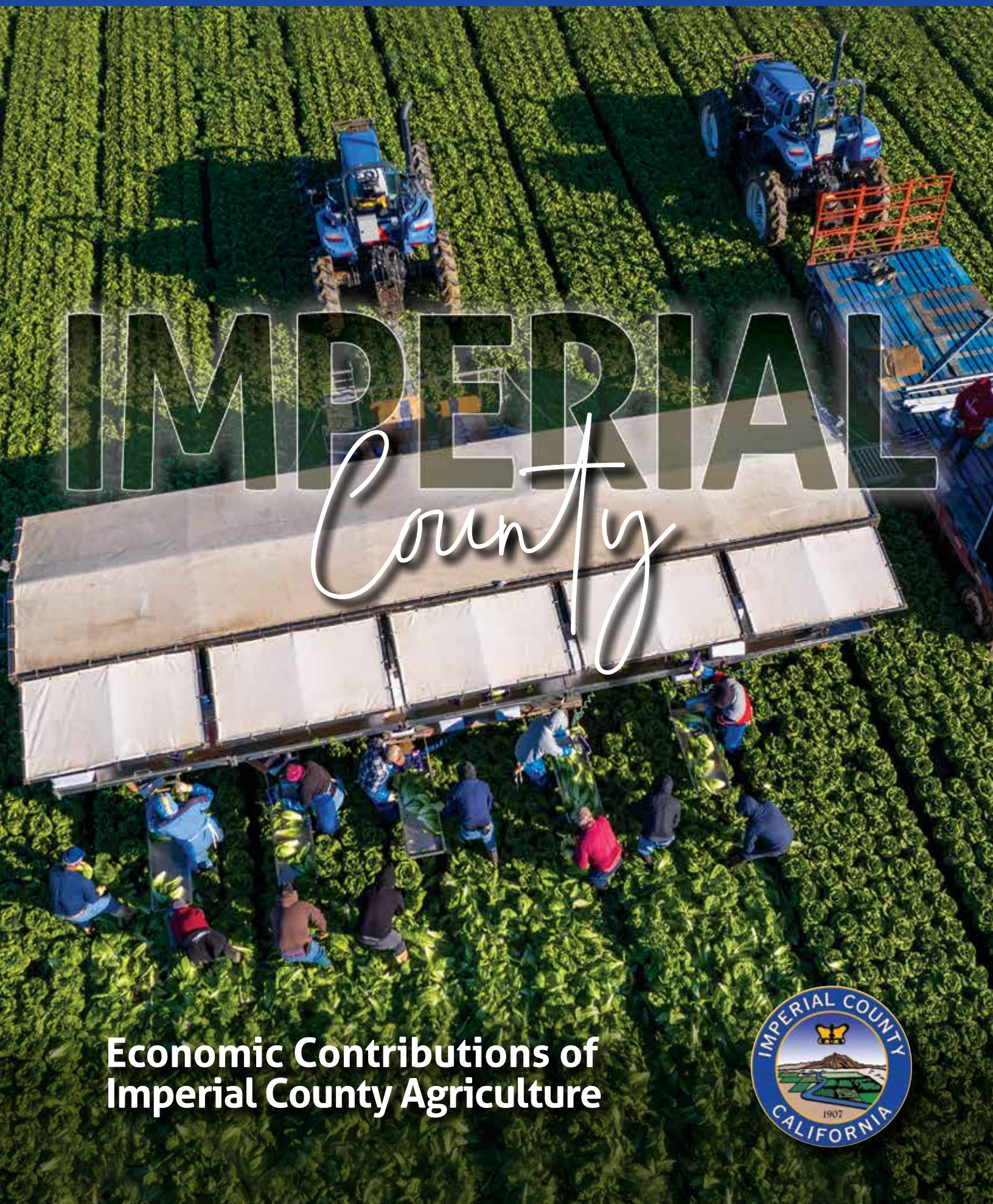


IMPERIAL *County*

Economic Contributions of Imperial County Agriculture

The Honorable Board of Supervisors, County of Imperial

Jesus Eduardo Escobar
District 1

Luis A. Plancarte
District 2 (Chairman)

Michael W. Kelley
District 3

Ryan E. Kelley
District 4

John Hawk
District 5

Miguel Figueroa
County Executive Officer

Imperial County Board of Supervisors
940 W. Main St., Suite 209
El Centro, CA 92243
Phone: 442.265.1030
Fax: 442.265.1027
luisplancarte@co.imperial.ca.us
board.imperialcounty.org

Supervisor's Letter

Agriculture is the backbone of Imperial County's rich history and bright future. Agricultural production, innovations to improve on-farm efficiencies, and supportive businesses contribute billions of dollars into our local economy each year. Farm dollars provide tax revenue used to improve our roads, build parks, and create jobs. Our farmers and ranchers produce fruits, vegetables, forage, and beef for the nation and world's population, consistently ranking Imperial in the top ten agricultural producing counties in California. With an abundance of open space and a reliable water supply, agriculture in Imperial County will remain strong for generations to come.

Sincerely,

Luis A. Plancarte
Chairman, Supervisor District 2

Commissioner's Letter

I am pleased to share this production of **Economic Contributions of Imperial County Agriculture**, which was compiled, in part, using our 2022 Agricultural Crop and Livestock Report. This report takes a significant step beyond the Agricultural Crop and Livestock Report our department publishes each 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.

The new study shows that in 2022, agriculture contributed a total of $5.095 billion to the county economy. In addition, this report documents exceptional economic diversification within agriculture, which has implications for countywide economic resiliency.

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

Sincerely,

Jolene Dessert
Agricultural Commissioner/Sealer of Weights & Measures

Agricultural Commissioner's Mission Statement

To promote and protect our agricultural industry by providing clear direction and appropriate regulatory oversight while protecting our citizens and the environment through the enforcement of pesticide laws, weight and measurement standards, the detection and eradication of pests harmful to our agricultural industry, human health, and other plant resources.

