



Economic Contributions of Stanislaus County Agriculture





The Honorable
Board of Supervisors
of Stanislaus County



Kristin Olsen

District 1, Vice-Chair

Vito Chiesa

District 2

Terry Withrow

District 3, Chair

Tom Berryhill

District 4

Jim DeMartini

District 5

3800 Cornucopia Way, Ste. B
Modesto, CA. 95358
Phone: 209.525.4730
Fax: 209.525.4790
stanag.org

Commissioner's Letter

I am pleased to share the **Economic Contributions of Stanislaus County Agriculture**. This report takes an important step beyond the Stanislaus County Agricultural Report that we publish every year. Instead of stopping at crop production values and acreage, it quantifies agriculture's total economic contributions through production, local processing, employment, and economic multiplier effects.

In short, this report uses twenty-first century economic tools to document agriculture's broader role in sustaining a thriving local economy.

This new study shows that in 2017, agriculture contributed a total of \$7.148 billion to the county economy. This far exceeds the \$3.649 billion figure from our 2017 Stanislaus County Agricultural Report. Agriculture supported 29,192 direct employees, just over one of every eight jobs in the county. Adding multiplier effects brought total agriculturally-related employment to 34,425 jobs. This report also examines economic diversification within agriculture, which has important implications for countywide economic resiliency.

Agriculture has a long tradition in Stanislaus County. For more than a century, it has been a pillar of our economy and culture. With this report, we renew our commitment to sustaining that tradition well into the future.

Respectfully submitted,

A handwritten signature in blue ink that reads "Milton O'Haire".

Milton O'Haire
Agricultural Commissioner/
Sealer of Weights & Measures

Table of Contents

Agricultural Commissioner’s Letter	Inside Cover
Stanislaus County Agriculture by the Numbers	2
Introduction.....	3
Our Approach.....	4
Direct Effects of Stanislaus County Farm Production	4
<i>Figure 1. Distribution of Stanislaus County Farm Production</i>	
Multiplier Effects of Stanislaus County Farm Production	6
<i>Figure 2. Economic Effects of Farm Production</i>	
Locally Sourced, Value-Added Food Processing	9
<i>Figure 3. Economic Effects of Locally Sourced, Value-Added Food Processing</i>	
Total Economic Contributions of Stanislaus County Agriculture	12
<i>Figure 4. Overall Economic Effects of Stanislaus County Agriculture</i>	
How Resilient is Agriculture to Economic Shocks?.....	13
<i>Figure 5. Agricultural Diversification is More Than Just the Number of Products</i>	
<i>Figure 6. Relative Distribution of Stanislaus County Agricultural Commodities</i>	
<i>Figure 7. Ten-Year Trend in Stanislaus County Agriculture's Economic Diversification</i>	
Toward the Future	16
Additional Questions	16
Acknowledgments	16



Stanislaus County Agriculture By the Numbers

Economic Contributions

of the Agricultural Industry

FOR 2017

\$7.148 billion

Stanislaus County Agriculture's total contribution to the local economy



Employment Effects

of the Agricultural Industry



29,192
direct employees

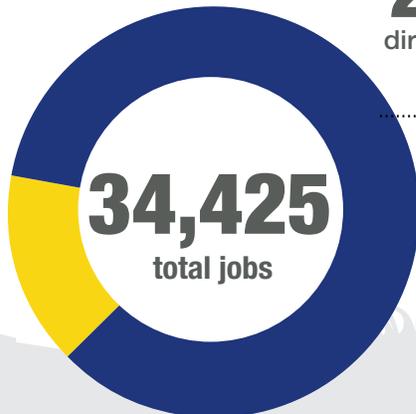


ONE in eight

jobs in Stanislaus County directly attributable to the agricultural industry

5,233

additional jobs attributable to multiplier effects: expenditures by agricultural companies and their employees



Introduction

Residents and visitors alike know and value the contributions agriculture makes to Stanislaus County. Almonds, walnuts, and other crops grow in some of the world's most productive soils. Livestock thrive in local barns and pastures. Well-tended fields stretch for miles. It is not difficult to see that agriculture plays a vital role in sustaining a healthy economy in Stanislaus County.

What's not so apparent, however, is the true size of that role. How much money does agriculture pump into the local economy? How many jobs does agriculture support? In other words, just how important is agriculture as a driver of Stanislaus County's economic health?

This report sheds light on these and related questions. Using multiple data sources and advanced economic modeling techniques, it analyzes agriculture's total contribution to the Stanislaus County economy. The report also examines agricultural diversification and its role in supporting economic resilience, including a quantitative measure. Overall, the findings offer important information for policy makers, the public, and anyone who values a thriving local economy.



Our Approach

A *basic industry* is one that sells most of its products beyond the local area and thus brings outside money into local communities. Agriculture easily qualifies as a basic industry in Stanislaus County.

Calculating a reasonable range of economic contributions by a basic industry entails quantifying three economic areas: 1) *direct* economic effects; 2) *indirect* economic effects; and 3) *induced* economic effects. This report covers all three.

Direct economic effects include farm production, local processing, and their related employment. Indirect effects consist of inter-industry, business-to-business supplier purchases. *Induced* effects reflect consumption spending by employees. The **Multiplier Effects** section on pages 6-8 explains this further.

To understand the furthest economic impacts of agriculture, one would also need to assess agricultural-related costs to society, such as net impacts on water and other natural resources. While important, these impacts lie beyond the scope of this study.

Our calculations draw from local and national data sources. The local sources include industry experts and the annual Stanislaus County Agricultural Report produced by the office of the Agricultural Commissioner and Sealer of Weights and Measures. The main national data source is IMPLAN, a widely used economic modeling program (see www.implan.com). Originally created for the U.S. Department of Agriculture (Forest Service), IMPLAN uses econometric modeling to convert data from more than a dozen federal government sources into local values for every U.S. county and zip code, across 536 industry sectors. Because IMPLAN draws from multiple sources, its employment and economic output numbers often differ from those reported by individual state and federal agencies.

