San Diego Agricultural Planning Program

Sustainable Agricultural Lands Conservation Grant (SALC) Program

Profitability Analysis for Production of San Diego County Avocados, Lemons, Strawberries and Tomatoes

Gap Analysis under *SALC Grant #21-PG01: Cultivating Solutions: Market Analysis to Inform and Support Economically Sustainable Small Farming in San Diego County*

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Prepared by Agricultural Impact Associates LLC (www.ag-impact.com) on Behalf of the San Diego County Local Agency Formation Commission and the County of San Diego Planning and Development Services Department

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EXECUTIVE SUMMARY

INTRODUCTION

San Diego County has one of the nation's largest and most important agricultural industries. A combination of fertile soils, an ideal Mediterranean climate and other factors support production of more than 200 commodities worth an estimated $1.6 billion in 2023. San Diego County consistently ranks among the nation's top counties for nursery production, organic farming and the number of small farms. But significant challenges threaten long-term viability of local agriculture, reflected by steady declines in the number of farms and agricultural acres in recent decades.

Any attempts to stem these declines require solid empirical data. Unfortunately, as identified in the San Diego Agricultural Planning Program (SALC 1.0) report, policy makers and others face significant data gaps regarding costs, returns, and other economic aspects of farming in San Diego County. The SALC 2.0 report ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations*** was crafted to fill part of that knowledge gap. That study analyzed agricultural profitability at the county level. This follow-up report complements that broad countywide assessment through deeper analysis of profitability among specific commodities.

This study analyzes costs and returns for four focal commodities selected in collaboration with agricultural industry stakeholders and others: **avocados**, **lemons**, **strawberries**, and **tomatoes**. The primary data sources consisted of relevant University of California Davis cost & return studies combined with detailed financial records provided by local producers. Other sources included personal interviews with producers, direct observations made at farms and other locations, and a review of key documents such as water bills, receipts, permits, and other farm records.

KEY FINDINGS

The results detail costs, revenues, and net returns across various scenarios for each of four focal commodities. At the risk of oversimplifying the key points from more than 1,200 specific numbers, answers to the four research questions are outlined below. Please see the Methods section for definitions of operating costs, total costs, and other financial terms.

AVOCADOS | How profitable is San Diego County avocado production?

- Assuming $6,419 per acre production costs and a scenario where avocados yielded 5,900 pounds per acre that sold for $1.65 per pound (the actual average price in 2022), avocados generated a 2022 net return per acre of $3,316 above total costs. At that yield level, the price

needed to break even on operating costs was $0.92 per pound. To break even based on total costs, the required price was $1.09 per pound.

- Multiplying the 2022 per-acre return by San Diego County's total number of avocado acres in 2022 (estimated at 12,597 acres) resulted in an aggregated countywide net return of $41,771,652 above total costs.
- Avocado costs and returns vary dramatically across San Diego County locations and years. Water costs, in particular, exert powerful influence on financial performance. Readers are encouraged to explore alternative scenarios by adjusting water, labor, yield, price and other parameters.

LEMONS | How profitable is San Diego County lemon production?

- Assuming $18,659 per acre production costs and a scenario where lemons yielded 900 cartons per acre that sold for $26 per carton (the actual average price in 2022), lemons generated a 2022 net return per acre of $4,741 above total costs. At that yield level, the price needed to break even on operating costs was $12.90 per carton. To break even based on total costs, the required price was $20.74 per carton.
- Multiplying the 2022 per-acre return by San Diego County's total number of lemon acres in 2022 (estimated at 2,985 acres) resulted in an aggregated countywide net return of $14,151,885 above total costs.
- Eureka lemons served as proxy for citrus in this study. Readers are encouraged not just to explore alternative lemon scenarios, but also to run similar analyses for San Diego County's other prominent citrus crops such oranges, grapefruit and tangerines.

STRAWBERRIES | How profitable is San Diego County strawberry production?

- Assuming $101,313 per acre production costs and a scenario where strawberries yielded 5,500 trays per acre that sold for $11 per tray (the estimated average price in 2022), strawberries generated a net return per acre of $40,813 below total costs. At that yield level, the price needed to break even on operating costs was $17.30 per tray. To break even based on total costs, the required price was $18.42 per tray.
- Multiplying the 2022 per-acre return by the total number of strawberry acres (estimated at 215 in 2022) resulted in an aggregated countywide net return of $8,774,795 below total costs.
- Strawberry profitability varies widely depending on numerous factors, including the operation's size and production methods. Many San Diego County strawberry producers benefit from higher prices by selling directly to consumers at farmers' markets and U-pick operations. Readers are encouraged to explore alternative scenarios by adjusting water, labor, yield, price and other parameters.

TOMATOES | How profitable is San Diego County tomato production?

- Assuming $18,099 per acre total production costs and a scenario where fresh tomatoes yielded 15 tons per acre that sold for $2,000 per ton (the estimated average price in 2022), fresh tomatoes generated a net return per acre of $11,901 above total costs. At that yield level, the price needed to break even on operating costs was $1,043 per ton. To break even based on total costs, the required price was $1,207 per ton.
- Multiplying the 2022 per-acre return by the total number of tomato acres (estimated at 1,193 in 2022) resulted in an aggregated countywide net return of $14,197,893 above total costs.
- Tomato results are based on greater extrapolation and assumptions than the other four focal commodities due to the lack of relevant benchmark data from University of California Davis cost & return studies and other sources. Readers are encouraged to explore alternative scenarios by adjusting water, labor, yield, price and other parameters.

THE "AGRICULTURAL PROFITABILITY ASSESSMENT TOOL" (AG-PAT)

Similar to University of California Davis cost & return studies for individual California agricultural commodities, the key findings of this study apply to hypothetical farms under a narrow set of specific assumptions. Readers who want to explore alternative scenarios are invited to do so using the Agricultural Profitability Assessment Tool, or AG-PAT for short. Produced as part of the SALC 2.0 project, the AG-PAT is a simple Excel-based instrument that allows users to adjust costs for water, labor and more than a dozen other expenses, as well as yields and prices. The results instantly show how those changes affect profitability (returns per acre) for an individual farm and countywide based on the total acreage of a given crop. The tool is available for public use under the SALC 2.0 page of San Diego LAFCO's website at www.sdlafco.org.

SIGNIFICANCE OF THE STUDY

The study's results shed important new light on the state of San Diego County agriculture and have key implications on three levels. First, producers of the four focal commodities in San Diego County can use the findings to put their own operations in a larger context. Second, public and private sector readers of the annual *County of San Diego Crop Statistics & Annual Report* now have important supplemental information about four of the commodities covered by that publication. Last, the findings provide an essential foundation for future projects, starting with the SALC 2.0 "Strategic Plan" phase that explores potential ways policy makers can assist in closing profitability gaps, i.e. to keep farmers farming. A thriving agricultural industry, in turn, benefits all residents of San Diego County through enhanced food supply, carbon sequestration, economic trade, economic resiliency for the region, and many other ways.

INTRODUCTION

San Diego County has one of the nation's largest and most important agricultural industries. A combination of fertile soils, an ideal Mediterranean climate and other factors support production of more than 200 commodities worth an estimated $1.6 billion in 2023.[1]

In the latest (2022) Census of Agriculture, San Diego County ranked in the top 1.5% of all U.S. counties for the total dollar value of its agricultural output and the top 1% for the value of crops, in particular. Among specific crop categories, San Diego County's nursery, greenhouse, and floriculture sector ranks #2 nationwide out of 2,660 counties producing such products, placing it in the top one-tenth of one percent. [2]

WHY THIS MATTERS: COSTS TO SOCIETY OF LOSING AGRICULTURAL LANDS

Although San Diego County boasts one of the nation's most productive agricultural industries, several challenges threaten local agriculture's ability to endure. Those challenges have led to significant, ongoing loss of agricultural lands. The SALC 2.0 "Market Analysis" report, ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***, summarized later in this section, estimated that San Diego County is currently *losing 18 acres of farmland per day and an average of one farm every three and a half days*.

The ongoing decline in agricultural acreage, in turn, negatively impacts San Diego County across three broad categories: economic, environmental, and social. For 15 specific examples of potential impacts across those categories, please see ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***.

[1] For details about individual commodities, please consult the *2023 County of San Diego Crop Statistics & Annual Report*, available at: https://www.sandiegocounty.gov/content/sdc/awm/crop_statistics.html.

[2] See the *2022 Census of Agriculture, San Diego County Profile*, available at: https://www.nass.usda.gov/Publications/AgCensus/2022/Online_Resources/County_Profiles/California/cp06073.pdf

Figure 1. Avocado Acres Removed from Production

The bare foreground shows land removed from avocado production due to rising costs, especially water costs. San Diego County is currently losing an estimated 18 acres of farmland per day and an average of one farm every three and a half days.

ABOUT THE SALC PROGRAM

Launched in 2014, the Sustainable Agricultural Lands Conservation Program (SALC), a component of the Strategic Growth Council's Affordable Housing and Sustainable Communities (AHSC) Program, administered by the Department of Conservation, supports California's greenhouse gas (GHG) emission reduction goals by making strategic investments to protect agricultural lands from conversion to more GHG-intensive uses. Protecting critical agricultural lands from conversion to urban or rural residential development encourages infill development within existing jurisdictions, ensures open space remains available, and supports a healthy agricultural economy and resulting food security. Agricultural lands also sequester and store carbon, strengthening society's resilience to climate change.

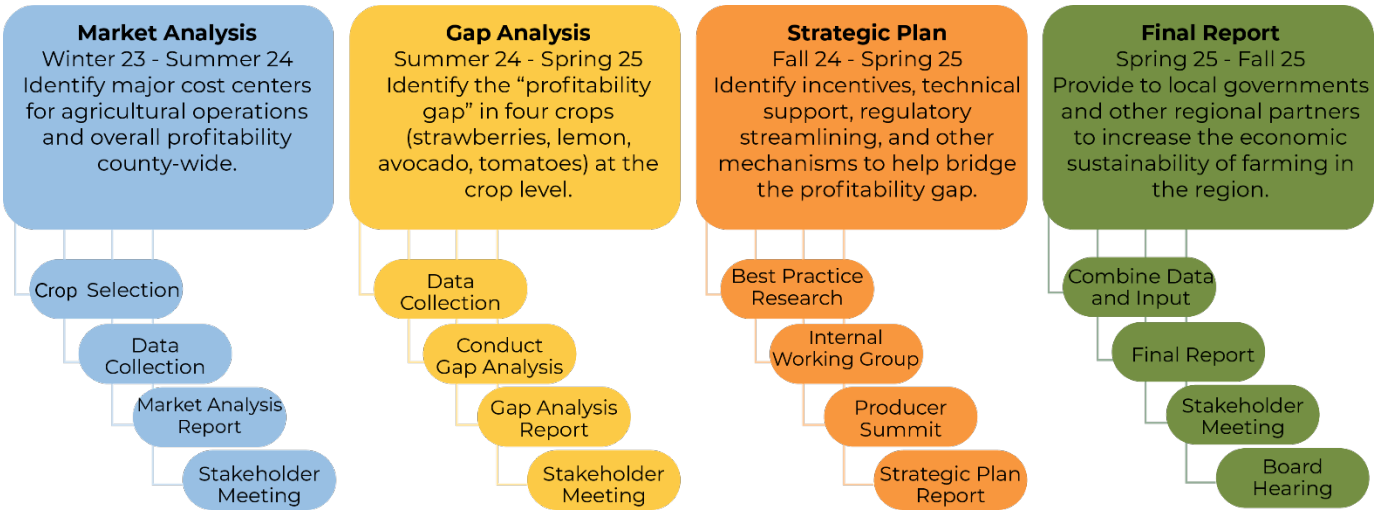
SALC is part of California Climate Investments, a statewide program that puts billions of Cap-and-Trade dollars to work reducing GHG emissions, strengthening the economy, and improving public health and the environment– particularly in disadvantaged communities. The Cap-and-Trade program also creates a financial incentive for industries to invest in clean technologies and develop innovative ways to reduce pollution. California Climate Investments projects include

affordable housing, renewable energy, public transportation, zero-emission vehicles, environmental restoration, more sustainable agriculture, recycling, and much more. At least 35 percent of these investments are located within and benefiting residents of disadvantaged communities, low-income communities, and low-income households across California. For more details, see the California Climate Investments website: www.caclimateinvestments.ca.gov.

The SALC 2.0 report ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations*** provides additional details about the program. The publication summarizes the types of SALC grants, including results from the SALC 1.0 planning grant awarded to San Diego County. The report also details the current SALC 2.0 project which has four major elements shown in **Figure 2**. Key findings from the report appear below.

The overall goal of SALC 2.0 is to fill specific knowledge gaps regarding financial aspects of San Diego County farms, especially their expenses and profitability, and then develop policy mechanisms designed to support improved financial health for local farms. In short, *the SALC 2.0 project goal is to identify and help bridge specific financial gaps so farmers can keep farming*.

Figure 2. Timeline and Major Activities for the SALC 2.0 Planning Grant 2023-2025



Source: County of San Diego (https://www.sandiegocounty.gov/content/sdc/sustainability/projects/SALC2.html)

KEY FINDINGS FROM THE FIRST SALC 2.0 STUDY

The SALC 2.0 "Market Analysis" phase in **Figure 2** resulted in the report ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***. The report was produced by Agricultural Impact Associates LLC on behalf of the County of San Diego Local Agency Formation Commission and the County of San Diego Planning & Development Services department (PDS). The primary data sources for the study were agricultural producers who provided detailed financial data via the 2022 USDA Census of Agriculture, which became publicly available in early 2024 and represented 4,031 San Diego County farms.

Key findings included:

- **Part One | TRENDS: How Many San Diego County Farms and Agricultural Acres Will be Lost if Current Trends Continue Unabated?** The section's 12 research sub-questions examined historical trends and projected future changes in the number of farms and agricultural acres in San Diego County, including for small farms.
  Key Finding: ***At current rates, San Diego County is losing 18 acres of farmland per day and an average of one farm every three and a half days, with no sign of letting up.***
- **Part Two | EXPENSES: What are the Costs of Farming in San Diego County?** The section's four research sub-question examined 17 types of operating expenses reported by San Diego County producers, including expenses' prevalence, dollar amounts, and trends.
  Key Finding: ***Comprehensive data representing 4,031 San Diego County farms show Taxes (on Property) as the most common expense, Labor (Contracted & Hired) as the biggest cost by far (at an average 2022 cost of $283,334 per farm), and that most farm expenses have risen faster than inflation over the past 20 years, especially Fertilizer, Chemicals, and Labor (Contracted & Hired).***
- **Part Three | PROFITS: How Profitable are San Diego County Farms?** The section's four research sub-question examined historical trends and future projections for operating profit margin (OPM) among San Diego County farms.
  Key Finding: ***Detailed financial data provided by San Diego County agricultural producers show large fluctuations in operating profit in recent decades and a 2022 average operating profit margin of 13%, roughly half the 25% threshold experts recommend for financial health.***

THIS STUDY'S GOAL & RESEARCH QUESTIONS

This study summarizes work under the second item in **Figure 2**. Whereas the first phase, "Market Analysis," provided a broad, countywide economic assessment of the agricultural industry, "Gap

Analysis" goes deeper into the profitability of four specific commodities selected in collaboration with public and private sector stakeholders: avocados, lemons, strawberries, and tomatoes. For each focal commodity, the study explores two overarching research questions: *How profitable is production on the individual farm level? On the countywide level?*

The project also entailed the creation of an Excel-based tool for modeling profitability based on different cost and return scenarios. This tool is intended to support the ensuing "Strategic Plan" phase shown in **Figure 2**, when stakeholders explore potential policy interventions.

What This Study Does Not Cover

This study does not address several related topics that, while interesting and important, lie beyond the current scope. Examples include:

- Production Practices. The study does not detail how producers grow each of the four focal commodities. Interested readers can consult relevant University of California (U.C.) Davis cost & return studies and other sources to learn about land preparation, plant establishment, fertilization, irrigation, pest management, harvest and other practices. For a complete set of cost & return studies see: https://coststudies.ucdavis.edu/.
- Trend Analysis. The study neither examines historical changes among the four focal commodities nor makes projections into the future. Interested readers can consult issues of the annual *County of San Diego Crop Statistics & Annual Report* to explore patterns among acres, yields, prices and related topics.
- Other Commodities. The study does not assess any of the other 31 commodities specified in the *2022 County of San Diego Crop Statistics & Annual Report*, the version of county's yearly report available when the analysis occurred. This study's methodology and resulting Excel-based profitability assessment tool, however, could provide a jumping off point for analysis of additional commodities.
- Other Locations. All four focal commodities are grown in several California counties, but the current study only analyzes them in the San Diego County context. The study's methodology and resulting Excel-based profitability assessment tool, however, could contribute to possible future analysis in other counties.
- Potential Solutions. The study does not explore ways in which the agricultural industry has evolved, adapted and innovated in ways that strengthen financial viability. Nor does the current study examine how public agencies could potentially support agriculture through revised, expanded, or new policies and programs. The ensuing "Strategic Plan" phase of the SALC 2.0 project focuses on these topics.

ANTICIPATED OUTCOMES

The study's results shed important new light on the state of San Diego County agriculture and have key implications on three levels:

- **For Agricultural Operators:** Producers of the four focal commodities in San Diego County can use the findings to put their own operations in a larger context. How do their costs and returns compare to ones documented in this study?

- **For Multiple Public and Private Sector Stakeholders:** Readers of the annual *County of San Diego Crop Statistics & Annual Report* – including private sector entities such as agricultural businesses, banking and financial companies, as well as decision makers from public agencies – now have important supplemental information about four of the commodities covered by that annual report.

  For a deeper dive into the many ways stakeholders measure profitability with respect to agricultural production, see research question 17 in Part 3 of the SALC 2.0 "Market Analysis" report, ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***, available on San Diego LAFCO's website at www.sdlafco.org.

