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Food Agriculture Supply Chains during a Pandemic

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ABSTRACTS

Nowdays COVID-19 (Coronavirus) pandemic has affected almost all countries and has made an effect on the global supply chain in general and food agricultural supply chain in specific. The effect of this pandemic can be cluster by time period as the initial blockade period and as the later period of the pandemic. This new condition made us to pay attention about what differences before, during, and after the pandemic that will occur. The aim of this research are to know not only during the pandemic, but also what may be happen after the pandemic, especially on food agriculture supply chain. In this research we use literature study method which there are 9 articles has been reviewed. We find out that this pandemic not to significantly affect the structure of food agricultural supply chain, but there is a possibility to shorten the food agricultural supply chain if needed.

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1. INTRODUCTION

The COVID-19 (Coronavirus) pandemic around late 2019 to the present has affected almost all countries and has made a significant effect on the global supply chain (Serpil Aday, Mehmet Seckin Aday,2020). The spread of the corona virus limits social activities, forcing public facilities such as schools, offices, restaurants to be closed (Zhao & Kim, 2021). The limitation of these activities aim to prevent the spread of corona virus, however it disrupts the food supply chain due to the suspension of transports and logistics channel. The impact of the spread of corona virus tends to be more severe for perishable products (Galanakis, 2020). The COVID-19 pandemic had an enormous impact on the agriculture supply chain in many countries such as India, Peru, United States, Canada, France, Germany,Italy, China, and many more. In the case of logistics in India, the inability to transport fruit tomarkets in the city makes farmers feed cows with strawberries. In Peru, due to the closureof restaurants and hotels, which used to be consumers, chocolate producers dumped tonsof white chocolate in landfills. Then in the United States and Canada, the same thing happened to Peru for the commodity of milk. Meanwhile, migrant workers from Eastern Europe and North Africa were trapped at the border so that they could not harvest agricultural products in France, Germany and Italy which resulted in rotting crops in the fields. Effective evaluation of the pandemic's influences on vegetable production is vital for policy settings to enhance the security of vegetable supply. Based on first-hand data from 526 households, founded the differences in different types of loss and potential factors affecting the severity farmer households suffered during the pandemic (Huang et al., 2021). From the supply side, seasonal labor migration was hindered that a large amount of vegetable cannot be picked up and distributed, but rot in the fields. The contracting source prices and purchasing was triggered by transport restrictions and further caused to the decrease farmer households' income (Nandi et al., 2021). Then the supply channels of seeds and other agricultural materials were also disrupted so as the farmer households have to spend more on production inputs (Zhang, Qing, & Yu, 2019). In addition the supply chain links producers and consumers and affects food availability in the market (Gray, 2020).

Two periods of the impact of pandemic to the vegetable industry: the initial blockade period and the later period of the pandemic. During the period of blockade and the self-isolation, the pandemic effected almost every stage of vegetable supply chain. In term of the production and supply, most of vegetable need to be supply by areas outside, which accounts approximately 60%, but for green leafy vegetables, approximately 80% of the consumption is supplied locally. However, the vegetables produced locally are also largely dependent on migrant farm workers. Because the pandemic broke out during the Chinese New Year, some workers had returned to their hometowns. Due to the blockade policy, these workers were either restricted from returning or they were temporarily unwilling to return. Therefore, there was a labor shortage for vegetable production at the beginning of the pandemic. The logistics of vegetables have also been affected. Although the governmentdid not restrict the transportation of agricultural products during the pandemic, the efficiency of vegetable logistics decreased due to the impact of inspections and the shortageof workers. Considering the wholesale and retail sale of vegetables, some vegetable brokers affected by the self-quarantine policy did not return to Shanghai in the early stage of the pandemic (Khan et al., 2020). Meanwhile, the decline at the demand for vegetables also led to a certain decline in the business of vegetable middlemen. However, for new business models, such as e-commerce, an opportunity for development emerged (Swinnen & Vos, 2021). On the demand side, in the first few days of the pandemic, there was a temporary increase in demand for vegetables due to public panic and the need to stock up during the Spring Festival, but then demand dropped.

Although agricultural products are a necessity of daily life, demand for vegetables has been greatly impacted by the shutdown of factories, the suspension of restaurants and the closing of schools. As a result, the pandemic reduced the demand for vegetables (Gu & Wang, 2020).