Office of the Agricultural Commissioner and Sealer of Weights & Measures
852 Broadway
El Centro, CA 92243
Phone: 442.265.1500
Fax: 442.265.5708
agcom@co.imperial.ca.us
agcom.imperialcounty.org

Table of Contents

Published June 2024

Summary of Key Findings

Economic Contributions
of the Agricultural Industry for 2022

$5.095 BILLION | Imperial County Agriculture's total contributions to the local economy

$3.681
BILLION in direct economic output

$1.415
BILLION in multiplier effects

$13.96
MILLION per day

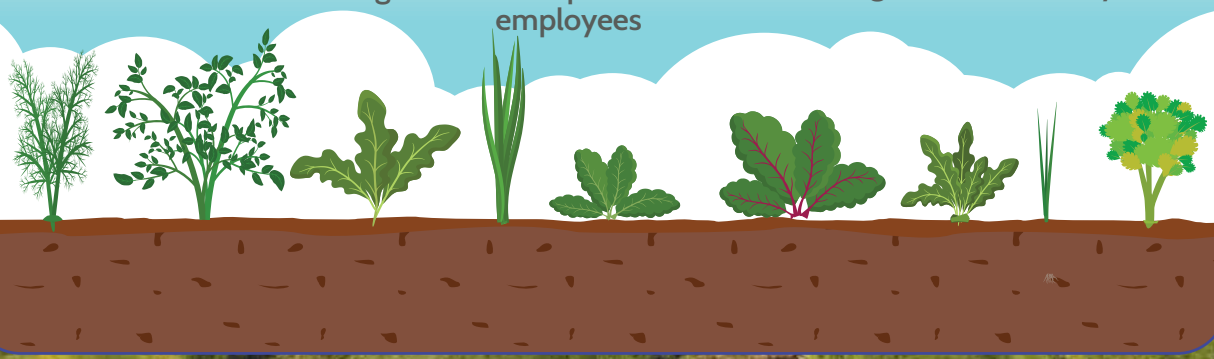
Employment Effects
of the Agricultural Industry

19,812
total jobs

14,537
direct employees

5,275
additional jobs attributable to multiplier effects: expenditures by agricultural companies and their employees

1 in 6
jobs in Imperial County attributable to the agricultural industry



Introduction

In 2017 and 2021, we published research reports that examined crop production values, generated from 2016 and 2019 Agricultural Crop and Livestock Report data respectively, and wider economic contributions such as local food processing, employment, and multiplier effects. Those documents created tremendously positive responses, providing detailed assessments of agriculture's role in sustaining a healthy local economy. This document updates and expands upon those earlier reports.

Like before, we used multiple data sources and advanced economic modeling techniques to analyze agriculture's total contribution to the Imperial County economy. As with the 2017 and 2021 reports, this one also measures economic diversification within agriculture, which has implications for economic resilience. Overall, the findings offer important information for policymakers, the public, and anyone who values a vibrant and resilient local economy.

Our Approach

A *basic industry* 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 Imperial 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. I*ndirect* effects consist of local inter-industry, business-to-business supplier purchases. I*nduced* effects reflect local consumption spending by employees. The **Multiplier Effects** section on page 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 Imperial County Agricultural Crop and Livestock Report produced by the Agricultural Commissioner and Sealer of Weights & 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 (USDA), 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 546 industry sectors. Because IMPLAN draws from multiple sources, including the latest USDA Census of Agriculture, 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 2022, the most recent IMPLAN dataset available. Where appropriate, we adjusted sector names for clarity and applied coefficients to IMPLAN values to reflect unique Imperial County conditions. Please contact the authors for additional details on the methods used.

Direct Effects of Imperial 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 agricultural jobs.

PRODUCTION

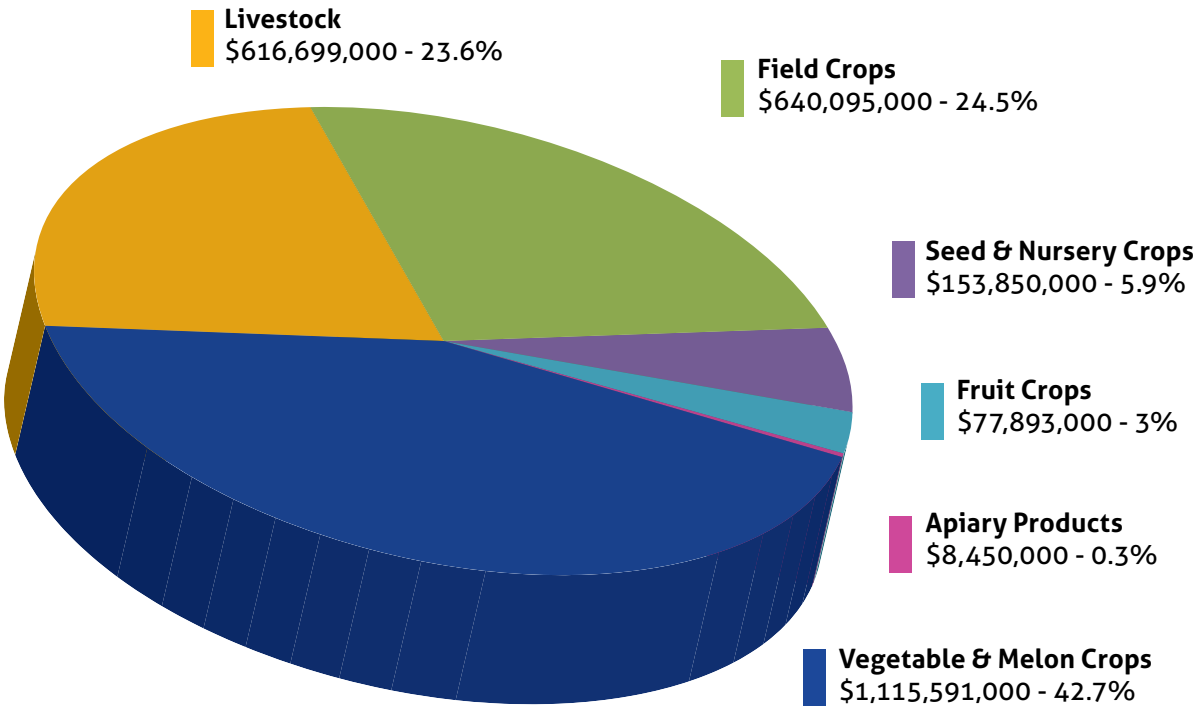
Figure 1 shows the various categories that made up Imperial County farm production value. At $1.116 billion, Vegetable & Melon Crops was the single largest production category by dollar value, comprising 42.7% of the county total. Head lettuce ($216.5 million) and leaf lettuce ($141.1 million) dominated this category, followed by broccoli ($93.0 million), spinach ($90.5 million), and onions ($82.2 million).

