Economic Contributions of

SUTTER COUNTY AGRICULTURE

Crop Report Plus Series

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Agricultural Impact Associates

"Quantifying the value of California agriculture"

OFFICE OF THE
AGRICULTURAL COMMISSIONER
SEALER OF WEIGHTS & MEASURES

LISA D. HERBERT
Agricultural Commissioner
Sealer of Weights and Measures

May 2019

The Honorable Board of Supervisors of Sutter County
Mat Conant, District 5, Chairman
Ron Sullenger, District 1
Dan Flores, District 2
Mike Ziegenmeyer, District 3
Jim Whiteaker, District 4

I am pleased to share Economic Contributions of Sutter County Agriculture. This report takes an important step beyond the Crop & Livestock Report that we publish every year. Instead of stopping at crop production values and acreage, it quantifies agriculture's total economic contribution through food production, local food processing, employment, and economic "multiplier effects." In short, the report documents agriculture's broader role in sustaining a thriving local economy.

Section 2279 of the California Food and Agriculture Code requires all county agricultural commissioners to report the annual "value" of agriculture. This typically occurs via our yearly Crop & Livestock Report. Using twenty-first century economic tools, we can now fulfill this mandate better than ever. We can also explore additional topics that clarify agriculture's role in sustaining a healthy local economy.

For 2017, agriculture contributed a total of $1.48 billion to the county economy. This consisted of $835.6 million in combined, direct output from food production and processing, plus $645.1 million in multiplier effects. This far exceeds the $584.0 million figure from our 2017 Crop & Livestock Report. Agriculture also supported 5,849 direct employees, or about one out of every seven jobs in the county. Adding multiplier effects brought total employment to 6,869.

Agriculture has a long tradition in Sutter 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,

Lisa D. Herbert
Agricultural Commissioner
Sealer of Weights and Measures

Economic Contributions of Sutter County Agriculture

Overview: 2017 Sutter County Agriculture

. . . contributed a total of $1.48 billion to the local economy, including:
- $835.6 million in direct economic output, representing 13.9% of the county's total economic output.
- $645.1 million in additional economic output in the form of expenditures by agriculture companies and their employees.
- This equates to just over $169,000 per hour and roughly $4.1 million per day.

. . . provided 6,869 jobs, including:
- 5,849 direct employees, or about one out of every seven jobs in the county.
- over 1,000 additional jobs attributable to expenditures by agriculture companies and their employees.

. . . had a medium level of resilience to economic shocks, as measured by its Shannon-Weaver Index of 0.56. This resilience has been stable over the past decade and even increased slightly since 2014.

Introduction

Residents and visitors alike know and value the contributions agriculture makes to Sutter County. Well-tended fields stretch for miles. Rice, walnuts, almonds, and dozens of other crops grow in deep, fertile soils and help feed the world, through exports to over 80 countries per year. Tomatoes and melons dot the landscape while cattle and sheep thrive in local pastures.

Clearly, agriculture plays a vital role in sustaining a healthy local economy. What's not so clear, 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 Sutter 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 Sutter County economy. The report also examines agricultural diversification and its role in supporting economic resilience, including a first-ever quantitative measure. On the whole, the findings offer important information for policy makers, the public, and anyone who values a thriving local economy.

