

# COVID-19 Pandemic: Influences on Food Safety and Security in Bangladesh

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## ABSTRACT

**Purpose:** The ongoing COVID-19 Pandemic has caused a new period in the efficacy of the food supply chain, while the repercussions of this brand-new age on humanity, the economy, and the food market are still under examination in Bangladesh. For example, food safety and security are crucial elements of food systems that are directly influenced.

**Methodology:** To offer historical and contextual evidence on Bangladesh and other COVID affected countries' nutrition and food sanctuary, we evaluated current papers, published pamphlets, and relevant grey literature

**Findings:** This evaluation summarizes food protection during upsurges and pandemics before carrying on panic buying, food scarcities, and rate spikes observed throughout the present situation. The importance of food strength and the requirement for dealing with concerns connected to food loss and food waste is highlighted in the testimonial in the direction of food safety and lasting advancement.

**Practical Implication:** As a outcome, the Pandemic has revealed that our food systems are vulnerable. Considering that the international population and urbanization will expand in the coming decades, pandemics will likely happen more often, and climate change will intensify. As a result, there is a requirement to guarantee that our food systems are more sustainable and robust.

**Originality:** This study highlighted the demand to create contingency plans and reduction methods that would allow more quick feedback to extreme events and transform the food field by making it more buoyant.

## 1. Introduction

An adequate quantity of nourishing and safe food is essential for maintaining life and endorsing good health. Nonetheless, as the world population increases, more initiatives and technologies are needed to feed the populace. Consequently, it is essential to sustain agricultural manufacturing, improve the worldwide supply chain, reduce food waste and loss, and ensure that all people have access to nourishing food (United Nations, 2020). According to the Food and Agriculture Organization (FAO), "Food protection exists when all people, whatsoever times, have physical as well as financial access to enough, secure and also healthy food that satisfies their dietary requirements and food preferences for an energetic as well as a healthy and balanced life." This definition indicates the various dimensions of food security, including food availability, accessibility, usage, and security of food supplies at international, national, and regional levels

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(Thomson 2007). The principle of protection describes both the access and accessibility measurements of food security, and within this context, the population has to have access to adequate food at all times. Accessibility to appropriate food needs to be reputable. For that reason, people should not risk losing access to food because of abrupt unanticipated climate, health, and wellness, or recessions. Presently, the globe consisting of Bangladesh is struggling to eliminate a wellness crisis: The COVID-19 Pandemic.

The Pandemic stood for a sudden emotional, financial, and partially physical disturbance to markets, societal sub-systems, and citizens. Food safety is among the four pillars of the food systems influenced by the Pandemic (Galanakis, 2020), while the latest extra aggravates a recurring nourishment situation (International Political Economy Society, 2020). In 2019, virtually 135 million people faced significant levels of acute food insecurity or worse. The variety of individuals in 2019 was the highest possible in the 4-year presence of the Global Report on Food Crises (Global Report on Food Crises, 2020). The Pandemic poses a potential risk to the Lasting Development Objectives, especially food-security-reliant objectives; no hardship and zero appetites will be walloped during the lockdown, specifically in developing nations (Workie et al., 2020).

Bangladesh is a nation of 164.7 million people with many foods and nourishment security alarms. Preliminary estimates show that COVID-19 sways have strapped an additional 20% of people beneath the poverty line in Bangladesh. In April of 2020, four CGIAR institutions functioning in Bangladesh (IFPRI, World-Fish, IRRI, and CIMMYT) submitted a recognized letter to the Administrator of the Ministry of Agriculture demarcation the scale of the COVID-19 bearing on food arrangements while also bestowing potential boulevards for corrective actions (Amjath-Babu et al., 2020). According to Ruszczuk et al. 2021, the Asian Development Bank prophesied that Bangladesh could mislay 1.1% of GDP growth and 894,930 formal jobs due to the Pandemic in a hypothetical worst-case situation. Research by Wasima and Rahman (2022) showed that the plaintiffs reported forfeiture of employment, loss of revenue, food shortages, incapability to pay rent, and inadequate societal security coverage as life-threatening vulnerabilities.