Industry 4.0 is known as the fourth industrial revolution, which has the potential to fulfil customized requirement during COVID-19 crisis (Asadollahi-Yazdi, E, et.all, 2020). This revolution has started with the applications of advance manufacturing and digital information technologies (Javaid et al., 2020). The diversified supply chain modes play important roles in stabilizing markets. Traditional channels such as wet market and the wholesale market will still be some of the vital channels for the distribution of agricultural products for a long time (Poapongsakorn et al., 2019). For example, with the participation of farmer households, agents, wholesale markets, wet markets, and retailers. Under such circumstances, the asymmetric information among participants might lead to a huge difference in prices between vegetable production and retail (Cao & Mohiuddin, 2019). The short supply chains make it possible to directly dock producers with retailers or consumers in the form of e-commerce, supermarket stores' online delivery services, community-supported agriculture (CSA), and any other types of modern marketing methods (Zhou et al., 2020). In this case, the development of short supply chain helps to expand sales channels of agricultural products especially that of fresh agricultural products, reduce the risks of poor sales, avoid long-distance logistics risks, and provide more conditions for certificated and high-quality agricultural products to gain premium prices (Zeng, Guo, Yao, & Huang, 2019).

2. METHODS

The research is applying the systematic literature review. This methodology aims to counteract bias by making explicit values and assumptions underpinning a review. This research examines 9 papers. The method starts by defining the keywords. The keywords used in this paper are; "food supply chain", "agriculture product", "pandemic", "Covid-19". The process then continued by drafting the protocol and training the team. The research also applies the practical screen which involves the researchers to determine what includes and excludes the research objectives. This step followed by extracting the data and synthesizing the studies to extract the applicable information from each study systematically. Finally, the process of reporting the sufficient details and reproducing the review's results.

3. RESULTS AND DISCUSSION

There have not been too many studies that discuss the supply chain of agriculturalproducts in the pandemic era because the pandemic has only occurred around late 2019 to the present. Researchers are still in the stage of observing, researching, and trying to find alternative solutions to new conditions that have drastically changed many societal structures and community habits that have an impact on various sectors, including the agricultural product supply chain sector. Based on several keywords "pandemic" and "Covid-19" in the agricultural product sector, there are at least 15 articles, the following results are obtained as presented in Table 1.

Table 1. Summary of Agricultural Product Supply Chain Articles in the Pandemic Phase

Keywords	**Related articles**
Covid 19 crisis	Gray, R. S. (2020); Barman, A., et al (2021); Zeng, Y., et al (2019);
Covid 19 pandemic	Gu, et al (2020); Hobbs, J.E., (2020); Javaid, M., et al. (2020); Mukhamedjanova, K., (2020); Zhang, X., et al (2019); Ivanov, D., (2020)

One of the earliest researches related to the impact of a pandemic was carried out by Ivanov, D. (2020) who construct pandemic crisis scenarios that impact demand disruption in the market and the opening of the closure of market facilities in China, Europe, North America and South America presented in Figure 1.

