



# Agricultural and Resource Economics ARE UPDATE

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## A Declining Farm Labor Supply Could Cost California Farmers Billions

Zachariah Rutledge and Pierre Mérel

**We analyze fruit and vegetable production and farm employment data to quantify the production and value losses from a declining supply of farm labor. We find that reduced labor availability could generate billions of dollars in losses over the next decade.**

California’s agricultural sector requires an army of workers to cultivate and harvest a multitude of labor-intensive crops. As the most prominent specialty-crop state in the United States, California produces two-thirds of the domestically produced fruits and nuts and one-third of the vegetables. However, in recent years, an alarming number of farmers have reported labor shortages that have reduced their capacity to harvest.

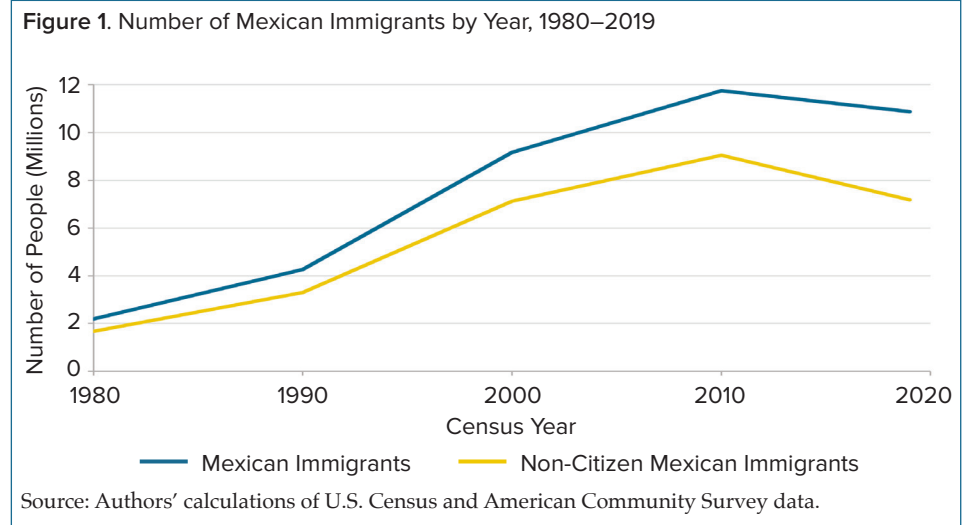
This issue has stimulated a dramatic surge in demand for the H-2A visa program, which allows domestic agricultural employers constrained by labor availability to hire temporary foreign-born workers. In fact, the number of H-2A jobs certified for work in California has increased by more than 1,900% over the past decade (from about 1,600 in FY2011 to 33,000 in FY2021). Indeed, a growing

body of economic research shows that the supply of farmworkers in the United States has been on the decline.

A declining farm labor supply could fundamentally alter the nature of California agriculture by reducing profitability and causing farmers to opt out of labor-intensive crop production in favor of crops whose harvest can more easily be mechanized, such as tree nuts, field crops, or wine grapes. Reduced labor availability on domestic farms could also contribute to food price inflation and cause our nation to become increasingly dependent upon foreign producers, generating new social costs—e.g., in terms of

transportation-related carbon emissions or lower food safety and quality. While the labor shortage issue has garnered media attention, highlighting farmer losses at harvest time, in this study we seek to quantify its economic impacts on California agriculture. We use detailed crop production and farm employment data from California counties to estimate the impact of changes in farm labor supply on the production and value of hand-harvested fruits and vegetables.

As shown in Figure 1, during the decade from 2010 to 2020, the number of Mexican immigrants in the United States declined for the first time in



history. California's farm labor force is comprised primarily of Mexican immigrants, so a decline in the number of Mexicans residing in the

country could reduce labor availability for fruit and vegetable producers. A recent survey conducted by UC Davis, Arizona State University, and

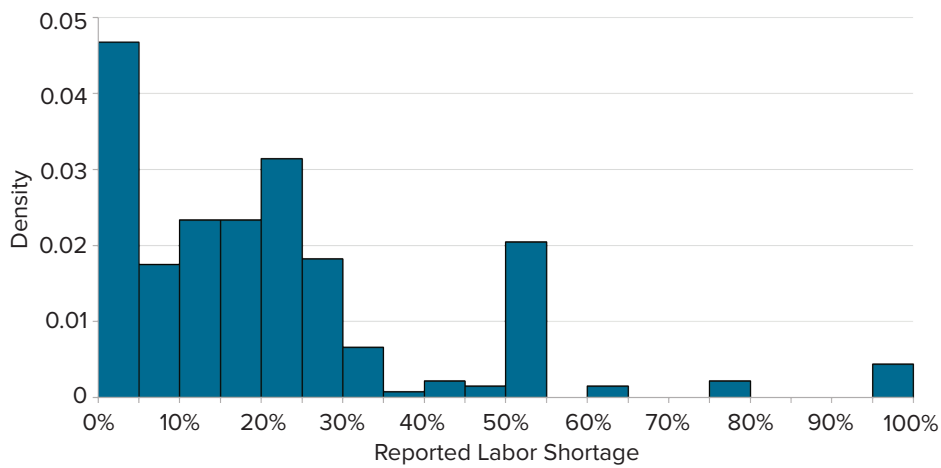
the California Farm Bureau Federation, which gathered information from more than 900 California farmers in the spring of 2022, reveals that 45% of surveyed farmers reported problems hiring enough employees during 2020. These results echo a previous survey published in a 2019 issue of *ARE Update*. Figure 2 depicts the percentage of their desired workforce that farmers experiencing a labor shortage were unable to hire. Among those reporting difficulties hiring workers, the average shortage was 20%.

