

The Influence Of COVID-19 On The Production And Distribution Of Food

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Abstract-

A pandemic is not an unusual event, considering that humans have always been vulnerable to them throughout history. As a common feature, all pandemics cause severe economic destruction over the globe. When looking at the food supply chain, one of the most essential sections of the economy, it has been shown that COVID-19 has an influence on the whole process, starting in the field and continuing through to the end customer. Because of recent challenges in the food supply chain, there is now a great deal of worry about food production, processing, distribution, and demand. The food supply chain was harmed in a variety of ways, both financially and otherwise, as a result of COVID-19, which restricted labour migration, altered consumer demand, eliminated food manufacturing facilities, and reduced the number of rules governing food commerce. Therefore, governments need to make it easier to move both people and agricultural and food-related goods. It is important that disadvantaged farmers and smaller farms get financial assistance. Changing safety procedures is something that should be done in order to improve working conditions at facilities, as well as to protect the employees' health and safety. If you want to avoid a rise in the cost of food, you should steer clear of pro-protectionist policies for the food industry. Finally, all governments must understand the seriousness of the situation and change current regulations in line with the pandemic's velocity of expansion. The system for distributing meals must also be versatile enough to cope with any problems that may arise. The objectives of this research are to: (1) examine the extent to which COVID-19 has damaged the food and agriculture sectors; and (2) explain the required mitigation actions.

Keywords: Lockdown, COVID-19, Production, Food, Supply Chain

1. Introduction-

Due to the rapid spread of the COVID-19 illness, which was caused by the new coronavirus SARS-nCoV-2, several nations have proclaimed health emergencies. The World Health Organization (WHO) designated the illness to be a pandemic on March 11, 2020, obliging all countries to take action in accordance with the GSPR Plan (WHO, 2020a). This is the first

coronavirus-related pandemic, according to the WHO. After the 1918 (H1N1), 1957 (H2N2), 1968 (H3N2), and 2009 (H1N1) pandemics, which are thought to have killed 50 million, 1.5 million, 1 million, and 300,000 people, respectively, COVID-19 is the sixth pandemic to plague humanity (**Liu, Kuo, & Shih, 2020**). The World Health Organization has declared this illness to be a catastrophe that will affect every sector of the economy. In light of this, everyone and every group should be fighting in this conflict (**WHO, 2020c**). The following table displays, as of August 5, 2020, the number of occurrences reported per one million residents in the following regions: The area of the Americas is around 10,000 square miles, that of Europe is 4,000, that of Southeast Asia is 1,100, that of the Eastern Mediterranean is 2,200.35, that of Africa is 750.75, and that of the Western Pacific is 180.5. An estimated 687,64 new deaths occur for every 1 million new cases, bringing the total number of confirmed cases worldwide to 17,528,223. (**WHO, 2020b**).

According to the WHO's "Strategic readiness and response plan," all nations were required to adopt certain health precautions in order to be ready for and resist this pandemic. Using the current understanding of the virus, this strategy seeks to direct the development of national and regional operational plans by all domestic and international partners. As such, the eight highlighted areas below should be given great consideration:

1. Country-level coordination, planning, and monitoring
2. Community involvement and risk communication
3. Quick reaction teams, surveillance, and case studies
4. Access points
5. Governmental laboratories
6. Infection control and prevention
7. Situational awareness
8. Support for operations and logistics (**WHO,2020a**).

When these restrictions were imposed, meetings and travel were temporarily prohibited, and stores, offices, and schools were closed. Remote work and virtual meetings are becoming more widespread in the corporate world. However, many individuals in the food service industry are unable to access and must report to work during normal business hours (**Nicola et al., 2020**).

In light of the COVID-19 issue, action plans were established for the food industry's personnel to preserve operations and prevent coronavirus transmission. Food and agricultural infrastructure may rely largely on meat and poultry processing plants. This strategy provides a hierarchy of protections for cleaning and sanitising work environments, testing employees for the COVID-19 virus, monitoring unwell workers, and implementing staff and manager apprenticeship sessions (**CDC, 2020b**).