Such duplicated pandemic waves thus bring extra threats to food safety and security. Therefore, this extensive review article aims to evaluate the effect of the Pandemic on the food safety of Bangladesh. Because of context, the post goes over disruptions and future dangers to food protection in the era of the COVID-19 Pandemic; after that explores the change in the food market that will undoubtedly be necessary to attain food resilience in the years ahead. Based on current papers, published pamphlets, and relevant grey literature, this review summarizes food security during epidemics and pandemics before moving on to panic buying, food shortages, and price spikes observed during the current crisis. The importance of food resilience and the need to address issues related to food loss and food waste is underlined in the review on food security and sustainable development.

## **2. Food Safety throughout Epidemics as well as the COVID-19 Pandemic**

Upsurges, such as HIV/AIDS, Ebola, and Middle East Respiratory Syndrome (MERS), have negatively influenced food security. For example, the Ebola epidemic had a significant impact on the economic climates of some African countries' agricultural manufacturing, advertising and marketing, and professions. Prone populaces, including youngsters, females, the elderly, and those

residing in. poverty, were most afflicted (Shenggen, 2020). Throughout these situations, farmers might not transfer their fresh create to regional and city markets, and much-needed aid could not be supplied to institutions. The distribution chain was also impacted as supply chains were delayed, and the labor force declined to travel to contaminated countries due to the fear of being contaminated. Because of this, the price of staple foods in Guinea, Liberia, and Sierra Leone enhanced significantly. For example, the costs of rice and cassava were raised by more than 30 and 150% (European Institute of Innovation & Technology, 2020).

During the COVID-19 Pandemic, various procedures were carried out to stop the spread of the virus and protect public health. Therefore of lockdowns during the Pandemic, families with high dependency on labor earnings experience a significant revenue shock that would undoubtedly jeopardize the food safety of these houses (Arndt et al., 2020). Sadly, the existing Pandemic has sped up an economic crisis and ongoing food safety and nutrition situation. It is still challenging to forecast how COVID-19 will impact lasting food protection. However, previous pandemics and international conditions have revealed that impacts on food safety and security can be fast and of dramatic percentages (Food and Agriculture Organization, 2020). Presently, dangers, frailties, and injustices in worldwide food systems occur almost daily.

The COVID-19 Pandemic has been a wake-up call for food systems, which have remained on a knife-edge for years (International Political Economy Society, 2020). Food systems (European Commission, 2018) incorporate the numerous food production phases, including preparation, processing, distribution, and disposal. Moreover, the appropriate allocation of food to customers entails land use, farming inputs, framework, delivery, and various actors (e.g., farmers and retailers) (Galanakis, 2020). Hence, lockdowns and disturbances set off by COVID-19 have made complex communications among these various food system aspects. From the primary supply to the last need, the whole food system was interrupted throughout the COVID-19 Pandemic (Workie et al., 2020). As reported by the European Commission, the food system itself needs to be changed right into a more comprehensive, varied, durable, affordable, accountable, and sustainable kind (European Commission, 2018). The current Pandemic has currently affected the entire food system, presenting an incredible difficulty with profound social and economic effects, consisting of endangering food safety and security as well as nutrition, as laid out in the Joint Declaration on COVID-19 Impacts on Food Protection as well as Nutrition (Food and Agriculture Organization, 2020).

### **3. Panic Acquiring, Food Shortages, and Price Spikes**

Table 1 offers the effects of the Pandemic on food systems. The instability caused by a shock and the relevant behavioral alterations can cause periodic cost spikes, market and supply disruptions, and food shortages (Food and Agriculture Organization, 2020). The COVID-19 Pandemic affected consumers' purchasing and food preparation behavior, spending even more time at residence and began cooking more than ever. On top of that, the uncertain effects of the lockdowns fretted consumers regarding sufficient materials and food distribution. This led to panic purchasing as many individuals stocked large quantities of products. Panic acquiring actions typically stem from consumers receiving more than expected, not from a limited food schedule. Without a doubt, and also ironically, the panic purchasing trigger seemed to be the minute when people were informed not to panic. The media partially increased this fad, frequently showing images of empty racks and consumers copying other individuals' panic-driven yet irrational and untrustworthy habits.

