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How COVID-19 Affects Food Security in Indonesia

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Abstract

As in other countries, COVID-19 has created pressure on Indonesia's food security through decreased income and reduced access, as well as increased transaction costs and uncertainty in the country's food system. Before assessing these impacts of COVID-19, we highlight several key facts about Indonesia's food system, including the high proportion of net consumers among farmers and the domination of informal small-medium enterprises in the supply chain. We then emphasize that food security is threatened by income shocks and purchasing power decline due to economic contraction, while effects on the supply side have been limited so far. While farmers' terms of trade have increased throughout the pandemic, downstream food SMEs such as traditional food vendors are likely worse affected by COVID-19 restriction measures. On the labor market, we observe a substantial shift of workers to agriculture, accompanied by a deeper drop in the sector's wage level compared to other sectors. Finally, we caution that risks to food security remain, especially as Indonesia faces new COVID-19 outbreaks post-Eid 2021, and outline policy recommendations related to social safety nets, supply chain resilience, and the use of technology.

JEL Classification: O13; Q18

Keywords

Food Security — COVID-19 — Food Supply Chain — Food SMEs — Indonesia

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1. Introduction

As in other countries, COVID-19 has created pressure on Indonesia's food security through decreased income and reduced access, as well as increased transaction costs and uncertainty in the country's food system. The effect of COVID-19 on food security concerns various actors in the food system, different food commodities, and multiple aspects, including availability, access, and nutrition. On the demand side, COVID-19 threatens food security through its adverse effects on employment and poverty, as well as nutrition and health outcomes (Béné et al., 2021; Devereux et al., 2020; GAIN, 2020). At the same time, the pandemic is increasing risk in the food supply chain, possibly causing volatility in food supply and prices (Reardon et al., 2020; Ihle et al. 2020; Akter, 2020). It is important to note that COVID-19's impact likely varies across these various dimensions, which are interconnected, through the course of the pandemic, and between different countries. It is therefore imperative to understand the specificity of Indonesia's food system and avoid inaccurate extrapolation based on evidence from other countries, given that robust data are still scant. The food security situation might differ considerably between different regions and groups of people within Indonesia, which is fairly heterogeneous in geography and socioeconomic conditions.

Historically, Indonesia's food security has been closely intertwined with rice, a staple consumed by almost the entirety of the population. McCulloch & Timmer (2008) summarize Indonesia's rice policy into three phases since the early 1970s: (i) heavy investment in agricultural inputs and technology, which succeeded in increasing rice production, coupled with explicit price stabilization by Bulog funded by oil revenues until the early 1980s, followed by

(ii) the decrease in rice output and the weakening of Bulog's monopoly, with agriculture investment declining further after the Asian Financial Crisis, (iii) and finally since 2004, the return of some price stabilization through rice import bans, with Bulog retaining a major role, along with subsidies for both rice and agricultural inputs. Higher real rice prices mark the current phase, both compared to previous eras and, most of the time, to world prices. While rice remains a staple for Indonesians, it now represents a smaller proportion of value-added in the economy and share of consumers' budget (Timmer, 2004), broadening the scope of food security beyond just rice.

In assessing the COVID-19 crisis's effect on food security, it might be relevant to recall previous food crisis episodes in Indonesia. The first major one was the world food crisis in 1973–1975, triggered by a large-scale El Niño event that caused widespread drought, including in Indonesia (Timmer & Dawe, 2010). From April 1973 to January 1974, there was virtually no global rice market, and prices were sky-high for several months afterward. This crisis pushed Indonesia to cultivate self-sufficiency through policies from the aforementioned first phase. Another episode was in 1998, coinciding with both an El Niño drought and the Asian Financial Crisis. During this time, harvests failed while price skyrocketed, hurting both rice farmers (some having to become net consumers as their production dropped) and the broader population of consumers (Ikhsan, 2011). The government responded by implementing market operation policies, subsidizing rice distribution for poor families (Raskin), and allowing rice imports with tariffs (Saifullah, 2010). These past food crises underline the importance of three policy responses: agriculture investment, import policy, and social protection. While there

might be lessons learned, the current COVID-19 crisis is very different in terms of both the food security shock and the shape of the country's food system.

Therefore, before analyzing the COVID-19 episode, we need to understand how food supply chains have formed in Indonesia recently, which have been transformed significantly by the rapid growth of per capita income and urbanization.

