Adjusting to the New Normal: Challenges of the Food Sector in the wake of COVID-19

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Abstract:

The ongoing COVID-19 pandemic has affected more than 180 countries around the globe causing severe business disruptions. Lockdown in many countries has led to panic buying and shortages of food, medicines, personal protective equipment, raw materials, basic goods, etc. As a result, while some businesses have benefited from this sudden spike in demand, many others have collapsed, and many are at the brink of collapse unless and until rescued by governments or private investors. In particular, the food sector which heavily relies on global supply chains to meet the demand of their local consumers are working around the clock to maintain the adequate flow of food products to feed the nation. However, countries that have taken strict measures such as full lockdown are struggling to balance their demand and supply as in-country and cross-border supply has been severely affected. Stock-outs are much more common in the early phase of the crisis due to panic buying that influence the vertical supply chain. To meet the changing food demand, grocery retailers have started working more closely with local farmers for the essential supply of food items, thus realizing the benefits of short food supply chains. This discussion paper attempts to explore the way food sector is dealing with the current unprecedented situation and proposes some potential risk-mitigating pathways.

Keyword: COVID-19; Food Supply Chains; Short Food Supply Chains; Industry 4.0; Disruptions; Resilience

Type: Discussion Paper

1. Introduction

The world is currently witnessing a situation that has never been faced in recent generations. The coronavirus (COVID-19) pandemic has brought the whole world on its knees with more than 28 million cases reported so far (September 2020) and is continuing to increase daily (COVID-19 tracker[1]). Close to a million fatal cases across the globe have already been reported, while there are more than 8 million active cases and the clock is still ticking. While the governments around the globe are seeking a solution to end this pandemic and scientists are working around the clock to develop vaccines, businesses, on the other hand, are struggling to deal with the severe disruption it has caused and fighting for their survival. The world bank and several media outlets have already reported

that the world is plunging towards the worst recession since the Second World War[2]. The COVID-19 pandemic has already exposed the vulnerabilities of businesses that are heavily dependent on the global supply chains. This pandemic has resulted in lockdown measures in many countries resulting in the closure of borders, movement of people, and shutdown of land, air and naval transport activities. Hence countries and businesses that have a high dependence on the movement of materials to fulfil their needs are struggling to cope up under these circumstances and fighting for their survival. There is barely any sector or industry that has not been affected by this ongoing pandemic.

Food, which is vital for the survival, has gathered a lot of attention during this COVID-19 crisis as pandemic has resulted in huge modifications in terms of food access, food security and food loss and waste[3,4,5]. Since the beginning of the pandemic, several media outlets across the globe reported a sudden shift in the buying behaviour of consumers and short-term shortages of essential products, and food being one of them. This issue became more debatable in countries such as the UK which depends significantly on the imports from other nations. In the UK, around 48 per cent of the food product including 84 per cent fresh and vegetables are imported primarily from the European countries such as Spain, Italy and the Netherlands[6]. As a result of this pandemic, worldwide food production and consumption are gaining more and more attention and there is an increasing concern with production capacity to meet the global demand for food[7]. The closure of the restaurants, cafes, catering services, schools, offices etc. further resulted in food waste and economic losses. For example, farmers were forced to pour a million litres of milk down the drain after demand from factories plummets amid coronavirus crisis. While some farmers had to let their harvest decompose because they were unable to re-distribute them due to lockdown and struggled with the facilities to store them[8]. Likewise, it was reported that major food producers struggled with disrupted food supply chains and food waste[9].

On the other hand, there are a few evidences that confirm that food supply chains exhibited remarkable resilience[10]. Supply chains responded quickly with the change in demand which could be alluded by replenished grocery stores' shelves. Reliance on local supplies became very important in this scenario[11]. In this regard, health awareness has altered the food choices of people and they have switched to fresh and healthy food[12]. Many food organisations admit that food supply resilience has become a competitive advantage. Building supply chain resilience helps organisations to minimize the adverse effects of supply disruptions and outperform their competitors.

The evidence however also indicates that the impact of COVID-19 related disruptions on food supply chains is a complicated domain. If the impacts become more complex to understand, then the supply chain disruptions will be less predictable[13]. The less predictable supply chain disruptions will make it difficult for organisations to quickly tap new sources of supply when existing sources are being compromised. Therefore, it is important to draw attention to the challenges that COVID-19 related supply chains disruptions bring to the businesses. Realising the kind of disruptions food suppliers could face, help them plan effectively and become highly resilient. The recommendations

provided in the study will help businesses and policymakers to swiftly respond to disruptions and enhance food security.

