The Fresh Produce Industry in Santa Cruz County, Arizona

Local, State, & National Economic Contributions

July 2022

Dari Duval, Ashley Bickel, & George Frisvold

University of Arizona Cooperative Extension
Department of Agricultural & Resource Economics

COLLEGE OF AGRICULTURE & LIFE SCIENCES
Agricultural & Resource Economics

THE UNIVERSITY OF ARIZONA
Cooperative Extension

We wish to acknowledge and thank Lina Benitez and Brenda Jimenez for research assistance on the project.

Contents

Figures

Tables

Executive Summary

What is the study about?

This study examines the importance of Santa Cruz County's fresh produce industry cluster to the county economy and to Arizona's state economy in 2019 and 2020. The study provides an overview of Santa Cruz County's fresh produce industry cluster, its direct economic activity, and the results of a survey of the industry characterizing business operations in the industry cluster. Following that, it presents two economic contribution analyses of the industry cluster at the county and state levels, followed by an analysis quantifying forward linkages of the industry cluster at the national level in the retail, wholesale, and foodservice industries. Finally, it presents survey results regarding the business operating environment in Santa Cruz County and recent investments by businesses in the produce industry cluster.

What did the study find?

Economic contribution of Santa Cruz County's fresh produce industry

- Including multiplier effects, the economic contribution of the fresh produce industry cluster to the Santa Cruz County economy in 2020 was $726 million in output (sales), $385 million in value added (the equivalent of GDP), and $277 million in labor income (business operator income and employee compensation), supporting 3,788 jobs.
- For the state of Arizona as a whole (and again including multiplier effects), the economic contribution of the fresh produce industry cluster in 2019 was $895 million in output (sales), $496 million in value added (the equivalent of GDP), and $343 million in labor income, supporting 4,849 jobs.
- By 2020 the fresh produce cluster was approaching a billion-dollar industry for Arizona, with output of more than $944 million, value added of $522 million, and labor income of $362 million, supporting 4,927 jobs in the state.

Fresh produce industry's importance to Santa Cruz County employment and income

- Direct employment in fruit and vegetable wholesaling accounts for nearly 1 in 9 private sector jobs in the county.
- Employment has seasonal swings but even so, average annual salaries are more than 50% greater than the county average for all private sector jobs.

Importance of fresh produce imports in the foreign trade logistics cluster in Santa Cruz County

- Fresh fruit and vegetable commodities, combined, became the highest-value category of imports through the Nogales port of entry as of 2020. With more than $3.4 billion in imports, fresh fruit and vegetable commodities surpassed motor vehicles and vehicle parts as the top category.

Forward-linked economic activity of fruit and vegetable imports through Nogales

- Produce that has been imported through the Nogales port of entry and handled by the fresh produce industry in Santa Cruz County supports economic activity in forward-linked industries throughout the United States that are involved in transporting, distributing, and selling this produce to end-consumers or foodservice businesses.
- The value of these forward linkages, occurring in U.S. wholesale, retail, and foodservice industries, totaled more than $4.5 billion in 2019 and nearly $5 billion in 2020.

Industry cluster business operating environment survey results

- Despite challenges, industry stakeholders report making investments in business expansion and improvements and expect employment to grow.
- Half of survey respondents rated labor availability and trucking availability as the top 2 challenges they face.
- More than 72% of respondents expected industry cluster employment to increase in the next five years, with 27% expecting it to increase by 20% or more. About 18% expected employment to remain the same, with the remainder unsure of trends.
- Roughly a third of survey respondents (6 of 19) reported having made investments in solar energy equipment in the past, and an additional 11% indicated they plan to invest in solar equipment in the future.
- Because of the small number of responses (19), adoption of rooftop solar panels was also estimated based on aerial photography assessment of more than 100 buildings operated by the industry cluster. Recent research suggests that 3.5% of all U.S. commercial buildings have rooftop solar panels. Visual inspection showed there were solar panels on 16.4% of industry cluster buildings, substantially more than the national average for commercial buildings.

How was the study done?

This study relies on primary data from a survey of businesses within the fresh produce industry in Santa Cruz County, Arizona as well as secondary data from government and proprietary sources. Economic contribution analyses were performed using the IMPLAN 3.1 model and data.

This study is an update to the fresh produce industry-related portions of the 2013 study "Bi-National Business Linkages Associated with Fresh Produce and Production Sharing: Foundations and Opportunities for Nogales and Santa Cruz County", which itself built upon a 1997 study of the region's fresh produce industry. This study presents industry estimates for both 2019 and 2020. While the value of fresh fruit and vegetable imports through Nogales was higher in 2020 than in 2019, considering the many irregularities resulting from the Covid-19 pandemic in 2020, both years are presented for comparison.

Introduction

Santa Cruz County, Arizona is home to a fresh produce industry cluster specialized in importing fresh fruits and vegetables from Mexico for distribution throughout the United States and beyond. The industry includes fresh fruit and vegetable merchant wholesalers, fresh produce growers and shippers, distributors, customs brokers, warehousing operations, transportation businesses, and other private and government operations that support the industry. Within the county, and within the Nogales, Arizona metro area in particular, this industry cluster represents a large share of regional employment and income.

This study examines the importance of the fresh produce industry cluster to the county and state economies. It updates the fresh produce industry-related portions of the 2013 study "Bi-National Business Linkages Associated with Fresh Produce and Production Sharing: Foundations and Opportunities for Nogales and Santa Cruz County", which was in turn built upon a previous 1997 study. Additionally, it provides an expanded scope of analysis, including a state-level economic contribution analysis, and a national-level analysis of forward-linked economic activity supported in wholesale, retail, and foodservice industries.

This study provides a snapshot of economic activity supported by the fresh produce industry cluster in Santa Cruz County, Arizona. Estimates are presented for both 2019 and 2020. While the overall value of fresh fruit and vegetable imports through Nogales was higher in 2020 than in 2019, considering the many irregularities resulting from the Covid-19 pandemic in 2020, both years are presented for comparison. The study begins by providing an overview of Santa Cruz County's fresh produce industry cluster, its direct economic activity, and the results of a survey of the industry characterizing businesses operation in the cluster. Following that, it presents economic contribution analyses of the industry cluster at the county and state levels, followed by an analysis quantifying forward linkages of the industry cluster at the national level in retail, wholesale, and foodservice industries. Finally, it presents survey results regarding the business operating environment in Santa Cruz County and recent investments by businesses in the industry cluster.

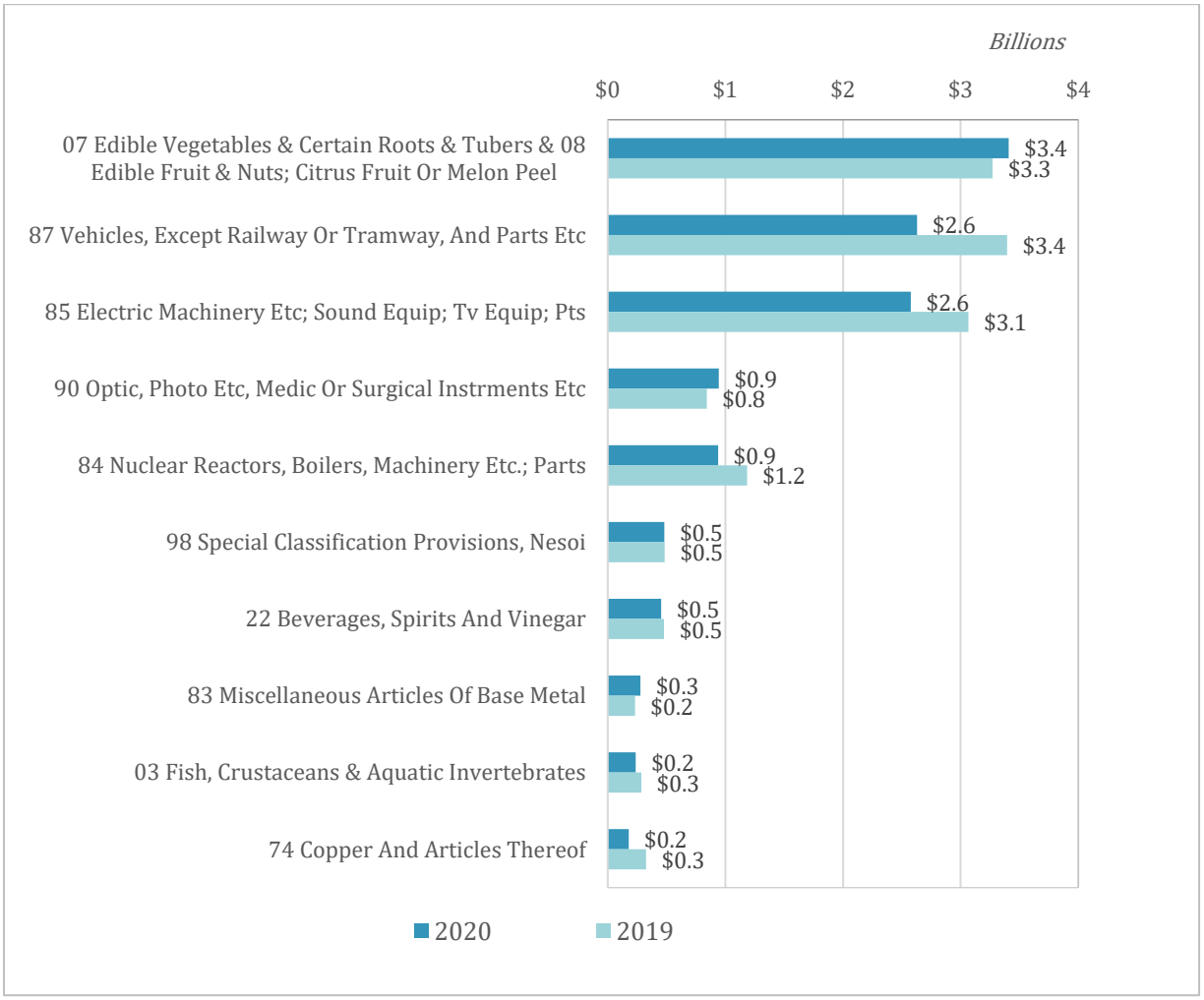
Santa Cruz County Fresh Produce Industry Cluster Overview

The following section provides an overview of the fresh produce industry cluster in Santa Cruz County, Arizona. This includes recent industry trends and the results of a survey of businesses in the cluster regarding their operations in the county.

Overview

Fresh fruit and vegetable commodities, combined, rank as the highest-value category of imports through the Nogales port of entry as of 2020, at more than $3.4 billion in imports (Figure 1). This was greater than the value of vehicles and vehicle parts, and electronic machinery imported in 2020. In 2019, the value of vehicles and vehicle parts imported through Nogales was slightly greater than the value of fresh fruits and vegetables.

