to 2017 figures).



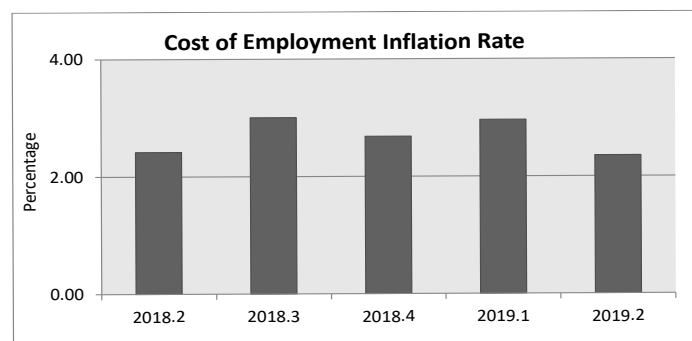
Wells Fargo Company:

WFC lost \$1 (or 2.1 percent) per share as its stock price decreased from \$48.32 to \$47.32 between the first quarter of 2019 and the second quarter of 2019. Relative to one year ago, WFC is down \$6.31 (or 11.8 percent).

Cost of Production – The Producer Price Index for all commodities (1982 = 100) rose between the first and second quarter of 2019. The cost of production increased at an annual rate of 3.68 percent. The cost of production inflation rate was -6.25 percent last quarter and 7.65 percent four quarters ago.

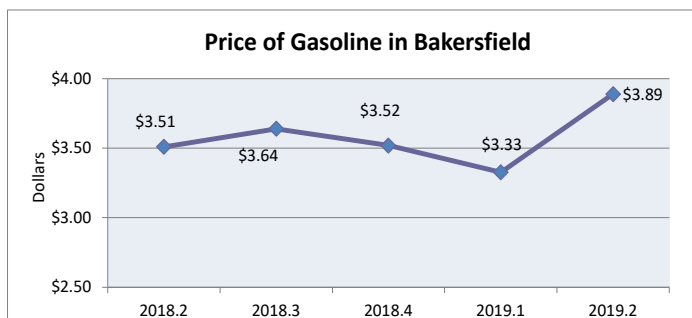


Cost of Employment - The Employment Cost Index (December 2005 = 100) for all civilian workers increased from 136.20 to 137. The cost of employment grew at an annual rate of 2.35 percent. The cost of employment inflation rate grew 2.96 percent last quarter and 2.42 percent four quarters ago.

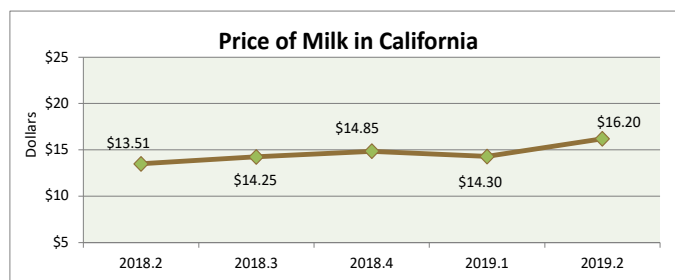


Commodity Prices

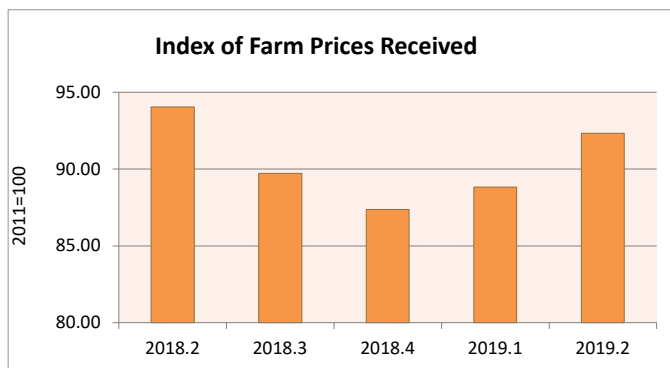
Price of Gasoline – In the Bakersfield Metropolitan Statistical Area, the average retail price of gasoline increased by \$0.56 to \$3.89. Gasoline prices in the region rose due to oil refinery maintenance and production of summer blends. The average prices are 10.8% higher than they were four quarters ago. The last time prices were \$3.89 in Bakersfield between 2012 and 2013.