2. Key Facts About Indonesia's Food System

First, as in some other countries, Indonesia is heterogeneous in terms of development. Some parts (particularly in urban Java-Bali) mimic the pattern in upper-middle-income Asian countries, while many are still lagging like some African countries.

Second, more than 90% of food is tradable in the market—meaning a very small portion of food is self-sufficiently cultivated and consumed by own household. In particular, only 6.8% of rice cultivating households do not sell any of their rice produce (Table 1; BPS, 2017). Meanwhile, in horticulture, over 80% of produce is sold to the market, with minor exceptions in fruits such as duku (77.7%) and rambutan (77.8%) (BPS, 2018). Even though modern retail markets are increasing in portion, most food is still traded through informal, traditional markets (Vorley, 2013). Around 88.5% of Indonesia's agriculture sector workers are informal as of Sakernas August 2020. Aside from farm owners and wage workers, local traders and collectors are also largely informal. The informality of Indonesia's food supply chain could limit the government's capability to implement policies and deliver social protection.

The *third* fact is that more than half of food is consumed by urban households. Obviously, most of them are net buyers of food and obtain their food consumption through the market. This relatively higher share of urban food consumption is very straightforward. First, Indonesia's population is dominated by urbanites, and second, the per capita food consumption of urban households is higher than their counterparts in rural areas (Table 2).

Fourth, using rice as a proxy, we also find that only 38% of households in the food agriculture sector are net producers. Among these households who are workers instead of entrepreneurs or landowners (employees), the percentage drops to 20%. Most rural households are net consumers and obtain their food through the market. Among the net producers, most of their products are sold to the market.

Interestingly as a consequence, among the ones who rely on the market are the poor. Any market disruption by any shocks, including COVID 19, will hit the poor hard.

Fifth, it is then clear that most of Indonesia relies on food security in the food supply chain. Indonesia has an additional problem, i.e., not all food production is self-sufficient, such as soybean, garlic, and occasionally rice (Ministry of Agriculture, 2020). The domestic food supply-demand imbalance could grow over time, which makes us more vulnerable. Geographically, Indonesia is more challenging to manage. Java is very populated but would probably feed itself since most food crops are planted there while other islands are more populated with plantation crops. Meanwhile,

many other provinces in other islands may have to rely on domestic or international trade to feed their population.

Sixth, the private sector dominates the purchased food market. Bulog and other SOEs such as RNI and Berdikari controlled only less than 5% of food trading¹. This implies that the private sector controls more than 95% of food exchanges. It is then not surprising that food stock is dominated by private-sector networks, which are different from the 1970s when Indonesia had severe drought conditions.²

Seventh, SMEs and post-farmgate dominate Indonesia's supply chain. A long chain of middlemen consists of collectors, rural cooperatives, millers, wholesalers, provincial markets, inter-island traders, retail stores, and other distributors. Due to this long chain of many players, each player operates in relatively small scale and is typically an SME. For instance, in Sulawesi alone, around 9000 local collectors, 1000 local traders, and 10-20 small-scale exporters are primarily classified as SMEs, while there are only 6-8 medium and big-scale exporters (Padjung, 2018). SME vendors also populate the traditional markets where much food is distributed at the retail level.

Eighth, we also need to consider the perishability of the food and the traditional and wet market domination. According to a 2010 Nielsen survey, buyers purchased 53% of fresh vegetables, 70% of fresh meat, and 67% of fresh fish in traditional markets, which offer personalized services, location proximity, and often lower prices for most food categories. Nevertheless, we also note that modern retail stores such as supermarkets have grown rapidly in Indonesia, especially after foreign direct investment in retail was allowed in 1998. While these stores have outcompeted traditional retailers in the United States (Artz & Stone, 2006) and some developing countries (Reardon & Berdegue, 2002), the situation is less particular in Indonesia since traditional markets are believed to target different segments and sell products complementary to modern stores (CPIS, 1994). Suryadarma et al. (2010) selected comparable samples to evaluate the impact of supermarkets on traditional market sellers in 2003–2006, discovering that traditional markets went through a decline but not because of supermarkets. However, the conclusion might be different over a more extended period as supermarkets further proliferate and Indonesia's consumer base evolves. Some local governments are protecting traditional markets in some localities by limiting permits for new convenience stores (Rangkuti & Wright, 2013).

