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2023 First Quarter



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Agricultural Land
Values in the U.S.



Projected Impacts of Climate
Change on Crop Production
in Kern County

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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.

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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 11

Featured Article

Changes in Agricultural Land Values in the U.S...... 13
Projected Impacts of Climate Change on Crop Production in Kern County 18

Economy at a Glance!

2023 FIRST QUARTER
BY DR. NYAKUNDI MICHIEKA
& DR. RICHARD S. GEARHART III

*National Economy*¹

Real GDP increased at an annual rate of 1.3 percent in the first quarter of 2023. In the fourth quarter of 2022, real GDP increased by 2.6 percent. The deceleration in real GDP reflected a downturn in private inventory investment and a slowdown in nonresidential fixed investment.

The increase in first quarter real GDP (compared to the fourth quarter) reflected an uptick in consumer spending, exports, federal government spending, state and local government spending, and nonresidential fixed investment, that were partly offset by decreases in private inventory investment and residential fixed investment. Imports also increased.

Current-dollar GDP increased by 5.4 percent (annual), or \$348.3 billion in the first quarter to a level of \$26.49 trillion.

Current-dollar personal income increased \$251.3 billion in the first quarter. This rise reflected increases in compensation (led by private wages and salaries) and government social benefits.

Real disposable personal income which is adjusted for inflation and taxes, increased by 7.8 percent.

Personal saving was \$829.2 billion in the first quarter. The BEA derives the personal saving rate by calculating personal saving as a percentage of disposable personal income.

Personal saving rate – personal saving as a percentage of disposable personal income – was 4.2 percent in the first quarter.

The Conference Board's Index of Leading Economic Indicators – a measure of future economic activity – decreased by 0.6 percent in April 2023 to 107.5 (2016=100), following a 1.2 percent decline in March.

The University of Michigan's Consumer Sentiment Index decreased from 58.8 in the fourth quarter of

2022 to 64.6 in the first quarter of 2023. The value of the index in the first quarter of 2022 was 63.1, and 80.2 in the first quarter of 2020.

*State Economy*²

In California, the unemployment rate grew by 0.5 percent to 4.3 percent in the first quarter of 2023, compared to 3.83 percent in the fourth quarter of 2022. The top five counties with the highest unemployment rate include Colusa (18.5), Imperial (15.9), Merced (10.6), Plumas (10.9) and Tulare (10.7). Counties with the lowest unemployment rates include Marin (3.1), Orange (3.4), San Francisco (2.9), San Mateo (2.7) and Santa Clara (3.1).

California's labor force increased by 92,767 in the first quarter of 2023. During this period, civilian employment increased by 35,400 from 18.47 million to 18.50 million. Nonfarm enterprises hired 211,333 more workers while farming employment increased by 18,567. The mining and logging sector hired 800 more workers while the construction sector hired 10,367 less workers. The manufacturing sector added 28,467 more workers. Service sector employment increased from 15.49 million to 15.68 million between the fourth quarter of 2022 and the first quarter of 2023. The state government lost 967 workers while local government added 23,867 workers.

Local Economy

The local economy witnessed a decrease (-1,567) in the labor force from 396,667 in the fourth quarter of 2022 to 395,100 in the first quarter of 2023. Civilian employment decreased by 11,333 from 371,200 in the fourth quarter to 359,867 in the first quarter. Nonfarm and farm employment decreased by 3,567 and 13,233, respectively.

In Bakersfield, nonfarm employment changed in the following manner: mining and logging lost 33 workers; construction lost 833 workers; manufacturing lost 100 workers while service lost 2,600 workers. Within

¹U.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://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>

²The 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/MapToolServlet?survey=la&map=county&seasonal=u>.



the service sector, trade, transportation and utilities lost 1,067 workers, financial activities lost 133 workers, professional and business services lost 767 workers, private education and health services added 567 workers while leisure and hospitality added 367 workers. Within the government, the federal government lost 400 workers, state government added 33 workers and local government lost 1,100 workers.

Total salaries and wages in Kern County decreased from \$351,567 in the fourth quarter of 2022 to \$340,567 (3.1 percent drop) in the first quarter of 2023. Compared to four quarters ago, salaries were higher by \$13,900 or 4 percent.

The unemployment rate varied considerably across cities, ranging from 2.8 percent in Ridgecrest to 26.1 percent in Delano. All cities in Kern County (except in Edwards Airforce Base) showed a mild increase in the unemployment rate compared to last quarter. The biggest quarter to quarter rise in the unemployment rate occurred in Lake Isabella where it surged from 9.5 percent to 21.5 percent. In Bakersfield, the unemployment rate was 5.93 percent in the first quarter of 2023 compared to 4.97 percent in the fourth quarter of 2022. In Kern County, unemployment was 8.9 percent in the first quarter of 2023 compared to 6.60 percent in the fourth.

In the first quarter of 2023, the median home price in Bakersfield was \$373,167 compared to \$386,248 in

the fourth quarter of 2022. Home prices are \$10,333 lower than they were four quarters ago. Within the region, median home prices in Taft were the lowest at \$214,150 compared to \$378,333 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) decreased by 6.47 percentage points from \$105.2 to \$98.8 (quarter to quarter). The index is 10.2 percentage point less than it was four quarters ago. All companies gained/lost as follows: Chevron (decreased 9.1 percent quarter-over-quarter), Tejon Ranch (decreased 3 percent quarter-over-quarter), Granite Construction (increased 17.1 percent quarter-over-quarter), Wells Fargo (decreased 9.5 percent quarter-over-quarter) and Sierra Bancorp (decreased 18.9 percent quarter-over-quarter).

The average retail price of gasoline decreased by \$0.44 to \$4.51 a gallon (quarter to quarter) from \$4.95. Gas prices are 0.6 percent lower than they were four quarters ago when they averaged \$4.53 a gallon. The unit price of California's Class III milk was \$21.11 in the fourth quarter of 2022 compared to \$18.44 in the first quarter of 2023. The Index of Farm Price Parity in the first quarter of 2023 (0.91) was lower than that of the fourth quarter of 2022 (0.97).

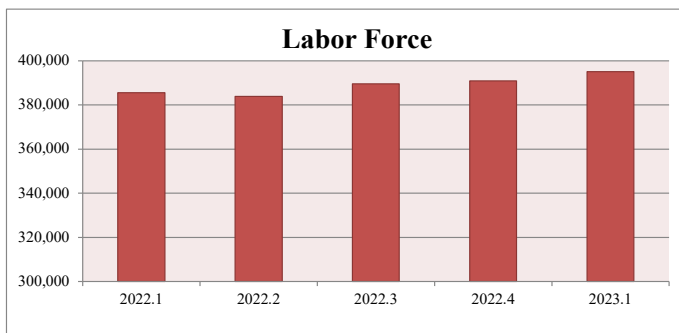
Tracking Kern's Economy¹

DR. NYAKUNDI MICHIEKA &
DR. RICHARD S. GEARHART III
2023 FIRST QUARTER

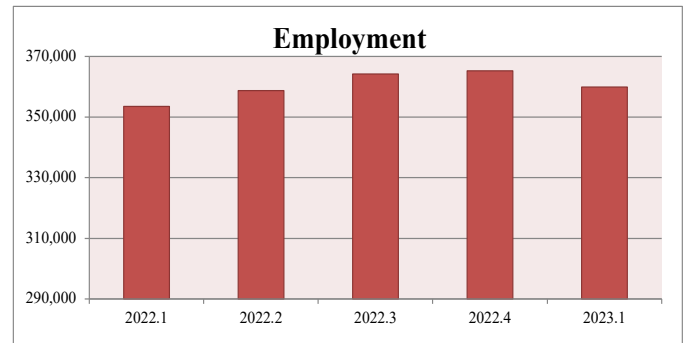
Labor Market

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.