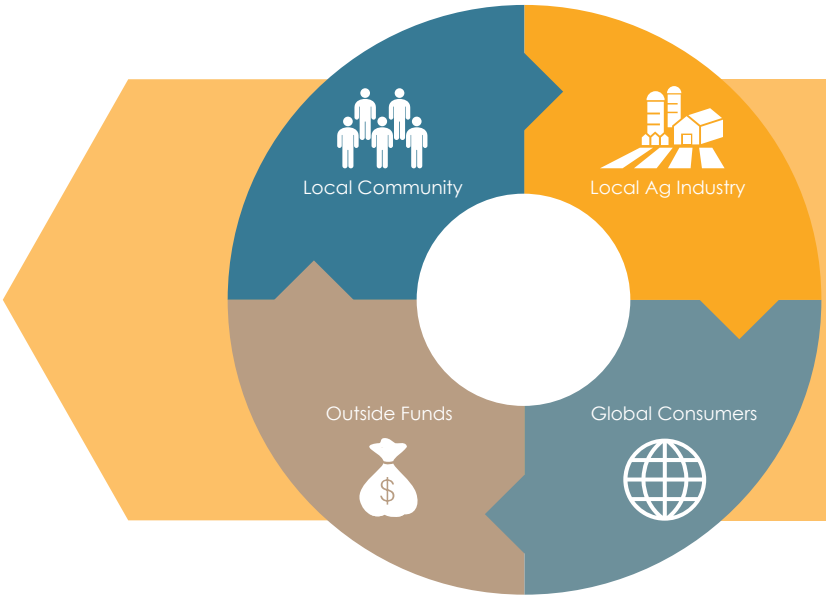
Our Approach

When it comes to economic analysis, it's important to examine the fullest possible range of economic contributions. This report does that by focusing not just on direct economic effect such as farm production and employment, but also on multiplier effects. Multiplier effects are ripples through the economy. These ripples include inter-industry "business to business" supplier purchases as well as "consumption spending" by employees. The **Multiplier Effects** section on page 6 explains this further.

It's appropriate to calculate multiplier effects when analyzing what economists call a basic industry. 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 Sutter County. Therefore, this report includes multiplier effects when describing agriculture's total economic contribution.

Our analysis only examines agriculture's economic contributions. To understand agriculture's full economic impact, one would also need to assess agricultural-related costs to society, for example 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 Crop & Livestock Report produced by the county Agricultural Department. The main national data source is IMPLAN®, a widely used economic modeling program (see www.implan.com). 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. Except where otherwise noted, all figures are from the year 2017, the most recent IMPLAN® dataset available. Please contact the authors for additional details on the methods used.



BASIC INDUSTRY

A basic industry is one that sells most of its products beyond the local area and thus brings outside money into local communities.

"Direct Effects" of Sutter County Farm Production

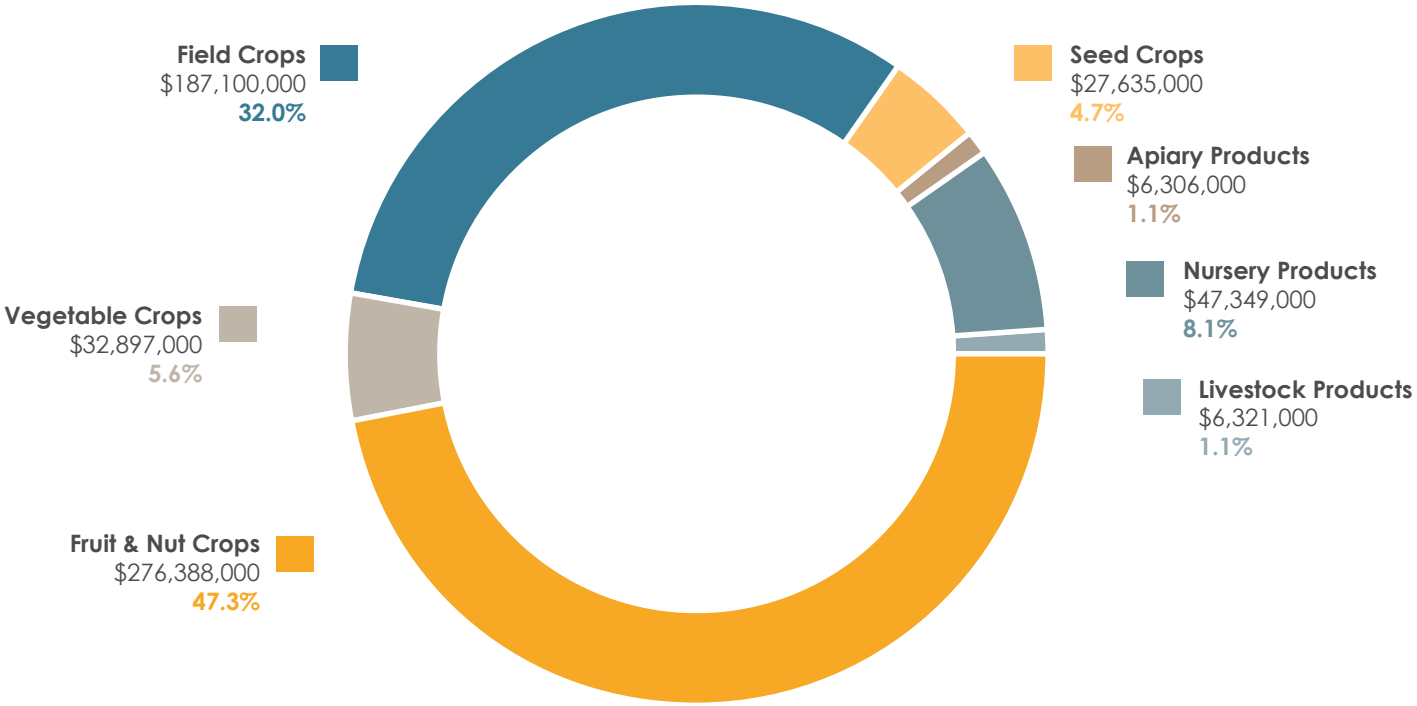
This section focuses on the simplest measures of economic activity: production and employment. It describes total farm production and the number of agriculture jobs.

