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Food and Agricultural Transportation Challenges Amid the COVID-19 Pandemic

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Introduction

As a human pandemic, COVID-19 affects the behavior and movement of people, with impacts on the food supply chain as displayed by consumer psychology and behaviors and workplace absenteeism (Mussell, Bilyea, and Hedley, 2020; Cranfield, 2020). In mid-March, statewide closures of nonessential businesses and institutions across the United States, coupled with stay-at-home advisories/orders, caused a sharp and sudden shift in food consumption away from commercial and institutional food service establishments primarily to home use. Food service sales plummeted while demand surged at grocery stores (Lusk, 2020; Karoub, 2020). Some consumers engaged panic buying and stockpiling in anticipation of possible shortages and movement restrictions (Hobbs, 2020). Across the nation, news reports of stockouts, numerous public health directives from state and federal authorities and conflicting political views heightened consumer anxieties about food availability and access. Labor supply concerns soon followed as workers were affected.

On March 19, 2020, the U.S. Department of Homeland Security identified the food, agriculture, and transportation systems sectors as “critical infrastructure” industries during the COVID-19 pandemic. This allowed for continuity of normal business operations and services with appropriate modifications per Centers for Disease Control and Prevention (CDC) workforce and customer protection guidance. Consequently, this identified some employees as “essential critical infrastructure workers” in that they conduct a range of operations and services that are deemed essential to continued critical infrastructure viability, and support crucial supply chains and enable functions for critical infrastructure (U.S. Department of Homeland Security, 2020). In this article, we discuss the logistical challenges posed by the COVID-19 pandemic for the U.S. food supply chain and review emergency support provided through the transportation sector given specific regulatory exemptions. We conclude that human resources have presented the greatest risk exposure to

the U.S. food supply chain but have also been the greatest asset underlying the innovative response to unprecedented shocks.

Pandemic-Related Food Supply Chain Shocks

Simultaneous demand and supply shocks have roiled food markets since the onset of COVID-19, at once revealing underlying vulnerabilities of food supply chains and raising concerns about resiliency. Modern food supply chains are complex networks of nodes and links: The nodes are the intermediaries where products are received, stored, and dispatched—such as factories, distribution centers, and meatpacking plants—and the links are the transportation corridors on which products move between the nodes, whether by roads, rail, air, or waterways (Hale, 1999). Much of the disruption to the supply chain appears to occur at the nodes, such as meatpacking plants and factories (Northwestern University Transportation Center, 2020). For a food distribution system based on just-in-time (JIT) manufacturing, delivery, and inventory management strategies, the shock to grocery supply chains was inevitable and resulted in empty store shelves. Under normal circumstances, the JIT system efficiently smooths production flows and relies on the transportation industry to move products quickly between nodes in supply chains. This system, however, was shown to be vulnerable in pandemic conditions (Johnson, 2020; Mussell, Bilyea, and Hedley, 2020; Hobbs, 2020).

As stated earlier, the sharp drop in food consumption at restaurants and other food service establishments and the surge in grocery store sales from panic buying were major factors that pressured the food system from the demand side (Hobbs, 2020; Lusk, 2020). To recoup losses incurred from the sharp drop in food consumption by the food service sector, some distributors—such as Sysco and U.S. Foods—pivoted to doing business within

the food retail sector, which they do not typically serve (Lucas, 2020). However, most products were sold at a loss and discarded as suitable markets could not be secured in the short term. Although products sold to food service and food retail sectors are similar in terms of ingredients, they differ with respect to volume, packaging, labeling requirements, and value (Lusk, 2020). Products may also differ with respect to value—for example, truffles, caviar, and other exotic seafood are used by high-end restaurants and hotels but not typically consumed by households (Lucas, 2020).