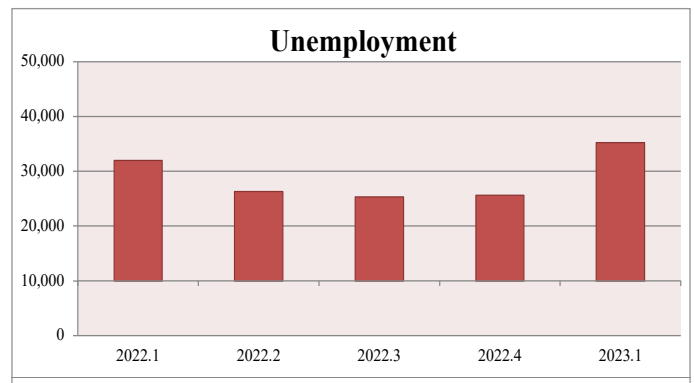
Labor Force – The civilian labor force increased by 4,200 members, from 390,900 in the fourth quarter of 2022 to 395,100 in the first quarter of 2023. The labor force estimates were similar to the pre-pandemic levels (first quarter of 2020) where they averaged 394,500. The labor force numbers continue to grow over the last four quarters. The Bureau of Labor Statistics defines the labor force participation rate as the proportion of the working-age population that is either working or actively looking for work. Recessions tend to push labor force participation down.



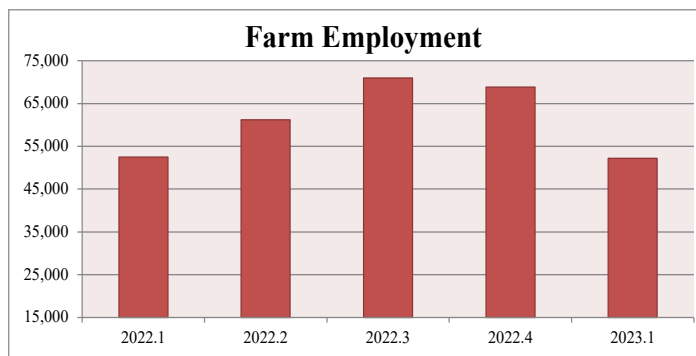
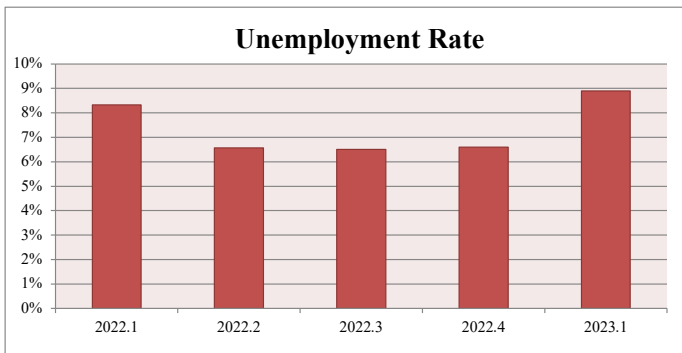
Employment – In the first quarter of 2023, Kern County hired 5,433 less workers (compared to last quarter) as total employment decreased from 365,300 to 359,868. This is a 1.8 percent increase in employment compared to the first quarter of 2022, when 353,533 persons were employed. Last year (2022), fourth to first quarter employment decreased by 2,667.



Unemployment – In the meantime, quarter to quarter unemployment increased by 9,567 as the number of jobless workers rose from 25,633 to 35,200. The number of unemployed workers is 10 percent higher than it were four quarters ago. In the first quarter of last year (2022), there were 31,967 unemployed workers.



Unemployment Rate – Kern County's year-to-year unemployment rate rose by 0.6 percentage points from 8.3 percent in the first quarter of 2022 to 8.9 percent in the first quarter of 2023. The unemployment rate in the first quarter of 2023 was 2.3 percent higher than that of the fourth quarter of 2022. Kern's unemployment rate was higher than that of California which was 4.3 percent.

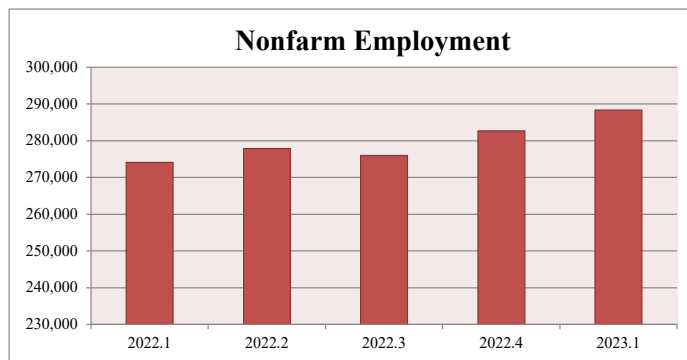


The unemployment rate varied considerably across cities, ranging from 2.8 percent in Ridgecrest to 26.1 percent in Delano. The quarter-to-quarter unemployment rate increased in all cities in Kern County except in Edwards Airforce Base. The biggest increase in the unemployment rate occurred in Lake Isabella, where it increased from 9.5 to 21.5 percent. In Bakersfield, the unemployment rate was 5.9 percent in the first quarter of 2023 compared to 4.97 in the fourth quarter of 2022.

Nonfarm Employment – Local nonfarm industries employed 5,633 more workers in the first quarter of 2023 as the number increased from 282,700 to 288,333. The industries hired 14,200 more workers compared to four quarters ago (5.2 percent more). The first quarter estimates of the number of nonfarm workers are the highest ever recorded.

Location	Unemployment Rate (%)	Location	Unemployment Rate (%)
KERN COUNTY	8.90	McFarland	8.00
Arvin	11.47	Mojave	8.70
Bakersfield	5.93	Oildale	14.17
California City	18.13	Ridgecrest	2.80
Delano	26.10	Rosamond	9.57
Edwards	8.47	Shafter	7.23
Frazier Park	8.77	Taft	6.07
Lake Isabella	21.53	Tehachapi	8.43
Lamont	8.53	Wasco	16.07

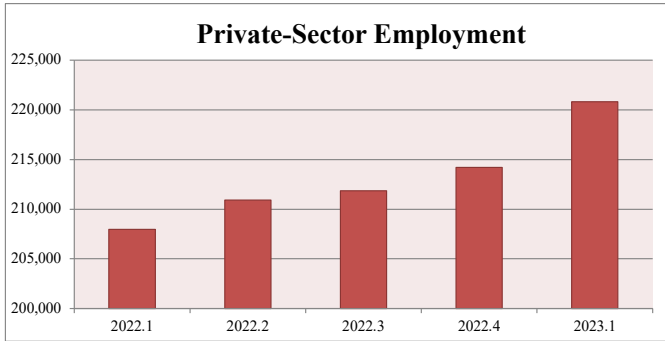
Note: City-level data are not adjusted for seasonality and “informal” market workers.



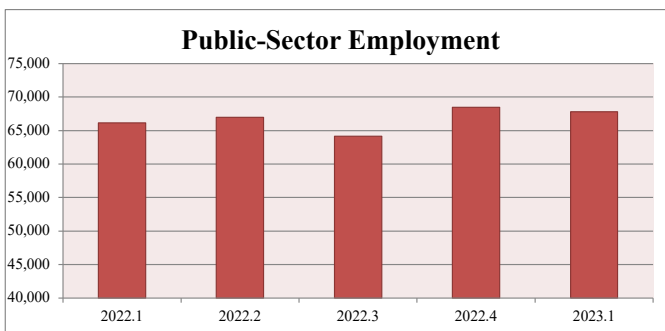
Farm Employment – In the first quarter of 2023, Kern County hired 16,634 less farm workers. As a result, farm employment decreased from 68,867 in the fourth quarter of 2022 to 52,233 in the first quarter of 2023. The year-over-year number of farm workers decreased by 300 to 52,233 (last year).

