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Agribusiness, Faculty of Animal and Agricultural Science, Diponegoro University

Drh. Soejono Koesoemowardojo Tembalang Campuss – Semarang Indonesia 50275

Telp/fax: 024-7474750 Email: [agrisocionomcs@gmail.com](mailto:agrisocionomcs@gmail.com)

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### INVESTMENT AND RESILIENCE OF THE AGRICULTURAL SECTOR IN FACING THE COVID-19 CRISIS

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## INVESTMENT AND RESILIENCE OF THE AGRICULTURAL SECTOR IN FACING THE COVID-19 CRISIS

Arman Arman<sup>1\*</sup>, Asep Saefuddin<sup>2</sup>, Fathia Anggriani Pradina<sup>3</sup>, Sri Yusnita  
Burhan<sup>4</sup>

<sup>1</sup>Program Studi Agribisnis Universitas Trilogi, Jl. TMP Kalibata, Jakarta Selatan  
12760, Indonesia

<sup>2</sup>Dept Statistika Fakultas MIPA Institut Pertanian Bogor, Jl. Raya Dramaga, Jawa  
Barat 16680, Indonesia

<sup>3</sup>Program Studi Manajemen Universitas Trilogi, Jl. TMP Kalibata, Jakarta Selatan  
12760, Indonesia

<sup>4</sup>Program Studi Ekonomi Pembangunan Universitas Trilogi, Jl. TMP Kalibata,  
Jakarta Selatan 12760, Indonesia

Corresponding author: [arman@universitas-trilogi.ac.id](mailto:arman@universitas-trilogi.ac.id)

### ABSTRACT

The Covid-19 caused a global crisis that threatened food security, food availability and disrupted the supply chains of various countries, but this did not happen to the agricultural sector in Indonesia. This study aims to (1) examine the role of the agricultural sector during the pandemic, (2) analyze the level of investment efficiency on the growth of the agricultural sector before and during the pandemic and (3) formulate policy solutions for the agricultural sector to face the crisis. The research method uses the Incremental Capital Output Ratio (ICOR) analysis and a literature study approach sourced from journals, government agency reports and government policies. The performance of the agricultural sector is still efficient in the 2012-2019 range, although the ICOR value during that period is relatively increasing and growth tends to decline. The resilience of the agricultural sector was marked by positive growth while other sectors experienced contraction. The agricultural sector faces food supply chain constraints, food loss and loss of added value. The triggers are long distribution chains, technology, high input costs, road and transportation infrastructure. The government and industry must support the provision of supporting infrastructure; namely technology, infrastructure, human resources, and institutional strengthening. Food diversification, industry 4.0, superior seeds and the food supply chain are part of mitigation and adaptation that need to be supported by strong human and institutional resources. Farmers have proven to play a vital role in food supply and security during the pandemic.

**Keywords:** *agriculture, investment, resilience*

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## BACKGROUND

The Covid-19 pandemic provides valuable lessons about food security and agriculture in general. First, agriculture is a strong sector that can save the national economy during the pandemic. Second, the government should pay attention to the skills and welfare of farmers. Third, the government needs to regulate the role of investment in the agricultural sector and the food supply chain to increase food production and national food security. This study aims to (1) the role of the agricultural sector during the Covid-19 pandemic crisis, (2) to analyze the relationship between investment and the growth of the agricultural sector before and during the Covid-19 pandemic crisis, and (3) the way out of the agricultural sector to face the crisis.

The agricultural sector has shown its resilience to face the Covid-19 crisis by continuing to grow positively when other sectors (industry, trade, construction, mining and transportation) decreased to the minus point. Throughout 2020, growth during the first quarter - fourth quarter (y-o-y) grew positively, respectively, namely 0.01 percent, 2.20 percent, 2.16 percent and 2.59 percent so that in aggregate it grew by 1.77 percent.

The export value of the agricultural sector increased to US\$ 4,119.0 million throughout 2020, or an increase of around 14.02 percent when compared to 2019. Furthermore, various agricultural commodities experienced an increase in exports including seasonal crops, annual plants, ornamental plants, capture fisheries, aquaculture and animal husbandry. and other agricultural commodities.