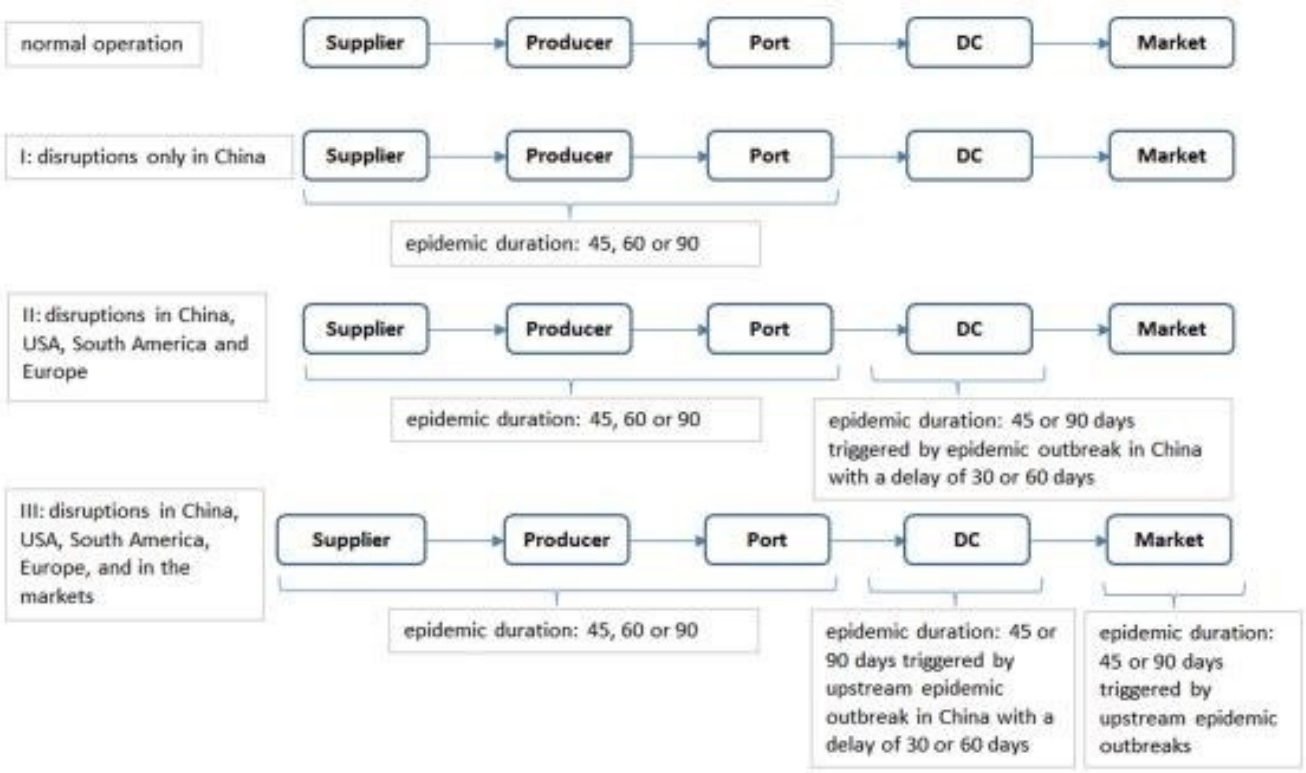

Figure 1. Case-study scenarios for simulation (Source: Ivanov, D., 2020)

From those scenarios, the impact of Covid 19 outbreaks on supply chains in several countries simulated by several scenarios. The operational rules of the supply chain during a pandemic are illustrated by the main scheme of materials and information flowing along thesupply chain which is presented in Figure 2.