Ninth, we observe rural-urban food market and labor market integration via food supply chains. While Indonesia's population has become increasingly urbanized, food production remains centered in rural areas, increasing rural-urban linkages in Indonesia's food supply chain. However, market integration might be hindered by the long chain of middlemen between rural producers and urban consumers, which can only be shortened if the former has more market

¹Based on estimates from Bulog's management data in Q1 2020, Bulog's rice sales amounts to around 9% of total rice consumption, while the figure is less than 1% for other commodities such as sugar, beef, poultry, and eggs.

²Indonesia had two significant drought episodes, in 1975 and 1998 (Timmer & Dawe, 2010; Saifullah, 2010).

Table 1. Percentage of Rice Cultivating Households by Production Use in 2016 (%)

Production Use	No	Yes				
		1–24.99%	25–49.99%	50–74.99%	75–99.99%	100%
Sold or bartered	6.83	1.02	2.75	8.94	24.9	55.56
Household consumption	61.02	23.48	6.83	4.14	2.56	1.97
Given to others	78.50	19.23	1.72	0.46	0.07	0.02
Others	83.56	12.63	1.98	0.89	0.57	0.37

Source: BPS, Cost Structure of Paddy Cultivation Household Survey 2017

Table 2. Urban and Rural Population and Food Expenditure)

	Population (Million)	Weekly food expenditure per capita (Rp)
Urban	153.2	389,252
Rural	116.9	272,448

Source: BPS, Susenas March 2020

Table 3. Cross Tabulation of Net Rice Consumer and Producer, 2013

	NET RICE CONSUMERS			NET RICE PRODUCERS			TOTAL
	Poorest 30%	Not Poor	Total	Poorest 30%	Not Poor	Total	
HH works on food sector	29%	33%	62%	15%	23%	38%	100%
Employees	42%	38%	80%	9%	11%	20%	100%
Employers	25%	31%	55%	18%	27%	45%	100%
Other Sectors	20%	68%	88%	3%	9%	12%	100%
TOTAL	21%	63%	84%	5%	11%	16%	100%

Source: Processed from BPS, Susenas 2013

information and better direct access to food processing³ (Octania, 2021).

Tenth, reliance on non-farm income among Indonesia's agriculture workers is relatively high. For the average smallholder farmer household in Indonesia, on-farm income only accounts for around 49% of annual income, among the lowest in Asia (FAO, 2018). This is because almost 60% of farmer households own land less than 0.5 hectares (BPS, 2018), which often only generates income less than the poverty line. Therefore, some farmers also take non-farm jobs, mostly low-skilled in sectors such as trade and retail, restaurant and hotels, other services, manufacturing, and construction. Over 90% of these side jobs are also informal, according to Sakernas August 2019. Despite this, farmers' access to non-farm employment is often constrained by their lack of skills and compatibility. Harmini (2019) found that the increase in non-agricultural sectors does not increase the probability of farmers being employed in those sectors.

3. Impact of COVID-19 on Indonesia's Food Security

While the COVID-19 crisis is still unfolding, it is widely agreed that any subsequent recovery will likely be K-shaped. K-shaped recovery refers to divergent trajectories between different countries, economic sectors, and population groups. The latter is particularly relevant for our discussion of food security, where K-shaped recovery will result from the interaction between existing vulnerabilities and COVID-19 containment measures. Existing vulnerabilities include high informality, low social security coverage, a weak health system, as well as high disparities in income and wealth, among others (ADB, 2021). While certain groups might be

more insulated from income losses and favored by stimulus policies, such as big businesses and government employees, others are more severely affected by income erosion, business losses, adverse health impacts, as well as inadequate relief. These groups, which include Indonesia's sizable informal workers, would be most vulnerable to food insecurity. We keep this context in mind as we assess the various effects of COVID-19 on food security.

We could analyze COVID-19 pandemic's implication on food security from both the demand and supply side. The demand side relates to households' ability to afford food during the crisis, on which there are two mechanisms at work. First, contracting the virus or fear thereof could hamper income-generating activities (Amare et al., 2021). This includes international sources of income such as remittance, which measures at 1% of GDP in 2019 (World Bank, 2020a), as Indonesian foreign workers (TKI) lose employment or face restrictions. Second, restrictions imposed by the government to curb the virus spread disrupt a wide range of economic activities, reducing business revenue and triggering layoffs (Abay et al., 2020; Arndt et al., 2020). Mahler et al. (2020) projects that the pandemic will push 49 million people worldwide into extreme poverty in 2020. On the other side, disruptions to the food system could both limit access to food as well as affordability. For instance, disruptions in the food supply chain could hike prices of certain food commodities. In Ethiopia, the pandemic has been shown to trigger significant but heterogeneous increases in vegetable prices (Akter, 2020; Hirvonen et al., 2021).