Table 1. Production value of agricultural commodities in 2013-2020

Year	Netto (thousand ton)	Value (Million US\$)	Value change (%)
2013	2,462.2	3,598.5	0.02
2014	2,777.3	3,373.3	-6.26
2015	3,621.5	3,726.5	10.47
2016	3,453.0	3,354.8	-9.97
2017	4,177.6	3,671.0	9.43
2018	4,345.4	3,431.0	-6.54
2019	4,981.7	3,612.4	5.29
2020	5,677.9	4,119.0	14.02

Source BPS (2021a)

The Food and Agriculture Organization (FAO) predicts that there will be a food shortage and emergency due to the Covid-19 pandemic. Indonesia can maintain domestic food security and increase the export value of food commodities by 14.02 percent. The agricultural sector is resilient to overcome the Covid-19 crisis when other sectors are experiencing contractions. The increase in the value of exports and production led to positive growth in the agricultural sector.

In Indonesia, the resilience of the agricultural sector is reflected in the increase in labor absorption during the Covid-19 pandemic. In 2020, the agricultural sector absorbs labor by 15.4 percent, the second highest after the wholesale and retail trade sector at 20.9 percent. In 2019, the population working in the agricultural sector was around 34.58 million or around 27.33 percent of the workforce structure. During the Covid-19 pandemic in 2020, the population working in the agricultural sector increased to 38.23 million people, around 29.76 percent. In the same year the number of unemployed increased from 5.29 percent in 2019 to 7.07 percent in 2020 (BPS, 2020a). The number of informal sector workers increased significantly in that year, namely 55.9 percent, increasing to 60.5 percent.

BPS (2020b) between 1 in 5 migrant workers in 2019 and 2020 has a main job in the wholesale and retail trade sector. The agriculture, forestry, and fisheries sectors absorb (15 percent in 2020 and 13 percent in 2019) quite a large immigrant workforce. Migration of people from cities to villages choose to work in the agricultural sector. Formal sector workers who experience layoffs (PHK) or who resign, choose to work in the agricultural sector. The agricultural sector is strong and able to reduce the Covid-19 crisis. The absorption of energy comes from the informal sector in the short term to maintain economic resilience and stability at the micro and macro levels of the agricultural sector. An increase in temporary workforce to increase the availability of food, fruits and vegetables during the Covid-19 pandemic in Europe, namely Italy. Subsequent increases in the use of unskilled and temporary workers in the livestock breeding sector (Cortignani et al, 2020). Huang (2020) migrant-rural workers to the agricultural sector have also increased since the country was hit by the Covid-19 outbreak and is expected to return to non-agricultural workers after the Covid-19 outbreak is under control.

### **Food Supply Chain**

Prices of several agricultural commodities experienced an increase and inflation in the fourth quarter of 2019 to the fourth quarter of 2020. The change in the value of inflation in that year's range, which was 0.49 percent, rose to 1.07 percent. On the other hand, commodity prices for local markets have increased so that the prices received by farmers also increase. Anugrah et al (2020) rice, sugar and shallots are food commodities that have been identified as experiencing an increase. An important lesson from supply shortages in several cities in India is that dramatic price increases have impacted on the urban poor. This implies the need for the development of sustainable agricultural development systems in developing countries (Kumar et al, 2021). Willy et al (2020) the Covid-19 pandemic has spread widely in African countries causing disruptions to production, productivity, planting season, supply chain of fertilizers and seeds so that it has an impact on prices of agricultural inputs. On the demand side, it disturbs farmers' income, unemployment and political instability.

The Covid-19 pandemic has made all countries aware of the security and reliability of the food system. Hobbs (2020) food supply chains sourced from local

suppliers can be more agile than larger supply chains. The speed of the food supply chain which can adapt to the shocks of the Covid-19 crisis has resulted in food security and supplies being met. Dudek and Spiewak (2022) reduce the negative impact of the crisis through the implementation of the fork strategy's principle, namely ensuring a sustainable food value chain.