In Bakersfield, nonfarm employment changed in the following manner: mining and logging employment lost 867 workers; construction lost 833 workers; manufacturing employment lost 100 workers while the service sector lost 2,600 workers. Within the service sector, trade, transportation, and utilities lost 1,067 workers; financial activities lost 133 workers; professional and business services lost 767 workers; health care and social assistance added 567 workers while leisure and hospitality added 367 workers. The federal government lost 400 workers while the state government added 33 workers. The local government lost 1,100 workers.

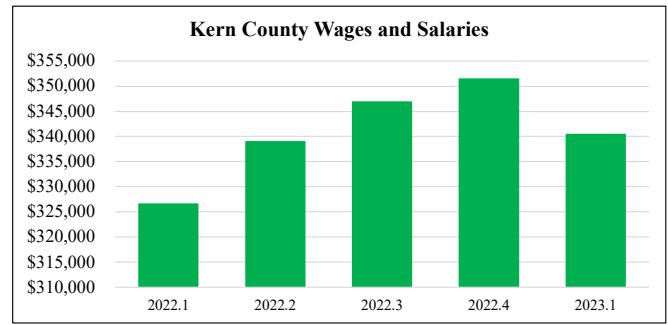
Private-Sector Employment – Nonfarm employment is comprised of private- and public-sector employment. In the fourth quarter of 2022, private companies hired an additional 2,333 workers compared to the third quarter of 2022. They also hired 2.5 percent more workers this quarter than they did four quarters ago. Today, the private sector employs 214,200 individuals.



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 first quarter of 2023, government agencies hired 700 less workers, as employment decreased from 68,500 to 67,800 – a 1.02 percent decrease. Compared to last year, 2.5 percent more workers were hired in the public sector.

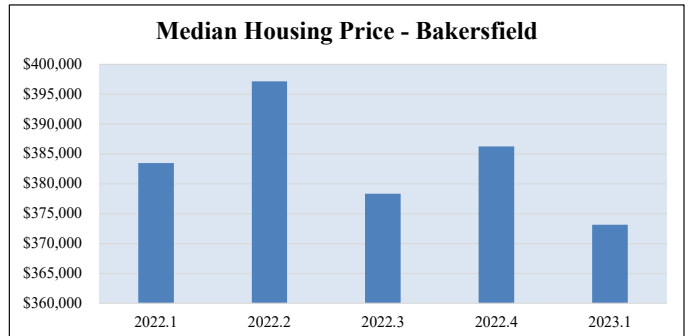


Salaries and Wages – Total salaries and wages in Kern County decreased from \$351,567 in the fourth quarter of 2022 to \$340,567 in the first quarter of 2023 – a 3.1 percent decrease. Compared to four quarters ago, salaries were \$13,900 (or 4 percent) higher.

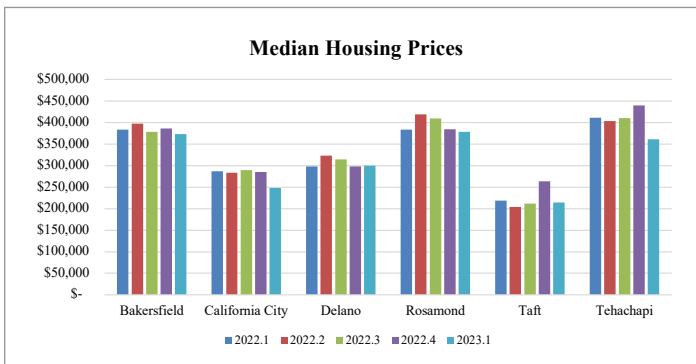


Housing Market

Housing Price – In the first quarter of 2023, Bakersfield’s housing prices were down by \$13,082 (3.39 percent) compared to the prices in the fourth quarter of 2022. The median home price averaged \$373,167 in the first quarter of 2023 compared to \$383,500 in the first quarter of 2022. Prices were \$10,333 lower than they were four quarters ago.



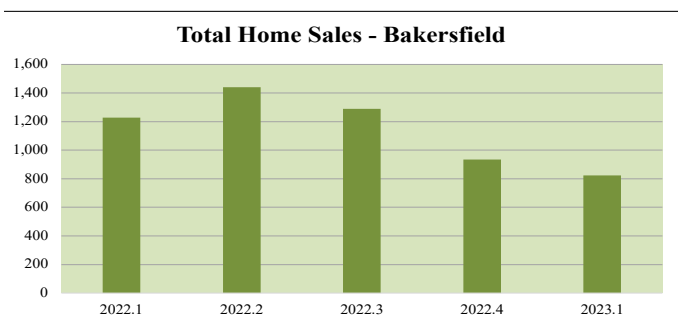
Regional Housing Prices – Changes in housing demand in Bakersfield are likely to spillover to surrounding cities as individuals who are on the margin of buying or selling are likely not located in the Bakersfield Metropolitan Statistical Area (MSA) directly. An assessment of fourth (2022) to first quarter (2023) changes in median sales price indicates that home prices dropped in Bakersfield, California City, Rosamond, Taft and Tehachapi, while prices increased in Delano. Tehachapi recorded the largest drop in prices (-\$78,500) while Delano recorded the only increase in prices (+\$1,083). The average price change was -9 percent across all regions in the county (i.e. some regions witnessed price increases while others witnessed a decrease in prices). The median home price across all regions averaged \$312,428 in the first quarter of 2023 compared to \$342,736 in the fourth quarter of 2022.



The year-to-year home prices changed as follows: Bakersfield (-2.69 percent), California City (-13.3 percent), Delano (+0.36 percent), Rosamond (-1.3 percent), Taft (-2.12 percent) and Tehachapi (-12.12 percent).

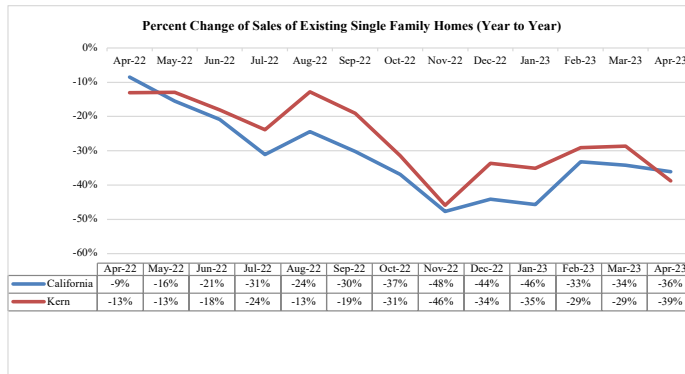
Location	Median Price	Median Price	Price Change (\$ (Annual))	Price Change (%) (Annual)
	2022.1	2023.1	2022.1 to 2023.1	2022.1 to 2023.1
Bakersfield	383,500	373,167	-10,333	-2.69%
California City	286,417	248,333	-38,083	-13.30%
Delano	298,333	299,417	1,083	0.36%
Rosamond	383,333	378,333	-5,000	-1.30%
Taft	219,000	214,150	-4,850	-2.21%
Tehachapi	411,000	361,167	-49,833	-12.12%
Average	330,264	330,264	-17,836	-5.21%

Home Sales – In Bakersfield, quarter to quarter sales of residential units decreased by 111 units, from 935 in the fourth quarter of 2022 to 824 in the first quarter of 2023. An average of 403 less homes were sold in the first quarter (of 2023) compared to the first quarter last year (2022).