Based on these general mechanisms, we proceed to analyze the COVID-19 food security situation in Indonesia from several aspects.

- A. Effect on food security.** The COVID-19 pandemic could affect Indonesia's food security by disrupting food distribution, increasing transaction costs, and lowering the purchasing power of both rural and ur-

³Trade margins of agricultural product vary across regions and commodities. Some reflect the quality of infrastructure and remoteness, while some relate to the market structure.

ban households. Looking at the price, while there are impacts on both supply and demand, demand might be a more significant concern for food security as COVID-19 cases continue to increase and prolong the economic downturn.

- a. On the supply side, there were some disruptions in the availability of certain food items, such as sugar and onion, causing price increases early in the pandemic, which has since eased as the government allowed more imports. Based on MoA prognosis, food stock and production for major food items should be sufficient to meet demand, though some commodities such as sugar, beef, and garlic require imports. Despite the late harvest season last year, full-year rice production in 2020 was marginally higher than in 2019. This year, the harvest season has shifted back to Q1 2021, resulting in a 52% increase in production compared to Q1 2020.⁴ While there have been some disruptions in the food supply chain, they generally have had limited effects on food supplies. The World Bank (2020b) also highlights that Indonesia's food supply is robust, with the food insecurity issue being more about access and affordability.
- b. On the demand side, food security is threatened by income shocks and purchasing power decline due to the pandemic's effect on the economy. The poverty rate increased to 10.2% in September 2020, up from 9.8% in March 2020. This represented an addition of 1.13 million people below the poverty line, following a 1.63 million increase in March 2020 from September 2019. The unemployment rate also increased to 7.1% in August 2020, up from 4.9% in February 2020. Although unemployment fell in February 2021, it remained 1.32 percentage points above the pre-pandemic level. Various surveys have reported that households are eating less during the COVID-19 pandemic.⁵ J-PAL's (2020) online survey found that as of October 2020, only 24% of households reported eating as much as they should in the last week, while another survey by UNICEF (2021) and others found that 12.6% of over 12,000 surveyed families were struggling to feed their families. This condition is also reflected by the pattern of food and beverages consumption in GDP by expenditure, which dipped in Q2 2020 and has not yet recovered to the pre-pandemic level (Figure 1). On a more positive note, a few high-frequency data such as transaction data from major banks indicate that consumption is already recovering,

including that of essential goods by low-income consumers. However, recent consumption data is not sufficiently robust to ascertain a recovery, especially as Indonesia faces a new spike in COVID-19.

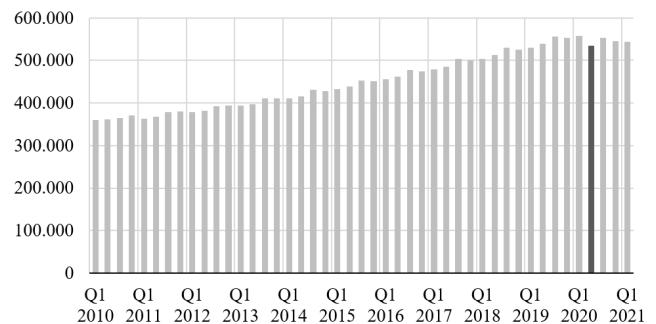


Figure 1. GDP by Expenditure: Food and Beverages, Other than Restaurant (Constant 2010 IDR Billion)
Source: BPS

In terms of distribution, the pandemic is likely to affect food security very differently across Indonesian households. Generally speaking, poorer households on the lower end of the income distribution are more vulnerable to the loss of income, business or employment during the pandemic, both in rural and urban areas (Ericksen et al., 2010; Ravallion, 2020). In an online survey by BPS, 70.5% of respondents from the lowest income group (less than Rp1.8 million) reported a decrease in income, compared to only 30–47% for higher income groups (BPS, 2020a). However, the evidence is more mixed if we look at the national household survey (Susenas), where the percentage decrease in real expenditure (September 2020, YoY) was most pronounced for the fourth expenditure quintile, followed by the third and the first (poorest) (Figure 2). Even though the poor, which is among the hardest hit, are likely supported by existing aid such as BPNT (Non-Cash Food Aid), the increase in poverty rate implies that there are the “new poor” who might not be covered by existing programs yet. Meanwhile by geography, urban citizens were worse affected by the COVID-19 crisis. For instance, urban poverty increased by 1.32 pp YoY in September 2020, more than double the 0.66 pp increase for rural poverty. Similarly, urban unemployment rose by 2.54 pp YoY in August 2020, compared to 0.74 pp for rural areas. This is expected as dense urban areas were more prone to COVID-19 outbreaks, which necessitated stricter mobility restrictions and lockdowns. The urban poor whose work requires face-to-face interactions is especially prone (Abay et al., 2020; Baldwin & Weder di Mauro, 2020), including those in the large informal service sector.