The Covid-19 pandemic has changed the behavior of consumers in Indonesia a lot. When the government implemented social distancing and large-scale social restrictions (PSBB), many supermarkets and shopping centers were closed to reduce the risk of the soaring number of people affected by the Covid-19 virus. Consumers turned to smaller stores through online purchases for food and other products. This accelerates agricultural and agrifood supply chains.

Innovation technology and industry 4.0 can help mobilize the flow of goods, on the other hand maintain the mobility of people to go out shopping, especially in urban areas. The government continues to provide flexibility for the mobility of food commodities that come from villages to meet the food needs of urban communities. The weakness of the logistics system is not being able to estimate the dynamics of demand and supply in real time. Industrial technology 4.0 can provide real-time information related to logistics system information that is the focus of food supply chain management.

### Farmer's Exchange Rate

Even though the price of agricultural products rose, the farmer's exchange rate fell in 2020, again in 2021. The Covid-19 crisis brought shocks to agricultural input prices, agricultural commodity prices, social and inter-regional interaction locks. Large-scale social restrictions (PSBB) and lockdown policies hinder the flow of goods from the demand and supply side, thus affecting input and output prices to be more expensive. The price of some food commodities during Covid-19 rose but the farmer's exchange rate fell in 2020. The reason is that the price of agricultural production inputs increases, thereby increasing farm production costs. In detail, the Farmer's Terms of Trade (NTP) is presented in Figure 1.

Year	NTP	Description
Dec-2017	103.06	Before Covid-19
Dec-2018	103.16	Before Covid-19
Dec-2019	104.46	Before Covid-19 in Indonesia
Dec-2020	102.09	Covid-19 pandemic
Dec-2021	108.34	Covid-19 pandemic
Mar-2022	108.46	After Covid-19 pandemic



Figure 1. Farmer's exchange rate Source BPS, processed

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The main reason for the increase in food prices is the management of the food supply chain on a local and national scale. The distribution of goods is constrained due to social restrictions and farmers' concerns about the deadly virus

Covid-19. Fortunately, the exchange rate of farmers has increased again in 2021, the main trigger being the rising price of palm oil in the global market. Oil palm plantations, which are mostly located on the islands of Sumatra and Kalimantan, affect the increase in the FTT of oil palm farmers. The government needs to support the stability of NTP by strengthening the food supply chain.

### Agricultural Sector Policy

OECD countries increased budget allocations to the agriculture and food sectors during and after the Covid-19 crisis. Most of the budget was to meet domestic food assistance, support for agriculture and food supply chains. Furthermore, the crisis is driving changes that require future improvements in agriculture and food and food supply chains (Gruère and Brooks, 2020). The Ministry of Finance (2020) allocates social protection financing through the National Economic Recovery (PEN) program to strengthen the demand side. Groups that are vulnerable to Covid-19 and have a strategic role in the economy are of concern to the government, especially farmers. The business sector received social assistance and farming financing by 18.4 percent, the largest compared to other working groups and businesses. Government assistance to private sector workers, construction workers, factory workers, communication sector workers, fishermen, mining sector workers and electricity and gas workers, respectively, amounted to 4.20 percent, 3.40 percent, 3.30 percent, 1.30 percent, 0.90 percent, 0.30 percent and 0.10 percent. In detail, business field assistance and business protection for handling the Covid-19 crisis are presented in Figure 2.

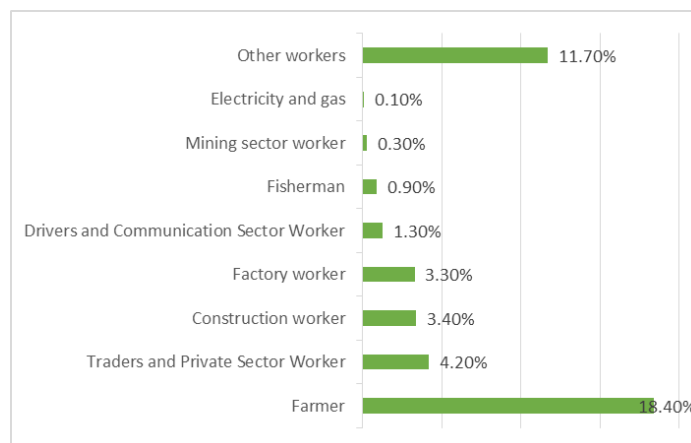


Figure 2. Assistance and protection for the handling of the Covid-19 crisis  
Source; Ministry of finance (2020)