Price of Milk – The unit price of California’s Class III milk rose from the first quarter of 2019, from \$14.30 to \$16.20. Noticeably, the last time prices were above \$16 was in the third quarter of 2015. The price is 20 percent or \$2.69 higher than it were four quarters ago (\$13.51).

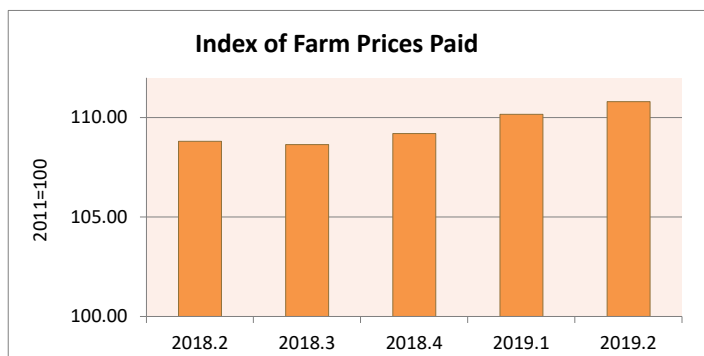


Farm Prices – In the second quarter of 2019, the National Index of Prices Received by Farmers for all farm products (2011 = 100) rose by 3.5 points, to 92.33 compared to 88.83 recorded in the first quarter of 2019. This is a slight decrease from the 94.03 points recorded in the second quarter of 2018.

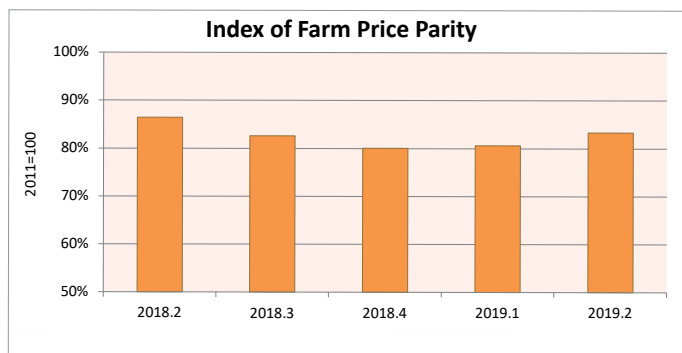


Meanwhile, the National Index of Prices Paid by farmers for commodities, services, interest, taxes, wages, and rents increased by 0.6 percent (compared to last quarter), rising 0.6 points to reach 110.8, meaning

that farmers are worse off this quarter compared to last. The index was 108.8 four quarters ago.



We measure the Index of Farm Price Parity as the ratio Index of Prices Received to the Index of Prices Paid. In the second quarter of 2019, the gap between prices paid and prices received increased slightly, as the Index of Farm Price Parity rose to 83 percent. These parity levels are similar to those witnessed in the third quarter of 2018. Four quarters ago, the price ratio was 86 percent.



¹ Source - Online databases: <http://www.labormarketinfo.edd.ca.gov>; www.usda.com; www.bakersfieldgasprices.com; www.bea.gov; www.car.org; www.trulia.com; www.census.gov; www.freddiemac.com; <https://www.cafmmo.com>; www.bls.gov

The Table Grape Industry: Labor Supply Challenges

John Deal Ph.D.
Lecturer / Director of the Agricultural Business Program
Department of Economics
California State University, Bakersfield



Grapes are the largest agricultural commodity in Kern County (25.6% of total value in 2017), followed by almonds, milk and dairy, citrus, and pistachios. Of the grapes produced in Kern County, over 60% are table grapes. Kern County is the major producer of table grapes in California, producing 53.6% of California production in 2017 (approximately \$ 1.5 billion), with Tulare County following at a distant 26.4% (Kern, 2017). Given the importance of table grape production to Kern County, factors that negatively impact costs and profits of table grape farmers have potential large impacts on Kern County and California agriculture. Since table grape vines are a fixed asset (such as almond and pistachio trees) that incur high initial costs of establishment and generate returns for many years, fluctuations in prices, costs, and profits are less likely to be managed through crop substitution. In this context, the industry faces a number of both short-run and long-run challenges (water availability and climate change, labor availability and increasing wages, and uncertainty associated with the introduction of new varieties to satisfy consumer preferences). Although each of these challenges deserve attention, we believe that the most pressing short-term issue is the impact of the labor market for farmworkers in an industry with limited opportunities for crop substitution and mechanization.

