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Differential Impacts of the COVID-19 Pandemic on California's Produce and Nut Industries

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Abstract

California consistently leads the U.S. in the value of agricultural commodities produced, specializing in the production of high-value fruit, vegetable, and nut crops. In this article, we outline the short-term, medium-term, and evolving long-term impacts of the COVID-19 pandemic on California's produce and tree nut industries. Many of California's top commodities are labor intensive and highly perishable, e.g., strawberries and lettuce, and consequently these types of commodities experienced some of the worst economic impacts of the COVID-19 pandemic. These initial impacts included higher production costs due to social distancing and other worker protection measures, and the discarding of millions of dollars' worth of produce which was intended for the food service sector. Other top commodities, such as almonds and processing tomatoes, have highly mechanized operations with relatively non-perishable products. These have been more resilient to the short-run effects of the pandemic on supply chains but have experienced disruptions in international trade. In this article, we highlight the differential effects of the pandemic on California's high-value crops

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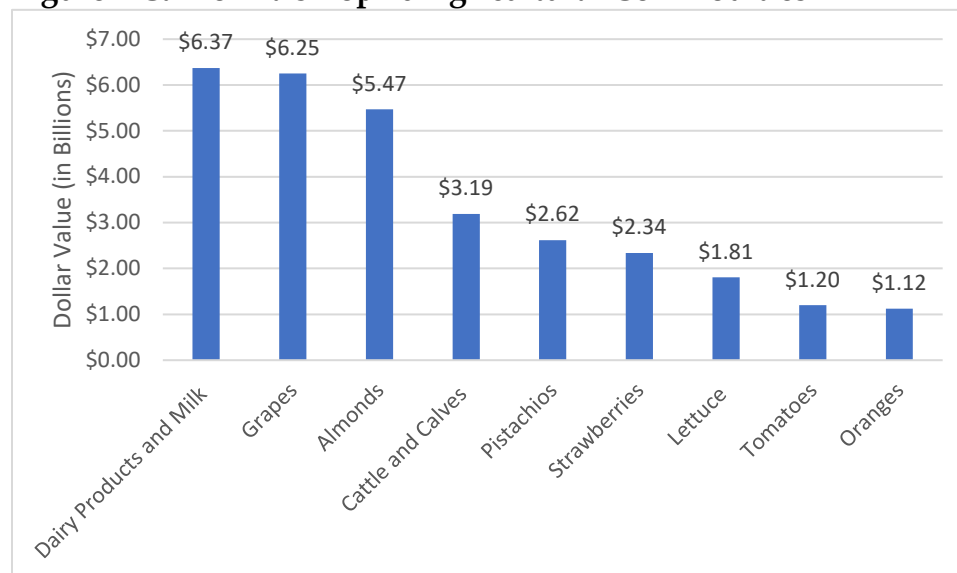
across the food service and retail supply chains, discuss the mitigating effects of federal, state and industry support, and highlight emerging consumer trends.

Introduction and Background

The spread of COVID-19 and the public responses and policies that followed have caused disruptions to the food supply chain and challenged the agricultural sector in new ways. In this article, we discuss the initial and evolving impacts of the COVID-19 pandemic on California's produce and tree nut industries. We evaluate the differential effects of the pandemic across these industries, spanning demand disruptions, export challenges, and emerging consumer trends. We also highlight challenges on the supply side which stem from the use of hired farm labor, the seasonal timing of operations, and the difficulty in adapting to the shifts in demand.

California is known for its production of a diversity of high-value crops. With total revenues of roughly \$50 billion annually, the state consistently leads the nation in the value of agricultural commodities produced. Fruits, vegetables, and nuts make up most of California's top 10 agricultural commodities (Figure 1). Over a third of the country's vegetables, two-thirds of all fruits, and virtually all the almonds, pistachios, walnuts and processing tomatoes produced in the U.S. are grown in California. With over 400 commodities grown in the state, the diversity of crops grown in California is larger than other places in the U.S. Though most of California's crops are typically grouped together into the specialty crops category, no industry looks the same.

Figure 1 California's Top 10 Agricultural Commodities



Source: *California Agricultural Production Statistics, California Department of Food and Agriculture (2019 Crop Year)*

The effect of the COVID-19 pandemic on fruit, vegetable, and nut production in California depends highly on a number of factors: the degree of mechanization along the supply chain, the degree of labor intensity and the extent to which social distancing hinders productivity, the perishability and storability of the crop, the adaptive capacity of the supply chain and the demand changes from food consumed away from home to food consumed at home.