- **For Future Projects**. The findings offered as part of this report provide an essential foundation for ensuing stages of the SALC 2.0 project and beyond. This report has analyzed profitability for individual commodities, then aggregated those results countywide. The next SALC 2.0 project phase, "Strategic Plan," explores potential ways policy makers can help fill profitability gap through policies and programs. Those efforts, in turn, can help play an important role in sustaining one of San Diego County's most important industries while also providing a foundation for future projects.

METHODS

This section details the study's methods and covers the following topics:

A) Selection of the Four Focal Commodities

B) Financial Model Construction: U.C. Davis Cost & Return Studies as the Foundation

C) Financial Model Construction: Data Provided Directly by Producers

D) Additional Data Collection Sources and Methods

While the extensive information contained in this section may exceed the requirements of certain readers, the detailed methodological discussion reflects the complexity and significance of answering the research questions.

Definitions: On the Use of "Farms" and "Producers"

Farmers, ranchers, and their properties go by many different names. Consistent with the USDA Census of Agriculture and other sources, we use the broad catch-all terms **farm** and **producer** in this report. A **farm** is any property with at least $1,000 of sales of agricultural products. A **producer** is anyone who operates such a property. Please note that **farm** reflects all agricultural **operations**, including **ranches**. **Producers** encompasses **farmers**, **growers**, **ranchers** and all other agricultural **operators**.

A. Selection of the Four Focal Commodities

Rigorous economic analysis of agricultural commodities requires considerable investments of time, effort and money. The budget and timeline for this project supported in-depth analysis of four San Diego County commodities.

The yearly *County of San Diego Crop Statistics & Annual Report* produced by the Department of Agriculture, Weights & Measures details roughly three dozen commodities each year. Each commodity is vitally important to someone. This raised the difficult question: *out of nearly three dozen agricultural commodities, which four should be the focus of this study?*

As defined by the University of California, sustainable agriculture is the integration of three main objectives: a healthy environment, economic profitability, and social and economic equity. [3]

[3] See: "What is Sustainable Agriculture?" (2021) by the Sustainable Agriculture Research and Education Program, University of California Agriculture and Natural Resources. <https://sarep.ucdavis.edu/sustainable-ag>

Selection of the four focal commodities entailed a combination of quantitative and qualitative methods based on this definition. Quantitative assessment involved rating each commodity ***according to its importance to the sustainability of San Diego County's agricultural sector in the coming years and decades***. Project staff rated each of 35 commodities listed in the *2022 County of San Diego Crop Statistics & Annual Report* on a 3-point scale in categories representing three pillars of sustainability: economy, society, and environment (**Figure 3**).

Figure 3: How Critical is a Given Commodity to the Sustainability of San Diego County's Agricultural Sector in the Coming Years and Decades? Examples of Criteria Used to Select the Four Focal Commodities

ECONOMIC Sustainability	**SOCIETAL** Sustainability	**ENVIRONMENTAL** Sustainability
Core Premise: SALC 2.0 should prioritize those commodities that make especially large contributions to San Diego County's overall farm gate production value.	**Core Premise:** SALC 2.0 should prioritize those commodities produced by the largest number and diversity of San Diego County farms & farmers.	**Core Premise:** SALC 2.0 should prioritize those commodities that advance the SALC goal to reduce greenhouse gas emissions by avoiding loss of agricultural lands.
Primary Indicator: dollar value.	**Primary Indicator:** number of farms and farmers.	**Primary Indicator:** number of acres
Scoring Protocol: ✓ LOW (1 point): Among the county's 35 commodities in 2022, this is one of 28 that contributed 0% to 2% of the county's total farm gate value. ✓ MEDIUM (2 points): Among the county's 35 commodities in 2022, this is one of four that contributed 2% to 10% of the county's total farm gate value. ✓ HIGH (3 points): Among the county's 35 commodities in 2022, this is one of three that contributed 10% to 30% of the county's total farm gate value.	**Scoring Protocol:** ✓ LOW (1 point): Among the county's 5,000-plus farm operations, fewer than 2% produced this product in 2022. ✓ MEDIUM (2 points): Among the county's 5,000-plus farm operations, an estimated 2% to 10% produced this product in 2022. ✓ HIGH (3 points): Among the county's 5,000-plus farm operations, an estimated 10% or more produced this product in 2022.	**Scoring Protocol:** ✓ LOW (1 point): Among the county's estimated 291,873 commercial agricultural acres in 2022, this commodity accounted for less than 1% of total acres. ✓ MEDIUM (2 points): Among the county's estimated 291,873 commercial agricultural acres in 2022, this commodity accounted for 1% to 10% of total acres. ✓ HIGH (3 points): Among the county's estimated 291,873 commercial agricultural acres in 2022, this commodity accounted for more than 10% of total acres.

After completing the initial rankings, project staff: 1) discussed results internally; 2) gathered additional data to fill information gaps; 3) tested how the weighting of certain criteria would affect results; and 4) explored tradeoffs.

Rangeland provides an example of tradeoffs considered. Covering roughly 80% of all agricultural acres in San Diego County, rangeland warranted the highest "Environmental" rating. But rangeland has few producers (Societal) and relatively low direct dollar value (Economic) compared to other products. Nursery products, in contrast, accounted for more than 70% of agriculture's total production value, with many producers, but involve comparatively few acres.

The qualitative component entailed engaging public and private sector stakeholders to refine the list of focal commodities. In November 2023, for example, staff conducted a public workshop with producers and industry partners to gather feedback. Producers participating by Zoom provided important input into selection of the four focal commodities.

Among public sector stakeholders, project staff consulted with personnel from four San Diego County agencies: the Local Agency Formation Commission (LAFCO), County of San Diego Department of Planning & Development Services (PDS) and Department of Agriculture, Weights & Measures (AWM), and the Resource Conservation District of San Diego County (RCDGSDC). A key theme that emerged was the value of selecting commodities that contribute to the county's flagship "Live Well San Diego Food System Initiative" – a vision to build better health, live safely, and thrive by increasing access to healthy and affordable food, supporting the local economy and food supply chain, and protecting natural resources through supporting small-scale farmers and sustainable farming practices.[4]

The iterative, mix-methods, collaborative approach resulted in the selection of four commodities for in-depth analysis: avocados (represented by the largest variety, Haas), lemons (as a proxy for the larger citrus category), strawberries (conventional, not organic), and tomatoes (fresh market, not processing).

B. Financial Model Construction: U.C. Davis Cost & Return Studies as the Foundation

Gathering sensitive financial information from any entity can be problematic, including from agricultural businesses. Agricultural producers have legitimate apprehension about privacy and confidentiality. They also have natural concerns about the time commitment and complexity required to compile and submit detailed, accurate financial data. For these reasons, this project drew heavily from existing research in the form of U.C. Davis cost & return studies.

[4] For details about the Live Well San Diego Food System Initiative, see: https://www.sandiegocounty.gov/content/sdc/sustainability/news/FoodSystemInitiative.html

For decades, U.C. Davis cost & return studies have provided evidence-based financial assessments of California agricultural commodities. Reports entail a high level of rigor and enjoy widespread use and respect in agricultural circles.

We built Excel-based financial models for each of the focal commodities, using U.C. Davis cost & return studies as the foundation, supplemented by data from multiple additional sources described below. For each U.C. Davis cost & return study, we applied time and location adjustments that made the data relevant to this study.

Location adjustments corrected for different costs of living between San Diego County and other counties, based on data from the Economic Policy Institute (www.epi.org). These cost-of-living corrections allowed expense data from U.C. Davis cost & return studies to inform analysis of San Diego County production. For example, the cost to purchase fertilizers, chemicals, and other inputs for strawberry production on the Central Coast were converted to local San Diego County prices.

Time adjustments, based on the Consumer Price Index (CPI) produced by the US Department of Labor's Bureau of Labor Statistics (www.bls.gov), corrected for inflation that occurred in the years between this study and a relevant U.C. Davis cost & return study. Data from the 2020 U.C. Davis study of Eureka lemons, for example, were adjusted for inflation to strengthen relevance to this project's 2022 analysis of Eureka lemons.

In addition to adjusting for time (inflation) and location (cost of living), we also adjusted U.C. Davis cost & return study data for different production methods and other factors, as needed. Examples of adjustments that helped localize the data to San Diego County included:

- Key U.C Davis tomato studies analyzed *processing* tomatoes rather than the *fresh* market ones that are common in San Diego County.[5]
- An important U.C. Davis strawberry study focused on *organic production* rather than conventional, which affected costs for crop fertilization, pest management and other practices.[6]

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[5] Aegerter, B, P. Lazicki, G. Miyao, D. Stewart, J. Murdock, and B. Goodrich (2023). Sample Costs to Produce Processing Tomatoes: Sub-Surface, Drip Irrigated (SDI) in the Sacramento Valley & Northern Delta 2023. University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

[6] Bolda, M., Murdock, J., Goodrich, B., and D. Sumner (2022). Sample Costs to Produce and Harvest Organic Strawberries: Fresh Market, Central Coast Region (Santa Cruz, Monterey and San Benito Counties). University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

Bolda, M., Tourte, L., Goodrich, B., and D. Sumner (2024). Sample Costs to Produce and Harvest Strawberries: Central Coast Region (Santa Cruz, Monterey and San Benito Counties). University of

- The 2020 U.C. Davis study of Eureka lemons in Ventura County assumed use of *well water*, which lowered the irrigation costs compared to San Diego County producers who often rely on municipal water. [7]
- The 2020 U.C. Davis cost & return study for San Diego County Haas avocados focused on an operation with nearly *triple the plant density* of a typical orchard, with 430 trees per acre instead of 145.[8]

For one commodity, tomatoes, we used a different hypothetical farm size (50 acres) than the 3,500-acre size indicated in the relevant U.C. Davis cost & return study. For the other three commodities, we used the same farm size as the relevant U.C. Davis cost & return study: lemons (50 acres), strawberries (30 acres), and avocados (21 acres).

Farm size matters not just because the SALC 1.0 and 2.0 projects emphasize small farms, but also because producers who buy inputs such as fertilizers, seedlings, and chemicals in high volume may enjoy bulk pricing discounts. Big operations also amortize expensive equipment over much larger farms, reducing the per-acre cost of vehicles, tractors, irrigation equipment, and other large items. In some cases, larger operations can also negotiate better terms for loans due to their generally stronger economic and commercial position compared to smaller farms.

Like U.C. Davis cost & return studies, this study includes ranging analyses to show break even points and returns per acre based on different values for yield and price. Midpoint values for yields and prices used in the ranging analyses were based on three sources: 1) relevant U.C. Davis cost & return studies; 2) data provided directly by producers; and 3) information contained in the annual *County of San Diego Crop Statistics & Annual Report*.

Consistent with U.C. Davis cost & return studies, we calculated financial returns based on three levels:

- Operating Costs reflect the gross returns (price times yield) minus the direct cash costs of production such as labor, fertilizer, and utilities.

California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

[7] Takele, E., Faber, B., Stewart, D., and D. Sumner (2020). Sample Costs to Establish an Orchard and Produce Eureka Lemons. University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

[8] Takele, E., Stewart, D., and Sumner, D. (2020). Avocado Establishment and Production Costs and Profitability Analysis in High Density Planting: San Diego County, 2020. University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

- Cash Costs reflect the gross returns (price times yield) minus not just the direct Operating Costs of production, but also indirect "overhead" cash costs such as property taxes, office expenses, insurance, leaf & soil analyses, and repairs on investments.
- Total Costs, sometimes called operating profit margin (OPM), reflect gross returns (price times yield) minus not just Operating Costs and Cash Costs, but also non-cash overhead expenses such as depreciation and capital recovery for items such as buildings, irrigation systems and land.

C. Financial Model Construction: Data Provided Directly by Producers

In addition to using existing information from U.C. Davis cost & return studies, we also gathered data directly from producers. This effort focused on collecting information that local producers already have on hand: data from their annual federal income tax returns, in particular the Internal Revenue Service (IRS) Schedule F: "Profit or Loss from Farming."

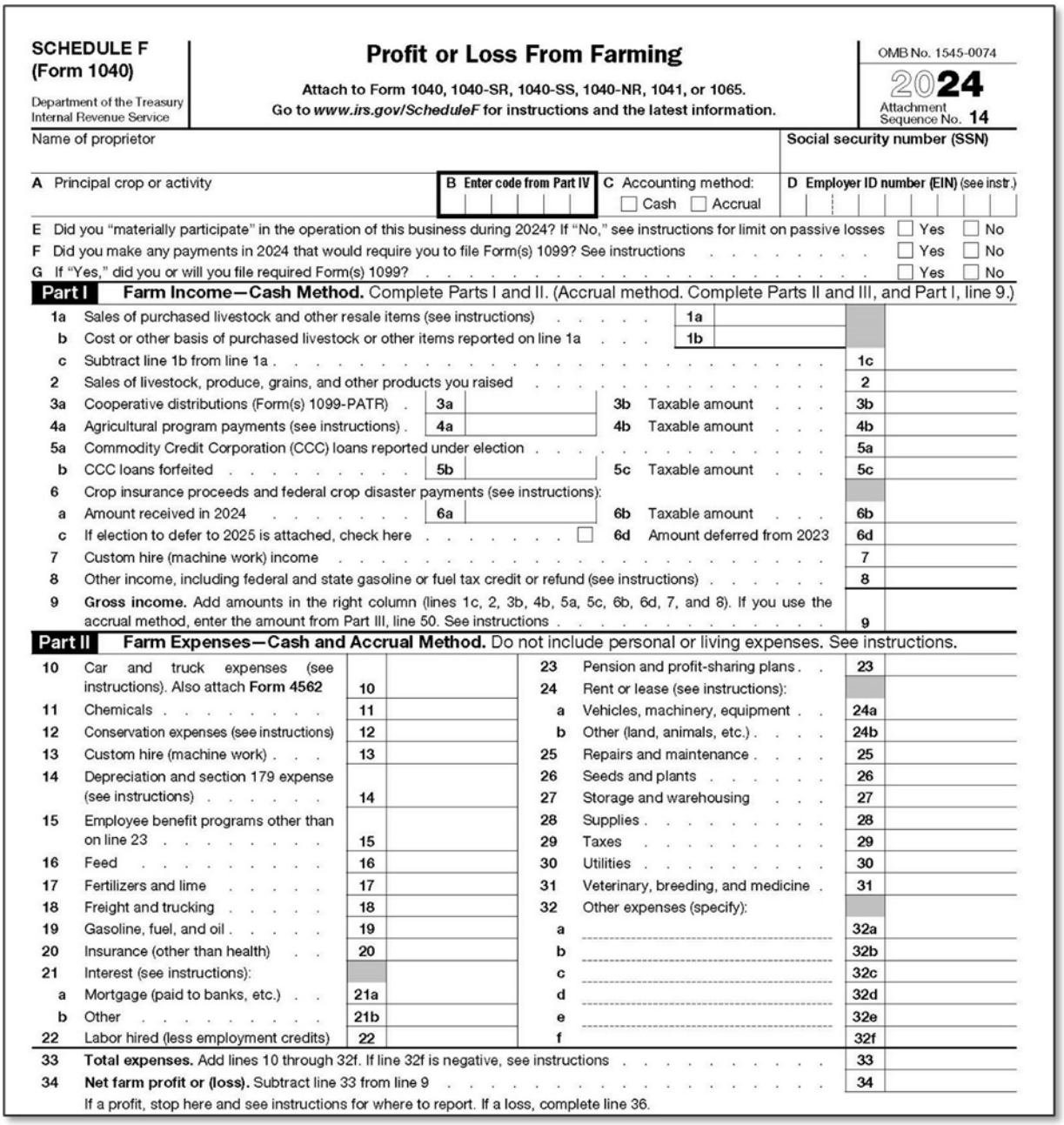
Figure 4 shows a blank IRS Schedule F "Profit or Loss from Farming" form for calendar year 2024. Note that Part I covers **Farm Income** from sale of agricultural products and other sources. Part II covers **Farm Expenses** across 32 categories. Line 34 combines income and expenses to reveal the farm's overall net profit or loss.

Using Schedule F "Profit or Loss from Farming" data posed several advantages and disadvantages, including:

Key Advantages of Using IRS Schedule F "Profit or Loss from Farming" Data:

- **Availability of Data**. Every agricultural operation with more than $1,000 in sales revenue must file a Schedule F form with its federal tax returns. This means San Diego County producers have their profit and loss data already compiled and available from multiple years. They do not need to expend time and effort to generate the numbers from scratch.
- **Accuracy of Data**. Given the risk of audits, fines, and imprisonment associated with federal income tax filings, it is reasonable to assume that Schedule F data have a high level of accuracy compared to what might be generated through alternative approaches.
- **Appropriate Level of Precision**. This study assesses profitability, which is exactly what Schedule F does. With 32 types of farming expenses, Schedule F financial data represent a suitable level of detail for this study's purposes. One of those expenses, "Chemicals," offers an example. Unlike a detailed U.C. Davis cost & return analysis, this study does not need to specify the types and names of various chemicals used, their individual costs per gallon, the months when each chemical is applied, the means of application, nor the amounts applied. Instead, the "Chemicals" total dollar value from Line 11 of a producer's Schedule F is sufficient.

Figure 4. Blank Schedule F "Profit or Loss from Farming" Form (2024)



SCHEDULE F (Form 1040)
Department of the Treasury
Internal Revenue Service

Profit or Loss From Farming

Attach to Form 1040, 1040-SR, 1040-SS, 1040-NR, 1041, or 1065.
Go to *www.irs.gov/ScheduleF* for instructions and the latest information.

