Economic Contributions of SANTA CRUZ *County* AGRICULTURE

The Honorable Board of Supervisors, County of Santa Cruz

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Commissioner's Letter

I am pleased to share the **Economic Contributions of Santa Cruz County Agriculture Report**. This report takes an important step beyond the **Santa Cruz County Crop Report** that we have published every year for nearly a century. Instead of stopping at crop production values and acreage, this report 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 2023, agriculture contributed **$1.566 billion** to the county economy. This far exceeds the **$654.7 million** value from our 2023 Santa Cruz County Crop Report. Agricultural production and processing also directly supported **8,809 employees**, plus **3,235 employees** through multiplier effects.

In addition, this report documents noteworthy economic **diversification** within agriculture, which supports **resilience** in agriculture and in the greater county economy.

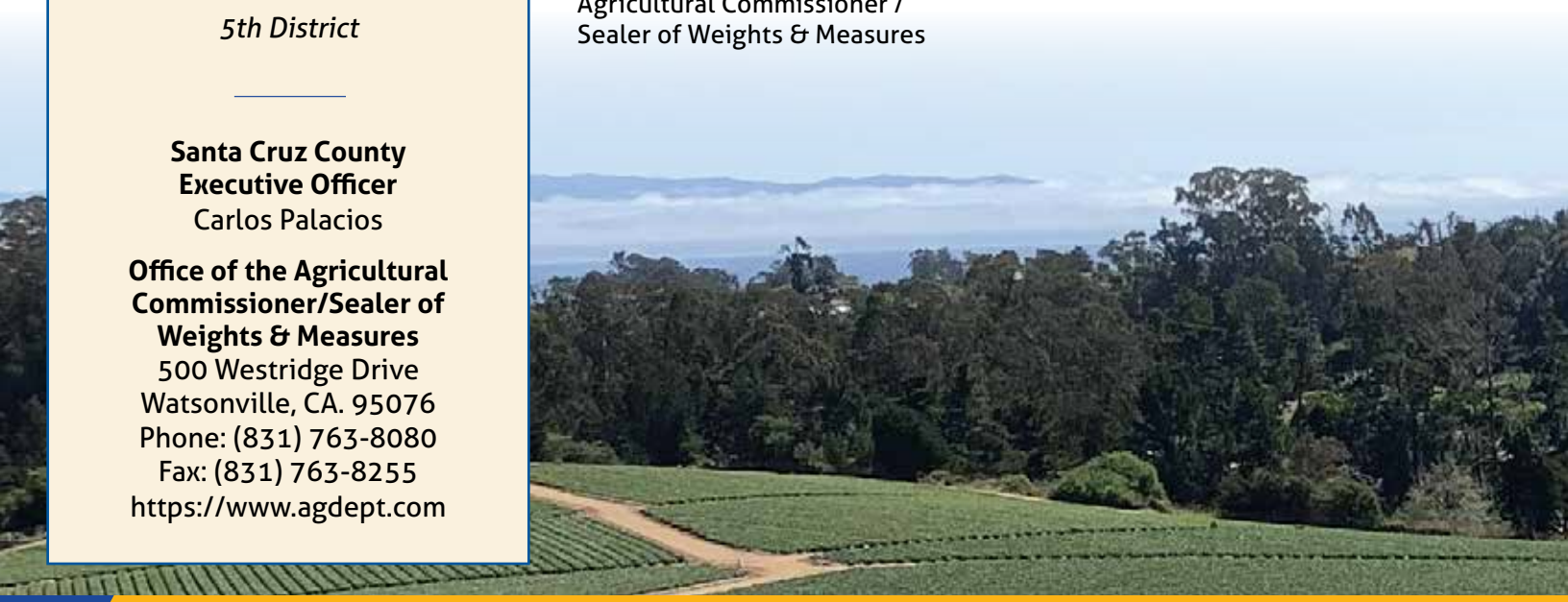
Finally, the study explores scenic beauty, wildlife habitat, wildfire protection, flood protection, aquifer recharge, and several other non-market services that agricultural lands provide to society, with a rough 2023 estimated value of **$206.7 million to $583.3 million**.

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

Respectfully submitted,

David Sanford

David Sanford
Agricultural Commissioner /
Sealer of Weights & Measures



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Published June 2025

Santa Cruz County Agriculture at a Glance

Economic Contributions
of the Agricultural Industry for 2023

$1.558 BILLION

Santa Cruz County Agriculture's total contributions to the local economy

$1.050
BILLION in direct economic output

$0.508
BILLION in multiplier effects

$4.27
MILLION per day

Employment Effects
of the Agricultural Industry

11,964
total jobs

8,744
direct employees across production & processing

3,220
additional jobs attributable to multiplier effects: expenditures by agricultural companies and their employees

1 in 18
jobs in Santa Cruz County attributable to the agricultural industry

Introduction

Nestled between misty coastal mountains and the shimmering Pacific, Santa Cruz County's agricultural lands produce some of the world's finest foods. Here, generations of passionate farmers cultivate berry and vegetable fields across the flatlands while apples, vineyards and livestock grace the hillsides. A combination of cool microclimates, fertile soils and dedicated workers deliver abundant and diverse foods to local communities and far beyond.

Clearly, agriculture plays a vital role in the Santa Cruz County 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 Santa Cruz County's economic health?

In 2013, we produced **Economic Contributions of Santa Cruz County Agriculture**. The report took an important step beyond the annual Santa Cruz County Crop Report by examining crop production values and wider economic contributions such as local processing, employment, and multiplier effects. That document painted a fuller picture of agriculture's economic role and generated a strong positive response. This report updates and expands upon that original study.

Like before, we used multiple data sources and advanced economic modeling techniques to analyze agriculture's total contribution to the Santa Cruz County economy. We also quantified the level of economic diversification within the agricultural industry and estimated the dollar value of flood protection, scenic beauty, wildlife habitat and other non-market services that agricultural lands provide. Overall, the in-depth analysis offers information that can help leaders from government agencies, industry groups, non-profit organizations and the general public make informed decisions.

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 Santa Cruz 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 page 8 explains this further.

To understand the furthest economic impacts of agriculture, one would also need to assess agricultural-related costs to society through, for example, net impacts on water and other natural resources. While important, a full assessment of these impacts lies beyond the scope of this study.