**Table 1. Impact of the COVID-19 Pandemic on the Food Systems**

Sector	Impact
Manufacturing	Lowered availability of food
	Price spikes
	Shortage of inputs as well as labor
	Demand fell due to lockdowns.
	Disposal of perishable foods and also enhanced food waste quantities.
Processing	Price spikes
	Developments gap due to absence of financial investments
	Demand broke down as a result of lockdowns
	Income reduction as well as unemployment of workers
	Disposal of the subject to spoiling foods and increased food waste quantities
Selling	Food lack because of panic purchasing
	The rapid advancement of shopping and also the straight connection of farmers with consumers
	Lowered neighborhood schedule
	Disturbance of transportation flows as well as wholesale markets
Usage	Need to be collapsed because of lockdowns
	The rapid growth of home delivery
	Food insecurity for susceptible people
	Income decrease, and also unemployment of employees in the catering sector
	Change in consuming habits

Source: Boyacı-Gündüz, et al. 2021.

Ultimately, a surge sought after for natural and staple foods was observed likewise to what had accompanied other dilemmas. These events included the Bovine Spongiform Encephalopathy (BSE) outbreak (2000), Severe Acute Respiratory Syndrome (SARS, 2004), and also the melamine detraction (2008) that bolstered the need for organic infant food in China (Ecovia, 2020). Undoubtedly, food shortages and rising prices took place in different countries (e.g., Ghana, Italy, Malaysia, Bangladesh, and New Zealand) as a result of the high demand (European Institute of Innovation & Technology, 2020; Christian, 2020; Bunyan, 2020; ITV News, 2020; Southey, 2020). In Italy, France, Spain, Germany, Denmark, the U.K., and the United States, consumers stocked up on dehydrated yeast, which became a hard-to-find commodity (Purdy, 2020). In Russia, the panic acquisition was observed the week before the self-isolation news, with individuals stockpiling buckwheat, garlic, and non-perishable foods, among the top-selling groups during the coronavirus panic shopping (Ostroukh, 2020; Melkadze, 2020). Ultimately, rates for staple food (e.g., sugar, tomatoes, garlic, lemon, buckwheat, and also bread) costs increased by 16, 15, 9, 8, 6, and 7%, specifically (Times, 2020). The government had actually advised consumers to make use of food delivery solutions, yet most of them fell logistically as putting orders ended up being progressively tricky because there were no free time ports (European Institute of Innovation & Technology, 2020). In Malaysia, the prices of cabbage and cucumbers were enhanced by 62.5% and 300%, respectively (Seng, 2020). Another consequence of the food scarcity caused by COVID-19 panic could be the spread of unsafe practices, such as methanol in liquors (Neufeld et al., 2020). Food shortages and cost spikes can also be associated with the problems observed in supply chains because of surrounding closings and quarantine actions, fewer workers readily available for collecting, manufacturing, logistics, and reduced manufacturing. Over the long term, labor scarcities will impact the manufacturing and processing of food, especially in labor-intensive plants. For example,

high-value products such as fruits, veggies, and fisheries require a tremendous amount of labor for their items and hence, have been greatly affected by the present scenario (Cullen, 2020). In Germany, Britain, as well as Italy, climbing costs were anticipated for certain veggies such as asparagus and also strawberries have, given that these products are all hand-harvested by knowledgeable employees from Eastern Europe that can't get to the area to function (Alderman et al., 2020).