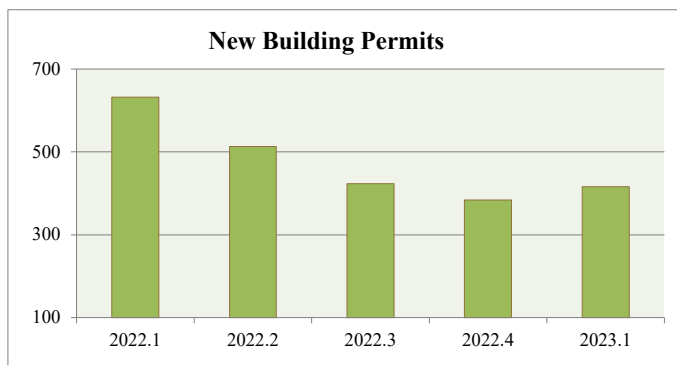


Growth in Housing Sales – We compare growth in sales of existing single-family homes in Kern County with growth in sales in California. Positive values indicate that more homes were purchased this year compared to last year. In April 2023, 39 percent less homes were sold in Kern County compared to April 2022. In California, sales were 36 percent lower. The

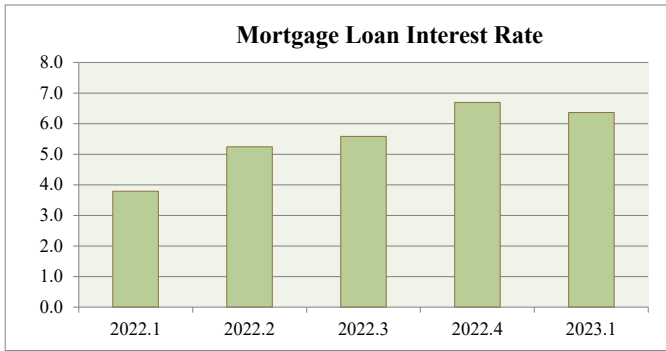
average growth in home sales in California between April 2022 and April 2023 was – 31.4 percent while the number was – 26.3 percent in Kern County.



New Building Permits – In the first quarter of 2023, Kern County issued 32 more permits for construction of new privately-owned dwelling units compared to the fourth quarter of 2022. A total of 416 permits were issued this (first) quarter compared to 632 in the fourth quarter of last year (2022). The number of permits issued has been on the decline over the last seven quarters, but this period witnessed a rise in issuances. Over the last five years, the average number of permits issued in the fourth quarter of every year is 469.

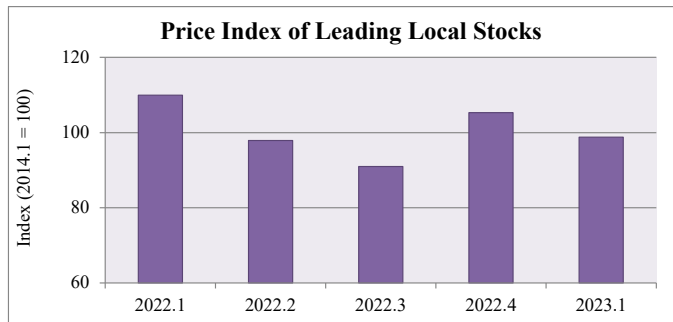


Mortgage Interest Rate – In the first quarter of 2023, the interest rate on thirty-year conventional mortgage loans decreased to 6.36 percent from 6.69 percent (fourth quarter 2022). This is the first drop in the thirty-year mortgage interest rates since they started rising in the first quarter of 2021. The interest rate in the first quarter of 2022 was 3.79 percent.

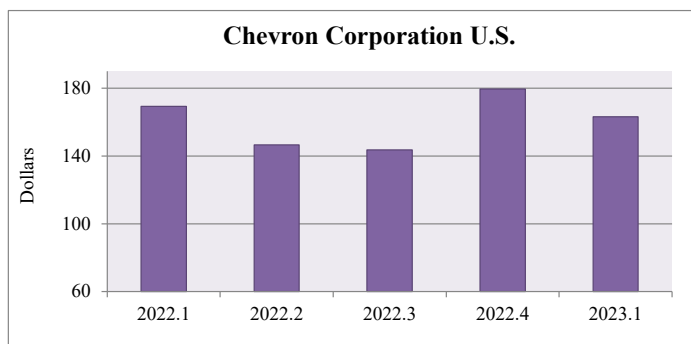


Stock Market

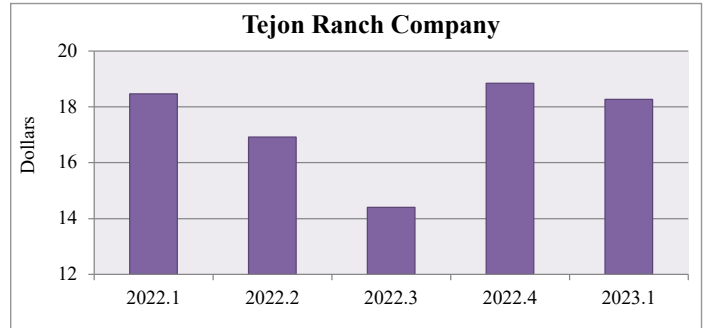
In the first quarter of 2023, the composite price index (2014.1=100) of the five publicly traded companies doing business in Kern County decreased by \$6.47, from \$105.2 to \$98.8 (quarter to quarter change). The index is 10.2 percentage points lower than it was four quarters ago. Average “close” prices 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 last quarter, CVX lost \$16.33 (or 9.1 percent) per share as its price decreased from \$179.49 to \$163.16. Relative to the first quarter of 2022, CVX was down \$6.15 (or 3.6 percent) this quarter.



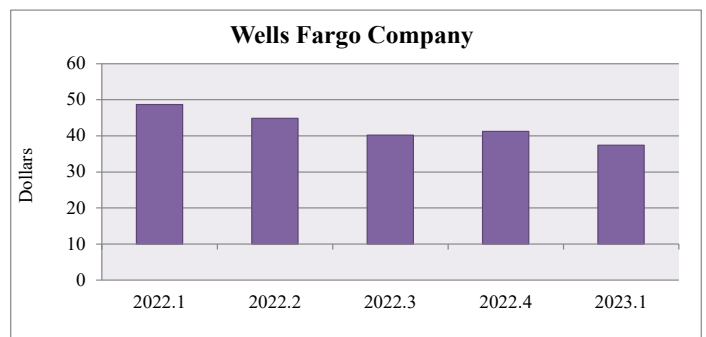
Tejon Ranch Company: TRC lost \$0.57 (or 3 percent) per share as its stock price decreased from \$18.84 to \$18.27, between the fourth quarter of 2022 and the first quarter of 2023. Compared to last year, the TRC stock price was down \$0.19 (or 1 percent).



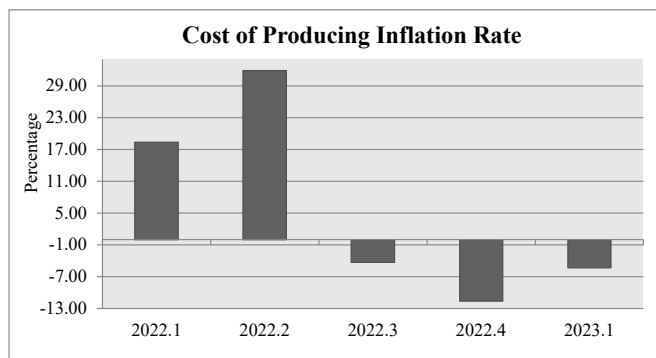
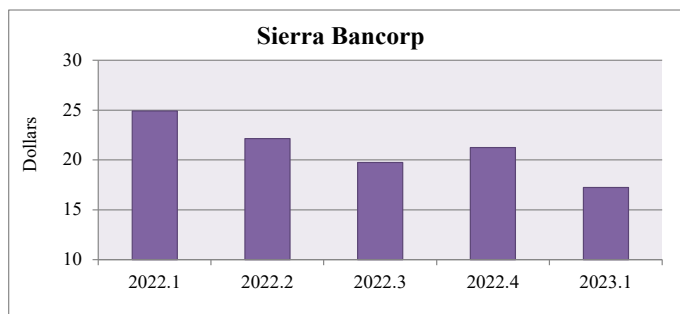
Granite Construction: GVA gained \$6.01 (or 17.1 percent) per share as its stock price increased from \$35.07 to \$41.08 between the fourth (2022) and first quarter of 2023. GVA gained \$7.97 (or 24.1 percent) over the last four quarters.