Figure 1 shows the various categories that made up Sutter County farm production value. Fruit & Nut Crops was the single largest production category by dollar value ($276.4 million), comprising 47.3% of the county total. English Walnuts dominated this category ($130.4 million), followed by Dried Prunes ($52.4 million), Clingstone Peaches ($43.7 million), and Almond Meats ($36.3 million).

At 32.0%, Field Crops represented the second largest category ($187.1 million) and consisted mostly of Rice ($147.6 million). Together, the two super categories of Fruit & Nut Crops and Field Crops accounted for 79.3% of the county's direct farm production values.

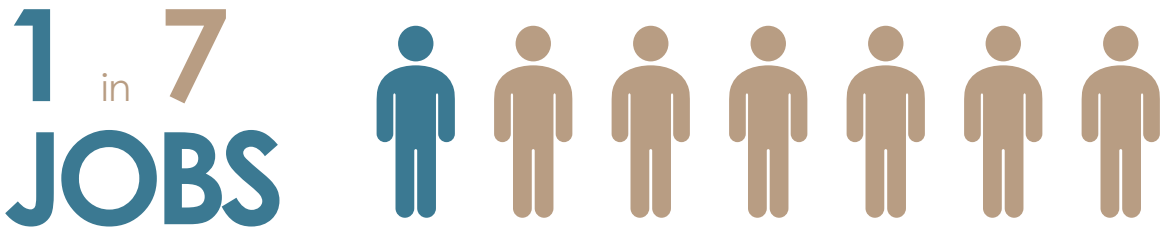
The combined, total dollar value for all products rose 17.2% over the previous decade, from $498.2 million in 2008 to $584.0 million in 2017. Inflation totaled 19.5% during this period, averaging just under 2% per year. Thus, agricultural production lost slight ground after adjusting for inflation (-2.3%). 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 annual Crop & Livestock Report for additional details on specific products and their value.

Figure 1. Distribution of Sutter County Farm Production
Source: 2017 Sutter County Crop & Livestock Report



Employment

How many people work in agricultural production? For 2017, agricultural production directly employed 4,466 people in Sutter County. The figure encompasses a wide range of production-related jobs, including not just growing and harvesting, but also sales, marketing and many other roles. It does not include 25 jobs in Sutter County's $4.7 million forest products industry. Nor does not include food processing jobs, which we discuss below.



Refer to "Total Economic Contribution of Sutter County Agriculture" on page 10

"Multiplier Effects" of Sutter 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 consist of "business to business" supplier purchases. For example, when a grower buys farm equipment, fertilizer, seed, insurance, banking services, and other inputs, the grower creates indirect effects.

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

Although agricultural companies and their employees certainly spend money in Yuba County, Sacramento County, and other nearby counties, this study only reflects those expenditures that occur within Sutter County. Quantifying expenditures outside Sutter County would be an expensive, complex effort that lies well beyond our scope here.