- B. Post-farm effect.** There have been disruptions in the post-farm food supply chain due to stricter protocols and social restrictions and transmission risk in down-

⁴The substantial year-on-year increase is due to base effect from Q1 2020's delayed harvest season. If we compare the first half of 2021 (projected by BPS) with 2020, the growth is only around 6%.

⁵The pandemic could also play some role in reducing food consumption, but evidence on the rise shows that as part of structural change, food consumption (as percentage of consumption) tends to decline overtime across deciles of the population. This could also help in easing speculation on rice price, which has resulted in relative calm in rice prices during the pandemic.

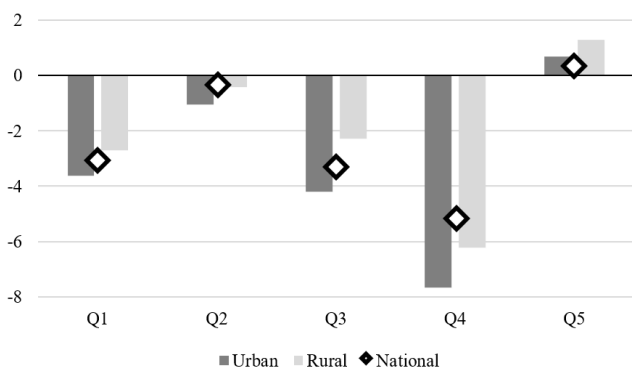


Figure 2. Change of Real Expenditure in September 2020 (% YoY), by Expenditure Quintile

Source: Processed from BPS, Susenas 2019 and 2020

stream food distribution such as traditional markets. This has led to supply gluts in some food warehouses and distribution centers, which could adversely affect the price for producers and lead to higher food waste for perishables. These disruptions also increase transaction costs, worsening inefficiency in the food supply chain.

- a. Stricter protocols such as health standards and checkpoints could disrupt the food supply chain. For instance, truck drivers traveling between certain regions must be isolated for 14 days upon arrival, which could reduce the available personnel and increase distribution costs. Checkpoints on land routes and seaports could also slow food distribution, especially if there is an inadequate number of workers (Patunru et al., 2020).
- b. There have been cases of social restrictions and roadblocks hindering food distribution at the regional level. Even though food is exempt from travel restrictions, transportation bans to PSBB and red-zone areas could still disrupt food distribution by imposing checkpoints and permit requirements.
- c. Retail distribution could also be disrupted by health protocols and containment policies, such as market closures, limited operational hours, and odd-even policies in some traditional markets. As of December 2020, there have been 207 market closures, with the highest number in DKI Jakarta, Jawa Tengah, and Jawa Timur (*Kabar24.bisnis.com*, 2020).

While mobility restrictions have largely eased compared to early in the pandemic, the threat of another surge in COVID-19 infections in Indonesia is coming to a realization (and is already occurring in several other countries) following the 2021 Eid holiday (“*mudik*”) season and the arrival of the Delta variant. It is expected that stricter restrictions could be reimposed, possibly disrupting the food supply chain.

- C. **Effect on downstream SMEs.** Downstream SMEs in the food supply chain suffer from falling purchasing power and shifting consumer behavior to formal and online channels induced by the COVID-19 pandemic. Much of retail food distribution occurs in traditional and wet markets. There is a high risk of infec-