OMB No. 1545-0074
2024
Attachment Sequence No. 14

Name of proprietor | Social security number (SSN)

A Principal crop or activity | B Enter code from Part IV | C Accounting method: ☐ Cash ☐ Accrual | D Employer ID number (EIN) (see instr.)

E Did you "materially participate" in the operation of this business during 2024? If "No," see instructions for limit on passive losses ☐ Yes ☐ No
F Did you make any payments in 2024 that would require you to file Form(s) 1099? See instructions ☐ Yes ☐ No
G If "Yes," did you or will you file required Form(s) 1099? ☐ Yes ☐ No

Part I **Farm Income—Cash Method.** Complete Parts I and II. (Accrual method. Complete Parts II and III, and Part I, line 9.)

1a	Sales of purchased livestock and other resale items (see instructions)			1a			
b	Cost or other basis of purchased livestock or other items reported on line 1a			1b			
c	Subtract line 1b from line 1a					1c	
2	Sales of livestock, produce, grains, and other products you raised					2	
3a	Cooperative distributions (Form(s) 1099-PATR)	3a		3b	Taxable amount	3b	
4a	Agricultural program payments (see instructions)	4a		4b	Taxable amount	4b	
5a	Commodity Credit Corporation (CCC) loans reported under election					5a	
b	CCC loans forfeited	5b		5c	Taxable amount	5c	
6	Crop insurance proceeds and federal crop disaster payments (see instructions):						
a	Amount received in 2024	6a		6b	Taxable amount	6b	
c	If election to defer to 2025 is attached, check here ☐			6d	Amount deferred from 2023	6d	
7	Custom hire (machine work) income					7	
8	Other income, including federal and state gasoline or fuel tax credit or refund (see instructions)					8	
9	**Gross income.** Add amounts in the right column (lines 1c, 2, 3b, 4b, 5a, 5c, 6b, 6d, 7, and 8). If you use the accrual method, enter the amount from Part III, line 50. See instructions					9	

Part II **Farm Expenses—Cash and Accrual Method.** Do not include personal or living expenses. See instructions.

10	Car and truck expenses (see instructions). Also attach **Form 4562**	10		23	Pension and profit-sharing plans	23	
11	Chemicals	11		24	Rent or lease (see instructions):		
12	Conservation expenses (see instructions)	12		a	Vehicles, machinery, equipment	24a	
13	Custom hire (machine work)	13		b	Other (land, animals, etc.)	24b	
14	Depreciation and section 179 expense (see instructions)	14		25	Repairs and maintenance	25	
15	Employee benefit programs other than on line 23	15		26	Seeds and plants	26	
16	Feed	16		27	Storage and warehousing	27	
17	Fertilizers and lime	17		28	Supplies	28	
18	Freight and trucking	18		29	Taxes	29	
19	Gasoline, fuel, and oil	19		30	Utilities	30	
20	Insurance (other than health)	20		31	Veterinary, breeding, and medicine	31	
21	Interest (see instructions):			32	Other expenses (specify):		
a	Mortgage (paid to banks, etc.)	21a		a		32a	
b	Other	21b		b		32b	
22	Labor hired (less employment credits)	22		c		32c	
				d		32d	
				e		32e	
				f		32f	
33	**Total expenses.** Add lines 10 through 32f. If line 32f is negative, see instructions					33	
34	**Net farm profit or (loss).** Subtract line 33 from line 9					34	

If a profit, stop here and see instructions for where to report. If a loss, complete line 36.

Key Disadvantages of Using Schedule F "Profit or Loss from Farming" Data:

- **Understandable Hesitancy among Producers.** Producers were understandably hesitant to provide their Schedule F data. The reticence was partially mitigated by producers providing their sensitive financial information not to a government agency, but rather to the consulting firm tasked with doing the research. Producers were not required to submit identifying

information; most producers submitted their information under conditions of confidentiality while others did so anonymously.

- **Not Crop-Specific**. The fact that agricultural operators often produce more than one commodity on a single farm complicates matters. Producers are required to indicate their "Principal crop or activity" on Line A at the top of Schedule F. Nearly all avocado producers who participated in this study, for example, had typed "AVOCADOS" into Line A. But many farms grow multiple crops, for instance farms diversifying from avocados into dragon fruit. Producers of the other three focal commodities were even more diversified. Lemons, for example, often occur with other citrus crops. Producers usually (but not always) produce strawberries and tomatoes in tandem with several other commodities, especially vegetables.
- **No Explicit Focus on Water**. Producers have raised concerns about the alarming rise in water costs. Similar to the USDA Census of Agriculture survey form, however, Schedule F lumps water into a larger "Utilities" category. Teasing out the specific water costs required additional data collection and analysis.
- **No Indication of Farm Size**. Similar to a typical U.C. Davis cost & return study, analysis in this study occurs on a 'per acre' basis. Per-acre analysis allows for comparisons across commodities, farms, and years. Schedule F, however, does not indicate farm size. This required follow up with producers to document their precise acreage.

COLLECTING SCHEDULE F & SIMILAR FINANCIAL DATA

A total of twelve producers, mostly avocado producers, submitted their Schedule F and similar financial data. They did so through multiple means:

- Online Questionnaire. Two producers responded to an anonymous questionnaire via a link distributed online and by email with the assistance of the San Diego County Farm Bureau. **Appendix A** shows a flyer used to encourage producers to complete the questionnaire.
- Email & Text Messages. One producer submitted a photo of Schedule F as a text message attachment. Two producers attached theirs to email messages. **Appendix B** shows Schedule F examples received from two avocado producers. **Appendix C** shows an especially detailed example of cost data provided by an avocado producer. The producer emailed an Excel spreadsheet containing data exported from the producer's financial management software. The data specify the producer's actual costs averaged over a three-year period ending in 2023.
- In Person at a SALC 2.0 Open House. Four producers brought their financial data to the July 24, 2024, SALC 2.0 Open House hosted at the San Diego County Farm Bureau. Submissions ranged from a piece of paper with handwritten numbers to copies of actual Schedule F forms. One producer provided a printed IRS Form 1065 "Return of Partnership" form used by business partnerships to report "pass through" income, gains, losses, deductions, credits, etc. Another producer shared a detailed printout from a financial management software program that documented every single expense for an entire year. In addition to providing these

quantitative data, several attendees also provided qualitative feedback by indicating which of 22 common expenses were most costly for their operation.

- In Person at the Avocado Growers of California Meeting. Three avocado producers provided Schedule F data during or shortly after the July 25, 2024, meeting of the Avocado Growers of California held in Pala, CA. That meeting, attended by an estimated two dozen avocado producers, included a brief SALC 2.0 project presentation by a member of the research team, followed by questions and answers.

D. Additional Data Collection Sources & Methods

Several other data collection methods supplemented the quantitative data that producers provided through their Schedule F forms and related documents:

- **Direct Observations on Farms**. Visits to seven farms offered opportunities to observe production practices and costs firsthand. Farms were selected on an opportunistic basis. Two farms primarily grew strawberries and tomatoes. The other five focused on avocados. Farms visited ranged in size from 1 to 250 acres. Visits lasted one to two hours and included walking the property to document types of production expenses, as well as costs. Each host received an honorarium of $100 per hour**. Figures 6, 7, 8,** and **10** include photos of expenses and other topics from these farm visits.

Figure 5. Examples of Local Produce Sold at Roadside Farm Stands

Roadside farm stands provided supplemental information on retail prices for tomatoes, avocados and many other agricultural commodities.

- **Direct Observations at Other Venues**. Visits to other venues provided additional context. Examples included: 1) the July 25, 2024, meeting of the Avocado Growers of California held in Pala, CA; 2) three separate farm stands that sold local products (**Figure 5**); 3) a local agricultural supply store (**Figure 6**); and 4) and a popular farmers' market to observe prices customers paid for each of the four focal commodities, including products grown by one of the farm visit hosts.

Figure 6. Examples of Supplies Purchased by Producers

Staff at a local agricultural supply store provided lists and prices of items that producers of avocados, citrus and other commodities often purchase. The photos below provide examples: irrigation tubing, rubber gloves and other personal protection equipment, gypsum soil conditioner, wooden stakes, fertilizer, PVC pipes and corrugated drainpipe.

- **Personal Interviews with Producers**. Formal and informal interviews with producers yielded extensive quantitative and qualitative data on production costs and revenues. Interviews mostly took place during farm visits but also occurred at two producer gatherings, two farm stands, a farmers' market, and by phone. Interviews with two avocado orchard managers and one farm stand operator were conducted in Spanish.[9]

[9] For an introduction to the topic, see Grandmaison, L. and P. F. Martinez (2024) report Violent and Vibrant: Mexico's Avocado Boom and Organized Crime. Geneva, Switzerland: The Global Initiative Against Transnational Organized Crime.

- **Review of Key Documents**. In addition to U.C. Davis cost & return studies, Schedule F "Profit or Loss form Farming," and other documents already mentioned, a diverse body of literature informed the analysis. Key documents spanned formal and informal outlets, published and unpublished sources, public and privately held. Examples include:

    - *County of San Diego Crop Statistics & Annual Report*. The annual reports produced by the Department of Agriculture, Weights & Measures provided supplemental data on acres, yields, prices, and gross revenues for each of the fou r focal commodities. The reports span several decades, which revealed long-term trends. To download reports, please visit: https://awmsdcropreport.com/.

    - USDA Census of Agriculture Data for San Diego County. In early 2023, producers representing more than four thousand San Diego County agricultural operations provided detailed 2022 financial data for the USDA Census of Agriculture. *Financial data submitted closely matched what producers report on their Schedule F forms.* The data became available in 2024 and featured prominently in the SALC 2.0 "Market Analysis" report, ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***. Please consult the USDA Census of Agriculture website for raw data and other information: https://www.nass.usda.gov/AgCensus/.

    - Additional Gray Literature. A wide range of miscellaneous documents informed the analysis, for example: 1) brochures and flyers for various programs designed to support agriculture (e.g. grants for composting and crop switching); 2) promotional materials from farms (e.g., websites, social media posts, blog posts, newsletters); 3) farm records (e.g., water bills, receipts, permits, and exports from financial management software); 4) laws and regulations (e.g., regarding water, labor); 5) internal communications (e.g. letters, memoranda, emails); 6) news media coverage (e.g., newspaper and magazine articles, television stories); and 7) relevant studies such as the March 2024 "Economic Contribution and Ecosystem Service Value of Avocados in the Escondido Area," produced by ERA Economics under contract to the California Avocado Commission.

Quantitative data analysis consisted of summary statistics, especially means, for costs, yields, prices, and related variables. Qualitative data analysis entailed transcribing and organizing raw case data from personal interviews and direct observations, then comparatively analyzing detailed case logs to identify important patterns, themes, and differences.

STUDY LIMITATIONS. No data collection and analysis effort is perfect, including this one. Shortcomings include reliance on existing U.C. Davis cost & return studies, a small sample size,

and uneven data across the four focal commodities. Also, if study participants experienced unusually large expenses in a given year, for example by purchasing or repairing large equipment, then that could impact per-acre estimates of costs.

Important caveats and disclaimers that appear in a typical U.C. Davis cost & return report apply to this study, as well. Readers of this report should bear in mind that:

- "*The study is intended as a guide only . . .*" [10]
- "*. . . cultural practices and material input costs will vary by grower and region, and can be significant. The practices and inputs used in the cost study serve as a guide only*." [11]
- "*Production practices, overhead costs, and methods of calculations used in this study . . . may not apply to all farms as production practices may vary among growers*." [12]

As this lengthy section has detailed, the study entailed significant measures to generate financial data of sufficient quantity and quality. The hybrid approach combined multiple methods, multiple researchers, and multiple types of data (quantitative and qualitative) to balance breadth with depth. Overall, the data collected are deemed sufficient to answer the study's main research questions. For additional methodological details, please consult the authors.

[10] See page 2 of the Bolda *et al*. 2024 strawberry study cited in the **Methods** section.
[11] See page 3 of the Aegerter *et al*. 2023 tomato study cited in the **Methods** section.
[12] See page 3 of the Takele *et al*. 2020 lemon study cited in the **Methods** section.

RESULTS & DISCUSSION

This section presents key findings for the four focal commodities. Each subsection answers seven research questions for the given crop:

- Question 1 explores *production costs*
- Questions 2-4 examine per-acre returns above *operating*, *cash*, and *total* costs.
- Questions 5-7 delve into aggregated countywide returns above *operating*, *cash*, and *total costs* based on the number of acres of the given crop that exist in San Diego County.

As the **Methods** section details, estimates are based on hypothetical farms in 2022, the most recent year for which comprehensive data were available. Interested readers can adjust the values for costs, yields and prices using the Excel-based Agricultural Profitability Assessment Tool (AG-PAT) described at the end of this section.

Focal Commodity #1: AVOCADO Net Returns and Ranging Analysis Per Acre and Countywide

This section explores the research question: ***How profitable is San Diego County avocado production?*** The discussion begins with an overview of costs to produce avocados, followed by per-acre returns above *operating*, *cash*, and *total* costs. The section ends with an examination of aggregated countywide returns based on San Diego County's total number of avocado acres.

Costs to Produce Avocados

1. **What are the estimated costs per acre to produce avocados in San Diego County? Table 1** shows estimated costs per acre to produce avocados in San Diego County for the 2022 calendar year. Operating costs comprised the largest portion at $5,446. Cash overhead expenses ($765) brought the total cash costs to $6,211. Adding non-cash overhead ($208) raised total costs to $6,419 per acre.

Table 1. Estimated Costs Per Acre to Produce Avocados in San Diego County in 2022

OPERATING COST	2022 ESTIMATE	% of Total Costs
Water	$2,600	40.5%
Fertilizer	$267	4.2%
Chemicals (insecticides, rodenticide, disease control, herbicides)	$858	13.4%

Custom Hires (seeding, pest control, road repair, etc.)	$100	1.6%
Hired Labor (equipment operators, pruning, irrigation labor, etc.)	$50	0.8%
Machinery Operation (fuel, lubricants and repairs)	$150	2.3%
Harvest (picking, hauling, CAC fees)	$1,250	19.5%
Interest on Operating Capital	$171	2.7%
Total Operating Costs/Acre:	**$5,446**	
CASH OVERHEAD		
Property taxes	$67	1.0%
Office expenses	$243	3.8%
Insurance (property, liability)	$63	1.0%
Various analyses (soil, leaf, etc.)	$309	4.8%
Repairs on Investments (buildings, certain equipment, etc.)	$83	1.3%
Total Cash Overhead Costs/Acre:	**$765**	
Total Cash Costs/Acre (Operating + Overhead)	**$6,211**	
NON- CASH OVERHEAD	$208	3.2%
(Includes Depreciation and Capital Recovery, e.g., buildings irrigation systems, establishment costs, land, etc.)		
Total Costs/Acre (All Cash & Non-Cash Costs)	**$6,419**	**100.0%**

Discussion of Avocado Costs. The results show that, for our hypothetical avocado orchard, the largest production cost was water at $2,600 per acre and 40.5% of total costs. A 2024 study commissioned by the California Avocado Commission showed that water can account for an even higher portion of production costs (up to 60%) in San Diego County.[13]

Water more than doubled the second ranked cost, harvesting, at $1,250 and 19.5%. Harvesting consists of picking and hauling avocados, plus fees paid to the California Avocado Commission.[14] Chemicals ranked third among costs at $858 per acre and 13.4% of total costs.

Avocado production cost estimates benefited significantly from primary data provided directly by producers. These include the example submissions noted in the **Methods** section and especially the detailed, multi-year example in **Appendix C**. Interviews and avocado orchard visits also

[13] ERA Economics, March 2024: "Economic Contribution and Ecosystem Service Value of Avocados in the Escondido Area," by ERA Economics under contract to the California Avocado Commission.

[14] For additional information about fees paid to the California Avocado Commission, see: https://www.californiaavocadogrowers.com/commission/assessment-rate-form.

provided deeper insights into production costs for water (**Figure 7**) and various other expenses (**Figure 8**).

For detailed descriptions of common production practices and expenses, please consult the relevant U.C. Davis avocado cost & return study.[15] As noted earlier, that study assessed a San Diego County avocado orchard with nearly three times the usual plant density which affected costs and yields. The study also factored the plant establishment phase into the calculations, i.e. costs incurred during the years before plants began to bear fruit.

Figure 7. Examples of Water-related Infrastructure in Avocado Orchards

Per-unit charges for irrigation water have exploded in recent years across much of San Diego County. Producers must also pay for water-related infrastructure, including wells, pumps, pipes, fertigation and other items shown in the photos below.

[15] See Takele *et al*. 2020 cited in the **Methods** section.

Figure 8. Examples of Other (Non-Water) Costs to Produce Avocados

Photos show selected examples of various (non-water) infrastructure and equipment costs to produce avocados, including tractor, ATV, pickup, bin, rodent control, electricity (solar), pollination, sanitation, mulch, chemicals, and a transplant with a stake. Photos taken during producer-hosted farm visits in mid-2024.