In recent years, the availability of farm labor has decreased and real wages paid to farmworkers has increased. The number of farmworkers in California declined by 32.4% between 2003 and 2017, and California experienced the highest growth in farmworker real wages in the United States between 2010 and 2017 (Bampasidou and Salassi,, 2019). Since approximately 68% of California farmworkers come from Mexico, changes in Mexico can have a large

impact on California agriculture. Researchers argue that changes in rural Mexico (reduced birthrates, increased levels of education, and a movement out of agriculture into the service sector) will continue to reduce the supply of farmworkers from Mexico, regardless of immigration policy and border enforcement. They estimate that real wages (nominal wages adjusted for inflation) will need to rise 1% per year for the next ten years to maintain the current labor supply (Charlton, et al., 2019).

These trends impact the production of all commodities, but particularly those that use a high amount of labor and have less ability to substitute machinery for labor. California farmers are aware of these trends. Recent surveys indicate that farmers have been unable to find all of the workers needed in the last 5 years (70% of respondents in 2017-18) and have increased the wages paid to workers (84% in 2018). In addition, they have switched acreage (mostly to tree nuts) and have adopted labor-saving technology (Rutledge, 2019).

While mechanization is a possible solution to the tight labor market for some crops (e.g., processed vegetables, wine grapes, apples, and raisin grapes), it is unlikely to provide a solution for table grape farmers. Without the likelihood of mechanization and the fixed nature of the asset, current table grape producers must find a way to increase the supply of labor without further increasing wages or raising prices to compensate for the higher labor costs.

One possible solution to the labor shortage would be expanded use of the H-2A program, which allows foreign workers to perform agricultural labor on a temporary or seasonal basis (Martin, 2019). Although the H-2A program could help alleviate some of the shortages, only 6% of surveyed farmers reported enrolling in the program (California Farm Bureau, 2019). Farmers often find that the advanced planning, paperwork, and program requirements (e.g., provision of free housing; payment of a “super-minimum wage” to avoid adversely affecting the wages of U.S. workers in similar jobs) discourage participation. Legislation proposed over the last 35 years aimed to eliminate some of these concerns raised by farmers have met with limited success. Representative Bob Goodlatte (R-VA) recently proposed to create a new guest worker program that would allow foreign workers to work year-round in agricultural jobs for 2 years, requiring them to leave for 45 days after the 2-year period is complete. In addition to an expansion in the number of visas, the other changes proposed in the legislation would reduce the current restrictions that reduce the incentive to hire foreign workers (Martin, 2019). Changes in the guest worker program that expand the labor supply could help reduce the upward pressure on farmworker wages.

Given the current labor trends and the forecasted reduction in labor supply from Mexico, farmers with planting flexibility or mechanization possibilities will probably continue to mechanize or switch to less labor-intensive crops. Unlike many other crops grown in the Central Valley, table grape producers do not have these options available to them (at least at this time). Comprehensive immigration reform and/or an expansion of a guest worker program may be the best way for table grape producers to manage their costs of production and avoid raising prices.

References

- Bampasidou, M. and Salassi, M. (2019). “Trends In U.S. Farm Labor and H-2A Hired Labor: Policy and Related Issues,” *Choices*, 34(1): 1-6.
- Charlton, D., Taylor J.E., Vougioukas, S., and Rutledge, Z. (2019). “Can Wages Rise Quickly Enough to Keep Workers in the Field?” *Choices*, 34(2): 1-7.
- Kern County Department of Agriculture and Measurement Standards, “2017 Kern County Agricultural Report.”
- Martin, P. (2019). “The Role of the H-2A Program in California Agriculture,” *Choices*, 34(1), 1-8.
- Rutledge, Zachariah & Farm Bureau Federation, California and Taylor, J. (2019). “Still Searching for Solutions: Adapting to Farm Worker Scarcity Survey 2019.”