Figure 1. Top 10 Imports by Harmonized Tariff Schedule Code through Nogales Port of Entry by Value, 2019 & 2020*

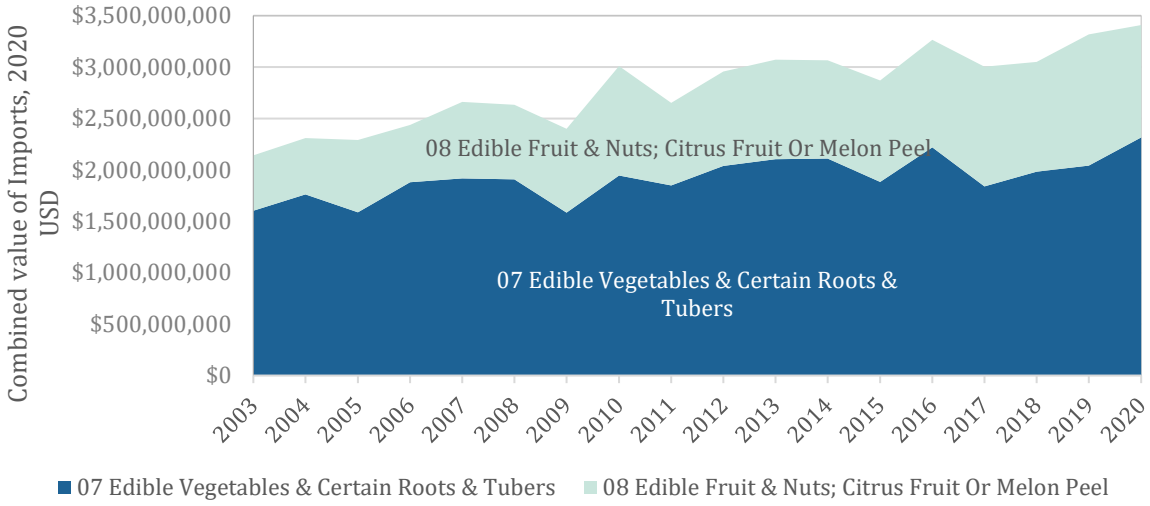


Source: U.S. Census Bureau (2022)

* 2-digit codes preceding categories are Harmonized Tariff Schedule (HTS) codes used to categorize imported commodities for calculating tariffs and for statistical purposes

Combined imports of fresh fruit and vegetables through Nogales have increased considerably over the past two decades, particularly for fresh fruits (Figure 2).

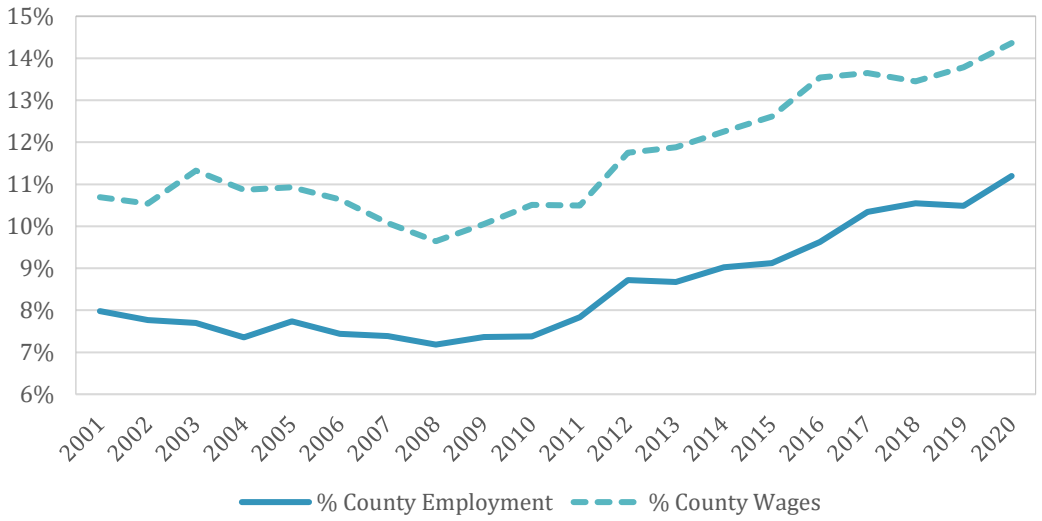
Figure 2. Annual Value Imports of Fresh Fruits & Vegetables from Mexico via Nogales, 2003-2020, 2020 USD



Source: USATrade Online (2022)

As imports have increased over this period, so too has the share of total employment in Santa Cruz County represented by *Fresh fruit and vegetable merchant wholesalers* and *Fruit and vegetable markets*. In government statistics, many fruit and vegetable importers are categorized as *Fruit and vegetable markets.* While the share of total county employment in these two industries stood at 11.2% in 2020, the share of total county wages was even higher, at 14.4% (Figure 3).

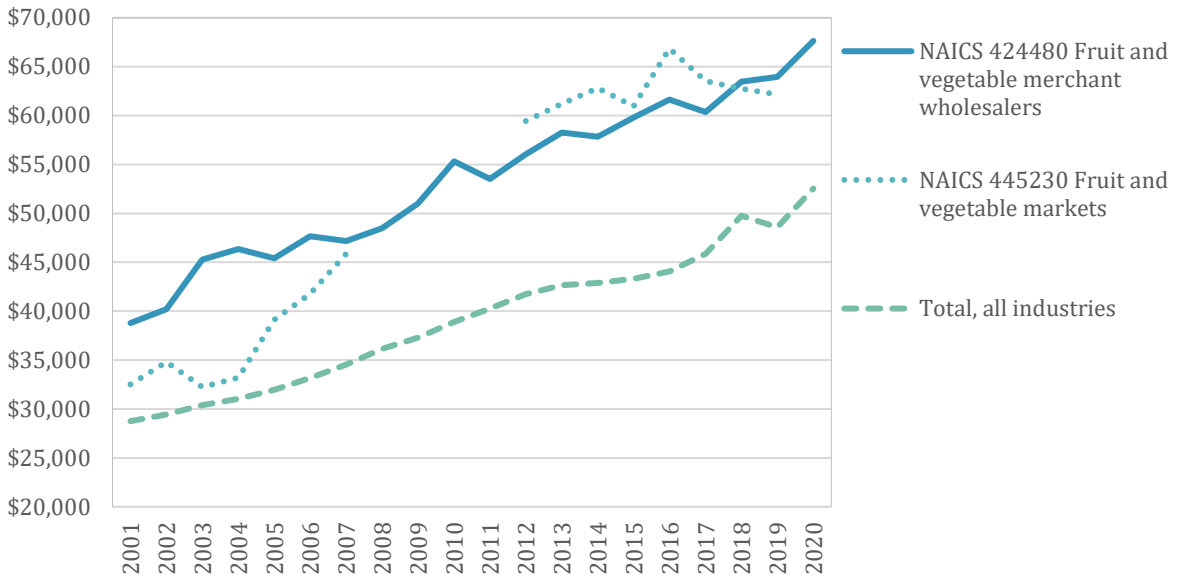
Figure 3. Fresh Fruit & Vegetable Merchant Wholesalers and Fruit & Vegetable Markets as a Percent of Santa Cruz County Employment & Wages, 2001-2020



Source: BLS (2021); Missing data for Fruit & Vegetable Markets linearly interpolated

The share of county wages has consistently been higher than the share of county employment because the industry pays wages that are higher than the average wage for the county (Figure 4).

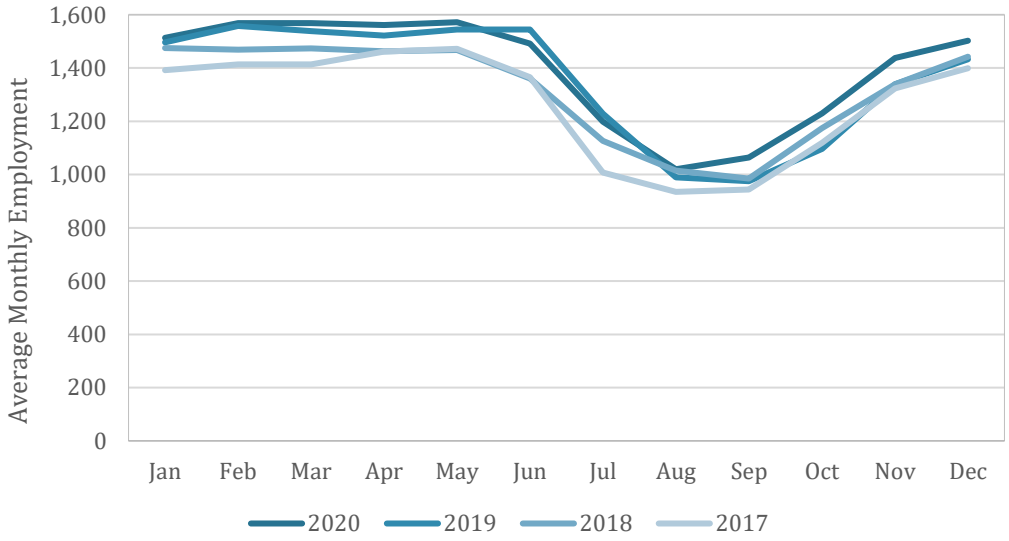
Figure 4. Average Annual Wage in Santa Cruz County, All private industries, Fruit & vegetable merchant wholesalers, and Fruit & Vegetable Markets 2001-2020



Source: QCEW (2021)

Employment by *fruit and vegetable merchant wholesalers* in Santa Cruz County follows a seasonal trend that mirrors the seasonal trend of fresh produce imports through the year (Figure 5).

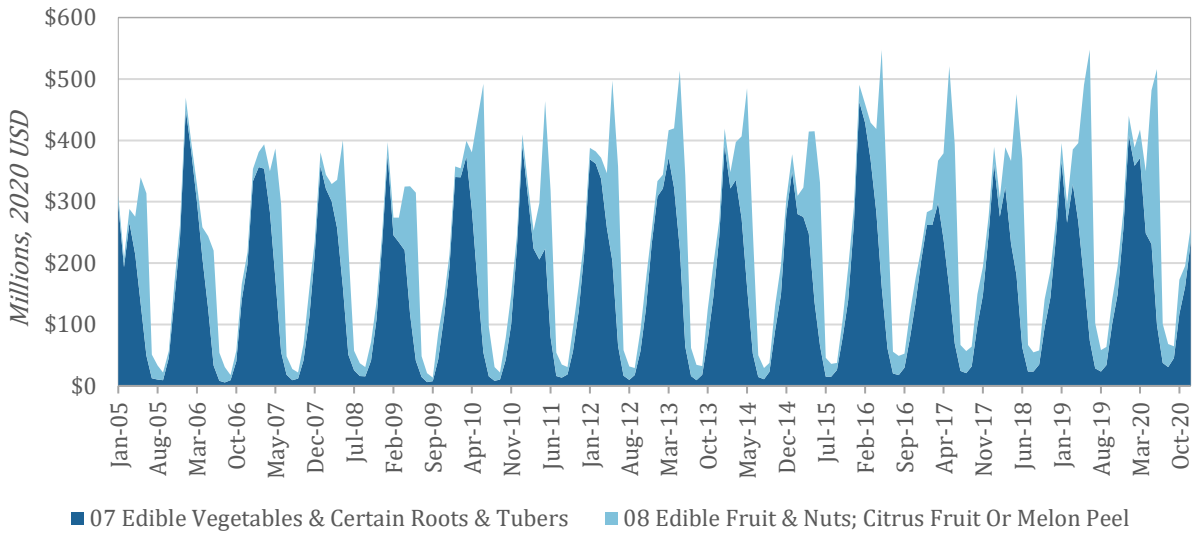
Figure 5. Average Monthly Employment in NAICS 424480 Fruit & Vegetable Merchant Wholesalers, Santa Cruz County, 2017-2020



Source: BLS QCEW (2022)

Produce imports decrease in summer months and increase in winter months. Though the industry pays above average within the county, the seasonal nature of some employment within the industry can contribute to regional unemployment. That said, over time, imports in summer months have been increasing, especially due to fruit imports, but also due to greater summer vegetable imports (Figure 6).