Except where otherwise noted, all figures are from the year 2017, the most recent IMPLAN dataset available. Where appropriate, we adjusted sector names for clarity and applied coefficients to IMPLAN values to reflect unique Stanislaus County conditions. Please contact the authors for additional details on the methods used.

Direct Effects of Stanislaus County Farm Production

This section focuses on the simplest measures of economic activity: production and employment. It describes total farm production values and the number of agricultural jobs.

PRODUCTION

Figure 1 shows the various categories that made up Stanislaus County farm production value. At \$1.39 billion, Fruit and Nut Crops was the single largest production category by dollar value, comprising 38.2% of the county total. Almonds dominated this category with \$1.06 billion in production value. Walnuts were second (\$163.6 million), followed by peaches (\$52.2 million) and grapes (\$42.7 million).

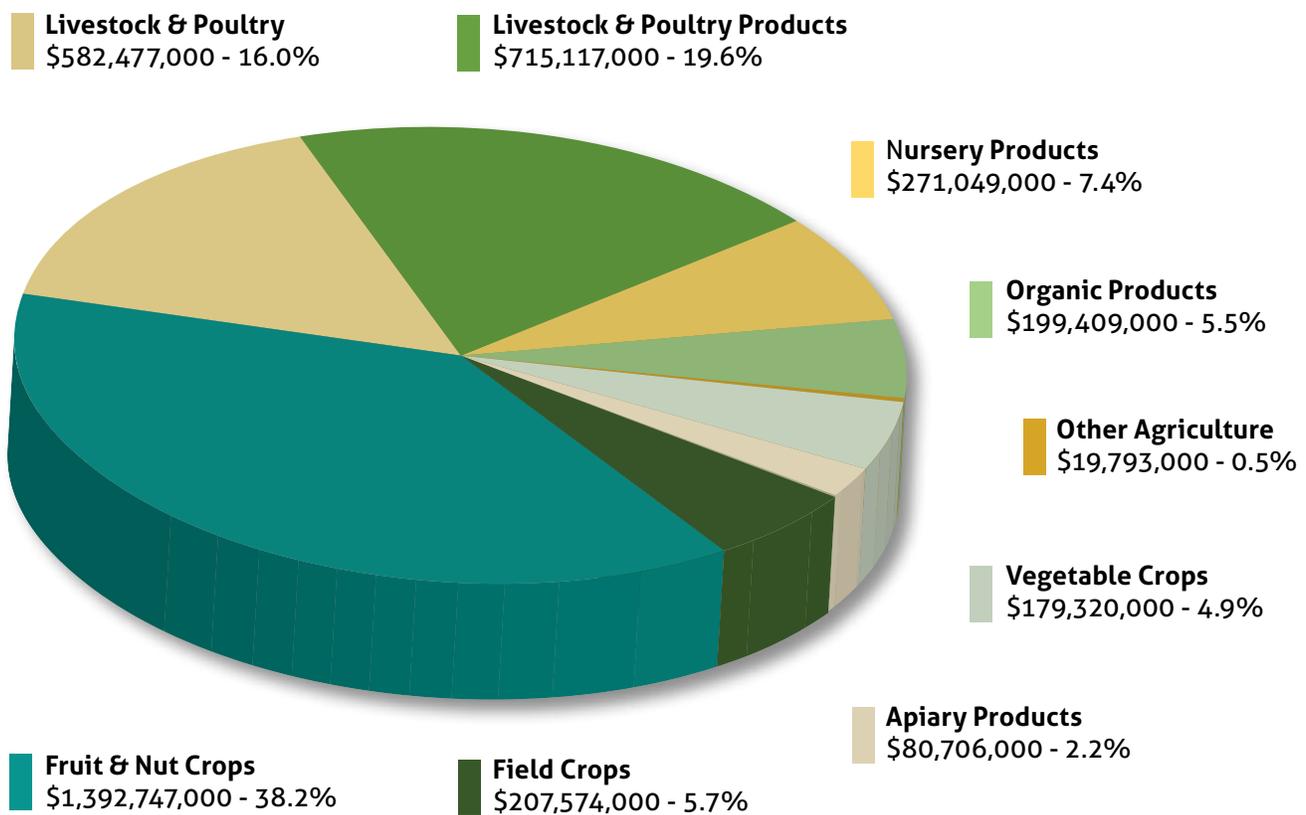


At 19.6%, Livestock & Poultry Products represented the second largest category (\$715.1 million) and consisted mostly of milk at \$663.7 million. Livestock and Poultry ranked third (\$582.5 million), led by chickens at \$254.7 million. Together, these three super categories accounted for 73.7% of the county's direct farm production values.

The combined, total dollar value for all products rose \$1.17 billion over the previous decade, from \$2.47 billion in 2008 to \$3.65 billion in 2017. Inflation totaled 19.5% during this period, averaging just under 2% per year. Thus, agricultural production grew an impressive 28.0% even after adjusting for inflation. Total values do not reflect net profit or loss experienced by individual growers or by the industry as a whole. Interested readers are encouraged to consult the 2017 Stanislaus County Agricultural Report for additional details on specific products and their value.

Figure 1. Distribution of Stanislaus County Farm Production

Source: 2017 Stanislaus County Agricultural Report



EMPLOYMENT

How many people work in agricultural production? In 2017, IMPLAN data indicate that agricultural production directly employed 26,551 people in Stanislaus County. This figure encompassed a wide range of production-related jobs, including not just growing and harvesting, but also sales, marketing and many other roles. It did not include food processing jobs, which are discussed on pages 9 -11. Nor did it include Stanislaus County's many public sector jobs in agriculture, across a wide range of local, state, and federal agencies.