Our calculations draw from local and national data sources. The local sources include industry experts and the annual Santa Cruz County Crop Report produced by the Office of the Agricultural Commissioner / 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 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 most recent USDA Census of Agriculture (2022), its employment and economic output numbers often differ from those reported by individual state and federal agencies. For details, please see "Data Sources for Select Industries: Farm, Construction, Railroad, and Government" on the company website: https://support.implan.com/hc/en-us/articles/115009505787-Data-Sources-for-Select-Industries-Farm-Construction-Railroad-and-Government.

Except where otherwise noted, all figures are from 2023, the most recent IMPLAN dataset available. Where appropriate, we adjusted sector names for clarity and applied coefficients to IMPLAN values to reflect unique Santa Cruz County conditions. Please contact the authors for additional details on the methods used.

Direct Effects of Santa Cruz 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

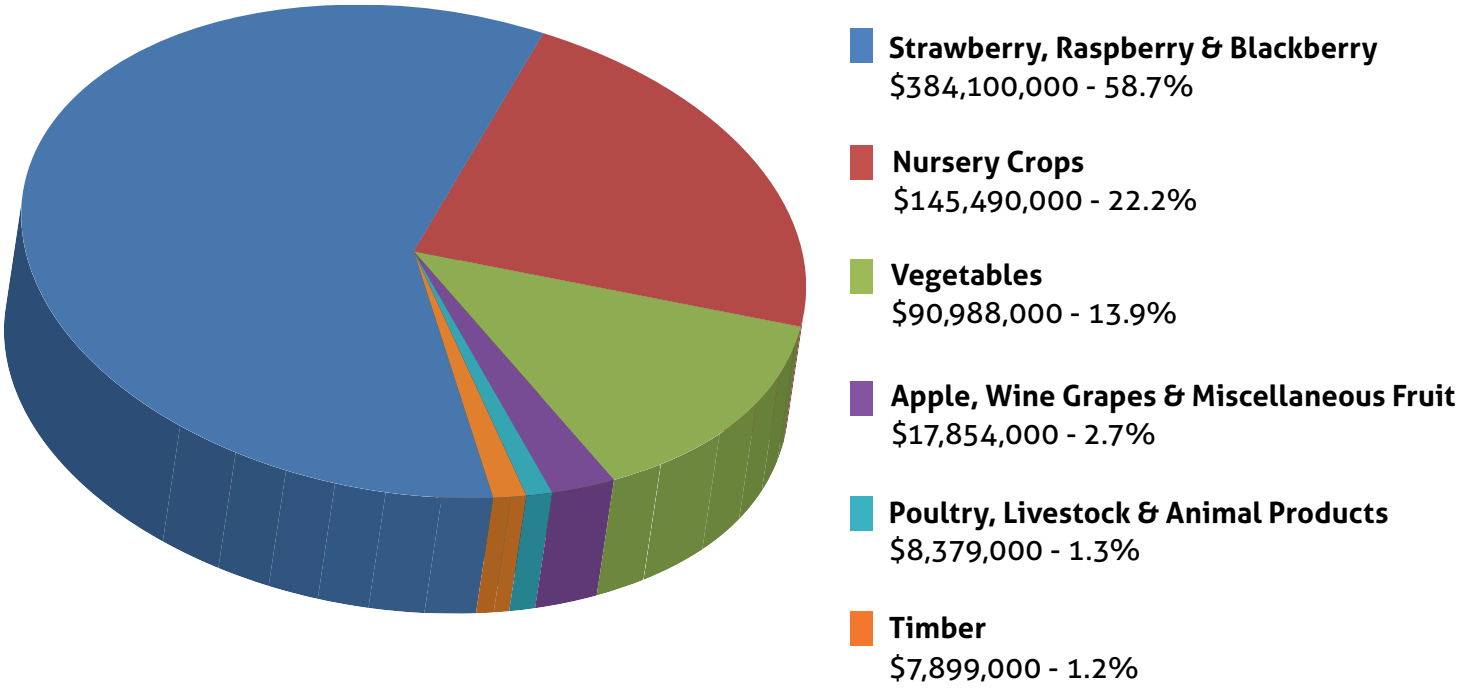
Figure 1 shows the various categories that made up Santa Cruz County's farm production value. At $384.1 million, Strawberry, Raspberry & Blackberry was the single largest production category by dollar value, comprising 58.7% of the county total. Strawberries dominated this category at $184.9 million. Raspberries followed ($114.9 million), then Blackberries ($84.3 million).

At 22.2%, Nursery Crops represented the second largest category ($145.5 million). Nursery Stock led this category with $128.1 million in production, followed by Cut Flowers & Cut Greens at $17.4 million. These two categories—Strawberry, Raspberry & Blackberry and Nursery Crops—accounted for 80.9% of all production value.

The combined total dollar value for all products rose $38.3 million (rounded) over the previous decade (+6.2%), from $616.5 million in 2014 to $654.7 million in 2023. Inflation totaled 27.3% during this period. 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 county's 2023 Crop Report for additional details on specific products and their value.

Figure 1. Distribution of Santa Cruz County Farm Production

Source: 2023 Santa Cruz County Crop Report, Office of the Santa Cruz County Agricultural Commissioner / Sealer of Weights & Measures



EMPLOYMENT

How many people work in agricultural production? In 2023, IMPLAN data indicate that agricultural production directly employed 7,231 people in Santa Cruz 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 page 10. Nor did it include Santa Cruz County's public sector jobs in agriculture across a range of local, state, and federal agencies.

Readers who want to know more about employment estimates are encouraged to consult IMPLAN's "Data Sources and Procedures Data Sources for Select Industries: Farm, Construction, Railroad, and Government" article referenced earlier. In general, IMPLAN data attempt to correct for omissions and inconsistencies among other sources. For example, IMPLAN counts farm owners (proprietors) even though other sources do not. IMPLAN also corrects for certain crops with low production levels not being reported by other sources due to privacy concerns. Last, IMPLAN counts part-time workers differently than the USDA Census of Agriculture. Imagine a farm with six humans who work two months each, sequentially in a year. The Census of Agriculture would report that as six jobs, whereas IMPLAN would consider it to be just one job – one job that happens to be filled by six different temporary workers.

Multiplier Effects of Santa Cruz 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 Santa Cruz County producer buys tractors, harvesting equipment, fertilizer, insurance, banking services, and other inputs, the producer creates *indirect effects*.