tion from frequent contact between sellers and buyers, substandard hygiene and sanitation, and poor physical distancing from crowding. BPS’s survey on behavior during COVID-19 documented that traditional markets and street vendors have the lowest observance of health protocols, with 17% of respondent admitting that the ones they visited implement no health protocol at all (BPS, 2020b). As a result, there have been many outbreaks in traditional markets, with IKAPPI reporting 1762 vendors in 286 traditional markets infected as of 7 December 2020 (*Kabar24.bisnis.com*, 2020). These have forced market closures and other containment policies on traditional markets, while middle- and upper-class consumers switch to modern grocery stores that are perceived to be safer. According to the Ministry of Trade (MOT), traditional food vendor revenues decreased by 40–70% during the COVID-19 pandemic. The MoT also reported that the number of traditional food vendors decreased by 29% in the first few months of the pandemic (*Kompas.id*, 2020). We highlight that these informal businesses are essential income sources for people who are already economically precarious and often excluded by social protection programs. Bénét et al. (2021) also note that they are frequently the only sources of affordable fresh food for many urban dwellers. On a positive note, traditional vendors were among the priority groups for the vaccination program, beginning in Pasar Tanah Abang back in February 2021 (*Kompas.com*, 2021).

- D. **Effect on the farm sector.** While farm activities are not subject to a high risk of COVID-19 transmission,⁶⁷ the farm sector faces various risks from COVID-19 disruptions downstream. Supply gluts in the food supply chains, and decreased demand could depress prices for the farm sector. Farm sectors of certain food commodities might be more impacted than others. For instance, COVID-19 restrictions have badly affected the hotels and restaurants sector, decreasing its demand for poultry, affecting the maize farm sector. Furthermore, relaxed import policies for sugar and onion could lower prices for local producers and hurt farmers’ welfare. Since the COVID-19 outbreak began in March 2020, volatile foods CPI had recorded deflation for every month (except June) until October, when it began to rise sharply before peaking at 2.2% mtm in December 2020. All strategic commodities aside from rice saw their prices increase in November 2020, both mtm and yoy, with shallots, chicken meat and eggs, and bird’s eye chili as the biggest contributors. Food price increase in the latter half of 2020 was attributed to recovering purchasing power on the demand side and high rainfall on the supply side. At the same time, farmers’ terms of trade were relatively high at 102.9 in March 2021, following a steady in-

⁶It is worth noting that agriculture sector GDP growth remained positive at over 2% YoY in Q2 2020–Q1 2021 while overall GDP growth were negative.

⁷Amare et al. (2021) using panel data from Nigeria found that lockdown measures have limited implications on wage-related activities and farming activities.

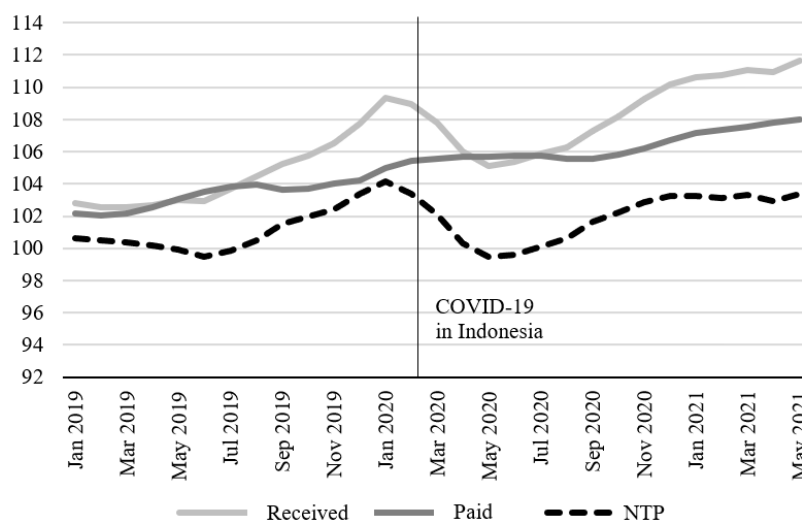


Figure 3. Farmers Terms of Trade (NTP)

Source: BPS

crease since its recent trough of 99.5 in May 2020 (Figure 3).

E. Effect on the labor market. Unlike in developed countries, where many farms rely on migrant workers, the agriculture labor market in Indonesia is more resilient to COVID-19. Food prices have moved both up and down throughout the pandemic with no singular trend, whereas farmers' terms of trade have generally increased. The previous risk of negative agriculture labor supply did not realize since outbreaks were much more severe in urban areas than rural areas. On the contrary, lay-offs and worsening prospects in non-agricultural sectors have forced workers to migrate to agriculture, increasing their labor supply (Figure 4). In August 2020, overall employment declined -0.2% YoY, but the agriculture sector made a 2.2% positive contribution, countering negative growth in almost all other non-agriculture sectors. While this helps absorb labor market shocks from the COVID-19 pandemic, this trend is not necessarily sustainable nor gainful for the workers. The agriculture sector wage level was not only among the lowest, but it also experienced the second-worst decline in August 2020 relative to the pre-pandemic level. This brought down agriculture laborer's wages relative to average labor wage after several years of increasing trend (Figure 5). The share of agriculture sector workers who are classified as informal also increased slightly in August 2020.