This discussion paper, therefore, aims to provide an overview of the challenges faced by the food sector during the ongoing coronavirus crisis. In section 2, the paper will explore a range of challenges brought by COVID-19 on global food supply chains such as supply and demand issues, workforce shortages, supermarket struggles, food price hikes, food delivery issues, food waste challenges, job losses in the food sector and changing consumer behaviour. Furthermore, in section 3, the paper will explore the potential mitigation strategies to deal with the coronavirus crisis affecting the food supply chains. Finally, the study will conclude (section 4) with the identification of potential pathways and future research directions.

2. COVID-19 impact on Global Food Supply Chains

The ongoing COVID-19 pandemic crisis is having a major impact on the global food supply chains affecting all segments such as farm production, food processing, transport and logistics, retailers and final demand[14,15]. Most countries around the globe have locked down their economy to slow down the spread of the coronavirus. Consequently, close to a billion people are confined to their homes and at the same time, there have been chaotic scenes in supermarkets. Grocery retailers have struggled to keep their shelves stocked up due to disruption in the movement of good, stockpiling, and hoarding resulting in a sudden spike in the consumer demand. Moreover, as a result of the closures, all areas of agriculture have been severely impacted. Access to the food items is essential, hence countries need to keep the food supply chains intact. The speed with which supply chain actors have been able to reorganise themselves to ensure the continued availability of food, at least in the developed world is commendable[16]. However, as pandemic continues to spread, new disruption may likely to emerge. Some of the potential challenges that the food sector is currently facing are discussed below.

Demand and Supply Issues amid COVID-19

The recent pandemic has massively impacted every aspect of the global supply chains. COVID-19 pandemic resulted in stockpiling and hoarding for certain goods as soon as the lockdown measures were announced in different countries. For example, in the UK the demand for flour soared in during the early phase of the lockdown as people stuck at home increasingly turned into home-baking. Similarly, demand for non-perishable staples such as canned goods, rice and pasta soared significantly during the early phases of the lockdown period[17]. In the US demand for beef in supermarkets rose sharply and sales shot up 92 per cent during March 2020. In France, coronavirus pandemic resulted in a surge in demand for organic and sustainable food. It was reported in the media worldwide about the overall decline in demand for dairy products from schools and restaurants that has saddled dairy farmers with unsold raw milk, forcing millions of gallons of milk to be dumped every day. In contrast, panic buying resulted in a shortage of milk at supermarket shelves and some supermarkets and grocery stores even had to impose restrictions on the amount of milk a single customer allowed to purchase to discourage hoarding.

Demand for eggs also spiked in mid-March in the UK and the US when the lockdown was being implemented. This resulted in widespread shortages in supermarkets and grocery stores. The US and Dutch potato farmers observed a decline in demand for potatoes from restaurants ending with tons of unsold potatoes. Similarly, demand for other vegetables and meat products plummeted that were destined to restaurants, schools and hotels and as a result farmer couldn't have enough time to find new buyers before their perishable products rot. Moreover, food banks have also been affected by panic buying and food stockpiling as donations reduced. Nicola et al. highlight that concerns about food running out also means that vulnerable populations who cannot afford to stockpile, may not find anything to eat[18].

The COVID-19 pandemic has hence exposed several vulnerabilities in the food system. The slow reaction of retailers to replenish the high demand products exposed the limitations of cost-efficient and streamlined supply chains to be agile and adapt to unforeseen shocks. Most retailers in the modern world believe in 'lean sourcing', just-in-time (JIT) logistics, standardized components and reductions in the supply base that have tended to neglect the systemic risks caused by exogenous shocks or disruptions to supply chains.

Shortage of Workforce

In the ongoing pandemic labour demand in food production, food supply, grocery retail, transport and delivery services are massively outstripping current supply. The looming shortage of seasonal agricultural workers has already caused a major source of concern, as it could severely disrupt food production and processing. An OECD (2020)[19] report highlights that limits on the mobility of people across borders and lockdowns are contributing to labour shortages for agricultural sectors in many countries, particularly those characterised by periods of peak seasonal labour demand or labour-intensive production. For example, many EU agricultural holdings rely on the work of foreign seasonal workers, especially from eastern Europe who are employed in the more labour-intensive western European sectors. A recent International Labour Organisation (ILO) report[20] indicated that over a quarter of the food produced in Italy relied on approximately 370,000 regular seasonal migrant workers. However, due to COVID around 100,000 farmworkers may not be able to come to Italy this year, and the figure may be double in France. In Germany, some 286,000 seasonal migrant workers are engaged every year in fruit, vegetable and wine production whereas in the UK requires approximately 80,000 seasonal agricultural workers every year and the Office for National Statistics (ONS) has stated that 99 per cent of these workers come from countries within the EU. Harvesting season is imminent for many products in the northern hemisphere, and a shortage of labour could lead to production losses and shortages in the market. Owing to the lockdown, in many countries, sourcing seasonal labour comes on top of existing supply chain difficulties. A recent study by Rossi (2020)[21] reports that labour shortages are a pressing problem, especially for those fruits and vegetables that need to be picked/harvested at the right time.