Net Returns Per Acre for Avocados

2. **What are the net returns per acre above *operating costs* for avocados at varying yields and prices?** The ranging analysis in **Table 2** examines net returns above *operating costs* based on different scenarios. The midpoint scenario, 5,900 pounds per acre at $1.65 per pound, resulted in a positive return of $4,289 per acre (79%). The worst- and best-case scenarios produced returns of -$2,720 (-50%) and $14,803 (272%), respectively. *In **Table 2**, and in all twenty-three ranging analysis tables that follow, break-even points occur between the last red-shaded cell in a column and the first green-shaded cell.*

Table 2. Net Returns Per Acre above *Operating Costs* for Avocados at Varying Yields and Prices

			Yield Ranges (lbs/acre)				
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$2,720 -50%	-$2,331 -43%	-$1,941 -36%	-$1,552 -28%	-$1,163 -21%	-$773 -14%	-$384 -7%
$0.99	-$1,357 -25%	-$773 -14%	-$189 -3%	$395 7%	$979 18%	$1,563 29%	$2,147 39%
$1.32	$6 0%	$784 14%	$1,563 29%	$2,342 43%	$3,121 57%	$3,900 72%	$4,678 86%
$1.65	$1,369 25%	$2,342 43%	$3,316 61%	$4,289 79%	$5,263 97%	$6,236 115%	$7,210 132%
$1.98	$2,731 50%	$3,900 72%	$5,068 93%	$6,236 115%	$7,404 136%	$8,572 157%	$9,741 179%
$2.31	$4,094 75%	$5,457 100%	$6,820 125%	$8,183 150%	$9,546 175%	$10,909 200%	$12,272 225%
$2.64	$5,457 100%	$7,015 129%	$8,572 157%	$10,130 186%	$11,688 215%	$13,245 243%	$14,803 272%

3. **What are the net returns per acre above *cash costs* for avocados at varying yields and prices? Table 3** examines net returns above *cash costs* for varying yield and price scenarios. The midpoint scenario, 5,900 pounds per acre at $1.65 per pound, resulted in a positive return of $3,524 per acre (57%). The worst- and best-case scenarios produced returns of -$3,485 (-56%) and $14,038 (226%), respectively.

Table 3. Net Returns Per Acre above *Cash Costs* for Avocados at Varying Yields and Prices

	Yield Ranges (lbs/acre)						
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$3,485 -56%	-$3,096 -50%	-$2,706 -44%	-$2,317 -37%	-$1,928 -31%	-$1,538 -25%	-$1,149 -18%
$0.99	-$2,122 -34%	-$1,538 -25%	-$954 -15%	-$370 -6%	$214 3%	$798 13%	$1,382 22%
$1.32	-$759 -12%	$19 0%	$798 13%	$1,577 25%	$2,356 38%	$3,135 50%	$3,913 63%
$1.65	$604 10%	$1,577 25%	$2,551 41%	$3,524 57%	$4,498 72%	$5,471 88%	$6,445 104%
$1.98	$1,966 32%	$3,135 50%	$4,303 69%	$5,471 88%	$6,639 107%	$7,807 126%	$8,976 145%
$2.31	$3,329 54%	$4,692 76%	$6,055 97%	$7,418 119%	$8,781 141%	$10,144 163%	$11,507 185%
$2.64	$4,692 76%	$6,250 101%	$7,807 126%	$9,365 151%	$10,923 176%	$12,480 201%	$14,038 226%

4. **What are the net returns per acre above *total costs* for avocados at varying yields and prices?** The ranging analysis in **Table 4** examines net returns above *total costs* based on different scenarios. The midpoint scenario, 5,900 pounds per acre at $1.65 per pound, resulted in a positive return of $3,316 per acre (52%). The worst- and best-case scenarios produced returns of -$3,693 (-58%) and $13,830 (215%), respectively.

Table 4. Net Returns Per Acre above *Total Costs* for Avocados at Varying Yields and Prices

	Yield Ranges (lbs/acre)						
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$3,693 -58%	-$3,304 -51%	-$2,914 -45%	-$2,525 -39%	-$2,136 -33%	-$1,746 -27%	-$1,357 -21%
$0.99	-$2,330 -36%	-$1,746 -27%	-$1,162 -18%	-$578 -9%	$6 0%	$590 9%	$1,174 18%
$1.32	-$967 -15%	-$189 -3%	$590 9%	$1,369 21%	$2,148 33%	$2,927 46%	$3,705 58%
$1.65	$396 6%	$1,369 21%	$2,343 36%	$3,316 52%	$4,290 67%	$5,263 82%	$6,237 97%
$1.98	$1,758 27%	$2,927 46%	$4,095 64%	$5,263 82%	$6,431 100%	$7,599 118%	$8,768 137%
$2.31	$3,121 49%	$4,484 70%	$5,847 91%	$7,210 112%	$8,573 134%	$9,936 155%	$11,299 176%
$2.64	$4,484 70%	$6,042 94%	$7,599 118%	$9,157 143%	$10,715 167%	$12,272 191%	$13,830 215%

Discussion of Net Returns Per Acre for Avocados. Whereas the previous subsection detailed costs to produce avocados, the three tables in this subsection have highlighted the critical influence of price and yield on profitability. When price and yield are both low, avocado orchards lose money. When price and yield both run high, avocado orchards generate positive returns.

At the mid-point value of 5,900 pounds per acre, the avocado price needed to break even on *operating costs* was $0.92 per pound. To break even based on *total costs* required $1.09 per pound.

As noted earlier, break-even points in each table occur between the last red-shaded cell in a column and the first green-shaded cell. Based on *total costs* (**Table 4**), an operation could break even and then cross into positive returns *either* at 5,310 tons per acre sold at $1.32 *or* at higher yield of 6,490 tons sold for a lower price of $0.99.

For perspective, the U.C. Davis cost & return study of high-density avocado production in San Diego County assumed an average price of $1.32 per pound. The return above *cash costs* was estimated at $6,260 per acre. That return far exceeds anything in the $1.32 row in **Table 3** because the study farm had nearly triple the number of trees per acre, with an average yield of 16,220 pounds.

Aggregated Estimates for San Diego County

5. **What is the estimated countywide net return for above *operating costs* for avocados at varying yields and prices? Table 5** shows aggregated countywide returns above *operating costs* for avocados after multiplying the per-acre figures from earlier (**Table 2**) by the 12,597 bearing acres of avocados estimated to exist in the county in 2022.

Table 5. San Diego County Aggregated Net Returns above *Operating Costs* for Avocados at Varying Yields and Prices

	Yield Ranges (lbs/acre)						
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$34,266,359 -50%	-$29,361,088 -43%	-$24,455,816 -36%	-$19,550,544 -28%	-$14,645,272 -21%	-$9,740,000 -14%	-$4,834,729 -7%
$0.99	-$17,097,908 -25%	-$9,740,000 -14%	-$2,382,093 -3%	$4,975,815 7%	$12,333,723 18%	$19,691,630 29%	$27,049,538 39%
$1.32	$70,543 0%	$9,881,087 14%	$19,691,630 29%	$29,502,174 43%	$39,312,718 57%	$49,123,261 72%	$58,933,805 86%
$1.65	$17,238,995 25%	$29,502,174 43%	$41,765,354 61%	$54,028,533 79%	$66,291,713 97%	$78,554,892 115%	$90,818,072 132%
$1.98	$34,407,446 50%	$49,123,261 72%	$63,839,077 93%	$78,554,892 115%	$93,270,707 136%	$107,986,523 157%	$122,702,338 179%
$2.31	$51,575,897 75%	$68,744,348 100%	$85,912,800 125%	$103,081,251 150%	$120,249,702 175%	$137,418,154 200%	$154,586,605 225%
$2.64	$68,744,348 100%	$88,365,436 129%	$107,986,523 157%	$127,607,610 186%	$147,228,697 215%	$166,849,784 243%	$186,470,872 272%

6. **What is the estimated countywide net return above *cash costs* for avocados at varying yields and prices? Table 6** repeats the previous table but for *cash costs*. It shows the aggregated countywide returns above *cash costs* for avocados after multiplying the per-acre figures from earlier (**Table 3**) by the 12,597 bearing acres of avocados estimated to exist in the county in 2022.

Table 6. San Diego County Aggregated Net Returns above *Cash Costs* for Avocados at Varying Yields and Prices

	Yield Ranges (lbs/acre)						
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$43,903,064 -56%	-$38,997,793 -50%	-$34,092,521 -44%	-$29,187,249 -37%	-$24,281,977 -31%	-$19,376,705 -25%	-$14,471,434 -18%
$0.99	-$26,734,613 -34%	-$19,376,705 -25%	-$12,018,798 -15%	-$4,660,890 -6%	$2,697,018 3%	$10,054,925 13%	$17,412,833 22%
$1.32	-$9,566,162 -12%	$244,382 0%	$10,054,925 13%	$19,865,469 25%	$29,676,013 38%	$39,486,556 50%	$49,297,100 63%
$1.65	$7,602,290 10%	$19,865,469 25%	$32,128,649 41%	$44,391,828 57%	$56,655,008 72%	$68,918,187 88%	$81,181,367 104%
$1.98	$24,770,741 32%	$39,486,556 50%	$54,202,372 69%	$68,918,187 88%	$83,634,002 107%	$98,349,818 126%	$113,065,633 145%
$2.31	$41,939,192 54%	$59,107,643 76%	$76,276,095 97%	$93,444,546 119%	$110,612,997 141%	$127,781,449 163%	$144,949,900 185%
$2.64	$59,107,643 76%	$78,728,731 101%	$98,349,818 126%	$117,970,905 151%	$137,591,992 176%	$157,213,079 201%	$176,834,167 226%

7. **What is the estimated countywide net return above *total costs* for avocados at varying yields and prices? Table 7** repeats the previous two tables but for *total costs*. It shows the aggregated countywide returns above *total costs* for avocados after multiplying the per-acre figures from earlier (**Table 4**) by the 12,597 bearing acres of avocados estimated to exist in the county in 2022.

Table 7. San Diego County Aggregated Net Returns above *Total Costs* for Avocados at Varying Yields and Prices

	Yield Ranges (lbs/acre)						
$/lbs	4,130	4,720	5,310	**5,900**	6,490	7,080	7,670
$0.66	-$46,523,240 -58%	-$41,617,969 -51%	-$36,712,697 -45%	-$31,807,425 -39%	-$26,902,153 -33%	-$21,996,881 -27%	-$17,091,610 -21%
$0.99	-$29,354,789 -36%	-$21,996,881 -27%	-$14,638,974 -18%	-$7,281,066 -9%	$76,842 0%	$7,434,749 9%	$14,792,657 18%
$1.32	-$12,186,338 -15%	-$2,375,794 -3%	$7,434,749 9%	$17,245,293 21%	$27,055,837 33%	$36,866,380 46%	$46,676,924 58%
$1.65	$4,982,114 6%	$17,245,293 21%	$29,508,473 36%	$41,771,652 52%	$54,034,832 67%	$66,298,011 82%	$78,561,191 97%
$1.98	$22,150,565 27%	$36,866,380 46%	$51,582,196 64%	$66,298,011 82%	$81,013,826 100%	$95,729,642 118%	$110,445,457 137%
$2.31	$39,319,016 49%	$56,487,467 70%	$73,655,919 91%	$90,824,370 112%	$107,992,821 134%	$125,161,273 155%	$142,329,724 176%
$2.64	$56,487,467 70%	$76,108,555 94%	$95,729,642 118%	$115,350,729 143%	$134,971,816 167%	$154,592,903 191%	$174,213,991 215%

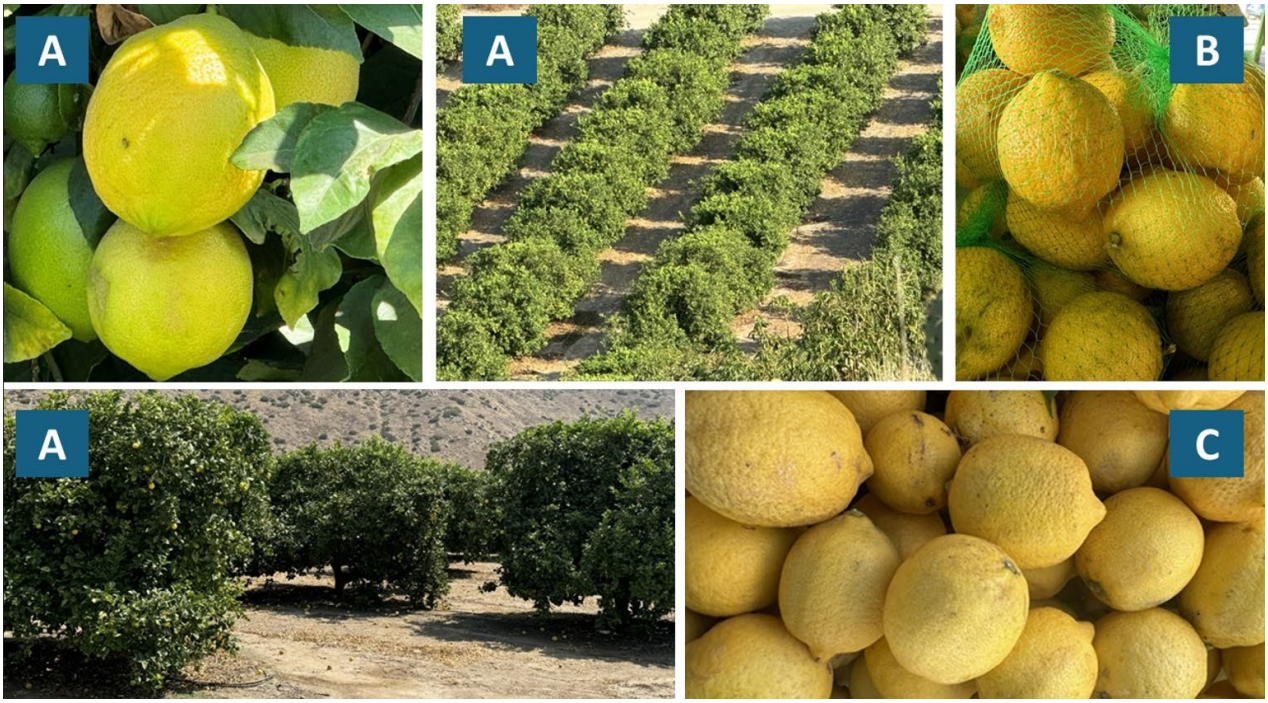
Discussion of Estimated Countywide Net Return for Avocados. This subsection has expanded the per-acre analysis from a single orchard to total acres actively producing avocados in San Diego County. The countywide results provide public and private-sector stakeholders with a snapshot of avocado net returns under various scenarios. Readers who want to explore alternative scenarios are encouraged to use the Agricultural Profitability Assessment Tool ("AG-PAT", available under the SALC 2.0 webpage at www.sdlafco.org) to adjust water, labor, yields, prices, acreage and more than a dozen other parameters.

Focal Commodity #2: LEMON Net Returns and Ranging Analysis Per Acre and Countywide

This section explores the research question: ***How profitable is San Diego County lemon production?*** The discussion begins with an overview of costs to produce Eureka lemons (the dominant variety in San Diego County), followed by per-acre returns above *operating*, *cash*, and *total* costs. The section ends with an examination of aggregated countywide returns based on San Diego County's total number of lemon acres.

Figure 9: San Diego County Lemons

Lemons being grown in an orchard (A), for sale at a local farm stand (B), and for sale at one of San Diego County's many farmers' markets (C).



Costs to Produce Lemons

8. **What are the estimated costs per acre to produce lemons in San Diego County? Table 8** shows estimated costs per acre to produce lemons in San Diego County for the 2022 calendar year. Operating costs comprised the largest portion at $11,519. Cash overhead expenses ($1,380) brought the total cash costs to $12,899. Adding non-cash overhead ($5,760) raised total costs to $18,659 per acre.

Table 8. Estimated Costs Per Acre to Produce Lemons in San Diego County in 2022

OPERATING COST	2022 ESTIMATE	% of Total Costs
Water	$800	4.3%
Fertilizer	$170	0.9%
Chemicals (insecticides, pest control, disease control, etc.)	$547	2.9%
Custom Hires (pest control, etc.)	$133	0.7%
Labor (incl. contracts)	$793	4.2%
Machinery Operation (fuel, lubricants and repairs)	$36	0.2%
Others (e.g., frost protection)	$583	3.1%
Harvest (picking, hauling, sorting, packing)	$8,175	43.8%
Assessments (CPDPP, State Marketing Order, etc.)	$120	0.6%
Interest on Operating Capital	$162	0.9%
Total Operating Costs/Acre:	**$11,519**	
CASH OVERHEAD		
Property taxes	$938	5.0%
Office expenses	$160	0.9%
Insurance (property, liability)	$107	0.6%
Various analyses and fees (soil, leaf, irrigation waiver, etc.)	$37	0.2%
Repairs on Investments (buildings, certain equipment, etc.)	$78	0.4%
Others (field sanitation, food safety, etc.)	$60	0.3%
Total Cash Overhead Costs/Acre:	**$1,380**	
Total Cash Costs/Acre (Operating + Overhead)	**$12,899**	
NON- CASH OVERHEAD	$5,760	30.9%
(Includes Depreciation and Capital Recovery, e.g., buildings irrigation systems, establishment costs, land, etc.)		
Total Costs/Acre (All Cash & Non-Cash Costs)	**$18,659**	**100.0%**

Discussion of Lemon Costs. The results show that, for our hypothetical lemon orchard, the largest production cost was harvest at $8,175 per acre and 43.8% of total costs. Non-cash overhead was the second highest cost at $5,760 and 30.9%. Water ranked a distant third at $800 (4.3%), followed closely by labor at $793 (4.2%).

In contrast to the avocado production cost estimates, lemon cost estimates did not benefit from primary data provided by willing San Diego County lemon producers. Estimates were derived

primarily from the relevant U.C. Davis cost & return study cited earlier, which also provides detailed descriptions of lemon production practices.[16]

Net Returns Per Acre for Lemons

9. **What are the net returns per acre above *operating costs* for lemons at varying yields and prices?** The ranging analysis in **Table 9** examines net returns above *operating costs* based on different scenarios. The midpoint scenario, 900 cartons per acre (at 37.5 pounds per carton) sold for $26.00 per carton, resulted in a positive return of $11,881 per acre (103%). The worst- and best-case scenarios produced returns of minus $4,967 (-43%) and $37,153 (323%), respectively.