The government realizes that farmers maintain food availability and security. During Covid-19, the price of production inputs rose so that it was relatively less affordable for farmers. On the other hand, food supplies are

threatened because the PSBB policy disrupts the food supply chain, which has implications for rising food prices. This social assistance helps farmers to ease the financing of production inputs so that farming activities can be more productive. Provision of facilities and infrastructure, market access and smooth supply chain is an integral part of this policy. The implications of the policy result in (1) achieving food security, (2) food availability and (3) food affordability. Even though there was an increase in prices, the government was still relatively able to control it.

Armed with the experience of Covid-19, the government needs to make a risk register as a way out of overcoming the food crisis (Qintharah, 2016). Jaafari (2001) farmers and institutions need to understand the analysis of risk approaches including (1) price, market and volume risks, (2) technical and financial risks, (3) organizational and operational risks, (4) environmental and political risks and (5) force majeure. Farmers and institutions have a risk register accompanied by solutions for handling it. Indeed, the relationship that is built between farmers and partners is not only profit sharing but must consider risk sharing. Often the risk is more burdened by upstream activities, so the risks that arise have a greater impact on farmers. Market, price, volume and financial risks are often the burden of upstream activities. The risk register is an instrument to describe the risks borne between stakeholders and the solutions. This can strengthen the resilience of the agricultural sector to face various risks. Good risk management helps food security, availability, affordability and accessibility.

Lioutas and Charatsari (2021) describe three important policy factors that must be considered to strengthen the resilience of the agricultural sector (1) crisis management planning and capacity building for farmers, (2) promoting marketing channels and (3) implementation smart technology and big data can help farmers solve the problem. The institutional support through the formal rules of the game and the play of the game will determine the success of the policy (Williamson et al., 2008). Dudek and Spiewak (2021) institutional procedures have weaknesses in overcoming the socio-economic crisis and the food supply chain during the Covid-19 pandemic. One of the weaknesses is related to the formal rules of the game which have not been able to protect farmers. The protection of farmers in terms of input and output has not been optimal. High input prices during the pandemic show that regulations have not fully protected farmers. The government needs to revive collective action through institutional strengthening of farmer groups (Ostrom, 1990). Institutions as a cognitive framework (rules, norms, values) that give birth to collective action. The level of institutional adaptation becomes strong if it is based on values and collective action.

The Agri Food Chain institutional system must adapt to various kinds of crises by implementing Good Agricultural Practices (GAP). The reason for the increase in local food prices during the Covid-19 crisis was the unintegrated management of the Agri Food Chain. The processing of the Agri Food Chain is part of the mitigation and adaptation of crisis management so that prices and food supply are stable. Infrastructure development, farmer education, technology provision, transportation and institutions are ways to mitigate and adapt to national food security. Farming requires the support and use of digital technology to produce good, diversified and healthy food at an efficient cost (De Clercq et al., 2018).

Control in terms of inputs and outputs of agricultural cultivation and marketing is largely determined by food chain management. Food security requires

formulas and farming systems, technology and institutions into food chain management. The formula invites farming groups to develop multifunctionality that is integrated with technology and the food chain. Multifunctionality agriculture is an agricultural cultural activity that does not rely on one type of commodity and pays attention to environmental sustainability. Agus et al (2006) multifunctionality of agriculture maintains the conservation of water resources and prevents soil erosion and functions very vitally as food security, environment, ecological agriculture and cultural heritage preservation (Huylbroeck et al., 2007; Baharsjah, 2006). Its role at the same time is village development through the promotion of ecotourism and entrepreneurship (Nugroho et al., 2016)

## RESEARCH METHOD

Harrod (1948) developed the notion of the role and relationship of saving, investment and economic growth. Harrod-Domar stated that additional investment increases one unit of output. The higher the output value for each additional investment, the more efficient the investment (Jhingan, 2003). This further increases the demand for labor and national income (Harrod, 1973). The ICOR assumption is that changes in output are solely caused by changes in capital/investment. Factors other than investment such as the use of labor, application of technology and entrepreneurial capabilities are held constant (BPS, 2021b).

