Bulgarian Journal of Agricultural Science, 27 (No 5) 2021, 865–874

Does Covid-19 have effects on the Indonesian horticultural subsector?

Agus Dwi Nugroho

Universitas Gadjah Mada, Faculty of Agriculture, Jl Flora Bulaksumur, Yogyakarta 55281, Indonesia
E-mail: agus.dwi.n@mail.ugm.ac.id

Abstract

Nugroho, Agus Dwi (2021). Does Covid-19 have effects on the Indonesian horticultural subsector? *Bulg. J. Agric. Sci., 27 (5)*, 865–874

The contribution of agriculture to Indonesian gross domestic product in the second quarter of 2020 has increased compared with same period last year. However, in certain occasions, this condition is not in line with the micro situation in the agricultural sector. This topic is important to study because agriculture, especially horticulture, has considerable effects on the Indonesian economy. This study aimed to ascertain the effects of Covid-19 on consumer and producer prices, import, and farmer welfare in the horticultural subsector in Indonesia. The research used Indonesian horticultural data in March–October 2019 and 2020. Trend and descriptive analyses were used to analyze the data. During the Covid-19 pandemic, Indonesia attempted to stabilize the price of horticultural commodities by increasing imports. The import policy and social restriction caused the decline in farmers' welfare because the prices of garlic and chili at the farm level declined. Meanwhile, social restriction policy caused difficulties in the distribution, and the shallot price increased at the consumer level.

Keywords: consumer price; Covid-19; farmer price; farmer welfare

Introduction

The Covid-19 outbreak caused harm in economies and industries around the world. The economic effects of this pandemic include the reduction of government income from taxes, changes in the interest rates, decrease in the consumer confidence index, diversion of foreign direct investment, and decline in export and import (Baldwin & Tomiura, 2020; Oravsky et al., 2020).

This epidemic also caused changes in the consumer business behavior. The Covid-19 outbreak reduced the purchasing power, and currently, people purchase important products only (Donthu & Gustafsson, 2020; Thorbecke, 2020). Meanwhile, producers were not prepared for this phenomenon, which disrupted the supply chain. Many service businesses, such as hotels and restaurants and those offering leisure activities (cinema) have closed either due to bankruptcy or the restriction imposed by the government (Kraus et al., 2020).

This panic has created market anomalies and caused global financial markets and global stock indices to plummet (Mckibbin & Fernando, 2020). The stock markets in the US, Asia, and Europe fell but rose significantly after governmental rescue support (Nicola et al., 2020).

The food sector also faced increased demand due to panic buying and stockpiling of food products. People in the UK food banks are stockpiling because of their fear of food deprivation (Heady et al., 2020). Meanwhile, the World Food Program estimates that the number of people in low-income and middle-income countries facing acute food shortages will double to nearly 265 million by the end of 2020. United Nations Children's Fund also predicts the increasing number of malnourished children in countries that experienced humanitarian crisis (Heady et al., 2020). Limited input and labor, pandemic protocols, and provisions disrupt the production and distribution processes of food. Thus, food security is seriously impacted and is predicted to create a food crisis (Food and Agriculture Organization of the United Nations, 2020; Poudel et al., 2020; Seleiman et al., 2020).

Various impacts of Covid-19 have been felt by Indonesia, starting from the economic recession, increasing unemploy-

ment and poverty, and other negative impacts. The Indonesian economic crisis in 1998 was a frightening event for Indonesian people, especially farmers. At that time, the price of almost all goods increased and caused a decrease in the real income of Indonesian farmers. For agricultural workers, a reduction in actual wages affects their ability to support their families, send their children to school, and gain access to adequate health care (Erwidodo & Stringer, 2009).

However, strangely, the contribution of agriculture to Indonesian gross domestic product (GDP) in the second quarter of 2020 has increased compared with same period last year. This situation may increase the farmers' real income. This event is good news because the Indonesian agricultural sector accounted for 29.46% of the total workers in 2019. However, on the other hand, agriculture was the largest contributor to inflation, that is, 4.28% for foodstuffs and 3.97% for processed foodstuffs, cigarettes, and tobacco. When viewed in detail, fruit and vegetables (horticultural subsector) produce the highest inflation value (Central Bureau Statistics, 2020). Thus, during this pandemic, the government may intervene with the horticultural subsector. Moreover, to date, fulfillment of horticultural products is carried out by importation.

Studies should determine the effects of Covid-19 on the Indonesian horticultural subsector. At present, no research has examined the impact of Covid-19 on the horticultural subsector using real data. Many studies on the impact of these pandemic used simulations are based on experiences in the 1998 Asian economic crisis or 2008 global crisis. This study aimed to ascertain the effects of Covid-19 on consumer and producer prices, import, and farmer welfare in the horticultural subsector in Indonesia.

Literature review

Indonesian horticultural subsector

In 2000–2015, the food demand in Indonesia increased rapidly. The demand increased by 155% for poultry (111% for all meat products), 105% for wheat, and 61% for vegetables. In 2030–2045, food demand is projected to increase in line with the growth in population, GDP, and per capita GDP. However, food demand in this period is predicted to be slower than that in 2000–2015 (Asian Development Bank, 2019).