Multiplier Effects of Stanislaus County Farm Production

This section quantifies the economic ripples that farm production creates in the local economy. These ripples take two forms: *indirect effects* and *induced effects*. The first consists of business-to-business supplier purchases. For example, when a grower buys farm equipment, fertilizer, pesticides, seed, insurance, banking services, and other inputs, the grower creates *indirect effects*.

The second ripple type, *induced effects*, consists of consumption spending by owners and employees of agricultural businesses and their suppliers. They buy groceries, housing, healthcare, leisure activities, and other things for their households. All this spending creates ripples in the economy.

Although agricultural companies and their employees certainly spend money in other counties, this study only reflects those expenditures that occur within Stanislaus County. Quantifying expenditures outside the county would be a complex effort that lies well beyond the scope of this report.

Figure 2 shows agriculture's *direct*, *indirect*, and *induced* economic effects within the county, for major production sectors. The numbers use IMPLAN multipliers for each sector, which are rooted in the most recent U.S. Bureau of Economic Analysis input-output models.

Figure 2. Economic Effects of Stanislaus County Farm Production

Dollar values are in \$ millions. Figures are for 2017 and come from IMPLAN and U.S. Bureau of Economic Analysis, with adjustments for local conditions. Not all columns and rows add exactly due to rounding.

FARM PRODUCTION SECTOR	Output Effects (\$ Millions)			TOTAL
	Direct	Indirect	Induced	
Tree Nut Farming	\$1,220.2	\$348.9	\$414.9	\$1,984.1
Dairy Cattle & Milk Production	\$787.7	\$164.0	\$168.7	\$1,120.4
Support Activities for Agriculture	\$445.9	\$9.5	\$200.3	\$655.7
Poultry & Egg Production	\$387.6	\$99.8	\$65.3	\$552.8
Greenhouse, Nursery & Floriculture Production	\$271.5	\$52.1	\$106.2	\$429.7
Fruit Farming	\$169.4	\$48.2	\$55.7	\$273.4
Vegetable & Melon Farming	\$176.1	\$42.3	\$50.7	\$269.0
Grain Farming	\$110.5	\$49.4	\$20.1	\$180.0
All Other Crop Farming	\$56.8	\$16.9	\$18.4	\$92.1
Beef Cattle Ranching and Farming	\$50.7	\$12.8	\$9.1	\$72.6
Firewood & Miscellaneous Products	\$18.1	\$6.8	\$2.3	\$27.1
Other Animal Production (excluding Cattle & Poultry)	\$9.5	\$0.3	\$3.9	\$13.7
TOTAL ECONOMIC OUTPUT	\$3,703.9	\$851.1	\$1,115.6	\$5,670.6
	Employment Effects (# Jobs)			TOTAL
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT	26,551	2,276	1,805	30,631

The 2017 multipliers update ones produced specifically for Stanislaus County forty-five years ago by George Goldman¹ Based on 1974 data, Goldman’s multipliers were much higher than modern ones. They reflect an era when county economies and agriculture were more localized and labor intensive than they are today, far less transformed by globalization and technology.

Note that sector names and production values in **Figure 2** differ from the County's annual report. They closely follow a standard classification system used nationwide, called the North American Industrial Classification System (NAICS).

NAICS and IMPLAN also combine familiar products in unfamiliar ways. For example, they lump the county's \$182.3 million dairy cattle (slaughter & replacement) with milk rather than with livestock. They also count the \$25.7 alfalfa hay crop under "All Other Crop Farming."



The following list helps bridge familiar Stanislaus County commodities with NAICS and IMPLAN sectors:

- **Tree Nut Farming:** Almond (all), Chestnut, Pecan, Pistachio, Walnut;
- **Dairy Cattle & Milk Production:** Dairy Cattle (slaughter & replacement), Milk (market);
- **Support Activities for Agriculture:** Pollination, Soil Preparation, Planting, Cultivating, Harvesting;
- **Poultry & Egg Production:** Chickens, Turkeys, Squab, Eggs (all);
- **Greenhouse, Nursery & Floriculture Production:** Fruit & Nut Trees and Vines, Ornamentals;
- **Fruit Farming:** Apricots, Cherries, Citrus (all), Grapes (all), Peaches (all);
- **Vegetable & Melon Farming:** Beans (succulent), Melons (all), Pumpkins, Sweet Potatoes, Tomatoes;
- **Grain Farming:** Beans (dried, all), Corn (silage);
- **All Other Crop Farming:** Hay (alfalfa, oat, other), Rangeland, Pasture (irrigated);
- **Beef Cattle Ranching & Farming:** Beef Cattle (feeders & slaughters);
- **Firewood & Miscellaneous Products:** Firewood, Christmas Trees;
- **Other Animal Production (excluding Cattle & Poultry):** Goats, Hogs & Pigs, Sheep & Lambs, Game Birds.

Note: Readers may assume a "Miscellaneous Other" category in each of the twelve sectors listed above, containing various minor products.

¹ Goldman, G. 1977. Economic Impacts of Resource Utilization: Stanislaus County, 1974 Input-Output Model. University of California / Berkeley, Cooperative Extension Service. The same multipliers appear in Sarquis (1981), Economic Impacts of Agricultural Production and Processing in Stanislaus County.

Each sector has distinct multipliers. "Greenhouse, Nursery & Floriculture Production," for example, had a 2017 *indirect effects* multiplier of 0.1918 and an *induced effects* multiplier of 0.3912. This means that each dollar's worth of direct output generated an extra 19 cents in supplier purchases, plus 39 cents more in consumption spending by owners and employees of agricultural businesses and their suppliers. Multipliers change every year, for each sector and county in the entire nation, reflecting where companies and employees spend their money.