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Easterly (1997) Harrod-Domar's growth model has been very strategic to measure short-term economic performance through investment. Domar assumes that production capacity is proportional to capital stock and measures the capital-output ratio of investment in the food sector with output growth in the food sector in the short term. Boianovsky (2018) argues that development economists are aware that the Harrod-Domar growth model analyzes economic instability, not long-term economic projections.

The analytical methods in this study are literature review analysis, descriptive analysis and ICOR quantitative techniques. National and international scientific publications related to Covid-19 are a source of literature review. The literature review is integrated with descriptive analysis with data sources published by BPS, Bappenas and the Ministry of Finance of the Republic of Indonesia. The quantitative technique uses ICOR analysis to analyze the relationship between investment and the growth of the agricultural sector before and during the COVID-19 outbreak in Indonesia. This method is used to answer the research objectives, namely the role of the agricultural sector, the relationship of investment to the growth of the agricultural sector and solutions to the Covid-19 crisis. The data used to measure the level of investment efficiency and investment performance of the agricultural sector before the Covid-19 outbreak (2012-2019) and when the Covid-19 outbreak was still ongoing (2020-2021) sourced from BPS. The ICOR formula for analyzing the level of investment efficiency in the agricultural sector and changes in output in the agricultural sector are;

$$ICOR = \frac{\Delta K}{\Delta Y} = \frac{I}{\Delta Y} \dots \dots \dots (1)$$

Description:



ICOR = ICOR Value

I =  $\Delta K$  = Changes in agricultural sector capital

$\Delta Y$  = Changes in output in agriculture sector

I = Agriculture sector investment

Equation (1) can then be simplified to relate investment to changes in output. Mathematically as follows;

$$ICOR = \frac{I}{PDB_t - PDB_{t-1}} \dots\dots\dots (2)$$

## RESULT AND DISCUSSION

The Covid-19 pandemic crisis, although the growth of the agricultural sector decreased but still grew positively, namely 1.77 percent in 2020 and 1.92 percent in 2021. Meanwhile, the growth of the industrial, service and other sectors experienced a contraction (negative growth). The agricultural sector saved Indonesia from the impact of the Covid-19 crisis. Not only in terms of growth, but the agricultural sector was also able to absorb the informal sector and maintain security, supply, and food security.

The trigger for positive growth in the agricultural sector was the increase in the export value of most agricultural commodities. Indonesian medicinal plants, aromatics, and spices, the export value of these commodities increased 4.38 percent to US\$618.5 million in 2020. In 2021, the export value increased again by 23.79 percent to US\$765.7 million. Furthermore, the annual export value of fruit commodities increased by 8.63 percent in 2019 and 35.4 in 2020, to reach US\$323.5 million and US\$438.1 million, respectively. Although the value of fruit commodities declined in 2021, it was still higher than in 2019.

Furthermore, the value of clove exports increased by 3.54 percent in 2019 to US\$107.1 million and increased significantly by 61.72 percent in 2020 to reach US\$173.2 million. Vegetable commodities have increased very significantly over the last eight years. Exports of vegetable commodities were recorded at US\$ +85 million. In 2019, it increased to US\$113.9 million. In the livestock sector, the export value of wallet bird nest commodities in 2019 was US\$369.98 million, a significant increase of 48.47 percent to US\$540.4 million in 2020.