Many industries have analysed how COVID-19 would effect production. Food is essential to living, unlike other sectors. Some workers may go without food if a business shuts down, but if manufacturers and suppliers fall ill, everyone could suffer (**Staniforth, 2020**). Food production and agriculture are also essential. Tourism and aviation have problems, but the

food business has its own. In a pandemic, the airline and tourist industries may lose \$113 billion each (UNTWO, 2020).

Some food producers are struggling to meet increased store demand, while others face diminishing sales. During the current COVID-19 epidemic, businesses had to be temporarily closed. This crisis showed the worldwide interconnection of enterprises across industries (Sebastian, 2020).

Health of employees and assuring enough individuals to complete the job due to sickness or fear of coronavirus are two of the greatest difficulties food corporations face. During this crisis, food supply chain workers must be kept safe and healthy (FAO and WHO, 2020). However, maintaining the distribution network via supply management techniques is equally crucial for satisfying customer expectations (De Sousa Jabbour et al., 2020). To ensure that sufficient amounts of food and other items are consistently available, it is imperative that all participants in the supply chain collaborate. Customer trust is crucial for ensuring food security and safety (WHO, 2020). Consumer food availability is significant than overall dietary diversity for considering food security in these difficult times (OECD, 2020b).

Consumers seldom think about meal preparation. Concerns about food safety have highlighted the huge infrastructure and people necessary for guaranteeing a secure and reliable food supply worldwide. Overspending on basics resulted from the temporary depletion of store shelves caused by the rise in consumer demand for food, especially during the start of the current global crisis. Farmers, producers, distributors, and retailers have scrambled to restock shelves despite high demand (Nicola et al., 2020).

COVID-19 is one of numerous viruses that food businesses should prevent by using hygienic precautions (Arellano, 2020). The stomach's acidic environment has halted MERS and SARS-CoV from spreading through food, reports say (pH 3.5). Several common feeding and cooking methods might spread the coronavirus from animals to people (Rizou et al., 2020).

Four issues with the food supply chain and industry have been brought up by Pandemic. Many individuals eat a balanced diet to boost their immune systems and avoid disease (Rodríguez-Pérez et al., 2020). As a consequence, bioactive functional foods gained popularity. Second, attempts to prevent coronavirus transmission among farmers, merchants, and consumers have raised food safety concerns. Third, jailed people are causing hunger concerns. Pandemics have raised concerns about long-term food security (Galanakis, 2020).

Recent concerns regarding food safety are common. This article explains how the COVID-19 epidemic impacted food supplies and summarises countermeasures. During COVID-19, official and unauthorised sources provided food supply chain information. We ignored websites without journalist, academic, or other editor review while seeking for supplemental information.

2. The Impact of the epidemic on the supply chain of food-

Cropland, agronomic management, manufacturing, and allocation make up the food supply chain. To guarantee the products' quality and cleanliness, the food manufacturing process employs two techniques. Government representatives first determine if laws and regulations are being obeyed. The second adopts internationally recognised market regulations or norms

(Bendekovic et al., 2015). To ensure uninterrupted food flow at each stage, food professionals take a variety of safety precautions, including keeping themselves clean, donning protective gear like gloves and helmets, sanitising work areas and surfaces, managing, planning, and dispensing food safely, and creating adequate spacing. Care must be exercised since the disruption of the food supply chain might affect more individuals (Rizou et al., 2020).

COVID-19 doesn't spread via animals or agricultural items like flu ,thus it doesn't affect productivity immediately (FAO, 2020a). After the outbreak, governments restricted labour and trade (by land, sea, and air). Since the outbreak, food delivery trucks in France have been used 30% less, according to sources. (FAO, 2020j).

In emerging and disadvantaged countries, seasonal labourers are widely utilised in agriculture (planting, sorting, harvesting, processing, and transporting commodities to markets). Local or migratory labour shortages due to sickness or shutdown affect the supply chain. A person's health or mobility affects their ability to cultivate food and maintain food safety (FAO, 2020k). Cattle farming, horticulture, planting, harvesting, and agricultural processing all suffered the COVID-19 manpower shortage (Stephens et al., 2020).