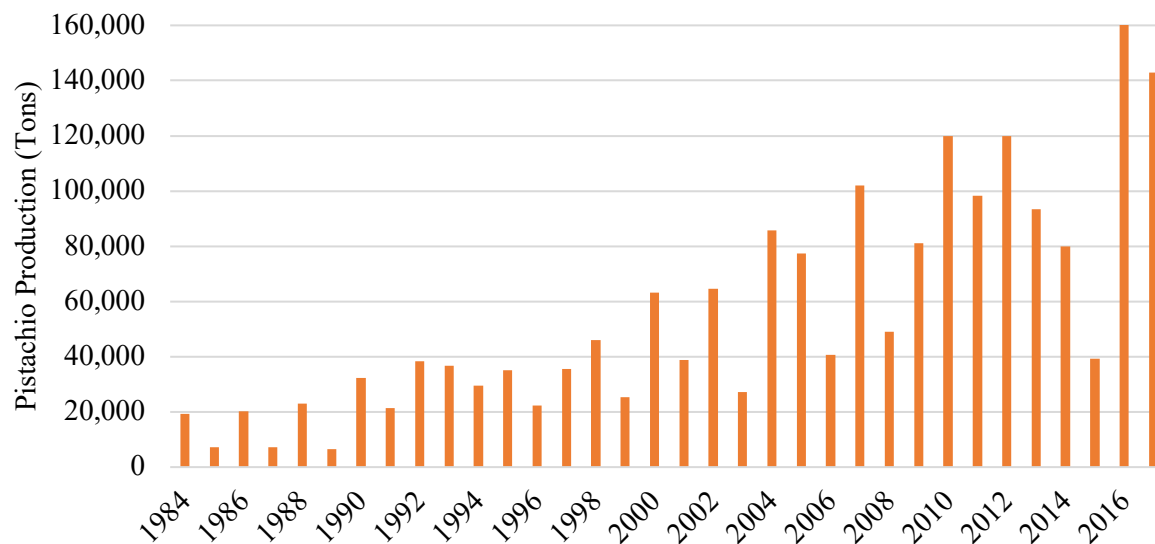
Pistachio Production and Temperature in Kern County

Nyakundi M. Michieka Ph.D.
Assistant Professor of Economics
California State University, Bakersfield

Kern County Farm Bureau released a report indicating that the 2017 crop in Kern County was valued at \$7 billion, making it the top agriculture crop producing county in the state (Kern County Department of Agriculture 2017). The top five commodities of the crop included grapes, almonds, citrus, milk and pistachios. (Kern County Department of Agriculture 2017). In that year, Kern County produced \$555,524,000 worth of pistachios and nearly 31.6 percent of California's pistachios (California Department of Food and Agriculture 2018). Pistachios are California's second most valued agricultural export, with a value of \$1.52 billion. Roughly 44 percent of exports end up in China or Hong Kong while 30 percent end up in Europe (California Department of Food and Agriculture 2018).

Pistachio production in Kern County has grown over the last 4 decades. Between 1980 and 1990, output averaged 14,245 tons, then more than doubled between 1991 and 2000, averaging 35,370 tons. Production then jumped from 68,660 to 107,414 between 2001 and 2010 and 2011 and 2017, respectively. In 2017, output was 143,000 tons compared to 178,000 tons in 2016. The graph below illustrates pistachio production in Kern County over the last four decades.

Figure 1: Pistachio Production in Kern



Source: Adapted from Measurement Standards (2018) and Kern County Department of Agriculture and Measurement Standards (2018)