On the supply side, labor shortages caused by workplace absenteeism due to illness (or fear of contracting COVID-19) significantly slowed operations and created bottlenecks, particularly in highly concentrated industries such as meatpacking (Mussell, Bilyea, and Hedley, 2020; Lusk, 2020; Funk and Groves, 2020). Roughly 45,000 workers at 30 meat-processing plants were affected by closures between April and June, when over 3,000 workers tested positive for COVID-19, with at least 44 deaths (Crampton, 2020a). While some workers were quarantined, others refused to work, citing unsafe conditions. This directly affected meat-processing volumes, which fell to 40% below 2019 levels (Curtis, 2020; Lusk, 2020). Although processing has since rebounded as working conditions have improved, there is some concern that safety measures and movement restrictions are lowering productivity and increasing production costs (Funk and Groves, 2020).

As the fruit and vegetable harvests have progressed, COVID-19 infection rates have also sharply increased among farm worker populations in Washington, New Jersey, and Tennessee (Doring and Skerritt, 2020) and in South Florida farmworker communities such as Immokalee, Belle Glade, and Homestead (Crampton, 2020b). With a population of 24,145, Immokalee has had one of the sharpest rates of increase, with confirmed cases increasing from 44 in May to over 1,100 by mid-June (Crampton, 2020b; Winchester, 2020). Workers typically live, travel, and work closely together, which makes physical distancing difficult. The CDC and U.S. Department of Labor issued interim guidance for agricultural workers and employers, which may be adapted for specific work operations and sites (CDC, 2020). Concerns with illness related absenteeism aside, travel/movement restrictions may be an issue for some farmworkers. Although farmworkers were declared essential, the crop farm workforce is predominantly immigrant and roughly half undocumented. Movement restrictions may be less of a concern to those who are lawfully employed on H-2A visas since the U.S. Citizenship and Immigration Services (2020) temporarily amended employment requirements during the pandemic. Undocumented workers, however, may still be apprehended and deported by immigration authorities despite being designated essential, and such fears may affect their willingness to travel with agricultural jobs that follow seasonal harvests.