Figure 2 (next page) shows agriculture's direct, indirect, and induced economic effects within the county, for major production categories. The numbers use IMPLAN® multipliers for each sector, which are rooted in U.S. Bureau of Economic Analysis data and other sources.

Figure 2. Economic Effect of Sutter County Farm Production

FARM PRODUCTION SECTOR	DIRECT	INDIRECT	INDUCED	TOTAL
	Output Effect ($ Millions)			
Tree nut farming	$232.4	$64.7	$48.5	$345.5
Grain farming	$138.2	$70.6	$17.5	$226.3
Fruit farming	$148.8	$41.3	$28.2	$218.3
Vegetable and melon farming	$73.0	$19.0	$11.6	$103.6
All other crop farming	$8.9	$2.8	$1.7	$13.4
Livestock and Animal Products	$7.1	$2.6	$0.9	$10.6
Greenhouse, nursery, and floriculture production	$6.8	$1.3	$1.3	$9.4
Oilseed farming	$3.2	$0.8	$0.5	$4.5
Cotton farming	$1.5	$0.5	$0.4	$2.4
TOTAL ECONOMIC OUTPUT:	$619.9	$203.5	$110.5	$934.0
Employment Effect (# Jobs)				
TOTAL EMPLOYMENT:	4,466	663	160	5,289

Dollar values are in $ millions. Figures are for 2017 and come from IMPLAN® and U.S. Bureau of Economic Analysis. Not all columns and rows calculate exactly due to rounding.

For example, "Fruit farming" in Sutter County has an indirect effects multiplier of 0.2776 and an induced effects multiplier of 0.1894. This means that for 2017, each dollar's worth of direct output generated an extra 28 cents in supplier purchases, plus approximately 19 cents extra in consumption spending by agricultural companies and employees. Every sector has its own, unique multipliers reflecting where companies and employees spent their money.

Each sector also has unique multipliers for employment. For example, "Tree nut farming" supported 1,625 direct jobs, plus an additional 132 jobs from indirect effects and 49 jobs from induced effects. The bottom row of **Figure 2** shows combined employment figures across sectors.

Note that category names and production data in **Figure 2** differ from Sutter County's annual Crop & Livestock Report. They follow a standard classification system used nationwide called the North American Industrial Classification System (NAICS). Each NAICS category has an explicit definition. For example, "All other crop farming" includes the county's $3.3 million in alfalfa hay production, among other things. "Cotton farming" is a NAICS category unto itself, but gets lumped with "Miscellaneous" Field Crops in the county's annual report. Also, because IMPLAN® uses a methodology based on input-output modeling, the 2017 direct production value shown here ($619.9 million) differs slightly from the $584.0 million reported in the Crop & Livestock Report.

Locally Sourced, Value-Added Food Processing

Farm production tells only part of the story. Sutter County is home to several food processors that play a key role in the local economy. This section captures 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.

This ruled out food-related sectors that source most raw ingredients from outside the county. Examples include Sutter County's $16.2 million in canned and bottled soft drinks, and $7.5 million in bread and bakery products. The analysis only captures those processing facilities unlikely to exist in Sutter County were it not for the abundant supply of fruits, nuts, grain, and other raw agricultural products.

Figure 3 shows the economic effects of locally sourced, value added food processing. Like the previous section, category names follow a standard classification system used nationwide called the North American Industrial Classification System (NAICS). We selected and validated the categories and numbers in consultation with local experts, and adjusted one of the IMPLAN sector names for clarity.