Sectors have unique multipliers not just for economic output, but also for employment. "Tree Nut Farming," for example, supported 6,884 direct jobs plus an additional 555 *indirect effects* jobs and 352 more from *induced effects*. The bottom row of **Figure 2** shows combined employment figures across sectors.

Because IMPLAN's methodology differs from that of the county's annual agriculture survey, the total 2017 direct production value in **Figure 2** (\$3.70 billion), differs slightly from the \$3.65 billion reported in the 2017 Stanislaus County Agricultural Report.

Production KEY POINTS

\$5.671
BILLION

in total
economic output
from
Farm Production

26,551
DIRECT JOBS

plus an additional
4,080 jobs from
multiplier effects,
for a total of
30,631

\$3.704
BILLION

in direct
output from
Farm Production

\$1.967
BILLION

in multiplier
effects from
Farm Production

Locally Sourced, Value-Added Food Processing

Farm production tells only part of the story. Stanislaus County is home to several food processors that play a key role in the local economy. This section estimates the economic value of local food processing. It is neither an exact science nor a full assessment, but rather gives the reader a basic overview of the topic.

To avoid overstating the numbers, we only include food manufacturers and sectors that fit two strict criteria: 1) they use mostly local agricultural inputs; and 2) they are unlikely to exist here without the presence of the associated agricultural sector. Many processing facilities would not operate in Stanislaus County were it not for the abundant supply of fruits, nuts, livestock, and other raw agricultural products.

Figure 3 shows the economic effects of locally sourced, value-added food processing. Like the previous section, sector names generally follow IMPLAN and a standard classification system used nationwide called the North American Industrial Classification System (NAICS).

Figure 3. Economic Effects of Locally Sourced, Value-Added Food Processing

Sources: IMPLAN and U.S. Bureau of Economic Analysis data, with input by local industry experts. Not all columns and rows add exactly due to rounding.

FOOD PROCESSING	Output Effects (\$ Millions)			TOTAL
	Direct	Indirect	Induced	
Meat, Poultry & Other Animal Products	\$392.7	\$81.2	\$37.9	\$511.8
Canned Fruits & Vegetables Manufacturing	\$333.6	\$83.0	\$31.3	\$447.8
Nut Processing & Products	\$223.9	\$44.9	\$18.2	\$286.9
Non-Fluid Milk Products	\$95.4	\$27.0	\$6.3	\$128.7
Miscellaneous Other Food Manufacturing	\$53.1	\$12.1	\$4.8	\$70.0
Wineries	\$16.3	\$2.8	\$2.6	\$21.7
Animal Food Manufacturing	\$8.4	\$1.7	\$0.5	\$10.5
TOTAL ECONOMIC OUTPUT	\$1,123.4	\$252.5	\$101.6	\$1,477.5
	Employment Effects (# Jobs)			TOTAL
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT	2,641	776	376	3,793

At \$392.7 million in direct output, “Meat, Poultry, and Other Animal Products” was the largest food processing category. It reflects the estimated portion of the county’s \$254.7 million in chicken production and \$84.1 million in turkeys believed to have been processed locally, especially at a large facility in Turlock. It also reflects smaller scale swine and other livestock facilities. Most livestock leave Stanislaus County for processing.

“Canned Fruits & Vegetables Manufacturing” (\$333.6 million) reflects portions of the county’s abundant fresh produce processed locally. For example, an estimated 75% of the \$20.5 million apricot crop went to processing or to the fresh market, as did 82% of the \$52.2 million peach crop and 84% of the \$47.9 million tomato crop. The wider Central Valley region boasts many nationally known processors that draw product not just from Stanislaus County, but also from Fresno, Madera, Merced, San Joaquin and Tulare. Stanislaus County provides a significant portion of these processors’ raw product, with the exact amount depending on the product type and processor.