Table 9. Net Returns Per Acre above *Operating Costs* for Lemons at Varying Yields and Prices

	Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$4,967 -43%	-$4,031 -35%	-$3,095 -27%	-$2,159 -19%	-$1,223 -11%	-$287 -2%	$649 6%
$15.60	-$1,691 -15%	-$287 -2%	$1,117 10%	$2,521 22%	$3,925 34%	$5,329 46%	$6,733 58%
$20.80	$1,585 14%	$3,457 30%	$5,329 46%	$7,201 63%	$9,073 79%	$10,945 95%	$12,817 111%
$26.00	$4,861 42%	$7,201 63%	$9,541 83%	$11,881 103%	$14,221 123%	$16,561 144%	$18,901 164%
$31.20	$8,137 71%	$10,945 95%	$13,753 119%	$16,561 144%	$19,369 168%	$22,177 193%	$24,985 217%
$36.40	$11,413 99%	$14,689 128%	$17,965 156%	$21,241 184%	$24,517 213%	$27,793 241%	$31,069 270%
$41.60	$14,689 128%	$18,433 160%	$22,177 193%	$25,921 225%	$29,665 258%	$33,409 290%	$37,153 323%

[16] See Takele *et al*. 2020 lemon study cited in the **Methods** section.

10. **What are the net returns per acre above *cash costs* for lemons at varying yields and prices?**
Table 10 examines net returns above *cash costs* for varying yield and price scenarios. The midpoint scenario, 900 cartons per acre at $26.00 per carton, resulted in a positive return of $10,501 per acre (81%). The worst- and best-case scenarios produced returns of minus $6,347 (-49%) and $35,773 (277%), respectively.

Table 10. Net Returns Per Acre above *Cash Costs* for Lemons at Varying Yields and Prices

	Yield Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$6,347 -49%	-$5,411 -42%	-$4,475 -35%	-$3,539 -27%	-$2,603 -20%	-$1,667 -13%	-$731 -6%
$15.60	-$3,071 -24%	-$1,667 -13%	-$263 -2%	$1,141 9%	$2,545 20%	$3,949 31%	$5,353 41%
$20.80	$205 2%	$2,077 16%	$3,949 31%	$5,821 45%	$7,693 60%	$9,565 74%	$11,437 89%
$26.00	$3,481 27%	$5,821 45%	$8,161 63%	$10,501 81%	$12,841 100%	$15,181 118%	$17,521 136%
$31.20	$6,757 52%	$9,565 74%	$12,373 96%	$15,181 118%	$17,989 139%	$20,797 161%	$23,605 183%
$36.40	$10,033 78%	$13,309 103%	$16,585 129%	$19,861 154%	$23,137 179%	$26,413 205%	$29,689 230%
$41.60	$13,309 103%	$17,053 132%	$20,797 161%	$24,541 190%	$28,285 219%	$32,029 248%	$35,773 277%

11. **What are the net returns per acre above *total costs* for lemons at varying yields and prices?** The ranging analysis in **Table 11** examines net returns above *total costs* based on different scenarios. The midpoint scenario, 900 cartons per acre at $26.00 per carton, resulted in a positive return of $4,741 per acre (25%). The worst- and best-case scenarios produced returns of minus $12,107 (-65%) and $30,013 (161%), respectively.

Table 11. Net Returns Per Acre above *Total Costs* for Lemons at Varying Yields and Prices

	Yield Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$12,107 -65%	-$11,171 -60%	-$10,235 -55%	-$9,299 -50%	-$8,363 -45%	-$7,427 -40%	-$6,491 -35%
$15.60	-$8,831 -47%	-$7,427 -40%	-$6,023 -32%	-$4,619 -25%	-$3,215 -17%	-$1,811 -10%	-$407 -2%
$20.80	-$5,555 -30%	-$3,683 -20%	-$1,811 -10%	$61 0%	$1,933 10%	$3,805 20%	$5,677 30%
$26.00	-$2,279 -12%	$61 0%	$2,401 13%	$4,741 25%	$7,081 38%	$9,421 50%	$11,761 63%
$31.20	$997 5%	$3,805 20%	$6,613 35%	$9,421 50%	$12,229 66%	$15,037 81%	$17,845 96%
$36.40	$4,273 23%	$7,549 40%	$10,825 58%	$14,101 76%	$17,377 93%	$20,653 111%	$23,929 128%
$41.60	$7,549 40%	$11,293 61%	$15,037 81%	$18,781 101%	$22,525 121%	$26,269 141%	$30,013 161%

Discussion of Net Returns Per Acre for Lemons. Whereas the previous subsection detailed costs to produce lemons, the three tables in this subsection have highlighted the critical influence of price and yield on profitability. When price and yield are both low, lemon orchards lose money. When price and yield both run high, lemon orchards generate positive returns.

At the mid-point yield of 900 cartons per acre, lemon price needed to break even on *operating* costs was $12.90 per carton. To break even based on *total* costs required $20.74 per carton.

As noted earlier, break-even points occur between the last red-shaded cell in a column and the first green-shaded cell. Based on *total costs*, for example (**Table 11**), a lemon operation could break even and then cross into positive returns *either* at 900 cartons per acre sold at $20.80 per carton *or* at lower yield of 720 cartons sold for a higher price of $26.00.

For perspective, the U.C. Davis cost & return study of lemon production cited in **Methods** assumed a return based on *total costs* of minus $779 per acre. That scenario assumed a yield of 1,018 cartons per acre and a price of $16.42 per carton.

Aggregated Estimates for San Diego County

12. **What is the estimated countywide net return for above *operating costs* for lemons at varying yields and prices? Table 12** shows aggregated countywide returns above *operating costs* for lemons after multiplying the per-acre figures from earlier (**Table 9**) by the 2,985 acres of bearing lemons estimated to exist in the county in 2022.

Table 12. San Diego County Aggregated Net Returns above *Operating Costs* for Lemons at Varying Yields and Prices

	Yield Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$14,826,495 -43%	-$12,032,535 -35%	-$9,238,575 -27%	-$6,444,615 -19%	-$3,650,655 -11%	-$856,695 -2%	$1,937,265 6%
$15.60	-$5,047,635 -15%	-$856,695 -2%	$3,334,245 10%	$7,525,185 22%	$11,716,125 34%	$15,907,065 46%	$20,098,005 58%
$20.80	$4,731,225 14%	$10,319,145 30%	$15,907,065 46%	$21,494,985 63%	$27,082,905 79%	$32,670,825 95%	$38,258,745 111%
$26.00	$14,510,085 42%	$21,494,985 63%	$28,479,885 83%	$35,464,785 103%	$42,449,685 123%	$49,434,585 144%	$56,419,485 164%
$31.20	$24,288,945 71%	$32,670,825 95%	$41,052,705 119%	$49,434,585 144%	$57,816,465 168%	$66,198,345 193%	$74,580,225 217%
$36.40	$34,067,805 99%	$43,846,665 128%	$53,625,525 156%	$63,404,385 184%	$73,183,245 213%	$82,962,105 241%	$92,740,965 270%
$41.60	$43,846,665 128%	$55,022,505 160%	$66,198,345 193%	$77,374,185 225%	$88,550,025 258%	$99,725,865 290%	$110,901,705 323%

13. **What is the estimated countywide net return above *cash costs* for lemons at varying yields and prices? Table 13** repeats the previous table but for *cash costs*.

Table 13. San Diego County Aggregated Net Returns above *Cash Costs* for Lemons at Varying Yields and Prices

	Yield Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$18,945,795 -49%	-$16,151,835 -42%	-$13,357,875 -35%	-$10,563,915 -27%	-$7,769,955 -20%	-$4,975,995 -13%	-$2,182,035 -6%
$15.60	-$9,166,935 -24%	-$4,975,995 -13%	-$785,055 -2%	$3,405,885 9%	$7,596,825 20%	$11,787,765 31%	$15,978,705 41%
$20.80	$611,925 2%	$6,199,845 16%	$11,787,765 31%	$17,375,685 45%	$22,963,605 60%	$28,551,525 74%	$34,139,445 89%
$26.00	$10,390,785 27%	$17,375,685 45%	$24,360,585 63%	$31,345,485 81%	$38,330,385 100%	$45,315,285 118%	$52,300,185 136%
$31.20	$20,169,645 52%	$28,551,525 74%	$36,933,405 96%	$45,315,285 118%	$53,697,165 139%	$62,079,045 161%	$70,460,925 183%
$36.40	$29,948,505 78%	$39,727,365 103%	$49,506,225 129%	$59,285,085 154%	$69,063,945 179%	$78,842,805 205%	$88,621,665 230%
$41.60	$39,727,365 103%	$50,903,205 132%	$62,079,045 161%	$73,254,885 190%	$84,430,725 219%	$95,606,565 248%	$106,782,405 277%

14. **What is the estimated countywide net return above *total costs* for lemons at varying yields and prices? Table 14** repeats the previous two tables but for *total costs*.

Table 14. San Diego County Aggregated Net Returns above *Total Costs* for Lemons at Varying Yields and Prices

	Yield Ranges (# of 37.5-lb cartons per acre)						
$/carton	630	720	810	**900**	990	1,080	1,170
$10.40	-$36,139,395 -65%	-$33,345,435 -60%	-$30,551,475 -55%	-$27,757,515 -50%	-$24,963,555 -45%	-$22,169,595 -40%	-$19,375,635 -35%
$15.60	-$26,360,535 -47%	-$22,169,595 -40%	-$17,978,655 -32%	-$13,787,715 -25%	-$9,596,775 -17%	-$5,405,835 -10%	-$1,214,895 -2%
$20.80	-$16,581,675 -30%	-$10,993,755 -20%	-$5,405,835 -10%	$182,085 0%	$5,770,005 10%	$11,357,925 20%	$16,945,845 30%
$26.00	-$6,802,815 -12%	$182,085 0%	$7,166,985 13%	$14,151,885 25%	$21,136,785 38%	$28,121,685 50%	$35,106,585 63%
$31.20	$2,976,045 5%	$11,357,925 20%	$19,739,805 35%	$28,121,685 50%	$36,503,565 66%	$44,885,445 81%	$53,267,325 96%
$36.40	$12,754,905 23%	$22,533,765 40%	$32,312,625 58%	$42,091,485 76%	$51,870,345 93%	$61,649,205 111%	$71,428,065 128%
$41.60	$22,533,765 40%	$33,709,605 61%	$44,885,445 81%	$56,061,285 101%	$67,237,125 121%	$78,412,965 141%	$89,588,805 161%

Discussion of Estimated Countywide Net Return for Lemons. This subsection has expanded the per-acre analysis from a single orchard to total acres actively producing lemons in San Diego County. The countywide results provide public and private-sector stakeholders with a snapshot of lemon net returns under various scenarios. Readers who want to explore alternative scenarios are encouraged use the Agricultural Profitability Assessment Tool (AG-PAT) to adjust water, labor, yields, prices, acreage and more than a dozen other parameters.

Focal Commodity #3: STRAWBERRY Net Returns and Ranging Analysis Per Acre and Countywide

This section explores the research question: ***How profitable is San Diego County strawberry production?*** The discussion begins with an overview of costs to produce strawberries, followed by per-acre returns above *operating*, *cash*, and *total* costs. The section ends with an examination of aggregated countywide returns based on San Diego County's total number of strawberry acres.

Costs to Produce Strawberries

15. **What are the estimated costs per acre to produce strawberries in San Diego County? Table 15** shows estimated costs per acre to produce strawberries in San Diego County for the 2022 calendar year. Operating costs comprised the largest portion at $95,124. Cash overhead expenses ($5,345) brought the total cash costs to $100,469. Adding non-cash overhead ($844) raised total costs to $101,313 per acre.

Table 15. Estimated Costs Per Acre to Produce Strawberries in San Diego County in 2022

OPERATING COST	2022 ESTIMATE	% of Total Costs
Water	$742	0.7%
Fertilizer	$774	0.8%
Chemicals (insecticides, fungicide, miticide,)	$1,588	1.6%
Custom Hires (pest control, clean up, etc.)	$5,129	5.1%
Labor (equipment operation, irrigation, etc)	$7,454	7.4%
Contracts (cooling, market/sales fees, etc)	$15,337	15.1%
Machinery operation (fuel, lubricants and repairs)	$855	0.8%
Plants	$3,289	3.2%
Materials (drip tape, mulch, trays, etc.)	$17,090	16.9%
Harvest (picking, hauling, sorting, packing)	$38,837	38.3%
Assessment (strawberry commission)	$202	0.2%
Interest on Operating Capital	$3,827	3.8%
Total Operating Costs/Acre:	**$95,124**	
CASH OVERHEAD		
Property taxes	$42	0.0%
Office expenses	$719	0.7%
Insurance (property, liability)	$20	0.0%
Land rent	$2,877	2.8%
Repairs on Investments (buildings, certain equipment, etc.)	$112	0.1%
Others (food safety, ranch super.)	$1,575	1.6%

Total Cash Overhead Costs/Acre:	**$5,345**	
Total Cash Costs/Acre (Operating + Overhead)	**$100,469**	
NON- CASH OVERHEAD	$844	0.8%
(Includes Depreciation and Capital Recovery, e.g., buildings irrigation systems, establishment costs, land, etc.)		
Total Costs/Acre (All Cash & Non-Cash Costs)	**$101,313**	**100.0%**

Discussion of Strawberry Costs. The results show that, for our hypothetical strawberry operation, the largest production cost was harvest at $38,837 per acre and 38.3% of total costs. Harvest more than doubled the second ranked cost, materials, at $17,090 and 16.9%. Contracts ranked a close third among costs at $15,337 per acre and 15.1% of total costs.

San Diego County strawberry operations vary widely in size and target markets. Larger farms that focus on U-pick, for example, have unique economics with costs for items such as parking lots, picnic tables, food & beverages for guests, staff to manage visitors, advertising, marketing, and significant liability insurance. Smaller operations, including organic ones and farms that produce strawberries in tandem with mixed vegetables, and often sell directly to consumers, have much different economics. Small farms have the added complexity of accounting for unpaid labor, as discussed in the SALC 2.0 report ***Trends, Expenses, and Profitability among San Diego County Agricultural Operations***.

As noted in **Methods**, a strawberry producer who declined to participate in this study said, "*Just get the numbers from the U.C. Davis study*." The most recent and relevant U.C. Davis study – the one that formed the basis of this analysis – was the 2024 study of strawberries in Monterey, Santa Cruz, and San Benito Counties [17] We also consulted similar U.C. Davis strawberry cost & return studies from 2021 (organic production) and from 2022 (conventional production).[18]

[17] See the Bolda *et al*. 2024 strawberry study cited in Methods.

[18] See the Bolda et al. 2022 organic strawberry study cited in Methods, as well as: Bolda, M., Tourte, L., Goodrich, B., and D. Sumner (2021). 2021 Sample Costs to Produce and Harvest Strawberries: Central Coast Region (Santa Cruz, Monterey and San Benito Counties). University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

Figure 10: San Diego County Strawberries

(A) fresh strawberries for sale at farmers' market; (B) strawberries as part of a diversified small farm; (C) strawberry farm infrastructure & equipment (tractor, water, plastic); and D) jars of strawberry jam for sale at a local farm stand.

Net Returns Per Acre for Strawberries

16. **What are the net returns per acre above *operating costs* for strawberries at varying yields and prices?** The ranging analysis in **Table 16** examines net returns above *operating costs* based on different scenarios. The midpoint scenario, 5,500 trays per acre at $11.00 per tray, resulted in a negative return of $34,624 per acre (-36%). The worst- and best-case scenarios produced returns of minus $78,184 (-82%) and plus $30,716 (32%), respectively.

Table 16. Net Returns Per Acre above *Operating Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$78,184 -82%	-$75,764 -80%	-$73,344 -77%	-$70,924 -75%	-$68,504 -72%	-$66,084 -69%	-$63,664 -67%
$6.60	-$69,714 -73%	-$66,084 -69%	-$62,454 -66%	-$58,824 -62%	-$55,194 -58%	-$51,564 -54%	-$47,934 -50%
$8.80	-$61,244 -64%	-$56,404 -59%	-$51,564 -54%	-$46,724 -49%	-$41,884 -44%	-$37,044 -39%	-$32,204 -34%
$11.00	-$52,774 -55%	-$46,724 -49%	-$40,674 -43%	-$34,624 -36%	-$28,574 -30%	-$22,524 -24%	-$16,474 -17%
$13.20	-$44,304 -47%	-$37,044 -39%	-$29,784 -31%	-$22,524 -24%	-$15,264 -16%	-$8,004 -8%	-$744 -1%
$15.40	-$35,834 -38%	-$27,364 -29%	-$18,894 -20%	-$10,424 -11%	-$1,954 -2%	$6,516 7%	$14,986 16%
$17.60	-$27,364 -29%	-$17,684 -19%	-$8,004 -8%	$1,676 2%	$11,356 12%	$21,036 22%	$30,716 32%

17. **What are the net returns per acre above *cash costs* for strawberries at varying yields and prices? Table 17** examines net returns above *cash costs* for varying yield and price scenarios. The midpoint scenario, 5,500 trays per acre at $11.00 per tray, resulted in a negative return of $39,969 per acre (-40%). The worst- and best-case scenarios produced returns of minus $83,529 (-83%) and plus $25,371 (25%), respectively.