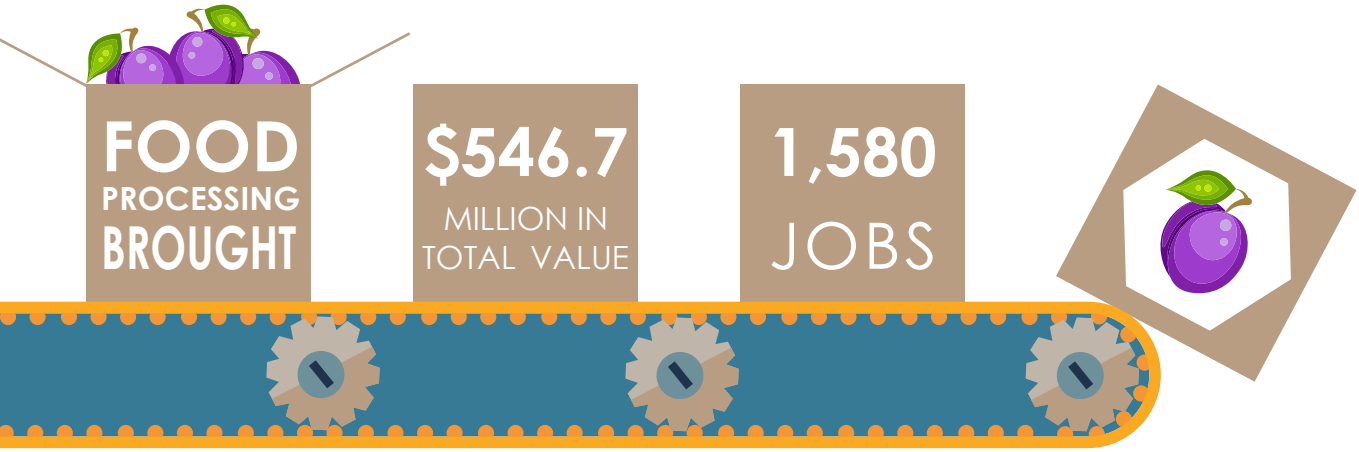
Largest by far, the $168.0 million "Dehydrated food products manufacturing" sector consists of several facilities that dry and package fruits, vegetables, nuts, and grains. Most of these facilities exist in or near Yuba City. Significant portions of the county's $130.4 million walnut crop and $36.3 almond crop go to these facilities. Likewise, much of the county's $52.4 million dried prune crop goes to local facilities for dehydration, sizing, grading, bagging, and shipping.

Figure 3. Economic Effect of Locally Sourced, Value-added Food Processing

FOOD PROCESSING SECTOR	DIRECT	INDIRECT	INDUCED	TOTAL
	Output Effect ($ Millions)			
Dehydrated food products manufacturing	$168.0	$55.8	$223.8	$447.5
Miscellaneous processing and packing	$45.8	$1.2	$47.0	$94.0
Canned fruits & vegetables manufacturing	$2.0	$0.6	$2.6	$5.1
TOTAL ECONOMIC OUTPUT:	$215.7	$57.6	$273.4	$546.7

Employment Effect (# Jobs)				
TOTAL EMPLOYMENT:	1,383	133	65	1,580

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



Refer to Figure 3 on page 8

This category also captures the portion of Sutter County's $151.7 million rice crop that is milled locally. If we were to add rice milling facilities that sit just a few miles outside the county, in Colusa County and Yuba County, then the number would be even higher.

"Miscellaneous processing and packing" is a catch-all category combining multiple niche activities, many of them from the IMPLAN® category called "Support activities for agriculture." Among other things, this includes nut hulling and shelling (e.g., for almonds and walnuts); grain cleaning, drying, and grinding; and fruit and vegetable sorting, grading, cleaning and packing. It also reflects seed processing of various kinds (e.g., safflower, sunflower), including a Yuba City company that produces, stores, and conditions a wide range of vegetable seeds, then sells them in over seventy countries worldwide.

This category also includes other, small-scale processing. For example, a farm south of Yuba City sells retail and wholesale jams, jellies, pies, and other products made with fruit grown on the farm. Another company specializes in locally produced olive oils. Honey is also sold locally, including from a nationally significant beekeeping operation. Finally, a small but growing number of wineries have taken root in Sutter County, selling bottled product in local stores and beyond.

The last category in **Figure 3**, "Canned fruits and vegetables manufacturing" includes fresh, canned, and bottled products made from the county's abundant fruits and vegetables. This includes juices made from prunes and other local produce. It does not include the county's $43.7 million peach crop or $25.1 million in tomatoes, since they leave the county for processing.

Total Economic Contribution of Sutter 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 effect of Sutter County agriculture.