The fisheries sector has increased, especially in shrimp commodities. exports of captured shrimp commodities continued to increase to reach a value of US\$ 80.8 million and a weight of 3.2 thousand tons in 2020. Furthermore, the largest increase in the export value of fresh/chilled fish occurred in 2019 by 18.23 percent. In addition, there was a slight increase in the value in 2020, which was 0.56 percent, bringing the value to US\$125.8 million. Seaweed cultivation experienced a decline in export value in 2020 but increased by 23.5 percent in 2021. The export value of various agricultural commodities is presented in Figure 3.

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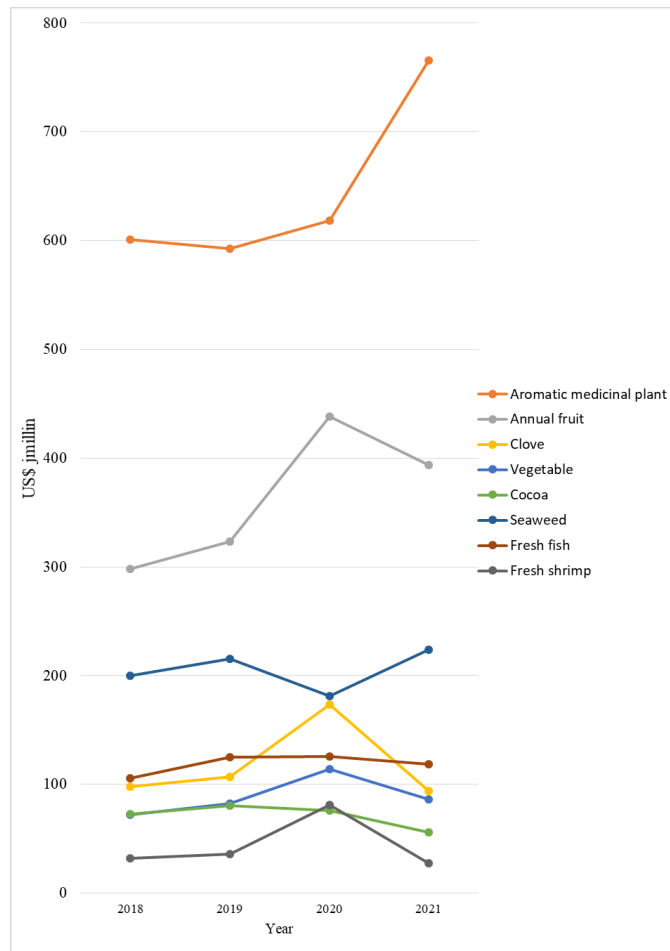


Figure 3. Export value of agricultural commodities, BPS (2021c), after processing

The Covid-19 crisis has caused world commodity prices to increase, especially in 2020. Global food demand is triggered by the concerns of various world countries regarding food conditions. This has caused global food demand to increase as part of guaranteeing food availability during the Covid-19 crisis. On the other hand, global supply chain constraints due to lock down policies in various countries have hampered the flow of food commodities. At the same time, agricultural production inputs have increased in price. Supply chain shocks increase the prices of local (Indonesian) food commodities, on the other hand, causing the prices of agricultural inputs to rise.

Food-producing countries also maintain domestic supplies and supplies, thereby limiting exports of these commodities. This situation brought global food prices to their highest point. The highest export value of food commodities in Indonesia is crude palm oil (CPO). This industry increased by 18.4 percent in 2020 to US\$18,444 million and rose again by 54.6 percent in 2021 to US\$28,516 million. Contribution to foreign exchange reserves of CPO reached a record high in the history of the palm oil industry in Indonesia. This shows the role of the agricultural sector is very strategic in maintaining national economic stability during Covid-19. The export value of several agricultural commodities will again decline in 2021, although global food prices are still high. Only medicinal plants and seaweed commodities experienced an increase in export value.