Table 17. Net Returns Per Acre above *Cash Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$83,529 -83%	-$81,109 -81%	-$78,689 -78%	-$76,269 -76%	-$73,849 -74%	-$71,429 -71%	-$69,009 -69%
$6.60	-$75,059 -75%	-$71,429 -71%	-$67,799 -67%	-$64,169 -64%	-$60,539 -60%	-$56,909 -57%	-$53,279 -53%
$8.80	-$66,589 -66%	-$61,749 -61%	-$56,909 -57%	-$52,069 -52%	-$47,229 -47%	-$42,389 -42%	-$37,549 -37%
$11.00	-$58,119 -58%	-$52,069 -52%	-$46,019 -46%	-$39,969 -40%	-$33,919 -34%	-$27,869 -28%	-$21,819 -22%
$13.20	-$49,649 -49%	-$42,389 -42%	-$35,129 -35%	-$27,869 -28%	-$20,609 -21%	-$13,349 -13%	-$6,089 -6%
$15.40	-$41,179 -41%	-$32,709 -33%	-$24,239 -24%	-$15,769 -16%	-$7,299 -7%	$1,171 1%	$9,641 10%
$17.60	-$32,709 -33%	-$23,029 -23%	-$13,349 -13%	-$3,669 -4%	$6,011 6%	$15,691 16%	$25,371 25%

18. **What are the net returns per acre above *total costs* for strawberries at varying yields and prices?** The ranging analysis in **Table 18** examines net returns above *total costs* based on different scenarios. The midpoint scenario, 5,500 trays per acre at $11.00 per tray, resulted in a negative return of $40,813 per acre (-40%). The worst- and best-case scenarios produced returns of minus $84,373 (-83%) and plus $24,527 (24%), respectively.

Table 18. Net Returns Per Acre above *Total Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$84,373	-$81,953	-$79,533	-$77,113	-$74,693	-$72,273	-$69,853
	-83%	-81%	-79%	-76%	-74%	-71%	-69%
$6.60	-$75,903	-$72,273	-$68,643	-$65,013	-$61,383	-$57,753	-$54,123
	-75%	-71%	-68%	-64%	-61%	-57%	-53%
$8.80	-$67,433	-$62,593	-$57,753	-$52,913	-$48,073	-$43,233	-$38,393
	-67%	-62%	-57%	-52%	-47%	-43%	-38%
$11.00	-$58,963	-$52,913	-$46,863	-$40,813	-$34,763	-$28,713	-$22,663
	-58%	-52%	-46%	-40%	-34%	-28%	-22%
$13.20	-$50,493	-$43,233	-$35,973	-$28,713	-$21,453	-$14,193	-$6,933
	-50%	-43%	-36%	-28%	-21%	-14%	-7%
$15.40	-$42,023	-$33,553	-$25,083	-$16,613	-$8,143	$327	$8,797
	-41%	-33%	-25%	-16%	-8%	0%	9%
$17.60	-$33,553	-$23,873	-$14,193	-$4,513	$5,167	$14,847	$24,527
	-33%	-24%	-14%	-4%	5%	15%	24%

Discussion of Net Returns Per Acre for Strawberries. Whereas the previous subsection detailed costs to produce strawberries, the three tables in this subsection have highlighted the critical influence of price and yield on strawberry profitability. When price and yield are both low, strawberries lose money. When price and yield both run high, strawberries generate positive returns.

At the mid-point yield of 5,500 trays per acre, the strawberry price needed to break even on *operating* costs was $17.30 per tray. To break even on *total* costs required $18.42 per tray.

As noted earlier, break-even points in each table occur between the last red-shaded cell in a column and the first green-shaded cell. Based on *total costs*, for example (**Table 18**), a strawberry operation could break even and then cross into positive returns *either* at 6,600 trays per acre sold at $15.40 per tray *or* at lower yield of 6,050 trays sold for a higher price of $17.60.

For perspective, the Bolda *et al*. 2024 U.C. Davis cost & return study of strawberry production cited earlier showed a negative return of $13,694 per acre based on *total costs*. That scenario assumed a yield of 9,000 trays per acre and a price of $11.00 per tray.

Aggregated Estimates for San Diego County

19. **What is the estimated countywide net return for above *operating costs* for strawberries at varying yields and prices? Table 19** shows aggregated countywide returns above *operating costs* for strawberries after multiplying the per-acre figures from earlier (**Table 16**) by the 215 bearing acres of strawberries estimated to exist in the county in 2022.

Table 19. San Diego County Aggregated Net Returns above *Operating Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$16,809,560 -82%	-$16,289,260 -80%	-$15,768,960 -77%	-$15,248,660 -75%	-$14,728,360 -72%	-$14,208,060 -69%	-$13,687,760 -67%
$6.60	-$14,988,510 -73%	-$14,208,060 -69%	-$13,427,610 -66%	-$12,647,160 -62%	-$11,866,710 -58%	-$11,086,260 -54%	-$10,305,810 -50%
$8.80	-$13,167,460 -64%	-$12,126,860 -59%	-$11,086,260 -54%	-$10,045,660 -49%	-$9,005,060 -44%	-$7,964,460 -39%	-$6,923,860 -34%
$11.00	-$11,346,410 -55%	-$10,045,660 -49%	-$8,744,910 -43%	-$7,444,160 -36%	-$6,143,410 -30%	-$4,842,660 -24%	-$3,541,910 -17%
$13.20	-$9,525,360 -47%	-$7,964,460 -39%	-$6,403,560 -31%	-$4,842,660 -24%	-$3,281,760 -16%	-$1,720,860 -8%	-$159,960 -1%
$15.40	-$7,704,310 -38%	-$5,883,260 -29%	-$4,062,210 -20%	-$2,241,160 -11%	-$420,110 -2%	$1,400,940 7%	$3,221,990 16%
$17.60	-$5,883,260 -29%	-$3,802,060 -19%	-$1,720,860 -8%	$360,340 2%	$2,441,540 12%	$4,522,740 22%	$6,603,940 32%

20. **What is the estimated countywide net return above *cash costs* for strawberries at varying yields and prices? Table 20** repeats the previous table but for *cash costs*.

Table 20. San Diego County Aggregated Net Returns above *Cash Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$17,958,735 -83%	-$17,438,435 -81%	-$16,918,135 -78%	-$16,397,835 -76%	-$15,877,535 -74%	-$15,357,235 -71%	-$14,836,935 -69%
$6.60	-$16,137,685 -75%	-$15,357,235 -71%	-$14,576,785 -67%	-$13,796,335 -64%	-$13,015,885 -60%	-$12,235,435 -57%	-$11,454,985 -53%
$8.80	-$14,316,635 -66%	-$13,276,035 -61%	-$12,235,435 -57%	-$11,194,835 -52%	-$10,154,235 -47%	-$9,113,635 -42%	-$8,073,035 -37%
$11.00	-$12,495,585 -58%	-$11,194,835 -52%	-$9,894,085 -46%	-$8,593,335 -40%	-$7,292,585 -34%	-$5,991,835 -28%	-$4,691,085 -22%
$13.20	-$10,674,535 -49%	-$9,113,635 -42%	-$7,552,735 -35%	-$5,991,835 -28%	-$4,430,935 -21%	-$2,870,035 -13%	-$1,309,135 -6%
$15.40	-$8,853,485 -41%	-$7,032,435 -33%	-$5,211,385 -24%	-$3,390,335 -16%	-$1,569,285 -7%	$251,765 1%	$2,072,815 10%
$17.60	-$7,032,435 -33%	-$4,951,235 -23%	-$2,870,035 -13%	-$788,835 -4%	$1,292,365 6%	$3,373,565 16%	$5,454,765 25%

21. **What is the estimated countywide net return above *total costs* for strawberries at varying yields and prices? Table 21** repeats the previous two tables but for *total costs*.

Table 21. San Diego County Aggregated Net Returns above *Total Costs* for Strawberries at Varying Yields and Prices

	Yield Ranges (# of trays per acre)						
$/tray	3,850	4,400	4,950	**5,500**	6,050	6,600	7,150
$4.40	-$18,140,195 -83%	-$17,619,895 -81%	-$17,099,595 -79%	-$16,579,295 -76%	-$16,058,995 -74%	-$15,538,695 -71%	-$15,018,395 -69%
$6.60	-$16,319,145 -75%	-$15,538,695 -71%	-$14,758,245 -68%	-$13,977,795 -64%	-$13,197,345 -61%	-$12,416,895 -57%	-$11,636,445 -53%
$8.80	-$14,498,095 -67%	-$13,457,495 -62%	-$12,416,895 -57%	-$11,376,295 -52%	-$10,335,695 -47%	-$9,295,095 -43%	-$8,254,495 -38%
$11.00	-$12,677,045 -58%	-$11,376,295 -52%	-$10,075,545 -46%	-$8,774,795 -40%	-$7,474,045 -34%	-$6,173,295 -28%	-$4,872,545 -22%
$13.20	-$10,855,995 -50%	-$9,295,095 -43%	-$7,734,195 -36%	-$6,173,295 -28%	-$4,612,395 -21%	-$3,051,495 -14%	-$1,490,595 -7%
$15.40	-$9,034,945 -41%	-$7,213,895 -33%	-$5,392,845 -25%	-$3,571,795 -16%	-$1,750,745 -8%	$70,305 0%	$1,891,355 9%
$17.60	-$7,213,895 -33%	-$5,132,695 -24%	-$3,051,495 -14%	-$970,295 -4%	$1,110,905 5%	$3,192,105 15%	$5,273,305 24%

Discussion of Estimated Countywide Net Return for Strawberries. This subsection has expanded the per-acre analysis from a single strawberry acre to total acres of active strawberry production in San Diego County. The countywide results provide public and private-sector stakeholders with snapshot of strawberry net returns under various scenarios. Readers who want to explore alternative strawberry scenarios are encouraged use the Agricultural Profitability Assessment Tool ("AG-PAT", available under the SALC 2.0 webpage at www.sdlafco.org) to adjust water, labor, yields, prices, acreage and more than a dozen other parameters.

Focal Commodity #4: TOMATO Net Returns and Ranging Analysis Per Acre and Countywide

This section explores the research question: ***How profitable is San Diego County tomato production?*** The discussion begins with an overview of costs to produce tomatoes, followed by per-acre returns above *operating*, *cash*, and *total* costs. The section ends with an examination of aggregated countywide returns based on San Diego County's total number of tomato acres.

Costs to Produce Tomatoes

22. **What are the estimated costs per acre to produce tomatoes in San Diego County? Table 22** shows estimated costs per acre to produce tomatoes in San Diego County for the 2022 calendar year. Operating costs comprised the largest portion at $15,629. Cash overhead expenses ($370) brought the total cash costs to $15,999. Adding non-cash overhead ($2,100) raised total costs to $18,099 per acre.

Table 22. Estimated Costs Per Acre to Produce Tomatoes in San Diego County in 2022

OPERATING COST	2022 ESTIMATE	% of Total Costs
Water	$600	3.3%
Fertilizer	$378	2.1%
Chemicals (insecticides, fungicide, herbicide, etc.)	$1,128	6.2%
Custom Hires (leveling, transplanting, pest control, etc.)	$1,401	7.7%
Labor (harvest, equipment operation, irrigation, etc.)	$6,986	38.6%
Land rent	$1,239	6.8%
Contracts (cooling, market/sales fees, etc.)	$498	2.8%
Machinery Operation (fuel, lubricants and repairs)	$699	3.9%
Seeds	$1,296	7.2%
Transplant	$1,077	6.0%
Assessment	$35	0.2%
Interest on Operating Capital	$292	1.6%
Total Operating Costs/Acre:	**$15,629**	
CASH OVERHEAD		
Property taxes	$9	0.0%
Office expenses	$65	0.4%
Insurance (property, liability)	$54	0.3%
Repairs	$22	0.1%
Others (GPS fees, field sanitation, managers, misc. costs)	$220	1.2%
Total Cash Overhead Costs/Acre:	**$370**	

Total Cash Costs/Acre (Operating + Overhead)	**$15,999**	
NON- CASH OVERHEAD	$2,100	11.6%
(Includes Depreciation and Capital Recovery, e.g., buildings irrigation systems, establishment costs, land, etc.)		
Total Costs/Acre (All Cash & Non-Cash Costs)	**$18,099**	**100.0%**

Discussion of Tomato Costs. The results show that, for our hypothetical tomato operation, the largest production cost was Labor at $6,986 per acre and 38.6% of total costs. Labor was more than triple the second ranked cost, non-cash overhead at $2,100. Custom hires ranked third at $1,401 (7.7%) per acre, closely followed by seeds ($1,296, 7.2%) and land rent ($1,239, 6.8%).

Tomato estimates are the most derived among the four focal commodities. U.C. Davis tomato studies focus on large, highly mechanized Central Valley operations that produce processing tomatoes, with little relevance to coastal fresh market tomato production. Estimated yields of 46 tons/acre, for example, are roughly triple the yields for coastal fresh market tomatoes.[19]

Compounding (and perhaps reflecting) the difficulty of making tomato estimates, the yearly *County of San Diego Crop Statistics & Annual Report* produced by the Department of Agriculture, Weights & Measures stopped specifying tomato yields and prices after 2018. Starting in 2019, the annual report lumps tomatoes in with "Vegetables, Other," valued at $114,116,705 in 2019 and $113,080, 084 in 2023.

The tomato analysis benefited from detailed financial data provided by two anonymous producers. Both producers specified their costs, yields, prices and other parameters. Visits to two farms added further insights into tomato production practices, costs and challenges. Last, observing a farm visit host sell tomatoes at a prominent farmers' market provided an opportunity to confirm the retail price received.

[19] See Aegerter *et al.* 2023 study cited in **Methods**, as well as: Turini, T., Stewart, D., Murdock, J. and D. Sumner (2018). 2018 Sample Costs to Produce Processing Tomatoes, San Joaquin Valley South, Fresno County: Sub-Surface, Drip Irrigated (SDI). University of California Agriculture and Natural Resources Cooperative Extension, Agricultural Issues Center U.C. Davis Department of Agricultural and Resource Economics.

Figure 11: Selected Examples of San Diego County Tomato Production Costs

Photos taken during farm visits show selected examples of expenses to produce vine-ripened tomatoes (A), including: (B) greenhouses; (C) pest control; (D) irrigation; and (E) poles. For a full list of production costs, see Table 22.

Figure 12: San Diego County Tomatoes for Sale

Fresh local tomatoes being sold at: (A) a roadside farm stand; (B) a prominent grocery store; and (C) a farmers' market, where the producer says the tomatoes always sell out completely and much faster than any other produce.

Net Returns Per Acre for Tomatoes

23. **What are the net returns per acre above *operating costs* for tomatoes at varying yields and prices?** The ranging analysis in **Table 23** examines net returns above *operating costs* based on different scenarios. The midpoint scenario, 15 tons per acre sold for $2,000 per ton, resulted in a positive return of $14,371 per acre (92%). The worst- and best-case scenarios produced returns of minus $7,229 (-46%) and plus $46,771 (299%), respectively.

Table 23. Net Returns Per Acre above *Operating Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$7,229 -46%	-$6,029 -39%	-$4,829 -31%	-$3,629 -23%	-$2,429 -16%	-$1,229 -8%	-$29 0%
$1,200	-$3,029 -19%	-$1,229 -8%	$571 4%	$2,371 15%	$4,171 27%	$5,971 38%	$7,771 50%
$1,600	$1,171 7%	$3,571 23%	$5,971 38%	$8,371 54%	$10,771 69%	$13,171 84%	$15,571 100%
$2,000	$5,371 34%	$8,371 54%	$11,371 73%	$14,371 92%	$17,371 111%	$20,371 130%	$23,371 150%
$2,400	$9,571 61%	$13,171 84%	$16,771 107%	$20,371 130%	$23,971 153%	$27,571 176%	$31,171 199%
$2,800	$13,771 88%	$17,971 115%	$22,171 142%	$26,371 169%	$30,571 196%	$34,771 222%	$38,971 249%
$3,200	$17,971 115%	$22,771 146%	$27,571 176%	$32,371 207%	$37,171 238%	$41,971 269%	$46,771 299%

24. **What are the net returns per acre above *cash costs* for tomatoes at varying yields and prices? Table 24** examines net returns above *cash costs* for varying yield and price scenarios. The midpoint scenario, 15 tons per acre sold for $2,000 per ton, resulted in a positive return of $$14,001 per acre (88%). The worst- and best-case scenarios produced returns of minus $7,599 (-47%) and plus $46,401 (290%), respectively.

Table 24. Net Returns Per Acre above *Cash Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$7,599 -47%	-$6,399 -40%	-$5,199 -32%	-$3,999 -25%	-$2,799 -17%	-$1,599 -10%	-$399 -2%
$1,200	-$3,399 -21%	-$1,599 -10%	$201 1%	$2,001 13%	$3,801 24%	$5,601 35%	$7,401 46%
$1,600	$801 5%	$3,201 20%	$5,601 35%	$8,001 50%	$10,401 65%	$12,801 80%	$15,201 95%
$2,000	$5,001 31%	$8,001 50%	$11,001 69%	$14,001 88%	$17,001 106%	$20,001 125%	$23,001 144%
$2,400	$9,201 58%	$12,801 80%	$16,401 103%	$20,001 125%	$23,601 148%	$27,201 170%	$30,801 193%
$2,800	$13,401 84%	$17,601 110%	$21,801 136%	$26,001 163%	$30,201 189%	$34,401 215%	$38,601 241%
$3,200	$17,601 110%	$22,401 140%	$27,201 170%	$32,001 200%	$36,801 230%	$41,601 260%	$46,401 290%

25. **What are the net returns per acre above *total costs* for tomatoes at varying yields and prices?** The ranging analysis in **Table 25** examines net returns above *total costs* based on different scenarios. The midpoint scenario, 15 tons per acre sold for $2,000 per ton, resulted in a positive return of $11,901 per acre (66%). The worst- and best-case scenarios produced returns of minus $9,699 (-54%) and plus $44,301 (245%), respectively.