At 24.5%, Field Crops represented the second-largest category ($640.1 million), led by alfalfa hay ($269.7 million) and Bermuda grass hay ($101.5 million). Livestock ranked a close third with $616.7 million and 23.6%, consisting mostly of feedlot cattle ($477.4 million). Together, these three categories accounted for 90.8% of the county's direct farm production values.

The combined total dollar value for all products rose $666.8 million (34.3%) over the previous decade, from $1.946 billion in 2012 to $2.613 billion in 2022. 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 Imperial County's 2022 Agricultural Crop and Livestock Report for additional details on specific products and their value.

Figure 1. Distribution of Imperial County Farm Production

Source: 2022 Agricultural Crop and Livestock Report, Office of the Imperial County Agricultural Commissioner/ Sealer of Weights & Measures.



EMPLOYMENT

How many people work in agricultural production? For 2022, IMPLAN data indicate that agricultural production directly employed 9,404 people in Imperial 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 5,133 food processing jobs, which are discussed on page 13. Nor did it include Imperial County's many public sector jobs in agriculture, across a wide range of local, state, and federal agencies.

Multiplier Effects of Imperial 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 local economy.

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

Agriculture's *direct*, *indirect*, and *induced* economic effects within the county for major production sectors appear in **Figure 2**. 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 Imperial County Farm Production

Dollar values are in $ millions. Figures are for 2022 and come from IMPLAN and U.S. Bureau of Economic Analysis, with adjustments for local conditions. Columns and rows may not compute exactly due to rounding.

FARM PRODUCTION SECTOR	Output Effects ($ Millions)			
	Direct	Indirect	Induced	TOTAL
Vegetable & Melon Farming	$1,115.6	$227.1	$184.7	$1,527.4
All Other Crop Farming	$635.2	$106.0	$102.3	$843.5
Beef Cattle Ranching & Farming	$531.1	$139.8	$46.3	$717.3
Support Activities for Agriculture	$139.6	$4.6	$45.4	$189.6
Other Animals & Animal Products	$85.6	$11.1	$10.8	$107.5
Grain & Oilseed Farming	$73.2	$20.2	$13.1	$106.5
Fruit Farming	$77.9	$9.0	$16.3	$103.2
Sugarcane & Sugar Beet Farming	$55.8	$7.0	$10.9	$73.7
Cotton Farming	$7.7	$0.3	$1.4	$9.4
Greenhouse, Nursery & Floriculture Production	$6.2	$0.9	$0.8	$7.9
TOTAL ECONOMIC OUTPUT	$2,727.8	$526.0	$432.0	$3,685.9
	Employment Effects (# of Jobs)			TOTAL
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT	9,404	2,569	1,735	13,707

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), as adapted by IMPLAN. Each NAICS/IMPLAN category has an explicit definition. Agricultural

producers in Imperial County and nationwide use the NAICS categories on Schedule F of their annual federal tax returns ("Profit or Loss from Farming"). Schedule F requires producers to designate the NAICS category that best fits their operation. Producers also use NAICS categories when completing the Census of Agriculture, most recently in spring 2022.

NAICS/IMPLAN also combines familiar products in unfamiliar ways. For example, Imperial County's $65.8 million wheat crop fits into "Grain & Oilseed Farming" in **Figure 2**, whereas hay and other field crops occur under "All Other Crop Farming." Cotton and sugar beets each have a separate category with distinct multipliers. The county's $149.2 million in seed production occurs across multiple sectors, depending on the type of seed.

Each sector has distinct multipliers. Imperial County "Vegetable & Melon Farming," for example, had a 2022 *indirect effects* multiplier of 0.2036 and an *induced effects* multiplier of 0.1656. This means that each dollar's worth of direct output generated an

extra 20 cents in supplier purchases, plus 16 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 to reflect where companies and employees spent their money. The i*nduced effects* multiplier for Sugarcane & Sugar Beet Farming, for example, was 0.2090 in 2016 and 0.1962 for 2022.

Sectors have unique multipliers not just for economic output but also for employment. Imperial County "All Other Crop Farming," for example, supported 2,313 direct jobs plus an additional 158 *indirect effects* jobs and 117 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 agricultural and livestock report, the total 2022 direct production value in **Figure 2** ($2.728 billion) differs slightly from the $2.613 billion reported in the 2022 Imperial County Agricultural Crop and Livestock Report. Also, identical to the 2021 study, a portion of "Support Activities for Agriculture" was allocated to the "Light Processing of Fruits & Vegetables" sector detailed in **Figure 3** and its associated text.