According to FAO, the COVID-19 Pandemic has also disrupted the food supply chain as a result of trade and also logistics issues (Food and Agriculture Organization, 2020). These disturbances mirror disruptions in the production or distribution of the items (Zheng et al., 2020). As an example, as a result of the reality that the manufacturing of staple assets such as wheat, maize, corn, soybeans, as well as oilseeds is capital intensive, the labor lack issue will undoubtedly have a more substantial unfavorable influence on the distribution logistics of these products as well as much less impact on their production (Cullen, 2020). In Thailand, at the start of the COVID-19 episode, supermarkets could remained well-stocked up despite the observed panic purchasing. Still, a few days later, lots of things (mainly fruit and vegetables) were missing from shop shelves (European Institute of Innovation & Technology, 2020). Commodity costs have bordered by 17.34% of the average export price (from the United States 481.50/ ton to 565/ton) because of the greater worldwide need (Seng, 2020). Nevertheless, in this case, the primary obstacle for Thai food exports was logistics, as many countries had taken lockdown procedures in the air travel sector (Arunmas et al., 2020).

Additionally, although there is no sign that Thailand will certainly restrict its exports, the authorities should think about the possibility of various other countries limiting their exports. For example, the Vietnamese federal government announced outlawing brand-new rice-export contracts at the end of March (Seng, 2020). With such new export policies in place, national governments of various nations may understand that they are currently too based on international food materials and, therefore, should consider globalization's influence on their own food systems. Whether this propensity prevails will rely on the economic scenario and social aspects complying with the post-lockdown duration and the disequilibrium sped up by the Pandemic (Kerr, 2020).

Food shortages and cost rises triggered by an excessive need for specific food products have affected food availability and are disturbing for customers. In addition, these conditions can worsen if the COVID-19 Pandemic lasts for a very long time. The FAO declared that panic and consumer stockpiling of foods lowered the donations made to food financial institutions from supermarkets. Hence, customers need to avoid panic buying and stockpile to reduce the resultant food financial institution anxiety in food-insecure populaces (Food and Agriculture Organization, 2020). There is also a requirement to consistently advise consumers that ample food materials are readily available and that the stockpiling of food is unnecessary and unwittingly contributes to food instability for many vulnerable people. The OECD reported that for the current pandemic circumstance, there is no basis for advancing an international food dilemma since staple plant materials and cereal supplies are adequately large. Additionally, compared to various other fields, the food industry has been less impacted by organization closures and motion restrictions during the Pandemic. Nevertheless, the Pandemic postures an extreme risk to food protection in the poorest nations where farming

production systems are more labor-intensive (Organization for Economic Co-Operation and Development, 2020).

#### **4. Other Impacts of the COVID-19 Pandemic**

##### **4.1. Effects of the Pandemic on Agriculture**

The total result of the COVID-19 Pandemic on the food chain includes vacant racks because of panic-buying and various other facets that are hard to anticipate on either scale or nature and yet to be seen. These influences problems in minor and industrial farming, specifically in developing countries where lockdowns have caused slower food distribution systems due to border hold-ups and the decreased capability of workers to migrate for farming labor and food harvesting. Sadly, the pre-existing food situations will continue to worsen and negatively impact the impoverished and vulnerable populations. According to the FAO, essential adverse effects on manufacturers, carriers, CPUs, and customers have been observed and will undoubtedly proceed (Food and Agriculture Organization, 2020). The issues are more intense in developing nations where much smaller farmers must transport produce and inputs by bus (Morton, 2020). In particular, as the COVID-19 Pandemic sweeps through the developing nations, more than 30 are facing a widespread famine of historical percentages, whereas, in 10 of those countries, more than a million people are on the brink of starvation (Guardian, 2020).

The COVID-19 Pandemic created the food and the agricultural sector to experience an adverse downturn with an enormous labor loss (Nasereldin et al., 2021). Labor loss prevented farming tasks and also influenced supply chains. On the other hand, it created a loss of income for individuals with farming economic climates, and numerous houses are faced with poverty. Unfortunately, many farmers and farm laborers' self-destructions were reported as a loss of income during the Pandemic (Singh, 2020).