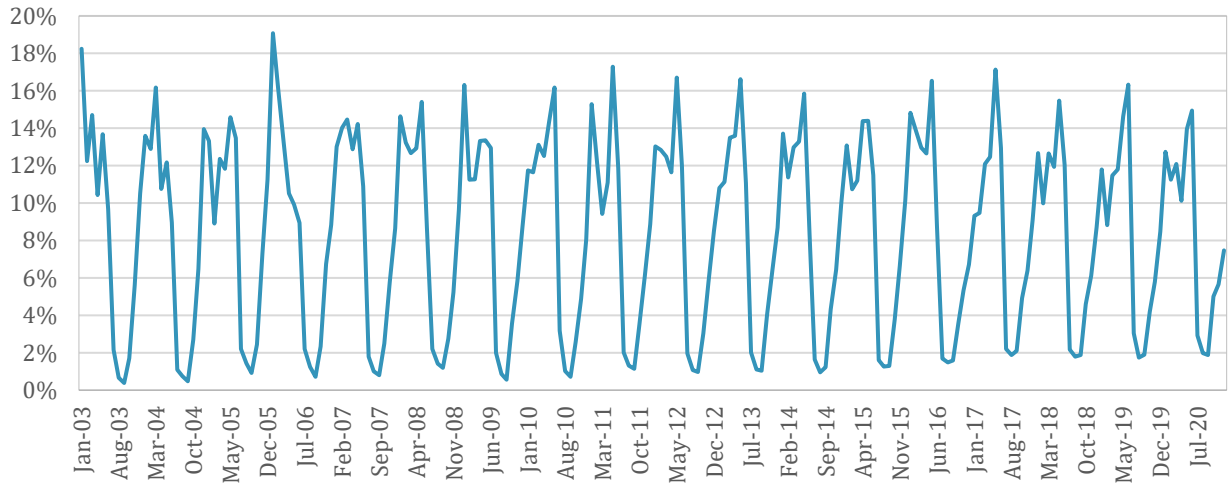
Figure 6. Monthly Value of Fresh Fruit & Vegetable Imports from Mexico via Nogales, 2005-2020, 2020 USD



Source: USATrade Online (2022)

While a strong seasonal pattern exists for fruit and vegetable imports through Nogales, the difference in the monthly share of annual imports between the high season (winter months) and low season (summer months) has been gradually narrowing over the past 20 years (Figure 7).

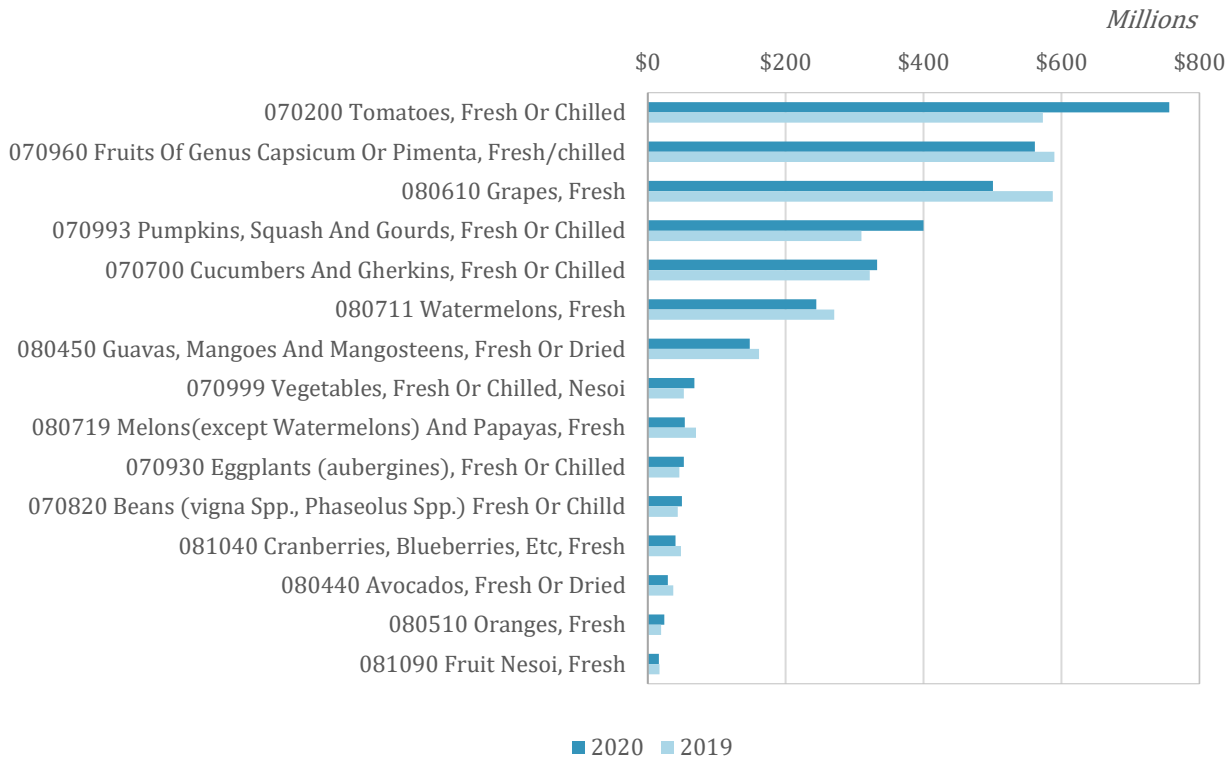
Figure 7. Monthly Fruit & Vegetable Imports (Combined) through Nogales as Percent of Total Calendar Year Imports, 2003-2020



Source: USATrade Online (2022)

By value of imports, the top fresh produce commodities imported through Nogales are tomatoes, bell peppers and peppers (fruits of genus capsicum or pimenta), grapes, squash, cucumbers, watermelons, and mangoes (Figure 8).

Figure 8. Top Fresh Fruit & Vegetable Commodities Imported from Mexico via Nogales by Value, 2019 & 2020



Source: USATrade Online (2022)

Tomatoes, bell peppers and peppers, grapes, squash, and cucumbers have consistently ranked as some of the top fresh produce commodities imported through Nogales (Table 1). In Table 1, increasingly darker red cells denote a higher rank of imports from tenth to first. Increasingly darker blue cells denote a lower rank of imports from 11th to 21st. One category that has increased in its importance among imports through Nogales is berries, rising from below 20th in rank among commodities in 2013 to between 9th and 12th in recent years.

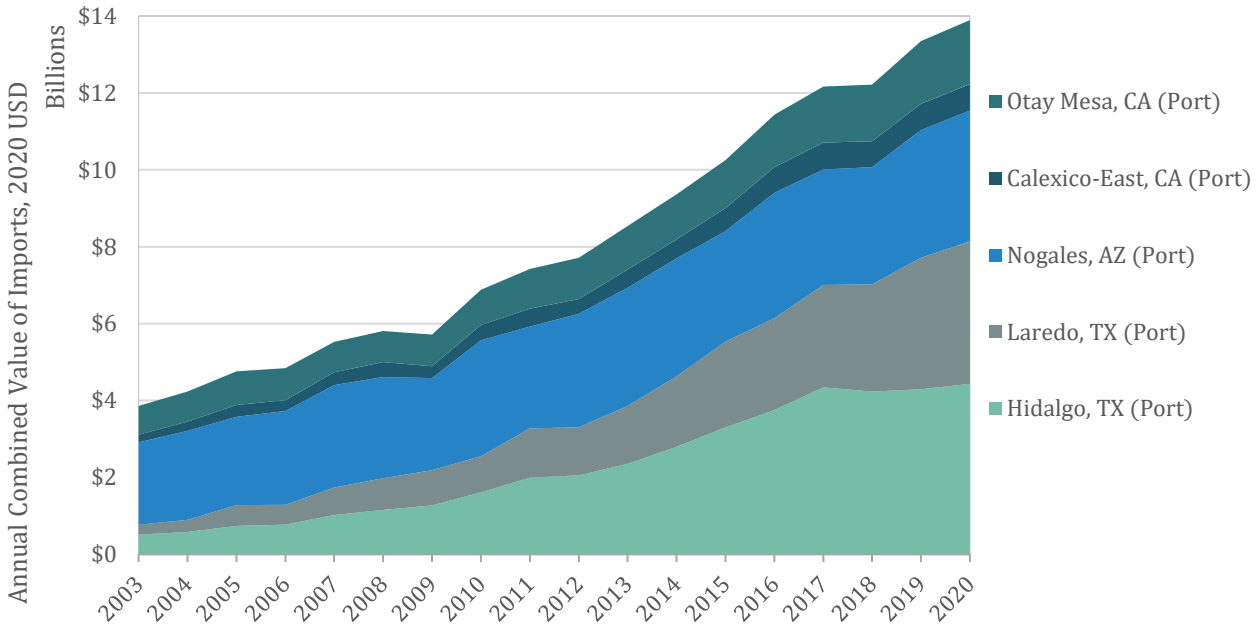
Table 1. Fresh Fruit & Vegetables Imported from Mexico via Nogales, Rank by Value of Imports, 2013-2020

Commodity	2013	2014	2015	2016	2017	2018	2019	2020
0702 Tomatoes, Fresh or Chilled	1	1	1	1	1	1	3	1
070960 Fruits of Genus Capsicum or Pimenta, Fresh/chilled	2	2	2	2	3	2	1	2
0806 Grapes, Fresh or Dried	3	3	4	3	2	3	2	3
070993 Pumpkins, Squash and Gourds, Fresh or Chilled	6	6	6	5	4	4	6	4
0707 Cucumbers and Gherkins, Fresh Or Chilled	5	4	5	6	6	5	5	5
0807 Melons and Papayas, Fresh	4	5	3	4	5	6	4	6
0804 Dates, Figs, Pineapples, Avocados Etc, Fr or Dried	7	7	7	7	7	7	7	7
070999 Vegetables, Fresh or Chilled, Nesoi	10	9	8	8	8	11	9	8
0708 Leguminous Vegetables, Shelled or Not, Fr or Chill	8	8	9	9	11	8	8	9
070930 Eggplants (aubergines), Fresh or Chilled	9	10	10	10	12	12	11	10
0805 Citrus Fruit, Fresh or Dried	11	11	11	11	10	9	12	11
081040 Cranberries, Blueberries, Etc, Fresh	20	13	12	12	9	10	10	12
0704 Cabbages, Cauliflower, Kale Etc, Fresh or Chilled	16	15	14	14	13	15	15	13
081090 Fruit Nesoi, Fresh	12	12	13	13	14	14	14	14
0803 Bananas, Including Plantains, Fresh or Dried	13	14	15	15	15	13	13	15
0703 Onions, Shallots, Garlic, Leeks Etc, Fr or Chilled	19	18	21	19	16	19	18	16
070920 Asparagus, Fresh or Chilled	14	16	18	17	17	16	17	17
0706 Carrots, Turnips & Other Edible Roots, Fr or Chill	17	17	16	18	19	17	16	18
070940 Celery Other Than Celeriac, Fresh or Chilled	21	20	20	20	21	21	19	19
0705 Lettuce And Chicory, Fresh Or Chilled	18	21	19	21	20	20	20	20

Source: USATrade Online (2022)

Among the major ports located along the U.S. southern border, Nogales ranked third in 2019 and 2020 in the value of fresh fruit and vegetable imports it handled. While the inflation-adjusted value of fruit and vegetable imports through Nogales has increased by 59% between 2003 and 2020, its rank among southern ports in terms of fresh produce imports has fallen due to large increases in imports through Hidalgo and Laredo in Texas (Figure 9).

Figure 9. Annual Combined Value of Fresh Fruits & Vegetable Imports from Mexico, Major Ports, 2003-2020, 2020 USD



Source: USATrade Online (2022)

Survey Responses on Operations in Santa Cruz County

This study included a survey of companies involved in the fresh produce industry cluster in Santa Cruz County, Arizona. The survey was carried out between October 2021 and January 2022. A total of 35 companies responded, 25 of which identified as distributors, growers, or shippers. Four (4) respondents identified as sales brokers, one (1) as a transportation / logistics company, one (1) as a customs broker, and four (4) as other types of businesses (Table 2).

Table 2. Survey Respondents by Type of Business in Santa Cruz County

Business Type	Respondents
Distributor / Grower / Shipper	25
Sales broker	4
Other (please specify)	4
Transportation / logistics	1
Customs broker	1
Total	35

By type of operation, 74% of respondents reported operating a warehouse in Santa Cruz County, followed by 71% with a headquarters, and 69% with administrative offices (Table 3). Respondents can have multiple operation types in Santa Cruz County.