Wells Fargo Company: WFC lost \$3.91 (or 9.5 percent) per share as its stock price decreased from \$41.29 to \$37.38 between the fourth quarter of 2022 and first quarter of 2023. Relative to one year ago, WFC was down \$11.33 (or 23.3 percent).

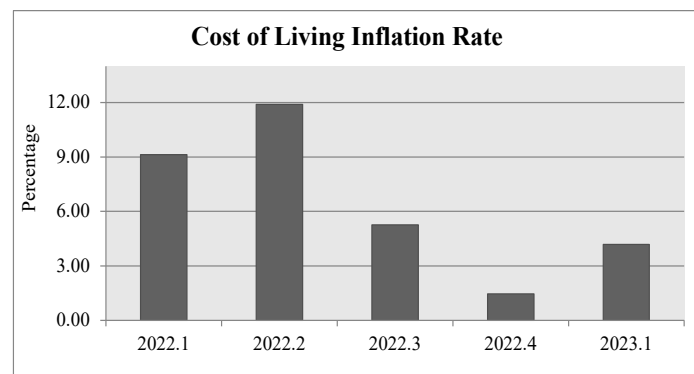


Sierra Bancorp: BSRR lost \$4.02 (or 18.9 percent) per share as its price decreased from \$21.24 to \$17.22. Similar to CVX, WFC and TRC, BSRR lost \$7.91 (or 21.8 percent) this quarter compared to the first quarter of 2022.



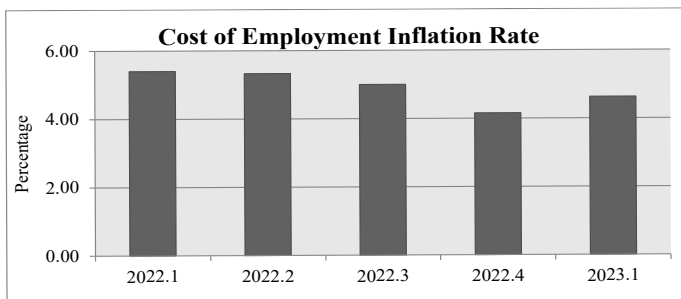
Inflation

Cost of Living – In the first quarter of 2023, the Consumer Price Index for all urban areas (1982-84 = 100) increased from 297.51 to 300.62. As a result, inflation for the cost of living accelerated at an annual rate of 4.18 percent. The index was 284.12 in the first quarter of 2022.



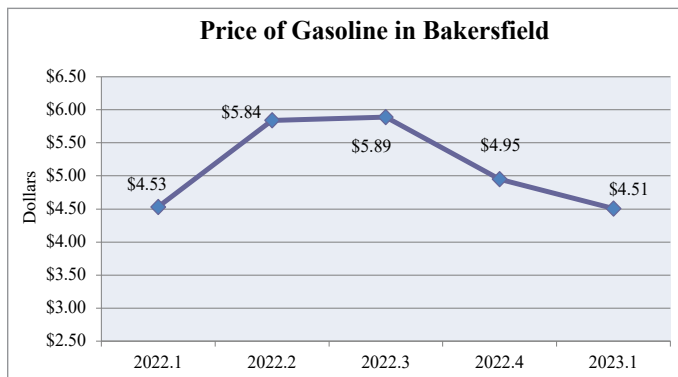
Cost of Production – The Producer Price Index for all commodities (1982 = 100) decreased between the fourth quarter of 2022 and the first quarter of 2023; from 262.18 to 258.66. The inflation rate for the cost of producing decelerated at an annualized rate of -5.53 percent. The cost of production inflation rate was 252.75 four quarters ago.

Cost of Employment – The Employment Cost Index (December 2005 = 100) for all civilian workers increased from 155.60 in the fourth quarter of 2022 to 157.40 in the first quarter of 2023, causing employment inflation to rise by 4.63 percent.

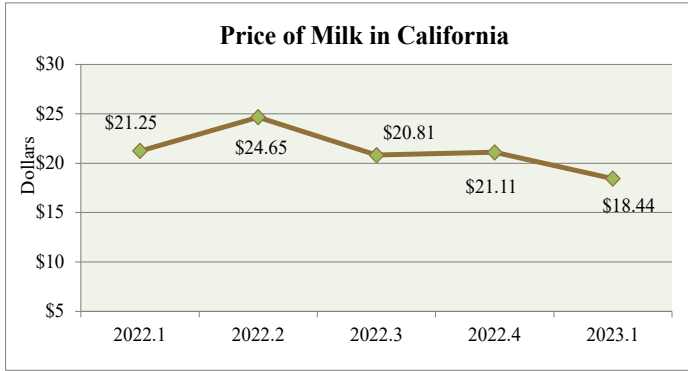


Commodity Prices

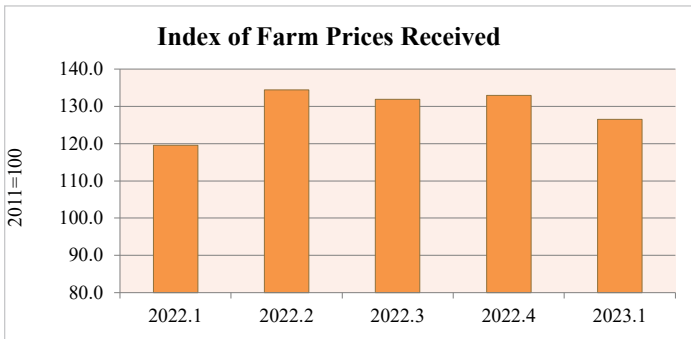
Price of Gasoline – In the Bakersfield MSA, the average retail price of gasoline decreased by \$0.44 to \$4.51, from \$4.95 between the fourth quarter of 2022 and the first quarter of 2023. Average prices were 0.6 percent lower than they were a year ago.



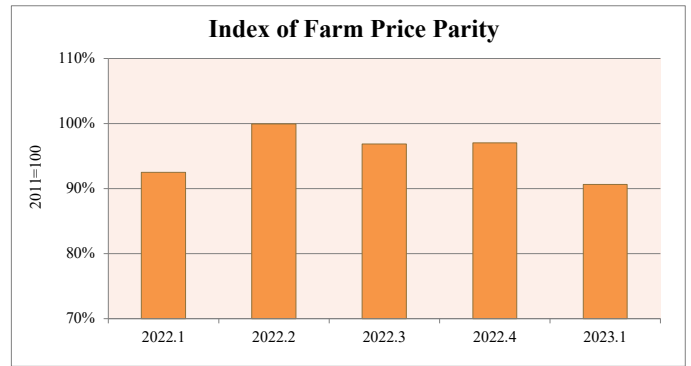
Price of Milk – The unit price of California’s Class III milk decreased in the first quarter of 2023 by \$2.67, to \$18.44 from \$21.11 last quarter. Noticeably, milk prices continued to drop following the peak in the second quarter of 2022. Prices are 13.2 percent or \$2.81 lower than they were four quarters ago.