##### **4.2. Impacts of the Pandemic on Food Supply Chains**

Various other influences of the Pandemic on the food chain include the following: Lowered earnings, minimized accessibility to essential services (e.g., vets, seeds, and plant foods) and purchasers, alterations in food distribution, and also raised distribution requirements because of closed dining establishments, kids losing cost-free institution meals, absenteeism as a result of illness across the food. Chain sectors boosted food waste from ranch to fork and potential spikes in food prices due to the increased need and slower food supply chains (Southey, 2020; Agriculture and Food Security Network, 2020; China Shipbuilding Industry Corporation, 2020; Siche, 2020). Fresh fruit and vegetables can accumulate without being offered, bringing about food losses, loss of revenue, and more significant food costs. Similarly, the life span of fresh food for the foodservice sector is minimal, which results in added food waste (European Institute of Innovation & Technology, 2020). Auditing, evaluations, and surveillance guidelines could be momentarily decreased or modified to accelerate the activity of products. For instance, in the United States, Food & Drugs has released acting standards that offer adaptability for different criteria such as product labeling to assist sustain the food supply chain and meet consumer demand (Mayne, 2020). Such administrative and regulative changes could be encouraging for some food companies attempting to

deal with lower margins and broken supply lines, thus addressing food top quality, safety and security, and authenticity concerns.

These effects highlight the need to proactively ensure contingency preparation and the implementation of reliable mitigation techniques and control steps, which help guarantee that the wellness or recession will not turn into a food crisis. For that reason, the current COVID-19 wellness situation can become a food crisis if sufficient contingency plans are not implemented (Food and Agriculture Organization, 2020); World Food Programme, 2020). Undoubtedly, an essential strategy from governmental and study bodies and the market and customers is vital to provide a safety net for the most prone populaces and ensure that the food supply chain operates successfully. This approach includes health and wellness measures (Seymour et al., 2020) as well as social distancing (Kissler et al., 2020), also as federal government interventions, financial investments, and also minimized tax policies in the agricultural market (Cullen, 2020). Various other appropriate procedures include buying farming products from small farmers and shorter supply chains (Cappelli&Cini, 2020), growth of e-commerce systems, and mobilization of non-governmental food banks whose personnel have the technical knowledge and experience to deliver food successfully (Cullen, 2020). Nonetheless, those actions will not be sufficient unless applied promptly and efficiently. For instance, local food crop manufacturing can only meet less than one-third of the globe's population (Kinnunen et al., 2020). Despite the Pandemic, the food supply chain should keep working, as well as, at the same time, adequate measures must be in a location to make sure the most essential requirements to stop even more spreading of the virus. Unfortunately, the supply chain is, in some cases, weak, and also, many products have been lost considering that the demand is not appropriate sufficient to buy the products at their regular price (Cullen, 2020).

Furthermore, the food web is complex and includes numerous elements from farm to table. This complexity can produce voids among the producer, customer, and the product itself. The following factors influence customers' food options: Rate, nourishment, health advantages, top quality, beginning, seasonality, emotions, routine, labeling, accessibility, sensory attributes, culture, personal preference, ecological footprint, previous positive experience, and also information. Other aspects consist of an appreciation for organic items, choosing local products, pet welfare, sourcing components for prepared dishes, advertisements, minimal processing, as well as shelf-life (PoPAa et al., 2011; Boyland& Christiansen, 2015; Bucher et al., 2016; Asioli et al., 2017).

#### **4.3. Effects of the Pandemic on Packaging**

The COVID-19 Pandemic has also impacted the product packaging market on various sides, such as raising consumer recognition of the hygiene and safety of product packaging products, boosting digital printing, packaging for e-commerce deliveries, and reassessing the products design requirements of sustainable packaging (Menjivar, 2020; Feber et al., 2020). Many product packaging businesses have created multiple-use cutting-edge product packaging innovations to achieve sustainable objectives. Nevertheless, the Pandemic triggered by a coronavirus influenced customer behaviors due to the worries about hygiene. In addition, the safety and security of reusable packaging briefly stopped the packaging market's enhancements on a lasting supply chain (Menjivar, 2020). For example, Starbucks momentarily suspended using unique mugs rather than single-use paper cups at its shops around the globe in response to the COVID 19 pandemic (Alcorn,

2020; Evans, 2020), given that worries about health have a greater top priority than environmental issues. Because of context, product packaging companies should change product packaging design considering a right the main demands consisting of sustainability, enhanced health and safety worries of the consumers, style for e-commerce, ship-ready layout, and direct-to-consumer versions (Feber et al., 2020).