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

Although agricultural companies, suppliers and their combined employees certainly spend money in other counties, this study only reflects those expenditures within Santa Cruz County. Quantifying expenditures outside the county would be an expensive, complex effort that lies well beyond our scope here.

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

Note that sector names and production values in **Figure 2** differ from the county's annual report. Names and values draw from a standard classification system used nationwide called the North American Industrial Classification System (NAICS), as adapted by IMPLAN. Each year, agricultural producers in Santa Cruz County and nationwide use the NAICS categories on Schedule F of their federal tax returns ("Profit or Loss from Farming"), which 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 for 2022.

The following list helps bridge familiar Santa Cruz County commodities with **Figure 2** categories, which draw from NAICS and IMPLAN:

- **Vegetable & Melon Farming:** Brussels Sprouts Lettuce (Head), Lettuce (Leaf), Broccoli, Misc. Vegetables (e.g., Artichokes, Beans, Beets, Cabbage, Cauliflower, Celery, Chard, Chicory, Collards, Cucumbers, Herbs, Kale, Leeks, Mushrooms, Mustard, Peas, Pumpkins, Radicchio, Spinach, Squash, Vegetable Seeds).
- **Fruit Farming:** Strawberries, Raspberries, Blackberries, Apples, Wine Grapes, Misc. Fruit (e.g., Other Berries, Apricots, Avocados, Figs, Kiwifruit, Lemons, Olives, Peaches, Pears, Plums, Persimmons, Pomegranates, Prunes).
- **Greenhouse, Nursery & Floriculture:** Cut Flowers, Cut Greens, Nursery Stock (e.g., Indoor Potted Plants, Landscape Plants, Transplants, Christmas Trees).
- **Cattle & Other Animal Production:** Cattle, Poultry, Other Livestock, Misc. Products (e.g. Eggs, Honey).
- **Timber:** Timber and Other Forest Products.

Each sector has distinct multipliers. For example, Santa Cruz County "Vegetable & Melon Farming" sector had a 2023 *indirect effects* multiplier of 0.2095 and an *induced effects* multiplier of 0.1746. This means that each dollar's worth of direct output generated an extra 20 cents in supplier purchases, plus 17 cents more in consumption spending by the owners and employees of agricultural businesses and their suppliers.

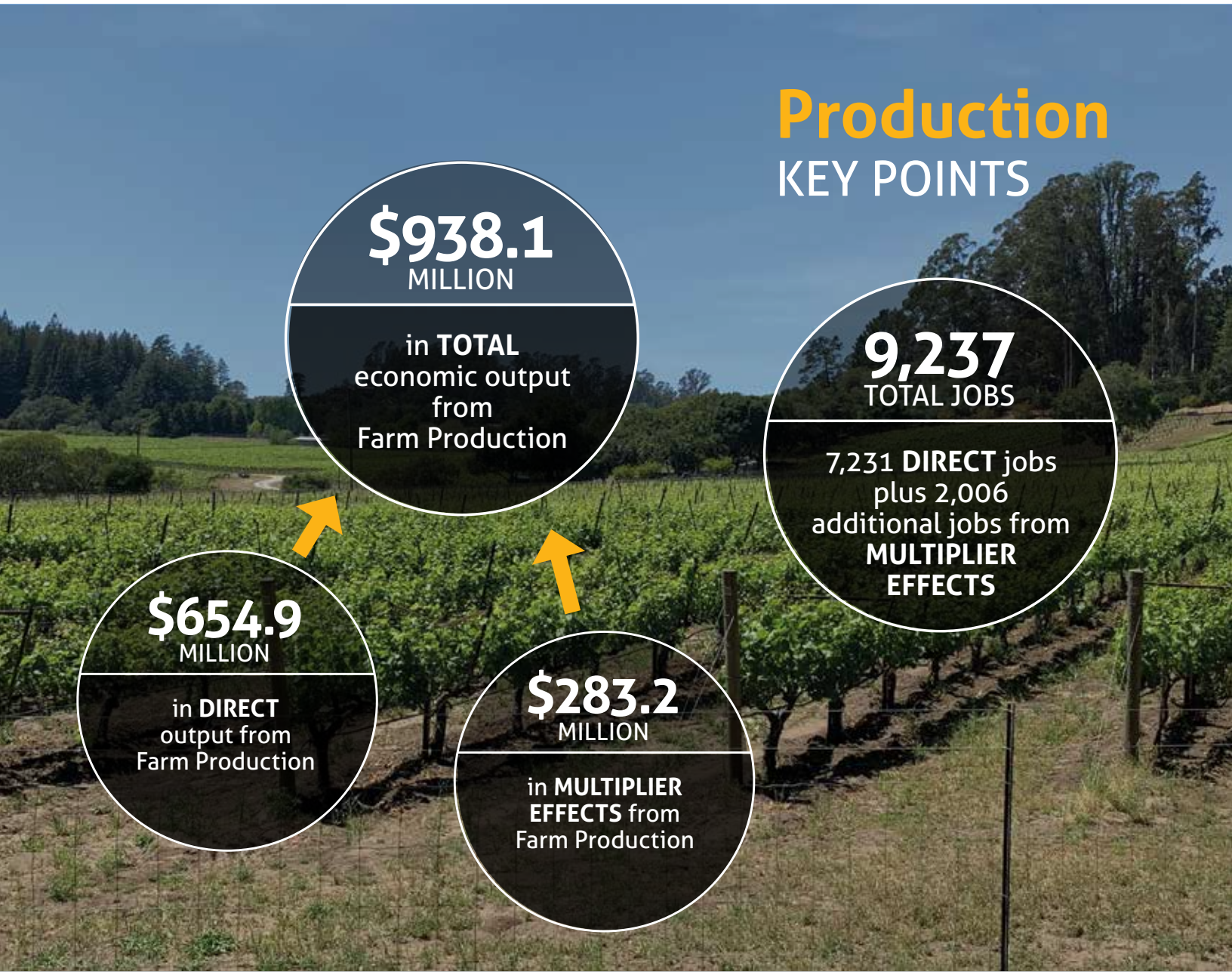
Multipliers change every year for each sector and county nationwide. The multipliers update to reflect where companies and employees spent their money. For example, the *indirect effects* multiplier for Santa Cruz County "Greenhouse, Nursery & Floriculture" was 0.1119 in 2011, then rose to 0.1912 for 2023.