Fruits and vegetables (horticulture products) are one of the agricultural products that consumers need every day. The horticultural production center in Indonesia is currently centered on the island of Java. This condition creates an imbalance between supply and demand. People outside Java especially need horticultural supplies. However, the logistics system of transportation and distribution remain dissatisfactory and often creates price disparities between consumer systems and producer centers. In addition, horticultural marketing is often detrimental to farmers given the lack of cooperation between farmers and the wholesale market, which is available in almost all major cities in Indonesia (Arifin et al., 2018).

Horticultural development in Indonesia aims to increase fruit and vegetable production and reduce imports. One related activity is the Food Self-Sufficiency Special Effort. This program seeks to introduce new technology to farmers to increase their production and income. However, introducing new technology for smallholder farmers might take a certain period given their doubt prior to observation of the results (Nugroho et al., 2017). In the end, changing from import to increase production can improve the trade balance and create jobs in the short term. However, empirical evidence also suggests that this action may lead to the loss of nutrient safety (Joosten et al., 2015).

The Ministry of Agriculture also sets restrictions on horticultural imports in the form of price and time limits for imports. The first limitation explains that imports are allowed if the domestic prices of horticultural products rise and exceed the reference price limit. Imports are needed to decrease domestic prices. Meanwhile, the second restriction is implemented by preventing imports several months before and after the main harvest. This step aims to prevent the excess supply of products and prevent product prices from declining during the harvest period.

Impact of pandemic Covid-19 on horticultural subsector

The impact of Covid-19 pandemic has been felt by horticultural farmers in India. Farmers experience difficulty in obtaining input. The transport and sale of horticultural products are also affected by the lockdown. However, farmer initiatives have also emerged to develop alternative marketing channels, that is, Krishi Vigyan Kendras, which have been proven to be effective and appropriate in the marketing of horticultural products (Singh et al., 2020).

Parwada's research (2020) also showed that the Covid-19 pandemic forced the Zimbabwean government to implement a lockdown. This lockdown had an impact on the decreased production (quantity and quality), price, market share, and income. In developed countries, such as Italy, significant losses have also been observed due to delayed transportation, which caused products to disappear. Meanwhile, this condition is also due to decreased consumption of up to 1/3 of normal conditions (World Farmer Organization, 2020).

In the labor aspect, many horticultural workers also experienced massive layoffs, salary cuts (50% pay), unpaid leaves, and a weak power to negotiate to save laborers. This event was attributed to the declined income or bankruptcy of

landowners or companies (Hivos, 2020). However, Covid-19 had another impact on the labor aspect, that is, the availability of labor. Countries, such as Austria, experienced difficulty in finding workers in the fruit and vegetable sector due to restrictions on free movement. Specifically, this country needs +/− 3000 workers from eastern European countries (Poland, Czech Republic, Slovakia, Hungary, and Romania) and from outside the European Union such as Ukraine (World Farmer Organization, 2020).

Distribution disruption was also felt by the horticultural trade. Shipments of tropical fruits from Southeast Asia were disrupted by traffic jams at the ports of Shanghai and Tianjin. This condition resulted in losses due to product defects. The trading price of horticultural products also fell. For example, Thailand's wholesale price of red meat dragon fruit fell by almost 85%, whereas the price of longan fruit from Cambodia has plummeted after exports to China were stopped. Meanwhile, import and domestic horticultural supplies were also disrupted (Food and Agriculture Organization of the United Nations, 2020).

Governments of various countries are aware of the impact of Covid-19 on horticulture, especially the decline in farmers' income. Many countries have to allocate additional funds to provide financial assistance to support farmers. For example, Northern Ireland provided aid of £1.6 million for horticultural farmer (Department of Agriculture, Environment and Rural Affairs, 2020).

Material and Methods

This research used Indonesian horticultural data from March to October of 2019 and 2020. The data from March to October 2019 covered the conditions before the Covid-19 pandemic, whereas those for 2020 accounted for those in the period of the Covid-19 pandemic. This time span was selected to compare the effects of Covid-19. In this time frame, the economic, social, and agricultural conditions in Indonesia were assumed to be the same despite the different years (ceteris paribus).

The types of data used in this study were consumer and producer prices (from Central Bank of Indonesia and Indonesian Ministry of Trade), horticultural farmer exchange rates (Central Bureau of Statistics), and import of horticultural products (Indonesian Ministry of Agriculture). The types of horticultural products considered in this study were garlic, shallot, and chili. These products were selected because they are a national superior commodity based on the Regulation of the Indonesian Minister of Agriculture.

This study applied the following methods to analyze the data:

Trend analysis

Statistically, trend analysis is carried out to evaluate the hypothesized linear and nonlinear relationship between two quantitative variables. Typically, this method is implemented either as an analysis of variance for quantitative variables or as a regression analysis (Lavrakas, 2008).

A trend is a progressive change or (tendency) fluctuating and long-term movement of a variable over time under a simple analysis. Meanwhile, other trends involve multiple variables, and the analysis increases in complexity (Greben, 2007). The analysis aims to find patterns to understand or predict certain behaviors or phenomena (Rae, 2014). Trend analysis can be used in economics, demographics, environment, and medical or other sciences (Birnbaum et al., 1997; Antonopoulus et al., 2001; Logan, 2014; Patle & Libang, 2014; Tomas, 2014).