## **5. Food Loss and Waste**

The COVID-19 Pandemic might also affect the shed and squandered food temporarily and permanently (Organization for Economic Co-Operation and Development, 2020). Customer waste has arisen generally from the over-buying pattern and improper storage of high amounts of foods. On the other hand, food supply chains were disrupted because of roadway closures which created a build-up of products, causing enhanced degrees of food loss and waste (Cullen, 2020). To lower food waste, the E.U. Platform on Food Losses and Food Waste shared the food loss and waste prevention actions taken by E.U. Member States of the E.U. in the context of this unmatched dilemma (Boyacı-Gündüz et al., 2021). Also, numerous federal governments advised citizens that no prevalent food shortages had been observed and informed them on exactly how to plan buying and food storage space to modify their usage routines (Organization for Economic Co-Operation and Development, 2020; Boyacı-Gündüz et al., 2021). The mobilization of private charities and community-based groups to distribute food throughout the lockdown might address numerous issues by helping to lower food waste while supporting individuals in need (Galanakis, 2020). A comparable method was implemented by several cooperatives and towns that accumulated excess food from college cafeterias and restaurants and redistributed it to the low-income and other prone teams (Boyacı-Gündüz et al., 2021). Such alternate supply channels for handling possible surpluses or possible food loss and waste that have resulted from the closure of restaurants, schools, resorts, and catering companies have been substantial and also appreciated sources during the Pandemic (Organization for Economic Co-Operation and Development, 2020).

In general, contemporary food supply chains have concentrated on reducing food loss and waste (primarily to reduce expense) and, consequently, environmental effects. Nonetheless, the unanticipated spike in food demand due to COVID-19 control measures has caused empty shelves. This enormous shock to well-organized food supply chains highlighted the require for raised customer education. Numerous modern innovations are recommended to monitor food manufacturing and consumption (targeting lowering food loss and waste), which can be used to make a specific reputable, undisturbed food supply throughout these challenging times (Boyacı-Gündüz et al., 2021).

## **6. Food Strength**

Any arranged system intends to reach an optimal operational state and remain stable. However, this method is perfect and typically not possible in our fast-changing world where systems stability depends on the episode frequency of severe occasions instead of typical conditions. The greater the effort to enhance the aspects of a complicated system, a lot more decreased resilience is. An outside change throughout the optimum state can lead to disturbances and an extra at-risk system (Walker, & Salt, 2012). The present food systems could be interfered with because of numerous elements: urbanization, populace aging, occasional shocks such as recessions, natural catastrophes because of environmental modification, and sudden reactions to extreme events (Tendall et al., 2015).

Therefore, food systems must be a lot more durable to adapt to severe scenarios such as the one we are living in today (European Commission, 2018), and also system weak points, canal, susceptibilities, and also essential solutions should be well-refined (Organization for Economic Co-Operation and Development, 2020).

Resistant food systems could add to food security and, eventually, to lasting food systems (Naylor, 2009), as those are complementary ideas (Maleksaeidi & Karami, 2013). Specifically, sustainability worries about the ability to accomplish today's goals without endangering the future capability to accomplish them, and resilience is the vibrant capacity to proceed to achieve goals regardless of shocks and disturbances (United Nations, 1987; Brown et al., 1987). Thus, the food systems could be lasting when their elements are adaptable sufficient to soak up shocks and mitigate problems resulting from adjustments in their all-natural conditions (Maleksaeidi, & Karami, 2013; Cutter et al., 2008; Milman & Short, 2008).