Sectors have unique multipliers not just for economic output but also for employment. For example, Santa Cruz County "Fruit Farming" supported 5,843 direct jobs plus an additional 810 *indirect effects* jobs and 626 more from *induced effects*. The bottom row of **Figure 2** shows combined employment figures across sectors.

Figure 2. Economic Effects of Santa Cruz County Farm Production

Dollar values are in $ millions. Figures are 2023 values 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)			TOTAL
	Direct	Indirect	Induced	
Fruit Farming	$402.0	$79.5	$113.2	$594.6
Greenhouse, Nursery & Floriculture	$145.6	$27.8	$22.8	$196.3
Vegetable & Melon Farming	$91.0	$19.1	$15.9	$126.0
Cattle & Other Animal Production	$8.4	$2.2	$1.0	$11.7
Timber	$7.9	$0.1	$1.6	$9.6
TOTAL ECONOMIC OUTPUT	$654.9	$128.7	$154.5	$938.1
	Employment Effects (# of Jobs)			TOTAL
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT	7,231	1,153	853	9,237



Locally Sourced, Value-Added Food Processing

Farm production tells only part of the story. This section captures the economic value of local food processing, which plays a key role in the Santa Cruz County economy. 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, i.e., Santa Cruz County's abundant supply of berries, vegetables and other raw agricultural products.

We also took precautions to avoid double-counting. For example, we did not factor wine grape production into this section because **Figure 2** already captured the $5,603,000 direct dollar value of wine grapes in its "Fruit Farming" row. We only calculated the value created by converting wine grapes into wine. The same applies to other crops that undergo 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 Santa Cruz County's $119.1 million in bread and bakery products because most raw ingredients such as flour and yeast came from outside the county. Nor did we include the county's manufacturing of bottled and canned soft drinks and water ($71.9 million), coffee and tea ($19.5 million), and spices and extracts ($12.0 million).

Figure 3 shows the economic effects of locally sourced, value-added food processing. As with **Figure 2**, the sector names have been adapted from IMPLAN and NAICS, which lump and split products according to a national classification system for tracking economic output.

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

Sources: IMPLAN and U.S. Bureau of Economic Analysis data, with input from local sources. Columns and rows may not compute exactly due to rounding.

	Output Effects ($ Millions)			
FOOD PROCESSING	Direct	Indirect	Induced	TOTAL
Frozen Fruits, Juices & Vegetables Manufacturing	$146.9	$84.5	$21.4	$252.9
Canned & Jarred Fruits & Vegetables Manufacturing	$122.0	$39.3	$13.3	$174.6
Wineries	$73.5	$32.8	$9.7	$116.1
Light Processing of Fruit, Vegetable & Nursery Products	$44.4	$4.2	$15.7	$64.3
Meat & Other Animal Products	$5.4	$1.8	$0.6	$7.8
Miscellaneous Other Food Manufacturing	$3.4	$0.8	$0.3	$4.5
TOTAL ECONOMIC OUTPUT	$395.7	$163.5	$61.0	$620.2
	Employment Effects (# of Jobs)			TOTAL
	Direct	Indirect	Induced	
TOTAL EMPLOYMENT	1,513	877	337	2,727

The largest sector by far, "**Frozen Fruits, Juices & Vegetables Manufacturing"** in **Figure 3**, mostly reflects production of frozen berry juices and purees from strawberries that are not suitable for the fresh market. Prominent national and global suppliers of frozen strawberry products operate facilities in Santa Cruz County, especially in Watsonville. Customers can buy individually quick frozen (IQF) and block quick frozen (BQF) strawberries whole, sliced, or diced, with or without sugar and stabilizers, pasteurized or unpasteurized, in packaging ranging from retail poly bags and foodservice tubs to cases, pails, drums and totes. Ready-to-use frozen bases serve as a key ingredient in frozen novelties such as smoothies, sorbets, sherbets, bars, ice creams, custards, gelatos, and slushies.

As the name suggests, **"Canned & Jarred Fruits & Vegetables Manufacturing"** in **Figure 3** reflects canned, jarred, and bottled products made from fruits and vegetables that are not destined for the fresh market. Some of the same Watsonville-based processors that create the frozen products mentioned in the preceding paragraph also manufacture jarred items. Processors turn strawberries and other fruit into purees, concentrates, jams, jellies, and other forms with extended shelf life and easy storage. This includes bases that are sold as real-fruit ingredients in refrigerated juices, shelf-stable juices and flavored waters. The same

bases are used for dairy items such as berry-flavored yogurts, milks, and dairy alternative products. Related, a prominent national brand converts much of the county's $11.9 million apple crop into bottles of juices and ciders for distribution across the United States.

Boutique-scale fruit and vegetable processing supplements the large-scale operations. A few olive growers, for example, mill their own product on-site. The owners of an olive grove in the foothills of the Santa Cruz Mountains, for example, produce and sell award-winning olive oils online and at local markets. Another family-owned olive farm in Pleasant Valley (near Aptos/Corralitos) produces olive oil from over a thousand trees, specializing in Tuscan varietals such as Leccino, Maurino, Moraiolo, Frantoio and Pendolino.

"Wineries" reflects the significant value added to the county's $5.6 million wine grape crop. Santa Cruz County is home to a diverse and distinctive collection of wineries, each shaped by the region's dramatic mountain terrain and cool, coastal influences. The Wineries value in **Figure 3** especially reflects wine from local, estate-grown grapes, produced on 600-plus acres across various subregions of the larger Santa Cruz Mountains American Viticultural Area (AVA). Prominent subregions, each with distinct flavor profiles, include Summit Road, Ben Lomond Mountain, The Coastal Foothills, and Corralitos / Pleasant Valley. Many wineries add value to grapes by hosting tastings, weddings, private tours and other events.

"Light Processing of Fruit, Vegetable & Nursery Products" in **Figure 3** in Figure 3 reflects post-harvest value added to the county's 15,685 acres of fruits, vegetables, nursery stock and flowers. This sector captures portions of IMPLAN's "Support Activities for Agriculture" sector that involve the sorting, grading, cleaning, and packing of fresh fruits and vegetables, including when those activities occur in fields during harvest. The sector also includes IMPLAN's "All Other Food Manufacturing" which captures fruits and vegetables that are cut, peeled, and turned into perishable foods, including ready-to-use refrigerated products. Some of these products are served at farmers markets and even at events such as the Strawberry Festival and Santa Cruz County Fair.