Additionally, labour shortages due to social distancing rules are further starting to impact producers, processors, traders and trucking/logistics companies in food supply chains – particularly for food products that require workers to be in close proximity. Ensuring farmers have access to inputs and labour for the next planting season is another common area of concern across countries amid COVID-19. In the UK there has been a 'Feed the Nation' campaign to encourage domestic workers to plug any labour gaps to avoid food waste. Although many countries are now getting back on track towards filling the labour gaps, the fear of the second and third wave is threatening to make this issue worse in the coming future.

Supermarket Supply Chain Struggles

The COVID-19 pandemic has significantly resulted in a decline in product demand for many industries (e.g. automobiles, crude oil, and transportation). On the other hand, technology companies and supermarkets have seen an increase in product demand. Demand in supermarket food shops soared faster during the coronavirus pandemic than at any time in at least 26 years as households stockpiled many essentials. This was driven by a lot of factors such as panic buying, hyped media coverage, social distancing requirement imposed by the governments around the globe and shift in demand due to closures of restaurants, hotels and canteens[22]. However, this shift in supermarket product demand brought challenges such as empty shelves for essential food products (milk, fresh vegetables, eggs, meat, flour, etc.), increasing demand for online order and longer wait times for home delivery as more consumers stay inside their homes and avoid unnecessary travel. This was largely due to the just-in-time (JIT) approach followed by most retailers that are designed with maximum efficiency in mind and characterised by frequent orders, small lead times and low levels of stock[23]. As a result, supermarkets have struggled to deal with their supply chain pressures and profit concerns despite skyrocketing sales. Ensuring that consumers can buy what they need, and the right products are delivered/picked up quickly and efficiently was the key challenge for many supermarkets and grocers. Most supermarkets and grocery shops were neither ready to deal with a large volume of online orders nor had the infrastructure to fulfil the delivery promises. Customers struggled to find delivery slots and workforce shortages further added to this misery. This pandemic has, therefore, highlighted the vulnerabilities and capabilities of supermarkets and grocery retailers to deal with disruptions and uncertainties.

Food Delivery Challenges

COVID-19 is having a detrimental impact on all services and food delivery service is one of them that had struggled during this period with the added pressure of surge in demand for staples and groceries. While the global supply chains have been disrupted due to lockdown measures across the countries, the last mile delivery has also suffered severe roadblocks. It has been pointed out earlier that in light of panic-buying and stockpiling, many supermarkets have struggled to keep up with the demand and keep shelves stocked. Their misery was further elevated due to home quarantine situation stretching

the supply chain with more demand that the service providers can fulfil. Supermarkets have hence worked very hard to streamline delivery to stores as well as to their consumers. According to the Wall Street Journal, more people are opting for grocery delivery and pickup as opposed to food and restaurant delivery during COVID-19 lockdowns. However, the situation is different in the US. According to Satista.com[24], food delivery only accounted for 9 per cent share of off-premises US restaurant sales for 2020. As consumers have transitioned to online shopping, supermarkets have been trying to recruit more delivery drivers to meet the demand. However, they have struggled to recruit enough workforce due to the health risks that are associated with the nature of the job such as obesity, a lack of exercise, exposure to stress, and sleep deprivation or disturbance. Besides, many of their existing delivery drivers had to start self-isolating depending on their exposure to the virus that further challenged the efforts of the supermarkets to meet the growing consumer demand.

The coronavirus pandemic has affected all sectors across the globe and the discussions above reflect that the food sector is no different. Discussions so far highlight the ongoing challenges that the food sector is facing as a result of this pandemic. Food sector must, therefore, learn from their bitter experiences to ensure that they can continue to function effectively and meet the expectation of consumers as well as all stakeholders involved in their supply chains. Maintaining health and safety of the workforce and consumers, operating supply chains effectively and efficiently, and embracing disruptive technologies seem the way forward.