As **Figure 4** shows, the total 2017 economic contribution of Sutter County agriculture was $1.48 billion, or $1,480,674,765 to be exact. This consisted of $835.6 million in combined, direct output from production and processing, plus $645.1 million in multiplier effects.

For perspective, agriculture pumped over four million dollars per day into the county economy during 2017 ($4,056,643), or $169,027 per hour. The $835.6 million in direct output represented 13.9% of the county's total economic output of $6.01 billion, about one out of every seven dollars.

Total employment was 6,869. This included 5,849 jobs directly in agriculture and another 1,021 attributable to multiplier effects. For perspective, the 5,849 direct agriculture jobs represented 13.8% of Sutter County's total employment of 42,515, or about one out of every seven jobs.

Figure 4. Overall Economic Effect of Sutter County Agriculture

TYPE OF EFFECT	DIRECT	INDIRECT	INDUCED	TOTAL
FARM PRODUCTION				
Output Effect ($ Millions)	$619.9	$203.5	$110.5	$934.0
Employment Effect (# Jobs)	4,466	663	160	5,289
LOCALLY SOURCED, VALUE-ADDED FOOD PROCESSING				
Output Effect ($ Millions)	$215.7	$57.6	$273.4	$546.7
Employment Effect (# Jobs)	1,383	133	65	1,580
TOTAL VALUE OF AGRICULTURE				
Output Effect ($ Millions)	$835.6	$261.1	$383.9	$1,480.7
Employment Effect (# Jobs)	5,849	796	225	6,869

Not all columns and rows calculate exactly due to rounding

How Resilient is Agriculture to Economic Shocks?

Like growers and ranchers everywhere, Sutter 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. Diversification is especially important in today's uncertain times, as the pace and scale of change continue to grow.

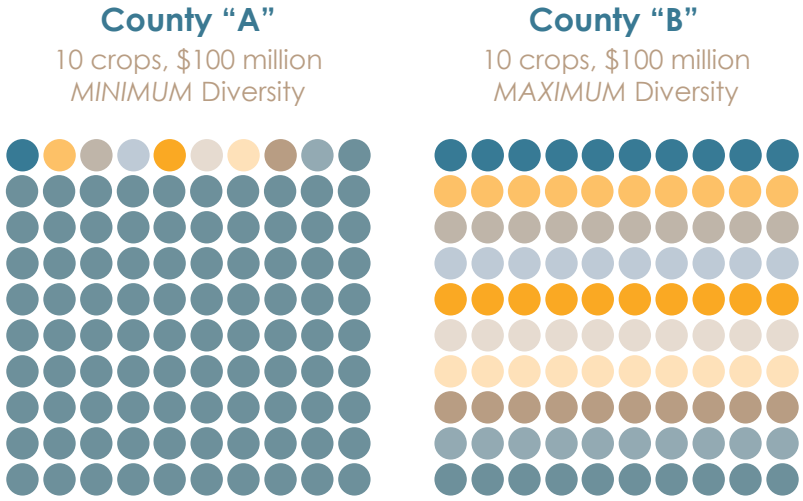
This raises the question: How economically diversified is Sutter County agriculture? Does the county have low agricultural diversity, making it vulnerable to catastrophic shocks? Or is agriculture highly diversified, promoting economic resilience?

To answer this question, we calculated the Shannon-Weaver Index for Sutter 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" is the opposite. Production perfectly balances across all crop categories. Each crop type contributes 10% of the total. This gives County "B" the highest possible resilience 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" greater resilience to economic shocks