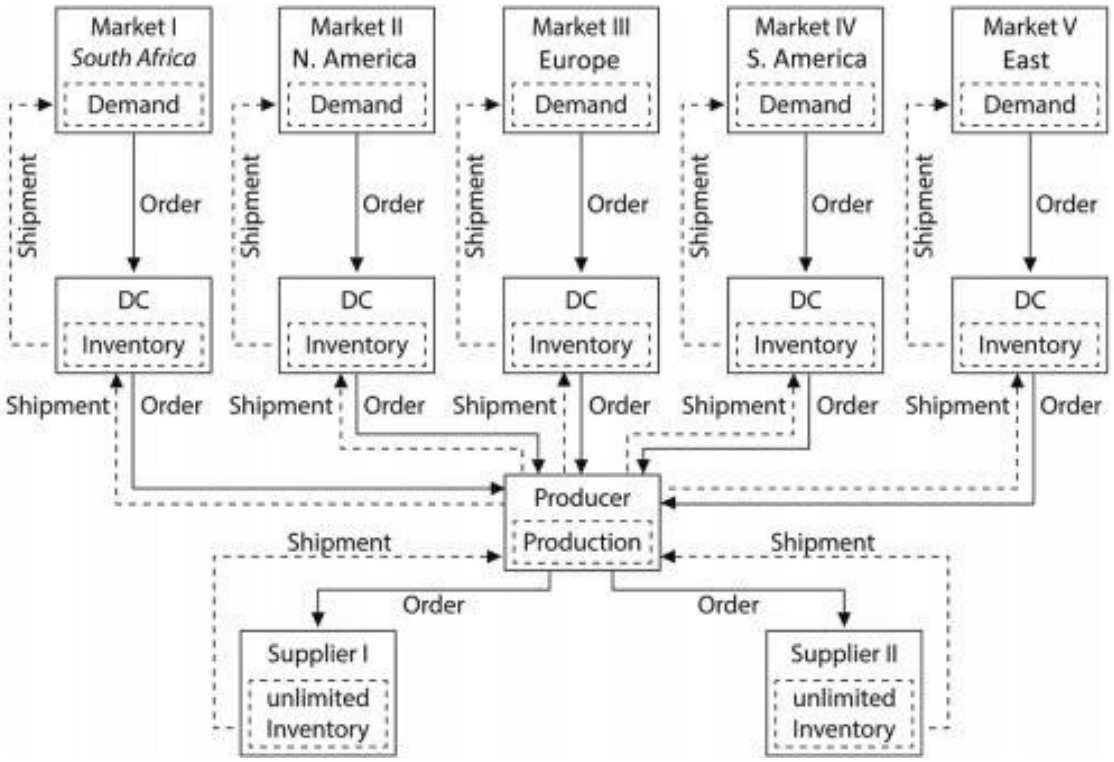

Figure 2. The material and information flows in the SC (Source: Ivanov, D., 2020)

The results of these simulation observations indicate that the timing of closure and opening of facilities at various levels of the supply chain is a major factor in determining how much impact this outbreak will have on supply chain performance.

In general, pandemic conditions have an impact on several things, namely:

1. Demand shocks at the beginning of the pandemic period, namely increasing demand for perishable goods and decreasing demand for non-perishable goods, however over time the demand began to stabilize even though the trend of demand in general decreased due to changing economic conditions resulting in a decrease in people's purchasing power. Due to reduced income, caution in spending money due to future concerns, and rising unemployment.
2. Restrictions on workers, especially immigrant workers can no longer be employed because of the activity restriction / lockdown policy that occurred in several places, within the scope of the region and country, so that countries that employ immigrants to meet domestic food needs and export needs suffer losses due to shortages labor to harvest and distribute agricultural products.
3. There are additional mechanism to maintain the hygienicity of the agricultural products by implementing health protocols in the process of planting, harvesting, processing, packaging, and distributing agricultural products. Health protocols that need to be carried out, starting from spraying disinfectants in rooms, vehicles, and product packaging, as well as for workers to check body temperature, use masks, maintain distance, to shifting jobs so that there are no crowds of workers.

There are many researchers who are starting to look for alternative solutions to the supply chain problems of agricultural products, one of them Hobbs, J.E., (2020) the fundamental elements to achieve food security in the pandemic era include access to food that is hygienic, nutritious, and affordable. In the early phases of a pandemic, what needs to be

considered is the phenomenon of panic buying which disrupts demand patterns. Strategies that can be applied are limiting the number of purchases accompanied by building good communication with all elements of the supply chain, including consumers, to understand the causes of panic buying and how to control the panic buying phenomenon.

According to Barman, A., et al, (2021) developed A recovery supply chain strategy through a product sanitization process scheme to accommodate health protocol policies during a pandemic so that agricultural products are guaranteed safety and cleanliness and workers and consumers along the supply chain are better protected from opportunities for exposure covid 19 virus as presented in Figure 3 below.

Figure 3. A recovery supply chain strategy (Source: Barman, A., et al, 2021)

In other hand, Kamola Muhamedjanova (2020) developed a visualization of the supply chain of a company with all partners in the supply chain called the maximum supply chain to responds covid 19 crisis, such as graphic info in Figure 4.