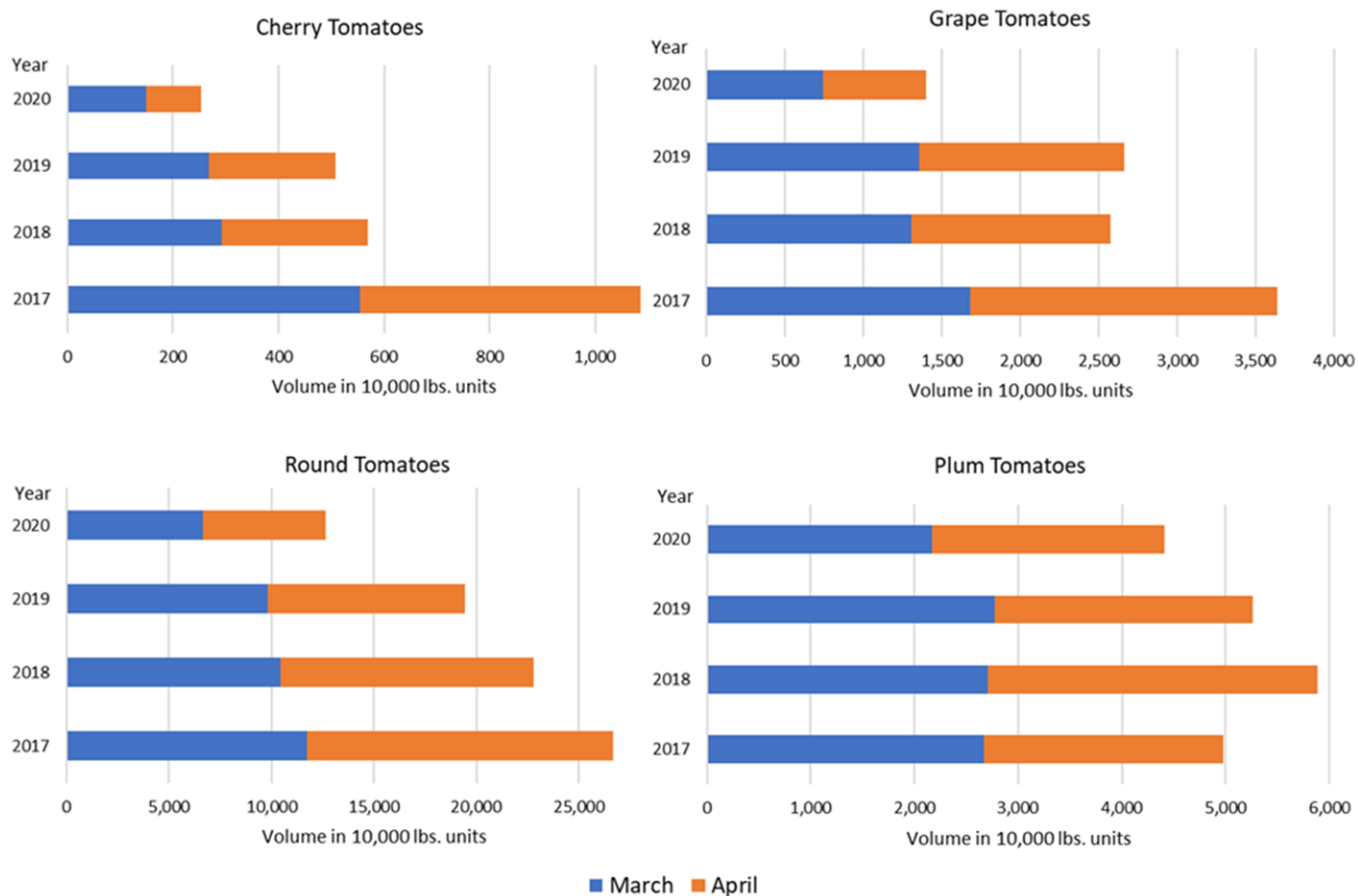
Industry-level produce shipment data may offer some insight, so we examine data for Florida tomatoes. Figure 1 shows the total volume of conventionally grown tomatoes that were shipped via truck from Florida for March through April 2020. This coincides with the time frame for nonessential business closures and stay-at-home orders/advisories. Volumes for previous years (2017–2019) are included for comparison. There are annual reductions in supply—largely attributed to competition from Mexican producers (Guan, Biswas, and Wu, 2017)—but there are also larger than expected reductions in the same months for 2020. Almost all Florida cherry tomatoes and 80% of grape tomatoes are grown for the food service industry. Likewise, up to 80% of round and plum tomato varieties are marketed to the food service industry, but these varieties were more easily diverted to grocery stores than cherry and grape tomatoes (M. Schadler, personal communication, June 10, 2020). Cherry and grape tomato shipments declined 50% and 47%, respectively, from 2019 levels, whereas shipment volumes for round and plum varieties were not as severely affected. While some of these losses could be attributed to yield reductions from an unusually dry and hot 2019 winter, Figure 1 also likely captures disruptions to the supply chain from COVID-19. Tens of millions of pounds were discarded or donated, and some growers lost as much as 30% of their winter crop. Winter crops are harvested from January to mid-April in South Florida. Some growers in South Florida do not have fields in Central Florida, where spring crops are grown, so the timing of the COVID-19 related closures was especially devastating for those producers (M. Schadler, personal communication, June 10, 2020). However, when considering the effect of the pandemic on this industry, we should note that the Florida tomato season begins in October and ends in June; therefore, the industry-wide impact is limited to those growers who harvested during March and April.

Transportation Regulatory Exemptions under COVID-19

The transportation sector provides crucial support for commodity and food distribution to the food and agriculture sector. As a highly flexible means of transportation, trucking is responsible for roughly 75% of all agricultural commodities and food products shipped (Blanton, 2017). This flexibility was a key factor in shaping the emergency relief response and delivery of essential supplies. Figure 2 illustrates the timeline of federal emergency declarations that permitted exemptions to transportation safety regulations for commercial motor vehicle (CMV) carriers and drivers involved in emergency relief efforts during the COVID-19 pandemic.