Table 25. Net Returns Per Acre above *Total Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$9,699 -54%	-$8,499 -47%	-$7,299 -40%	-$6,099 -34%	-$4,899 -27%	-$3,699 -20%	-$2,499 -14%
$1,200	-$5,499 -30%	-$3,699 -20%	-$1,899 -10%	-$99 -1%	$1,701 9%	$3,501 19%	$5,301 29%
$1,600	-$1,299 -7%	$1,101 6%	$3,501 19%	$5,901 33%	$8,301 46%	$10,701 59%	$13,101 72%
$2,000	$2,901 16%	$5,901 33%	$8,901 49%	$11,901 66%	$14,901 82%	$17,901 99%	$20,901 115%
$2,400	$7,101 39%	$10,701 59%	$14,301 79%	$17,901 99%	$21,501 119%	$25,101 139%	$28,701 159%
$2,800	$11,301 62%	$15,501 86%	$19,701 109%	$23,901 132%	$28,101 155%	$32,301 178%	$36,501 202%
$3,200	$15,501 86%	$20,301 112%	$25,101 139%	$29,901 165%	$34,701 192%	$39,501 218%	$44,301 245%

Discussion of Net Returns Per Acre for Tomatoes. Whereas the previous subsection detailed costs to produce tomatoes, the three tables in this subsection have highlighted the critical influence of price and yield on tomato profitability. When price and yield are both low, tomatoes lose money. When price and yield both run high, tomatoes generate positive returns.

At the mid-point yield of 15 tons per acre, the tomato price needed to break even on *operating* costs was $1,043 per ton. To break even based on *total* costs required $1,207 per ton.

As noted earlier, break-even points in ranging analysis tables occur between the last red-shaded cell in a column and the first green-shaded cell. Based on *total costs*, for example (**Table 18**), a tomato operation could break even and then cross into positive returns *either* at 17 tons per acre sold at $1,200 per ton *or* at lower yield of 12 tons sold for a higher price of $1,600.

As noted earlier, the 2023 U.C. Davis cost & return study of tomato production cited in **Methods** held little relevance to this analysis. That study assumed an extremely large tomato farm (3,500 acres), machine harvesting, and production of tomatoes for processing rather than the fresh market. That study's hypothetical operation showed a net return based on *total costs* of $1,100 per acre, assuming a yield of 46 tons per acre and a price of $138.00 per ton.

Aggregated Estimates for San Diego County

26. **What is the estimated countywide net return for above *operating costs* for tomatoes at varying yields and prices? Table 26** shows aggregated countywide returns above *operating costs* for tomatoes after multiplying the per-acre figures from earlier (**Table 23**) by the 1,193 bearing acres of tomatoes estimated to exist in the county in 2022.

Table 26. San Diego County Aggregated Net Returns above *Operating Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$8,624,197 -46%	-$7,192,597 -39%	-$5,760,997 -31%	-$4,329,397 -23%	-$2,897,797 -16%	-$1,466,197 -8%	-$34,597 0%
$1,200	-$3,613,597 -19%	-$1,466,197 -8%	$681,203 4%	$2,828,603 15%	$4,976,003 27%	$7,123,403 38%	$9,270,803 50%
$1,600	$1,397,003 7%	$4,260,203 23%	$7,123,403 38%	$9,986,603 54%	$12,849,803 69%	$15,713,003 84%	$18,576,203 100%
$2,000	$6,407,603 34%	$9,986,603 54%	$13,565,603 73%	$17,144,603 92%	$20,723,603 111%	$24,302,603 130%	$27,881,603 150%
$2,400	$11,418,203 61%	$15,713,003 84%	$20,007,803 107%	$24,302,603 130%	$28,597,403 153%	$32,892,203 176%	$37,187,003 199%
$2,800	$16,428,803 88%	$21,439,403 115%	$26,450,003 142%	$31,460,603 169%	$36,471,203 196%	$41,481,803 222%	$46,492,403 249%
$3,200	$21,439,403 115%	$27,165,803 146%	$32,892,203 176%	$38,618,603 207%	$44,345,003 238%	$50,071,403 269%	$55,797,803 299%

27. **What is the estimated countywide net return above *cash costs* for tomatoes at varying yields and prices? Table 27** repeats the previous table but for *cash costs*.

Table 27. San Diego County Aggregated Net Returns above *Cash Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$9,065,607 -47%	-$7,634,007 -40%	-$6,202,407 -32%	-$4,770,807 -25%	-$3,339,207 -17%	-$1,907,607 -10%	-$476,007 -2%
$1,200	-$4,055,007 -21%	-$1,907,607 -10%	$239,793 1%	$2,387,193 13%	$4,534,593 24%	$6,681,993 35%	$8,829,393 46%
$1,600	$955,593 5%	$3,818,793 20%	$6,681,993 35%	$9,545,193 50%	$12,408,393 65%	$15,271,593 80%	$18,134,793 95%
$2,000	$5,966,193 31%	$9,545,193 50%	$13,124,193 69%	$16,703,193 88%	$20,282,193 106%	$23,861,193 125%	$27,440,193 144%
$2,400	$10,976,793 58%	$15,271,593 80%	$19,566,393 103%	$23,861,193 125%	$28,155,993 148%	$32,450,793 170%	$36,745,593 193%
$2,800	$15,987,393 84%	$20,997,993 110%	$26,008,593 136%	$31,019,193 163%	$36,029,793 189%	$41,040,393 215%	$46,050,993 241%
$3,200	$20,997,993 110%	$26,724,393 140%	$32,450,793 170%	$38,177,193 200%	$43,903,593 230%	$49,629,993 260%	$55,356,393 290%

28. **What is the estimated countywide net return above *total costs* for tomatoes at varying yields and prices? Table 28** repeats the previous two tables but for *total costs*.

Table 28. San Diego County Aggregated Net Returns above *Total Costs* for Tomatoes at Varying Yields and Prices

	Yield Ranges (# tons per acre)						
$/ton	11	12	14	**15**	17	18	20
$800	-$11,570,907 -54%	-$10,139,307 -47%	-$8,707,707 -40%	-$7,276,107 -34%	-$5,844,507 -27%	-$4,412,907 -20%	-$2,981,307 -14%
$1,200	-$6,560,307 -30%	-$4,412,907 -20%	-$2,265,507 -10%	-$118,107 -1%	$2,029,293 9%	$4,176,693 19%	$6,324,093 29%
$1,600	-$1,549,707 -7%	$1,313,493 6%	$4,176,693 19%	$7,039,893 33%	$9,903,093 46%	$12,766,293 59%	$15,629,493 72%
$2,000	$3,460,893 16%	$7,039,893 33%	$10,618,893 49%	$14,197,893 66%	$17,776,893 82%	$21,355,893 99%	$24,934,893 115%
$2,400	$8,471,493 39%	$12,766,293 59%	$17,061,093 79%	$21,355,893 99%	$25,650,693 119%	$29,945,493 139%	$34,240,293 159%
$2,800	$13,482,093 62%	$18,492,693 86%	$23,503,293 109%	$28,513,893 132%	$33,524,493 155%	$38,535,093 178%	$43,545,693 202%
$3,200	$18,492,693 86%	$24,219,093 112%	$29,945,493 139%	$35,671,893 165%	$41,398,293 192%	$47,124,693 218%	$52,851,093 245%

Discussion of Estimated Countywide Net Return for Tomatoes. This subsection has expanded the per-acre analysis from a single tomato acre to all acres of active tomato production in San Diego County. The countywide results provide public and private-sector stakeholders with snapshot of tomato net returns under various scenarios. Readers who want to explore alternative tomato scenarios are encouraged use the Agricultural Profitability Assessment Tool ("AG-PAT", available under the SALC 2.0 webpage at www.sdlafco.org) to adjust water, labor, yields, prices, acreage and more than a dozen other parameters.

AGRICULTURAL PROFITABILITY ASSESSMENT TOOL (AG-PAT)

Similar to U.C. Davis cost & return studies for individual California agricultural commodities, the key findings of this study apply to hypothetical farms under narrow sets of specific assumptions. The findings also became outdated almost immediately upon publication, if not before.

Readers who want to update and customize the numbers are invited to do so using the Agricultural Profitability Assessment Tool, or AG-PAT for short (**Figure 13**). A simple Excel-based instrument created for the SALC 2.0 project, AG-PAT allows users to explore different scenarios. They can adjust costs for water, labor and more than a dozen other expenses, as well as yields and prices (**Figure 14**). The results instantly show how changes affect profitability (returns per acre) for an individual farm and countywide based on the total acreage of a given crop. This tool is accessible to the public under the SALC 2.0 webpage of the San Diego County LAFCO website at www.sdlafco.org.

AG-PAT can be used not just to analyze individual farms and commodities, but also during the SALC 2.0 project's "Strategic Plan" phase to explore how potential policies, programs and projects might impact agricultural profitability on the county level.

Figure 13: Cover Page from the Agricultural Profitability Assessment Tool (AG-PAT)

The Excel-based AG-PAT allows users to run scenarios that explore how adjustments to costs, yields, and prices for a given commodity will affect profitability.

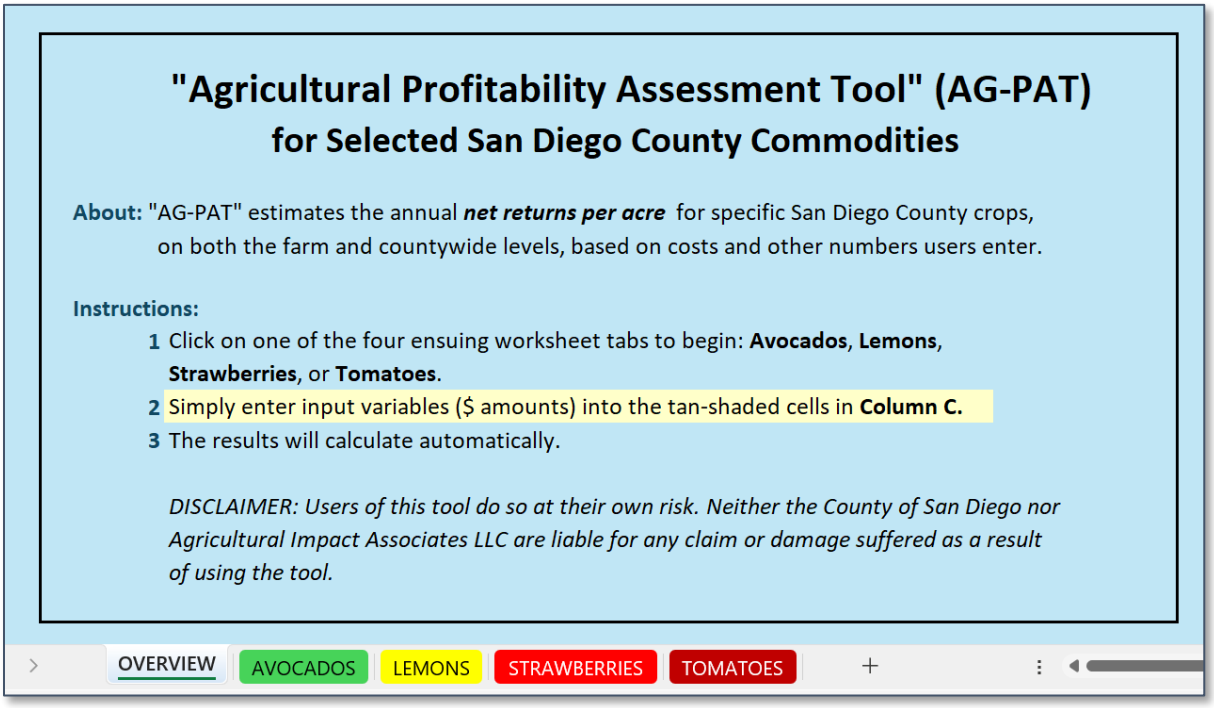
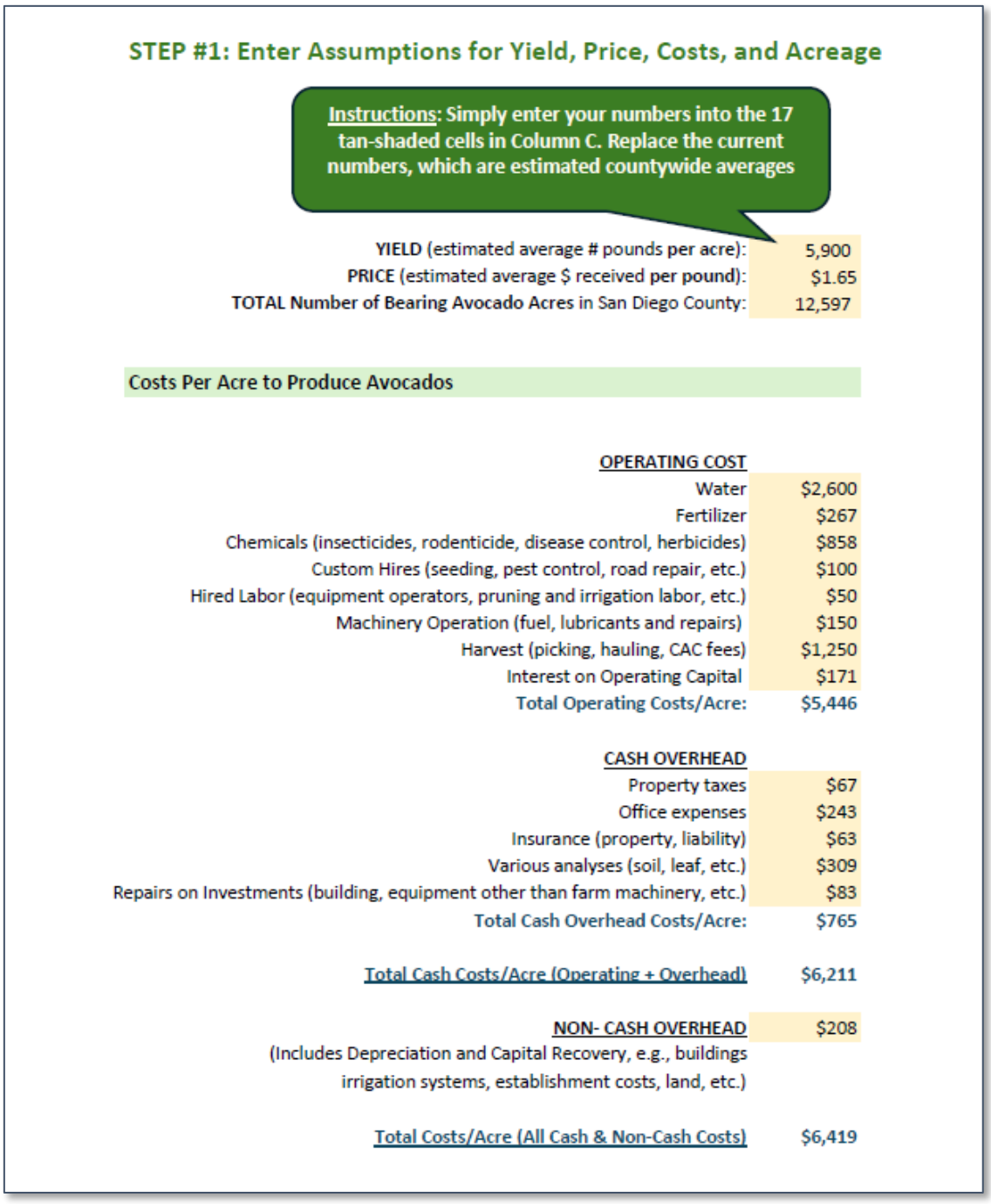


Figure 14: Screenshot from the Avocados Data Entry Page of the Agricultural Profitability Assessment Tool (AG-PAT)

Once a user enters numbers into the form shown below, in this case for avocados, AG-PAT instantly outputs results in the same form as Tables 1 through 7.



STEP #1: Enter Assumptions for Yield, Price, Costs, and Acreage

Instructions: Simply enter your numbers into the 17 tan-shaded cells in Column C. Replace the current numbers, which are estimated countywide averages

YIELD (estimated average # pounds per acre):	5,900
PRICE (estimated average $ received per pound):	$1.65
TOTAL Number of Bearing Avocado Acres in San Diego County:	12,597

Costs Per Acre to Produce Avocados

OPERATING COST	
Water	$2,600
Fertilizer	$267
Chemicals (insecticides, rodenticide, disease control, herbicides)	$858
Custom Hires (seeding, pest control, road repair, etc.)	$100
Hired Labor (equipment operators, pruning and irrigation labor, etc.)	$50
Machinery Operation (fuel, lubricants and repairs)	$150
Harvest (picking, hauling, CAC fees)	$1,250
Interest on Operating Capital	$171
Total Operating Costs/Acre:	$5,446
CASH OVERHEAD	
Property taxes	$67
Office expenses	$243
Insurance (property, liability)	$63
Various analyses (soil, leaf, etc.)	$309
Repairs on Investments (building, equipment other than farm machinery, etc.)	$83
Total Cash Overhead Costs/Acre:	$765
Total Cash Costs/Acre (Operating + Overhead)	$6,211
NON- CASH OVERHEAD (Includes Depreciation and Capital Recovery, e.g., buildings irrigation systems, establishment costs, land, etc.)	$208
Total Costs/Acre (All Cash & Non-Cash Costs)	$6,419

TOWARD THE FUTURE

The study has examined costs, revenues, and net returns across various scenarios for each of four focal commodities: avocados, lemons, strawberries, and tomatoes. The results include profitability levels based on *operating*, *cash*, and *total* costs on a per-acre level, as well as aggregated countywide based on total acreage of a given commodity.

The information fills important gaps in the literature. For example, the findings in this study supplement yield, price, and gross revenue data contained in the annual *County of San Diego Crop Statistics & Annual Report* by adding cost and profitability figures. The in-depth analysis of four specific commodities also complements the broad countywide profitability assessment in the SALC 2.0 "Market Analysis" report, "***Trends, Expenses, and Profitability among San Diego County Agricultural Operations"***.

Last, the findings confirm and build upon what U.C. Davis cost & return studies and related documents have consistently shown: that 'profitability' of a given commodity depends on the type of costs considered (*operating*, *cash*, or *total* costs) and depends largely on *yield* and *price* – two parameters influenced by many factors beyond producers' control. Thus, when it comes to describing the profitability of avocados, lemons, strawberries, tomatoes and any other commodity, *specific scenarios are more useful than generalizations*.