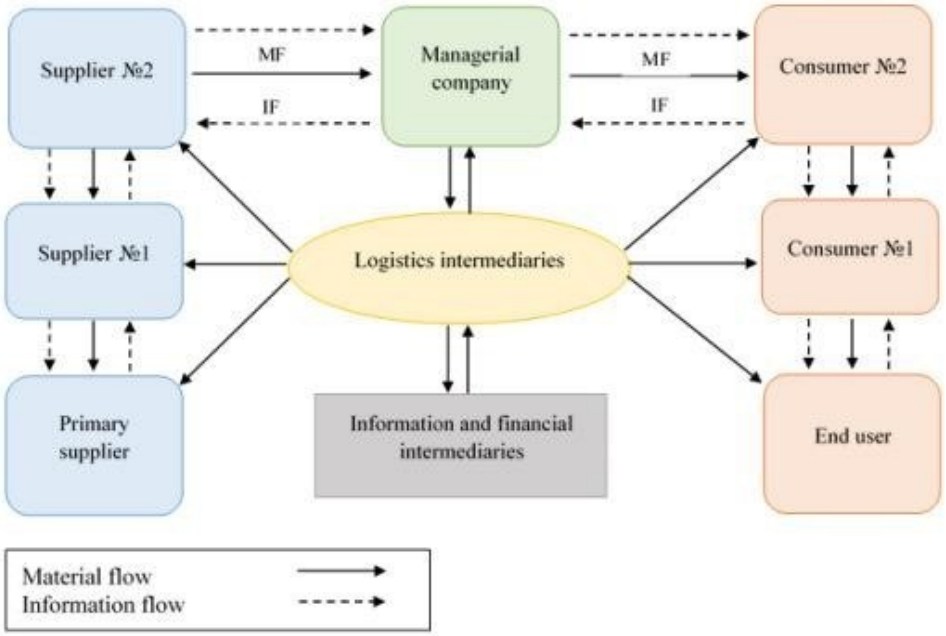

Figure 4. Maximum supply chain (Source: Kamola Mukhamedjanova, 2020)

Maximum supply chain is a multi-level system consisting of suppliers, intermediaries and consumers at various levels who interact with each other at various stages of the logistics process in a supply chain. The development of this supply chain is needed as an alternative

solution for efforts to overcome the phenomenon of decreasing demand for food products in the international market and in an effort to meet local food needs for food product exporting countries.

A case study in China, the vegetable supply chain experienced the impact of Covid-19 due to the lockdown policy, which are migrant workers who have been employed to become laborers in the agricultural sector to the distribution of agricultural products, which so far still use the services of middlemen, but on the other hand this is the agricultural product e-commerce business opportunity. The impact on the structure of the vegetable supply chain in China is presented in Figure 5.

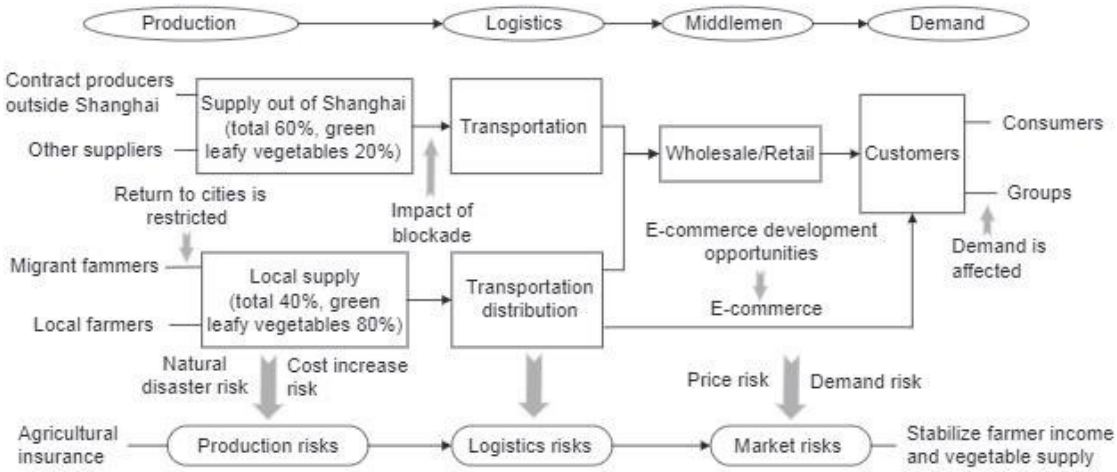

Figure 5. Pandemic's impact on the vegetable supply chain and the function of agricultural insurance. (Source: GU, H. ying, & WANG, C. wei., 2020)

Alternative solutions that are currently being developed are shortening the supply chain by utilizing technology optimization in the industrial era 4.0 and smart farming, so as to minimize costs and maximize product hygiene, as well as increase the speed at whichproducts arrive to end customers. The focus of supply chain development currently focuses on mitigating the impact of a pandemic in the period during the pandemic and the post-pandemic period. The development of supply chains before the pandemic in addition to efforts to shorten the supply chain in ideal condition cannot be continued for a whilebecause pandemic conditions have an impact on changes across sectors and human habits.

4. CONCLUSION

The pandemic has an impact in the form of demand shocks due to changing economic conditions resulting in a decrease in people's purchasing power and restrictions on workers, especially immigrant workers can no longer be employed because of the policy of restricting activities / lockdowns that occur in several places due to a shortage of workers to harvest and distribute agricultural products. Alternative solutions that can be developed are shortening the supply chain by utilizing technology optimization in the industrial era 4.0 and smart farming.

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