Due to constraints, several expert crop labourers were unable to go across borders to other nations, but France has hired them. In Britain, the "Pick for Britain" initiative sought to employ 70,000 individuals to work in the harvest and fields (Nature Plants, 2020). Farms and other agro - industries find it challenging to operate because to the sickness and the need for physical separation during manufacture. These issues made transporting and supplying food and agricultural items challenging (ILO, 2020). While many manufacturers might shut down without their core inputs, the great majority of factories have to rely on local markets to deliver them. Perishable food logistics make food supply networks susceptible (Shahidi, 2020).

Agricultural duties vary on the season and weather, therefore it's crucial to keep to a rigorous calendar that allows for swift judgments. Because supply chain activities are interrelated, even a momentary interruption may affect final goods (FAO, 2020k). In several cases, rules forced farmers to burn or abandon their crops. The Dairy Farmers of America Co-op says that daily delivery bottlenecks squander 14 million litres of milk. The chairman of the dairy farmers' group fears England's weekly milk supply is in jeopardy. Transporting tea plants inside India also contributed (BBC, 2020a). During global crises, the food industry must keep up with logistics. Meals sector issues include finding dependable raw materials and ensuring a steady supply of food to customers (Alonso et al., 2007).

Agricultural enterprises may lose money due to product freshness, safety, marketability, and price (FAO, 2020k). Supply chain management should concentrate on logistics (FAO, 2020j).

Basic products distribution is hampered by constraints among cities, provinces, regions, and countries (FAO, 2020c). The agricultural revolution, defined as technological advancement and labour force upskilling, may come from the necessity for higher productivity throughout time (Jeon, 2011). Consumer demand and transportation restrictions are major obstacles (such as blocked local or international borders). Customers are more inclined to cook at home due to restrictions. Shoppers are also afraid about COVID-19 (FAO, 2020g).

At least 462 meatpacking plants and 257 food processing enterprises were infected with COVID-19 in the U.S. 5788 farmers, 8,343 food processors, and 39,905 meat packagers are COVID-19 positive. 14 agricultural labourers, 184 meat packagers, and 34 food processors have died (**Douglas, 2022**). COVID-19 infects 24 slaughterhouses in 18 Brazilian municipalities. 2,400 employees. A few meat factories closed after 246 confirmed cases in England and Wales. 534 workers at a Gana fish processing business tested positive. Germany had 1,553 confirmed COVID-19 instances in meat processing plants, while France had over 100 (**BBC,2020b**).

As demand soared, stocks soon decreased, and meat and other costs rose. At other shops, buyers could only buy so much meat and pork. Many restaurants stopped serving beef hamburgers, hurting the food service business (**Hobbs, 2020**).

3. Pandemic's effects on consumer behaviour-

COVID-19 impacts consumer food demand based on price, income, sociodemographic characteristics, consumption habits, shopping preferences, and time restrictions. There were also differences in supermarket visits and spending (**Bakalis et al., 2020**). By encouraging people to consume sugary foods, which encourage the manufacture of serotonin, high-carb meals may be used as a kind of self-medication. Obesity from these unhealthy eating habits may promote chronic inflammation and COVID issues (**Muscogiuri et al., 2020**).

After outbreak, the individuals using meal services and purchasing groceries surged from 50% to over 100%. During COVID-19, customers have fewer eating alternatives. Consumers opted for takeaway and delivery due to lack of personal connection and business closures (**Bakalis et al., 2020**). In order to fulfil demand and allow egg shipping during the COVID-19 pandemic, the FDA loosened egg packaging and labelling standards (**FDA,2020**).

70% of 630 American consumers surveyed in May said they shopped online for food during the COVID-19 outbreak. 56% of customers fear losing or not finding an important item. 70% of diners eat at home more. 43% of consumers eat more veggies, fruits, and protein-rich meals to enhance their health (meat, chicken, or fish). 39% of people had a nutritious breakfast. 47% of consumers ate sweets(**DeBroff, 2020**).