Many of California's top commodities are labor intensive and highly perishable, e.g., strawberries and lettuce, and consequently these types of commodities experienced some of the worst economic impacts of the COVID-19 pandemic. One short-run outcome in these industries was the discarding of millions of dollars' worth of produce which was intended for the food service sector. In both the short- and medium-term, these industries have faced higher production costs due to social distancing and other worker protection measures. Other top commodities, such as almonds and processing tomatoes, have highly mechanized operations with relatively non-perishable products. These industries have been more resilient to the effects of the pandemic on supply chains but experienced short-term disruptions in international trade.

Demand Disruptions: Food Service and Export Markets

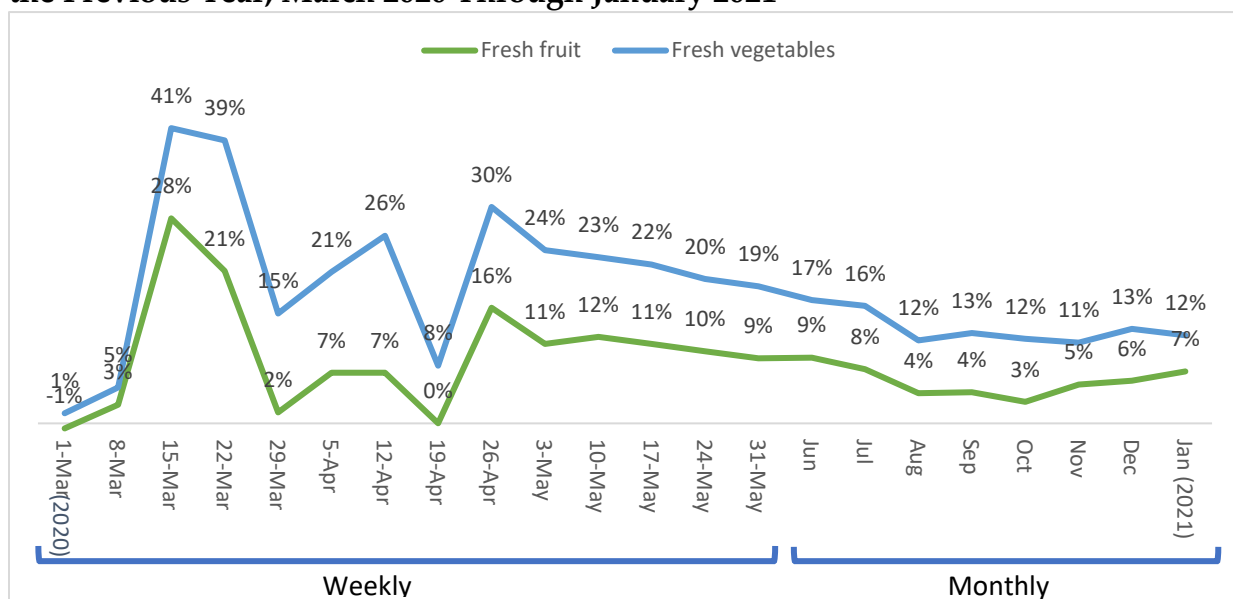
Undoubtedly, the largest demand disruption due to COVID-19 occurred in the food service channel. In 2019, the U.S. food marketing system supplied about \$1.77 trillion worth of food in approximately equal amounts via the food service and food retailing channel (USDA ERS, 2020a). Government-imposed lockdowns in 2020 effectively closed cafeterias in schools and institutions, hotels, full-service restaurants, and even fast-food outlets temporarily. These lockdowns resulted in 22% reductions in sales in March and 68% reductions in April, before starting to bounce back in May. Food service outlets saw the largest monthly increase in June before trending lower once more at the end of 2020. The reported gain of 6.9% in January of 2021 is a hopeful sign which points towards a slow recovery (U.S. Census Bureau, 2021). January sales are still registering 16% below their pre-COVID levels, and restaurant operators do not expect operations to return to normal before the end of 2021 (National Restaurant Association, 2021).

The disruption in the food service industry was accompanied by a surge in demand at retail. Produce never quite experienced the kind of retail surges seen in meat, dairy, dried and canned goods during the early phase of the pandemic, but demand for produce still increased significantly. While other factors aside from the pandemic may be affecting trends year over year, Figure 2 reveals an initial surge in mid-March of 2020 with a peak of 35% growth in fresh produce retail sales overall. Throughout summer, demand stabilized with both fresh fruits and vegetables selling at elevated levels relative to 2019. Fresh vegetables continue to outperform fresh fruits but

neither increases have offset the reduced demand via the food service channel, despite higher profit margins in the retail sector.