In this research, the trend model was least squares method. Trend lines in this method are obtained by determining the equation of the line that has the smallest number of squares of the difference in original data with data on the trend line.

$$Y = a + bX$$

The following equations can be used to find the value of constant (a) and parameter (b):

$$b = (n\sum XY - \sum XY) / (n\sum X^2 - (\sum X)^2)$$
$$a = (\sum Y / n) - b(\sum X / n)$$

Notes:

Y = dependent variables (consumer price or farmer exchange rates)

X = time (week)

a = constant

b = trend parameter (slope)

Descriptive analysis

Descriptive analysis is used to identify phenomena or patterns in previously unrecognized data. Descriptive analysis can be used to diagnose problems that require immediate attention by policymakers, practitioners, and researchers. This analysis helps researchers to understand the causes of phenomena and interpret them, generate hypotheses and intervention strategies, and identify new problems to study (Loeb et al., 2017). In this research, descriptive analysis was used to explain phenomena from the trend analysis.

Results and Discussion

Covid-19 sufferers in Indonesia were first discovered in early March 2020. Since then, their numbers began to increase, and the government became cautious of its rapid

spread. The government then restricted the community's socio-economic activities with social restrictions. Numerous economic facilities were closed, and workers were asked to work from home. As a result, a considerable number of workers lost their jobs, poverty in Indonesia increased, and the industry became bankrupt. Finally, Indonesia entered a period of economic recession.

Almost all economic sectors in Indonesia experienced a negative economic growth, except agriculture. This situation is the same as the 1998 economic crisis, when Indonesian agriculture continued to grow positively, albeit at a slow pace (Wie, 2000).

Horticulture is one of the advanced sub-sectors in Indonesian agriculture. Farmers cultivate vegetables and fruits because the profits are greater than those from food crops. The prices of garlic, shallot, and chili are the highest compared with those of other food and horticulture crops. These commodities are urgently needed by the Indonesian people every day. However, to date, domestic production fails to fully meet the demands for garlic, shallot, and chili, prompting Indonesia to import these commodities. However, the pandemic has restricted the country's capability to import and caused disruptions in global supply chains (Asian Development Bank, 2020).

Garlic

Indonesia is a top buyer of garlic, importing over 500 000 tons every year (Rusmana, 2020). Almost 95% of Indone-

Table 1. Producer price, consumer price, and import volume of garlic in Indonesia between March to October 2019 and 2020

Month	Week	Producer Price (IDR)		Consumer Price (IDR)		Import Volume, kg	
		2019	2020	2019	2020	2019	2020
March	1st	18 650	14 650	26 400	45 850	292 252	17 606 519
	2nd	18 650	n.a	29 050	44 700		
	3rd	n.a	n.a	31 300	44 300		
	4th	14 000	14 650	32 600	44 550		
April	1st	14 000	14 650	35 900	45 100	293 217	59 339.68
	2nd	14 000	n.a	37 900	43 200		
	3rd	n.a	10 000	43 050	40 900		
	4th	13 000	10 000	47 500	39 750		
May	1st	13 000	10 000	61 500	38 400	69 857 528	73 066 624
	2nd	n.a	n.a	51 900	36 650		
	3rd	12 000	8 000	43 550	34 600		
	4th	12 000	8 000	41 300	34 050		
June	1st	12 000	8 000	42 850	31 950	47 204 394	135 008 632
	2nd	n.a	n.a	41 700	29 900		
	3rd	8 650	n.a	41 350	27 850		
	4th	8 650	7 350	40 450	27 700		
July	1st	8 650	7 350	39 050	24 250	72 488 104	51 208 285
	2nd	n.a	n.a	37 850	23 300		
	3rd	n.a	7350	37 150	23 000		
	4th	10 650	7 350	36 450	22 950		
August	1st	10 650	7 350	34 650	22 650	33 815 466	19 015 119
	2nd	n.a	n.a	34 350	22 900		
	3rd	10 350	6 650	33 800	24 100		
	4th	10 350	6 650	33 150	25 400		
September	1st	10 350	n.a	32 700	26 500	35 508 294	n.a
	2nd	n.a	n.a	32 500	26 750		
	3rd	n.a	7 000	32 050	26 650		
	4th	11 000	7 000	31 700	26 550		
October	1st	11 000	7 000	31 350	26 500	37 897 352	n.a

Source: Central Bank of Indonesia, Indonesian Ministry of Trade, and Indonesian Ministry of Agriculture
n.a = not available
1 IDR = 0.000058 Euro

sia's garlic supply originates from China. Indonesia cannot cultivate garlic properly due to the incompatibility with suitable conditions for growing garlic. The remaining 5% comes from domestic production, such as East Lombok Regency, which is suitable for the cultivation of this plant (Muslim & Mulyani, 2019).

Table 1 presents the garlic price in the market during the Covid-19 pandemic. The price has decreased and is lower than that in 2019. The results of trend analysis is shown by $Y = 45\ 197 - 873.03X$, that is, the garlic price was very high in the early period of the pandemic and then decreased every month.