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The growth of the agricultural sector in the period 2012-2016 tends to decrease, namely 4.59 percent in 2012 and 3.36 percent in 2016. The amount of investment needed to produce an output of Rp. 1 trillion is Rp. 3.36 trillion in 2016. In 2017, the agricultural sector growth returned. rose to 3.93 percent but declined again in 2018 and 2019 to 3.88 percent and 3.61 percent, respectively. During the 2013-2017 period, investment growth in the agricultural sector reached 56.7 percent or 14.2 percent annually. Unfortunately, the increase in investment has not been accompanied by the performance of economic growth. The ICOR value continued to increase from 2012-2016, namely 0.57, 0.62, 0.92, 1.01 and 1.15. The increase in ICOR is still considered reasonable because its value is still lower than economic growth.

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In 2017, the increase in investment was accompanied by a 3.93 percent growth in the agricultural sector and a decrease in the ICOR value to 0.97. Unfortunately, the growth of the agricultural sector again fell to 3.88 percent, accompanied by an increase in the ICOR value to 1.23 in 2018. In 2019, the economic growth of the agricultural sector fell again to 3.66 percent with the ICOR value rising to 1.43. The agricultural sector experienced a trade-off, namely investment growth that was increasing but growth was decreasing and the ICOR value was increasing in 2012-2019. The agricultural sector is still efficient but the level of efficiency is decreasing, which is indicated by the investment value increasing but the ICOR value rising and growth decreasing.

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In 2020, the world experienced economic shocks due to the Covid-19 virus outbreak, so several sectors experienced contractions, except for the agricultural sector. This shock causes the ICOR value to rise and growth to fall beyond the ICOR value. When the Covid-19 virus broke out in 2020, the growth of the agricultural sector was only 1.7 percent while the ICOR value was 2.16. In 2021, the growth of the agricultural sector will increase by 1.84 percent with an ICOR value of 1.92 percent. During the Covid-19 crisis, the agricultural sector tended to be less efficient, which was marked by a higher ICOR value than economic growth. Rising raw material (input) prices, activity restrictions, supply chain constraints and uncertainty due to the COVID-19 crisis caused agricultural sector output to decline and investment performance was not optimal. In detail, the development of ICOR and the growth of the agricultural sector is presented in Figure 4.

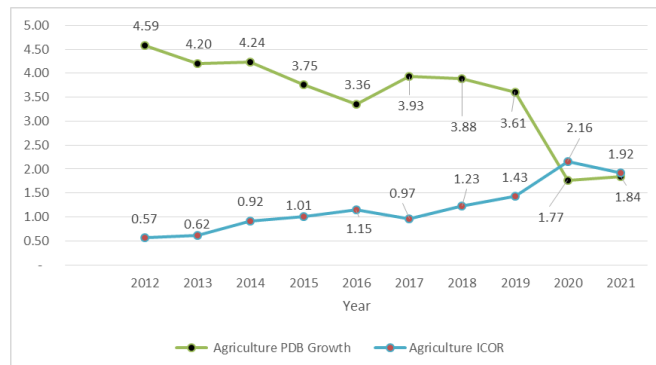


Figure 4. ICOR development and agricultural sector growth

Osorio et al (2011) 40 percent of large farmers/are capable of accessing subsidized fertilizers by 60 percent. Subsidized fertilizers that should be allocated to small and poor farmers are only able to access 40 percent of subsidized fertilizers. Furthermore, the allocation of subsidized fertilizers only meets 40 percent of the need for subsidized fertilizers (Bappenas, 2021). The government's limitation in providing subsidized fertilizer is due to limited budget considerations. The supply of subsidized fertilizers is unable to meet the market demand for subsidies, thus triggering a shortage of subsidized fertilizers and causing subsidized fertilizer prices to rise. Fertilizer investment becomes ineffective and inefficient because it creates price distortions, scarcity and the price of subsidized fertilizer exceeds the price set by the government. On the other hand, agricultural inputs become more expensive.

Food supply chain constraints are due to long distribution chains (many intermediaries involved), transportation problems, storage and processing infrastructure, high water content and input costs and road infrastructure. The extended distribution chain causes the margin and added value received by farmers to be smaller. Limited storage technology (cold chain) affects the durability of post-harvest results so that the quality is low and easily damaged. Limited drying technology causes low product quality. The road infrastructure network is not yet supported so transportation costs are expensive. The input of expensive fertilizers and seeds affects the financing of farming businesses. These various obstacles result in high food loss and expensive transportation costs so that farming business margins are low. The risk becomes greater because the Covid-19 outbreak creates uncertainty on the demand and supply sides, thus creating a shock to the agricultural sector.

