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ORIGINAL PAPER

COVID-19 AND THE FOOD CHAIN? IMPACTS AND FUTURE RESEARCH TRENDS

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ABSTRACT. **Background:** Throughout history, the world has witnessed natural disasters affecting businesses and societies with varying degrees of disruption. COVID-19 (henceforth C19) constituted a significant system shock and a stark reminder of the fragility and sensitive nature of supply chains. The pandemic has exerted considerable societal and economic pressure and has had an adverse impact on food supply chains in particular. Many food processing operations were forced to alter activities or close temporarily due to outbreaks. Societal lockdowns, travel restrictions, business closures and quarantine have led to structural changes in the productivity of economies and impacted the mental health and financial wellbeing of citizens.

Methods: We present a critical review of the literature to explore the impact of C19 on the food supply chain. We collected data from journal articles retrieved from a leading scientific database (i.e., Scopus), books, chapters, conference proceedings, reports, and a variety of Internet websites. For the literature search, we used the following words; "COVID-19" and "food".

Results and conclusions: The findings of the review suggest that the C19 pandemic poses unprecedented challenges for food supply chains. We reveal that C19 has raised food insecurity and food safety concerns, increased supply chain and logistics costs and radically changed consumer behavior. On the positive side, the pandemic has improved awareness of food waste and the importance of self-grown foods. We generated nine research propositions to foster future academic research. Our study also highlighted the need to advance this literature and calls for increased attention from the supply chain management and logistics community to further analyse and quantify the impact of C19 on the food chain.

Keywords: COVID-19, food supply chain, food insecurity, food safety, consumer behavior, food waste.

INTRODUCTION

Supply chains have witnessed a series of natural disasters creating system shocks for businesses and societies worldwide. These shocks have included the nuclear disasters in Chernobyl Russia and Fukushima Japan, Hurricane Katrina in the USA and the volcanic eruption in Iceland that grounded air traffic and impacted supply chains. Compounding the above disasters are increasing incidents and frequency of zoonotic diseases such as SARS, H1N1, MERS, Ebola and the SARS-Cov-2 (COVID-19 pandemic) [Foust et al., 2020]. In less than three months after reporting the first confirmed case in Wuhan, China, SARS-Cov-2 (C19) was declared as a global pandemic on March 11th, 2020, and by June 30th, 2020, more than ten million people were infected, and five hundred thousand died [WHO, 2020]. As C19 is a new or novel disease, no vaccines or effective treatments are available, and most countries have imposed severe lockdowns measures to prevent the spread of the virus and protect their health systems from overloading. Outside of the well-known and effective term “flattening the curve” aimed at limiting the stress on the healthcare systems capacity, the lockdown strategies aimed to stop the disease spread apply various interventions such as social or physical distancing, shelter-in-place,

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wearing of facial masks, personal hygiene and the suspension of all non-essential business, social and travel activities [CDC, 2020].

The C19 pandemic is considered a potent reminder of the fragile and sensitive nature of global supply chain networks and highlights the risks and reality of the cascading consequences of multiple system failures [Keogh, Unis, 2020]. C19 has disrupted food access and impacted food security, generating severe individual and public health outcomes [Niles et al., 2020]. For example, Deaton and Deaton [2020] note that C19 has posed significant threats to Canadian food security, stretching the capacity of the food supply chain to ensure adequate food availability. Keogh [2020] notes the importance of effective signalling to address the information asymmetry between health experts, government officials and citizen-consumers. Hossain [2020] argues that the C19 pandemic may cause economic hardship and food security issues in Pakistan, with a greater risk of a global economic recession. Therefore, C19 represents a global crisis that has dramatically disrupted the functioning of societies. It has resulted in widespread human and economic losses that can exceed the capacity of the affected nations to respond. It may take sectors of the economy many years to recover, and many businesses will not survive.