In the early days of the Covid-19 outbreak in Indonesia, the market price of garlic was very high because the country was experiencing the peak of rainy season. Thus, farmers could not cultivate garlic, and the supply was inadequate. According to the Ministry of Agriculture, the estimated national stock of garlic in March–May 2020 was 86 000 tons, whereas the national need for that period reached 151 000 tons. Thus, by the end of May 2020, Indonesia was estimated to experience a shortage of 65 000 tons of stock. Another reason was the panic buying of consumers at the start of the pandemic, which resulted in a surge in demand for garlic.

Meanwhile, the Ministry of Agriculture and the Ministry of Trade has tightened imports from China. The restriction involves requiring garlic importers to seek import permits from the Ministry of Agriculture (Import Recommendation for Horticultural Products (IRHC)) and the Ministry of Trade (Import Approval Letter (IAL)). Another policy is the Regulation of the Minister of Agriculture Number 46 of 2019, which requires importers to plant garlic at 5% of the import quota before obtaining IRHC. The planting process must involve local farmers. The last policy is the 5% import tariff for garlic from China to Indonesia, according to the agreement between China and Association of Southeast Asian Nations.

This restriction had been already implemented before the Covid-19 pandemic. However, the restriction was further tightened during the Covid-19 pandemic because China was the epicenter of the virus outbreak. The tightening of IRHC and IAL was then relaxed in March 2020 based on the Regulation of Minister of Trade 27/2020, with validity until 31 May (Indra & Fardah, 2020). In this case, the importer may import first and then plant later. This condition was attributed to the 40% increase in the garlic price above the reference price for importing set by the government. Another reduction is in the form of negating import approval and surveyor reports for the mentioned commodities (Indonesia Competition Authority, 2020). The Ministry of Agriculture gave permission to import garlic from March 2020. Since then, the market price of garlic has declined.

The negative impact of this policy is the decline in garlic price at the farm level. The prices are lower than those in the previous year without the pandemic. During the pandemic period, the lowest garlic price at the farm level occurred in July and August. At that time, the farmers were harvesting, and the government was importing in huge quantities. As a result, the market had an excess supply of garlic, and the price went down.

The main problem with garlic marketing in 2020 is that numerous farmers had unsold products given the lack of company buyers. In the previous year, companies that obtained IRHC cooperated with local farmers or bought garlic from local farmers to obtain import permits from the Ministry of Agriculture. However, at present, from the 122 companies that received IRHC, 10% of companies had finished planting with local farmers after importing. Others are still planting but have not finished or have not planted at all.

Another consistent problem in agricultural marketing is the failure of price transmission. In 2020, the garlic price in consumers is four times higher than the producer price, indicating an increase compared with that of the previous year (three times). This result shows that the garlic trade system in Indonesia during the Covid-19 pandemic has worsened. The government is currently concentrating on tackling the outbreak to ease the supervision process of the garlic trade system. This opportunity can be used by several parties to seek large profits from the garlic trade system.

Shallot

The shallot price during the Covid-19 pandemic was higher than that in the previous year, although a downward trend was observed. Similar to garlic, the trend analysis of shallot price (Table 2) showed $Y = 49290 - 549.8X$, that is, the price was high at the beginning of the pandemic and slowly decreased afterward. In April 2020, shallot was one of the commodities causing inflation. However, the farmers remained enthusiastic in planting of this crop.

The challenge for shallot farmers during the pandemic is the application of health protocols to prevent Covid-19, which is disrupting farmer activities on land. However, farmers still comply with these health recommendations. The second challenge is the armyworm (*Spodoptera exigua*) attack that forces farmers to use natural and chemical pesticides to control these pests. The last challenge is the weather, which hastens the decay of shallot. Farmers still cannot control this challenge, resulting in poor product quality and delayed harvest or crop failure (Citradi, 2020).

At the beginning of the pandemic, the shallot price in Indonesia has increased and yielded large profit for farmers. This event was due to panic buying and distribution delays

Table 2. Producer price, consumer price, and import volume of shallot in Indonesia between March to October 2019 and 2020

Month	Week	Producer Price (IDR)		Consumer Price (IDR)		Import Volume, kg	
		2019	2020	2019	2020	2019	2020
March	1st	16 400	25 100	30 300	36 800	29 021	48 050
	2nd	15 700	24 650	32 700	37 350		
	3rd	20 800	22 350	33 750	37 800		
	4th	20 550	24 950	36 500	39 350		
April	1st	20 550	24 500	38 150	42 350	37 628	3 126
	2nd	20 400	n.a	39 450	43 150		
	3rd	20 000	29 150	41 050	44 250		
	4th	25 300	29 250	41 500	46 050		
May	1st	26 000	29 400	38 900	49 750	4 520	3 247
	2nd	n.a	n.a	37 000	52 100		
	3rd	22 750	34 100	35 350	55 400		
	4th	23 650	34 850	35 850	57 700		
June	1st	23 600	35 050	39 050	59 150	28 798	34 932
	2nd	24 150	35 350	38 850	56 900		
	3rd	23 500	n.a	39 400	51 350		
	4th	25 000	32 450	38 950	47 450		
July	1st	24 800	33 150	37 000	41 050	15 194	288 008
	2nd	24 600	n.a	35 450	38 100		
	3rd	19 200	26 000	34 200	35 550		
	4th	22 150	22 750	33 050	34 100		
August	1st	22 300	22 300	30 550	32 900	18 337	241 873
	2nd	n.a	22 400	29 550	33 050		
	3rd	22 050	20 300	27 900	32 500		
	4th	18 900	20 800	26 000	30 900		
September	1st	18 650	20 400	24 500	30 950	18 722	n.a
	2nd	17 450	n.a	23 950	31 050		
	3rd	n.a	20 050	23 400	30 750		
	4th	16 050	19 750	23 100	30 300		
October	1st	15 800	19 550	23 300	31 450	30 951	n.a