In facility systems, abrupt changes might surprise us, but operating at the crossroads of these arising fields uses new strategies to expect crucial transitions (Scheffer et al., 2012). In the situation of the COVID-19 Pandemic, food safety is affected (World Food Programme, 2020), showing that our food systems are not resistant sufficient to adjust to severe modifications such as recessions (Galanakis, 2020) as well as environmental change (Food and Agriculture Organization, 2008). Although different, the pandemic and climate danger share usual characteristics as both of them represent physical shocks, systemic, non-stationary, and regressive changes. As a result, the existing Pandemic offers us a preview of future challenges to provide and demand disruption of food supply chains and boosting systems due to climate change. In addition, the measures taken for each might result in an increased understanding of the other one. For example, climate-resilient facilities could raise financial and environmental resiliency (Pinner et al., 2020).

This Pandemic and the occurring interruptions offer a distinct chance to read more regarding the fragility and crucial points of the system to boost readiness for future disturbances (Petetin, 2020). Also, it has developed opportunities for development (Khan, 2020), e.g., the need for social distancing; remote work, as well as enhanced distribution systems, bringing about the growth of mobile applications and net and interaction technologies that can additionally be applied when it comes to food loss and also waste (Galanakis, 2020). The conversion of farms to carbon and chemical-free farming might add to a more durable metropolitan food system (Pulighe & Lupia, 2020). Nevertheless, this will certainly not resolve food insecurity and diet-related troubles. Similarly, there is a requirement for boosted policy intervention concerning nutritional patterns, e.g., a lot more laws on the active ingredients in fast food and actions to make fresh food a lot more easily accessible and affordable (Fritsche et al., 2021). Within the international food syndetic, there are opportunities to create healthy and balanced eating patterns for consumers' wellness based on items that deal with food insecurity, poor nutrition, and weight problems.

Huff et al., 2015 forecasted the Pandemic's effect on the U.S. food system, revealing that a solemn occasion leading to a more than 25% decrease in labor availability might lead to multiple food scarcities. As a result, it is essential to restrict the interruption of vital infrastructures during a pandemic or a climate situation to preserve an ample movement of food and water products that are vital for the survival and health of the culture. Development can be achieved by accelerating

financial investments in information systems to enhance consumer self-confidence in supplies throughout disruptions (Organization for Economic Co-Operation and Development, 2020). The preparation of food systems against possible hazards is likewise essential (International Political Economy Society, 2020). Reduction measures such as boosted biosecurity plan to manage hygienic and phytosanitary threats should be considered (Organization for Economic Co-Operation and Development, 2020). Furthermore, system modifications should shift from a maximized shorter-term performance design to a strategy that makes certain just as longer-term resiliency (Pinner et al., 2020; Food, 2020). The COVID-19 Pandemic has shown the importance of a resilient agro-food system. The farming and food systems cannot be resilient if they are not lasting. For that reason, it is essential to transform food systems using new modern technologies and clinical explorations, incorporated with raising public awareness and the need for sustainable food (Barcaccia et al., 2020).

## **7. Improvement of the Food Industry**

Food safety depends not just on food availability but also food access and usage. According to Rasul (2021), the unmatched challenge modeled by the COVID-19 necessitates very pressing and pivotal actions to guarantee food and nutrition safety and save grassroots lives and livelihoods. Subsequently, considerable enhancements in the worldwide food system and forest/land governance are called for (Fritsche et al., 2021). The 47th Session of the U.N. Committee on Globe Food Safety suggested joint action toward a detailed makeover of global agro-food systems to make them a lot more comprehensive, resistant, and sustainable (Food and Agriculture Organization 2020). The foundations of the change are advancement (Herrero et al., 2020) and also efficiency (DeBoe, 2020), along with how the biomass for food as well as feed is produced, refined as well as eaten (Galanakis, 2020). During the change, it is necessary to embrace an incorporated technique that includes decreasing food waste and valorization (Galanakis, 2020; Galanakis, 2012) and a shift to a climate-neutral economic situation (European Commission, 2019). This strategy would give a brand-new point of view for farmers and backwoods, reducing greenhouse gas (GHG) discharges, improving carbon, nitrogen, phosphorous circularity, and total land-use performance (Fritsche et al., 2021).

