Chapter 13

# Smart Food Supply Chain: Recommendations after COVID-19 Pandemic in Agricultural Industry

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## A. Overview of Current Food Crisis

Many countries compete in the food crises resilience period due to the COVID-19 pandemic. To prevent further pandemic, several countries have implemented lockdowns or regulated some areas. This option requires the availability of food in large quantities in each country, which can disrupt the global food supply. Many food-producing countries directly restrict or close the export market of certain commodities to ensure their needs. The World Food Agency (FAO) has warned that the COVID-19 pandemic has paralyzed various sectors so that the economy can trigger a food crisis in multiple countries from April–May 2020 (WFP, 2020). In this situation, the world food market is getting tighter. For instance, countries with largest global wheat

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Putri, N. A., & Sitompul, F. R. (2022). Smart food supply chain: recommendations after COVID-19 pandemic in agricultural industry. In R. Trialih, F. E. Wardiani, R. Anggriawan, C. D. Putra, & A. Said (Eds.), *Indonesia post-pandemic outlook: Environment and technology role for Indonesia development* (209–225). DOI: 10.55981/brin.538.c512 ISBN: 978-623-7425-85-4 E-ISBN: 978-623-7425-89-2

production, such as Russia, Kazakhstan, and Ukraine, announced the export of basic ingredients for bread. Likewise with rice, the country in Southeast Asia that called the rice granary retains the importance and availability of supplies in his country. In Indonesia, since the government implemented Restrictions Large-Scale Social (PSBB), the policy triggers such condition that force many stalls and shops to be closed and affects the limitation of food access points from production center in agricultural areas to cities. This situation results in agricultural production in upstream and can lead to a drop in food prices, which directly cause harm to farmers, ranchers, and fishermen.

For example, most Indonesian consumers (about 60%) reside in the Jabodetabek region (Jakarta, Bogor, Depok, Tangerang, and Bekasi). At the same time, agricultural commodity producers, husbandry, and fisheries are spread throughout Indonesia. To overcome the long-distance obstacle, a good logistics system is needed by providing good infrastructures (roads, ports) and modern cold chain system for perishable foods. Inter-island trade and inter-regional trade should also be encouraged to take place efficiently. Another problem is the most primary suppliers of food products (farmers, fishers, and ranchers) are small-scale businesses. The relationship between farmers and stakeholders of the value chain is limited to make transactions. Consequently, the primer suppliers find it difficult to change their state to compete.

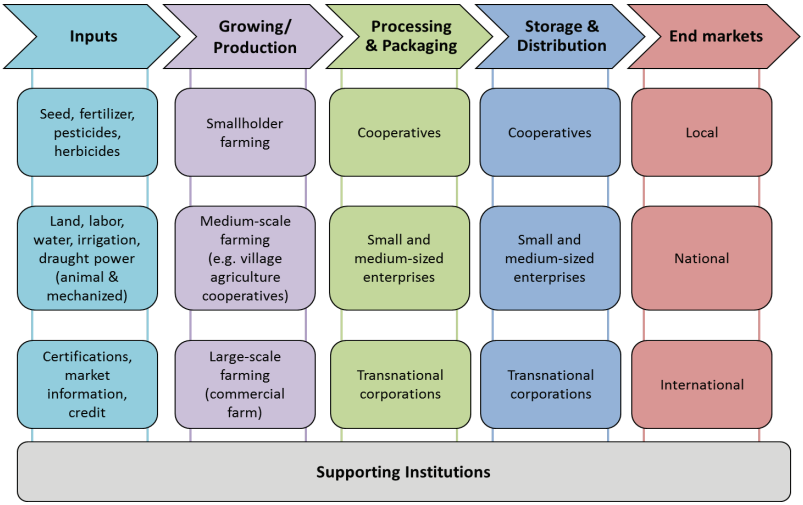
## B. Logistics Situation during COVID-19 Pandemic

There are several food security challenges during the period of the pandemic and post-COVID-19, unevenly distributed food products between regions, consumers (quantity and quality), distribution between provinces and islands, price tends to be unpatterned price, and drought problems.