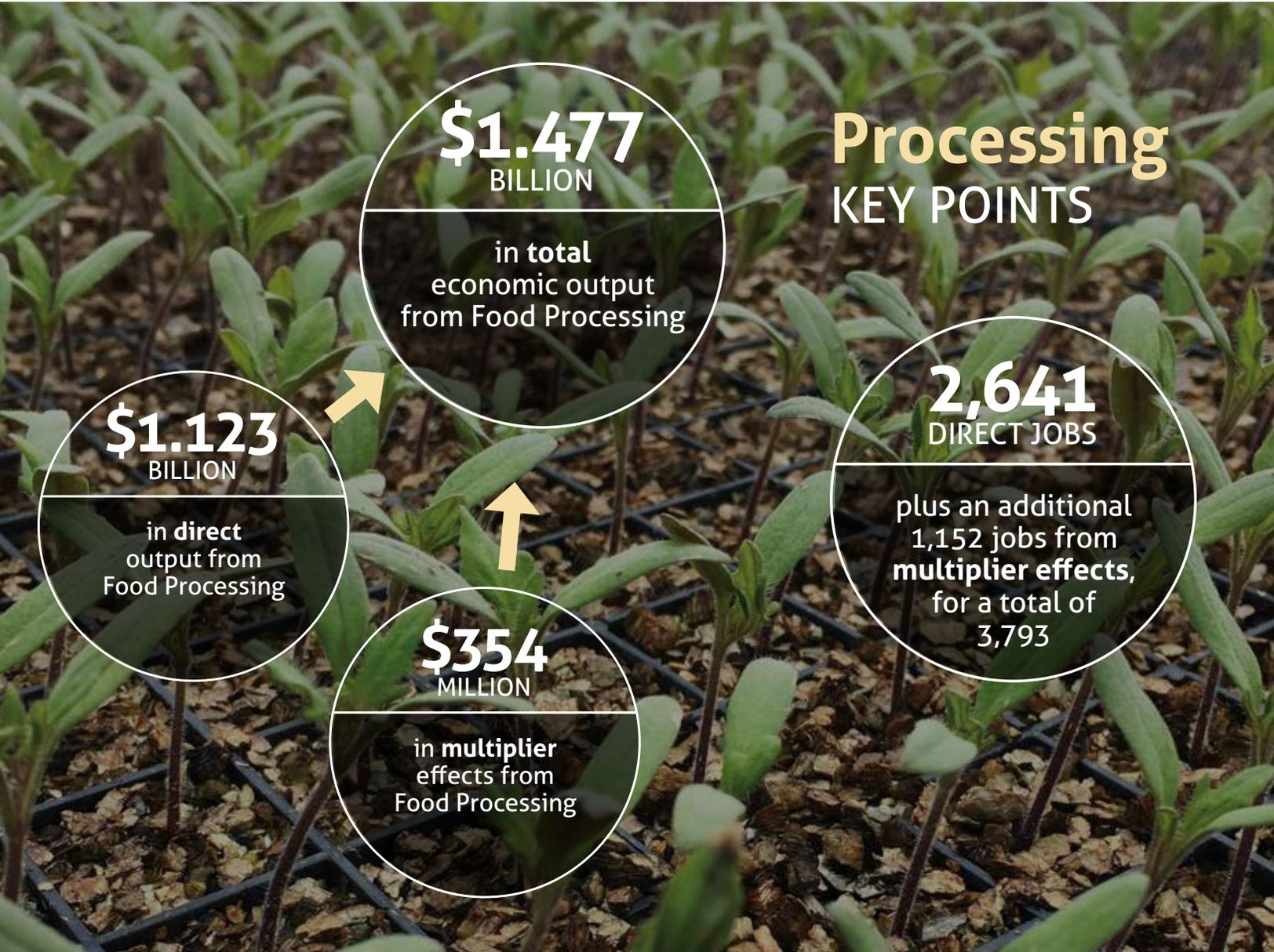
“Nut Processing and Products” in **Figure 3** mostly reflects portions of the county’s \$1.057 billion almond crop and \$163.6 million walnut crop processed at facilities in Hughson, Waterford, Modesto, and other locations within the county.

Several processing facilities produce “Non-Fluid Milk Products,” many of them located near Turlock. Examples include cheese, dry or powdered milk, ice cream, and especially butter. Most milk destined for cheese production goes to a large facility in Hilmar, just five miles outside the county.

Although “Wineries” accounted for over \$1.63 billion in direct economic output for 2017, an estimated 99% of the output did not meet our strict criteria. Presence of the nation’s largest and fourth largest wine companies in Stanislaus County is not coincidental, but their massive economic output does not strictly depend on the county’s \$42.7 million wine grape crop. Of note, many Stanislaus County grapes go elsewhere for crushing and fermentation into wine, then return to facilities within the

county for bottling, marketing and other activities.

At \$8.4 million, “Animal Food Manufacturing” consisted of homegrown forages (hays and silages) used at local dairies. Several large animal food manufacturing companies operate in Keyes, Hughson, Empire, Turlock, and





other Stanislaus County locations. Their combined 2017 output was an impressive \$840.1 million, but many raw ingredients such as corn and soy come by train from other states.

Based on our strict criteria, we excluded IMPLAN food and beverage sectors that other studies often include.² For example, Stanislaus County produced over \$1.5 billion in dog and cat food, mayonnaise, dressing, bread, tortillas, pastries, ice, spices, soft drinks, beer, liquor, tea, coffee, and related products. Their production supported more than 3,000 jobs. Adding these sectors to local agriculture's tally could overstate the value of local agriculture, including its employment and multipliers.

In a specific example, the county's "Other Snack Food Manufacturing" sector produced an impressive \$406.9 million for 2017. Two nationally prominent snack food companies likely contributed most of this total. We did not include them because production of pretzels, potato chips, and other snacks depends mostly on raw ingredients sourced elsewhere.

Likewise, we did not include the \$133.5 million "Breweries" sector. Local breweries could not operate in Stanislaus County were it not for outside ingredients, especially hops grown in the Pacific Northwest or Germany. A similar situation exists with "Bottled and Canned Soft Drinks & Water" (\$291.7 million), "Distilleries" (\$47.0 million), and "Coffee and Tea Manufacturing" (\$35.5 million).

² See, for example: Sexton et al. 2015, *The Economic Impact of Food and Beverage Processing in California and Its Cities and Counties*, and U.C. Davis Agricultural Issues Center (2009), *The Measure of California Agriculture* (Ch. 5).

Total Economic Contributions of Stanislaus County Agriculture



The previous sections have provided key pieces to an economic puzzle. This section combines those puzzle pieces into a final picture showing the overall economic effects of Stanislaus County agriculture.

As **Figure 4** shows, Stanislaus County agriculture’s 2017 economic contributions totaled \$7.148 billion. This consisted of \$4.827 billion in combined, direct output from production and processing, plus \$2.320 billion in multiplier effects.

For perspective, agriculture pumped over *nineteen million dollars per day* into the county economy during 2017 (\$19,583,734 to be exact), or \$815,989 per hour. The \$4.827 billion in direct output represented 11.5% of the county’s total economic output of \$42.06 billion, more than one out of every eight dollars.

Total agricultural employment covered in the scope of this study was 34,425. This included 29,192 jobs directly in agriculture and 5,233 more attributable to multiplier effects. The 29,192 direct agricultural jobs represented 11.4% of Stanislaus County’s total employment. With 255,019 jobs in the county, agriculture was responsible for nearly one out of every eight jobs.

Taking the 2017 IMPLAN data at face value, agriculture easily ranked as the county’s largest industry for direct output. It also ranked as the county’s second largest employer.