Regarding specific scenarios, the Agricultural Profitability Assessment Tool (AG-PAT) offers a way for producers, policy makers, and others to run customized profitability analyses for specific commodities. Exploring different scenarios will be especially important during the SALC 2.0 project's "Strategic Plan" phase (**Figure 2**). If a new policy could reduce irrigation water costs by 20%, for example, then how would that affect avocado profitability?

The "Strategic Plan" phase will explore a wide range of potential policies, programs and other initiatives to support the local agricultural industry. To jumpstart those conversations, we offer an initial list of ideas that emerged during the process of researching and writing this report:

1. Expanded Credits for Ecosystem Services. The 2024 ERA Economics report discussed earlier included an interesting proposal to reduce water rates for avocado producers in direct proportion to the value of ecosystem services they provide to society, estimated at $4,750 per acre.

2. Expand Crop Switching. Producers interviewed for this project shared positive experiences with the regional CropSWAP program that provided them with direct financial incentives to

switch from water-intensive crops to ones that require less water. [20] In one example, a former avocado producer who attended the July 24, 2024, SALC 2.0 Open House at the San Diego County Farm Bureau office expressed delight that their new dragon fruit orchard not only required a fraction of the irrigation water as avocados but also produced fruit that sold for five times the price of avocados. One of the avocado farms visited during this project included an experimental dragon fruit planting (**Figure 17**).

Figure 15: Example of an Avocado Farm with Dragon Fruit

3. Address Labor Costs, Especially during Harvest. For three of the focal commodities (lemons, strawberries, and tomatoes), harvest costs ranked higher than any other expense. In the case of the fourth commodity, avocados, harvest costs ranked second behind water. What interventions could potentially lower the costs associated with picking, sorting, packing, and hauling?

4. Support Higher Prices. What interventions, perhaps related to branding and marketing, could support higher prices for San Diego County commodities compared to ones produced outside the county, including imports from Mexico?

[20] For details on CropSWAP, please see: https://www.ranchowater.com/DocumentCenter/View/8978/CropSWAP_Regional-Agriculture-Program-Expands-to-San-Diego-and-Riverside-Counties

5. Facilitate Higher Yields. What farm innovations and policy interventions, perhaps related to better genetics, improved production practices or higher-density plantings, could lead to higher per-acre yields?

6. Benefits for Multiple Commodities. What farm innovations and policy interventions could potentially benefit not just the four focal commodities covered by this report, but also create widespread benefits across several other commodities produced in San Diego County?

Overall, this study has shed new light on costs and returns to produce four of San Diego County's important agricultural commodities. The findings mark a key step toward understanding the ongoing loss of farms and agricultural acres in San Diego County and the potential for supporting future endeavors to stem those losses. Efforts to maintain a thriving agricultural industry in San Diego County, in turn, benefit all residents of San Diego County in myriad ways, including through provision of abundant, fresh, healthy, and affordable food.

ACKNOWLEDGMENTS

This study was made possible by the generosity of San Diego County agricultural producers. We thank farmers and ranchers for taking time out of their busy schedules to help support a thriving agricultural industry in San Diego County. In particular, agricultural producers did the following five important things: 1) participated in various forums in fall 2023 to refine the list of focal commodities; 2) provided detailed financial information from their Schedule F "Profit or Loss from Farming" federal tax form and related documents; 3) hosted farm visits during summer 2024 that highlighted their various production costs and challenges; 4) offered vital feedback on preliminary findings at the July 2024 SALC 2.0 Open House, especially related to production costs and trends; and 5) participated in formal and informal interviews that added qualitative depth to the analysis. We are grateful for your time, input and expertise. We also thank industry organizations that supported this project, especially the San Diego County Farm Bureau and the Avocado Growers of California.

Among public agencies, we thank the State of California Department of Conservation and the California Strategic Growth Council for providing and administering the funding, as detailed in the Background section. Several San Diego County agencies supported the project, especially the Local Agency Formation Commission (LAFCO) and Planning & Development Services. Staff from the Department of Agriculture, Weights & Measures also contributed directly and indirectly.

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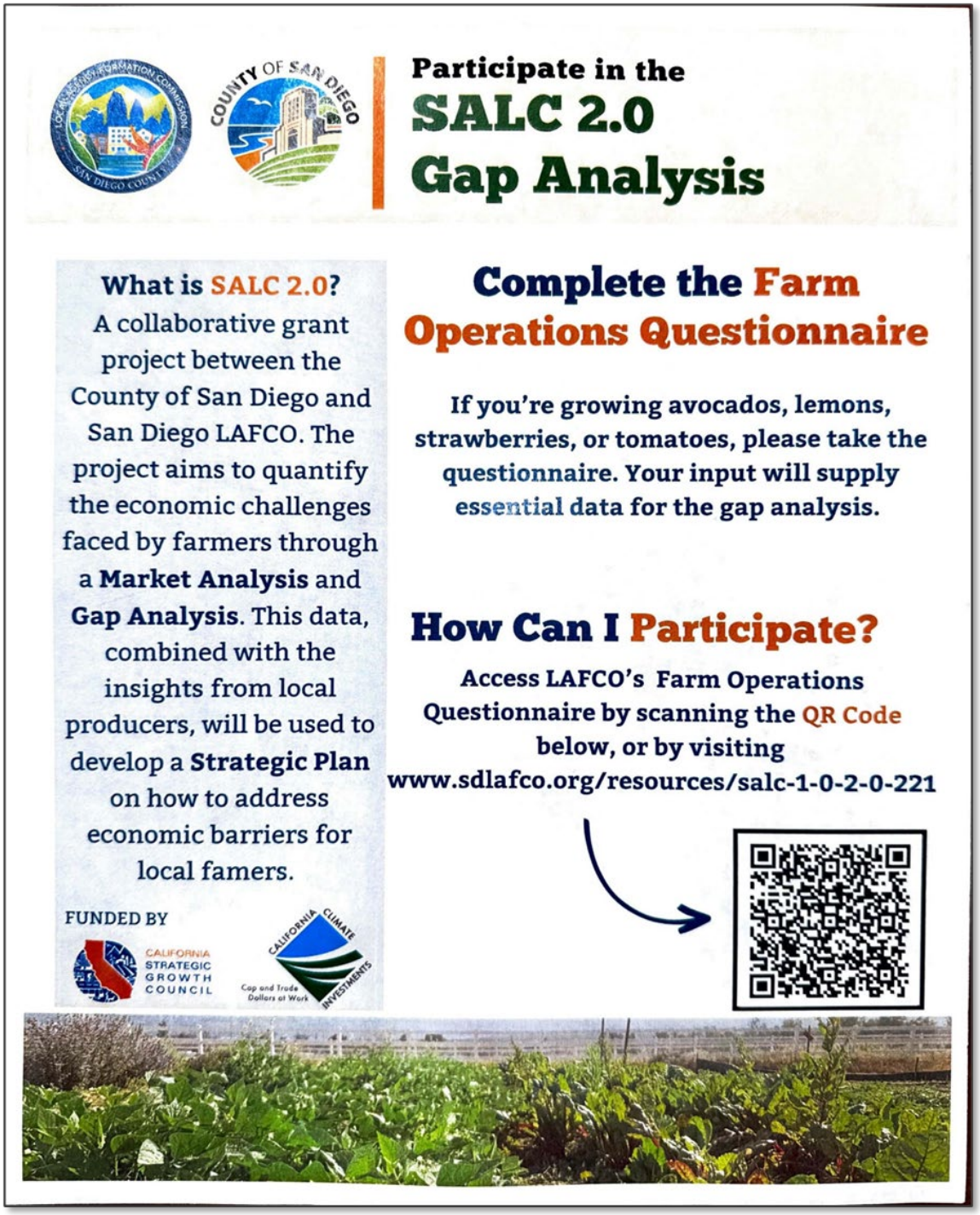
Appendix A

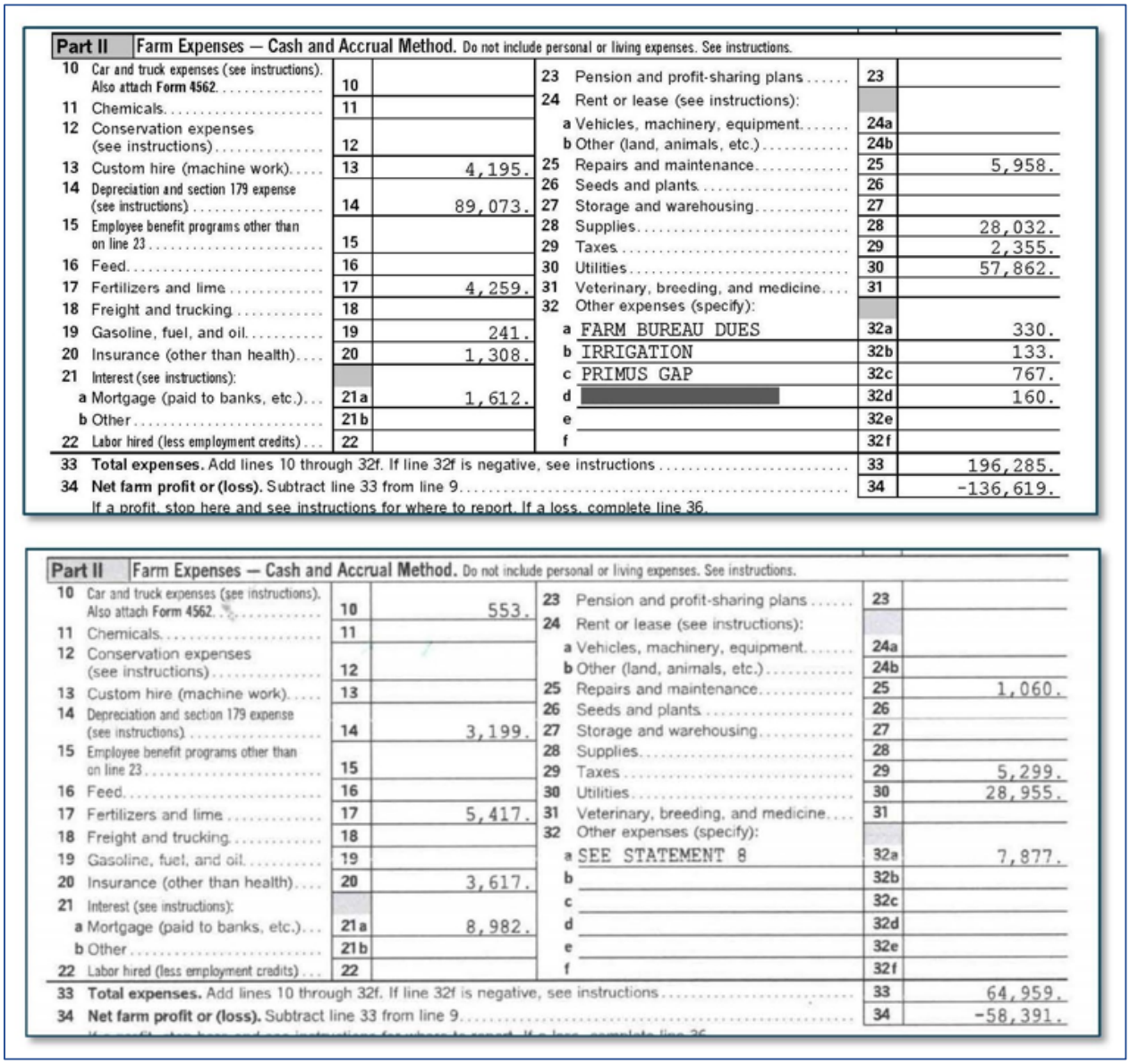
Flyer for SALC 2.0 Data Collection



Appendix B

Examples of "Schedule F: Profit or Loss from Farming" Income Tax Data Provided by Avocado Producers

The image below shows two examples of Section II "Farm Expenses" from two producers' federal income tax form "Schedule F: Profit or Loss from Farming." For confidentiality purposes, personally identifiable information was either removed from all documents or concealed like item #32d in the example below.



Part II Farm Expenses — Cash and Accrual Method. Do not include personal or living expenses. See instructions.

10 Car and truck expenses (see instructions). Also attach Form 4562	10		23 Pension and profit-sharing plans	23	
11 Chemicals	11		24 Rent or lease (see instructions):		
12 Conservation expenses (see instructions)	12		a Vehicles, machinery, equipment	24a	
13 Custom hire (machine work)	13	4,195.	b Other (land, animals, etc.)	24b	
14 Depreciation and section 179 expense (see instructions)	14	89,073.	25 Repairs and maintenance	25	5,958.
15 Employee benefit programs other than on line 23	15		26 Seeds and plants	26	
16 Feed	16		27 Storage and warehousing	27	
17 Fertilizers and lime	17	4,259.	28 Supplies	28	28,032.
18 Freight and trucking	18		29 Taxes	29	2,355.
19 Gasoline, fuel, and oil	19	241.	30 Utilities	30	57,862.
20 Insurance (other than health)	20	1,308.	31 Veterinary, breeding, and medicine	31	
21 Interest (see instructions):			32 Other expenses (specify):		
a Mortgage (paid to banks, etc.)	21a	1,612.	a FARM BUREAU DUES	32a	330.
b Other	21b		b IRRIGATION	32b	133.
22 Labor hired (less employment credits)	22		c PRIMUS GAP	32c	767.
			d [redacted]	32d	160.
			e	32e	
			f	32f	
33 **Total expenses.** Add lines 10 through 32f. If line 32f is negative, see instructions				33	196,285.
34 **Net farm profit or (loss).** Subtract line 33 from line 9				34	-136,619.

If a profit, stop here and see instructions for where to report. If a loss, complete line 36.

Part II Farm Expenses — Cash and Accrual Method. Do not include personal or living expenses. See instructions.

10 Car and truck expenses (see instructions). Also attach Form 4562	10	553.	23 Pension and profit-sharing plans	23	
11 Chemicals	11		24 Rent or lease (see instructions):		
12 Conservation expenses (see instructions)	12		a Vehicles, machinery, equipment	24a	
13 Custom hire (machine work)	13		b Other (land, animals, etc.)	24b	
14 Depreciation and section 179 expense (see instructions)	14	3,199.	25 Repairs and maintenance	25	1,060.
15 Employee benefit programs other than on line 23	15		26 Seeds and plants	26	
16 Feed	16		27 Storage and warehousing	27	
17 Fertilizers and lime	17	5,417.	28 Supplies	28	
18 Freight and trucking	18		29 Taxes	29	5,299.
19 Gasoline, fuel, and oil	19		30 Utilities	30	28,955.
20 Insurance (other than health)	20	3,617.	31 Veterinary, breeding, and medicine	31	
21 Interest (see instructions):			32 Other expenses (specify):		
a Mortgage (paid to banks, etc.)	21a	8,982.	a SEE STATEMENT 8	32a	7,877.
b Other	21b		b	32b	
22 Labor hired (less employment credits)	22		c	32c	
			d	32d	
			e	32e	
			f	32f	
33 **Total expenses.** Add lines 10 through 32f. If line 32f is negative, see instructions				33	64,959.
34 **Net farm profit or (loss).** Subtract line 33 from line 9				34	-58,391.

Appendix C

Example of Detailed Cost Data Provided by an Avocado Producer

Producers provided financial data via an anonymous survey, during interviews and via written documents such as their federal tax return form Schedule F "Profit or Loss from Farming." One producer emailed the data below showing actual costs averaged over a three-year period ending in 2023. We concealed the actual dollar amounts in the last column for confidentiality purposes. Dividing the dollar costs by the orchard size yielded per-acre figures.

PURPOSE	EXPENSE ITEM	OCCUREN(	YEARLY AV(
Irrigation	Water	monthly	*[confidential]*
Irrigation	Sprinkler system parts (sprinklers, valves, PVC, connectors, etc.)	monthly	*[confidential]*
Pest Control	Pest control chemicals	annual	*[confidential]*
Pest Control	Aerial spraying	annual	*[confidential]*
Pest Control	Ground squirrel trapping, traps	annual	*[confidential]*
Weed Control	Weed control chemicals	monthly	*[confidential]*
Weed Control	Weed cutting	monthly	*[confidential]*
Weed Control	Weed spraying	monthly	*[confidential]*
Fertilization	Fertilizer chemicals (15-15-15, phos, etc.)	bi-annual	*[confidential]*
Fertilization	Applying fertilizer (spraying, spreading)	bi-annual	*[confidential]*
Adding/Replacing trees	Avocado Trees	alt years	*[confidential]*
Equipment	Tools (cutters, sprayers, power tools, trimmers, hand tools, etc.)	as-needed	*[confidential]*
Equipment	Maint & repairs (to tractor, ATV, etc.)	as-needed	*[confidential]*
Equipment	Fuel (diesel for tractor, truck, gas for ATV, chainsaw, etc.)	as-needed	*[confidential]*
Tree maintenance	Mulch, pruning, propping branches, etc.	weekly	*[confidential]*
Erosion Control	Maintain drainages (clearing, drainage pipe, ditches, fill dirt, grading, etc.)	as-needed	*[confidential]*
Harvest	Avocado picking (18-24 cents/lb)	annual	*[confidential]*
Accounting	Quickbooks online	monthly	*[confidential]*
Accounting	Accountant (corp tax and planning)	annual	*[confidential]*
Tax	Franchise fee	annual	*[confidential]*
Organization membership	Farm Bureau Membership	annual	*[confidential]*
Organization membership	AGC (Avocado Growers of Calif) Membership	annual	*[confidential]*
Govt fee	HAB Assessment fee (2.5 cents/lb)	annual	*[confidential]*
Govt fee	CAC Assessment fee (2.25 cents/lb)	annual	*[confidential]*
Insurance	Insurance (grove liability)	annual	*[confidential]*
Grand Total			***[confidential]***