Tree nuts are perceived as a healthy snack, have a long shelf life, and are often used in baking, which experienced a revival to provide some comfort at home. As consumers hoarded staple foods at the beginning of the pandemic, tree nuts surged in sales. Shipments from tree nut handlers to domestic retail outlets in March 2020 were higher than in March 2019 for almonds (31%), pistachios (13%), and walnuts (18%) (Almond Board of California, 2020b; Administrative Committee for Pistachios, 2020; and California Walnut Board, 2020).

Figure 2 Growth in Fresh Produce Retail Sales Compared to the Same Time Period of the Previous Year, March 2020 Through January 2021



Source: IRI, Total U.S., MULO, % change vs. year ago (Compiled from several Produce Blue Book reports).

Disruptions in export markets also impacted California's agricultural industries to varying degrees. Table 1 shows how California's produce and tree nut industries differ in their reliance on export versus domestic markets. California is the sole U.S. exporter for almonds, pistachios, and walnuts, with roughly two-thirds of production being exported. Roughly 30% of processing tomatoes are exported, primarily to Canada, and strawberries and lettuce also rank in the top 20 export commodities (California Department of Food and Agriculture, 2019).

One relatively large export market for California almonds and walnuts documented sizeable disruptions due to the pandemic. The Indian government issued a three-week lockdown beginning March 25, 2020, which caused a shortage of workers at Indian ports, potentially due to confusion regarding which industries and workers were considered "essential" (Almond Board of California, 2020a). As a result, no

California pistachios were exported to India in April; almond and walnut exports dropped 52% and 12% as compared to April 2019 exports. These supply chain challenges combined with trade turmoil, which emerged prior to the pandemic in major export markets (e.g., China, India, and Turkey), meant that 2020 tree nut exports did not adjust proportionately to changes in production compared to 2019. While almond production increased by 12% between 2019 and 2020, exports only increased by 6% overall; pistachio production decreased by 27%, while exports decreased by 32%; and walnut production decreased slightly by 4% but exports decreased by 7%.

Table 1 Percentage U.S. Production in Domestic and Export Markets and California's Share of U.S. Receipts, 2015-2019 Average

	Exports	Domestic	CA Share of U.S. Receipts
Almonds	69	32	100
Pistachios	63	41	100
Walnuts	73	28	100
Head Lettuce	6	94	63
Leaf and Romaine	10	90	63
Strawberries	13	87	88
Processing Tomatoes	27	74	93

Sources: USDA ERS Fruit and Tree Nuts, Vegetable and Pulses Yearbook Tables, 2018-2019 California Agricultural Statistics Review

Note: Tree nut export and domestic percentages do not sum to 100 due to inventory carry-over between marketing years.

Emerging Consumer Trends at Retail

Notwithstanding early supply chain challenges and temporary surges due to panic buying, retail demand has since stabilized at slightly elevated levels related to 2019, suggesting moderate and evolving impacts of the pandemic on overall produce demand. Some produce categories, including berries, lettuce, oranges, cherries, and mushrooms significantly outperformed others during the early months of the pandemic and might reflect changing consumer preferences. Table 2 reports the top 10 early pandemic powerhouses—produce categories with the highest absolute dollar gains from mid-March to the beginning of September 2020, relative to the same period in 2019. Of course, these numbers need to be interpreted with caution because other factors may be influencing these trends. Berries, for example, have seen enormous growth throughout the last decade and their strong performance during the beginning months of the pandemic is likely an indication of longer-term changes in consumer preferences (Ogg, 2020). Avocado purchases, while not listed here, also continue to grow steadily, and continue to defy pre-pandemic trends in reduced consumption of fruits and vegetables overall (Produce for Better Health, 2021). Not all the consumer

retail trends reported here are attributable to relative changes in demand caused by the pandemic and could simply reflect changes in crop yield or other short-term supply changes.

The strong performance of these commodities may further be a result of five overall consumer trends which emerged since the start of the pandemic: (1) more meal occasions at home; (2) higher valuation placed on shelf life and flexibility; (3) greater emphasis on personal (immune system) health and nutrition; (4) increase in e-commerce; (5) ensuing economic decline and uncertainty. How these relatively short-term trends translate into persistent medium- and long-term changes remains to be seen, however, and will likely have important implications for the produce and nut industries.