Table 3. Survey Respondents by Type of Operations in Santa Cruz County

Operation Type*	Respondents	Percent
Headquarters	25	71%
Warehouse	26	74%
Administrative Offices	24	69%
N/A	1	3%
Total	35	100%

* Respondents can report more than one operation type

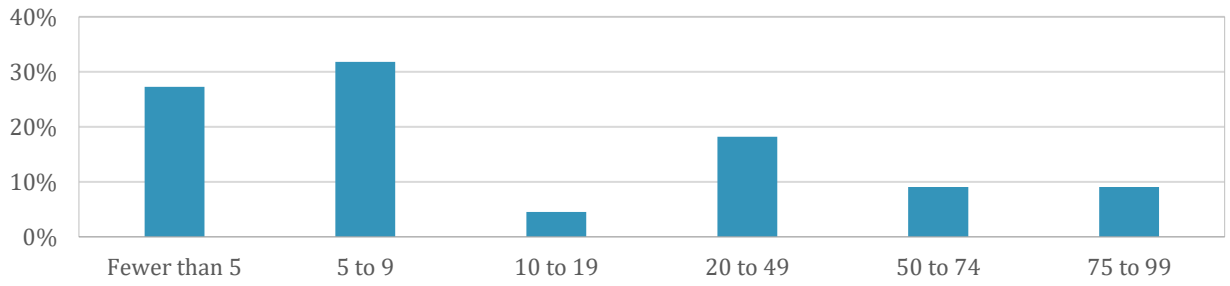
Respondents were asked whether they had other operations within Arizona but outside of Santa Cruz County. Roughly a third of respondents reported not having other operations in Arizona outside of Santa Cruz County, while smaller shares reported having warehouses, headquarters, agricultural production, administrative offices, and other operations elsewhere in Arizona (Table 4).

Table 4. Survey Respondents by Type of Operation Outside Santa Cruz County Elsewhere in Arizona

Operation Type	Respondents	Percent
Headquarters	5	14%
Warehouse	10	29%
Administrative Offices	5	14%
Agricultural Production	7	20%
Other	2	6%
N/A	12	34%
Total	35	100%

Respondents were asked to report the total number of employees working for their operation in Santa Cruz County in 2019. Five to nine (5 – 9) employees was the most commonly reported number of employees, followed by fewer than five employees (Figure 10).

Figure 10. Reported Number of Employees in Santa Cruz County, 2019



Two thirds of respondents reported that their establishment's employment levels were approximately the same in 2020 as in 2019, followed by roughly a third (29%) reporting that

employment was higher in 2020 than in 2019. Five percent reported lower employment in 2020 than in 2019 (Table 5). These responses are consistent with a modest increase in employment reported within the industry between 2019 and 2020 (BLS, 2021).

Table 5. Employment in Santa Cruz County in 2020 Compared to 2019

Answer	Percent
Higher than in 2019	29%
Approximately the same as in 2019	67%
Less than in 2019	5%
Total	100%

For purposes of estimating the regional and state economic contributions of the fresh produce industry, respondents were asked to provide information on their purchase of goods and services from within the region, within Arizona, and outside the state. Table 6 presents respondent spending on services within the regional and state economy, and Table 7 presents spending on the purchase of supplies.

Table 6. Services Purchased Within Santa Cruz County

	... Of those who purchased			Did not purchase
Service	*Local*	*In State*	*Outside AZ*	
Trucking from the border to the warehouse	56.5%	13.0%	30.4%	30.3%
US customs brokerage	89.3%	0.0%	10.7%	12.5%
Sales brokerage	63.6%	13.6%	22.7%	26.7%
Trucking to buyer(s) in Arizona	63.6%	13.6%	22.7%	35.3%
Trucking to buyer(s) outside Arizona	67.9%	7.1%	25.0%	22.2%
Food safety or technical services	51.9%	11.1%	37.0%	15.6%
Repacking	88.9%	0.0%	11.1%	10.0%
Outsourced warehousing services (in-and-outs)	66.7%	0.0%	33.3%	11.8%
Legal services	69.7%	15.2%	15.2%	2.9%
Accounting & tax services	82.1%	14.3%	3.6%	6.7%
Other professional services	52.0%	28.0%	20.0%	19.4%

Table 7. Supplies Purchased in Santa Cruz County

	... Of those who purchased			Did not purchase
Supply	*Local*	*In State*	*Outside AZ*	
Cartons for packaging	44.4%	14.8%	40.7%	22.9%
Seeds	55.0%	5.0%	40.0%	33.3%
Fertilizers	25.0%	0.0%	75.0%	63.6%
Agricultural chemicals	0.0%	0.0%	100.0%	70.0%
Pallets	63.6%	13.6%	22.7%	21.4%
Forklift or skids	63.6%	27.3%	9.1%	26.7%
Office materials	40.0%	42.5%	17.5%	7.0%
Other	100.0%	0.0%	0.0%	80.0%

Economic Contributions of the Santa Cruz County Fresh Produce Industry Cluster

The following section presents different economic contributions of Santa Cruz County's fresh produce industry cluster. This includes a county-level contribution analysis as well as a state-level contribution analysis for Arizona. Following that, an analysis estimating the value of forward-linked economic activity in the United States' wholesale, retail, and foodservice industries supported by imports through Nogales port of entry is presented. We start, however, with an examination of the economic activity directly supported within Santa Cruz County by the fresh produce industry.

Direct Economic Activity

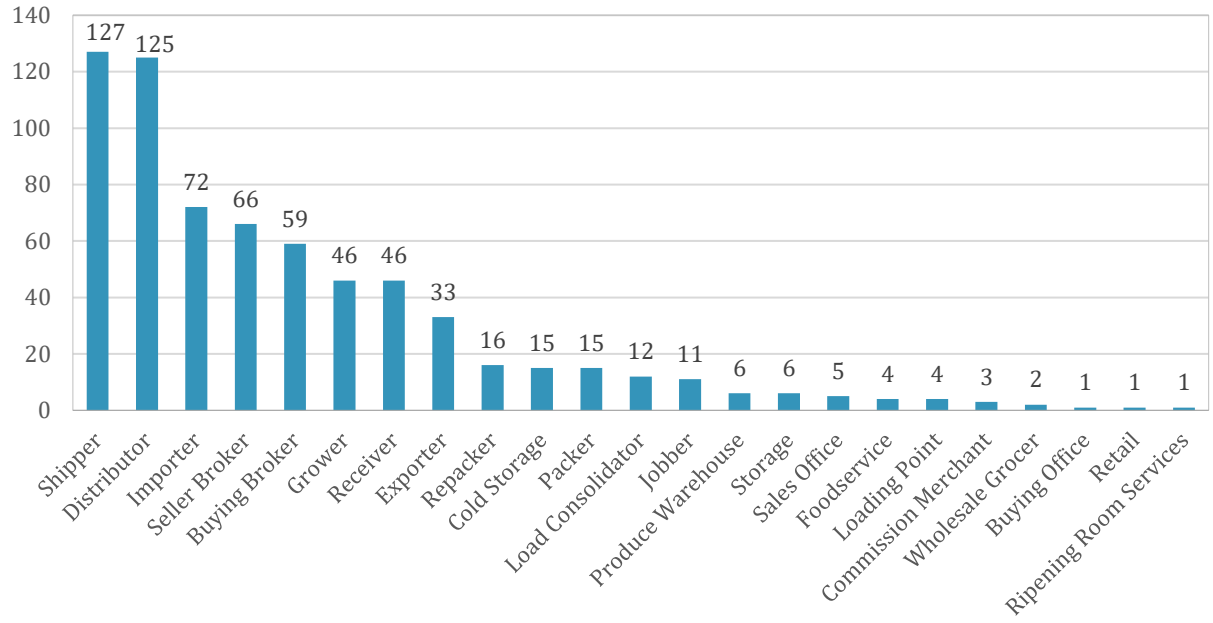
Economic activity directly attributable to the fresh produce industry cluster in Nogales and Santa Cruz County, Arizona includes economic activity in several industries. Adapting the definition used by Pavlakovich-Kochi and Thompson (2013), we define the fresh produce industry's direct economic activity as consisting of the following industries in Santa Cruz County (North American Industry Classification System (NAICS) codes in parentheses):

- *Fresh fruit & vegetable merchant wholesalers* (NAICS 424480)
- *Fruit & vegetable markets* (NAICS 445230)
- *Refrigerated warehousing & storage* (NAICS 493120)
- *Wholesale trade agents and brokers* (NAICS 425120)
- *General freight trucking, local* (NAICS 484110)
- *Regulation of agricultural marketing & commodities* (NAICS 926140)

While these NAICS codes serve as a guideline as to which industries are being counted in the analysis, accurately capturing data from government sources to quantify the industry can be complicated. Often, NAICS codes are self-identified by companies and are based on a company's primary source of revenue when they engage in multiple types of economic activity. For example, a produce company could self-identify as a distributor, though the company also serves as a transportation brokerage firm. In some cases, due to self-identification, produce companies may not be captured under the industry categorizations one would expect. In particular, many produce wholesale companies are categorized as *Fruit & vegetable markets*, or even under industries such as *Agricultural support services.* To account for these inconsistencies in reporting, this study relies on a number of different data sources to better capture the activity of all fresh produce industry cluster companies operating in Santa Cruz County.

Direct economic activity in the cluster is estimated relying on business establishment counts from Blue Book Services (2022), a fresh produce industry credit rating and marketing company, which identified 209 fresh produce companies located in Santa Cruz County. Of these, 187 companies identify as shippers or distributors, or otherwise do not self-report exclusively as brokers or cold storage companies, while 18 companies identified exclusively as brokers, and 4 identified as exclusively cold storage. These business counts serve as the foundation of our estimates of economic activity in the industry cluster. Figure 11 provides a count of the different services these 209 firms provide. Firms can provide more than one service.

Figure 11. Count of Services Provided by 209 Fresh Produce Industry Cluster Companies in Santa Cruz County (individual companies can provide multiple services)



Source: Blue Book Services (2022)

The Economic Census provides information on gross business receipts and operational expenditures by industry at the county level. These data are available for 2012 and 2017 (U.S. Census Bureau, 2021b). Inflation-adjusted receipts per establishment and operational expenditures per establishment for *Fresh fruit & vegetable merchant wholesalers* were calculated based on the number of business establishments reported in the county in the 2017 Economic Census. The inflation-adjusted averages were applied to the number of shipper / distributor operations from Blue Book Services to estimate wholesaling receipts and operating expenses in the county. Employment in fresh produce wholesaling was estimated using the number of companies from Blue Book Services and employment data from the Bureau of Labor Statistics (BLS) Quarterly Census of Employment and Wages (QCEW) (Bureau of Labor Statistics, 2021). Employees per establishment was estimated from the QCEW and then applied to the number of companies in the county (Table 8).

Table 8. Estimated Fresh Produce Wholesaling Receipts and Employment in Santa Cruz County, 2019 & 2020

	2019	2020
Receipts		
Avg. Gross Receipts per Establishment (inflation-adjusted)	$10,080,404	$10,217,700
Number of Fresh Produce Shipper / Distributors	187	187
Estimated Fresh Produce Wholesaling Gross Receipts	***$1,885,035,608***	***$1,910,709,895***
Employment		
Employees per Establishment (QCEW)	11.3	11.6
Estimated Fresh Produce Wholesaler Employees	***2,112***	***2,172***

To translate these metrics into terms compatible with the national input-output accounting framework, it is necessary to adjust some values. For example, total wages from the QCEW were adjusted to account for total employee compensation, including wages, benefits, and any additional compensation. We apply a multiplier of 1.16 for the IMPLAN industry *Wholesale - Grocery and related product wholesalers* (IMPLAN Group LLC, 2020). Margined industry output was estimated using the ratio of employee compensation to output from IMPLAN. This ratio is close to the ratio available in the most recent detailed use table from the Bureau of Economic Analysis Input-Output Accounts (BEA, 2021).