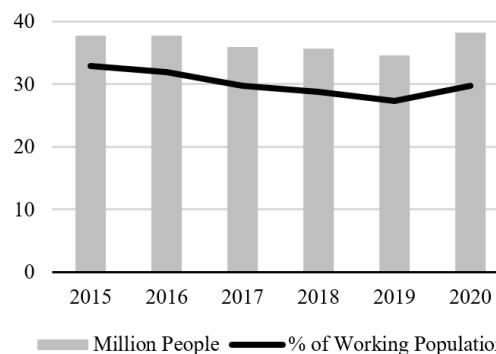


Figure 4. Employment in Agriculture Sector (August Sakernas)

Source: BPS

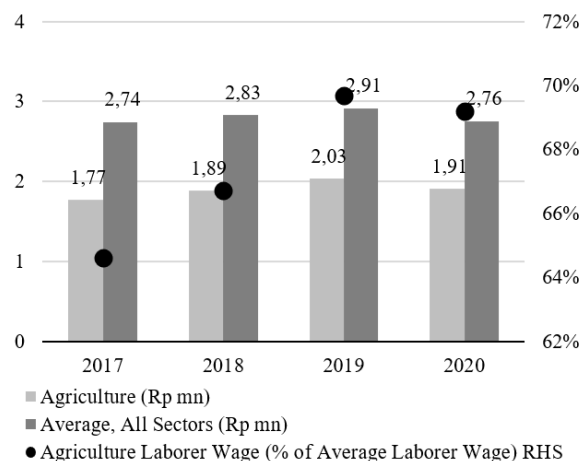


Figure 5. Average Laborer's Salary (August Sakernas)

Source: BPS

Table 4. The Informality of Agriculture Workers

Agriculture Workers	August 2019	August 2020
Informal (%)	87.7	88.6
Formal (%)	12.3	11.4
Total (Million)	35.2	38.2

BPS, Sakernas August 2019 and Sakernas August 2020

Furthermore, the COVID-19 crisis could increase workers' unemployment in the post-farm food supply chain, such as traditional market vendors who have to close their business.

F. Effect on the information. The COVID-19 crisis has

increased uncertainty as the number of cases remains high, not only in Indonesia but also in many other countries, especially with new and dangerous variants. While countries, including Indonesia, are already beginning mass inoculations, vaccination progress will remain at risk of supply and logistics issues. The Economist Intelligence Unit grimly predicts that Indonesia will only achieve widespread vaccination

coverage from early 2023 onwards; the Economist highlights supply as the main obstacle (EIU, 2021). Indeed, progress on inoculation has only reached 5% as of June 2021, reportedly slowed down by the government to ensure that there remain enough vaccines until another batch arrives. This uncertainty could adversely affect various markets, including food markets. At the domestic level, uncertainty due to COVID-19 could increase information asymmetries between suppliers, producers, sellers, and consumers, which may hinder food trade and cause volatile price movements. There has been anecdotal evidence of agrifood businesses losing access to markets due to COVID-19, such as chicken farmers in Papua having their feed input supply disrupted due to lockdowns in Java (Azis, 2021). Further uncertainty could drive up transaction costs and jeopardize business plans by these food businesses already hit by lowering food demand.

We also summarize some of our assessment in Table 5 using the typology of impacts adapted from Béné et al. (2021). We caution that for many of the impacts, our assessment is based on anecdotal evidence and should be completed with more data in future research.