Table 2 The Early Pandemic Top Sellers Based on Absolute Dollar Gains, March 15-September 6, 2020

Top 10 Produce Items (in absolute \$ growth)	Absolute \$ gain vs YA (Mill)	Average \$ % growth	Total \$ sales (Mill)
Berries	510	15.4	3,900
Potatoes	478	34.8	1,900
Lettuce	474	12.1	4,400
Tomatoes	400	22.6	2,200
Oranges	264	56.4	714
Peppers	259	24.9	1,300
Cherries	239	86.5	996
Onions	233	22.2	1,300
Mushrooms	151	27.7	697
Melons	123	6.2	1,900

Source: IRI, Total U.S. MUO, Sales March 15-September 6, 2020 versus same period a year ago. (Reported at the PMA Fresh Summit, Oct 16 2020)⁴

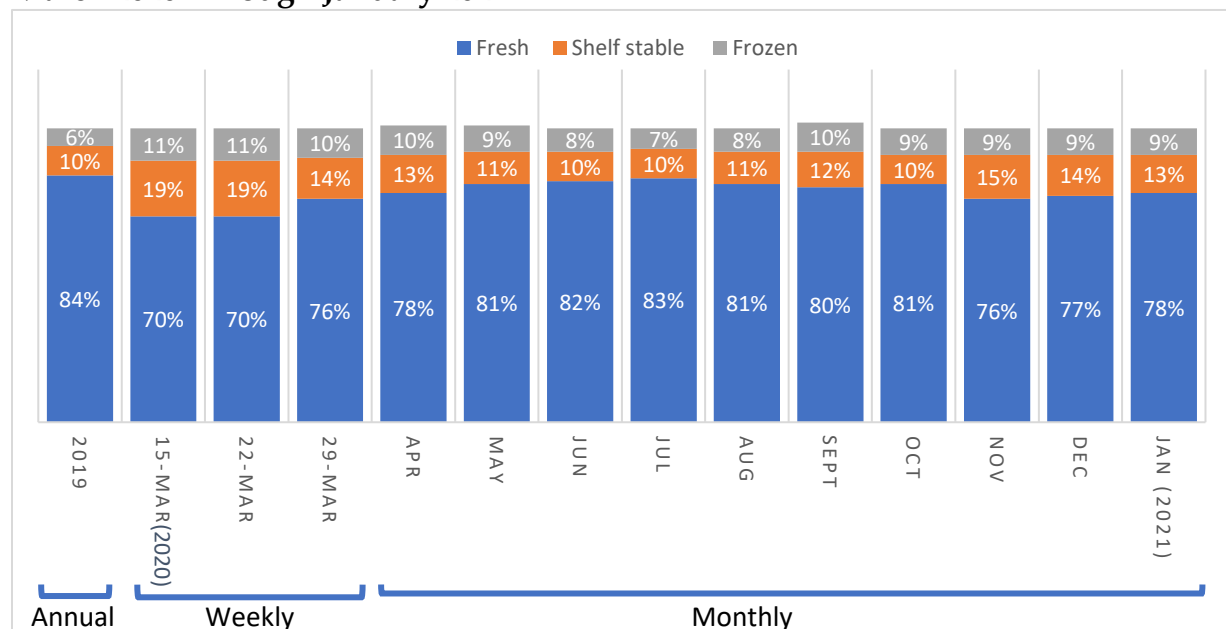
The first trend, more meal preparations at home, is likely the reason behind the sales increase for vegetables relative to fruit. When cooking additional lunches and dinners at home, relatively more vegetables than fruits will be used in the preparation. The second trend relating to the importance of shelf life might be behind the sustained relative increase in the share of sales of frozen produce depicted in Figure 3. Figure 3 shows that shares of shelf-stable and frozen produce spiked in March and April, as consumers substituted away from more perishable produce. We saw a renewed increase in shelf-stable foods as the number of COVID-19 cases spiked from November

⁴ Of course, these simple differences do not control for year over year fluctuations that would have likely occurred even in the absence of the pandemic. Using a difference-in-differences approach would provide additional insights but is beyond the scope of this paper.

2020 to January 2021. Throughout 2020, shares of frozen produce remained elevated relative to 2019 levels. This might be an indication that the emerging trends observed during the earlier months have persisted. In addition to the two trends already mentioned, the continued economic hardship and the increased time demands on families as schools remained closed likely resulted in increased price sensitivity and need for convenience, offering additional explanations for the persistent increase in the share of frozen produce.