Source: Central Bank of Indonesia, Indonesian Ministry of Trade, and Indonesian Ministry of Agriculture
n.a = not available

caused by the implementation of social restrictions (Roy et al., 2020). The vehicles carrying shallot cannot enter the consumer area, resulting in a shortage of products. This phenomenon was also reinforced by the Ministry of Agriculture, which stated the surplus in Indonesia's shallot stock, that is, 241 000 tons at the end of May 2020. This finding means that the shallot stock in Indonesia is sufficient but cannot be distributed properly.

Since June, the shallot price has declined because farmers have started the harvesting season. At the same time, the government has been importing shallot from other countries. Although no plans of import have been reported, based on the data from the Ministry of Agriculture, Indonesia imported large amounts of shallot in July and August 2020. However, the import volume in these 2 months is relatively small when compared with the export volume. In this period, Indonesia exported three (July) and eight times (August) that of the import volume. This situation is in accordance with a research by Rusdiana & Talib (2020), who predicted that shallot stocks during the pandemic will still meet national needs.

The shallot price at the farmer level during the Covid-19 pandemic was relatively good. The price in 2020 is higher than that in the previous year. Likewise, the price difference between producers and consumers showed no large difference, indicating a smooth price transmission. This phenomenon also indicates the better trading system of shallot than that of garlic.

Chili

Table 3 presents the chili price at the consumer level during the pandemic. This price has declined as shown in the trend analysis $Y = 36\ 131 - 50.089X$. The chili prices in 2020 are lower than those of the previous year and became one of the causes deflation. This condition is due to the abundant stock of chili in Indonesia (Indriani et al., 2020). According to the Ministry of Agriculture, the estimated chili stock in March–May 2020 reached 311 000 tons, whereas the estimated demand was 278 000 tons. Otherwise, Indonesia will experience a 33 000 ton surplus. However, in October, the chili price began to rise because the rainy season started in Indonesia, and chili production declined.

The imposition of social restrictions caused the shortage of orders among farmers. Many restaurants have closed because they were prohibited from operating by the local government. Meanwhile, traditional market traders in large cities also reduced their orders for chili because of the decreased purchasing power of consumers. Thus, according to the market law, given an excess supply, the price of chili from farmers will decrease (Pulubuhu et al., 2020; Widarti, 2020).

This situation shows the difference in the impact of social restrictions on shallot and chili. Social restrictions have an impact on difficulties in distribution and low consumer demand because shallot production centers are limited to several locations in Indonesia, such as West Java, Central Java, East Java, and West Nusa Tenggara. The high distribution costs resulted in the high shallot price during the Covid-19 pandemic. Meanwhile, chili is produced in

Table 3. Producer price, consumer price, and import volume of chili in Indonesia between March to October 2019 and 2020

Month	Week	Producer Price (IDR)		Consumer Price (IDR)		Import Volume, kg	
		2019	2020	2019	2020	2019	2020
March	1st	15 900	31 600	28 850	49 300	5 167 074	3 783 299
	2nd	15 700	31 350	30 400	44 950		
	3rd	n.a	20 000	31 200	40 150		
	4th	18 050	23 900	32 250	38 350		
April	1st	18 150	24 200	32 450	35 350	2 535 883	4 507 194
	2nd	18 300	n.a	34 100	33 900		
	3rd	n.a	17 500	35 100	33 100		
	4th	19 750	19 050	37 700	34 050		
May	1st	20 800	19 500	42 950	32 700	2 676 831	2 652 426
	2nd	n.a	17 200	40 150	31 250		
	3rd	18 850	n.a	38 350	32 600		
	4th	19 750	18 600	42 300	34 800		
June	1st	19 900	20 050	n.a	30 200	1 799 965	4 871 024
	2nd	20 200	21 900	49 750	30 250		
	3rd	21 900	n.a	48 850	30 050		
	4th	27 700	15 500	53 450	31 800		
July	1st	27 950	19 200	55 800	31 450	4 017 204	3 463 639
	2nd	28 400	22 150	56 350	32 200		
	3rd	40 250	16 350	58 000	32 150		
	4th	41 850	18 750	56 450	37 000		
August	1st	40 500	19 250	62 750	37 350	4 808 406	2 444 223
	2nd	n.a	21 500	n.a	33 600		
	3rd	46 050	19 650	58 300	31 300		
	4th	39 800	19 650	49 900	30 200		
September	1st	39 200	20 850	47 500	33 350	4 412 329	n.a
	2nd	35 600	n.a	45 150	34 950		
	3rd	n.a	17 250	43 050	36 650		
	4th	26 600	20 500	41 800	39 500		
October	1st	28 500	21 700	43 300	44 300	4 477 777	n.a

Source: Central Bank of Indonesia, Indonesian Ministry of Trade, and Indonesian Ministry of Agriculture
n.a = not available

almost all parts of Indonesia. Thus, no difficulty was encountered in its distribution, and its price was cheaper than that of shallot.