CREA questioned people during the COVID-19 quarantine about their diet and lifestyle patterns. 2,900 Italians answered. 20% drank more alcohol, but 45% ate more sweets. 46% of respondents said overeating and lack of exercise caused weight gain. 37% of respondents reported dieting to lose weight (**CREA, 2020**).

52% of 1,005 French citizens felt they had a new understanding for food production during the quarantine. French consumers will purchase "necessary" things, cook more, and pay more attention to food consumption if COVID-19 pandemic limits are abolished. One-third of respondents said a cultural shift decreased food waste. 29% shopped at neighbouring shops, while 20% shopped online (**Askew, 2020**).

Consumer buying behaviour affects food distribution. Food prices surged due to COVID-19's disruptions, panic buying, and lockdowns (**Shafiee-Jood and Cai, 2016**). Due to school, restaurant, and processing factory closures, many perishable items were thrown. Packaging, shipping, and storage will fluctuate with demand (**Reynold, 2020**).

4. The pandemic's influence on international food commerce-

Food supply system was prone to environmental and health concerns before COVID-19. 1970s energy crises, SARS and Ebola pandemics, and 2006-2008 food crisis all disrupted global food supply. In 2017, an epidemic of Africa swine flu expanded to Asia and Eastern Europe. China lost 37% of its pig population in 2019, despite producing one-third of the world's pigs (**IPES, 2020**).

Because of transit problems, most areas lacked enough employees and agricultural supplies like seeds, fertilisers, and pesticides. 40% of cropland is utilised. Since rural areas are far from cities, the pandemic had little impact on output (**Shahidi, 2020**).

Some nations are banning food exports and promoting imports because to the COVID-19 pandemic. Countries limit exports to maintain domestic product supply. Despite its short-term benefits, export restrictions have drawbacks. First, export limits lower local prices, hurting farmers and reducing agricultural output and industrial incentives. Second, losing foreign market share reduces competitiveness. Third, export restrictions hurt exporters' reputation and dissuade overseas purchasers (**Espitia et al., 2020**).

Despite rising domestic food costs in 2008, several large nations that could separate themselves from international markets were unaffected. Rice prices rose 224%, wheat 108%, and maize 89% from 2004. (**FAO, 2011**). Prices in import-dependent nations were higher than they ought to have been as a result of trade limitations, dangers, and market uncertainty worldwide. Export prohibitions on major foreign nations have led to frenzied purchasing in acquiring nations, which has increased goods costs (**DOS, 2011**).

During a lengthy pandemic crisis, the grain distribution system may be weakened, which would result in trade constraints. According to the FAO, 512 million tonnes of rice and 763 thousand tons of wheat will make up the 1.44 billion metric tonnes of grain that will be produced in 2019. According to the FAO, the output of wheat and coarse grains will be comparable to that of 2019 in 2020. Global grain prices shouldn't be impacted by the COVID-19 virus (**FAO, 2020b**).

19 countries have prohibited 27 food exports as a result of COVID-19 due to import limitations (**IFPRI, 2020**).

Trade decreases domestic scarcity and food poverty by shifting surpluses to shortage regions (**Fitton et al., 2019**). Pandemic export restrictions affected food distribution and trade. Due to export restrictions, staple agricultural mainstays including wheat, maize, and rice have witnessed quantity and quality declines (**Fyles & Madramootoo, 2016**). The imported commodity ran out. Since the global market offers limitless customers, the limits hurt enterprises. Due to export limitations, local merchants lost money and squandered commodities. Lack of availability to non-local ingredients for processing hampered food manufacturing facilities' ability to satisfy demand (**Ndemezo et al., 2018**).