Food Price Hikes

It is evident from the previous section that this pandemic has resulted in changes in our food shopping and eating habits. A survey[25] by Which? that quizzed more than 2,000 members of the public about how their shopping habits had changed since the UK-wide lockdown was introduced in March revealed that 45 per cent of shoppers were spending more on groceries and 14 per cent were spending a lot more than usual. Consumers were attributing this rise in spending because of having to buy more-expensive brands or types of products, due to lack of choice (39 per cent); a lack of multi-buy promotions (29 per cent), which were stopped by many supermarkets at the start of the outbreak to help manage stock levels; and using more expensive independent/convenience stores. Although Which? reported that grocery prices had gone up by merely 1.9 per cent over the 12 weeks ending 19 April. This was also echoed by a tweet by World bank that food commodity prices were broadly stable in April and May, despite the spread of the pandemic. According to a survey of 1,500 UK people by the Office for National Statistics (ONS) conducted over the last days of March and the first week of April, 23 per cent said the outbreak was affecting their household finances. According to separate figures published by the ONS, the price of high-demand food products has risen sharply in online shops over the past month as the crisis mounts. There is a general fear that food supply disruptions caused by COVID-19 could lead to price spikes and erode people's access to food particularly in low- and middle-income countries.

Pandemic related Risks to Jobs and livelihoods

The ongoing pandemic has resulted in significant job losses across the globe with airline companies, the service sector and the automobile sector making some of the biggest job cuts. In the EU, more than 397,000 people lost their jobs in April 2020, according to data from the EU's stats agency, released in June. Whereas in the UK it is reported that around 7.6 million jobs (24 per cent of the UK workforce) are at risk because of the COVID-19 related lockdown[26]. Millions of workers have been put on government-supported job retention schemes as parts of the economy, such as tourism or hospitality, came to a standstill under lockdown. A recent report by the United Nations highlights that food systems directly employ over 1 billion people[27]. Additionally, agriculture is the second greatest source of employment worldwide after services, accounting for 28 per cent of global employment. This figure becomes more interesting for low-income countries, where this sector employs 60.4 per cent people and contribute up to two-thirds of gross domestic product (GDP). However, the COVID-19 pandemic has severely impacted the employment across all sectors including the food and agricultural sector. Food and Agriculture Organisation (FAO)[28] reports that disruptions in agricultural value chains and markets are also severely affecting rural livelihoods of tens of millions, particularly in primary food production, processing, services and distribution. Due to lockdowns and movement restrictions, small farmers and agribusinesses are often unable to process their fresh produce and/or access markets. Declining demand and lower prices are further leading to heightened food waste and income losses. Seasonal and migrant workers, no longer generating income, are returning to their areas of origin which is causing ripple effects on their households. In the US vast majority of the industry's layoffs were in food service, where the government said 5.5 million chefs, waiters and cashiers lost jobs[29]. Thus, this pandemic is having a detrimental impact on the jobs and livelihoods of individuals across the globe.

Changing Consumer Behaviour

The pandemic has led to some changes in what consumers are trying to buy. For example, the UK has seen demand for flour soar in during the early phase of the lockdown as people stuck at home increasingly turned into home-baking. French shoppers have been increasingly buying more organic food since coronavirus fears took hold of the country showing the growing conscious towards healthy and safe food products. A survey by YouGov of French consumers further reports that over half of French people have changed their view of the social, economic and ecological value of food production, 29 per cent of people have started buying more local foods and 20 per cent switched to online shopping. Whereas the YouGov survey of UK shoppers revealed that 42 per cent of Brits have reported an increased appreciation for food and other essentials, with 38 per cent cooking from scratch more often. The SRG Consumer Attitude and Behavior survey[30]of American people reported that due to COVID-19 around 74 per cent people have made changes to their grocery shopping behaviour, 50 per cent people were buying more shelf-stable/frozen food, 48 per cent were stocking food, 28 per cent paying less attention to prices, and around 17 per cent were shopping online.

A recent study by Singapore-based start-up Ai Palette[31] explored COVID-19's impact on consumers' food preferences and reported that health is top of mind for consumers in Indonesia and the Philippines, with taste as a second preference; in Thailand, however, those preferences are flipped. There is also a trend towards homemade food emerging in the Philippines and Thailand, where consumer interest saw a significant surge. In the UK, a report by AHDB[32] (2020) showed that lockdown has led to 503 million more (+38 per cent) in-home meals eaten per week creating further pressures on food supplies. Mckinsey[33] has fielded consumer surveys across the globe to understand the impact of COVID-19 on consumer sentiment and stated behaviour. The findings from 45 countries show that there have been significant changes in consumer spending behaviour across countries. Most countries have shown increasing spend on grocery items while a significant reduction in spending on restaurants. Though this is obvious, as most countries were under lockdown for an extended period with restaurants/hotels shut and people mostly staying at home. Pandemic has reported positive growth toward online purchases. Governments around the globe have been promoting healthy eating habits as preliminary research of the COVID-19 patients revealed that patients with certain health conditions such as diabetes, heart problems, and obesity are more likely to have complications from this virus. As a result, the demand for healthy food products and personalised nutrition has seen a sudden increase. It is clear that this pandemic has certainly affected consumer behaviour and going forward post-COVID-19, the new behaviour will continue to evolve.