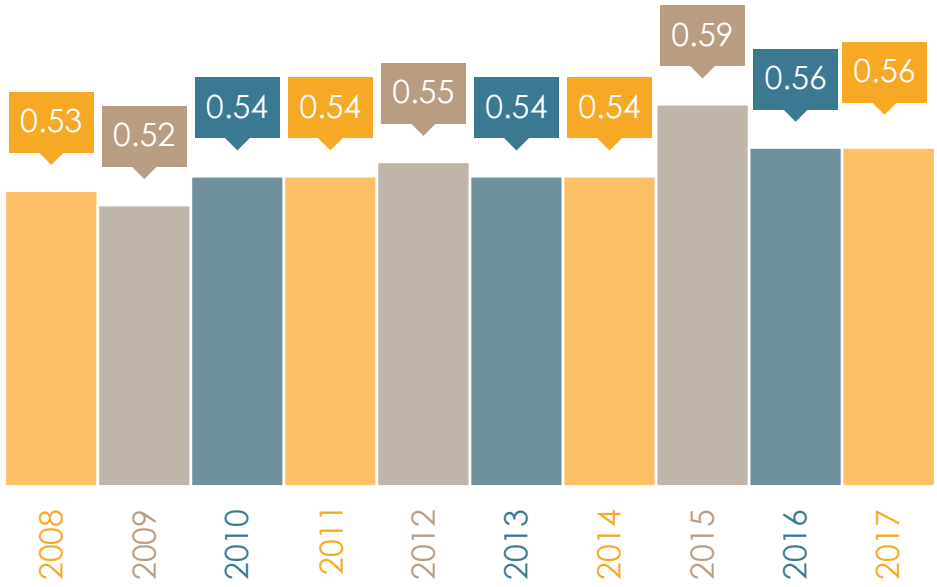
How exactly does one calculate the Shannon-Weaver Index for agriculture? The main steps are: 1) create a list of agricultural products and their production values; 2) remove minor, outlier products that have production values less than 0.25% of the county total, such as wheat, sheep, and persimmons; 3) enter the data into the Shannon-Weaver formula; and 4) convert to a 1.0 scale. Readers who want more details may wish to consult an article on the topic available at www.ag-impact.com.

For 2017, the Shannon-Weaver Index for Sutter County's agricultural industry was **0.56**. This gives agriculture **medium** protection from economic shocks.

How has the Shannon-Weaver Index changed over recent years? Is agriculture becoming more or less diversified? **Figure 6** shows the Shannon-Weaver Diversity 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 we see in counties that have become increasingly dependent on one or two major crops.

The 2015 index in **Figure 6** underscores the importance of a strong, diverse production base. In that year, the county saw a 60% drop in walnuts, its second largest crop category by value. Walnuts plummeted from $191.6 million in 2014 (27% of the county's total production value) to just $77.5 million in 2015 (14% of the county total). Such a sudden, significant drop might have crippled a less diverse agricultural economy. But instead of being plunged into crisis, Sutter County agriculture hit its fifth highest total production value ever, $536.5 million, and set a new high mark for its Shannon-Weaver Index: 0.59.

Figure 6. Ten-year Trend in Sutter County Agriculture's Economic Resiliency



The Shannon-Weaver Diversity Index combines the number of different crops grown and their relative economic value.

$1,480,674,765
TO THE LOCAL ECONOMY

or

$169,027 PER HOUR

Toward the Future

This report has documented the role that Sutter County agriculture plays as a local economic driver. Including local food processing and multiplier effects, agriculture contributed $1,480,674,765 to the county economy. Agriculture also played an important role in county employment, directly or indirectly supporting 6,869 jobs. Finally, agriculture's solid economic diversification continues to provide critical stability to the county economy. The dollar value of this stability is certainly high, albeit hard to quantify.

Agriculture is an important pillar of the Sutter 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. The process of developing this report has raised several additional questions that lie beyond the scope of this report but may warrant future research. In the meantime, the findings herein provide the clearest picture yet of Sutter County agriculture's important economic role.

Additional Questions to Answer

- **Processing**. As this report has shown, processing of Sutter 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 Sutter County?

- **Ecosystem services**. What is the annual dollar value of wildlife habitat, scenic beauty, carbon sequestration, pollination, and more than 20 other "ecosystem services" that Sutter County's agricultural lands provide to society?

- **Diversification**. What can Sutter County policy makers do to maintain or even increase economic resilience within agriculture? Related, how diverse is the county not just in terms of economic production across crop types, but also across farm sizes, geographical markets, and organic / conventional?

- **Economic shocks**. How would potential "shocks" affect agriculture's economic results, for example significant new regulations, labor policies, or changes in the price of key inputs?

Acknowledgments

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