Growers add value to the county's abundant nursery stock in many ways. On the most basic level, indoor potted plants, landscape plants, farm stock, and other plants are put into suitable containers ranging from inexpensive flats and trays to decorative clay and wooden pots. Growers prune, trim and shape product, and add labels as appropriate for wholesale and retail markets. One company specializes in propagating avocados, boxing and selling over two dozen varieties. A Watsonville-area farm and nursery specializes in rare and unique plants as well as California natives, medicinal plants and edible plants.

Producers add similar value to the county's $17.4 million in cut flower products. In fields and greenhouses alike, growers trim, cool, arrange, and package flowers after harvest, then add labels. Some flower farms, including a two-acre operation near Waddell Creek, sell retail and wholesale, and provide floral services for weddings and other special events.

"Meat & Other Animal Products" captures the portion of the county's $18.4 million in cattle, sheep, poultry and miscellaneous other animals that are processed within Santa Cruz County. Nearly all of these products leave the county for processing. A well-known butcher shop in Corralitos processes various meats, including beef, pork, lamb, and poultry. The company offers custom meat processing for locally-raised or hunted animals and create over thirty varieties of smoked and fresh sausages. A handful of apiary operations offer occasional beeswax and pollination services in addition to producing and selling jars of small-batch local honey from domesticated and wild hives.

The catchall category **"Miscellaneous Other Food Manufacturing"** encompasses a wide range of boutique-scale processing. For example, an apple orchard near Watsonville is a popular source for fresh and frozen pies, as well as other products. A 45-acre biodynamic farm in South County has an onsite shop where customers can buy skincare products, aromatherapy sprays and other items. A lavender farm near Corralitos adds value to raw product by producing and selling a wide variety of lavender skin care products and related items.

Last, this category reflects a tiny portion of the county's $79.1 million beer brewing industry. While nearly all Santa Cruz County breweries depend on hops grown in the Pacific Northwest or Germany, one exception exists: a Corralitos company that uses a locally-grown hop variety that is uniquely adapted to local conditions.

Total Economic Contributions of Santa Cruz 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 Santa Cruz County agriculture.

As **Figure 4** shows, the **total** 2023 economic contribution of Santa Cruz County agriculture was **$1.558 billion.** This consisted of **$1.051 billion** in combined **direct output** from production and processing, plus $**507.7 million** in multiplier effects.

The $1.051 billion in direct output represented 3.40% of Santa Cruz County's total 2023 output of $30.93 billion across all industries, or about **one out of every twenty-nine dollars.**

For perspective, agriculture pumped over f**our million dollars per day into the county economy during 2023** ($4,269,305 to be exact). This translates to $177,888 per hour.

Total agricultural employment covered in the scope of this study was 11,964. Of these, 8,744 jobs were directly in agricultural production and processing, with the remaining 3,220 from multiplier effects.

The 8,744 direct agricultural jobs represented 5.6% of Santa Cruz County's total 2023 employment of 156,212, or about **one out of every eighteen jobs**.

Figure 4. Overall Economic Effects of Santa Cruz County Agriculture

Columns and rows may not compute exactly due to rounding.

Type of Effect	Direct	Indirect	Induced	TOTAL
FARM PRODUCTION				
Output Effects ($ Millions)	$654.9	$128.7	$154.5	$938.1
Employment Effects (# Jobs)	7,231	1,153	853	9,237
LOCALLY SOURCED, VALUE-ADDED FOOD PROCESSING				
Output Effects ($ Millions)	$395.7	$163.5	$61.0	$620.2
Employment Effects (# of Jobs)	1,513	877	337	2,727
TOTAL VALUE OF AGRICULTURAL INDUSTRY				
Output Effects ($ Millions)	$1,050.6	$292.2	$215.5	$1,558.3
Employment Effects (# of Jobs)	8,744	2,030	1,190	11,964

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 Santa Cruz 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, Santa Cruz 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, tariffs and other trade policies, 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 Santa Cruz County, where solid diversification helped agricultural production grow 1.7% when the pandemic began in 2020, then increase by another 3.4% during the pandemic's peak in 2021.

HOW DIVERSIFIED IS SANTA CRUZ COUNTY AGRICULTURE?

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

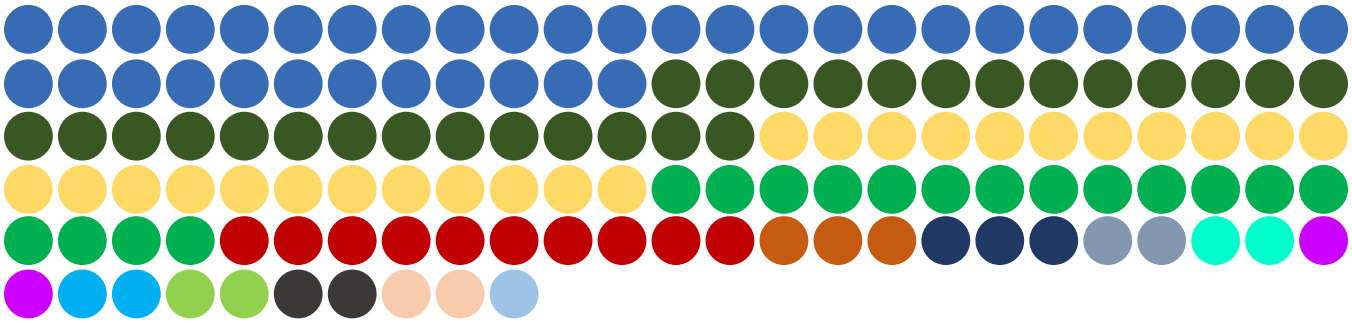
To answer this question, we calculated the Shannon-Weaver Index for Santa Cruz County agriculture. Created in 1949 for military code breaking, the Shannon-Weaver index is widely used by economists and others interested in quantifying diversification. Different versions of the basic Shannon-Weaver formula 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 or crops grown in a county – but also their relative *evenness or abundance*.

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 "Misc. Fruit," the single outlier product that had a production value less than 0.25% of the county total; 3) enter the data into the Shannon-Weaver formula; and 4) convert to scale from 0.0 to 1.0. For additional details, please contact the authors.

Over the past decade, Santa Cruz County has consistently produced and reported fifteen 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 37.1% of the county total (strawberries in 2014). **Figure 5** depicts their most recent relative contributions.