Based on data produced by Central Statistics Agency (BPS), in 2019, the current year's surplus reached 2.28 million tons, in 2020 the current year surplus reached 1.95 million tons, and in 2021 the

current year surplus was estimated to reach 2.21 million tons. The production surplus is safe enough to cover the production deficit in January of around 1.29 million tons. In February 2022, it is estimated that there will be a surplus in the current month because production has exceeded the demand, which is around 1.17 million tons.

In the COVID-19 pandemic, the government, through the Food Security Agency, has a national food logistics system as a development strategy to stabilize food supply and prices throughout Indonesia. This strategy includes first, increasing production in deficit areas, and bringing production closer to consumers. The strategy consists of adding new planting areas "Perluasan Areal Tanam Baru" (PATB) in deficit areas, providing production inputs (seeds, fertilizers), and the provision of production facilities and infrastructure (agricultural machinery aid, irrigation networks). Second, improving distribution system, namely improving the smooth distribution of food. This strategy includes simplifying supply chain and intervention distribution,




Source: Abdulsamad et al. (2013)

**Figure 13.1** Agricultural Value Chain

developing National and Regional food hubs in each province, and establishing e-commerce. Third, institutional development, namely coordinating and synergizing between logistics actors. This strategy includes strengthening the role of logistics actors (farmers, traders, logistics service actors), establishing a central food logistics institution and regions (BUMN/BUMD) in each province, and synchronizing logistics system regulations and national policies (central and regional). Fourth, encourage local food consumption, namely carrying out food development locally. This strategy includes developing local food industry areas and campaigning to promote local food consumption.

The latest report, mentioned that more than 3 million people worldwide had been tested positive for COVID-19. That is a huge number for a pandemic, at least after the Spanish flu pandemic, infected 500 million people worldwide. This pandemic also has a tremendous impact on all aspects of human life. Public places such as plazas, schools, and markets should be closed, and human mobilization is limited only to essential business, such as logistics, food, and health. This phenomenon will globally affect the economy and food availability. The crisis is imminent. Forecasts from various world economic research institutes indicate that it certainly all countries in the world will experience a recession, minus economic growth, massive budget cuts, and reduction of workers number. This information is not intended to frighten, but it is a fact, the path that humanity will face in the future. So how should we respond to the crisis that is very likely to occur.

## C. Some Options to Stabilize Logistics Stocks during COVID-19

One of the efforts that can be done is to build a logistics supply chain in each region. A typical pandemic that comes from urban areas, and then spreads throughout the world, gives hope to suburban areas that with plenty of agriculture land and food barns. This does not mean pandemic should spread to urban areas, but at least the suburbs are far from population density and mobility susceptible to the quick

spread of COVID-19, and thus can avoid this situation that will be much more dangerous. Therefore, the suburban area must be guarded with a social safety net regarding food availability. Many countries are predicted to experience a recession or minus economic growth during the pandemic. JP Morgan and the IMF predict world economic growth in 2020 to at -1.1% and -3% (https://bondsloans.com/news/em-currencies-local-bonds-top-picks-for-2020-jp-morgan-asset-management-1). Negative economic growth will directly impact food availability.

The Food and Agriculture Organization of the United Nations (FAO) has even warned that the global coronavirus pandemic could trigger a "threatening food crisis," as many restrictions have hampered production patterns during the pandemic. Rapid action must be taken to protect the most vulnerable asset, keep the global food supply chain alive, and reduce the impact of the pandemic on the entire food system, and Indonesia is no exception.

In fact, Indonesia is currently facing the threat of an agricultural crisis caused by a crisis in the number of farmers, massive conversion of agricultural land, and high urbanization. Indonesia's agricultural sector cannot speak much. Meanwhile, based on data from the Ministry of ATR/BPN in 2018, the raw area of rice fields in Indonesia was only 7.1 million hectares (ha) or decreased compared to 2013 which was still 7.75 million hectares. BPS also launched that in 2018, the number of workers in the agricultural sector were recorded at 35.7 million people or 28.79% of total population, but most of them had entered old age. Meanwhile, only 10% of the total number of farmers came from groups of young farmers (19–39 years old). If this condition persists, in the next 10 years, the threat of a food crisis will certainly occur.