The C19 pandemic has exerted significant pressure on food supply chains. This health crisis has also affected processes that extend from farm production to consumers [Poudel et al., 2020]. From the consumer perspective, the response to C19 has created an 'income shock' that is expected to exacerbate household food insecurity [Deaton, Deaton, 2020]. Likewise, the limit of social movement, containment, and quarantines have impacted on the mental health and wellbeing of citizens. Because of the reduced number of grocery shop trips, consumers have dramatically changed their food purchasing habits and revisited their food storage and sourcing options [Schmidt et al., 2020]. To mitigate against uncertainties, Schmidt et al. [2020] point out that the C19 pandemic has encouraged consumers to store (and potentially hoard) essential food items. Given that food supply chains are driven by consumer demand, when consumers change behaviours and preferences, they exert a significant impact on the entire food supply chain. Moreover, the initial shock on food supply chain operations has been captured through the adverse effects that the pandemic has on the food supply due to workers' infections, morbidity, soaring unemployment levels, and social/physical distancing practices [Espitia et al., 2020]. Apart from engendering a significant decline in the international trade flows, the pandemic has led to the supply and demand imbalances, creating conditions for food insecurity. The pandemic illustrates the need for rethinking the existing food system resilience as outlined by Keogh and Unis [2020]. They argue that the food industry must adopt a systems thinking approach to better understand the cascading consequences of system failures within and outside of the food system itself. For example, the pandemic urged academics and practitioners to question the effectiveness of the Just-in-Time (JIT) strategies in the food ecosystem as their underlying logistics structure cannot respond to supply chain disruptions and turbulences [Petetin, 2020]. As the pandemic continues to spread and interrupt healthy economic life around the globe, the shortage of local and temporary foreign workers for farms exacerbates food insecurity risks. Moreover, labour shortages in transportation, logistics, food processing, and food supply chain activities constitutes a pressing challenge to overcome. The unprecedented shutdowns of borders and airlines have impacted the movement and increased the costs of food exports. Moreover, from an existential perspective, food processing firms were forced to switch their supply efforts from foodservice to retail channels [Hailu, 2020] and direct to consumers. There is strong evidence that the mitigation strategies taken during the pandemic have complicated food distribution processes and intensified food crises in developing countries [Burki, 2020]. Poorer nations lag far behind developed economies in their ability to respond to the pandemic because of poor infrastructure, poverty, and siloed healthcare systems, which cannot support an integrated pandemic response [Austin et al., 2016]. Another adverse effect of the pandemic on the food supply chain lies in the vulnerability of import-dependent countries. In this context, Espitia et al. [2020]

note that import-dependent economies such as Botswana, Mexico and Jamaica would be extremely vulnerable to supply shocks in essential food products such as cereals, meat, and fresh fruits. Therefore, food industry actors should develop well-designed food supply networks as the pandemic persists because resilient supply chains are vital to prevent food shortages and rapid upswings in prices. The pandemic is a critical situation that necessitates immediate, coordinated responses, and proactive food supply networks that can ensure access to adequate agricultural inputs, supplies, and food. The purpose of this paper is to review the impact of C19 on food supply chains. While the pandemic has triggered abundant research quickly [Ivanov, 2020, Ivanov, Dolgui, 2020, Pierre, Simchi-Levi, 2020], studies reviewing the implications of C19 on food supply chains are a patchwork of insights. To close this research gap, we review the current scientific literature on the nexus of C19 and the food chain. More specifically, we attempt to examine the impact of C19 on the food industry and how the present crisis reshapes the operations of food businesses. We aim to offer a robust research agenda by providing various research propositions for fostering future academic endeavours and providing food practitioners and decision-makers with reliable insights for the development of resilient food chains in the future. In this study, we take the lead of research by trying to answer the following research questions:

- How does COVID-19 impact food supply chains?
- What are the future research questions framing food supply chains during COVID-19?

The contributions of the study are the following. First, our research systematises the growing knowledge related to C19 from the food supply chain perspective and provides a timely review. Second, we shed light on the main challenges posed by C19, which hamper the effective operation of food chains. Third, we identify various research propositions (RPs) to be explored in the near future.

In terms of organization, the next section highlights the methodology used in the study. Section 3 provides detailed answers to the research questions raised in this study. The last section concludes the paper and underscores other vital considerations.

DESIGN/ METHODOLOGY/ APPROACH

We performed a literature review and searched for journal articles, books, chapters, conference proceedings, and technical reports that contained the words "COVID-19" and "food*" in their titles, abstracts, or keywords. These resources were selected for conducting our study. Our review of the extant literature primarily focused on identifying the impact of C19 on the food supply chain. For the moment, the topic is still in a nascent stage, thus ruling out the chance for conducting a systematic literature review. Instead, we employed a critical literature review because it is more likely to provide insights into the current state of knowledge and the major questions being investigated so that gaps related to existing knowledge can be recognized with confidence [Carnwell, Daly, 2001]. During the search, priorities were given to all resources studying this topic from a management science and business perspective. Papers were also selected from the Scopus database and a variety of Internet websites, including Google Scholar, and ResearchGate through May 2020. The outcome of the review is a summary of discussions that captured the dynamics of food supply chains amid the pandemic.