Figure 5. Relative Distribution of Santa Cruz County Agricultural Commodities

Each circle below represents approximately $5,000,000 in gross sales, and each color represents a unique agricultural commodity. Combined, the circles and colors visually portray major agricultural commodities' relative contributions to Santa Cruz County's total 2023 farm gate value. Commodities less than $5,000,000 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: 2023 Santa Cruz County Crop Report)



For 2023, the Shannon-Weaver Index for Santa Cruz County's agricultural industry was **0.47**.

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, Santa Cruz County's index of 0.47 seems near the 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 0.47 index is high compared to typical U.S. counties, many of which focus on a just one or two crops such as corn, soybeans or wheat. Compared to more than twenty California counties analyzed thus far, the 0.47 index is slightly below average. Overall, Santa Cruz County's number suggests decent protection from economic shocks.

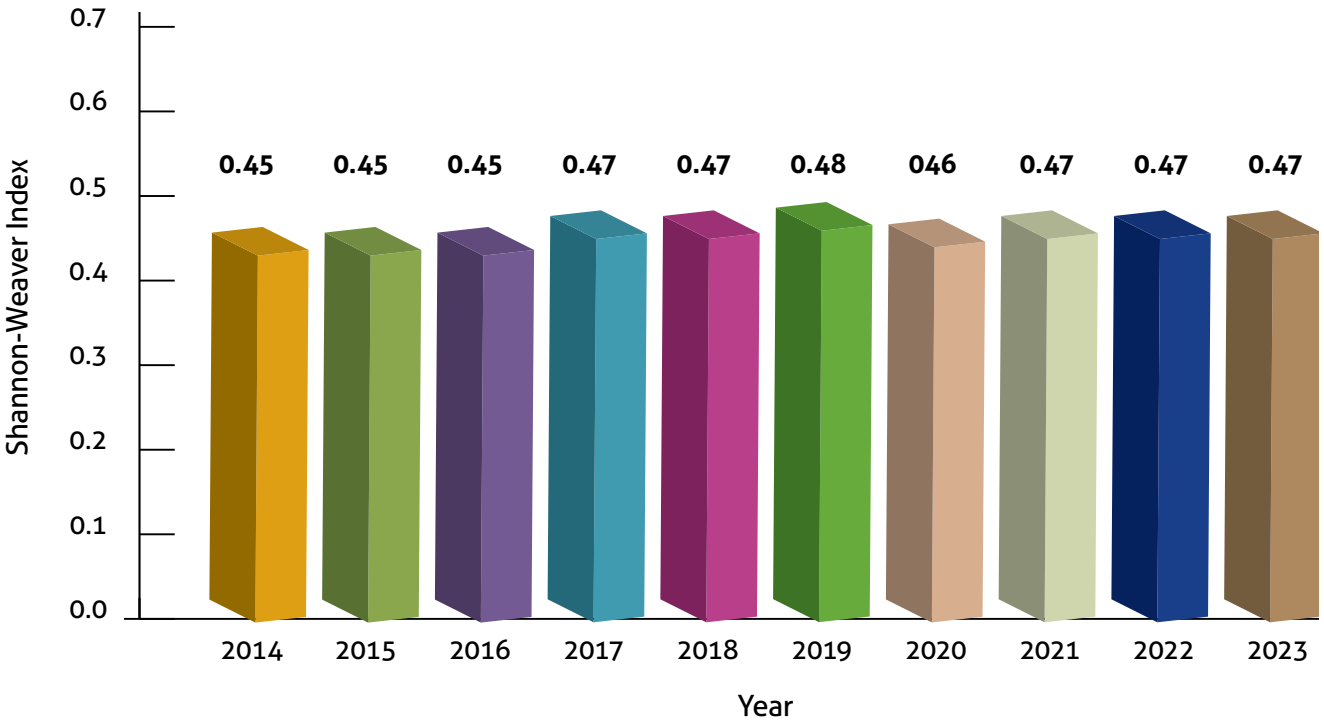
HOW HAS AGRICULTURE'S LEVEL OF ECONOMIC DIVERSIFICATION TRENDED OVER TIME?

Has agriculture become more diversified in Santa Cruz County, or less? **Figure 6** shows the Shannon-Weaver Index for the past decade.

The main thing to note is consistent, substantial economic diversification across the years. The index has held steady over time, always within the narrow 0.45 to 0.47 range. This suggests solid ongoing 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 or wine grapes.

Figure 6. Ten-Year Trend in Santa Cruz County Agriculture's Economic Diversification

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



The Covid-19 pandemic underscored the importance of a strong, diversified production base. Starting in early 2020, 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.

Not surprisingly, several Santa Cruz County products declined in value when the Covid-19 pandemic hit. Prominent examples included cut flowers & cut greens (-57.6%), apples (-44.2%), wine grapes (-17.8%), leaf lettuce (-13.1%), head lettuce (-9.2%), and poultry, livestock & other animal products (-6.7%).

But increases in Brussels sprouts (+26.8%), blackberries (+19.9%), nursery stock (+17.1%), strawberries (+7.2%) and three other products offset the losses in 2020. The county's overall production value rose $10,701,000 (1.7%) for the year. The agricultural industry's resilience continued into the ensuing year (2021) with an additional $21,338,000 (3.4%) gain.

Bottom Line

The discussion here supports three key points:

- Economic diversification helps buffer against economic shocks such as wildfires, droughts, and even pandemics.
- Santa Cruz County agriculture has a decent level of economic diversification across crops, which likely benefited the industry during the recent Covid-19 pandemic.
- Agriculture's 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."

Ecosystem Services from Agricultural Lands

Santa Cruz County agricultural lands produce more than the items people can easily buy or sell. Local growers and ranchers also provide open space, wildlife habitat, carbon storage and many other benefits to society, including protection from wildfires. Often called ecosystem services, these benefits have significant value but are poorly understood and rarely counted.

This section helps raise awareness about the topic. It provides a general overview of ecosystem services, then explores three main questions:

- What types of ecosystem services occur on Santa Cruz County agricultural lands?
- How can we best quantify the dollar value of these ecosystem services?
- What is an initial estimated range of their annual value in Santa Cruz County?

WHY IS THIS IMPORTANT?

In recent decades, thousands of articles and books have described ecosystem services and their importance. The term generally refers to goods and services provided by natural and modified ecosystems that benefit, sustain, and support the well-being of people.

As one might expect, heavily visited and beautiful protected natural areas such Wilder Ranch State Park, Henry Cowell Redwoods State Park and The Forest of Nisene Marks State Park tend to provide the highest value. But even city parks and highly modified agricultural landscapes deliver nature-related benefits to people.