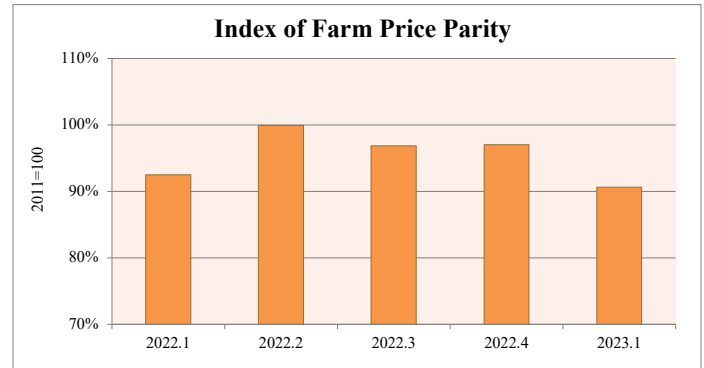
Farm Prices – In the first quarter of 2023, the National Index of Prices Received by Farmers for all farm products (2011 = 100) decreased by 6.43 points to 126.5 compared to the 133 in the fourth quarter of 2022. This is a 6.97 point increase from the 119.6 points recorded in the first quarter of 2022.



Meanwhile, the National Index of Prices Paid by farmers for commodities, services, interest, taxes, wages, and rents increased by 1.82 percentage points compared to last quarter. This means that farmers are worse off this quarter compared to last quarter.



We measure the Index of Farm Price Parity as the ratio Index of Prices Received to the Index of Prices Paid. In the first quarter of 2023, the Index of Farm Price Parity was 91 percent compared to 97 percent last quarter. Four quarters ago, the price ratio was 92 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; <https://www.redfin.com>; <https://www.cafmno.com>; www.bls.gov

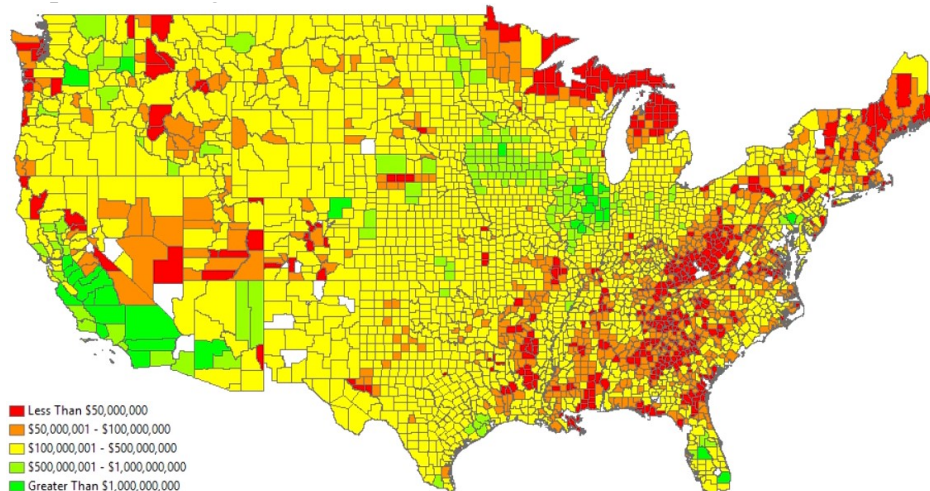
Changes in Agricultural Land Values in the U.S.

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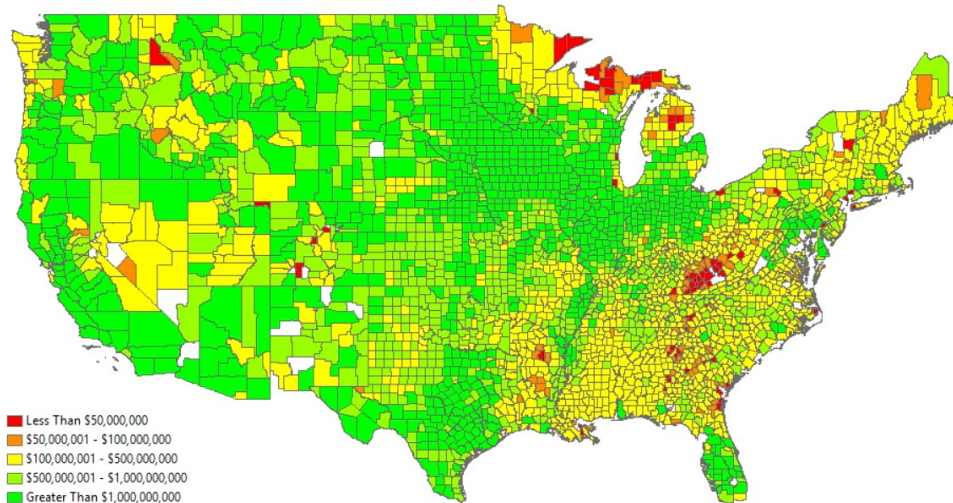
The United States has experienced an overall increase in agricultural land and building values over the past few decades. In 1978, agricultural land for each county averaged \$207 million, while in 2017 average value was \$879 million. Over this 40-year period, agricultural land values increased by roughly 320%. The region with the highest agricultural value of land and buildings in 1978 was the Midwestern region, with a total value of \$304 billion. Agricultural land values were least in the Northeastern with a total value of \$24 billion (U.S. Department of Agriculture 2023). The scenario was similar in 2017 as illustrated in figures 1 and 2.

Figure 1: Estimated Market Value of Agricultural Land and Buildings in U.S. (1978)



Source: Authors Adaptation from the United States Department of Agriculture (2023)

Figure 2: Estimated Market Value of Agricultural Land and Buildings in U.S. (2017)



Source: Authors Adaptation from the United States Department of Agriculture (2023)

Table 1 provides an overview of the top 5 states where land values were highest (and lowest) in the U.S., both in 1978 and 2017. States ranking at the top (and bottom) are similar for both time periods. Table 2 presents similar rankings at the county level; counties with the largest agricultural values were found in the Western part of the country.

Table 1: Most/Least Expensive Agricultural Land Values by State¹

	1978		2017	
	State	Total Value	State	Total Value
Most Expensive Agricultural Land Values – States (in Dollars)	Illinois	\$54,937,236,703	Texas	\$243,549,279,000
	Iowa	\$51,832,957,840	California	\$229,341,960,000
	Texas	\$51,645,197,962	Iowa	\$215,846,569,000
	California	\$38,153,466,985	Illinois	\$196,542,080,000
	Indiana	\$26,659,327,519	Nebraska	\$123,914,581,000
Least Expensive Agricultural Land Values – States (in Dollars)	Delaware	\$963,697,550	Delaware	\$4,420,092,000
	Massachusetts	\$901,649,974	Vermont	\$4,225,664,000
	Maine	\$799,551,836	Maine	\$3,394,267,000
	New Hampshire	\$425,715,234	New Hampshire	\$2,225,315,000
	Rhode Island	\$159,357,952	Rhode Island	\$936,443,000

Source: United States Department of Agriculture (2023)

Table 2: Most/Least Expensive Land Values by County²

	1978		2017	
	County/State	Total Value	County/State	Total Value
Most Expensive Agricultural Land Values – Counties (in Dollars)	Fresno County, CA	\$3,750,322,284	Fresno County, CA	\$18,703,714,000
	Kern County, CA	\$2,567,328,024	Kern County, CA	\$16,941,719,000
	Tulare County, CA	\$2,210,464,129	Tulare County, CA	\$14,658,910,000
	McLean County, IL	\$2,074,440,249	Sonoma County, CA	\$12,585,655,000
	San Joaquin County, CA	\$1,875,352,383	Merced County, CA	\$12,384,483,000
Least Expensive Agricultural Land Values – Counties (in Dollars)	Cameron County, PA	\$1,750,008	Leslie County, KY	\$6,300,000
	Martin County, KY	\$1,672,997	Chattahoochee County, GA	\$5,142,000
	Crawford County, MI	\$1,208,000	Clayton County, GA	\$4,930,000
	Knott County, KY	\$923,994	Wyoming County, WV	\$4,867,000
	Cook County, MN	\$621,999	Logan County, WV	\$2,296,000

Source: United States Department of Agriculture (2023)