Despite the sufficient availability of food products, Indonesia continues to import. This practice is a necessary measure to maintain national food security, which is less than that in the previous year when Indonesia was consistently importing chili. As stated by Food and Agriculture Organization, the Covid-19 pandemic has prompted many countries to be vigilant about maintaining their food security. The Covid-19 pandemic is estimated to reduce Indonesia's food production by 3.28% (Gregorio & Ancog, 2020). Thus, the Indonesian government avoids risks and attempts to keep its stocks stable. After importation, the chili price at the consumer level dropped.

Chili price at the farm level fell during the pandemic and was lower than the previous year. Excess stock, low consumer purchasing power, and social restrictions keep the chili prices low. This condition is exacerbated by the poor price transmission due to a poor trading system.

FER of Indonesian horticultural subsector

The farmer exchange rate (FER) shows the level of farmer welfare. This indicator is based on farm income compared with farm and non-farm expenditures. If the indicator value is more than 100, then the farmer is prosperous, and vice versa. During the Covid-19 pandemic, the FER of the horticultural subsector (Figure 1) experienced a drastic decline compared with the previous year. The value is less than 100, indicating that farmers are not prosperous given their lower income compared with their expenditure. This result is in accordance with a previous situation, which showed the continued decline in the prices of garlic, shallot, and chili at the farmer level during the Covid-19 outbreak. In addition, the prices of garlic and chili at the farmer level in 2020 were lower than those in 2019.

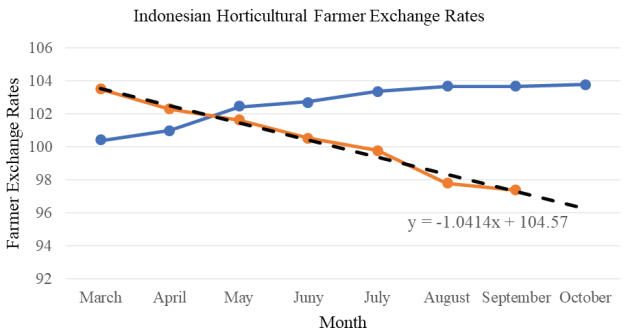

Fig. 1. FER of Indonesian horticultural subsector
Source: Central Bureau Statistics (2020)

The low price at the farm level is due to the excess supply of horticultural commodities in the market. The government made huge imports to maintain food security. However, this policy resulted in excess supplies, especially during the main harvest, causing price decline. Another reason for this low FER is the poor sales of farmer products. Social and transportation restrictions interfered with the food distribution process. Markets, hotels, restaurants, and other industries had to close or reduced the number of guests or consumers. This restriction also affected the freshness of agricultural products, resulting in a decrease in agricultural commodity prices (Pulubuhu et al., 2020; Utami, 2020).

Finally, COVID-19 pandemic led to job losses and reduced working hours. This phenomenon has resulted in a decrease in people's purchasing power and market demand, which can impact the decline in sales of agricultural commodities (see also Utami, 2020).

Conclusion

During the Covid-19 pandemic, Indonesia attempted to stabilize the price of horticultural commodities by increasing production and/or imports. The imported amounts of garlic and chili in 2020 were higher than those in 2019. This policy lowered the price of horticultural commodities in the market during the Covid-19 pandemic compared with the previous year. In addition, falling prices indicate that the Covid-19 pandemic caused a decrease in purchasing power or deflation in the economy.

Food import policies and social restrictions have a negative impact on farmers. The prices of garlic and chili at the farmer level are substantially lower than those in 2019. As a result, the welfare of horticultural farmers during this pandemic declined. The exchange rate of horticultural farmers in 2020 shows that the farmers experienced losses. The negative impact was also felt by consumers because social restrictions resulted in increased distribution costs and costlier shallot price.

The government needs to calculate domestic consumption and production accurately to avoid financially harming consumers and producers. The import policy was implemented when domestic supplies cannot meet national needs. Funds for food imports can be reallocated to subsidize food prices. This subsidy is expected to ensure that farmers sell products at a high price but at the level that is not expensive for consumers. This program can facilitate the increase in people's purchasing power. Meanwhile, improvement in food distribution is also urgently needed by providing access for food transport vehicles to enter areas that implement social restrictions.

References

Antonopoulos, V. Z., Papamichail, D. M, & Mitsiou, K. A. (2001). Statistical and trend analysis of water quality and quantity data for the Strymon River in Greece. *Hydrology and Earth System Sciences*, *5(4)*, 679-691. https://doi.org/10.5194/hess-5-679-2001.

Arifin, B., Achsani, N. A., Martianto, D., Sari, L. K. & Firdaus, A. H. (2018). Modeling the future of Indonesian food consumption. Jakarta, National Development Planning Agency, World Food Programme (WFP), and Food and Agricultural Organization of the United Nations (FAO).