In this context, the spotlight must be focused on the size and portion of the budget for handling the pandemic and economic recovery of 110 trillion that is used to build social safety nets. At least with the support of the funding and human resources from various task forces for handling COVID-19, food availability, food accessibility, and food

affordability (the three pillars) for realizing food security are expected to be discovered.

## D. Strategies for Food Supply Chain

Before the pandemic, one-third of all food produced for human consumption was lost or wasted across the food supply chain that which includes many stages, such as production, postharvest handling, processing, distribution, and consumption. Therefore, food waste has gained more attention in the era of coronavirus. A study by Aldaco et al. (2020) indicated that COVID-19 had a minor impact on the overall food loss and waste generation, but resulted in 12% higher production of food waste on household level.

Valuable bioactive components such as phenols, carotenoids, pectins, flavonoids, essential oils, glucosinolates, isothiocyanates, and whey protein isolate can be derived from food waste in order to be reutilized in the food chain. These functional compounds can be used as preservatives, gelling agents, food, or nutritional supplements. Conventional or innovative techniques can be applied in the extraction, fractionation, and isolation stages of bioactive components from food wastes. However, additional collection and processing centers are required to recover food wastes generated during the production, processing, or consumption stages.

The European Food Safety Authority indicated that food itself is not a source of coronavirus as viruses cannot be transmitted through food consumption. Nonetheless, various environmental surfaces such as doorknobs, light switches, or foods contaminated with the COVID-19 virus remain at potential risk of become transmission media of virus (Thevenard, 2020). In addition, the latest study by Mathilde et al. (2020) showed that SARS-CoV-2 could be transmitted via air. Therefore, people should always care about handwashing. In addition, retailers must follow the hygiene requirements when handling food. Food preparation workers must wear masks and gloves and change them frequently during cutting, slicing, or packaging foods. Consumers are also responsible for preventing contamination by not

touching foods other than what they are willing to purchase in the stores (Morawska & Cao, 2020).

## E. Implementation of Smart Food Supply Chain

Various robot systems can be used to ensure food safety in food facilities by preventing the transmission of microorganisms by humans. The Industry 4.0 era now plays a vital role by making a data-driven autonomous decision in production. Automation opens new opportunities to increase productivity by 25% and complete tasks such as loading/unloading, placing, and packaging more efficiently than human beings. Robots can also help us serve the foods to consumers in the food-serving industry. In addition, Cyber-Physical System (CPS) can monitor the unsafe or low-quality products in the food supply chain (Iqbal et al., 2017).

The COVID-19 pandemic also resulted in onerous requirements for human resource management. These challenges include changing working conditions by adopting new workplace policies and actions to reduce physical contact. Therefore, organizations must respond to the challenges by some measures. First, COVID-19 symptoms of the workers, visitors, suppliers, and contractors should be monitored before entering the facility. The food safety or HACCP teams can perform temperature screening of all staff at the plant entrance. Ensuring workers to wear face protection equipment and gloves is essential, too. Second, facilities should consider reducing working hours and rotating employees. The overall number of workers in each shift should be divided into three or four groups and their break time should be adjusted to avoid overcrowding. Finally, warehouses and processing facilities should be redesigned to implement social distances among employees. Building dividers or barriers which cover the upper part of the body of workers can be used to maintain social distance. A diagonal arrangement should be used if employees use two-side engagement in food processing. Robotic machines also can be used to lower the risk associated with COVID-19-infected workers during the coronavirus pandemic.

Furthermore, robots can replace humans in food-processing operations to maintain social distancing by reducing the number of food workers. These precautions against the COVID-19 will stabilize international market mechanism. Countries should maintain the balance between the production quantity and the safety of workers.