5. Recommendations to reduce the negative effects of the Covid-19-

Due to covid, food safety, nutrition, and security are all at risk. Both the quantity and price of food are impacted by the global recession. Marketing, logistics, and trade networks may cause hunger (**FAO, 2020g**). According to the World Food Programme, COVID-19 might

affect 265 million people by 2020 (**WFP, 2020a**). Children under the age of six in low income countries see an increase in wasting of 15% due to malnutrition or flaws in the health and social support systems.

6. Strategies for food supply chain-

Prior to the epidemic, one among the food used to feed people was lost or wasted during cultivation, agronomic administration. The coronavirus stops individuals from throwing away food. COVID-19 increased household food waste by 13% without affecting leaching of nutrients (**Aldaco et al., 2020**).

Isolating phenols, essential oils from food wastes might restore these elements into the food supply. These compounds are used as additives, vitamins, and gelling agents. Food wastes may be extracted, fractionated, and isolated using traditional or cutting-edge technologies (**Deng et al., 2015**). More facilities must be built for collecting and handling food waste..

The European FSA said that food cannot transmit coronavirus. Infection from COVID-19-contaminated doorknobs, light switches, or food remains a danger SARS-CoV-2 may be airborne (**EC, 2020**). Handwashing should always be done. Food merchants must also observe sanitary rules (**Richard et al.,2020**).

Pandemic spread complicated HR management. Social norms on the work, physical limits, and limited human connection are problems (**Carnevale and Hatak, 2020**). Companies must solve their problems. Everyone who enters the building must have their COVID-19 status checked. HACCP or food safety teams may examine employees' temperatures as they enter and depart. Workers must wear gloves and masks. Reduce hours and rotate employees. Splitting shifts into three or four groups and adjusting break periods may alleviate congestion. Redesigning warehouses and factories will help employees adjust to separation. To keep employees apart, build separators or barriers that cover their upper bodies. If food processors utilise two-sided engagement, use diagonal layout (**Shahbaz et al., 2020**). COVID-19-infected personnel may also be protected by robots. To preserve social distance, robots may replace food staff. COVID-19 safeguards will stabilise international markets. Countries should balance production and worker safety (**FAO, 2020j**).

Businesses should also examine the number of impacted personnel and blocked roadways (alternatives should be identified). Border patrol must hire and teach locals to be effective. Training locals may create long-term jobs. Without the workforce, agricultural wages and working conditions wouldn't have risen (**Petetin, 2020**). Agriculture depends on inputs. It's advisable to build collection centres near product factories. Small producers may reduce transit costs by locating near big aggregation facilities (**Galanakis, 2020**).

Demand impacts supply chain efficiency. Demand should be determined using simulations and predictions. Initially, food and disinfectant were scarce. Perishable food commodities are subject to COVID-19's supply chain effects because to their limited shelf life. Manufacturers may employ statistical models to fulfil COVID-19 demand. This might affect production, supply chain management, and marketing (**Paul and Chowdhury, 2020**).

7. Advice for small farmers-

Governments should protect farmworkers. Doctors and nurses should monitor work-related illness. Low mobility requires collecting centres near small-scale farmers in various countries. Ag hubs require large cold storage areas (FAO, 2020c). Better food storage might reduce food waste in the supply chain. Investing in modern infrastructure and equipment raises production costs. So, government or donors may finance small and medium-sized agricultural enterprises (Anang et al., 2015).

Distribution Centre's for may help farmer groups develop contractual agricultural arrangements via horizontal and vertical cooperation. During the COVID-19 pandemic, producers may sell their unsold goods to food banks to build new markets and connect with disadvantaged individuals (Jackson & Yurkevich, 2020).

Second, governments should build warehouse receipt systems to assist small businesses maximise profits. This ticket lets local farmers keep their crops in a modern warehouse until they can sell them for more (Miranda et al., 2019).

Third, governments should encourage small company internet trade. Internet-connected farmers may save money on supplies and reach new clients (Khanal & Mishra, 2016). Small-scale manufacturing shouldn't have any financial limits. Several countries provide incentives for small-scale farming (FAO, 2020c).

Small farmers need guaranteed loans from private creditors to safeguard them against government loss (FAO, 2020j). Small farmers and producers need trade and regulatory obstacles eliminated to reach markets. Rural small-scale farmers need energy from government agencies (FAO, 2020h).