PAYMENTS FOR ECOSYSTEM SERVICES

A key challenge is that most ecosystem services are hard to see and measure. Thus, their contribution to economic and social well-being rarely factors into management decisions. A growing number of efforts are trying to address this, including through economic markets and public policies.

Many Santa Cruz County producers already participate in various state and federal programs that pay for ecosystem services. The Williamson Act, U.S. Farm Bill programs, and the California Department of Food and Agriculture's (CDFA) Healthy Soils Initiative are especially popular. Organizations such as the Natural Resources Conservation Service, Farm Services Agency, CDFA, and the Resource Conservation District of Santa Cruz County play key roles in implementing these and other programs.

Current trends suggest the number and types of opportunities will increase in coming years. New private sector markets have emerged for water, biodiversity, and greenhouse gases. The Ecosystem Services Market Consortium (ESMC), for example, is an industry-led non-profit organization that compensates farmers and ranchers who improve the environment through their agricultural practices (See: https://ecosystemservicesmarket.org/). Others are under development. In fact, some experts believe that market-based ecosystem services could become a major economic driver for rural America.

CALIFORNIA AGRICULTURE: LEADING AGAIN

California agriculture has emerged as a national leader in documenting and valuing ecosystem services. A key early milestone occurred in 2011 when CDFA created the Office of Environmental Farming and Innovation, which later evolved into the Office of Agricultural Resilience & Sustainability (OARS). The OARS mission is to: *"use the best available science and knowledge from the agricultural community to design and implement practical solutions to California's natural resource challenges that improve the environmental and economic sustainability of producing nutritious food, fiber, and energy."*

Among many other innovations, CDFA created the first typology of specific ecosystem services that California's agricultural lands provide **(Figure 7)**. CDFA also launched a project to document, recognize, and incentivize them. Note that we added "Wildfire Protection" to CDFA's list in **Figure 7**. For an overview of the critical role California's agricultural producers play in wildfire risk management and response, see Pinzón, N. *et al.* 2025. (Farming and Ranching through Wildfire: Producers' Critical Role in Fire Risk Management and Emergency Response. *California Agriculture*, Vol. 79, Issue 1, 2025, February 06.)

Figure 7. Typical Ecosystem Services Provided by California Agricultural Lands

Source: California Department of Food and Agriculture. See, for example: https://www.cdfa.ca.gov/oars/ecosystemservices/

Wildlife Habitats

Providing food, water, shelter and space to support resident and transient wildlife, especially through riparian areas and perennial vegetation.

Nutrient Cycling

Managing plant nutrients and soil amendments in ways that help store, transform, and cycle important nutrients in the soil, such as carbon, nitrogen, and phosphorus.

Food Production

Nourishing a growing global population with nutrients and energy, the primary product of agricultural production.

Fiber Production

Clothing people by producing cotton, wool, and other fibers that can be processed into thread, yarn and cloth.

Fuel Production

Meeting energy needs by producing plant-based biofuels, and through mechanized production of renewables such as wind, solar, hydro, and geothermal.

Recreation and Cultural

Improving quality of life by providing places for wildlife viewing, nature walks, outdoor recreation, entertainment, and educational experiences.

Soil Structure, Formation and Fertility

Sustaining healthy soils, the foundation of all life, by managing them in ways that not only support plant growth, but also reduce erosion, prevent landslides, suppress pathogens, sequester carbon, and purify water.

Biodiversity Conservation

Promoting ecosystem productivity, beauty, pest control, and other benefits by managing on-farm streams, trees, shrubs, wetlands, and cropped areas in ways that support diverse plants and animals.

Water Cycling

Maintaining or improving soil moisture and water storage, while minimizing runoff, through cover crops, tillage, residue management, and dozens of related practices.

Atmospheric Gas & Climate Regulation

Reducing greenhouse gas levels through practices that make farm operations more energy efficient, and by building capacity to store carbon.

Pest Control

Controlling pests and weeds through many management practices that support their natural enemies, such as raptors, beneficial insects, and other wildlife.

Water Quality

Improving and protecting water quality through vegetative buffers, stream bank protection, prescribed grazing, grassed waterways, and dozens of other management practices.

Pollination Services

Supporting agricultural production and healthy ecosystems by providing nesting habitat and floral resources for wild pollinators such as bees, bats, and birds.

Wildfire Protection*

Crops, orchards, grasslands, and other agricultural areas can help protect people and property from wildfires.

**This new category, Wildfire Protection, does not occur on CDFA's original list.*

ASSIGNING DOLLAR VALUES TO ECOSYSTEM SERVICES

Economists have tried with varying success to assign monetary values to ecosystem services. They use more than a dozen methodologies, for example, Travel Cost Method, Hedonistic Pricing, Replacement Cost Method and Contingent Valuation.

This raises an important question: ***What is the annual dollar value of ecosystem services provided by Santa Cruz County agricultural lands?***

Answering this question thoroughly would require primary data collection, likely taking several years and costing over a million dollars. Fortunately, economists have developed a cost-effective approach to estimate such values that takes full advantage of existing research. Called the Benefit Transfer Methodology, the approach estimates economic values by transferring existing benefit estimates from studies already completed for another location.

For example, researchers have used the Benefit Transfer Methodology to estimate the value of ecosystem services in three California counties. The philanthropic foundations that commissioned these expensive pilot studies hoped the results would prove useful for other counties, too. Fortunately, Santa Cruz County was one of the three selected. According to the detailed study, Santa Cruz County's natural capital provides at **least $800 million to $2.2 billion in benefits** to people and the local economy each year.[1]

Figure 8 summarizes a subset of relevant results from those three studies. It shows average dollar value per acre for ecosystem services provided by four specific land use types that are common in agricultural settings, adjusted for compounding inflation through 2023

Figure 8. Annual Average Value of Select Ecosystem Services in Three California Counties

	Santa Cruz County [2]		Santa Clara County [3]		Sonoma County [4]	
Land Cover Type	Low	High	Low	High	Low	High
Grassland	$5,163	$11,002	$4,428	$9,457	$3,009	$13,361
Pasture	$655	$14,065	$1,360	$13,403	$643	$10,382
Cultivated	$163	$3,386	$163	$3,386	$163	$3,386
Evergreen forest	$4,370	$11,575	$4,443	$11,558	$3,690	$8,863

1 See: Santa Clara Valley Open Space Authority, Resource Conservation District of Santa Cruz County, Sonoma County Ag + Open Space. (2018). *Healthy Lands & Healthy Economies: Natural Capital in Santa Clara, Santa Cruz, and Sonoma Counties.*

2 2023 inflation-adjusted averages calculated from Table 7 (pp. 27-30) in R. Schmidt et al., 2015, Nature's Value in Santa Cruz County. Earth Economics, Tacoma, WA & the Resource Conservation District of Santa Cruz County, Capitola, CA.