Decentralization of food manufacture might also be used to avoid drawbacks and risks associated with the centralization paradigm in COVID-19. Low-scale facilities near the consumers can significantly reduce the storage and transportation costs and minimize the environmental impacts. Building the production facilities closer to consumers helps shorten the supply chain and decrease emissions and energy consumption during transportation and storage. Decentralization provides flexibility in supply chain and allows customers to get fresh and natural products. It also simplifies the administrative procedures in order to reach poor and disadvantaged people in certain areas (Almena et al., 2019a; Almena et al., 2019b; Lai & Cistulli, 2005).

The industry also should determine which transportation routes are blocked (potential alternatives should be sought) and how many workers cannot work due to restrictions. The local labor force should be trained and activated in cross-border restrictions. It would be an opportunity to ensure a reliable and long-term workforce for the future by training and increasing the skills of local employees. Agricultural workers were now identified as essential people, which ensured them to work under better conditions with higher wages. At the same time, agricultural inputs should be considered as essential products to ensure food production. Collection centers should be selected and planned considering their distance to the manufacturer. Integration of small producers closer to collection centers with high capacity can also decrease mobility.

Changes in demands are another factor affecting supply chain performance. Therefore, the demands should be determined using forecasts and simulations. Especially, the products essential for daily life, such as sanitizers and food items, gained more demand at the beginning of the crisis. However, the perishable nature of food products

makes them more susceptible to the impacts of COVID-19 on the supply chain. Therefore, the manufacturer can apply statistical models to propose optimal solutions for supply and demand disruptions due to the COVID-19 pandemic. Using those results, production, processing, and distribution can be adapted appropriately (Paul & Chowdhury, 2020).

In addition, it is necessary to use the logistics facilities in the most optimum way, especially the logistics vehicles should not return empty to the starting point. The concept of 'Urban Distribution Center' can allow us to use better capacity with consolidating the number of deliveries by one or more vehicles. It also improves the effectiveness of the collection or transportation process. In addition, food protection should be ensured by coordinating the supply chain members. Private or government institutions need to invest in storage centers. Consumers should have access to markets, and attention should be paid to the needs of low-income consumers. The relationship between buyer and seller should be strengthened by establishing web-based food distribution systems. Web-based supply chain management system can be referred to as an internet-enabled system that allows information flow among suppliers, facilities, collection centers, and retailers. This system enables faster and more flexible collaboration between producer and customer (Morganti & Gonzalez-Feliu, 2015; FAO, 2020b; Ngai et al., 2004).

Digital commerce services play an integral role in the interaction and trading activities among food supply chain actors. E-commerce provides opportunities to reduce costs and increase demand. In addition, for a long time, small farmers are considered disadvantaged in the food supply chain due to many challenges they face in accessing market. Higher transaction charges in all deals do not allow small farmers to stand in benefit positions due to their small scale. Therefore, digitalization of procedures enables small farmers to sell their crops at a higher price and helps them reach more customers directly and effectively bypassing intermediaries. The largest e-commerce companies can collaborate with the government to digitalize the services

of rural markets and encourage them to be part of the e-commerce economy. These platforms offer mostly organic fertilizers to the market at a reasonable cost.

Supply Chain Management (SCM) Data Science' can be used by governments and private sectors to solve SCM problems and forecast the outcomes by performing quantitative and qualitative methods owing to the data quality and data availability. Therefore, data availability and dissemination should be improved. Access to correct data at the right time is important for the efficient functioning of the supply chain. The availability of reliable information reduces uncertainties in the market and allows private and public organizations to determine sources of potential disruptions and risks. Correct data also provide better decision-making and enhanced profitability. In addition, a collaboration between a government agency and a private sector can be more effective by easily accessible data. Sharing data and information across the food supply chain can reduce the negative impacts and strengthen flexibility in the long run.