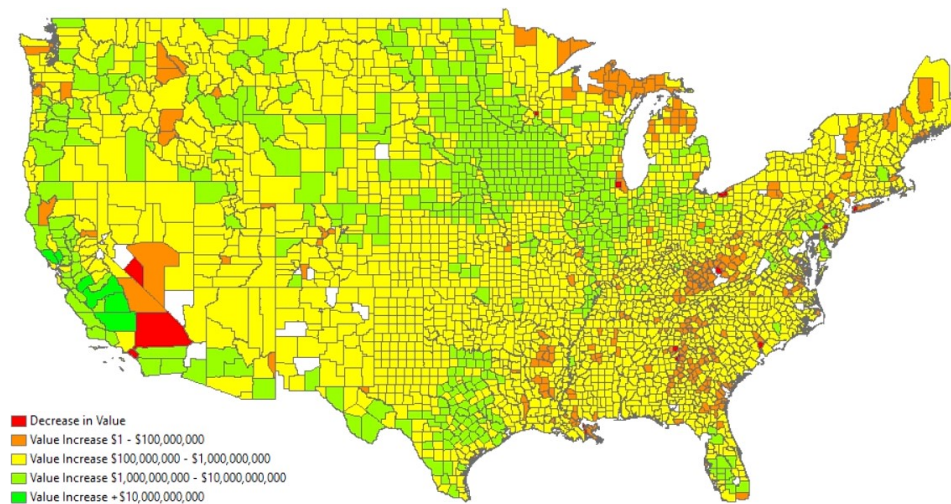
Changes in agricultural land and building values are closely linked to socio-economic, climatic, geographic, and soil-based variables. One of the more common factors affecting agricultural land and building values is climate (Lobell and Field 2007). Studies that consider growing seasons and non-growing season periods have found that colder winters are crucial to reducing pest incidence while warmer springs and autumns extend growing season periods which improve crop yields and land values (Vaitkeyciute et. al., 2019; Battisti and Naylor, 2009). Some authors suggest that converting to warmer weather crops or having irrigated agriculture can make rising climates slightly beneficial for agriculture (Mendelsohn et. al., 1994). One study found that dryland counties would experience estimated losses ranging from \$5-5.3 billion due to climate variables (Schlenker et. al., 2005). Another suggests that farmland values would decline 10-25% on an annual basis, as climates rose (Schlenker et. al., 2006). Land values in northern counties could benefit from rising climates which translates to a 34% increase in value while land values in southern counties could experience losses in value by up to 69% (Schlenker et. al., 2006). These factors may contribute to

¹ This table reports the total estimated market value of land and buildings in the United States by state. Values are arranged by highest-valued and lowest-valued land and buildings for the years 1978 and 2017.

² This table reports the total estimated market value of land and buildings in the United States by county. Values are arranged by highest-valued and lowest-valued land and buildings for the years 1978 and 2017.

Figure 3 illustrates the change in the estimated market value of agricultural land and buildings between 1978 and 2017. Counties are color-coated by their gain or loss in market value. West Virginia and Kentucky, the northern tip of Michigan, and the California regions witnessed a moderate increase in agricultural land values over this period. The Midwest and Western regions, together with Southern regions (Texas and Florida) witnessed the largest gains in agricultural land values.

Figure 3: Change in the Estimated Market Value of Agricultural Land and Buildings between 1978 and 2017



Source: Authors Adaptation from the United States Department of Agriculture (2023)

States witnessing the greatest gains over this period (between 2017 and 1978) were Texas, California, Iowa, Illinois, and Nebraska while the individual counties that saw the greatest gains were all from California (see Table 3). The states that saw the least gain in values were Delaware, Vermont, Maine, New Hampshire, and Rhode Island.

Table 3: Change in Land Values by State and County Between 1978-2017³

Greatest Gain in Value		Greatest Loss/Lowest Gain in Value	
State	Total Value	State	Total Value
Texas	\$243,549,279,000	Delaware	\$3,456,394,450
California	\$229,341,960,000	Vermont	\$3,161,121,278
Iowa	\$215,846,569,000	Maine	\$2,594,715,164
Illinois	\$196,542,080,000	New Hampshire	\$1,799,599,766
Nebraska	\$123,914,581,000	Rhode Island	\$777,085,048
County/State	Total Value	County/State	Total Value
Fresno County, CA	\$14,953,391,716	Clayton County, GA	-\$13,068,017
Kern County, CA	\$14,374,390,976	Delaware County, PA	-\$16,485,346
Tulare County, CA	\$12,448,445,871	Esmeralda County, NV	-\$118,066,997
Sonoma County, CA	\$11,594,296,384	DuPage County, IL	-\$136,766,974
Merced County, CA	\$10,863,022,406	Orange County, CA	-\$191,970,350

Source: United States Department of Agriculture (2023)

³ This table reports the total change in the estimated market value of agricultural land and buildings by state (upper rows) and county (lower rows) between 1978 and 2017. States and counties with the greatest gain and their differences are found to the left. States and counties with the greatest losses or lowest gains and their differences are found to the right.

Table 4: Change in Agricultural Land Values by State by Period⁴

	1982	1987	1992	1997	2002	2007	2012	2017	Overall 1978-2017
Alabama	17.77%	-12.27%	14.64%	68.54%	7.48%	36.87%	14.30%	8.19%	263.17%
Arizona	45.34%	-11.01%	8.80%	-0.53%	-1.42%	84.67%	-13.83%	24.84%	174.12%
Arkansas	27.96%	-24.77%	14.00%	41.23%	21.14%	53.14%	12.03%	20.65%	288.62%
California	61.37%	-21.12%	31.12%	15.93%	30.19%	69.11%	-1.23%	42.88%	501.10%
Colorado	35.08%	-17.92%	16.29%	39.19%	17.21%	39.15%	23.45%	25.31%	352.81%
Connecticut	21.73%	39.96%	27.71%	18.42%	39.54%	45.41%	-5.84%	-1.55%	384.62%
Delaware	26.37%	-9.98%	23.20%	13.95%	52.30%	125.23%	-21.33%	6.42%	358.66%
Florida	37.01%	-0.39%	8.99%	14.21%	16.81%	78.64%	-5.20%	14.20%	283.77%
Georgia	8.58%	-11.86%	16.09%	56.38%	26.11%	40.27%	-6.19%	17.69%	239.26%
Idaho	33.80%	-28.51%	11.71%	37.52%	22.90%	47.79%	15.24%	28.26%	294.49%
Illinois	-3.81%	-32.29%	16.95%	39.18%	14.47%	52.31%	67.26%	15.73%	257.76%
Indiana	-1.99%	-28.37%	16.12%	49.21%	18.55%	37.71%	48.89%	24.90%	269.26%
Iowa	4.88%	-45.13%	27.60%	42.18%	18.54%	62.40%	87.78%	10.33%	316.43%
Kansas	18.73%	-32.74%	13.82%	28.31%	19.21%	29.54%	78.37%	12.34%	260.87%
Kentucky	13.24%	-12.80%	17.77%	37.56%	25.28%	47.40%	5.13%	23.79%	284.47%
Louisiana	32.57%	-39.12%	1.59%	37.99%	18.04%	37.37%	20.91%	20.64%	167.61%
Maine	31.81%	25.32%	5.68%	22.00%	34.94%	29.17%	13.07%	1.14%	324.52%
Maryland	15.79%	0.77%	21.24%	8.41%	18.68%	70.74%	-2.49%	11.16%	236.86%
Massachusetts	22.90%	93.06%	12.73%	26.25%	49.46%	39.92%	-14.85%	-1.86%	490.18%
Michigan	26.48%	-25.06%	14.79%	55.93%	51.15%	25.98%	16.93%	21.01%	357.12%
Minnesota	25.50%	-42.43%	25.27%	34.57%	33.13%	65.56%	58.87%	12.69%	380.57%
Mississippi	23.62%	-32.92%	8.44%	58.65%	23.92%	37.00%	16.01%	15.05%	223.23%
Missouri	14.32%	-25.82%	18.44%	48.14%	38.55%	39.60%	24.74%	19.20%	327.89%
Montana	32.23%	-22.34%	9.34%	32.29%	29.61%	104.32%	-1.40%	13.52%	340.26%
Nebraska	31.50%	-35.10%	9.05%	32.22%	18.97%	47.49%	104.77%	14.85%	407.76%
Nevada	31.31%	-11.14%	-0.02%	10.08%	13.88%	21.51%	70.92%	-0.85%	201.13%
New Hampshire	30.28%	62.28%	-7.12%	38.86%	16.67%	71.76%	-15.09%	12.66%	422.72%
New Jersey	11.50%	26.17%	56.02%	2.57%	27.97%	52.89%	-18.54%	7.95%	287.33%
New Mexico	23.30%	1.16%	11.35%	4.21%	9.62%	39.16%	27.05%	13.57%	218.57%
New York	19.01%	9.95%	10.51%	14.26%	23.39%	26.81%	14.39%	18.71%	251.06%
North Carolina	18.28%	-13.38%	17.77%	48.20%	35.33%	24.08%	5.16%	7.21%	238.53%
North Dakota	21.67%	-27.02%	1.77%	21.79%	-1.30%	93.36%	83.03%	19.89%	360.95%
Ohio	-0.86%	-22.61%	14.45%	46.81%	30.83%	24.30%	37.14%	28.19%	268.55%
Oklahoma	32.73%	-33.23%	4.32%	37.41%	9.92%	70.54%	13.47%	28.60%	247.53%
Oregon	47.54%	-24.26%	23.20%	50.08%	14.87%	52.10%	-1.05%	26.61%	352.23%
Pennsylvania	15.63%	-1.60%	19.33%	35.41%	32.07%	41.54%	12.13%	14.10%	339.65%