In general, consumers continue to rely on staples and well-known produce that, in addition to a longer shelf life, give them flexibility. One area where this trend is evident is in the comparison of domestic tree nut consumption between 2019 and 2020. Domestic consumption in 2020 increased for almonds, walnuts, and pistachios, despite production decreases in the latter two (USDA ERS, 2020b). One of the trends which might feed into the extraordinary growth in berry and avocado sales, as well as the strong performance of oranges and tree nuts, is the continuous emphasis on personalized nutrition, diets optimized for individual lifestyles and values, and even produce as prescriptive medicine. While brands tried to stay away from explicitly mentioning the pandemic and highlighting immune-boosting qualities in their messaging, consumers continue to have strong preferences for superfoods, tree nuts packed with protein and “good” fats, and produce high in vitamin C and antioxidants, for instance.

Figure 3 Share of Produce Sales Across Fresh, Shelf-stable, and Frozen, 2019 and March 2020 Through January 2021



Source: IRI Integrated FreshTotal U.S. MULO (Compiled from several Produce Blue Book reports)

One of the most pronounced consumer trends of the pandemic is certainly the increase in e-commerce. While grocery delivery sales started to decline slightly in August compared to the previous months, they amounted to \$5.7 billion in sales and were still 5 times larger than in 2019 (Brick Meets Click, 2020). Most of this growth is driven by sales increases via well-established online platforms, like Instacart and Walmart.com.⁵ Produce is still a small percentage of online grocery sales, making it harder to capture consumers' attention and incentivize impulse buys than in the produce section of a brick-and-mortar grocery store. Nevertheless, this trend is likely here to stay. Here too, consumers were more likely to purchase staples and well-known produce. A recent report by IRI indicates that the early acceleration in e-commerce continued after the late summer months, and retailers have increased their investments in these services (IRI, 2021).

Finally, the sudden and severe loss of income and continuing uncertainty for many families resulted in a trend back to the basics and away from value-added products. Most food products, including tree nut and produce items, have a small income elasticity of demand, but consumers are substituting across and within categories away from value-added and higher-priced products towards commodities. Salad mixes continued to do well, as they give consumers flexibility in their use, and price promotions have helped to encourage purchasing of other value-added products that communicate additional benefits clearly.

Supply Disruptions: On-farm Operations and Shifting Markets

On the supply side, the degree of reliance on hand labor is a large contributor to the magnitude of the impacts of the pandemic experienced by a given industry. Agricultural equipment operators are typically socially distanced given the nature of their job, so few adjustments may have been needed in highly mechanized industries. However large users of hand labor where laborers work closely together have experienced increased costs associated with social distancing measures, likely having a large impact on grower profitability for as long as the pandemic persists. Table 3 displays labor costs broken down into shares of equipment-operator labor and non-equipment labor for select commodities in California. Tree nut and processing tomato production have a much heavier reliance on machinery operators than lettuce and strawberry production. For strawberries in particular, labor costs make up a large percentage of total operating costs and revenues per acre.

⁵ While Amazon dominated the online purchases for nonedible products, Instacart and Walmart.com outperformed Amazon for edible products during the pandemic so far according to IRI retail data.

Table 3 Labor Percentages of Operating Costs by Select Commodity

	Equipment Operator Labor/Total Labor Costs	Non- Equipment Labor/Total Labor Costs	Irrigation Labor/Total Labor Costs	Labor Costs/Total Operating Costs	Labor Costs/Revenue
Pistachios	77	11	12	11	4
Processing Tomatoes	47	6	47	16	14
Almonds	46	27	27	15	7
Walnuts	44	27	29	7	3
Lettuce-Iceberg	37	26	37	6	5
Lettuce-Romaine	31	36	33	7	7
Strawberries	4	95	1	39	35

Source: Authors' calculations based on various University of California Cost and Return Studies

<https://coststudies.ucdavis.edu/en/current/>

On-Farm Operations

The seasonal timing of on-farm operations early in the pandemic also played an important role in how industries were impacted. Tree nut and processing tomato operations had more time to adjust to social distancing practices given the timing and mechanization of operations, while fresh fruits and vegetable operations were impacted immediately.