COVID-19 related Food Waste Challenges

COVID-19 pandemic has resulted in the generation of a significant amount of food waste due to lockdown measures and a sudden fall in demand from businesses (schools, catering services, restaurants, hotels, etc.). Some producers have tried to pivot supplying ordinary shoppers but changed market demand and the excess stock remained a problem across the sector. The New York Times, which interviewed some US producers, cited an example of one chicken processor having to smash 750,000 unhatched eggs every single week[34]. They also reported about an onion farmer who was having to let most of his harvest decompose as he was unable to re-distribute his onions in high enough quantities without the facilities to store them. Media also reported that farmers in the UK were forced to pour a million litres of milk down the drain in April 2020 after demand from factories plummets amid coronavirus crisis as the dairy industry lost £13m just in May 2020[35]. Stock sitting unused due to lockdown further contributed to food waste. For example, due to lockdown measures in the UK resulted in the closure of pubs and restaurant. Hence some beers that had a best-before date of just weeks resulted in thousands of unused barrels in pub basements undrinkable by the time the lockdown was lifted.

Similar, reports were also published about the US, where farmers were dumping milk down the drain or letting vegetables rot in their fields. CNBC[36] reported that before the crisis, over half of Americans' food dollars were spent outside the home, at restaurants and other food-service locations. But with that industry largely shuttered, many farmers have found themselves without a market for their crops resulting in a massive amount of food waste. In developing countries like India, the lockdown has hit supply chains severely

and also vegetables were left to rot in fields. Tea planters in India also reported that the first wave of their precious Darjeeling crop has gone waste due to lockdown measures. In Germany, growers of white asparagus fear that their crop might go to waste this year because seasonal workers from eastern Europe are not allowed to cross the border. Whereas Dutch potato farmers must now deal with a million tons of unsold potatoes because they can no longer be sold to catering businesses. Besides, stockpiling and hoarding of food products is further causing huge food wastage if not consumed timely. These pieces of evidence show the massive impact that COVID-19 is having on food waste. Next section will discuss how some of the challenges highlighted above can be addressed.

3. Mitigating Risks imposed by COVID-19

It is evident from the discussions so far that the current pandemic is testing the limit of most organisations. The ongoing pandemic is presenting significant challenges across all sectors and the food sector, in particular, has been severely impacted, affecting the population across the globe. Therefore, it is essential to develop a mitigating strategy to deal with these challenges. Below are some of the potential pathways that have the potential to address the ongoing challenges of the food supply chains.

Harnessing Power of Industry 4.0 Technologies

Industry 4.0 technologies have created a lot of buzz in recent years due to their potential to transform the manufacturing sector. Industry 4.0 refers to a new phase in the Industrial Revolution that focuses heavily on interconnectivity, automation, machine learning, and real-time data. It is normally referred to the convergence and application of a set of technologies namely, advance robotics, artificial intelligence, big data analytics, cybersecurity, additive manufacturing, simulation, augmented reality, blockchains, industrial internet and cloud computing. Technology has the potential to assist with the challenges imposed by the coronavirus pandemic, particularly when it comes to enabling the agile responses in the wider food supply chain. Several challenges that were highlighted earlier could potentially be addressed through the use of these disruptive digital technologies. For example, digital technologies can collect real-time data to improve the communication between suppliers and buyers and simplify the redistribution of food. Advanced technologies such as internet of things (IoT) sensors are already being used to monitor soil, plants and water, allowing the growth of plants through scientific nutritional data, making the most of the biological cycle of the soil, increasing production, while respecting nutritional values of the soil. A combination of digital technology assets - data collection, data storage and management, analytics, and decision modelling can work together to unlock farming's potential.

Industry 4.0 technologies have shown their potential in the agricultural and food sector. IoT sensors are being used to provide real-time end-to-end visibility of perishable/non-perishable products and thus help in minimization of food waste in the supply chains. While data analytics platforms including artificial intelligence and machine learning can be used to identify and anticipate changes in demand, shortages and surpluses throughout

the system thus making supply chains more efficient and resilient. Robotics is being used to support non-value-added labour-intensive activities thus improving the resilience of supply chains while, the mobile technology and augmented/virtual reality can use used to enable workers to perform tasks they were not trained for more easily. The use of autonomous electric vehicles and drones can be used in warehousing and distribution activities thus reducing the reliance on people and further assisting with social distancing. Some companies, for example, Starship Technologies[37] have started delivering food using autonomous robots to those who need it while maintaining social distancing in the wake of the Covid-19 pandemic. Blockchains can be used to improve the traceability of food products and thus ensuring food safety. The tracking aspect of blockchain also becomes useful in reducing food waste. Food organisation can harness the power of big data to understand the shifting consumer behaviour and hence plan adequate strategies to serve their customers better. It is clear from these discussions that technological innovations can help to reduce risks in supply chains, reduce food waste and make supply chains resilient. These digital technologies present companies with exciting opportunities to boost their productivity and reduce their costs.