When we apply local adjustments and our strict inclusion criteria – for example, not counting production of coffee, tea, and other food & beverage products that do not depend on raw product sourced within the county – the rankings change slightly. In that case, agriculture ranked second for direct output and third for employment.

Figure 4. Overall Economic Effects of Stanislaus County Agriculture

Not all columns and rows add exactly due to rounding.

Type of Effect	Direct	Indirect	Induced	TOTAL
FARM PRODUCTION				
Output Effects (\$ Millions)	\$3,703.9	\$851.1	\$1,115.6	\$5,670.6
Employment Effects (# Jobs)	26,551	2,276	1,805	30,631
LOCALLY SOURCED, VALUE-ADDED FOOD PROCESSING				
Output Effects (\$ Millions)	\$1,123.4	\$252.5	\$101.6	\$1,477.5
Employment Effects (# Jobs)	2,641	776	376	3,793
TOTAL VALUE OF AGRICULTURAL INDUSTRY				
Output Effects (\$ Millions)	\$4,827.3	\$1,103.5	\$1,217.2	\$7,148.1
Employment Effects (# Jobs)	29,192	3,052	2,181	34,425

How Resilient is Agriculture to Economic Shocks?

Like growers and ranchers everywhere, Stanislaus County agricultural producers face a long and growing list of risks. Prominent examples include: droughts, floods, disease outbreaks, new regulations, new competitors, labor availability and cost, price drops, and rising costs for fuel, equipment, and other inputs. Any one of these risks can deal a damaging blow. When combined, they can undermine not just an individual operation, but an entire industry.

What's the best way to lower these risks? Opinions vary, but most emphasize *product diversification*. From the old adage, "don't keep all your eggs in one basket" to the advice modern financial planners give, diversity tends to create stability.

A growing body of research supports this conventional wisdom. The more diversified a local economy is, the better it protects economic growth and employment during economic shocks. It's a complex topic, though, with many factors in play and much research yet to be done.

This raises the question: How economically diversified is Stanislaus County agriculture? Does the county have low agricultural diversity, likely increasing its risk to economic shocks? Or is agriculture highly diversified, implying a stronger economic buffer?

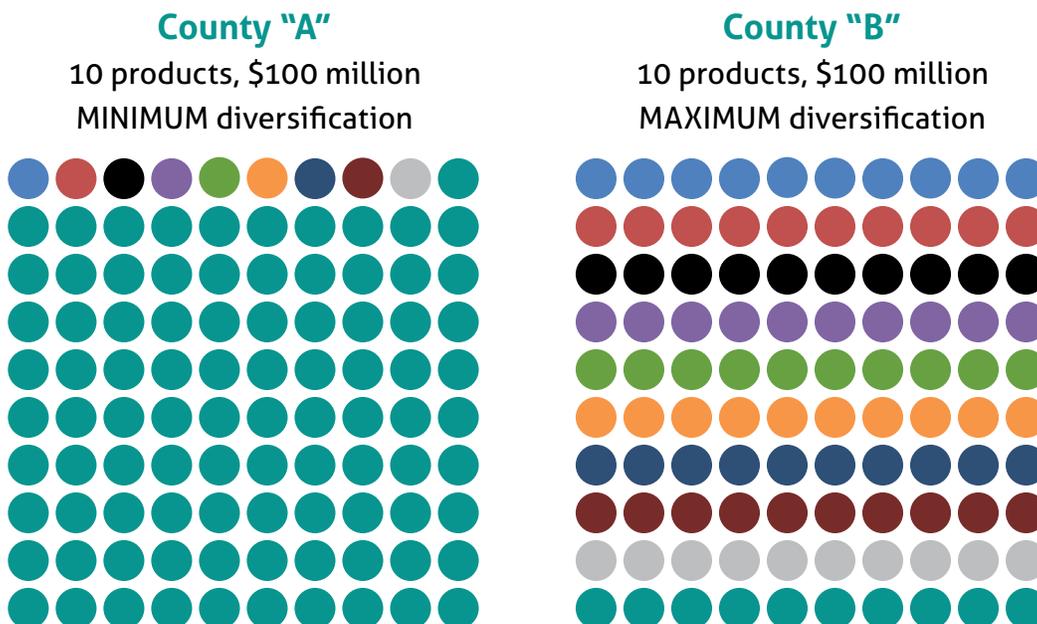
To answer this question, we calculated the Shannon-Weaver Index for Stanislaus County agriculture. Created in 1949 for military codebreaking, the Shannon-Weaver index is widely used by economists, ecologists, and others interested in quantifying diversity. Different versions of the basic Shannon-Weaver formula exist. What they all have in common, though, is that they quantify not just the number of different items – such as characters in a coded message, species in a rainforest, or crops grown in a county – but also their relative *evenness* or *abundance*.

Figure 5 portrays this relationship. County "A" and County "B" both grow the same number of crops and have the same total value of that production. But County "A" has a low index, near zero, because 91% of production concentrates in a single crop. Any shock to that crop could devastate the agricultural economy.

County "B" depicts the opposite. Production perfectly balances across all crop categories. Each crop type contributes 10% of the total. This gives County "B" a strong buffer against economic shocks.

Figure 5. Agricultural Diversification is More Than Just the Number of Products

The two fictitious counties have identical agricultural products and total revenues, but diversification gives County "B" a stronger buffer against economic shocks



SHANNON-WEAVER INDEX



How exactly does one calculate the Shannon-Weaver Index for agriculture? The main steps are: 1) create a list of agricultural products and their production values; 2) remove minor, outlier products, with production values less than 0.25% of the county total, such as pumpkins, squash, rice, wheat and citrus; 3) enter the data into the Shannon-Weaver formula; and 4) convert to a 1.0 scale. For additional details, please contact the authors.