In retail and wholesale industries, industry output is not equivalent to industry sales. An industry's output is measured as the difference between their total receipts and the cost of merchandise sold by the industry, prior to any markup charged by businesses to cover their costs of operation. Within wholesale industries, companies may track sales in different ways. *Gross sales* measures the total receipts of a business, including the value of products that are re-sold on behalf of suppliers. In that sense, gross sales measures the value of goods sold plus the value of wholesale services provided by the company.

When measuring output of retail and wholesale industries, convention is to only measure the value of the retail or wholesale services provided by the company. In other words, company receipts *net* of the cost of goods sold. For wholesalers, the cost of the merchandise sold was roughly $1.4 billion in both 2019 and 2020 (Table 9). These costs are based on USDA Agricultural Marketing Service (AMS) price data and information reported to U.S. Customs and Border Patrol. Note, there is a difference between value of imports through the Nogales Port of Entry (see Figures 1 and 2) and the estimate of the cost of imports reported as handled and sold by Santa Cruz County-based companies. Based on interviews, a significant share of produce that enters through the Nogales port of entry is destined for California-based companies, and therefore is not reported by Arizona companies.

Table 9 presents the direct economic activity of the industry in 2019 and 2020 expressed in terms of metrics used as inputs to the IMPLAN model. Figures capture wholesaler economic activity within Santa Cruz County and not subsequent activity in California or other states.

Table 9. Direct Fresh Fruit & Vegetable Merchant Wholesaler Economic Activity in Santa Cruz County

Measure	2019	2020
Receipts	$1,885,035,608	$1,910,709,895
Intermediate Expenditures	$218,207,595	$237,410,407
Value Added	$259,803,919	$282,667,311
Employee Compensation	$156,659,148	$170,445,543
Proprietor Income	$36,883,386	$40,129,216
Other Property Type Income	$56,728,905	$61,721,190
Taxes on Production and Imports	$9,532,480	$10,371,362
Cost of Merchandise Sold (Imports)	$1,407,024,095	$1,390,632,177
Merchant Wholesaler Industry Output*	$478,011,513	$520,077,718

* In retail and wholesale industries, output is the difference between their total receipts and the value (cost) of merchandise sold by the industry, prior to markups to cover operation costs.

The output of other industries considered as part of the industry cluster (Table 10), such as brokers and refrigerated warehousing, was estimated using a number of methods. Total QCEW-reported wages for *Refrigerated warehousing and storage* was used to estimate industry output based on the ratio

of employee compensation to industry output in IMPLAN. To account for the use of refrigerated warehousing by other industries, total estimated output was adjusted according to the share of refrigerated warehousing used by the fresh produce industry in the county. According to interviews of industry experts, the only other major user of refrigerated warehousing for imports in the county is the seafood import industry. By value, fresh fruits and vegetables accounted for an average of 93% of imports of fruits, vegetables, and seafood between 2019 and 2020. Therefore, the fresh produce industry was assumed to account for 93% of refrigerated warehousing activity in the county.

Based on listings through Blue Book Services (2022), there were a total of 18 companies self-reporting as exclusively providing brokerage services. This matches closely with the number of establishments reported in the QCEW (Bureau of Labor Statistics, 2021). Therefore, total QCEW-reported wages for *Wholesale trade agents and brokers* were used to estimate industry output based on the ratio of employee compensation to industry output in IMPLAN. Additionally, total QCEW-reported wages for *Regulation of agricultural markets* were used to estimate industry output based on the ratio of employee compensation to industry output in IMPLAN for *Other government enterprises.*

While truck traffic through Santa Cruz County carrying fresh produce is considerable, many of the enterprises involved in trucking are non-local. Locally-procured trucking is therefore estimated using estimated fresh produce wholesaler spending on trucking as an input based on IMPLAN industry spending patterns, and the share of trucking services purchased locally as reported by survey respondents.

Table 10. Estimated Output by Industry, Santa Cruz County Fresh Produce Industry Cluster, 2019 & 2020

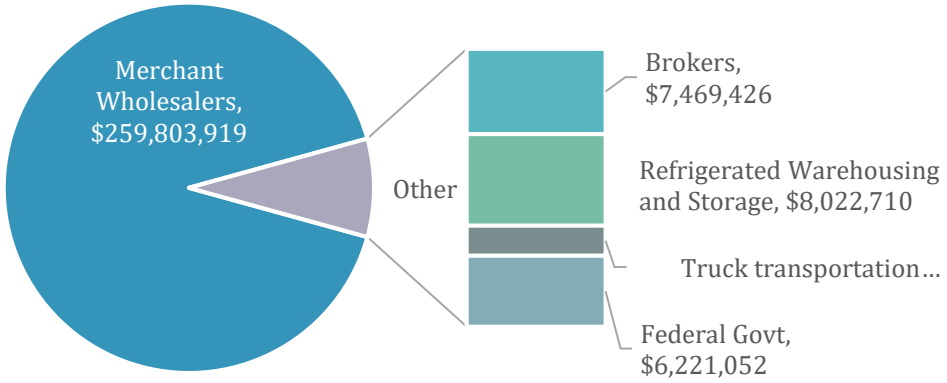
Industry	2019	2020
Merchant Wholesaler Industry Output*	$478,011,513	$520,077,718
Refrigerated warehousing	$17,537,155	$22,454,280
Federal agricultural inspection	$10,060,003	$9,744,888
Wholesale trade agents and brokers	$8,387,481	$6,230,137
General freight trucking, local	$4,520,919	$ 4,918,771
Total	$518,517,072	$563,425,793

* In retail and wholesale industries, output is the difference between their total receipts and the value (cost) of merchandise sold by the industry, prior to markups to cover operation costs. Figures may not add due to rounding.

While industry output is a measure comparable to sales, value added is a measure comparable to gross domestic product (GDP). Estimated direct value added for the fresh produce industry in Santa Cruz County totaled $284 million in 2019 and $307 million in 2020. Figure 12 illustrates the breakdown of industry value added by component. Wholesaling constitutes a large share of industry activity.

In 2019, $259 million in value added was generated within produce wholesaling companies, while the remaining $24 million was in other components of the industry cluster (brokers, refrigerated warehousing, truck transportation, and federal government).

Figure 12. Value Added by Industry Cluster Component, 2019

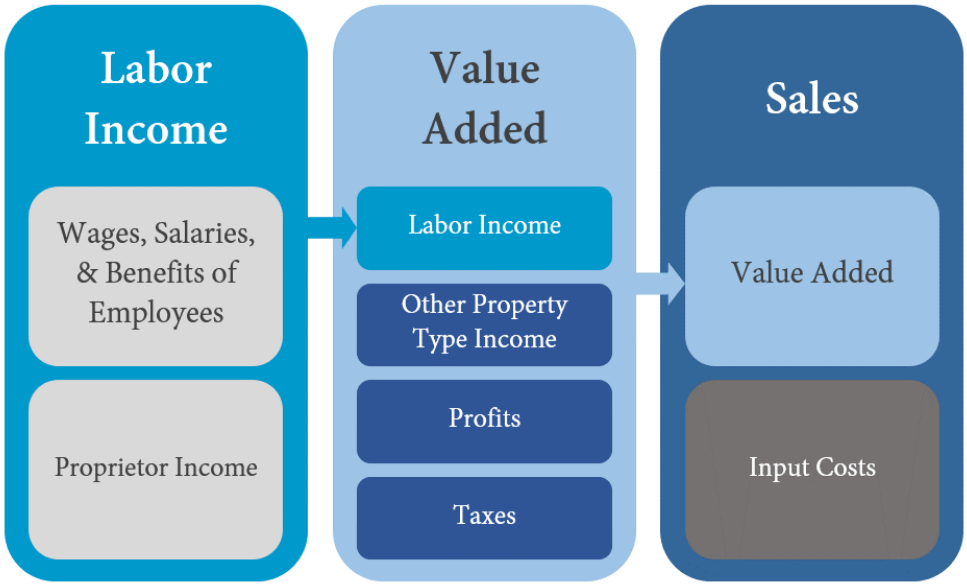


Economic Contribution Analyses

An economic contribution analysis presents a snapshot of economic activity supported by (or attributable to) the existence of an industry at a given time in a given geographic area. The economic activity can be broken down into different effects, referred to as *economic multiplier effects*. *Direct effects* represent the economic activity generated directly when an industry in question produces the goods or services it specializes in. *Indirect multiplier effects* capture secondary rounds of economic activity generated when the businesses that supply goods or services as inputs to the industry in question produce those goods and services. *Induced multiplier effects* capture economic activity generated when individuals employed in the industry spend their income on household goods and services within the local economy, generating additional economic activity. These multiplier effects are attenuated by what is known as *leakage* — the flow of money out of the local economy when goods and services are purchased from non-local businesses.

Economic contributions can be measured using a series of metrics. *Output* measures the value of sales taking place in the local economy. While intuitive to understand, it double counts the sales value of inputs that are produced locally. For example, if a locally grown vegetable is purchased by a restaurant and then sold as part of a meal to a customer, the sales value of the vegetable is counted twice, once as the raw vegetable, and once as part of the full sales price of the meal. *Value added* is a metric that avoids this double counting by capturing only the value of goods sold over and above the cost of intermediate inputs used to make them. Synonymous with Gross Domestic Product (GDP), value added measures the value of production generated within the local economy. A component of value added is *labor income* which measures both *employee compensation* (wages, salaries, and benefits to employees), and *proprietor income* (income to business owners). Other components of value added include *corporate profits* and *taxes*. Finally, *jobs* measures full- and part-time jobs supported by an industry. Figure 13 illustrates the relationship between these different measures.

Figure 13. Relationship between Economic Contribution Metrics



County Economic Contribution

The economic contribution of the fresh produce industry cluster to Santa Cruz County's economy was estimated using the IMPLAN 3.1 model and data. The calculation was performed using analysis-by-parts, modeling industry spending on inputs with a series of industry spending patterns, and wages, salaries, and business income as labor income changes. Federal government employment and operations were modeled using an institutional spending pattern and labor income changes.

In 2019, the fresh produce industry was estimated to directly account for an estimated 2,400 jobs in Santa Cruz County. Direct industry output was roughly $519 million, and the industry directly contributed $284 million to county GDP. Including indirect and induced multiplier effects in addition to direct economic activity, the industry cluster supported an estimated 3,700 jobs, $679 million in output, $362 million in county GDP, and $261 million in labor income (Table 11).

Table 11. Economic Contribution of Fresh Produce Industry Cluster, Santa Cruz County, 2019

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	2,409	$218,054,226	$284,147,573	$518,517,072
Indirect Effect	605	$20,018,915	$28,520,061	$72,764,306
Induced Effect	697	$22,875,466	$48,866,066	$88,153,849
Total Effect	3,712	$260,948,607	$361,533,700	$679,435,227

In 2020, the fresh produce industry was estimated to directly account for an estimated 2,500 jobs in Santa Cruz County. Direct industry output was roughly $563 million, and the industry directly contributed $307 million to county GDP. Including indirect and induced multiplier effects in addition to direct economic activity, the industry cluster supported an estimated 3,800 jobs, $726 million in output, $385 million in county GDP, and $277 million in labor income (Table 12). In 2019,

the industry supported an estimated $10.6 million in state and local tax revenues, including multiplier effects. In 2020, this figure was estimated at $11.0 million.

Table 12. Economic Contribution of Fresh Produce Industry Cluster, Santa Cruz County, 2020

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	2,487	$235,265,639	$307,375,810	$563,425,793
Indirect Effect	570	$17,509,535	$26,295,037	$69,419,075
Induced Effect	730	$24,257,402	$51,817,239	$93,630,230
Total Effect	3,788	$277,032,576	$385,488,086	$726,475,098

State Economic Contribution

When examined for the entire state economy, the estimated economic contribution of the industry grows. This is because by including a larger geographic area, there is greater likelihood that purchases of inputs by businesses will be fulfilled within the regional economy, in this case the state economy, as opposed to the county economy in the previous calculations. Tables 13 and 14 present the estimated statewide economic contribution of Santa Cruz County's fresh produce industry cluster for 2019 and 2020.