The response of Supermarkets to COVID-19

Supermarkets have observed an unprecedented surge in demand since the beginning of the coronavirus pandemic. However, this surge in sudden demand due to panic buying by consumers have put supermarkets in a really difficult situation. With the government imposing strict lockdown and social distancing measures in most countries across the globe, supermarkets are attempting to adjust their operations for the new normal. However, in these unprecedented circumstances the food supply chains have so far demonstrated remarkable resilience. Though some bottlenecks remain such as the availability of inputs for farming (e.g. shortage of labour for harvesting fruits and vegetables), plant shutdowns in the food processing sector (e.g. meat processing) and the ongoing disruption of air freight, which affects high-value perishable products[38]. To deal with these challenges as a first step to abide by the new regulations, supermarkets provided clear guidance on social distancing and hygiene upon arrival to the store and visible signage outside and inside the store were provided. Many supermarkets also established disinfectant measures for trolleys or baskets, provided sanitiser for customers to use upon entry, employed one-way flow system in the store, floor markings for queuing at tills, and even restricted entry of a limited number of people at one point in time to ensure social distancing could be maintained inside the stores.

To stop stockpiling, most supermarkets set a limit on several products that can be purchased. This was to also ensure that every consumer gets hold of the essential commodity and a steady flow of food commodity can be maintained without putting additional strain on their supply chains. They further asked their suppliers to simplify the range of food products on offer to help increase production volume. Replenishing the items on the shelves also proved to be quite challenging during these times hence, most supermarkets altered their opening hours and recruited extra staff through deployment from other sectors. A certain group of the population was more vulnerable to this

pandemic, supermarkets ensured to have dedicated hours for the elderly, vulnerable, social/health care workers and other vulnerable customers. Some supermarket chains took some innovative steps such as installing a traffic light system at their entrances, only giving shoppers the green light to enter when a store has a safe number of customers inside. While some supermarkets even offered online virtual queuing system. Most supermarkets struggled to meet the abrupt online demand of consumers during the beginning of the pandemic. Therefore, supermarkets expanded delivery hours and increased click-and-collect points as well as encouraging cashless payment to reduce the contact with their personnel. Overall, supermarkets have managed the whole situation quite well so far. However, going forward retailers will need to rethink on their existing approaches to efficiency such as JIT and Lean and look for strengthening the resilience of their supply chains to counter the future unpredictable disruptions.

The Re-emergence of Short Food Supply Chains

Short Food Supply Chains (SFSCs) have emerged as one of the sustainable alternatives to conventional food supply chains in recent years[39]. It is a type of Alternative Food Networks (AFNs) that operates like a local food system and short-circuits the traditional long food supply chains. The 'short' not only refers to the close proximity in geography but also the social relations between producers and consumers[40,41]. While there hasn't been a consensus on a unified definition of SFSCs[42,43,44], it generally refers to any forms of re-joining farmers with consumers, with a minimized number of intermediaries[45]. Several types of SFSCs can be identified, for example, community-supported agriculture, on-farm sales, off-farm schemes (farmers markets, box delivery schemes), collective sales in particular towards public institutions, being mostly local / proximity sales and in some cases distance sales.

The globalization led to the opportunity to make available several food products all over the world, with positive returns for the profitability of the food industries and consumers. However, at the current uncertainty amid COVID-19 where borders are closed and global supply chains are severely disrupted, the key issue faced by many organisations in food supply chains sector is to guarantee the availability of food and ensuring the movement of goods. As a result, there has been a shift in the trend of finding more food from local sources during COVID-19 which feel less the effect of international restrictions and which, since their rooted presence in the territory, could be closer to the consumers[46,47]. Under these circumstances, there has been a growing push on SFSCs to meet the local demand as not only it helps in plugging the gaps but it also yields environmental benefits such as reduces food waste, fewer greenhouse emissions and improving biodiversity; social benefits such as connecting farmers and consumers, creating a cultural identity, and improving food security and the viability of local communities; economic benefits such as improving the livelihood of farmers and providing more local employment opportunities; and health benefits such as access to fresh fruits and vegetables. Cappelli & Cini (2020)[48] highlight that the reinforcement of this local micro-economy is also useful in non-crisis situations since they allow to increase the chances of employment and improve people's quality of life.