Among the immediate challenges for the food industry in the post-COVID period is the advancement of competitive, lasting, and inexpensive items that promote and also boost health and wellness. Scientists are not only seeking food bioactive substances (Galanakis et al., 2020) but likewise recuperating these compounds from food handling by-products to replace artificial additives with natural active ingredients that possess wellness benefits (Galanakis et al., 2018; Galanakis, 2018; Ananey-Obiri et al., 2018; Wong et al., 2015; Rahmanian et al., 2014; Galanakis, 2013). Extra energy-efficient as well as sustainable processing technologies; are required to support these initiatives (Galanakis, 2021; Sarfarazi et al., 2020; Bursa'cKova'cevi'cet al., 2018; Barba et al., 2015; Deng et al., 2015; Deng et al., 2015; Roselló-Soto et al., 2015; Zinoviadou et al., 2015). Phenotyping and genetics editing and enhancement have likewise resulted in brand-new chances. Advances in precision fermentation, synthetic biology, and microbiology will quickly result in food created in laboratories, e.g., lab-grown meat and novel alternative healthy protein sources (Fritsche et al., 2021). Consumers, federal governments, and firms will also play an essential duty in the

transformation by aiding in altering dietary behaviors to include much healthier selections such as plant-based foods and much less meat. The most recent would eliminate food overconsumption, end lack of nutrition, and ultimately enhance wellness (Ibrahim, 2020; International Institute for Applied Systems Analysis, 2019). Additionally, there is a demand to create bioanalytical tools to ensure food and ecological safety throughout this change (Rizou et al., 2020).

The transformative food industry needs various plans that reassess the elements of our food systems and assist in the relations between them. Taking the E.U. as an instance, the Biodiversity Strategy (European Commission, 2020), as well as the E.U. Ranch to Fork (European Commission, 2020) strategies, has highlighted the change in the food system by decreasing making use of fertilizers as well as chemicals and also promoting carbon neutrality, as well as the increase in organic farming and also secured agricultural areas. Additionally, numerous changes need to take place at the same time at the social level. For instance, investing extra in neighborhood food should be a top priority to reduce the urban-rural gap considering potential energy cost savings from the transportation expense (Fritsche et al., 2021). Furthermore, customer confidence in the security of the agro-food system should be thought about by enhancing government communication techniques (Organization for Economic Co-Operation and Development, 2020).

The agricultural self-sufficiency of individuals, cities, and countries should also increase, whereas farming and aquaculture need to be durable versus market failure and climate change. In such a system, healthy and balanced cultures will undoubtedly expand, and also this system could be accomplished by human-centered and nature-based design (Khan, 2020). Emergency capital and financial procedures for the food supply chain are required to sustain the demands of farmers, fishers, and agro-food organizations (Rowan & Galanakis, 2020). For example, federal governments need to think about crowdfunding for regional bio-economic financial investments as part of their regional growth funds and recovery plans. Lastly, the execution of modern technology disturbances is necessary to change the food field in the brand-new period. Sector 4.0 applications, blockchain in the food supply chain, Web, and Communication Technologies are the technologies with the highest capacity in the brand-new age. There is also a just as pushing requirement to exploit social marketing to recognize consumers' mindsets to adapt to new standards forged by the COVID-19 Pandemic, where there is a considerable gap in understanding for choice-making (Galanakis et al., 2021).

## **8. Conclusion**

The COVID-19 Pandemic ushered in a new era in the food supply chain as we are still trying to figure out the consequences on humanity, the economy, food safety, and food security (Galanakis, 2020). From panic buying, food shortages, and price spikes to other social and economic impacts and food loss and waste issues, this crisis has shown that our food systems in Bangladesh and the world are fragile and need to be redesigned to increase food security. Improving food systems to make them more sustainable and resilient should be an urgent priority. Over the following decades, both the global population and urbanization will grow, pandemics will occur more often, and climate change will intensify. As a result, our societies' transitions towards sustainable development and a climate-neutral economy must be based on resilient food systems. Such systems should include contingency plans and mitigation strategies based on innovations, productivity issues, and

consumption patterns that would allow rapid response and adaptation to extreme events and ensure those inevitable crises will minimally affect the food chain and our most vulnerable populations.

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