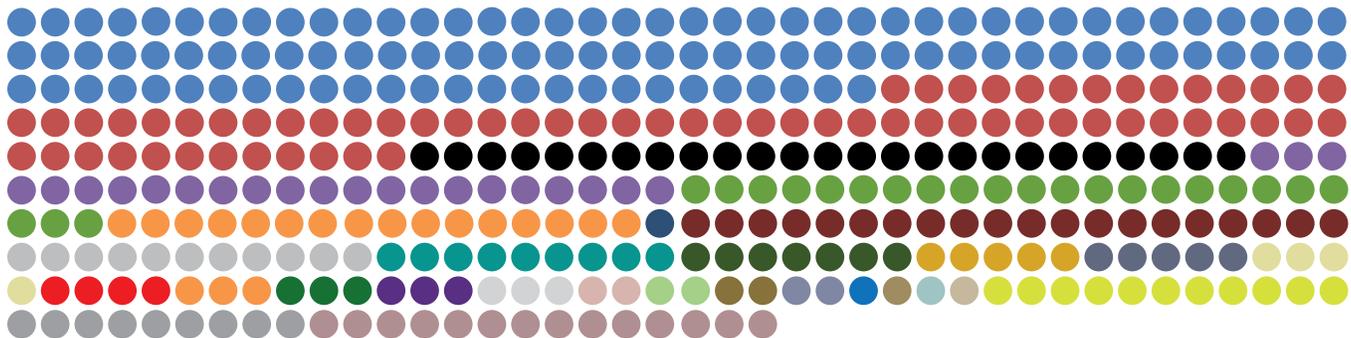
For 2017, the Shannon-Weaver Index for Stanislaus County’s agricultural industry was **0.57**.

What exactly does this number mean? For starters, getting the highest index, a perfect 1.00 on a scale from 0.00 to 1.00, would require the impossible: produce all seventy-two of California’s major commodities and have farm gate values equally distributed across them. In such a case, the hypothetical county in **Figure 5** would show seventy-two rows instead of ten, each row a different color and identical length. No single county could accomplish this.

Over the past decade, Stanislaus County has consistently produced twenty-eight major commodities. The relative contribution of individual commodities has varied from 0.25% of the county’s total farm gate value (the minimum threshold for this analysis) to 35.0% of the county total. **Figure 6** depicts their relative contributions.

Figure 6. Relative Distribution of Stanislaus County Agricultural Commodities

Colored circles represent approximately \$10 million each and depict major agricultural commodities’ relative contributions to Stanislaus County’s total 2017 farm gate value (Source: 2017 Stanislaus County Agricultural Report).



At first glance, Stanislaus County’s resulting index of 0.57 seems near the middle of 0.00 to 1.00 range. But the Shannon-Weaver formula includes a logarithmic function, which complicates interpretation. The logarithm makes the scale exponential, like the Richter Scale that measures earthquakes. Many Californians understand that a 7.4 earthquake releases twice the energy of a 7.2 earthquake even though the numbers are not far apart. The same principle applies here.

The 0.57 index is quite high compared to other California counties analyzed thus far. It likely suggests solid protection from economic shocks. Validating that protection would require stress testing, i.e. modeling specific shocks to see how they affect the industry. For now, suffice it to say that Stanislaus County agricultural production is both diverse and well distributed across types.

How has the Shannon-Weaver Index changed over recent years? Has agriculture become more diversified, or less so? **Figure 7** shows the Shannon-Weaver Index over time. The main thing to note is consistency across years. Agriculture’s economic resiliency has held steady for the past decade and has even risen a bit. This contrasts with the downward trend in many California counties that have become dependent on one or two major products.

Again, the logarithmic scale means that what might look like small shift in **Figure 7** is actually a big one. Going from 0.53 to 0.57, for example, represents exponential change.

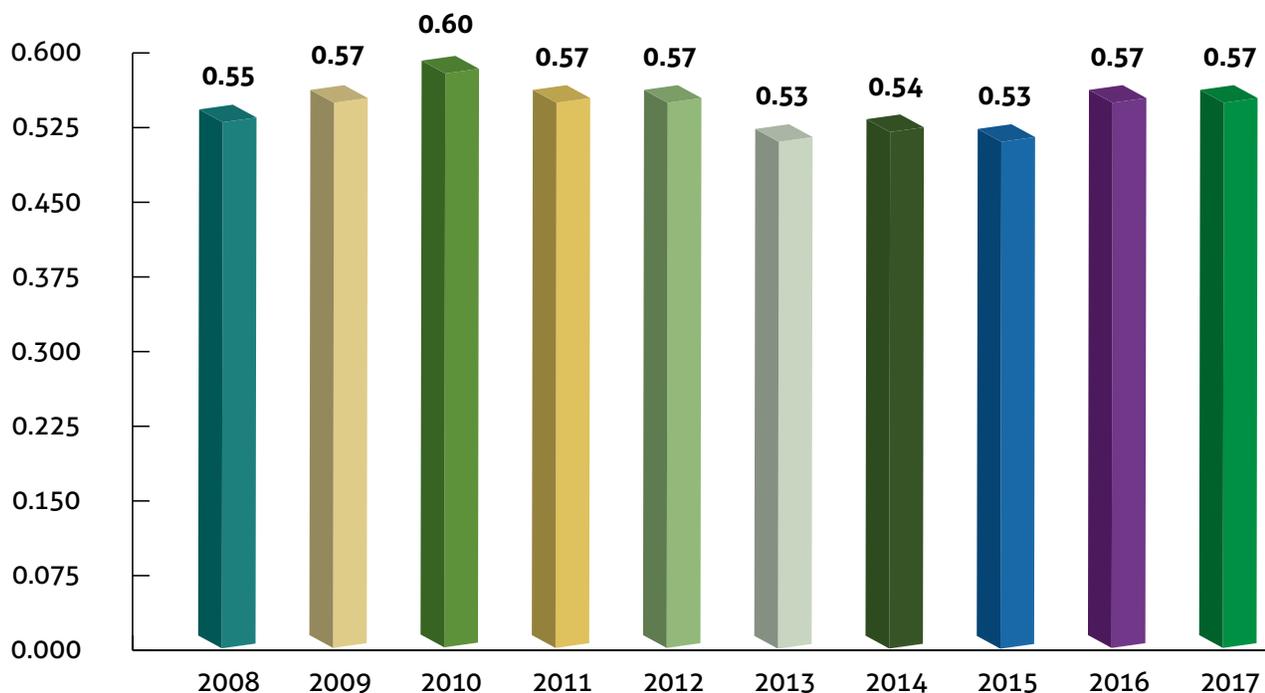
Changes over time underscore the importance of a strong, diversified production base. For example, in 2010 the county saw a 15% drop in almond production value, its second largest crop category by value. Such a sudden, significant drop might have damaged a less diversified agricultural economy. But instead of crisis, Stanislaus County agriculture set a record for total production value, as other commodities such as milk, cattle, chickens, cherries, beans, silage, and tomatoes all saw big increases in value, compensating for the decrease in almonds. As a result, Stanislaus County also hit a new high mark for its Shannon-Weaver Index: 0.60 (**Figure 7**).