The following list helps bridge NAICS and IMPLAN sectors in Figure 2 with familiar Imperial County commodities listed in the 2022 Agricultural Crop and Livestock Report:

- **Grain & Oilseed Farming:** Barley, Field Corn, Oats, Sorghum, Wheat, plus Oilseeds such as Flax and Safflower;
- **Vegetable & Melon Farming:** Broccoli (Market), Cabbage (Market), Carrots, Cauliflower (Market), Head Lettuce, Leaf Lettuce, Onions, Spinach, Sweet Corn, Romaine Lettuce, Misc. Vegetables, Cantaloupes, Honeydew & Misc. Melons, Vegetable Transplants, and Various Vegetable, Melon & Herb Seeds (e.g., Bean, Broccoli, Coriander, Mustard).
- **Fruit Farming:** Dates, Grapefruit, Lemons, Citrus By-Products, and Misc. Fruit Crops (e.g., Grapes, Mangos, Sweet Limes, Tangelos, Tangerines).
- **Greenhouse, Nursery & Floriculture Production:** Aloe Vera, Coriander Seed, Grass Seed, Mustard Seed, Palms, Sunflower Seed, and Nursery Plants (e.g., Date Palms, Ornamental Perennials, Cut Flowers, Cacti and Succulents).
- **Cotton Farming:** Cotton (Lint), Cotton (Seed);
- **Sugarcane & Sugar Beet Farming:** Sugar Beets, Sugarcane;
- **All Other Crop Farming:** Alfalfa Hay & Seed, Bermuda Grass Hay & Seed, Klein Grass Hay, Onion Seed, Misc. Non-Certified Seed, Misc. Certified Seed, Pastured Crops, Straw (Baled), Sudan Grass Hay, and Misc. Field Crops;
- **Beef Cattle Ranching & Farming:** Beef Cattle (Feedlot), Misc. Livestock (e.g., Calves, Replacement Cattle, Mixed Cattle, Wagyu Cattle)
- **Other Animals & Animal Products:** Aquatic Products, Dairy Animals, Milk, Manure/Compost, Sheep, Wool;
- **Support Activities for Agriculture:** Pollination, Soil Preparation, Planting, Cultivating, Misc. Other Farm Management Services (see text for additional details).

Locally Sourced, Value-Added Food Processing

Farm production tells only part of the story. Imperial 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.

Like the previous studies, we avoid overstating the numbers by only including 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 Imperial County were it not for the abundant supply of fruits, vegetables, meat, and other raw agricultural products.

We also took precautions to avoid double-counting. For example, we did not factor sugar beet production into this section because the farm production section already captured the $53.9 million direct dollar value of sugar beets. We only calculated the value created by converting sugar beets into sugar, pulp, and molasses. The same applies to leafy greens and other vegetables that undergo light processing into value-added products.

Based on these strict criteria, we excluded several IMPLAN food and beverage sectors that other studies often include. Adding these sectors could overstate the value of local agriculture, including its employment and multiplier effects.

For example, we did not include Imperial County's $16.3 million in bread and bakery products because most raw ingredients such as flour and yeast came from outside the county. The county does produce wheat ($65.8 million), but it goes to Texas, Missouri, and Illinois for milling into wheat flour. Other examples include the county's manufacturing of frozen cakes and other pastries ($9.0 million), roasted nuts and peanut butter ($6.0 million), and various other snack foods ($5.7 million).

Nor did we include the county's $7.7 million beer brewing sector. Although brewers sometimes flavor beer with local lemons, melons, honey, and carrots, they still depend on outside grains such as hops grown in the Pacific Northwest or Germany.

Figure 3 shows the economic effects of locally sourced, value-added food processing. Like the previous section, sector names generally follow the NAICS and IMPLAN classification system with adjustments for Imperial County context.

The largest sector, "Meat & Other Animal Products," consists mostly of one facility that handles about 30% of the county's cattle production. Most cattle go to other counties for processing (e.g., Los Angeles, Fresno) or to Arizona. Sheep only spend the winter in Imperial County, then go elsewhere for processing.

Several smaller examples exist. Boutique-scale processing of goats, rabbits, cattle, poultry, swine, and lambs occurs in conjunction with the California Mid-Winter Fair & Fiesta, with show animals sold by auction or barn sales. Imperial County has a few remaining dairies for dairy products and was home to California's last remaining producer of Swiss and Muenster cheeses until it closed in late 2013. The county is a major fish supplier to California and Asia but only sells live fish. Other examples include compost and wool.

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. Columns and rows may not compute exactly due to rounding.

FOOD PROCESSING	Output Effects ($ Millions) Direct	Indirect	Induced	TOTAL
Meat & Other Animal Products	$385.9	$196.0	$27.9	$609.9
Light Processing of Fresh Fruits & Vegetables	$283.4	$9.3	$92.2	$384.9
Miscellaneous Other Food Manufacturing	$142.6	$77.4	$17.6	$237.6
Compressed Hay & Other Animal Feed	$140.9	$29.9	$6.2	$177.0
TOTAL ECONOMIC OUTPUT	$952.8	$312.7	$143.8	$1,409.2
	Employment Effects (# of Jobs) Direct	Indirect	Induced	TOTAL
TOTAL EMPLOYMENT	5,133	694	278	6,105

"Light Processing of Fresh Fruits & Vegetables" in **Figure 3** reflects post-harvest value added to the county's abundant produce. As with our 2021 report, this sector captures portions of IMPLAN's "Support Activities for Agriculture" sector that involve the sorting, grading, cleaning, and packing of fresh produce, including when those activities occur in the field during harvest.

Vegetables go mostly to the fresh market or other counties for processing. For example, 52% of the county's $82.2 million onion crop was processed ($43.0 million), but it occurred outside the county. Similarly, 58% of the county's $69.0 million carrot crop went to processing ($40.3 million), nearly all of it in Kern County. Leafy greens, too, mainly go elsewhere for processing, often into ready-to-eat and ready-to-use products. Estimated percentages of key crops that get processed range from 30% of leaf lettuce, 40% of cabbage, and 50% of romaine and head lettuce, to 99% of spinach, and 100% for arugula, mizuna, and romaine hearts.