Asian Development Bank (2015). *Policies support investment requirements of Indonesia's food and agriculture development during 2020-2045*. Mandaluyong, Asian Development Bank.

Asian Development Bank (2020). Food security in Asia and the Pacific amid the COVID-19 pandemic. *ADB Briefs., 139*, 1-15. http://dx.doi.org/10.22617/BRF200176-2.

Baldwin, R. & Tomiura, E. (2020). *Thinking ahead about the trade impact of Covid-19. In: economics in the Time of COVID-19*. London, Centre for Economic Policy Research.

Birnbaum, D., Ely, J. W., Dawson, J. D. & Lemke, J. H. (1997). An introduction to time-trend analysis. *Infection Control & Hospital Epidemiology.*, *18*(4), 267-274. https://doi.org/10.2307/30141214.

Central bureau statistics (2020). Indonesian Inflation Based on Expenditure. Jakarta, Central Bureau Statistics.

Citradi, T. (2020). The Price of Shallots is Hard to Tame, What is It? https://www.cnbcindonesia.com/news/20200504161530-4-156132/harga-bawang-merah-susah-jinak-ada-apa.

Department of Agriculture, Environment and Rural Affairs (2020). Grants and funding Covid-19 schemes for agriculture and horticulture sectors. https://www.daera-ni.gov.uk/publications/covid-19-schemes-agriculture-and-horticulture-sectors.

Donthu, N. & Gustafsson, A. (2020). Effects of COVID-19 on business and research. *Journal of Business Research., 117*, 284-289. https://doi.org/10.1016/j.jbusres.2020.06.008.

Erwidodo, W. G. & Stringer, R. (2009). Effects of agricultural policy reform in Indonesia on its food security and environment. In: Indonesia in a reforming world economy. Adelaide, University of Adelaide Press.

Food and Agriculture Organization of the United Nations (2020). COVID-19: Channels of Transmission to Food and Agriculture. Rome, Food and Agriculture Organization.

Greben, J. M. (2007). A theory of quantitative trend analysis and its application to South African general elections. *South African Journal of Science, 103*, 232-238.

Gregorio, G. B. & Ancog, R. C. (2020). Assessing the impact of the COVID-19 pandemic on agricultural production in Southeast Asia: toward transformative change in agricultural food systems. *Asian Journal of Agriculture and Development., 17(1),* 1-14. https://doi.org/10.22004/ag.econ.303781.

Heady, D., Heidkamp, R., Osendarp, S., Ruel, M., Scott, N., Black, R., Shekar, M., Bouis, H., Flory, A., Haddad, L. & Walker, N. (2020). Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. *The Lancet., 396*, 519-521. https://doi.org/10.1016/S0140-6736(20)31647-0.

Hivos (2020). Impact of Covid-19 on Women Workers in the Horticulture Sector in Kenya. Nairobi, Hivos, East Africa.

Indonesia Competition Authority (2020). Press conference of commission for the supervision of business competition number 18/KPPU-PR/IV/2020 about KPPU warns importer of garlic.

Indra, A. P. & Farida (2020). Imported garlic to enter domestic markets this month: minister. https://en.antaranews.com/news/147765/imported-garlic-to-enter-domestic-markets-this-month-minister.

Indriani, R., Darma, R., Musa, Y., Tenriawaru, A. N. & Arsyad, M. (2020). Policy design of cayenne pepper supply chain development. *Bulg. J. Agric. Sci., 26 (3)*, 499–506.

Joosten, F., Dijkxhoorn, Y., Sertse, Y. & Ruben, R. (2015). How does the fruit and vegetable sector contribute to food and nutrition security? Wageningen, LEI Wageningen UR (University & Research centre).

Kraus, S., Clauss, T., Breier, M., Gast, J., Zardini, A. & Tiberius, V. (2020). The economics of COVID-19. In: initial empirical evidence on how family firms in five European countries cope with the corona crisis. *International Journal of Entrepreneurial Behaviour & Research., 26(5),* 1067-1092. https://dx.doi.org/10.1108/IJEBR-04-2020-0214.

Lavrakas, P. J. (2008). Trend analysis. In: *Encyclopedia of survey research methods.* California, Sage Publishing. https://dx.doi.org/10.4135/9781412963947.n589.

Loeb, S., Dynarski, S., McFarland, D., Morris, P., Reardon, S. & Reber, S. (2017). Descriptive analysis in education: a guide for researchers. Washington DC, U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance.

Logan, T. (2014). Introduction to trend analysis. In profiting from market trends: simple tools and techniques for mastering trend analysis. New Jersey, Wiley Online Library. https://doi.org/10.1002/9781118835043.ch1.

Mckibbin, W. & Fernando, R. (2020). The economic impact of COVID-19. *In: economics in the time of COVID-19*. London, Centre for Economic Policy Research.

Muslim, R. Q. & Mulyani, A. (2019). Land characteristics and suitability for development of garlic in East Lombok Regency, West Nusa Tenggara Province. *IOP Conf. Series: Earth and Environmental Science, 393 (2019) 012079*, 1-8. https://doi.org/10.1088/1755-1315/393/1/012079.