2013 tells an opposite story. Almond production value jumped 50.8% in a single year, from \$786.9 million in 2012 to \$1.186 billion for 2013. Reflecting this, the economic diversification index dipped to a new low: 0.53. As **Figure 7** shows, the index stayed low for two more years. In 2016, almonds dropped back below 30% of the county’s combined overall production value. The index rose again.



Figure 7. Ten-Year Trend in Stanislaus County Agriculture’s Economic Diversification

The Shannon-Weaver Index quantifies diversification by combining the number of different agricultural commodities produced and their relative economic value.



Toward the Future

This report has documented the role that Stanislaus County agriculture plays as a local economic driver. Including local food processing and multiplier effects, agriculture contributed \$7.148 billion to the county economy. Agriculture also played an important role in county employment, directly or indirectly supporting 34,425 jobs. Finally, agriculture's diversified production has provided critical economic stability not just to the agricultural industry, but to the larger county economy. The economic value of this stability is certainly high, albeit hard to quantify.

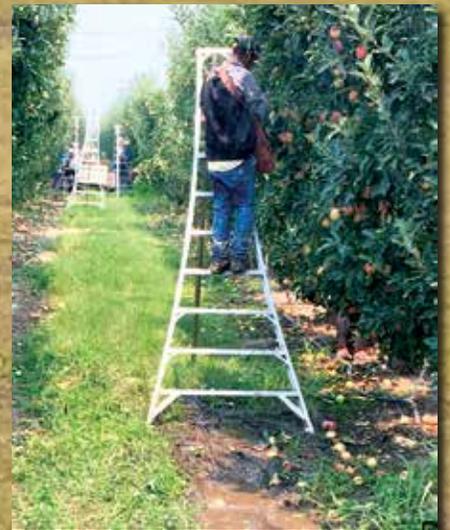
Agriculture is an important pillar of the Stanislaus County economy and represents a vital link to both the county's cultural past and competitive future. Although this report has presented many facts and figures, it has barely begun to fill key information gaps about agriculture's role. Several additional questions that lie beyond the scope of this report may warrant future research (see below). In the meantime, the findings herein provide the clearest picture yet of Stanislaus County agriculture's powerful economic role.

Additional Questions

- **ADDING VALUE LOCALLY.** As this report has shown, processing of Stanislaus County's raw agricultural products occurs mostly outside the county. What new policies, programs, and other initiatives could expand locally sourced, value-added food processing within Stanislaus County?
- **PROCESSING OF IMPORTED RAW PRODUCT.** As noted earlier, many local canneries, wineries, and other processors handle raw agricultural product brought from other Central Valley counties and beyond. What economic output and employment effects does this create for Stanislaus County? Initial analysis suggests more than seven thousand jobs and over seven billion dollars in direct economic output.
- **WATER.** Stanislaus County's abundant food production begins with water. What risks does this water supply face? What measures, if implemented, could best safeguard this vital resource well into the future?
- **ECOSYSTEM SERVICES.** What is the annual dollar value of wildlife habitat, scenic beauty, carbon sequestration, and more than twenty other ecosystem services that Stanislaus County's agricultural lands provide to society?
- **DIVERSIFICATION.** How is economic diversification trending not just in terms of production across commodities, but also in terms of farm sizes, geographical markets, and organic/conventional?
- **ECONOMIC SHOCKS.** How would potential shocks affect agriculture's economic results, for example significant new regulations, pests, labor policies, water issues, or changes in the price of key inputs?
- **CANNABIS AND HEMP.** Commercial cannabis and industrial hemp production continue to gain momentum in California. What economic opportunities and risks do they pose for Stanislaus County agriculture?

Acknowledgments

This report was produced by Dr. Jeff Langholz (jeff@ag-impact.com) and Dr. Fernando DePaolis (fernando@ag-impact.com) under contract to the Stanislaus County Office of the Agricultural Commissioner and Sealer of Weights and Measures. Milton O'Haire supervised the project on behalf of the county. We would like to thank Agricultural Commissioner staff Susan Azevedo, Richard Homer, Steve Logan, Amy Lomeli, Cari Miller, and other agency staff who provided key input. We also thank Stanislaus County Workforce Development, Opportunity Stanislaus, and Dr. Dan Sumner and William Mathews from the University of California Davis Agricultural Issues Center, as well as many growers, processors, and other local industry experts who graciously contributed information about their operations.





Stanislaus County Department of Agriculture
www.stanag.org
(June 2019)

Agricultural Impact Associates 