⁴ This table reports the total change in the estimated market value of agricultural land and buildings by state (upper rows) and county (lower rows) between 1978 and 2017. States and counties with the greatest gain and their differences are found to the left. States and counties with the greatest losses or lowest gains and their differences are found to the right.

Rhode Island	8.39%	70.81%	5.98%	27.56%	41.61%	102.06%	-14.38%	-4.16%	487.63%
South Carolina	13.45%	-20.59%	23.38%	48.65%	33.18%	38.61%	6.05%	14.41%	270.08%
South Dakota	35.41%	-24.07%	3.25%	27.07%	26.64%	100.16%	86.55%	22.39%	680.73%
Tennessee	15.76%	-7.55%	20.00%	60.54%	27.16%	29.87%	4.57%	9.94%	291.39%
Texas	38.37%	-1.00%	-8.04%	26.87%	21.75%	64.76%	31.73%	11.66%	371.58%
Utah	33.37%	-21.86%	10.45%	53.39%	24.26%	54.56%	15.63%	22.62%	380.78%
Vermont	22.57%	16.60%	13.70%	23.74%	18.79%	40.81%	12.03%	5.35%	296.95%
Virginia	24.49%	-1.79%	29.45%	29.73%	33.49%	46.35%	3.62%	0.10%	316.08%
Washington	37.46%	-21.80%	18.67%	47.19%	7.41%	33.05%	13.69%	20.76%	268.35%
West Virginia	16.52%	-7.05%	24.68%	49.56%	14.63%	83.02%	0.75%	9.44%	367.15%
Wisconsin	26.21%	-28.13%	3.97%	43.98%	74.06%	36.86%	16.68%	22.82%	363.51%
Wyoming	34.94%	-24.39%	6.76%	44.75%	34.38%	51.74%	33.45%	9.42%	369.52%

Source: United States Department of Agriculture (2023)

Acknowledgement

This work is supported by Award No. 2020-38422-32245 from the USDA National Institute of Food and Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

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Projected Impacts of Climate Change on Crop Production in Kern County

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Agricultural production in Kern County is likely to be impacted by climate change over the remainder of this century. Changes in temperatures, variability in rainfall and snow melt (a primary source of irrigation water), increased pest infestations, and extreme weather events (e.g., heat waves) will potentially change crop yields and the economic viability of growing specific crops in the county. In 2021, the top five commodities by value produced in Kern County were grapes (23.6%), citrus (17.0%), pistachios (15.3%), almonds (14.9%) and milk (8.7%) (2021 Kern County). Over the last twenty years, production has shifted from low-value row crops to high-value perennial crops, such as pistachios and almonds. Given the longevity of the trees, planting decisions today may face uncertain returns in the future if projected climate changes occur. Each of these commodities, along with many others, have optimal growing conditions that may no longer be met as the climate changes. Crop yields are projected to decrease for some crops (e.g., almonds, table grapes), while other crops may see higher yields (e.g., alfalfa). In the extreme, some crops (e.g., pistachios) may no longer be economically viable to produce in the San Joaquin Valley (Pathak, et al., 2018).

Although water availability is likely to be the primary limiting factor for many crops, temperature changes may have a huge negative impact on some major crops. Temperatures are projected to increase by approximately 3.6° - 10.0° F over the remainder of the century, though an increase in minimum temperatures in the winter or maximum temperatures in the summer may have a greater impact than mean annual temperature changes. For example, an increase in winter minimum temperatures will reduce chill hours (hours between approximately 32° F and 45° F) needed to break dormancy for fruit and tree nut crops. Of the major crops grown in Kern County, almonds require 200-300 hours and pistachios require 1000 hours. Projections are that only 10% of the Central Valley will be suitable for growth for crops requiring more than 700 chill hours by 2095. In addition to reductions in yield, small temperature changes can have negative impacts on commodity quality, such as size, firmness, and color (Pathak, et al., 2018).

One of the largest impacts of climate change may occur due to extreme weather events. During the last twenty years, California has experienced two of the worst droughts in recorded history – 2007-2009 and 2012-2016. Extreme droughts increase the potential of fires and put additional pressure on groundwater use, both of which negatively impact agricultural production. In addition, projections are that runoff from potential “megaflood” events may be 200 to 400% greater than historical levels (Huang and Swain, 2022). The potential adverse effects of flooding can be seen in the recent reemergence of Tulare Lake and the loss of agricultural land.

The adoption of mitigation strategies can reduce the impact of climate change. Those strategies include water-conserving irrigation strategies, reduction in nitrogen fertilizer use, the use of cover cropping, crop breeding and enhanced crop diversity, and carbon sequestration. For example, reduction in nitrogen use would reduce nitrous oxide, a greenhouse gas that contributes to climate change (Jackson, et al., 2011). Although reductions in crop yields can have an adverse impact of revenue and profit, the decrease in supply will lead to higher prices. If the demand for the commodity is not price responsive (i.e., demand is inelastic), small decreases in production can generate higher revenues. In addition to the impacts on price, revenue,



and profit, changes in crop yields and crop mix can have an impact on the demand for farm labor. For example, table grapes require approximately 800 - 900 labor hours per acre (depending on the variety), while treenuts require 15 - 30 labor hours per acre (Fidelibus et al., 2018; Haviland, et al. 2019). If climate change leads producers to shift production from treenuts to table grapes, the demand for farm labor will increase significantly (assuming no labor-saving technological advances in table grape production). Without further mechanization, crop mix changes could exacerbate the current farm labor shortage resulting from lower levels of immigration, higher expenses of contracting workers through the H2-A visa program, and higher wages (Charlton, et al., 2019).

The overall impact of these changes will depend on a complex interaction of the magnitude and timing of the climate change, the sensitivity of crop yields to the climate changes, technological innovation and farmer responses (e.g., planting decisions) to the changes, and the adjustments of markets in response to the changes in production. The impacts are likely to be location- and crop-specific, so some farmers will potentially benefit from climate change, while other farmers will struggle to adapt to the changes.

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