REVIEW DISCUSSION

Food insecurity

C19 has heightened global awareness of the zoonotic risks posed by economic development. As there are no vaccines to protect against the virus, protective measures through personal protective equipment (PPE), together with physical distancing and personal hygiene, are being taken to stop the spread of the disease [Bhatta, 2020]. Besides affecting the global population and the functioning of economic activities, C19 has revealed that food systems are less equipped to deal with the unprecedented shock and disruption [FAO, CEPAL, 2020]. For food supply chains, this health crisis has posed unpredictable and severe risks to the continuity of food businesses. For instance, Goddard [2020] argues that food retail and foodservice sectors have encountered some of the most significant impacts of C19. The author further notes that the effects of C19 range from unemployment, higher transaction costs, to radical changes in consumer behaviour. More alarming, perhaps, is the very close link of food insecurity with national and household economic conditions. In this context, Niles et al. [2020] highlight that the pandemic has substantially increased unemployment, created an inability to afford food and affected all dimensions of food security. It is expected that there will be a higher prevalence of moderate to severe food-insecure households due to the lack of employment and loss of income [Deaton, Deaton, 2020]. The escalation of the pandemic and precautionary interventions taken by governments has led to the lowering of business and personal incomes, significant demand drops across certain commodities, and temporary or permanent closures of businesses [Hossain, 2020]. In the long-run, food supply chains could observe a reduction in particular agricultural products, especially for labour-intensive agriculture such as flowers and vegetables [Forsido et al., 2020]. Forsido et al. [2020] argue that the extended drop in demand for some foods such as dairy products and fresh fish might halt food chains and eventually lead to the collapse of businesses, worsen unemployment due to labour layoff, cause economic crises, and intensify food and nutrition insecurity gaps. The lack of income and the increase in unemployment have adverse demand-side effects. As such, many food supply chain actors would be unable to withstand the continuous business pressures, resulting in market withdrawals, jobless growth, income losses, and social unrest due to the inability to secure food supplies. Given the increasing intensity of C19 and its threat to food security, we suggest the following research propositions.

RP-1: The C19 pandemic hampers the efforts, policies, and strategies of food supply chains to ensure food security and economic empowerment of small farmers and rural economies.

RP-2: The spread of the virus constitutes a threat to food supply chains because it limits consumers' access to nutritious foods in several ways.

Supply chain and logistics costs

With rising unemployment and a massive slowdown in the global economy, traditional food supply chains have faced several challenges to operate on a worldwide basis and ensure highly coordinated flows of food products within and across national borders. According to Torry [2020], the C19 pandemic has deepened the digital divide, amplifying gains for businesses that cater to customers online, while companies with traditional retail distribution models have struggled to survive. Realizing the real dangers posed by C19 toward national development, several countries have mobilized resources to fight against the spread of the virus, implementing several interventions such as the suspension of public transportation, closure of airports, railway stations, and highways. While these measures are necessary to prevent further disease transmission, they have adverse implications on food supply chain distribution and overall transaction costs.

The pandemic impacts food accessibility due to its detrimental effects on infrastructure, including logistics, and distribution. Accessibility is compounded by shortages of certain products and price increase in others [Niles et al., 2020]. The restrictions imposed on food logistics are likely to increase transaction costs and, thus, food prices. The ability to supply food more quickly and at reasonable costs is a challenging task during the pandemic [Amanta, Aprilianti, 2020]. Larue [2020] suggests that C19 may cause an increase in the cost of farm labour, with wages amounting up to 80% of the cost of producing many fruits and vegetables. In the livestock sector, Zhang et al. [2020] indicate that the pandemic may generate difficulties in accessing animal feed and satisfying labour demand needs. The closure of borders presents a significant physical barrier for food access [Niles et al., 2020] and international transport