Table 13. Economic Contribution of Fresh Produce Industry Cluster, Arizona, 2019

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	2,409	$218,054,226	$284,147,573	$518,517,072
Indirect Effect	769	$43,383,739	$64,012,938	$119,366,205
Induced Effect	1,671	$81,974,019	$148,475,117	$257,182,196
Total Effect	4,849	$343,411,984	$496,635,628	$895,065,473

For the state of Arizona as a whole (including multiplier effects), the economic contribution of the fresh produce industry cluster in 2019 was more than $895 million in output (sales), $496 million in value added (the equivalent of GDP), and $343 million in labor income, supporting 4,849 jobs (Table 13).

Table 14. Economic Contribution of Fresh Produce Industry Cluster, Arizona, 2020

Impact Type	Employment	Labor Income	Value Added	Output
Direct Effect	2,487	$235,265,639	$307,375,810	$563,425,793
Indirect Effect	769	$43,934,437	$64,825,496	$120,814,734
Induced Effect	1671	$83,014,569	$150,359,809	$260,492,985
Total Effect	4,927	$362,214,645	$522,561,115	$944,733,512

By 2020 the fresh produce cluster was approaching a billion-dollar industry for Arizona, with output of more than $944 million, value added of $522 million, and labor income of $362 million, supporting 4,927 jobs in the state (Table 14).

National Forward Linkages of Santa Cruz County Fresh Produce Trade

Once imported fresh produce is handled by the industry cluster in Santa Cruz County, that produce is transported throughout the country. A chain of companies is involved in transporting, distributing, and selling the produce to end-consumers or foodservice businesses. Similar to a previous study which examined the forward-linked economic activity associated with tomato imports (Duval, et al, 2018), this study estimates forward linkages for produce traveling through the Nogales port of entry. This includes economic activity supported in the wholesale, retail, and foodservice industries throughout the United States in 2019 and 2020.

The analysis estimates economic activity supported directly through these forward-linked industries using price margins. USDA AMS reports average prices for commodities over different time periods as they are imported, at wholesale markets, and at retail. By taking the difference between the price of a commodity at wholesale and its import price, or its price at retail and its price at wholesale, the markup charged by the wholesaler or retailer can be estimated on a per-unit basis. These margins are then applied to volumes of produce being marketed at wholesale, retail, and foodservice to estimate the total economic activity taking place within these industries attributable to produce imports through Nogales.

To begin, we estimate the shares of top commodities imported through Nogales sold through different market channels. Within the industry survey, respondents were asked to report the share of their top commodities imported that they sell through wholesale, foodservice, and retail market channels, as well as directly to brokers or other channels. Table 15 presents the results of survey responses.

Table 15. Market Channels Sold to by Top Commodity among Survey Respondents

Commodity	Directly to Wholesale	Directly to Foodservice	Directly to Retail	Directly to Brokers	Other	TOTAL
Bell Pepper	36%	24%	19%	20%	2%	100%
Blueberries	30%	0%	60%	10%	0%	100%
Cucumbers	28%	9%	39%	22%	2%	100%
Eggplants	47%	11%	24%	18%	0%	100%
Grapefruit	50%	20%	15%	15%	0%	100%
Grapes	8%	4%	78%	6%	4%	100%
Lemons	50%	20%	15%	15%	0%	100%
Mangoes	25%	0%	75%	0%	0%	100%
Melons	46%	6%	24%	23%	1%	100%
Oranges	50%	20%	15%	15%	0%	100%
Other	60%	15%	20%	5%	1%	100%
Peppers	62%	9%	15%	14%	0%	100%
Squash	33%	4%	39%	23%	1%	100%
Tomatoes	34%	14%	27%	23%	1%	100%
Watermelons	34%	4%	39%	21%	1%	100%

This information was used to estimate the share of each commodity that was assumed to flow through each market channel. All produce was assumed to go through wholesale, and then move to either retail or foodservice. The percent going to foodservice was calculated from the survey responses as the percent of produce going directly to foodservice, plus half of produce going directly to wholesale, directly to brokers, and other. Produce going to retail was assumed to include all produce going directly

to retail, plus half of produce going directly to wholesale, directly to brokers, and other. That yields the following breakout by commodity for foodservice versus retail channels (Figure 14).

Figure 14. Distribution of Produce between Foodservice and Retail by Commodity

Based on these breakouts of import volume through Nogales between foodservice and retail, a shrink factor was applied to the estimated volume at retail to account for spoilage and shrinkage at retail (Table 16).

Table 16. Estimated Retail Shrink by Commodity

Commodity	Est. Retail Shrink
Tomatoes, round & Roma	14.5%
Bell peppers	10.7%
Grapes	8.7%
Zucchini squash	23.1%
Cucumbers	12.2%
Watermelons	25.4%
Mangoes	21.1%
Cantaloupes & Honeydew*	20.4%
Eggplants	20.6%
Blueberries	8.9%
Oranges	14.8%
Grapefruit	18.8%
Overall	12.2%

Source: Buzby, et al, 2016; * Cantaloupe & honeydew is average of two rates

F.O.B. (import), terminal market (wholesale), and retail prices by commodity were retrieved from the USDA AMS Custom Average Tool portal for non-organic produce (USDA AMS, 2022). F.O.B. prices were retrieved for produce imported via Nogales, terminal market prices were national average prices for produce originating from Mexico, and retail prices were national averages for produce of all origins. All prices were converted to a per-pound basis for comparison based on reported container approximate net weights reported by USDA AMS in their Fresh Fruit and

Vegetable Shipments report (USDA, 2021). Percent price markup by commodity was calculated for wholesale price over F.O.B. price and retail price over wholesale price for 2019 and 2020 (Table 17).

Table 17. Price Markups at Wholesale and Retail by Commodity, 2019 & 2020

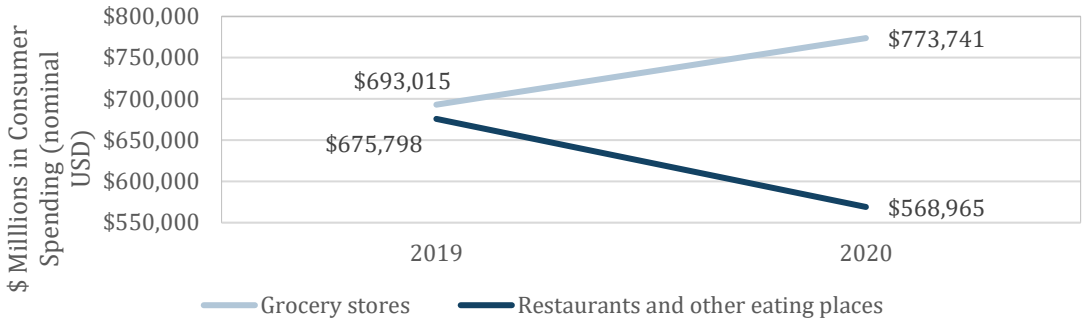
Commodity	2019		2020	
	Wholesale over FOB	*Retail over Wholesale*	*Wholesale over FOB*	*Retail over Wholesale*
070200 Tomatoes, Fresh or Chilled	69%	125%	63%	101%
070960 Fruits of Genus Capsicum or Pimenta, Fresh/chilled	33%	174%	37%	185%
080610 Grapes, Fresh	46%	68%	51%	46%
070993 Pumpkins, Squash & Gourds, Fresh or Chilled	106%	101%	105%	59%
070700 Cucumbers & Gherkins, Fresh or Chilled	97%	121%	92%	141%
080711 Watermelons, Fresh	57%	90%	28%	66%
080450 Guavas, Mangoes & Mangosteens, Fresh or Dried	62%	248%	60%	224%
080719 Melons (except Watermelons) & Papayas, Fresh	66%	116%	111%	163%
070930 Eggplants (aubergines), Fresh or Chilled	76%	103%	74%	77%
070820 Beans Fresh or Chilled	36%	57%	42%	58%
081040 Cranberries, Blueberries, Etc, Fresh	58%	18%	71%	8%
080440 Avocados, Fresh or Dried	19%	84%	24%	83%
080510 Oranges, Fresh	78%	194%	92%	143%
080550 Lemons & Limes, Fresh or Dried	43%	14%	70%	13%
080540 Grapefruit, Fresh or Dried	71%	50%	89%	67%
Average	**61%**	**104%**	**67%**	**96%**

Source: USDA AMS (2022); Author calculations

In the case of foodservice, individual commodities are not sold as-is, but rather as part of transformed final products plus the services provided by the foodservice establishment. As such, there is no price per se for lettuce served as part of a salad at a restaurant, for example. Rather, a customer purchases the salad as a whole. For that reason, to estimate the share of foodservice sales associated with the commodities used as inputs, an industry margin is applied to the value of produce commodities at wholesale. The gross margin of *Food services and drinking places* (NAICS 722) as a percent of all expenses, including intermediate inputs, labor expenses, and taxes, was 11.6% in 2019 (BEA, 2022). This is the price markup over wholesale prices applied to fresh produce sold at foodservice establishments used in this analysis.

Due to the COVID-19 pandemic, a major shift in consumer spending occurred between spending at food away from home and spending at grocery stores in 2020. To accurately reflect spending between these two market channels, we apply an adjustment to account for this change. Figure 15 shows the shift in U.S. consumer spending away from restaurants and towards grocery.

Figure 15. Annual U.S. Consumer Spending at Grocery Stores & Restaurants and Other Eating Places, 2019 & 2020



Source: U.S. Census Bureau (2022)

As a share of combined spending in these two categories, grocery stores shifted from 51% of spending to 58% of spending, while restaurants and other eating places moved from 49% to 42%. As a change from their original shares, grocery spending increases by 13.8% and restaurant spending decreases by 14.2%, similar in absolute value because the values started near parity in 2019. These adjustments are applied to shift estimated spending between retail and foodservice. Applying price markups to the value of imports, percent shrink at retail, and share of each commodity destined for retail versus foodservice (with an adjustment for the breakout between foodservice and retail in 2020), we arrive at the following estimates for wholesale, retail, and foodservice margins generated through forward linkages for fresh produce imported via Nogales (Table 18). In total, economic activity taking place within these industries nationally attributable to produce imports through Nogales is more than $4.5 billion in 2019 and nearly $5 billion in 2020.