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M. & Agha, R. (2020). The socio-economic implications of the corona virus pandemic (COVID-19): a review. *International Journal of Surgery, 78*, 185-193. https://doi.org/10.1016/j.ijsu.2020.04.018.

Nugroho, A. D., Utami, S. N. U., Yuslianti, Y., Nurrokhmah, L., Al Huda, M. A., Suryani, L., Riyadi, I., Ulfaizah., Septijono, T. & Adhini, H. A. N. (2017). Implementation of the food self-sufficiency special effort program in Wonosobo Regency, Central Java Province. *Jurnal Pengabdian kepada Masyarakat (Indonesian Journal of Community Engagement)., 3(1)*, 1-17. https://doi.org/10.22146/jpkm.27345.

Oravsky, R., Toth, P. & Banociova, A. (2020). The ability of se-

lected European countries to face the impending economic crisis caused by COVID-19 in the context of the global economic crisis of 2008. *Journal of Risk and Financial Management*., *13,* 233-264. https://doi.org/10.3390/jrfm13100233.

Parwada, C. (2020). COVID-19 outbreak lockdown and its impacts on marketing of horticultural produces in Zimbabwe. *International Journal of Horticultural Science, 26,* 38-45. https://doi.org/10.31421/IJHS/26/2020/6178.

Patle, G. T. & Libang, A. (2014). Trend analysis of annual and seasonal rainfall to climate variability in North-East region of India. *Journal of Applied and Natural Science, 6(2),* 480-483.

Poudel, P. B., Poudel, M. R, Gautam, A., Phuyal, S., Tiwari, C. K., Bashyal, N. & Bashya, S. (2020). Covid-19 and its global impact on food and agriculture. *Journal Biology Today's World, 9(5),* 221-224. https://doi.org/10.3390/ijerph17165775.

Pulubuhu, D. A. T., Unde, A. A., Sumartias, S., Sudarmo & Seniwati (2020). The economic impact of COVID-19 outbreak on the agriculture sector. *International Journal of Agriculture System, 8(1),* 57-63. http://dx.doi/10.20956/ijas.v8i1.2337.

Rae, A. (2014). Trend analysis. In: Michalos A. C. (eds) Encyclopedia of quality of life and well-being research. Berlin, Springer. https://doi.org/10.1007/978-94-007-0753-5_3062.

Roy, N. D., Tomycho, O. & Charles, K. (2020). The impact of the covid-19 pandemic on price disparities and fluctuations of shallot in traditional markets. *Russian Journal of Agricultural and Socio-Economic Sciences., 103(7),* 113-119. https://doi.org/10.18551/rjoas.2020-07.14.

Rusdiana, S. & Talib, C. (2020). National strategy and policy on the agricultural sector during the Covid-19 outbreak. *SOCA Jurnal Sosial Ekonomi Pertanian, 14(3),* 572-590. https://doi.org/10.24843/SOCA.2020.v14.i03.p17.

Rusmana, Y. (2020). Garlic prices jump in Indonesia on worries about Chinese exports. https://www.bloomberg.com/news/articles/2020-02-10/garlic-prices-jump-in-indonesia-on-worries-about-chinese-exports.

Seleiman, M., Selim, S, Alhammad, B, A., Alharbi, B. M. & Cezar, J. F. (2020). Will novel coronavirus (COVID-19) pandemic impact agriculture, food security and animal sectors? *Bioscience Journal, 36(4),* 1315-1326. https://doi.org/10.14393/BJ-v36n4a2020-54560.

Singh, A. K., Singh, L. & Kumar, S. (2020). Impact of COVID-19 on agriculture and allied sectors. *Journal of Community Mobilization and Sustainable Development, 15(1),* 8-16.

Thorbecke, W. (2020). The Impact of the COVID-19 pandemic on the U.S. economy: evidence from the stock market. *Journal of Risk and Financial Management*., *13,* 179-194. https://doi.org/10.3390/jrfm13080179.

Tomas, L. (2014). Trend analysis of human resources development representing the base for researchers in selected economies. *Journal of Competitiveness, 6(1),* 71-86. https://doi.org/10.7441/joc.2014.01.05.

Utami, D. W. (2020). Food security and farmers' irony in the middle of the COVID-19 Pandemic. https://kependudukan.lipi.go.id/id/berita/53-mencatatcovid19/879-ketahanan-pangan-dan-ironi-petani-di-tengah-pandemi-covid-19.

Widarti, P. (2020). East Java farmers' chili harvest less absorbed during the Covid-19 pandemic. https://surabaya.bisnis.com/read/20200604/532/1248611/panen-cabai-petani-jatim-kurang-terserap-saat-pandemi-covid-19.

Wie, T. K. (2000). The impact of the economic crisis on Indonesia's manufacturing sector. *The Developing Economies, XXXVIII-4 (December 2000),* 420-453. https://doi.org/10.1002/app5.264

World Farmer Organization (2020). Covid-19 outbreak pandemic: overview of the impact on the agricultural sector. https://www.wfo-oma.org/wp-content/uploads/2020/05/COVID19-WFO-technical-assessment_005082020.pdf.

Received: November 10, 2020; *Accepted:* July 26, 2021; *Published:* October, 2021