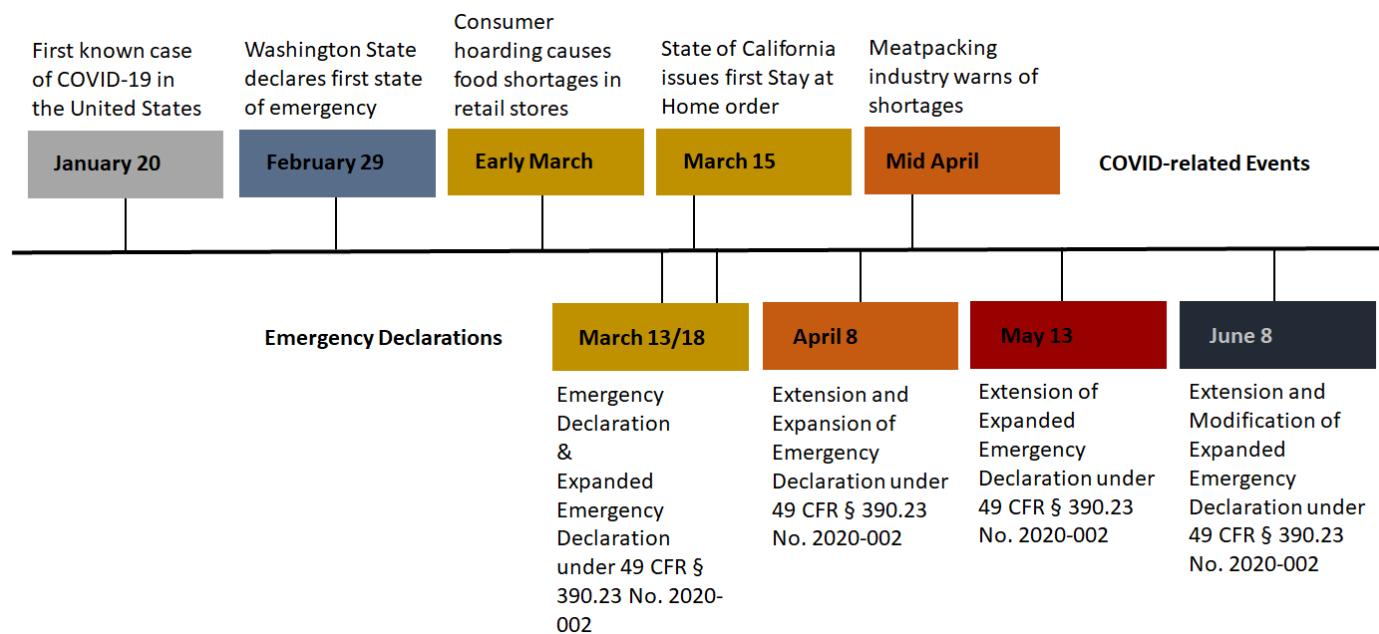
The original emergency declaration on March 13, 2020, stated that CMV carriers and drivers providing direct assistance in support of emergency relief efforts related to the COVID-19 pandemic were granted emergency

Figure 1. Florida Tomatoes Shipped by Truck, 2017–2020



Note: Horizontal scale varies by graph
 Source: USDA, Agricultural Marketing Service, 2020

Figure 2. Timeline of Emergency Declarations under CFR § 309.23 No. 200-002 with Updates



Source: FMCSA (2020a,d,e,f,g).

Box 1. The Federal Motor Carrier Safety Administration (FMCSA)

The primary mission of the U.S. Department of Transportation's Federal Motor Carrier Safety Administration (FMCSA) is to prevent commercial motor vehicle–related fatalities and injuries. The FMCSA oversees transportation safety regulations, including general motor carrier regulations, hours of service regulations, and employee safety and health standards regulations. For five days, between March 13 and 17, none of these existing transportation safety rules applied to drivers providing emergency relief through direct assistance under the original emergency declaration. CMV carriers and drivers were also not required to record drivers' on-duty drive times while providing direct assistance, nor was specific documentation required to verify participation in direct assistance during the emergency period. This was promptly updated on March 18 to require transportation safety by drivers who were providing emergency relief.