In this line, the Food Foundation, the CSA Network UK and Better Food Traders gathered and collated evidence from 101 UK veg box schemes during April 2020 and reported that sales went up by 111 per cent overall during the six weeks from the end of February to mid-April[49]. Before the impacts of the coronavirus pandemic were felt, 101 box schemes sold 70,029 boxes a week (last week of February 2020). By the week beginning the 16th April (i.e. six weeks later) they had more than doubled sales and were delivering 147,564 boxes. The highest rates of growth were seen by smaller box schemes (starting from 68 boxes and supplying up to 300 boxes per week) who grew sales by 134 per cent. COVID-19 pandemic also saw the emergence of farmers using digital technologies and platforms to sell their produce directly to consumers. The pandemic has already shown growing reliance on SFSCs for essential food and popularity of SFSCs will continue to grow as consumers are getting health conscious and more concerned about the food safety and transparency.

Growing need to Build Resilience in Supply Chains

A report published in Fortune reported that 94% of the Fortune 1000 organisations 8are seeing coronavirus supply chain disruptions[50]. These disruptions have caused several issues such as shortages of essential products and a sharp increase in prices reflecting the extent of the impact COVID-19 is having across the globe. Organisations have also been focusing on reducing inventories following the JIT principles and drive up asset utilization removing buffers and flexibility to absorb disruptions. However, this pandemic has shown that cost competitiveness strategy is not always appropriate particularly at the times of uncertainty like what we are going through currently. In these circumstances, perhaps risk competitiveness is more appropriate to ensure resilience[51]. Since the emergence of coronavirus, the need to build resilience in supply chains has been floating everywhere. However, the concept of resilience is not a new one as Sheffi[52] states that the ability of an organization to successfully confront the unforeseen has always been a core element of success. This pandemic has compelled supply chain managers across the globe to minimise risks and reassess whether supplies from single-source factories are a good thing as the current situation has exposed many of the vulnerabilities and fragility brought about by this strategy and approach. This pandemic has hence offered an opportunity to drive real change in the supply chain system by improving supply chain resilience in the mid to long-term.

To counter the ongoing challenges, the organisation needed a holistic approach to manage their supply chains. It has become a necessity for organisations to build sufficient flexibility in their supply chains to protect against future disruptions. Organisations can achieve this capability through technology-led, leveraging platforms that support applied analytics, artificial intelligence and machine learning. Emerging technologies offer organisations to strengthen their supply chains and maintain a level of continuity during times such as these. For example, Artificial intelligence (AI) can be used to meet the new demands of a supply chain in flux, by predicting shortages, demand spikes and direct supplies. These technologies also ensure end-to-end transparency across the supply chain. For example, blockchain technology is being used to strengthen the traceability of

the products. Data plays a vital role in ensuring resilience in supply chains as visibility into data provides useful insight into which decisions to make. We have seen that COVID-19 is having a significant impact on the workforce and many organisations are already deploying autonomous trucks and drones for intralogistics and last-mile delivery challenges thus helping support businesses struggling with a reduced workforce. Real-time information exchange, diversifying the supplier base, strong collaboration with suppliers, adequate forecasting and planning and use of disruptive technologies are some of the way organisations can achieve resilience. The era of turbulence demands a robust and resilient supply chain strategy.

4. Conclusions

The COVID-19 pandemic has highlighted the vulnerabilities of existing food supply chains and demands adequate strategies to deal with them. The pandemic related food supply chain disruptions are transforming businesses across the globe. The threat of disruptions is worsening existing issues related to food security. The food sector has been plagued with demand and supply challenges, shortage of labours, food price hikes, disruption in farming activities, food waste problems, job losses and changing consumer behaviours. To mitigate these risks new business models have emerged. For instance, there has been a growing trend towards the adoption of short food supply chain practices. Disruptive technologies have also come to rescue food organisations in managing demand and supply disequilibrium, strengthening their supplier network and improving the visibility of supply chains. Moreover, there has been a growing demand to build or strengthen their supply chain resilience.