## F. Suggestions for Government and Businesses in Indonesia

First, a crisis committee should be established to focus on the effect of COVID-19 on the food value chain without waiting too long to implement of specific strategies and interventions. This committee should act as a key actor in observing the progress and recommend actions to reducing COVID-19 effects on agricultural production and food supply cuts. To ensure adequate and full implementation of the strategies, the committee must collaborate with the private sector. In Turkey, the Ministry of Agriculture and Forestry has formed the COVID-19 commission consisting of seven academicians and two members from the Ministry of Agriculture and Forestry for measures and recommendations to be taken in the field of agriculture and food within the scope of the pandemic Ministry of Agricultural and Forestry, 2020.

In the aftermath of the pandemic, governments worldwide announced response plans to help the agriculture industry reduce the effect of the COVID-19 pandemic. In Turkey, the Ministry of Agricultural and Forestry announced the precautions and funding assistance programs for farmers and manufacturing facilities/stores such as slaughterhouses, greenhouses, and bakery stores. In addition, the Ministry of Internal Affairs issued the lockdown guidelines allowing the farmers and food production plants to continue their operations during lockdown (MAF, 2020; MIA, 2020).

In Canada, Agriculture Response Program was designed for 50–75% funding assistance which does not have to be paid back regarding health protocol, marketing and product movement, distribution, strategic projects, abattoir efficiency, and development (Novascatia, 2020).

In the USA, the Department of Agriculture committed programs and flexibilities such as food assistance, dumped milk, crop insurance, farm loan, commodity loan, crop acreage, animal mortality, paycheck protection, and economic injury disaster loan to help agricultural producers whose business are affected by the COVID-19 pandemic (USDA, 2020).

Governments should also establish and operate emergency provisioning strategies to support production. Temporary input subsidy programs should protect the regions most affected by the pandemic. Timely support is essential for planting season for the following spring. Data collection and assessment programs for migrant workers should be able to determine when and where the migrants are needed. Facilitating the cross-border movement of migrant workers is vital because movement restrictions and border closures have a strong negative influence on the agricultural labor supply.

In Canada, the government announced a US$ 50 million financial aid program for small farmers who hired temporary foreign employees through the COVID-19 pandemic. The program allowed employers to receive US$ 1,500 per foreign worker who had to self-isolate for 14 days upon entry into Canada (Ker, 2020). The resulting labor short-

age can be reduced by policies that classify agricultural workers as critical persons and exempt them from travel limitations. In the USA, the government highlighted the importance of people employed in agricultural production and considered them as 'critical infrastructure workers'. It should also be focused on giving more extended stay permits by changing the country's visa and residence regulations for seasonal workers. In some countries such as Canada and Belgium, governments allowed employers to postpone recruitment or offer long-term contracts. Commission of European Union (EU) introduced 'the green lanes' for vehicles carrying agri-food products to ensure free and fast movement on borders. EU measures also highlighted the free movement of agri-food and seasonal workers by enabling them to reach their workplace and exercise their activities. In addition, the commission extended the farmers' application deadline to receive income support, known as Common Agricultural Policy (CAP) payments. A temporary framework for state aid measures was approved to support farmers and agri-food businesses to ensure liquidity. However, it is necessary to encourage the local population to become agricultural workers.

Local populations and unemployed people can be trained to work in actual farming practices like sowing, weeding, or harvesting to minimize the effect of the restriction on migrant workers. Online platforms should facilitate connections between local residents and the agriculture sector. Unemployed people or local workers should be encouraged to be agricultural laborers by adding a premium reward to their wages since local workers do not seem interested in farming due to the possibility of finding better non-agricultural alternatives. COVID-19 pandemic showed that labor-replacing mechanization policy is the best way to solve the labor shortage over the medium to longer-term (Troskie, 2020).

Employment contracts between the food value chain actors should be fair to all parties. They should be clear about the rights and responsibilities of each of the party, since public and private standards define the minimum requirements for food safety and quality. How-

ever, personal measures involve more stringent regulations than public standards and affect the producers' prices and produce quantity. In addition, these standards significantly impact their income and market access. In addition, legal frameworks can regulate the rights of producers and vulnerable groups affected by supply and demand changes and the need to adapt in accordance with these changes. In emergencies such as the COVID-19 pandemic, these regulations can contribute to safe transactions and problem-free operation.