Table 18. Estimated Forward-Linkages by Commodity for Fresh Produce Imported via Nogales ($ millions)

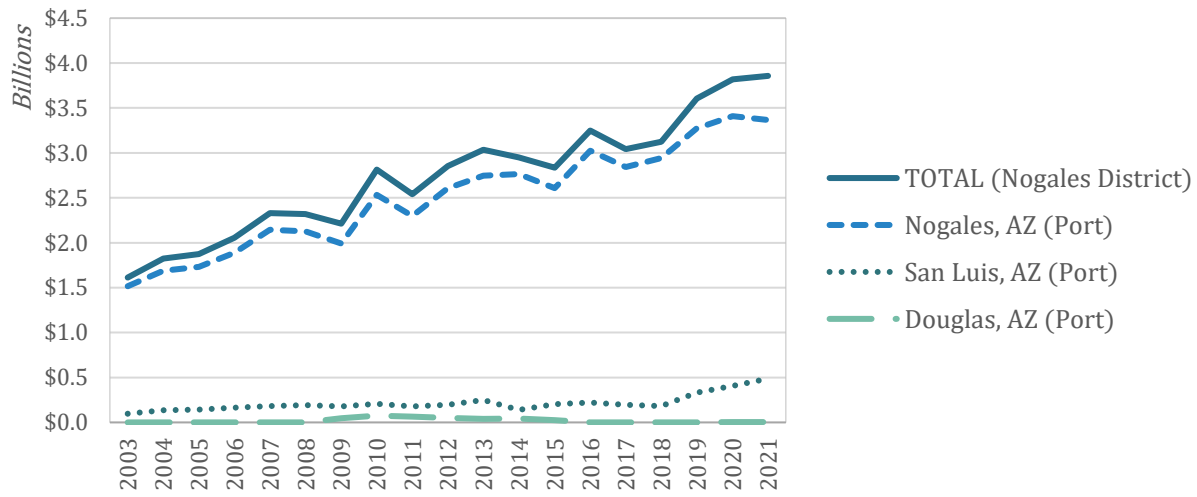
	2019				2020			
Commodity	***Wholesale Margin***	***Retail Margin***	***Food-service Margin***	***Combined Margins***	***Wholesale Margin***	***Retail Margin***	***Food-service Margin***	***Combined Margins***
Tomatoes	397.4	432.8	20.1	850.3	479.8	530.8	20.8	1,031.5
Bell Pepper	194.3	228.6	12.0	434.9	209.8	291.2	11.1	512.0
Grapes	270.9	361.3	4.1	636.3	255.4	336.9	3.3	595.6
Squash	328.7	343.2	12.4	684.4	418.8	392.8	13.6	825.3
Cucumbers	310.9	391.3	12.6	714.8	305.9	479.1	10.7	795.7
Watermelons	155.1	148.6	5.9	309.6	68.2	64.9	2.2	135.3
Mangoes	100.6	241.9	1.5	344.0	88.6	225.4	1.1	315.1
Melons	46.3	46.9	2.2	95.4	59.9	84.1	2.5	146.5
Eggplants	34.9	31.7	1.8	68.3	38.7	35.0	1.7	75.4
Blueberries	27.8	23.9	0.6	52.3	28.6	25.6	0.6	54.8
Oranges	14.9	17.7	0.9	33.5	21.9	24.5	1.1	47.5
Grapefruit	2.6	1.5	0.2	4.2	4.6	3.4	0.2	8.3
Other	166.1	157.9	9.3	333.3	195.7	202.7	9.4	407.8
TOTAL	**2,050.5**	**2,427.3**	**83.5**	**4,561.3**	**2,176.0**	**2,696.5**	**78.3**	**4,950.7**

Comparison of Results to Previous Studies

This study differs from past studies of the economic contribution of the fresh produce industry in Santa Cruz County. We present a comparison of the methods used in this study to those used by Pavlakovich-Kochi & Thompson (2013) for their study which examined the industry in calendar year 2011.

First, the import data used varies slightly. The U.S. Census Bureau reports imports at a number of geographic aggregations, including by the port and the district through which it traveled. The Nogales District includes seven different ports in Arizona: Douglas, Lukeville, Naco, Nogales, Phoenix, San Luis, and Tucson. The Nogales port accounts for a large share of fruit and vegetable imports moving through the Nogales District (Figure 16), however the San Luis port accounts for a considerable share of these imports in some years. The previous study was based on imports for the entire Nogales District, some of which are located in other Arizona counties, while this analysis only examines imports moving through the Nogales port, located in Santa Cruz County. For this reason, estimates of economic contribution from the previous study are not strictly comparable to estimates presented here.

Figure 16. Fruit & Vegetable Imports via Nogales District, and Top District Ports, 2003-2021 (Nominal USD)



Another difference lies in the definition of the industry cluster. Pavlakovich-Kochi & Thompson (2013) define the industry cluster as follows:

- *Fresh fruit & vegetable merchant wholesalers* (NAICS 424)
- *Agents and brokers engaged in wholesaling* (NAICS 425)
- *Truck transportation* (NAICS 484)
- *Support activities for transportation including freight forwarders & customs brokers* (NAICS 488)
- *Warehousing & storage* (NAICS 493)

This study uses the following definition:

- *Fresh fruit & vegetable merchant wholesalers* (NAICS 424480)
- *Fruit & vegetable markets* (NAICS 445230)
- *Refrigerated warehousing & storage* (NAICS 493120)
- *Wholesale trade agents and brokers* (NAICS 425120)
- *General freight trucking, local* (NAICS 484110)
- *Regulation of agricultural marketing & commodities* (NAICS 926140)

This study relies on more specific NAICS codes to avoid counting economic activity in industries such as warehousing and transportation that is not attributable to the fresh produce industry. This study also does not include sale of diesel fuel as a direct part of the industry, but rather fuel purchases are captured through indirect economic impacts.

The final major difference between the studies is the methods used to estimate economic activity in the industry cluster. The previous study relied on IMPLAN data for estimates of industry sales and output, whereas this study takes a ground-up approach, applying average sales per establishment from the 2017 Economic Census to an establishment count which includes companies categorized under a number of NAICS codes, not only *Fresh fruit & vegetable merchant wholesalers* (NAICS 424480). IMPLAN data reflect government statistics, and therefore likely undercounts the economic activity of wholesalers within the county. Other primary industries are counted differently in this study compared with the previous study. Whereas the previous study uses higher level, more general NAICS codes, this study uses more specific NAICS codes, and in some cases only counts a portion of the total activity within the industry to account for the fact that not all activity in industries such as warehousing or truck transportation is attributable to the fresh produce industry.

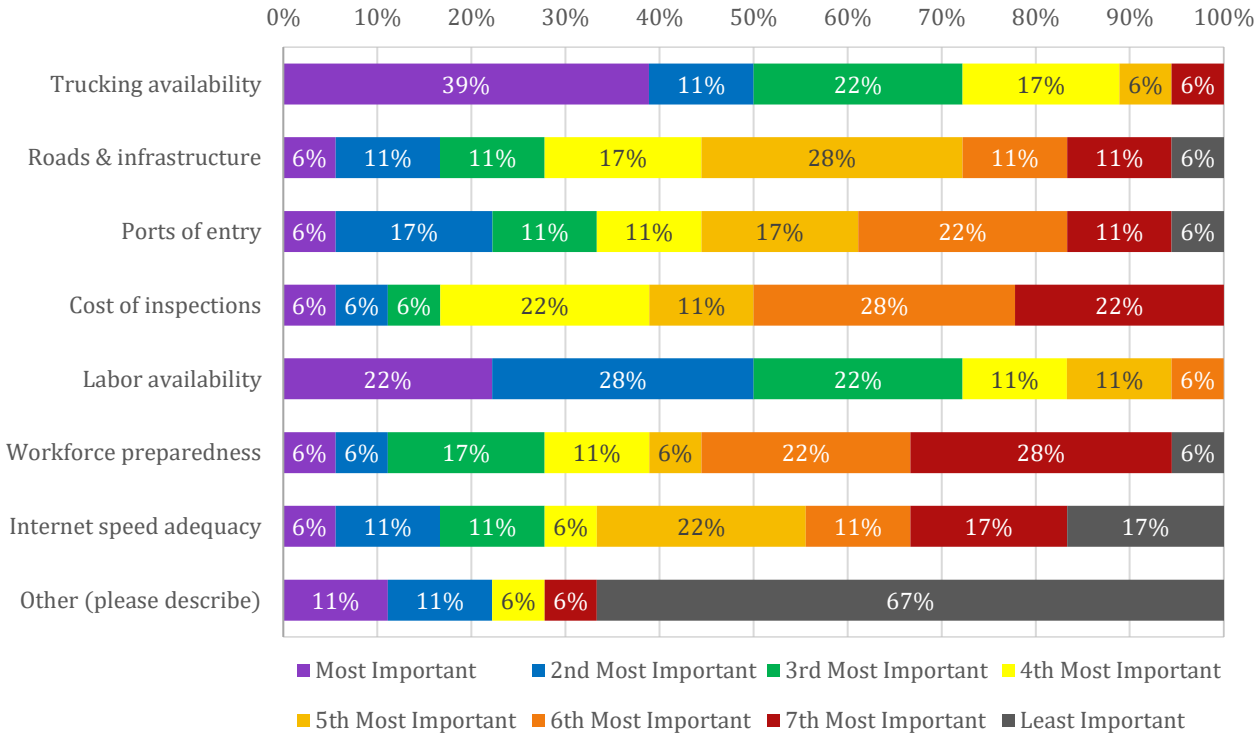
Understanding differences in the data and methods used, results of this study should not be compared directly with results of the previous study.

Survey Responses on Business Operating Environment

Finally, the industry survey asked respondents a number of questions about the operating environment in Santa Cruz County and their operations' plans for future employment and investment.

Respondents were asked to provide information about a series of operating challenges, ranking them from 'most important or challenging' to 'least important or challenging'. The issue rated as most challenge was 'trucking availability', with over 39% of respondents ranking that as the greatest challenge and 11% as the second-greatest challenge. That was followed by 'labor availability', ranked as the greatest challenge by 22% of respondents and as the second-greatest challenge by 28% of respondents. Other concerns, such as 'roads and infrastructure', 'ports of entry', 'cost of inspections', 'workforce preparedness', 'internet speed adequacy', and 'other' concerns had more mixed results in terms of their rankings (Figure 17). Challenges described under 'Other' included inspections, the cost of freight, banking, customs, and politics.

Figure 17. Ranking Importance of Operating Environment Challenges



When asked how they expect their operation's employment will change in Nogales or Santa Cruz County within the next five years, respondents overwhelmingly reported that they expect employment to increase (Table 19). Over 27% expect their employment to increase by more than 20%, followed by roughly 23% of respondents reporting employment increases between 10% and 20% and another 23% of respondents reporting between 1% and 10%. Another 18% expect their employment to remain the same, and 9% were not sure.

Table 19. Expected Change in Operation's Employment in Nogales / Santa Cruz County in Next 5 Years

Answer	Percent
Increase by more than 20%	27.3%
Increase by 10% to 20%	22.7%
Increase by 1% to 10%	22.7%
Roughly stay the same	18.2%
Decrease by 1% to 10%	0.0%
Decrease by 10% to 20%	0.0%
Decrease by more than 20%	0.0%
I'm not sure	9.1%
Total	100%

Over a quarter of respondents reported having invested in new warehouse space or facility upgrades since 2018 (Table 20).

Table 20. Companies Investment in New Warehouses or Facility Upgrades Since 2018

Answer	Percent	Count
Yes	27%	6
No	73%	16
Total	100%	22

Of those who made investments, the most commonly reported type of investment was building upgrades, followed by new equipment, new buildings, or other investments (Table 21).

Table 21. Type of Investments Made

Answer	Percent	Count
New building	9%	1
Building upgrades	55%	6
New equipment	27%	3
Other	9%	1
Total	100%	11

Respondents were specifically asked if they had invested in solar power equipment in Nogales or elsewhere in Santa Cruz County. Roughly a third of respondents (6 of 19) reported having made investments in the past, and an additional 11% indicated they plan to invest in solar equipment in the future (Table 22).

Table 22. Past & Future Investment in Solar Power Equipment by Fresh Produce Companies in Santa Cruz County

Answer	Percent	Count
Yes	31.6%	6
No, but we have plans to install solar power equipment in the future	10.5%	2
No, and we don't have plans to install solar power equipment in the future	26.3%	5
N/A	31.6%	6
Total	100%	19

Because of the relatively small number of responses (19) compared to the total number of businesses and buildings operated by the industry cluster, an alternative approach was used to measure the adoption of rooftop solar technology. First, a list of companies was identified through Blue Book Services (2022). Next, this list was paired down to companies that listed physical street addresses (as opposed to only PO boxes) in Santa Cruz County, or whose physical street addresses could be ascertained using Google Maps. This eliminated operations with missing data or ones headquartered outside the county. Aerial photography from Google Maps was then examined to record whether solar panels were atop business roofs (and in some cases, parking structures). Businesses often share the same building, so the number and percentage with solar panels was calculated on a per-building basis.