4. Policy Recommendations

- **Safeguard food distribution networks from disruptions.** Food distribution must continue to be exempt from any COVID-19-related transport restrictions. Any remaining bottlenecks, such as the requirement of permits, should be addressed. Containment measures such as the requirement for drivers to self-isolate and closure of food production facilities should be reconsidered if they could safely be substituted with increased testing, tracing, and health protocols.
- **Increase targeted social safety nets to address the decline in purchasing power and maintain food consumption, with attention to nutrition.** Cash or voucher-based food aid such as BPNT should be prioritized and expanded as it could also help stimulate the local economy instead of in-kind aid from centralized procurements. Social safety nets could maintain demand for food and be used as a tool to help traditional food retailers.
- **Remain flexible with food import policy to ensure food supply.** However, import policy must be substantiated with accurate supply-demand projections to prevent excess imports that could lead to inefficient stock levels for years to come.
- **Enhance the role of SOEs in ensuring food security.** Bulog should be prepared, both in terms of stock quantity and operational efficiency, to perform market operations to stabilize prices with minimal inefficiencies. The government must caution against agrifood policies that incentivize rent-seeking and crowd out the private sector. Furthermore, food SOEs and related technical ministries should refrain from

agriculture projects that are not productive and incur potential fiscal costs, which become opportunity costs for essential government spending such as social protection transfers.

- **In the longer term, optimize technology use to improve food system resilience.** In the food supply chain, this could entail investments in real-time monitoring to rapidly address bottlenecks and storage technology in the cold chain infrastructure, such as ozone technology. Digital technology could also equip farmers with better access to information and markets, particularly for rural and SME food producers to be better integrated with online food distribution channels. Access to alternative markets could help food producers weathering disruptions to both agriculture inputs and consumers. Several Indonesian start-ups link rural farmers with urban buyers; the government's role is to review regulations that may constrain competition, innovation, and upscaling of these start-ups while monitoring to ensure that farmers are benefited. This similarly applies to other technology that could help agricultural productivity, such as precision farming.

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Table 5. Typology of Impacts of COVID-19

Typology of impacts induced by COVID-19	Actor affected by the event	Relevance in Indonesia's Case	Remarks
Direct effects of COVID or directly-related responses by authorities			
Mobility restriction and lockdown	All actors	Yellow	Mobility restrictions have been mild relative to other countries
Safety and sanitary decrees/regulations	Primarily mid-stream actors	Yellow	Lack of evidence
Immediate consequences on food system actors			
Disruption in upstream supply chain (e.g. fertilizer) and/or subsequent effects on prices or quantity/accessibility/quality of inputs	Producers, workers and/or mid-stream actors	Orange	Based on anecdotal evidence
Disruptions in actors' own activities due to mobility restriction and lockdown	Producers, workers and/or mid-stream actors	Yellow	Lack of evidence
Loss of or reduced connectivity with established downstream actors (direct consumers, contracted business partners, e.g. processor, retailers, etc.)	Producers, workers and/or mid-stream actors	Yellow	Based on anecdotal evidence
Reduction in labor/workers availability (due to mobility restriction, increase in public transport costs, or fear of exposure to virus)	Producers, workers and/or mid-stream actors	Yellow	Lack of evidence; increased labor in agriculture sector
Forced closure of business due to safety or sanitary decrees/regulations	Producers, workers and/or mid-stream actors	Yellow	Small number of cases
Disruption in food supply due to hoarding behavior	Producers, workers mid-stream actors and/or consumers	Yellow	Lack of evidence
Subsequent repercussions on food system actors and/or other (non-food system) actors			
Drop in (agri)food business profitability	Farmers	Yellow	Farmers' terms of trade has increased
	Agri-food businesses	Orange	Based on anecdotal evidence
Reduction in downstream demand	Producers, workers and/or mid-stream actors	Red	Based on anecdotal evidence, HH food consumption GDP
Increased wasted food/post-harvest losses due to disruption in supply chain (upstream or downstream)	Producers, workers and/or mid-stream actors	Yellow	Lack of evidence
Loss of job and/or reduction in income/revenues (due to mobility restriction, forced closure of business, etc.)	Producers, workers and/or mid-stream actors	Red	Based on Susenas and various surveys
Disruption in access to (usual) food outlets	Consumers	Yellow	Lack of evidence; no major closures of food outlets
Increased price of food – lower purchasing power	Consumers	Yellow	No singular upward trend in food price
Final impacts on consumers' food security dimensions and food system actors' health and well-being			
Degradation in food choice and diversity (e.g. shift to cheaper, fewer or less nutritious food items)	Consumers	Orange	Lack of evidence.
Reduction in proximity and/or convenience – due to mobility restriction, increase in public transport costs, or fear of exposure to virus	Consumers	Yellow	Mobility restrictions have been mild relative to other countries

Source: Adapted from Béné et al. (2021).

Note: Color scale in Relevance in Indonesia's Case column is as follows: red=most relevant; orange=mildly relevant; yellow=less relevant.

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