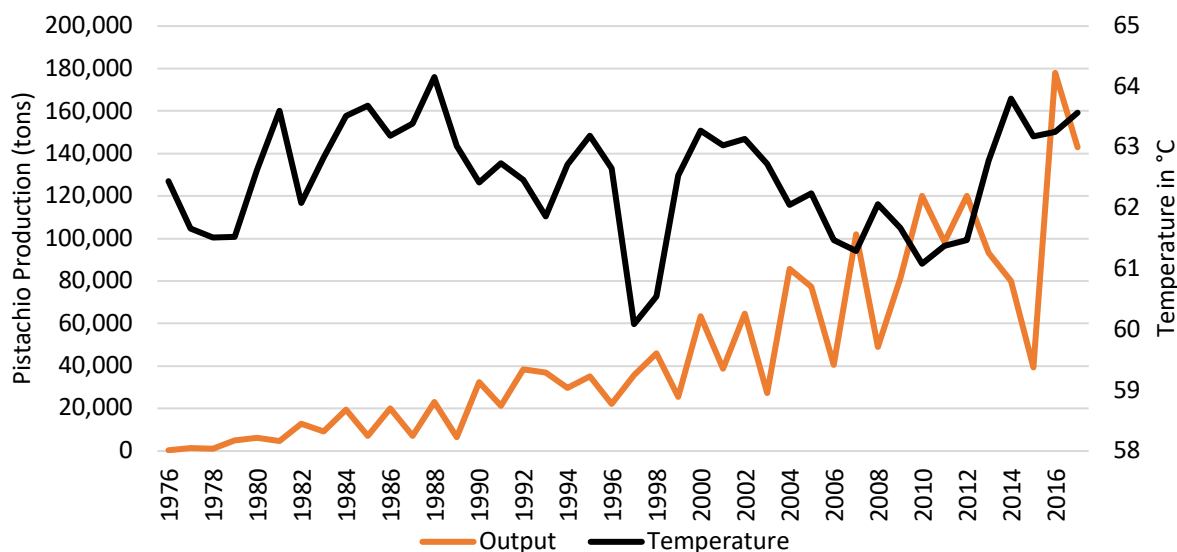
Although concerns have been raised on whether food prices will increase following the recent droughts, the U.S. Department of Agriculture found no evidence of this claim. In fact, they reported that the increase in retail prices for citrus in 2014 were driven by a freeze which occurred in 2013 (Cooley, Donnelly et al. 2015, United States Department of Agriculture 2015). Gordon (2017) reported that temperatures greater than 65°F during dormancy period are negatively correlated to the yield. On average, each hour in excess of this temperature resulted in a loss of 13.1 pounds per acre. Have temperature changes affected Kern County's pistachio output?

California's Central Valley is well suited for growing pistachio trees, which thrive in heat and temperatures above 100°F. Temperatures below 10°F can kill them. They are also drought resistant, but cannot tolerate excessive humidity (California Rare Fruit Growers 2019). The trees do well in heat where better nut filling and less blanks are produced. Winters, however, need to be cold enough to complete their dormancy (Herrera 1997).

The Central Valley was known for ground fog (tule fog) which reduced visibility and caused weather related accidents. The fog, which is now less common, helped provide the winter chill required to improve productivity of pistachios. Studies have shown that the fog declined by 76 percent over the last 36 winters, mostly due to reduction of NO_x and ammonium nitrate aerosol concentrations caused by emission regulation (Gray, Gilardoni et al. 2019).

Nonetheless, Kern County has been experiencing higher than average winter temperatures which may affect pistachio production. In fact, the California Department of Food and Agriculture (2016) reported that the 2015 drop in California's pistachio production was due to warmer climate. A cursory observation of the relationship between pistachio production and temperature in Kern County hints that there is a negative relationship between the two, as shown in Figure 2. This is evident in the early 1990s, the early 2000's and more significantly 2012 to 2014, when the series went in opposite directions.

Figure 2: Pistachio Production Vs. Temperature in Kern County



Source: Authors adaption (Kern County Department of Agriculture and Measurement Standards 2018, United States Department of Agriculture 2018, National Oceanic and Atmospheric Administration 2019).



A quick estimation of the coefficient of correlation between pistachio output, temperature and prices indicates that output responds positively to prices, while the temperature-pistachio correlation is negative (Table 1).

Table 1: Coefficient of Correlation between Pistachio Output and Temperature, Rainfall and Prices

	Output	Temperature
Output	1	-0.1132
Temperature	-0.1132	1

	Output	Prices
Output	1	0.4751
Prices	0.4751	1



So where do we go from here? The relationship between temperature and pistachio production has gathered considerable attention. Studies have shown that increased temperatures have an effect on output. Various technologies have been proposed to mitigate the adverse effects of weather on pistachio production. At CSUB, a project funded by the California Department of Food and Agriculture seeks to investigate the temperature changes on pistachio production (American Pistachio Growers 2019). A system which uses mist to cool down bud temperature has been developed and is in its experimental stages. The viability of adoption of the system depends on whether benefits of the system outweigh costs.