When the pandemic began, tree nut operations were doing regular orchard maintenance such as applying fertilizer or weed control, operations often done by equipment with one operator. Tree nut growers and processors had time to adjust practices before the busy harvest season in the fall. Processing tomatoes are transplanted throughout January to June to be harvested from June to October. While some growers were transplanting tomatoes at the beginning of the pandemic, transplanting is typically done mechanically.

By taking advantage of different regional growing seasons, lettuce and strawberries can be harvested year-round in California. Peak strawberry production occurs in April and May in California (Boris et al. 2006), while peak lettuce production occurs during May and June (Smith et al. 2011). Thus, both lettuce and strawberry growers were preparing for peak season when the pandemic first began. Labor-intensive operations such as hand weeding and harvesting needed to be performed. Lettuce and strawberry operations had to make adjustments quickly to prevent the spread of COVID-19 among their workers.

In these high-labor industries, immediate responses to the pandemic involved implementing social distancing requirements, installing additional washing and disinfecting stations, implementing disinfection protocols, making personal protective

equipment (PPE) available to all employees, and providing emergency housing to employees who tested positive and needed to isolate (Monterey County Agricultural Commissioner's Office, 2020). Implementing these measures and operating below optimal capacity due to social distancing rules significantly increased costs per unit of output for these operations. The leafy greens industry had to reduce each crew by 18% in processing and 15% in harvesting to comply with CDC guidelines, increasing the total time spent processing and harvesting. While these measures decreased efficiency, the industry successfully avoided outbreaks like the ones documented in meat packing, which undoubtedly would have been even more costly.

Shift from Food Service to Retail

The shift in consumption from food away from home to food at home meant any California produce or nuts destined for food service outlets had those marketing options severely reduced. For those trying to pivot to retail, bulk packaged foods had to be repackaged into smaller grocery sizes, which for some industries was easier than others.

Strawberry growers typically market their production through shippers who then sell to brokers supplying the food service industry or to retailers selling directly to consumers. Often sales from shippers are contracted two to four weeks in advance, though spot market sales of fresh strawberries still exist, often from smaller shippers (Mohapatra et al. 2010). Strawberry sales to the food service sector typically make up 20-25% of sales. Fresh strawberry shipments decreased by 35% between the weeks of March 14 and March 21, a time when in previous years shipments would be increasing (California Strawberry Commission, 2021).

Roughly half of California's leafy green production goes toward the food service industry, making it vulnerable to a sudden shift. According to Taylor Farms, the nation's largest producer of leafy greens and a major player in the food service channel, some categories such as loose-leaf romaine lettuce dropped to 40% of pre-pandemic levels, while some, like iceberg lettuce, remained at 80% in the early months. By late summer, many operations had adjusted, and all categories stabilized to sales at about 70% of pre-COVID-19 levels. Rapid early volume reductions in food service sales and unexpected changes in product mix, coupled with 60-120 day growing cycles, depending on the season, meant that Taylor Farms had to till under \$11 million in produce by early summer.⁶

A relatively small percentage of tree nut production, roughly 13%, goes to the food service industry. Tree nuts are storable, so any prepackaged nuts destined for

⁶Insights were shared during an interview with Mark Borman, president of Taylor Farms, California in preparation of a commentary and webinar on the effects of COVID on the produce industry (See Kiesel, 2020).

food service industries could be stored and sold later or repackaged for retail. Across the industries, there are numerous tree nut handlers that have the capabilities of processing different products. Transfers between almond handlers in March and April 2020 were 38% higher than those months in 2019 (Almond Board of California, 2020b), suggesting handlers were able to transfer nuts destined for food service packaging to be processed into retail products.

Processing tomato harvest dates are scheduled by the processor so that the processing plant can run at capacity throughout the harvest season. Most processing tomatoes are initially processed into tomato paste and only later processed into other products such as spaghetti sauce, ketchup, etc. Tomato paste is a storable product, which helps to partially alleviate losses. Similar to tree nuts, bulk product that was originally intended to be an ingredient in food service manufacturing could be stored until the food service sector recovered, or shifted to use in retail production. For example, processors could repurpose a 300-gallon package of tomato paste intended as an ingredient in food service spaghetti sauce to make sauces in retail-size containers, which were in high demand as consumers stocked up on storable products. Canneries likely faced increased costs and logistical challenges in the conversion process, but the lengthy shelf-life of the 300-gallon product helped aid these adjustments.

Overall, the extreme fluctuations during the early months of the pandemic likely resulted in significant and immediate losses of highly perishable produce, although most suppliers tried to pivot and reposition produce as rapidly as possible for distribution in the retail channel. How quickly grower-shippers have been able to transition has depended on planting cycles, and the flexibility of processing equipment and packaging.