Moving forward, organisations need to learn from their experience of existing challenges and think of ways to develop higher resilience. This pandemic has affected every aspect of the supply chains and hence organisations need to respond to issues proactively and flexibly. A dynamic response will help organisations to effectively deal with the pandemic. Even though the world is moving towards digital transformation, many organisations are still failing to adopt modern technologies. Organisations need to realize the potential benefits of digital technologies in building resilience. For instance, use of industry 4.0 technologies across the supply chains (e.g. smart manufacturing, warehouse automation, blockchains for traceability, drones for delivery, data analytics for demand and supply management, etc.) can bring numerous benefits to organisations and help them strengthen their supply chain resilience. However, it should also be kept in mind that although disruptive technologies have the potential the social responsibility should not be overlooked. For example, carefully looking at whether using robots is a viable or economically feasible solution to replacing hundreds of thousands of seasonal workers. There is also a need for careful evaluation of cost and benefit analysis to explore what works best in different situations. As we embark towards the new digital future, there is a growing demand for ethics of invention that focuses on understanding how technology affects human beings, their perception of themselves and their way to relate to each other. This will become vital to overcoming resistance to technological adoption. Existing pandemic has also shown new emerging trends. Grocery retailers have already seen a

sudden shift toward online shopping and changing consumer behaviour trends. For example, during the pandemic, health awareness has increased, and consumers are looking for food products that are fresh and suitable for their particular lifestyle. There has been a surge in personalised nutrition and organic food consumption. These sorts of changes are likely to change the existing business models and new business models will emerge aligned with the evolving new normal.

The pandemic has raised the significance of responsible production and consumption and hence promotes sustainability in food supply chains. Moreover, the pandemic has highlighted the issue of food waste resulting from stockpiling that necessitated organisations and consumers to follow a more sustainable approach towards food products. A transition towards more sustainable practices such as the adoption of circularity in food systems[53] that advocates reduction of the amount of waste generated in the food system, reuse of food, utilization of by-products and food waste, and nutrient recycling seems a way forward. Health and well-being of stakeholders involved in the supply chains have also gathered attention amid COVID-19 pandemic. There has already been a lot of discussions over the years on the importance of supply chain visibility and the ability to track product literally from farm to fork due to many food scandals. Post-COVID-19, supply chain visibility across food supply chains will become essential. The technology exists today (e.g. blockchains) that can dramatically improve visibility across the end-to-end supply chain, and support companies' ability to resist such shocks. This simply requires significant effort on the part of the foodservice operators and the distributors to agree to conform to the standards and configure their systems.

The pandemic has exposed the dangers of relying on a single supplier or single geolocation as it is similar to putting all eggs in one basket and, thus, encourages diversification of the supplier base. One thing is very clear that post-COVID there will a greater emphasis on the safety, cleanliness, and hygiene even at the expense of speed and efficiency. The need for an integrated ecosystem in the food value chain involving wider stakeholders such as governments, NGOs, the healthcare sector, universities and the financial sector has never been so important than now. Bringing this diverse range of parties together and getting them to communicate and cooperate is a challenge in itself, but the dividends of such cooperation are tremendous[54]. This pandemic has shown the impact of labour shortages (due to lockdown and social distancing measures) that almost derailed the agricultural supply chains. The future strategy should, therefore, also focus on maintaining business continuity amid disruptions, establishing a safe working environment and should pay due consideration to the health and safety of the workforce.

The ongoing pandemic has created several challenges for the food system and many lessons need to be learnt. These lessons need to be reflected in future food policy to effectively deal with similar situations in the coming future. One thing which has emerged strongly from this situation that there is a need for a diversified source of supply to allow firms along the food chain to adapt rapidly when specific input sources are being compromised by transport or logistics disruptions. It is also important to have greater cross-government coordination to effectively deal with the disruptions which appeared to

be missing in early phases of the coronavirus pandemic across many nations. Businesses linked to food sector need to ensure that there is a contingency planning in place to deal with a much higher level of disruptions. Maintaining good personal hygiene, cleaning of premises and equipment, food safety, ensuring the health & safety of employees and consumers, availability of Personal Protective Equipment (PPE) for staff, stock control, and revised staff training etc. is going to be the new norm to maintain the continuity of businesses as well as for a fairer, resilient and healthier food system. There also needs to be a greater focus on the needs of vulnerable groups to ensure food access, such as by ensuring targeted, flexible safety nets[55]. Thus, future food policy needs to ensure that it is well thought, reflects on lessons learnt from the pandemic and is forward-facing ready to deal with future challenges of new normality.

In summary, COVID- 19 has highlighted the existing vulnerabilities in the food supply chains, however, at the same time, it has shown a pathway to redemption. The existing scenario has created an opportunity for scholars, practitioners and policymakers to join hands to create a better future ensuring continuous flows of staple food and social and economic access to safe and nutritious food, especially for the poorest and the more vulnerable segments of populations. This can only be achieved if future strategies are built on the premise of trust, innovation, and future vision. Future studies should therefore focus on developing a research framework to assess the impact of the pandemic on supply chain performance. This framework further needs to be tested empirically by collecting primary data through survey questionnaire and expert interviews. The author intends to develop this paper further and present the empirical findings that could be generalised across the food sector.

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