References

- American Pistachio Growers (2019). "Automated Solid State Canopy Delivery (SSCD) System to Deliver Mist-Cooling to Increase Winter Chill for Dormancy and Bud Break." Available at <https://americanpistachios.org/sites/default/files/inline-files/1.%20Automated%20Solid%20State%20Canopy%20Delivery__Edited%2012-29-2017.pdf>.
- California Department of Food and Agriculture (2018). California Agricultural Exports 2017 - 2018. Available at <<https://www.cdfa.ca.gov/Statistics/PDFs/2017-18AgExports.pdf>>.
- California Department of Food and Agriculture (2018). California Agricultural Statistics Review 2017 - 2018. Available at <<https://www.cdfa.ca.gov/Statistics/PDFs/2017-18AgReport.pdf>>.
- California Rare Fruit Growers (2019). "PISTACHIO." Available at <<https://www.crfg.org/pubs/ff/pistachio.html>>.
- Cooley, H., et al. (2015). Impacts of California's Ongoing Drought: Agriculture, Pacific Institute, 654 13th Street, Preservation Park Oakland, California 94612. Available at <<https://www.shrm.org/ResourcesAndTools/legal-and-compliance/state-and-local-updates/Documents/ImpactsOnCaliforniaDrought-Ag.pdf>>.
- Gordon, P. (2017). Botany and Physiology of the Pistachio Tree. 8th Advances in Pistachio Production. November 14 - 16, 2017, University of California, Davis. Available at <<https://ucanr.edu/sites/PistachioShortCourse/files/274433.pdf>>.
- Gray, E., et al. (2019). "Impact of Air Pollution Controls on Radiation Fog Frequency in the Central Valley of California." Journal of Geophysical Research: Atmospheres.
- Herrera, E. (1997). Growing Pistachios in New Mexico, New Mexico State University. Cooperative Extension Service. Circular 532. College of Agriculture and Home Economics. Available at <https://aces.nmsu.edu/pubs/_circulars/CR532.pdf>.
- Kern County Department of Agriculture and Measurement Standards (2018). 2018 Kern County Agricultural Crop Report. Kern County Crop Reports. 1001 S. Mount Vernon Avenue, Bakersfield, California 93307. Available at <http://www.kernag.com/caap/crop-reports/crop10_19/crop2018.pdf>.
- Kern County Department of Agriculture (2017). Kern County Annual Crop Reports. Available at <http://www.kernag.com/caap/crop-reports/crop10_19/crop2017.pdf>, County of Kern Agriculture and Measurement Standards.
- Kings County Department of Agriculture and Measurement Standards (2018). 2018 Kings County Crop Report. Kings County Crop Reports. 680 N. Campus Drive, Suite B. Hanford, California 93230. Available at <<https://www.countyofkings.com/departments/general-services/crop-reports>>.
- National Oceanic and Atmospheric Administration (2019). Global Summary of the Month. National Center for Environmental Information, Asheville, NC.
- United States Department of Agriculture (2018). California County Agricultural Commissioners' Reports Crop Year 2016-2017. Sacramento, CA 95812. California Department of Food and Agriculture. Available at <https://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/index.php>.
- United States Department of Agriculture (2015). California Drought: Food Prices and Consumers. E. R. Service. Available at <<http://www.ers.usda.gov/topics/in-the-news/california-drought-farm-and-food-impacts/california-drought-food-prices-and-consumers.aspx>>, Economic Research Service.



CSU Bakersfield

School of Business and Public Administration

KERN ECONOMIC JOURNAL is a quarterly publication of California State University, Bakersfield. Its purpose is to track local trends and analyze regional, national, and global issues that affect the well-being of Kern County. The journal provides useful information and data that can help the community make informed economic decisions. Please visit <http://www.csub.edu/kej> for more information.