[Hossain, 2020]. As a result, countries that are heavily dependent on a variety of food items in both raw and processed forms will suffer economically as food suppliers deal with the uncontrollable external events caused by the pandemic [Hossain, 2020]. Specific perils could be noticed from this pandemic, such as the rising costs of transportation that are brought about by the rescheduling of orders, extension of transport times, and the additional prevention and control measures. As an illustration, food supply chain actors are compelled to adhere to the C19 disaster regulations and incur extra costs on transportation (i.e., to comply with the new transport regulations), social/physical distancing practices, and personal protection equipment (PPE) like facial masks and hand sanitizers. The difficulties faced by food businesses to adjust to the new normal require the orchestration of food processes and the commitment of additional resources in terms of time and costs, thus paving the way for operational inefficiencies [Petetin, 2020]. For example, several small meat plants have been working overtime in the United States as a result of the temporary closure of large plants due to infection outbreaks among staff. In such a scenario, these small food businesses are required to pay extra costs because the USA's Food Safety and Inspection Services charge overtime fees for food inspectors [Shearer, 2020]. Therefore, we propose:

RP-3: The C19 pandemic increases the costs of food preparation, processing, transportation, inspection, and distribution.

Changes in consumer behaviour

While the pandemic is unfolding, a long-term change may emerge in the way consumers purchase food products [Richards, Rickard, 2020]. Several recent studies have emphasized that consumers have changed their food purchasing habits in response to the pandemic [Kolodinsky et al., 2020, Schmidt et al., 2020, Worstell, 2020]. At first, the uncertainty and fear of food supply disruption have prompted panic buying and hoarding behaviour. Consumers have become increasingly interested in storing essential food products such as canned foods as well as frozen or dried foods [Schmidt et al., 2020]. In times of crisis, consumers may hold the belief that prices will increase, or that supply shortage will occur. As a result, panic-buying has prevailed during the early stages of the pandemic, and consumers emptied supermarket shelves of foods, personal hygiene products (e.g., soaps, hand sanitizers, toilet paper) and household cleaning products (e.g., anti-bacterial cleaning liquids, sprays and wipes). Supermarket shelves in Germany have been emptied by consumers even though Germany's flour association declared they had sufficient raw materials, and flour producers were working overtime to meet the peak demand [CBI, 2020]. In the United States, American consumers have raised concerns over the fragility of food supply chains and the depletion of specific stocks in supermarkets and grocery retail stores [Dickinson, 2020]. The risk of food insecurity and hunger has haunted several nations where infection preventative measures led to hoarding and resulted in food shortages in urban areas where vegetables such as cauliflower and green onions could not be shipped out [Galanakis, 2020]. These examples suggest dramatic changes are occurring in consumer buying behaviour and habits. Moreover, the lockdown conditions and social/physical distancing measures have continued to affect consumer purchase behaviour [Cranfield, 2020] in the sense that consumers have moved to online grocery shopping. There is a significant increase in online purchases made by infection-vulnerable retirees and households that have no previous experience in purchasing foods online [Charlebois, 2020]. The declaration of national emergencies across many countries has triggered a broader societal shift toward online grocery shopping. In their study, Jribi et al. [2020] highlight that online grocery shopping can offer attractive opportunities for consumers, including time savings, convenience, home deliveries, and eliminates the risk associated with the need for social/physical distancing in stores. However, the authors note that some consumers, including Tunisians, are still reluctant to engage in e-commerce because of a certain degree of mistrust of online purchases. In a similar vein, Richards and Rickard [2020] maintain that the long-term impact of C19 on the sale of fruits and vegetables (both fresh and processed) will depend significantly on consumer satisfaction with the engagement in online shopping experiences. There is growing evidence that online grocery shopping is increasingly accepted by consumers due to its convenience, availability of information, increased selection, and the lack of physical contact and reduced risk of infection. Evidence also shows that consumers tend to make healthier purchases when groceries are ordered using automated online shopping lists, thereby avoiding impulsive purchases [Pozzi, 2012]. Therefore, this element of the food distribution system is expected to receive a sustained upward shift in the adoption of online food ordering and delivery. Hence, the following research propositions emerge:

RP-4: The C19 pandemic significantly changes the flow of traditional consumption patterns for foods.

RP-5: The C19 pandemic contributes to the proliferation of online food marketplaces.