Sources: FMCSA, 2020a,d,e

relief from parts 390 through 399 of Title 49 Code of Federal Regulations (Federal Motor Carrier Safety Administration, 2020a, 2020b, 2020c). "Direct assistance" was defined as transportation and other relief services provided by carriers or drivers to support the immediate restoration of essential services supplies related to COVID-19 pandemic. This included transportation to meet immediate food needs, such as the emergency restocking of retail food outlets. Transportation of agricultural products and livestock were included given that the emergency declaration covered "immediate precursor raw materials... that are required and to be used for the manufacture of items" (Federal Motor Carrier Safety Administration, 2020d). On March 18, the emergency declaration was expanded to explicitly require that CMV drivers maintain transportation safety by complying with local traffic laws and observing rest periods as required by law (Federal Motor Carrier Safety Administration, 2020e).

Another expansion on April 8 clarified that direct assistance excluded routine commercial deliveries, including mixed loads with nominal quantities of qualifying emergency relief added to obtain the benefits of the emergency declaration's exemptions. Essential food and agricultural items qualifying as emergency relief were explicitly updated to include "food, paper products, and other groceries for emergency restocking of distribution centers or stores" (Federal Motor Carrier Safety Administration, 2020e). On June 8, essential status for agricultural goods and food products was removed, except for livestock and animal feed, as emergency relief was no longer deemed necessary for those categories (Federal Motor Carrier Safety Administration, 2020g). That the emergency declaration was expanded and updated several times reflects the fluidity and uncertainty associated with the COVID-19 pandemic. Further, federal and state authorities were required to consider speed and efficiency of response within the context of existing transportation safety regulations and laws. Transportation safety for commercial motor carriers and motor vehicle operators is overseen by the Federal Motor Carrier Safety Administration (Box 1).

Trucking Industry Emergency Relief Response

In an effort to understand the real-world implications of shocks to the food supply chain for the transportation sector and the resulting transportation safety waivers, we interviewed an East Coast mix-load driver, a West Coast fresh produce driver, and a Midwest wholesale transportation director under conditions of anonymity afforded by IRB protocol (authors' interviews, 2020). As seen in Box 2, these industry experts suggest that because the shocks to the food supply chain were so varied, it is difficult to determine long-term implications of the pandemic to the transportation sector. The transportation director, however, remains optimistic about the future opportunities. We also learned that, despite the regulatory exemptions, CMV drivers were careful to observe Federal Motor Carrier Safety Administration hours of service rules to avoid jeopardizing their commercial driver's licenses and livelihoods.

There have not been widespread reports of labor shortages in trucking owing to illness from COVID-19. From the onset of the pandemic, companies have emphasized safety measures, including the use of personal protective equipment (PPE) and intensive cleaning of trucks between and during shifts. Some carriers shifted to contactless transactions with digital processing of paperwork, and the flow of drivers and trucks through customer facilities is now more strictly controlled to enforce physical distancing (Smith, 2020).

As essential workers, state stay-at-home orders do not apply to truck drivers, who also do not have to self-quarantine for the recommended 14 days if they are working. Drivers are not subject to movement restrictions when working and can freely cross the U.S. borders with Canada and Mexico, which have been closed to nonessential travel since late March. During the initial weeks of the pandemic, availability of rest areas and full-service travel amenities was a major concern. CMV drivers had limited options as several states closed their rest areas and commercial travel centers amid fears of disease transmission. By late March, the Federal Highway Administration encouraged state transportation

Box 2. Voices from the Trucking Industry

Long-Haul Driver

We interviewed a long-haul driver employed with a West Coast trucking company. The driver transports fresh produce grown on the West Coast to wholesale markets on the East Coast, which means he often backhauls prepared foods. During the height of the COVID pandemic, the driver felt travel between destinations was easier and safer because there were fewer private vehicles on the road. His company notified its staff that their accident rate was down during the pandemic while the demand for produce transportation remained stable. The driver mentioned that despite the price of transportation increasing during the pandemic, drivers' wages have not increased accordingly. As for the driver's health and wellness, he cleans his cab with sanitizing products daily and has not had an issue with finding a rest stop while traveling to maintain personal hygiene.