Moreover, it is necessary to strengthen the capacities of legal regulations, including ensuring the proportionality and necessity of restrictive measures, and providing flexibility in implementing certain administrative requirements to face the challenges caused by the new situation. Providing flexibility in licensing requirements for direct selling, e-commerce, and food transport can also help small producers and agricultural businesses find alternative market opportunities since flexibility is relatively associated with the weak/strong position of farmers and the presence of long/short food supply chains. Customers sometimes believe supply chain challenges can impose the food choice.

Logistic operations are also critical to maintaining food delivery. Therefore, some regulations are needed to be maintained appropriately. For instance, some investments in infrastructure should be established to upgrade monitoring and supervision methods, sanitation systems, digital documentation use, and operations. Countries should follow rigid hygienic control in the distribution sector to prevent virus transmission. The health and safety of the logistic employees who carry tradable products should be maintained. For instance, Logistic Sub-Group developed three work streams in the UK: safe passage programs; crisis management, accommodation, and transportation; and shore base logistics and freight management. These work streams were intended to provide safe passage (health issues) and assurance to personnel and their families. It also ensures the movement of staff effectively and consistently. Lastly, it provides guidelines and raises awareness in the logistic sector.

Rapid yield prediction and determination of national food stocks need to define shortages or surpluses, particularly because of import prohibition or export restrictions. Better management of food stocks in different regions should be considered, and farm products' non-food uses (e.g., biofuel) should be reduced. Crop yield information models can help governments decide on food security or grain marketing. Local models can use intensive data techniques appropriate for small areas, whereas regional models use extensive data techniques suitable for larger areas. Therefore, a proper modeling method should be carefully selected to understand the impacts of policy decisions. The duration of the COVID-19 pandemic is uncertain. Agricultural firms have begun to change their business models. For example, it is important to address crucial issues, such as promoting understanding of the virus transmission, creating reporting system for positive cases, establishing progressive investment and resource plans covering the next three years, planning business continuity, alternating input source channels, increasing focus on stock management, reviewing personnel occupational health and safety practices, limiting travel, and preparing human resource in the face of increasing demand or absenteeism (Clift & Court, 2020; ICC & WHO, 2020). However, companies also need to cooperate with competing companies on some issues, e.g., raw material supply. Small companies need to be more organized, using the crisis as a driving force. Firms should care about developing the information and communication technology infrastructure that can be used for the agriculture and food sector. It is also necessary to benefit from financial incentive packages according to the needs of the enterprises.

## G. Conclusion

During a pandemic, continuing the supply flow in the and food sector, which is one of the most important sectors together with health, is vital to prevent the food crisis and reduce the negative impact on the global economy. Although no major problems have been observed in the food supply chains, it remains uncertain in the future. As a result,

each country has to realize the severity of the situation and sometimes should tighten or loosen the measures flexibly according to the spread of the pandemic. The supply chain also should be flexible enough to respond to the challenges in the food supply chain.

To mitigate the impact of COVID-19 on the availability and stability of food prices in Indonesia, the government must ensure facilities and assistance in all lines of food, starting from production to consumption, running accordingly as it supposed to. Coordination between Ministries and State Institutions is the key to implement this food policy strategy. The trend of food commodity trade restrictions and logistical disruptions is inevitable due to pandemic. Therefore, the government needs to optimize the potential for domestic food production and improve the national food logistics system.

Valid data related to the food balance in Indonesia need to be reviewed immediately and all ministries and state institutions are required to use the same food data. If several food commodities need to be imported to meet domestic food needs, it is necessary to obtain granting for import facilities, before the rise of food trade restrictions in several nations' food commodity suppliers. However, if it is not required to import, therefore domestic supply chain should be optimized. Domestic food must be a top priority so there is no disruption to resilient food in Indonesia.

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