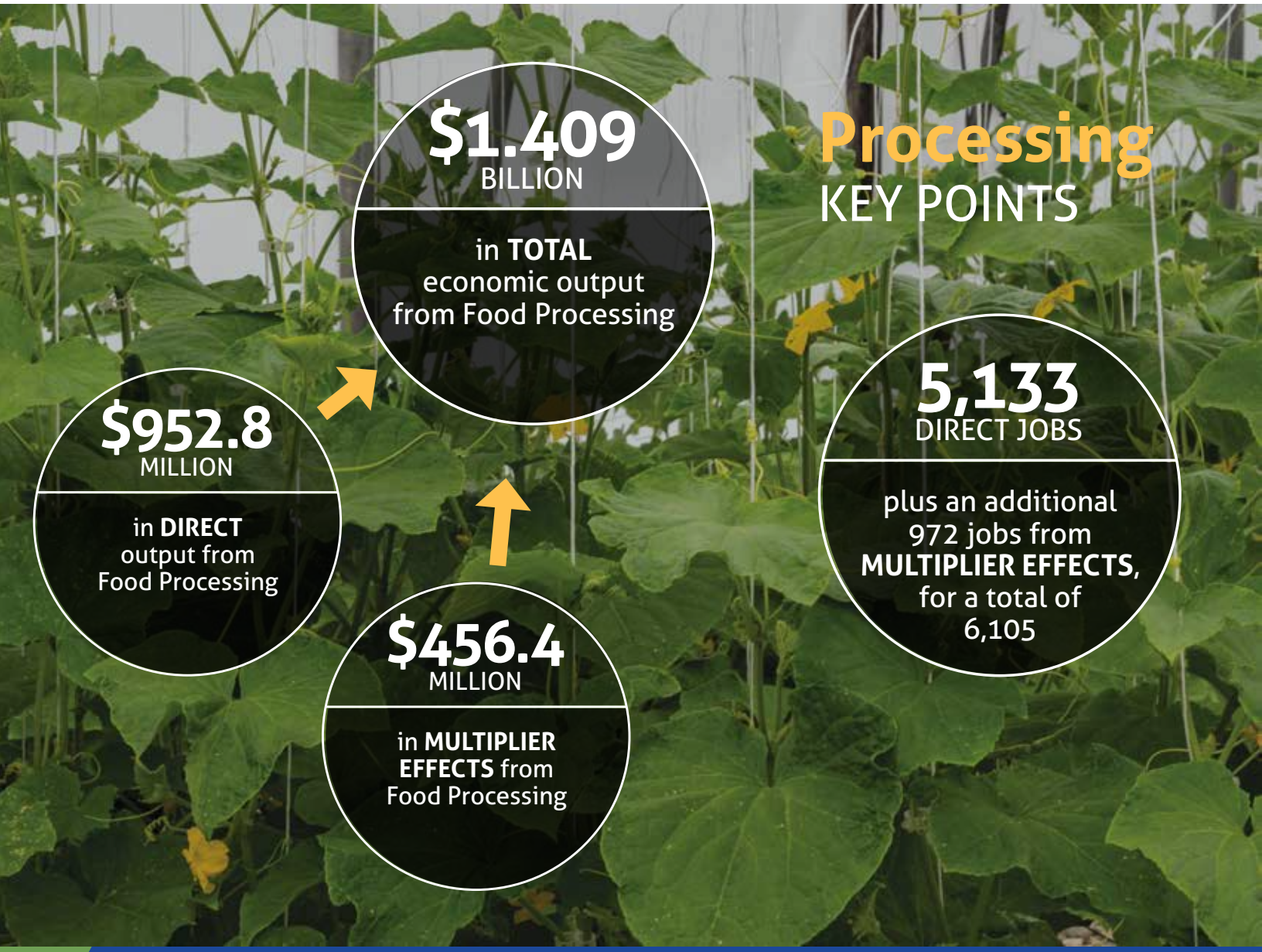
Most citrus goes to the fresh market, including 100% of limes and tangerines. Depending on the quality of the fruit, an estimated 23% of tangelos are processed, along with 28% of grapefruit and 31% of lemons. The estimated amount of this citrus processing that occurs inside Imperial County varies from 60% (grapefruit) to 100% (tangelos).

In addition to large-scale citrus processing, a variety of small-scale fruit processing occurs. For example, a portion of the county's $23.8 million date crop was processed into date nut bread, date butter, and related products. A portion of the olive crop was milled into olive oil at locations in Brawley, Imperial, and elsewhere, then sold online and at physical stores. At least one producer used local figs to make jams.

"Compressed Hay & Other Animal Feed" in **Figure 3** captures the estimated 30% to 40% of the county's $269.7 million alfalfa hay production that growers compress into small, dense cubes, rather than sell for direct consumption in feedlots. Several alfalfa compressing facilities operate within the county. In 2022, these facilities exported most of their product to China, Japan, Saudi Arabia, and eleven other Asian countries.

An estimated 50% of the county's $101.5 million Bermuda grass production also gets compressed, as does 80% to 90% of the $47.8 million klein grass crop and 80% to 95% of the $63.1 million in Sudan grass. These, too, go mostly to Asia.

The catch-all category "Miscellaneous Other Food Manufacturing" reflects various niche products. For example, the county has become the world's largest manufacturer of spirulina and spirulina-based products, with exports to more than 20 countries. Beet sugar manufacturing also occurs here. Of the eleven beet processing facilities built in California since 1870, the only remaining one is in Imperial County. That operation converts the county's $53.9 million sugar beet crop into beet sugar and co-products such as dried beet pulp and beet molasses.



Total Economic Contributions of Imperial 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 Imperial County agriculture.

As **Figure 4** shows, the total 2022 economic contribution of Imperial County agriculture was $5.095 billion. This consisted of $3.681 billion in combined, direct output from production and processing, plus $1.415 billion in multiplier effects.

The $5.095 billion in total 2022 output marked a 16.8% increase from the $4.364 billion figure in our 2021 report, which was based on 2019 data. For perspective, agriculture pumped nearly fourteen million dollars per day into the county economy during 2022 ($13,959,199 to be exact), compared to twelve million per day in 2019. That equated to $581,633 per hour (compared to $498,397 in 2019) and $9,694 per minute (compared to $8,307 in 2019).