Results were calculated on a per-building basis to make them comparable to a recent national study of rooftop solar installations on all commercial buildings. A recent national study reports that 3.5% of commercial buildings in the United States have solar panels on their roofs (Yale School of the Environment, 2020). Based on inspection of the aerial photography, rooftop solar adoption rates by the fresh produce industry cluster are more than four times this national average. We estimate that 18 of 110 unique buildings had rooftop solar panels, 16.4% of the facilities observed.

References

Blue Book Services (2022). Blue Book Services Database. https://www.producebluebook.com/

Bureau of Economic Analysis (2021). The Use Table (Supply-Use Framework), 2012, Industry Economic Accounts. Retrieved from https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1

Bureau of Economic Analysis (2022). The Use of Commodities by Industries – Summary. 1997-2020. Retrieved from https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1

Bureau of Labor Statistics (2021). Quarterly Census of Employment and Wages. Private, All Industry Aggregations, Santa Cruz County, Arizona. Retrieved from https://data.bls.gov/cew/apps/data_views/data_views.htm#tab=Tables

Bureau of Transportation Statistics (2021). TransBorder Raw Data. Retrieved from https://www.bts.gov/topics/transborder-raw-data

Buzby, J., Bentley, J., Padera, B., Campuzano, J., & Ammon, C. (2016). Updated Supermarket Shrink Estimates for Fresh Foods and Their Implications for ERS Loss-Adjusted Food Availability Data. United States Department of Agriculture, Economic Research Service, Economic Information Bulletin Number 155, June 2016. Retrieved from www.ers.usda.gov/publications/eib-economic-information-bulletin/eib155

Duval, D., Bickel, A., & Frisvold, G. (2018). Mexican Fresh Tomatoes: Agribusiness Value Chain Contributions to the U.S. Economy. University of Arizona Cooperative Extension. Retrieved from https://economics.arizona.edu/mexican-fresh-tomatoes-agribusiness-value-chain-contributions-us-economy

IMPLAN Group, LLC (2020). 2019 FTE & Employee Compensation Conversion Table. Retrieved 1/2022 from https://support.implan.com/hc/en-us/articles/115002782053-IMPLAN-to-FTE-Income-Conversions

Pavlakovich-Kochi, V. & Thompson, G. (2013). Bi-National Business Linkages Associated with Fresh Produce and Production Sharing: Foundations and Opportunities for Nogales and Santa Cruz County. Eller College of Management Economic & Business Research Center, University of Arizona.

U.S. Census Bureau (2022). Estimates of Monthly Retail and Food Services Sales by Kind of Business. Retrieved from https://www.census.gov/retail/index.html

U.S. Census Bureau (2021a). USA Trade® Online. Retrieved from https://usatrade.census.gov/index.php?do=login

U.S. Census Bureau (2021b). 2017 Economic Census. Retrieved from https://www.census.gov/programs-surveys/economic-census/data/tables.html

USDA AMS (2021). Fresh Fruit and Vegetable Shipments, FVAS-4 Calendar Year 2020. Specialty Crops Program, Market News Division, March 2021.

USDA AMS (2022). Custom Average Tool (CAT). Retrieved from https://cat.ams.usda.gov/app/main#/dashboards/58d7ca1a733656a41a000029?embed=true&l=false&r=false&h=false&t=false&volatile=true

Yale School of the Environment (2020). U.S. Commercial Rooftops Hold 145 Gigawatts of Untapped Solar Potential. Yale 360 Environment Digest. https://e360.yale.edu/digest/u-s-commercial-rooftops-hold-145-gigawatts-of-untapped-solarpotential#:~:text=The%20report%2C%20done%20in%20collaboration,solar%20projects%20located%20off%2Dsite.

Appendix: The Survey Instrument

Survey of Fresh Produce Industry in Nogales & Santa Cruz County, Arizona

This survey is a part of a study by the University of Arizona in collaboration with the Fresh Produce Association of the Americas. The purpose of the study is to quantify the economic activity in Santa Cruz County and Arizona attributable to the Nogales fresh produce industry. The survey will collect information about your business operation, including employment, expenses, and sales. It may be helpful to have relevant information accessible in completing the survey. You can leave the survey and return to complete it at a later time if necessary.

We suggest using a computer or laptop to take the survey because some questions are in a table format.

All survey responses are anonymous and study results will be presented so as to maintain the privacy of all respondents. Should you have any concerns, please feel free to contact us at duval@arizona.edu.

Your participation is greatly appreciated!

Q1 What is your company's main type of business?
- o Distributor / Grower / Shipper (1)
- o Customs broker (2)
- o Sales broker (3)
- o Transportation / logistics (4)
- o Independent warehouse (5)
- o Other (please specify) (6) _____

Q2 Please indicate if your company has any of the following operations located in Nogales/Santa Cruz County:
- ▢ Headquarters (1)
- ▢ Warehouse (2)
- ▢ Administrative offices (3)
- ▢ Agricultural production (4)
- ▢ Other (5)
- ▢ Not applicable (6)

Q3 Please indicate if your company has the following operations located elsewhere in Arizona, outside of Santa Cruz County:
- ▢ Headquarters (1)
- ▢ Warehouse (2)
- ▢ Administrative offices (3)
- ▢ Agricultural production (4)
- ▢ Other (5)
- ▢ Not applicable (6)

Q4 Which services does your company purchase from other companies located in Nogales / Santa Cruz County* or from companies located elsewhere in Arizona?
*Please indicate, to the best of your ability, where the actual physical operation is (versus where billing takes place)

	Purchase within Nogales / Santa Cruz County (1)	Purchase from elsewhere in Arizona (2)	Purchase OUTSIDE Arizona (3)	N/A (do not purchase) (4)
Trucking from the border to the warehouse (1)				
US customs brokerage (2)				
Sales brokerage (3)				
Trucking to buyer(s) in Arizona (4)				
Trucking to buyer(s) outside Arizona (5)				
Food safety or technical services (6)				
Repacking (7)				
Outsourced warehousing services (in-and-outs) (8)				
Legal services (9)				
Accounting & tax services (10)				
Other professional services (12)				
Other (please specify) (11)				

Q5 Which products does your company purchase from other companies located in Nogales / Santa Cruz County* or from companies located elsewhere in Arizona?
*Please indicate, to the best of your ability, where the actual physical operation is (versus where billing takes place)

	Purchase within Nogales / Santa Cruz County (1)	Purchase from elsewhere in Arizona (2)	Purchase OUTSIDE Arizona (3)	N/A (do not purchase) (4)
Cartons for packaging (1)				
Seeds (2)				
Fertilizers (3)				
Agricultural chemicals (4)				
Pallets (5)				
Forklift or skids (6)				
Office materials (7)				
Other (please specify) (8)				

Q6 What was the total value of sales generated by your company's operations in Nogales / Santa Cruz County in calendar year 2019? (please enter a number)

_____

Q7 What was the total value of sales generated by your company's operations in all of Arizona in calendar year 2019, including Nogales / Santa Cruz County?

_____

Q8 Of your company's total expenses for operations in Arizona (including Nogales / Santa Cruz County), how do expenses break out across the following categories? Rough estimates are acceptable. If category not applicable, please leave blank. Rows sum to 100%.

	Nogales / Santa Cruz County (% of expenses at this location) (1)	Elsewhere in Arizona (% of expenses at this location) (2)	Outside Arizona (% of expenses at this location) (3)
Labor (1)			
Administrative (2)			
Materials (not including fresh produce) (3)			
Machinery (4)			
Fresh produce (if applicable) (6)			
Legal & professional services (9)			
Other services (5)			
Operations overhead (7)			
Other (8)			

Q9 Since 2018, did your business invest in new warehouse space or perform any facility upgrades? (this includes construction of new warehouse space, renovation, expansion, or upgrades of existing space, or investment in capital equipment)

o Yes (1) o No (2)

Q10 If yes, how much was invested?

_____

Q11 Year(s) in which the investment was made

▢ 2018 (1)
▢ 2019 (2)
▢ 2020 (3)
▢ 2021 (4)

Q12 Type of investment

▢ New building (1)
▢ Building upgrades (2)
▢ New equipment (3)
▢ Other (please specify) (4) _____

Q13 What was your company's total number of employees in calendar year 2019 in Nogales / Santa Cruz County, AZ?

o Fewer than 5 (1)
o 5 to 9 (2)
o 10 to 19 (3)
o 20 to 49 (4)
o 50 to 74 (5)
o 75 to 99 (6)
o 100 to 149 (7)
o 150 to 249 (8)
o 250 or more (9)

Q14 What was your company's total number of employees in calendar year 2019 in all of Arizona (including Nogales / Santa Cruz County)?

o Fewer than 5 (1)
o 5 to 9 (2)
o 10 to 19 (3)
o 20 to 49 (4)
o 50 to 74 (5)
o 75 to 99 (6)
o 100 to 149 (7)
o 150 to 249 (8)
o 250 or more (9)

Q15 What % of the total number of employees were seasonal employees in Nogales / Santa Cruz County?

_____

Q16 What is the average duration of work (in months) for your operation's seasonal employees in Nogales / Santa Cruz County? (please answer in terms of months)

_____

Q17 Our number of employees in 2020 in Nogales / Santa Cruz County was:

o Higher than in 2019 (1)
o Approximately the same as in 2019 (2)
o Less than in 2019 (3)

Q18 How do you anticipate your operation's employment in Nogales / Santa Cruz County will change in the next 5 years?

o Increase by more than 20% (1)
o Increase by 10% to 20% (2)
o Increase by 1% to 10% (3)
o Roughly stay the same (4)
o Decrease by 1% to 10% (5)
o Decrease by 10% to 20% (6)
o Decrease by more than 20% (7)
o I'm not sure (8)

Q19 Of the top fresh produce commodities your business imports / distributes / brokers, please indicate the share (%) of each commodity (by value) your business sells through wholesale, foodservice, and retail market channels.

For purposes of this question, wholesale refers to businesses that aggregate fresh produce for sale to foodservice or food retail businesses; foodservice refers to restaurants (full-service and fast-food), caterers, cafeterias, and institutions that prepare food such as schools, hospitals, correctional facilities, etc.; retail refers to supermarkets, grocery stores, markets, and other businesses selling fresh produce directly to the consumer. Rows sum to 100%.

	Directly to Wholesale (1)	Directly to Foodservice Businesses (2)	Directly to Retail Businesses (3)	Directly to Brokers (4)	Other (5)
Commodity 1: (1)					

Commodity 2: (2)					
Commodity 3: (3)					
Commodity 4: (4)					
Commodity 5: (5)					
Commodity 6: (6)					

Q20 Roughly what percent of your fresh produce sales are to businesses in Arizona?
0 10 20 30 40 50 60 70 80 90 100

Q21 Which states do these top commodities travel to?
o [Commodity 1] (1) _____
o [Commodity 2] (2) _____
o [Commodity 3] (3) _____
o [Commodity 4] (4) _____
o [Commodity 5] (5) _____
o [Commodity 6] (6) _____

Q22 With regards to your operations in Nogales / Santa Cruz County, please rank the following challenges in their order of importance to your company, with 1 being the most important / most challenging and 8 being the least important / least challenging.
(To rank items, click the option and move it up or down in the list)
_____ Trucking availability (1)
_____ Roads & infrastructure (not including ports of entry) (2)
_____ Ports of entry (3)
_____ Cost of inspections (4)
_____ Labor availability (5)
_____ Workforce preparedness (6)
_____ Internet speed adequacy (7)
_____ Other (please describe) (8)

Q23 Has your operation installed solar power equipment at your facilities in Nogales / Santa Cruz County?
o Yes (1)
o No, but we have plans to install solar power equipment in the future (2)
o No, and we don't have plans to install solar power equipment in the future (3)
o N/A (4)

Q24 If Yes, how many megawatts is the installation?
_____

Q25 Do you have plans to install more solar power equipment in Nogales / Santa Cruz County?
o Yes (1)
o No (2)
o Not sure (3)

[End of Survey]