Governmental and industry support played a big part in dampening losses in the food service channel. Most notably, the Farmers to Families Food Box Program (FFFB) allowed grower-shippers, processors and distributors to contract with USDA and pack fresh produce boxes distributed to consumers in need.⁷ By mid-September, USDA had purchased more than \$3.6 billion worth of food, and contracts approved in the fourth round delivered an additional \$500 million of food through Dec. 31, 2020 (USDA AMS, 2020). In the fourth round of FFFB, USDA made significant changes to companies supplying produce. Large players like Sysco Corp., a leading wholesale distributor to restaurants, and educational and healthcare facilities, did not see their \$100 million contracts renewed while others (e.g., Oakes Farms Food & Distribution Service, a wholesale distributor to restaurants in the eastern U.S.) saw dramatic increases in their contract volume. While costs per box were as high as \$60 in the third round of FFFB,

⁷ The program supplies boxes of fresh fruits and vegetables, dairy products and meat products. Contractors package these products into family-sized boxes and transport them to food banks, community and faith-based organizations, and other non-profits.

companies that saw their contracts renewed in round four lowered their costs to below \$40 per box, indicating that offering boxes at lower costs at least partially explained the shifts in suppliers (Johnson, 2020).⁸ The fifth round of FFFB contracts announced in January 2021 have been extended through April. Prices decreased once more with some vendors offering boxes below \$30 a box. Most of the \$1.5 billion budget allocated to USDA AMS in December will fund the food box program, although some will go to support the food service supply chain in other ways. The food box program will likely continue beyond April, although pieces of the program are expected to be redesigned after feedback is gathered (Johnson, 2021).

Impacts to Consumer Prices

Overall, COVID-19 will likely result in upward pressure on consumer prices for labor-intensive commodities. Quantity reductions, coupled with increased costs of regulatory requirements, will lead to shifts in supply that will push wholesale prices upward.

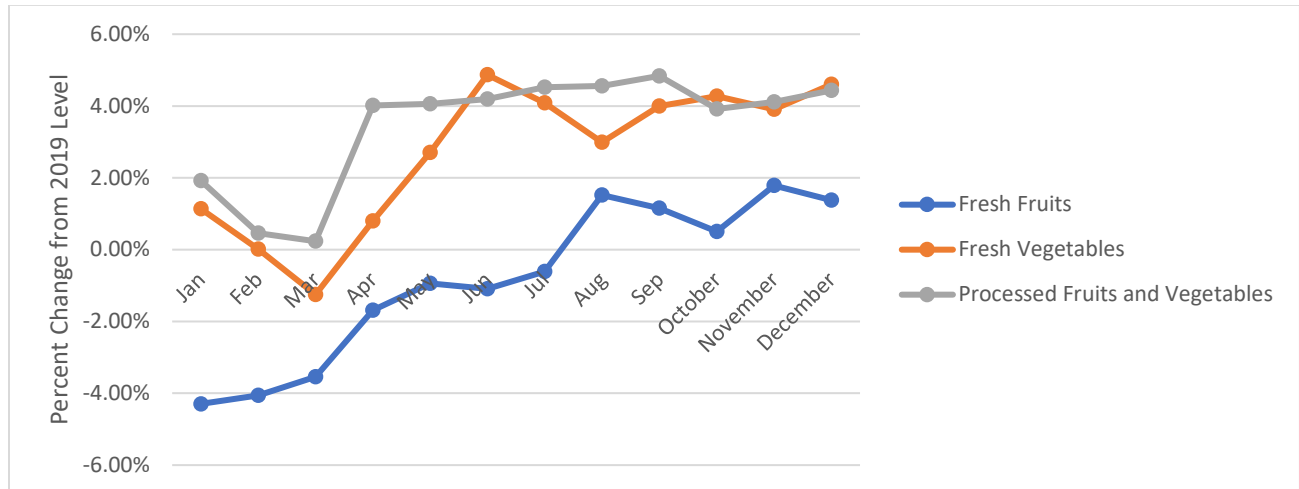
Produce markets tend to be volatile. Supply shortages, new safety measures, and logistical challenges in the beginning of the pandemic might have contributed to slightly higher retail food prices observed initially. During the initial panic-buying stage, highly perishable items were sometimes pushed to the back of the priority list as retail partners were having a difficult time restocking their shelves. Figure 4 shows modest price increases of less than 5% above 2019 levels across fresh fruits and vegetables, as well as processed fruits and vegetables. The price increases in processed fruits and vegetables occurred much more rapidly as initially consumers stocked up on storable produce. In the later months of 2020, prices remained modestly above their 2019 levels.