Food waste and self-grown food

As food waste is partially attributed to consumer behaviour, the pandemic has raised consumer awareness. On this point, Jribi et al. [2020] find that a vast majority (89%) of respondents claimed to be more aware of food waste during the pandemic. Food waste represents a growing global issue that threatens food security and environmental sustainability. Consumers need to further develop their awareness, skills and tools to address their food-related activities and habits [Jribi et al., 2020]. For example, Hobbs [2020] opined that the pandemic would intensify consumer interest in locally sourced foods, thus empowering local farmers. However, the widespread personal income losses due to the pandemic have the potential to shape consumer preferences and consumption decisions. Consumers seeking to protect themselves and boost their immune systems have become more committed to healthy and organic foods. More specifically, the perceived risk to human health during the C19 pandemic might be an impetus for consumers to adopt healthier diets and search for bioactive ingredients in food products. C19 acts as a strong motivation for certain consumers segments to reconsider their food provisioning practices and eating habits. However, lost income, employment uncertainty and rising costs serve to weaken consumer purchasing power. In turn, this undermines their ability to afford more nutritious or healthier choices, such as less processed foods and more natural or organic foods. As per a report by the World Economic Forum, urban farming is thriving during the pandemic as people with more free time have created home garden setups and use tools like indoor grow lights and outdoor planters to support their consumption with home-grown food [GritDaily, 2020]. Therefore, we suggest the following research propositions:

RP-6: The C19 pandemic raises awareness of food waste.

RP-7: The C19 pandemic constitutes a growth opportunity for self-grown foods.

Food safety

Food safety represents a critical public concern, and outbreaks of food-borne illnesses can be significant [Feng, Sun, 2012]. As food is a basic necessity for existence, the food industry must continue to operate at high standards during the pandemic. Despite efforts to ensure strict food control measures, the pandemic has revealed lapses in the existing food systems and exposed the risks facing the production and delivery of safe food products to consumers [Jawed et al., 2020]. Jawed et al. [2020] contend that unlike other industries, employees working in the food industry are not able to work from home owing to the very nature of the work and the need for physical presence. As a consequence, disease transmission is still possible through poor PPE or health and safety practices in food processing plants. Moreover, although scientifically contentious, if an infected worker touches a surface, tool or food product, and shortly afterward another worker comes in contact and touches his/her eyes or mucous membranes of the mouth, nose or throat, there may be an increased risk of infection [Galanakis, 2020]. Although scientific evidence is nascent and inconclusive, additional concerns arise because of the unknown risk of cross-contamination at different stages of the supply chain, and potential disruption of the safe supply of food.

The discontinuous supply of raw materials necessary for the production of food could pose significant food safety risks, especially for perishable foods and vegetables. Moreover, the pandemic has generated other sources of concerns that are associated with inadequate handwashing, packaging, and other food-handling practices. Inadequate personal hygiene and inappropriate use of PPE (e.g., a mask cover the mouth but not the nose) may increase the risk that respiratory droplets adhere to food packaging materials [Shahidi, 2020], thus exposing consumers to potential risk. Importantly, there is currently no evidence that consumers can be infected by eating food, and no recorded cases of infection through food packaging. Nevertheless, as of late June 2020, despite the lack of scientific evidence, China is demanding that all foreign food shipments carry a guarantee that the food and food containers have been tested for the presence of the virus before shipping to China [Patron, 2020].

Another critical supply chain activity that has been hindered by the pandemic is food audits. The travel restrictions and lockdown procedures following the pandemic have hampered the ability of food certification bodies to carry out onsite regulatory audits and issue certifications to food supply chain actors. Auditors have been unable to travel, perform onsite audits, confirm compliance, and ensure the consistency of food safety systems [Shahbaz et al., 2020]. Although some solutions could be implemented to augment the process and conduct food safety audits using remote auditing tools such as CCTV cameras, smart glasses, wearable and handheld devices, many food companies and supply chain partners still lack the technical expertise, infrastructure and insights to safely and efficiently perform remote audits. Therefore, the pandemic has exposed new challenges for the monitoring of food safety and the delivery of safe food products to consumers. The absence of effective food auditing measures could amplify consumer anxiety and increase the vulnerability to food-borne illnesses and increase the risk of food fraud. Reflecting these discussions, we present the following research propositions, intended to encourage future research:

RP-8: The C19 pandemic poses significant food safety risks in the food chain.

RP-9: The C19 pandemic changes the way food safety is monitored and gives rise to remote inspections and other technological solutions for food audits.