Total agricultural employment covered in the scope of this study was 19,812. This included 14,537 jobs directly in agriculture and another 5,275 attributable to multiplier effects. The 14,537 direct agricultural jobs represented a 7.9% rise over the 2019 level of 13,472. It also represented 17.0% of Imperial County's total employment of 85,623, or about one out of every six jobs (5.9 to be exact, identical to our previous report).

Figure 4. Overall Economic Effects of Imperial County Agriculture

Columns and rows may not compute exactly due to rounding.

Type of Effect	Direct	Indirect	Induced	TOTAL
FARM PRODUCTION				
Output Effects ($ Millions)	$2,727.8	$526.0	$432.0	$3,685.9
Employment Effects (# of Jobs)	9,404	2,569	1,735	13,707
LOCALLY SOURCED, VALUE-ADDED FOOD PROCESSING				
Output Effects ($ Millions)	$952.8	$312.7	$143.8	$1,409.2
Employment Effects (# of Jobs)	5,133	694	278	6,105
TOTAL VALUE OF AGRICULTURAL INDUSTRY				
Output Effects ($ Millions)	$3,680.6	$838.7	$575.8	$5,095.1
Employment Effects (# of Jobs)	14,537	3,262	2,013	19,812

Agriculture In The Larger Economy

Agriculture's $3.681 billion in direct output represented 24.4% of the county's total economic output of $15.080 billion, about one out of every 4.1 dollars. This made agriculture the largest economic sector in Imperial County, as shown in **Figure 5**.

Government ranked second ($3.369 billion), as it did in our previous study. Among other things, government included public safety, public education, military, social services, and even agricultural agencies. Of note, Imperial County has an especially large government sector called "Other Local Government Enterprises." This category reflects government entities that sell goods and services to the public much like a private company. The Imperial Irrigation District, for example, reported $859.4 million in 2022 operating revenues from water and electricity sales.

As **Figure 5** shows, Real Estate & Rentals ranked third again, this time at $1.086 billion. Retail Trade, Wholesale Trade, and Health & Social Services followed, showing little change from previous years.

Figure 5. Imperial County Industries Ranked by Direct Economic Output

CATEGORY NAME	OUTPUT	RANK 2016 Data	RANK 2019 Data	RANK 2022 Data
Agriculture (production & processing)	**$3,680,639,351**	**1**	**1**	**1**
Government (all levels & types)	$3,369,022,506	2	2	**2**
Real Estate & Rentals	$1,085,980,142	3	3	**3**
Retail Trade	$841,973,666	4	5	**4**
Wholesale Trade	$774,693,005	5	4	**5**
Health & Social Services	$683,854,311	6	6	**6**
Transportation & Warehousing	$585,790,928	7	7	**7**
Other Services	$527,836,310	14	12	**8**
Accommodation & Food Services	$518,829,423	9	9	**9**
Construction	$473,713,392	10	10	**10**
Administrative & Waste Services	$449,739,968	15	14	**11**
Professional, Scientific & Technical Services	$432,641,082	13	13	**12**
Finance & Insurance	$385,118,514	11	8	**13**
Manufacturing	$361,712,374	8	16	**14**
Information	$317,793,939	17	17	**15**
Utilities	$271,886,787	12	11	**16**
Mining	$244,918,439	16	15	**17**
Arts, Entertainment & Recreation	$28,634,688	19	19	**18**
Management of Companies	$25,764,536	18	18	**19**
Educational Services	$19,717,945	20	20	**20**

For direct employment, Agriculture once again ranked second in the county, behind Government (Figure 6). Health & Social Services ranked third again with 10,287 jobs and included, for example, doctors, dentists, hospitals, and day care services.

As we have seen with other California counties, local employment attributable to agriculture's multiplier effects has declined over time. A combination of factors likely drives this phenomenon, led by century-long trends toward increased globalization and mechanization.

Figure 6. Imperial County Industries Ranked by Employment

CATEGORY NAME	EMPLOYMENT	RANK 2016 Data	RANK 2019 Data	RANK 2022 Data
Government (all levels & types)	19,338	1	1	**1**
Agriculture (production & processing)	**14,537**	**2**	**2**	**2**
Health & Social Services	10,287	3	3	**3**
Other Services	8,085	7	6	**4**
Retail Trade	6,592	4	4	**5**
Accommodation & Food Services	5,160	5	5	**6**
Transportation & Warehousing	3,748	8	7	**7**
Administrative & Waste Services	3,583	6	8	**8**
Construction	2,970	10	9	**9**
Professional, Scientific & Tech. Services	2,514	11	10	**10**
Real Estate & Rentals	2,039	12	11	**11**
Finance & Insurance	1,894	13	12	**12**
Wholesale Trade	1,827	9	13	**13**
Manufacturing	904	14	14	**14**
Information	498	19	19	**15**
Arts, Entertainment & Recreation	475	16	16	**16**
Educational Services	355	18	15	**17**
Utilities	333	17	18	**18**
Mining	332	15	17	**19**
Management of Companies	152	20	20	**20**

How Resilient is Agriculture to Economic Shocks?

We have all heard the old saying "don't keep all your eggs in one basket." If the basket drops, then you might lose everything. This section takes a deep dive into that concept and focuses on three questions: 1) Why is economic diversification important? 2) How economically diversified is Imperial County agriculture? and 3) How has agriculture's level of economic diversification trended over time?

Answers to these questions can shed important light on the agricultural industry's economic resilience, with implications for the wider county economy and beyond.

WHY IS ECONOMIC DIVERSIFICATION IMPORTANT?

Like growers and ranchers everywhere, Imperial County's agricultural producers face a long list of risks. Examples include: wildfires, droughts, floods, pandemics, crop pests and diseases, food safety-related outbreaks, new regulations, new competitors, labor availability and cost, price drops, and rising costs for fuel, equipment, water 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.