Wholesale Transportation Director

We interviewed a transportation director employed with a wholesale produce company in the Midwest. The company has two sales channels: retail and food service. Prior to the COVID pandemic, the company kept transportation separate for each sales channel, but with reduced demand from its food service customers during the pandemic, the company is doing mixed loads.

The company laid off nearly one-third of its drivers given that many of its food service customers (e.g., school cafeterias) were forced to close at the start of the pandemic. Rerouting deliveries to both high-demand retail grocery customers and low-demand food service customers has been a challenge. Its drivers are working longer shifts because, despite less business, there are fewer drivers. As to not jeopardize their commercial driver's licenses and livelihoods, drivers will not violate FMCSA hours of service rules to extend shifts beyond what is allowable. Additionally, all deliveries take longer during the pandemic because drivers must follow health and safety protocols throughout the workday. Drivers have their temperature taken and answer a survey on COVID-19 symptoms before being allowed on each customer's premises. As more food service clients open for business, however, the company has been calling its drivers back to work. The transportation director remains optimistic. He believes that although there is no blueprint for a pandemic, wholesale businesses and drivers will come out of the crisis better for having dealt with the panic of rerouting inbound shipments and outbound deliveries in a complex food system.

Sources: Authors' interviews, 2020

agencies to keep rest areas open as a resource for drivers to ensure safe and timely delivery of essential goods (Fisher, 2020). Since then, rest areas and travel centers have reopened with safety measures and protocols in place.

In certain instances, ingenuity and resiliency in the transportation sector were not able to overcome the disruption in the food supply chain. As an example, meatpacking plant closures impacted other activities along meat supply chain, subsequently affecting demand for livestock transportation. As a result, cattle freight volumes have reportedly been flat as producers either kept cattle for longer periods or delayed and canceled transportation services outright. In some cases, the animals were redirected to other processing plants (Hawes, 2020; Smith, 2020). Drivers who transport livestock and processed meats reported fewer high-paying loads and backhaul opportunities (Hawes, 2020). Some companies have incentivized drivers with bonuses and guaranteed pay to discourage absenteeism—for example, Tyson Foods Inc. paid its drivers up to \$1,000 in bonuses (Premack, 2020). In the produce sector, the sharp drop in food service demand led to crop losses at the farm level, but issues with transportation have not been reported.

Prior to the pandemic, there were widespread reports of driver shortages, but these appear to have disappeared with increased demand for trucking in some sectors, particularly the transportation of goods deemed essential (Costello, 2020; Ronan, 2020). However, normal trucking routes have been disrupted and trucking capacity has reduced (Fisher, 2020; ABI Research, 2020), so the medium- to long-term challenges and opportunities are unclear.

Concluding Remarks

The COVID-19 pandemic has created many challenges globally as countries have struggled to coordinate public health and economic responses across multiple systems. Social distancing and isolation measures to control transmission have had significant adverse impacts on personal routines and economic and commercial activities.

Regulatory exemptions granted to critical infrastructure industries such transportation enabled rapid emergency relief efforts to mitigate food supply chain shocks. Food supply chains have since rebounded, but vulnerabilities were exposed. Closures of some food service establishments revealed problems where adaptations could not be easily made to allow repurposing of food

products for the food retail sector. While much emphasis has been placed on specialization, it has also created a rigidity that inhibits response in times of crisis. With over 5.6 million confirmed cases of COVID-19 disease in the United States and no consistent downward trend presently, the long-term implications for the food service

sector are uncertain. For pandemic crises however, it appears that human resources are *the* crucial component, as they pose the greatest risk to business operations and yet are critical to effective emergency response.

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