CONCLUDING REMARKS

The pandemic poses significant threats to food supply chains around the world. In this paper, we presented a critical literature analysis of the impacts of C19 on food supply chains and extracted nine (9) research propositions to foster future academic investigations. In reviewing publications on the interplay between the pandemic and the food supply chain, we found that the impacts of the C19 pandemic are mainly focused on food insecurity, food supply chain and logistics costs, consumer behaviour, food waste and self-grown food, and food safety. Inevitably, the pandemic will have long-lasting and potentially devastating effects on food supply chains. In tapping into this research area, we aspire to provide insights and inspiration for academics and practitioners to explore the impacts of this pandemic on food chains. To the authors 'best knowledge, this is the first attempt to systematize the scant and rapidly evolving literature on the impact of C19 on the food chain. The results of our review offer valuable contributions to supply chain management and logistics functions. However, it should be noted that the paper has several limitations. Unlike systematic literature reviews, critical literature reviews do not aim to aggregate all existing literature but rather to extract valuable insights and advance the conceptual development of the topic under study. Moreover, the query used to search for resources and articles could be a barrier to investigate other food supply chain-related themes. To overcome these issues, future studies can use a systematic review method and build on this research to generate additional insights and outcomes. We acknowledge that the C19 impacts on food supply chains are not yet possible to quantify as the pandemic is still ongoing. Taking into account this limitation, future researchers may be interested in adopting empirical methods to analyze the ripple effects that C19 has on the food industry and the potential for food fraud.

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REFERENCES

Amanta F., Aprilianti I. 2020, April 30. [Policy Brief] Indonesian Food Trade Policy during Covid-19. CIPS. https://www.cips-indonesia.org/post/policy-brief-indonesian-food-trade-policy-during-covid-19

Austin K.F., DeScisciolo C., Samuelsen L., 2016. The Failures of Privatization: A Comparative Investigation of Tuberculosis Rates and the Structure of Healthcare in Less-Developed Nations, 1995–2010. World Development, 78, 450–460. http://doi.org/10.1016/j.worlddev.2015.10.027

Bhatta A., 2020. Choice of Food: A Preventive Measure during Covid-19 Outbreak. Europasian Journal of Medical Sciences, 2(1), Article 1. http://doi.org/10.46405/ejms.v2i1.49

Burki T., 2020. COVID-19 in Latin America. The Lancet Infectious Diseases, 20(5), 547–548. http://doi.org/10.1016/S1473-3099(20)30303-0

CBI, 2020. COVID-19 disrupts supply chains for grains, pulses and oilseeds | CBI – Centre for the Promotion of Imports from developing countries. https://www.cbi.eu/news/covid-19-disrupts-supply-chains-grains-pulses-oilseeds/

CDC, 2020, February 11. Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention. https://www.cdc.gov/coronavirus/2019-ncov/index.html

Charlebois S., 2020. Why COVID-19 Will Change Canadian Grocery Industry Forever: Expert. RETAIL INSIDER. https://www.retail-insider.com/retail-insider/2020/3/why-covid-19-will-change-the-food-industry-forever

Cranfield J.A.L., 2020. Framing consumer food demand responses in a viral pandemic. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie. http://doi.org/10.1111/cjag.12246

Deaton B.J., Deaton B.J., 2020. Food security and Canada's agricultural system challenged by COVID-19. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie. http://doi.org/10.1111/cjag.12227

Dickinson M., 2020. Food frights: COVID-19 and the specter of hunger. Agriculture and Human Values. http://doi.org/10.1007/s10460-020-10063-3

Espitia A., Rocha N., Ruta M., 2020. Covid-19 and Food Protectionism: The Impact of the Pandemic and Export Restrictions on World Food Markets (SSRN Scholarly Paper ID 3605887). Social Science Research Network. https://papers.ssrn.com/abstract=3605887

FAO, CEPAL, N., 2020. Analysis and responses of Latin America and the Caribbean to the effects of COVID-19 on food systems, 2. https://repositorio.cepal.org//handle/11362/45526

Feng Y.-Z., Sun D.-W., 2012. Application of Hyperspectral Imaging in Food Safety Inspection and Control: A Review. Critical Reviews in Food Science and Nutrition, 52(11), 1039–1058. http://doi.org/10.1080/10408398.2011.651542

Foust A.M., Winant A.J., Chu W.C., Das K.M., Phillips G.S., Lee E.Y., 2020. Pediatric SARS, H1N1, MERS, EVALI, and Now Coronavirus Disease (COVID-19) Pneumonia: What Radiologists Need to

Know. American Journal of Roentgenology, 1–9. http://doi.org/10.2214/AJR.20.23267

Galanakis C.M., 2020. The Food Systems in the Era of the Coronavirus (COVID-19) Pandemic Crisis. Foods, 9(4), 523. http://doi.org/10.3390/foods9040523

Goddard E., 2020. The impact of COVID-19 on food retail and food service in Canada: Preliminary assessment. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie. http://doi.org/10.1111/cjag.12243