A number of factors have been linked to the decline in farm labor supply. To start, until recently, tighter border security measures have made it more difficult for undocumented workers to enter the country. Farmworkers in the United States have also settled down and are much less willing to engage in follow-the-crop migration, reducing the geographical reach of local labor markets. Furthermore, job opportunities in the U.S. construction, food service, and personal service sectors have reduced the labor pool available to U.S. agricultural producers.

### Data Description

In this study, we use a statistical model to estimate a relationship between crop employment and production data from the top 10 fruit- and vegetable-producing counties in California (see Figure 3). Our analysis utilizes detailed crop production data from the California County Agricultural Commissioners' Reports and employment data from the Quarterly Census of Employment and Wages. We restricted our sample of crops to those that did not have a mechanical harvest technology available during our study period (1990 to 2019). Our employment measures include workers hired directly by crop farmers (NAICS code 111) and those that are brought to farms by farm labor contractors (FLC; NAICS code 115115), to capture the set of workers who are most likely to serve in the harvest labor force.

**Figure 2.** Histogram of Labor Shortage Intensity in 2020 for Surveyed California Farmers



Source: Authors' calculations of farmer responses from the 2022 CFBF Farm Labor Survey.

Note: Based on the responses of farmers who indicated they had a labor shortage, in answer to the question: "In percentage terms, approximately how many employees did you lack for the production of your [main crop] in [your main county] during 2020? Please enter a number between 1 (meaning 1%) and 100 (meaning 100%) in the box below or select 'I don't know.'" Sample size: 274.

**Figure 3.** Top 10 Labor-Intensive Crop-Producing California Counties



Note: The top 10 counties are shown in blue. The top 5 counties are outlined with a thick black border.

Our analysis measures farm employment during each county's peak employment quarter—the period of time when the bulk of the county's harvest activities take place and production activities are particularly sensitive to employee availability. Figure 4 shows monthly state-level crop employment for each group of crop workers in 2019, the last year in our sample. While this figure highlights the seasonal nature of agricultural employment in the state, it masks regional differences. For example, some counties, such as Imperial County, perform the bulk of their harvest activities in the winter and spring months; our analysis takes into account these differences.

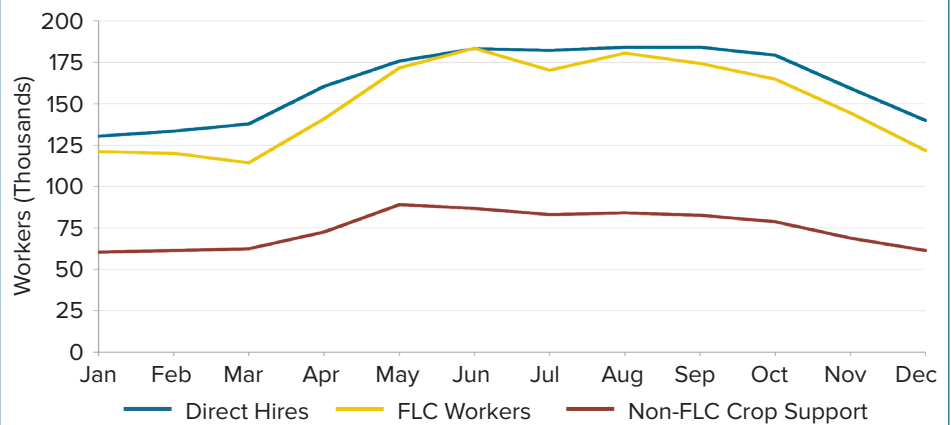
## Production Results

### Fruits and Vegetables

The estimates from our statistical analysis indicate that a 10% reduction in the farm labor supply causes, at most, a 4.2% reduction in hand-harvested fruit and vegetable production in the top 10 counties. These production effects are driven mainly by a reduction in the number of acres harvested, but we also find small effects on crop yield. Specifically, a 10% decline in the farm labor supply could cause as much as a 2.8% decrease in the number of acres harvested and a 1.4% decrease in yield.

According to our data, in 2019, the top 10 counties produced about 16 million tons of hand-harvested fruits and vegetables on roughly 1.1 million acres. Thus, our estimates imply that a 10% decrease in the supply of farm labor could cause as much as 31,000 ( $1,100,000 \times 2.8\%$ ) fewer acres of fruits and vegetables to be hand harvested each year, and up to 670,000 ( $16,000,000 \times 4.2\%$ ) tons of lost produce. A reduction in crop yields may result from scarce crews engaging in selective harvesting to bring in the most valuable produce, or a reduction in the number of rounds of harvests

Figure 4. Monthly Crop Farm Employment in 2019



Source: Quarterly Census of Employment and Wages.