The magnitude of these price changes and the longer-term impact of increased costs and uncertainty in the demand for produce will vary across commodities depending on the type of contracts utilized and the relative market power of the negotiating parties. For leafy greens for instance, most growers sell their harvest under long-term contracts, while strawberry growers sell a larger share of their harvest under short-term precommitments or on the spot market. In general, retail contracts are negotiated over even longer time periods than grower-shipper-processor contracts, and continuously increasing market concentration in the retail sector will put downward pressure on wholesale prices going forward. The more immediate price changes observed likely reflected changes in operational costs at the retail level or strategic pricing, and additional price increases due to the various supply chain disruptions during the pandemic. It is likely that not all cost increases along the supply chain were

⁸ While the composition of these boxes varies, Oakes Farms Food & Distribution Service will pack combo boxes consisting of meat, dairy and produce. For produce, they plan to pack apples, pears, sweet potatoes, onions, carrots, cucumbers, squash, and tomatoes.

passed on, so retail prices may increase further once long-term contracts are renegotiated.

Figure 4 Fruit and Vegetable Price Monthly Percentage Change 2019 to 2020, Consumer Price Index



Source: Bureau of Labor Statistics, CPI data, seasonally adjusted, U.S. city average

How pronounced these increases will be will depend on the relative bargaining power of processors and retailers, and persistence of consumer trends. In general, processors and producers that were more easily able to switch into the retail channel might be better positioned when re-negotiating new long-term contracts. However, retailers will try to negotiate lower prices to be able to continue to run price promotions and attract consumers. The previously discussed emerging consumer trends might translate into longer term changes in product assortment. A move towards commodities and larger package sizes in retail due to increased at-home consumption (as compared to away-from-home and on-the-go consumption) might mean lower profit margins for processors in retail overall. Stakeholders all along the supply chain will likely try to spread out their incurred losses across all their product offerings. Although how much prices will increase over the longer term will likely depend on how severely and how long the emerging consumer trends will affect produce demand.

To further put the recently observed and relatively short-term changes into perspective, a research report just published by the Produce for a Better Health Foundation (2021) confirms that fruit and vegetable consumption has declined by 10% since 2004. Americans eat produce just once a day on average, despite the continuous industry and public health efforts to promote their consumption over the last decade. Effective marketing will be more important than ever to try to reverse these longer-term trends, especially in light of likely price increases across the board as a result of the pandemic. The observed pandemic-induced increases in retail demand might be

temporary and unlikely to translate into increased demand overall. They also suggest, however, that campaigns which are able to convince shoppers that they can be proactive about their health, care about sustainability and their communities, and enjoy delicious meals when purchasing produce will mean that at least some categories (e.g., berries, avocados, and almonds) will continue to outperform others despite likely price increases.

Conclusion

The COVID-19 pandemic and ebb and flow of restrictions and regulations that have followed have challenged the food sector from farm to processor, retailer to restaurant. California's produce and tree nut industries have faced different types of demand shocks and supply challenges. In particular, tree nut and processing tomato industries had to make few adjustments due to their mechanization and longer shelf-life. While these supply chains are less likely to be substantially changed in the long-term due to the pandemic, additional inventory from trade uncertainties and food-service sector disruptions might result in reduced farm-gate prices in the short- to medium-term.

Fresh fruit and vegetable industries faced some of the largest challenges due to the disruptions in the food service sectors, and the relatively short shelf life of fresh produce. Food service losses are only partially offset by increases in the retail sector, despite higher margins realized in this channel. The incurred losses and increased labor costs associated with the pandemic-related protective measures will likely lead to higher prices across the board when long-term contracts are renegotiated. Increased prices and ensuing economic uncertainty present challenges for the fresh produce industry as it must rethink strategies to increase fruit and vegetable consumption given the declining consumption trends of the last decade. Additionally, fruit and vegetable growers, handlers and processors might explore mechanization even more quickly than they otherwise would have. Reduced reliance on hand labor will decrease production costs as well as make these industries more resilient to future pandemics.

In general, the longer-term outlook for specialty crop agriculture will largely depend on the timing of the economic recovery, changes in market structure and concentration, and the permanence of emerging consumer trends.

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