GritDaily, 2020, April 19. 4 Ways Technology Is Helping the Food Supply Chain During COVID-19. Grit Daily News. https://gritdaily.com/4-ways-technology-is-helping-the-food-supply-chain-during-covid-19/

Hailu G., 2020. Economic thoughts on COVID-19 for Canadian food processors. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie. http://doi.org/10.1111/cjag.12241

Hobbs J.E., 2020. Food supply chains during the COVID-19 pandemic. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie. http://doi.org/10.1111/cjag.12237

Hossain S.T., 2020. Impacts of COVID-19 on the Agri-food Sector: Food Security Policies of Asian Productivity Organization Members. Journal of Agricultural Sciences – Sri Lanka, 15(2), 116–132. http://doi.org/10.4038/jas.v15i2.8794

Ivanov D., 2020. Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case. Transportation Research Part E: Logistics and Transportation Review, 136, 101922. http://doi.org/10.1016/j.tre.2020.101922

Ivanov D., Dolgui A., 2020. Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. A position paper motivated by COVID-19 outbreak. International Journal of Production Research, 58(10), 2904–2915. http://doi.org/10.1080/00207543.2020.1750727

Jawed I., Tareen F.R., Cauchan K., Nayeem M., 2020. Food safety and COVID-19: Limitations of HACCP and the way forward. The Pharma Innovation Journal, 9(5), 01–04.

Forsido S.F., Mitiku F., Lemessa F., Tolemariam T., Belew D., Berecha G., Garedew, W., Bekele Y., Geda F., Eneyew A., 2020. COVID-19 Probable Impacts on Ethiopian Agriculture and Potential Mitigation and Adaptation Measures: No Food-No Health-No Life. Jimma, Ethiopia: Jimma University.

Jribi S., Ben Ismail H., Doggui D., Debbabi H., 2020. COVID-19 virus outbreak lockdown: What impacts on household food wastage? Environment, Development and Sustainability, 1–17. http://doi.org/10.1007/s10668-020-00740-y

Keogh J.G., 2020. COVID-19: Regaining trust of citizen-consumers through effective signalling. https://www.foodincanada.com/food-in-canada/covid-19-regaining-trust-of-citizen-consumers-through-effective-signalling-144143/ (accessed on 7/8/2020)

Keogh J.G., Unis C.J., 2020, June 24. Rethinking Future Food Chains: Systems Thinking and the Cascading Consequences of System Failures. Food Safety Magazine. https://www.foodsafetymagazine.com/magazine-archive1/junejuly-2020/rethinking-future-food-chains-systems-thinking-and-the-cascading-consequences-of-system-failures/ (accessed on 7/8/2020)

Kolodinsky J., Sitaker M., Chase L., Smith D., Wang W., 2020. Food Systems Disruptions: Journal of Agriculture, Food Systems, and Community Development, 9(3), 5–8. http://doi.org/10.5304/jafscd.2020.093.013

Larue B., 2020. Framing consumer food demand responses in a viral pandemic. Journal of Agricultural Economics, 68(n/a). http://doi.org/10.1111/cjag.12246

Niles M.T., Bertmann F., Belarmino E.H., Wentworth T., Biehl E., Neff R.A., 2020. The Early Food Insecurity Impacts of COVID-19. MedRxiv, 2020.05.09.20096412.

http://doi.org/10.1101/2020.05.09.20096412

Patron D., 2020, June 19. Food exporters to China asked to declare produce is coronavirus-free. Reuters. https://www.reuters.com/article/us-health-coronavirus-china-food-idUSKBN23Q1SB

Petetin L., 2020. The COVID-19 Crisis: An Opportunity to Integrate Food Democracy into Post-Pandemic Food Systems. European Journal of Risk Regulation, 11(2), 326–336. http://doi.org/10.1017/err.2020.40

Pierre H., Simchi-Levi D., 2020. How coronavirus could impact the global supply chain by mid-March. Harvard Business Review, 28.

Poudel B.P., Poudel M.R., Gautam A., Phuyal S., Tiwari G.K., Bashyal N., Bashyal S., 2020. COVID-19 and its Global Impact on Food and Agriculture. Journal of Biology and Today's World, 9(5), 221.