Note: FLC is an abbreviation for the term farm labor contractor. Farm labor contractors are intermediaries who bring workers to farms to perform certain tasks, such as weeding, pruning, and harvesting.

that would have normally taken place for crops, like strawberries, that do not ripen uniformly during the growing season.

We also investigate whether production losses would be greater if fewer direct-hire workers were available, as opposed to fewer FLC workers, who tend to include a higher percentage of undocumented immigrants. Our estimates indicate that a decline in the supply of direct hires would have a greater impact on production, suggesting that a stable, documented workforce is important for labor-intensive agriculture. This finding may also be partly driven by the fact that direct-hire employees tend to have more employer-specific job experience. For example, data from the National Agricultural Workers Survey reveal that direct hires have an average of two additional years of work experience relative to their FLC worker counterparts and are about 15 percentage points more likely to have had only one employer during the previous 12 months (72% of direct hires had a single farm employer during the previous 12 months compared to 57% of FLC workers).

### Mechanically Harvested Nut and Field Crops

We also perform a parallel analysis on mechanically harvested nut and field crops. One would expect the production of mechanically harvested crops to be much less sensitive to labor availability. Indeed, our analysis fails to uncover a statistically meaningful relationship between the supply of farm labor and the production of nut and/or field crops, suggesting that the aggregate production of mechanically harvested crops is largely unaffected by labor supply shocks. In some specifications, our estimates even suggest that a reduction in farm labor supply might cause an increase in the production of mechanically harvested crops. One possible explanation for this result is that farmers partially anticipate labor shortages and switch acreage towards labor-saving crops.

### Production-Value Results

Our results suggest that the primary economic impacts of a labor shortage would be concentrated in the top five labor-intensive fruit- and vegetable-producing counties, where about two-thirds of the state's labor-intensive crops are grown. In those counties, we find that a 10% decline in the

supply of farmworkers could cause at most a 5.5% decrease in the total value of labor-intensive crops. Our calculations indicate that if the farm labor supply were to decline at a rate of 1% per year, as recent estimates suggest, California farmers in these top five counties could lose as much as \$3.7 billion dollars over the course of a decade. Due to the high value of California's hand-harvested fruit and vegetable crops, such a loss would account for about 3% of the total value of these crops.

## Conclusions

California farmers have reported labor shortages for over a decade. Such shortages have caused undeniable production losses as well as changes to production- and labor-management practices. Previous economic studies have argued that the supply of farmworkers, which is comprised mainly of Mexican immigrants, is on a downward trajectory.

In this study, we quantify the extent to which decreases in the farm labor supply may affect the production and value of hand-harvested fruit and vegetable crops in California. Our analysis suggests that a declining farm labor supply could create billions of dollars in lost crop value over the next decade, yet the aggregate production of fruits and vegetables is expected to remain relatively stable. Importantly, our analysis shows that mechanically harvested crops are largely unaffected by changes in labor supply, suggesting that mechanized harvesters for currently hand-harvested fruit and vegetable crops could serve as an alternative if they were advanced enough to avoid damage that is considered unacceptable to buyers.

For instance, recent technology developments include tiered, targeted shake-and-catch harvest systems that prevent fruit from falling more than 12 inches, robotic arms that target specific branches on a tree, artificial

intelligence (AI) vision systems that identify fruit location on tree branches, and co-robots that work along harvest workers. However, industry experts have cited concerns about these systems. Notably, there are lingering issues with speed and accuracy, damage caused to fruit and plants, ability to harvest all the marketable fruit, and costs of adoption.

In some cases, adoption would also require overhauling the production process, possibly through the use of plant varieties that are bruise resistant, or changes to infrastructure. For example, automated apple harvesters are being developed that require trees grown in a vertical trellis system, which enables the AI vision system's fruit-recognition software to identify ripened fruit in a two-dimensional canopy. Such systems require large up-front investments, and adoption may only be feasible for large producers who can spread the cost over a large volume. As a result, if these technologies evolve to a stage where they are ready to be deployed, smaller operations could be priced out of the market, and the scale of production could be altered.

True to its intentions, the H-2A foreign agricultural guest worker program, which has expanded rapidly over the past decade, has helped relieve agricultural labor supply pressures. However, employing workers through the H-2A program is significantly more expensive than employing immigrant workers who currently reside in the country. As a result, agricultural employers face a tradeoff between paying more for H-2A labor and the risk of not being able to secure U.S.-based workers during harvest time. Thus, even if the H-2A program serves as a short- to medium-run solution for the farm labor problem, it seems likely that labor costs will continue to rise and that consumers will ultimately bear some cost.

## Suggested Citation:

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## Authors' Bios

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## For additional information, the authors recommend:

Castillo, Marcelo, Philip Martin, and Zachariah Rutledge. 2022. "The H-2A Temporary Agricultural Worker Program in 2020." USDA Economic Research Service, Economic Information Bulletin No. 238. Available at: <http://bit.ly/3hP70kJ>.

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