Take Napa County, for example, where wine grapes account for 99% of the annual agricultural value. When wildfires and a pandemic caused a 51% decline in wine grapes for 2020, the county's overall agricultural value declined by that same percent. Contrast that with Imperial County where, thanks to strong diversification, total agricultural output rose slightly during 2020 when the Covid-19 pandemic began (0.5%), then grew 12.6% for 2021 during the pandemic's peak.

HOW DIVERSIFIED IS IMPERIAL COUNTY AGRICULTURE?

If economic diversification is like an "insurance policy" against risks, then that raises the question: how economically diversified is Imperial County agriculture?

The Office of the Agricultural Commissioner and Sealer of Weights & Measures first answered that question in its 2017 report titled, *Economic Contributions of Imperial County Agriculture*. The study reported agriculture's Shannon-Weaver Index, a measure of diversification that captures not just the number of different commodities produced, but also their relative abundance. Agricultural officials in more than twenty other California counties have also reported their own 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 over the past decade; 2) remove minor, outlier products with production values less than 0.25% of the county total, such as: citrus by-products, cotton (lint), cotton (seed), grapefruit, honey, onion seed, pasture crops, straw (baled) and wax; 3) enter the data into the Shannon-Weaver formula; and 4) convert to a 1.0 scale. For additional details, please contact the authors.

Over the past decade, Imperial County has consistently produced and reported thirty-two major commodities. The relative contribution of individual commodities varied during this period from 0.25% of the county's total farm gate value (the minimum threshold for this analysis) to 25.6% of the county total (feedlot cattle in 2013). **Figure 7** depicts their most recent relative contributions.

Figure 7. Relative Distribution of Imperial County Agricultural Commodities

Colored circles represent approximately $10 million each and depict major agricultural commodities' relative contributions to Imperial County's total 2022 farm gate value. Commodities less than $10 million in value are depicted with a single dot. The number of commodities produced, and their relative evenness, influences the industry's economic diversification score and its resilience to economic shocks.
(Source: 2022 Imperial County Agricultural Crop and Livestock Report)

For 2022, the Shannon-Weaver Index for Imperial County's agricultural industry was 0.67.

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. No single county could accomplish this.

At first glance, Imperial County's index of 0.67 seems near the upper-middle of the 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 0.67 index is high compared to more than twenty California counties analyzed thus far. The only higher index documented to date was Imperial County's 0.69 for 2019. The next highest was Monterey County at 0.61 in 2018. Imperial County's high numbers suggest exceptional protection from economic shocks.

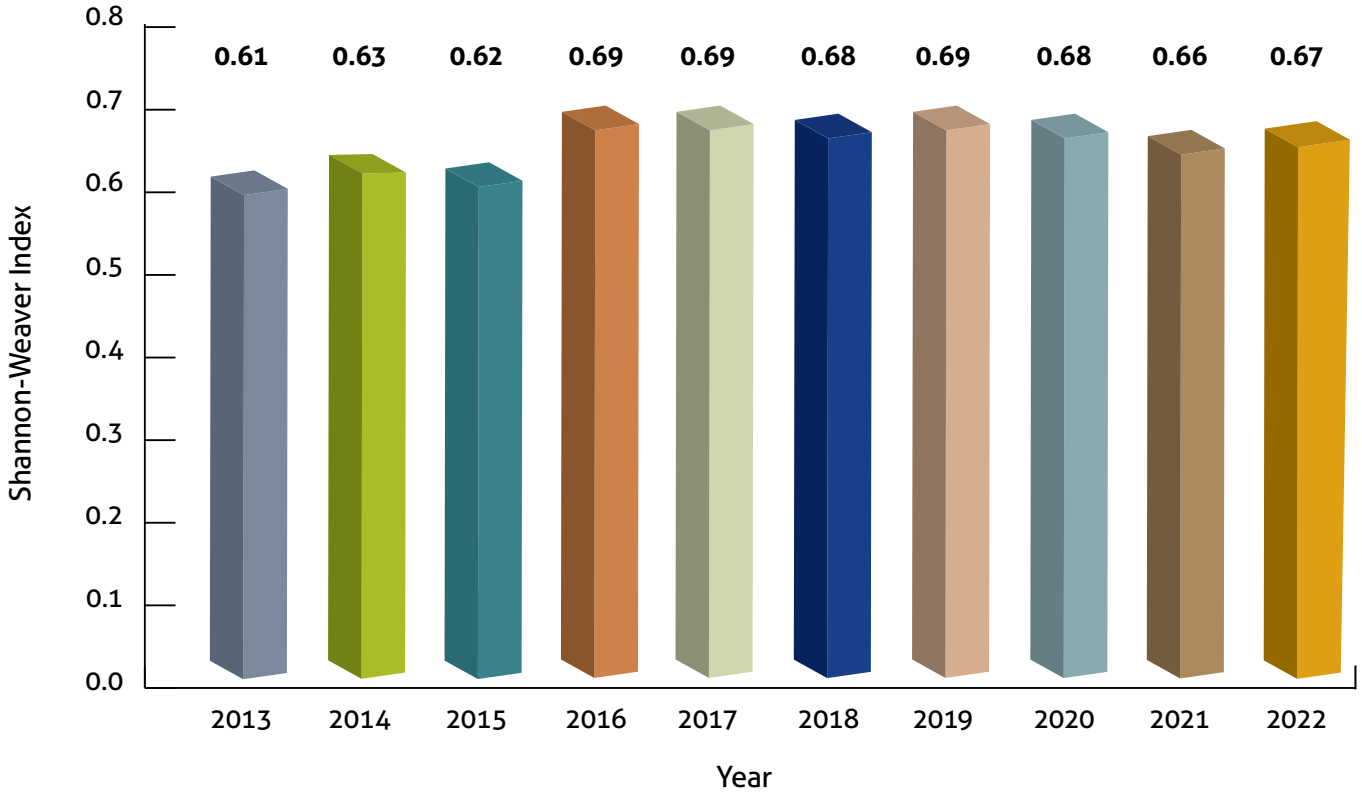
HOW HAS AGRICULTURE'S LEVEL OF ECONOMIC DIVERSIFICATION TRENDED OVER TIME?