3 2023 inflation-adjusted averages calculated from Table 7 (pp. 30-33) in D. Batker et al., 2014. Nature's Value in Santa Clara County. Earth Economics, Tacoma, WA & the Santa Clara Valley Open Space Authority, San Jose, CA.

4 2023 inflation-adjusted averages calculated from Table 8 (pp. 33-37) in R. Schmidt et al., 2015, Nature's Value in Sonoma County. Earth Economics, Tacoma, WA & Sonoma County Agricultural Preservation and Open Space District, Santa Rosa, CA.

Figure 9 lists acreages for Santa Cruz County agricultural land use types based on information provided by the Office of the Agricultural Commissioner / Sealer of Weights & Measures, then multiplies those acreages by the 2023 inflation-adjusted Santa Cruz County values from Figure 8. As the final column shows, this puts the 2023 estimated total value of ecosystem services provided by Santa Cruz County agricultural lands at **$206.7 million to $583.3 million per year**.

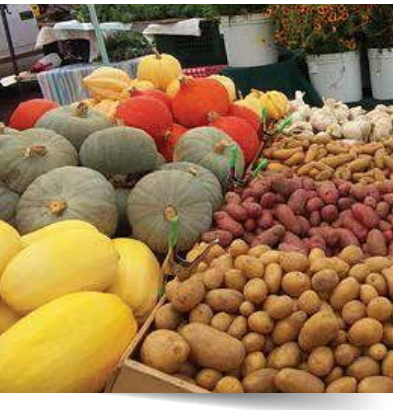
Figure 9. Estimated Value of Ecosystem Services Provided by Santa Cruz County Agricultural Lands in 2023

Agricultural Land Cover Type	# of Acres	Value per Acre ($)		Total Value ($)	
		Low	High	Low	High
Timber (Evergreen Forest)	42,000	$4,370	$11,575	$189,525,395	$486,164,362
Fruits, Vegetable & Nursery Crops (Cultivated)	15,685	$163	$3,386	$250,037	$53,109,853
Grasslands (Range & Pasture)	4,000	$5,163	$11,102	$20,653,042	$44,009,179
TOTALS	61,685			$206,738,475	$583,283,394

Please see text for details and important caveats. "Value per Acre" derived from a detailed Santa Cruz County study. Acreages were provided by the Office of the Agricultural Commissioner / Sealer of Weights & Measures.

We would like to highlight two key points from **Figure 9**. First, the total value, $206.7 million to $583.3 million per year, may be higher than some readers expected. It might come as a surprise that for 2023, Santa Cruz County's agricultural industry likely produced ecosystem services worth another 32% to 89% in economic value on top of the county's $654.7 million in direct production of commodities.

Second, forests delivered nearly all of the value. The county had an estimated 42,000 acres of land on parcels zoned for timber production, which we categorized as evergreen forest for the purposes of this study. The 2023 Santa Cruz County Crop Report indicates that timber acres accounted for $7.9 million in direct economic output, or 1.2% of the county's total agricultural production value. However, because forests produce so



many invisible benefits for people, their total 2023 economic contribution through ecosystem services alone was likely $183.5 million to $486.2 million. This represents 83.3% to 88.8% of the total value of all ecosystem services provided by Santa Cruz County's agricultural lands.

LIMITATIONS

We want to underscore the limitations of this analysis and the many caveats that are in order. The most important caveat is that estimates in this report are for illustrative purposes only. They provide some indication of magnitude but are by no means definitive. Any mention of specific dollar values from this section should make clear they are initial, imprecise estimates, not verified with actual data collection. For additional discussions of methods and limitations, please consult the studies cited above.

Getting robust numbers would require a follow-up study to the detailed 2015 Santa Cruz County study cited earlier. *The results of such a follow-up study would likely yield higher dollar values than the conservative estimates contained in this report.* The following three factors would likely increase the total value per acre:

- Steadily rising per capita personal income in Santa Cruz County, which could increase residents' willingness to pay for ecosystem services;
- Increased scarcity of western monarch butterflies, California red-legged frogs, Southwestern pond turtles and other imperiled species, making their presence on Santa Cruz County agricultural properties even more valuable; and
- Ongoing expansion of the 'agritourism' sector fueled by visitors who value products and services such as local wines, farm visits, u-picks, hiking and beautiful scenery.

FINAL THOUGHTS ON THE VALUE OF WORKING LANDS

This section has explored the non-market economic benefits that Santa Cruz County's farms, ranches and production forests provide to society. These agricultural lands clean our water, control floods and erosion, recharge aquifers, provide fire breaks, supply habitat for fish, wildlife and pollinators, control pests, sequester carbon, remove pollutants from the air, create space for outdoor recreation, attract tourists and offer beautiful views and scenery.

Until recently, we have taken these services for granted. But now, modern economics allows us to attach dollar values to the many non-market benefits working lands provide to society. Documenting the true value of Santa Cruz County's agricultural lands, while challenging, reminds us that protecting them is a smart investment—one that pays dividends today and into the future.

Toward the Future

This report has documented the fuller contributions that Santa Cruz County agriculture makes to the local economy. Including local food processing and multiplier effects, agriculture contributed $1.558 billion to the county economy in 2023. Agriculture also played a vital role in county employment, directly or indirectly supporting 11,964 jobs.

In addition, this report has documented noteworthy economic diversification within agriculture, which has supported resilience in agriculture and in the greater county economy. The study also examined scenic beauty, wildlife habitat, flood protection, wildfire protection and more than a dozen other non-market services that agricultural lands provide to society, with a 2023 estimated value of $206.7 million to $583.3 million per year.

Agriculture is an important pillar of the Santa Cruz County economy and represents a vital link to the county's cultural past and competitive future. Agriculture will no doubt face many challenges and opportunities in the coming years. For now, the findings herein provide the most complete view to date of Santa Cruz County agriculture's vital economic role.

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