Pozzi A., 2012. Shopping Cost and Brand Exploration in Online Grocery. American Economic Journal: Microeconomics, 4(3), 96–120. https://doi.org/10.1257/mic.4.3.96

Richards T.J., Rickard B., 2020. COVID-19 impact on fruit and vegetable markets. Canadian Journal of Agricultural Economics/Revue Canadienne d'agroeconomie, 1–19. https://doi.org/10.1111/cjag.12231

Schmidt C., Goetz S., Rocker S., Tian Z., 2020. Google searches reveal changing consumer food sourcing in the COVID-19 pandemic. Journal of Agriculture, Food Systems, and Community Development, 9(3), 1–8.

Shahbaz M., Bilal M., Akhlaq M., Moiz A., Zubair S., Iqbal H.M.N., 2020. Strategic Measures for Food Processing and Manufacturing Facilities to Combat Coronavirus Pandemic (COVID-19). Journal of Pure and Applied Microbiology, 14(2), 1–8.

Shahidi F., 2020. Does COVID-19 Affect Food Safety and Security? Journal of Food Bioactives, 9. https://doi.org/10.31665/JFB.2020.9212

Shearer S., 2020, May 29. Food supply protection legislation introduced. National Hog Farmer. https://www.nationalhogfarmer.com/business/food-supply-protection-legislation-introduced

Torry H., 2020, April 1. Coronavirus Pandemic Widens Divide Between Online, Traditional Businesses. Wall Street Journal. https://www.wsj.com/articles/coronavirus-pandemic-widens-divide-between-online-traditional-businesses-11585733402

WHO, 2020. Coronavirus disease (COVID-19) pandemic. https://www.who.int/emergencies/diseases/novel-coronavirus-2019

Worstell J., 2020. Ecological Resilience of Food Systems in Response to the COVID-19 Crisis. Journal of Agriculture, Food Systems, and Community Development, 9(3), 23–30. http://doi.org/10.5304/jafscd.2020.093.015

Zhang Y., Yang H., Cheng P., Luqman A., 2020. Predicting consumers' intention to consume poultry during an H7N9 emergency: An extension of the theory of planned behavior model. Human and Ecological Risk Assessment: An International Journal, 26(1), 190–211. http://doi.org/10.1080/10807039.2018.1503931

COVID-19 A ŁAŃCUCH DOSTAW ŻYWNOŚCI? ZALEŻNOŚCI I PRZYSZŁE TRENDY BADAŃ

STRESZCZENIE. Wstęp: W ujęciu historycznym, świat już nieraz doświadczał naturalnych katastrof, które miały wpływ w różnym nasileniu na biznes oraz społeczeństwo. COVID-19 (C19) spowodował istotny szok dla systemu oraz przypomniał o kruchości i wrażliwości łańcuchów dostaw żywności. Pandemia wywarła istotny wpływ w szczególności na tą część ogólnego łańcucha dostaw. Wiele przedsiębiorstw produkujących żywność musiało zmienił sposób swojej działalności lub czasowo ją przerwać. Lockdown, ograniczenia w podróżowaniu, zamknięcie części działalności

gospodarczej i kwarantanna doprowadziły do strukturalnych zmian w produktywności ekonomii i wpłynęły na zarówno psychiczne zdrowie jak i poziom zamożności obywateli.
Metody: W pracy zaprezentowany jest krytyczny przegląd literatury dotyczącej wpływu C19 na łańcuch dostaw żywności. Dane zostały zebrane na podstawie przeglądu artykułów prasowych z wiodących baz naukowych (np. Scopus), książek, rozdziałów, materiałów konferencyjnych, raportów oraz różnych stron internetowych. Przy wyszukiwaniu tych prac, słowami kluczowymi były słowa: „COVIS-19" oraz „żywność".
Wyniki i wnioski: Uzyskane wyniki badań sugerują, że pandemia C19 jest niespotykanym wyzwaniem dla łańcuchów dostaw żywności. C19 spowodował obniżenie bezpieczeństwa łańcucha dostaw żywności, zwiększył koszty logistyki i radykalnie zmienił upodobania konsumentów. Jak pozytywny efekt, pandemia zwiększyła świadomość marnotrawstwa żywności i istotność niezależności produkcji żywności. Zostały opracowane propozycje dalszych kierunków badań naukowych w tym obszarze. Pokreślono potrzebę tych badań oraz rozpracowanie wpływu C19 na łańcuch dostaw żywności w kontekście zarządzania łańcuchem dostaw.

Słowa kluczowe: COVID-19, łańcuch dostaw żywności, bezpieczeństwo dostaw żywności, bezpieczeństwo żywności, zachowanie konsumenckie, marnotrawstwo żywności

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