The COVID-19 epidemic revealed farmer-buyer relationships. Coronavirus affects low-income, elderly farmers in underdeveloped nations (Johr, 2012). Farmers must halt the spread of illnesses and their tactics (Wang & Wang, 2020). Crop rotation and intercropping may help farmers vary their crops and lengthen the harvesting season (Hufnagel et al., 2020). Buyers, investors, and lenders that prepay small farmers for crops may ensure next season's cash flow. Organic vegetable sales may rise as consumers gain faith in it. By partnering with companies or the government, small farmers may use adaptive technology to enhance production and revenue (ITC, 2020).

8. Recommendations for both the government and the private sector-

A crisis committee should assess how COVID-19 would affect the food value chain before drafting laws or adopting solutions. The committee must assess pandemic impact on foodstuff production and food security and provide remedies. Working with business is vital to the Committee's policy execution (FAO, 2020k). The COVID-19 Commission in Turkey comprises of eight academics and 02 agricultural officials. It gives suggestions for agriculture and food in a pandemic (MAF, 2020).

As a consequence of the pandemic, governments worldwide created COVID-19 agricultural response measures. The Turkish Ministry of Food authority has granted financing preparations bakeries, greenhouses, and slaughterhouses. Food production, storage, and farms

may stay open if they meet MIA shutdown guidelines (**MIA, 2020**). Canada offers 51-76% non-repayable fund for research, distribution, strategic initiatives, slaughterhouse efficiency, marketing, product mobility, and health procedures (**Novascatia, 2020**).

9. Actions on international trade-

Even under quarantine or border closures, agricultural inputs must be exchanged. Therefore, short-term steps to simplify the trade of agricultural supplies including equipment and fertilisers are needed to keep planting operations running smoothly (**FAO, 2020j**). Since there is a plentiful supply of food and promising production forecasts for essentials, it is crucial to comprehend the pandemic effect underlying limiting regulations. Due to rising consumer demand and price rises, governments are attempting to assure food security. However, prior experiences show that avoiding trade restriction regulations may safeguard consumers and agricultural incomes as well as direct assistance operations (**Martin and Glauber, 2020**).

Global commerce requires trade and tax policies. Beggar thy neighbour also raises food costs and decreases food security (**Barichello, 2020**). To promote food commerce, nations should act immediately on trade and tax policy alternatives and their impacts. Lack of market information (production, inventories, consumption, trade, pricing) and ineffective country policies disrupted the 2006–2008 food crisis and raised food prices. If one nation imposes the same limitations as in 2006–2008, others will follow, causing market chaos. Countries should react to COVID-19 based on the 2006–2008 crisis. Therefore, governments should eliminate export prohibitions and import levies since cutting import tariffs may prevent food prices from increasing owing to limited food **availability (FAO, 2020j, 2020c)**.

Short-term surplus national supply owing to export restrictions and low domestic pricing hurt smallholder farmers. We're all in this together owing to globalisation and our common humanity. To increase agricultural output and ensure food and nutrition security, we must abolish limitations and prohibitions (**Espitia et al., 2020**). Therefore, trade restrictions are unnecessary, harmful to all parties involved in the food supply chain, and result in market panic (**Liu et al., 2020**).

10. Conclusions-

We must prioritise preserving a consistent supply of food and agricultural goods in order to prevent a food crisis and lessen the pandemic's impact on the world economy. The two most important economic sectors, after healthcare, are food and agriculture. Reduce the detrimental impacts of the epidemic on the world economy and prevent a food catastrophe, we need to make maintaining a steady supply a top priority. Because the future is unknowable, it is not possible to say for definite whether or not there will be significant challenges with the systems that produce food. As a result, it is imperative that all countries recognise the seriousness of the issue and decide, taking into account the pace at which the illness is spreading, whether the limits that are now in place should be loosened or tightened.

A flexible supply system is required in the event that there are disruptions in the food production process.

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