Has agriculture become more diversified in Imperial County, or less so? **Figure 8** shows the Shannon-Weaver Index for the past decade.

The main thing to note is consistent, high economic diversification across the years. The index has risen over time, from 0.61 in 2013 to all-time highs of 0.69 for 2017 and 2019. Since then, the index has maintained its high overall level. This suggests an ongoing high level of economic resiliency within agriculture. It also contrasts with the downward trend occurring in many California counties that have become dependent on one or two major products such as almonds, berries, or wine grapes.

Figure 8. Ten-Year Trend in Imperial County Agriculture's Economic Diversification

*An indicator of economic resilience, the **Shannon-Weaver Index** quantifies diversification by combining the number of different commodities produced and their relative economic value.*



Changes over time underscore the importance of a strong, diversified production base. Our 2021 report documented 2016 as a telling example. Twenty Imperial County commodities experienced double-digit declines, including top-ranked cattle and alfalfa. But the county's strong diversification buffered the negative effects, led by gains in leafy greens. What could have been a double-digit drop for the county's total agricultural production transformed into a 7.1% increase.

We can now add the Covid-19 pandemic as another example. The pandemic disrupted supply chains, farm labor, production costs, exports, prices, and other factors. Many crops went unharvested, and grocery store shelves sat empty across much of the Northern Hemisphere. Sixteen Imperial County products declined in value, including the two largest commodities of cattle and alfalfa hay. But increases in sweet corn (191%), cantaloupes (174%), and twenty-four other products offset the losses, resulting in an overall 0.5% gain for 2020.

Bottom Line

The discussion here supports three key points: 1) economic diversification helps buffer against economic shocks such as wildfires, droughts, and even pandemics; 2) Imperial County's agricultural industry has the highest level of economic diversification documented among California counties, which likely benefited the industry during the recent Covid-19 pandemic; and 3) agriculture's exceptional level of economic diversification has held steady over time.

All of this bodes well for the future. In an era of rapid change and rising risks, the agricultural community can take pride and comfort in not having "all of its eggs in one basket."

Toward the Future

This report has documented the role that Imperial County agriculture plays in the county economy. The key points for 2022 are:

- Including local food production, processing, and multiplier effects, agriculture contributed $5.095 billion to the county economy. This represents fourteen million dollars per day and a 16.8% increase over the $4.364 billion figure from three years earlier. Agriculture retained its #1 ranking as the county's largest industry.
- As the county's second-largest employer behind government, agriculture directly supported 14,537 employees – about one out of every six jobs in Imperial County – plus another 5,275 attributable to multiplier effects.
- With a Shannon Weaver Index of 0.67, agricultural production has retained its exceptionally high level of economic diversification, which provides important economic resilience to the industry and to the larger county economy.

Agriculture is an essential pillar of the Imperial County economy and represents a vital link to 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 economic 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 Imperial County agriculture's powerful economic role.

Additional Questions

- ADDING VALUE LOCALLY. As this report has shown, much processing of Imperial County's raw agricultural products occurs outside the county. What new policies, programs, and other initiatives, if implemented, could expand locally sourced, value-added food processing within the county?
- REGIONAL ANALYSIS. What economic impacts, dependencies, and synergies occur across Imperial County and its key agricultural neighbors such as Yuma County, Riverside County, San Diego County, and Mexicali? What opportunities exist to strengthen agriculture across the greater region?
- AGRIVOLTAICS. Agrivoltaics, the practice of growing crops below and between solar panel arrays, has gained traction in California and worldwide. Benefits to farmers, in some cases, have included higher yields and less water use as well as an additional income stream from energy production. What is the current state and potential future for agrivoltaics in Imperial County?
- INDUSTRIAL HEMP AND CANNABIS. A few years have elapsed since commercial industrial hemp and cannabis production began in Imperial County. Depending on who you ask, cultivation of these crops would create a grave threat or vast opportunities for local agriculture and the wider county economy. What has been the actual experience to date?
- WATER. Imperial County's abundant food production depends on Colorado River water delivered via the All-American Canal. What challenges does this water supply face? What measures, if implemented, could best safeguard this vital resource well into the future?
- GEOTHERMAL PRODUCTION and LITHIUM VALLEY. Significant energy production from geothermal continues in Imperial County with lithium recovery from the geothermal brine beginning, bringing national and international attention and implications. Having a small footprint, the geothermal facilities have built their brine pipelines to run parallel to surrounding agriculture. What potential synergies and tradeoffs exist between agriculture and the planned expansion of lithium recovery, processing, and possible related verticals such as battery manufacturing and recycling? What opportunities will Lithium Valley bring?
- COUNTYWIDE ECONOMIC DIVERSIFICATION. This report has documented strong economic diversification within agriculture and its implications for economic resilience, but what about Imperial County on the whole? What is the county economy's current state of economic diversification? Which way is it trending? A mandate to answer these questions appears in the 2020 Imperial County Comprehensive Economic Development Strategy. In a section titled "Resilience through Economic Diversification," the Strategy articulates a goal to "Strengthen Imperial County's economy by promoting a balanced yet diversified regional economic base."

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 Imperial County Office of the Agricultural Commissioner and Sealer of Weights & Measures. Margo Sanchez supervised the project on behalf of the county. We thank Rachel Garewal, Sandra Mendivil, and other agency staff for input during the project design and implementation. Photos were provided by agency staff and Darco Productions. We extend special thanks to the growers, processors, and other local industry experts who contributed information about their operations through participation in the county's annual crop and livestock report survey. This report would not have been possible without them.

Imperial County
Agricultural Commissioner/Sealer of Weights & Measures

agcom.imperialcounty.org

June 2024

Agricultural Impact Associates