Hayuningtyas and Yuliasih (2020) mitigating food loss and added value in the food supply chain that needs attention include (1) objective elements including added value, supply chain, price guarantees, facilities and infrastructure and Good Agriculture Practice (GAP), (2) elements constraints include cropping patterns, price fluctuations and capacity building, (3) institutional elements include farmer groups, business groups and cooperatives, (4) benchmark elements include market

access, information disclosure, guaranteed supply and packaging and (5) change elements include regulation appropriate cropping pattern and minimum price, product quality and technology application.

Implementation of these various elements through collective action and institutional strengthening. The development of the food supply chain has to move to a digital 4.0 basis. Efforts to mitigate and adapt to food security, such as technology and road infrastructure, food diversification, farmer education, technology provision and transportation must be digital based so that food supply chain control is integrated. De Clercq et al (2018) about 33-55 percent of the world's food is never eaten due to weak food supply chains and human awareness. Hausmann et al (2008) countries that can carry out economic diagnostics to overcome binding constraints can produce better profit cycles and production capacity (Rodrik 1999). Therefore, digitizing the food supply chain must be a priority for investment policies to strengthen the resilience of the agricultural sector.

### CONCLUSION

The role of the agricultural sector during the COVID-19 crisis was very strategic and had very strong resilience. The role of the agricultural sector in resilience includes the value of export commodities of various agricultural products increasing rapidly, food security protecting Indonesia from the threat of hunger, absorbing labor, increasing foreign exchange and increasing the exchange rate of farmers. The performance of the agricultural sector is still efficient in the 2012-2019 range of investment. Unfortunately, the ICOR value during that period was relatively increasing, while growth tended to decrease, indicating that the level of efficiency was decreasing (but still efficient). The resilience and resilience of the agricultural sector were marked by positive growth while other sectors experienced contraction during the Covid-19 crisis.

The agricultural sector faced food supply chain constraints during the Covid-19 crisis, causing food loss and loss of added value. The triggers are long distribution chains, storage and processing infrastructure, high water content and input costs, road and transportation infrastructure. The government and industry must support farmers by providing supporting infrastructure, namely technology and infrastructure. No less important is providing skilled human resources and institutional strengthening. Food diversification, industry 4.0, superior seeds and food supply chains are part of mitigation and adaptation that need to be supported by skilled human resources and strong institutions. Farmers have proven to play a vital role in food supply and security during the COVID-19 pandemic.

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## REFERENCES

- Agus, F., Irawan, I., Suganda, H., Wahyunto, W., Setiyanto, A., & Kundarto, M. (2006). Environmental multifunctionality of Indonesian agriculture. *Paddy and Water Environment*, 4(4), 181-188.
- Anugrah, I. S., Saputra, Y. H., & Sayaka, B. (2020). Dampak Pandemi Covid-19 pada Dinamika Rantai Pasok Pangan Pokok. *Jurnal Sosial Ekonomi Pertanian*.
- Baharsjah, S. (2006). Multifunctionality Of Agriculture The Indonesian Case. [Bappenas] Badan Perencanaan dan Pembangunan Nasional. (2021). Kebijakan Nasional Penyediaan Pupuk Pertanian. Bahan Paparan Focus Group Discussion (FGD); Mencari Solusi Kebijakan Pupuk Nasional yang Efektif dan Efisien, PT Pupuk Kaltim, 14-15 Juli 2021, Jakarta.
- Boianovsky, M. (2018). Beyond capital fundamentalism: Harrod, Domar and the history of development economics. *Cambridge Journal of Economics*, 42(2), 477-504.
- [BPS] Badan Pusat Statistik. (2020a). Keadaan Ketenaga Kerjaan Indonesia. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2020b). Analisis Mobilitas Tenaga Kerja; Hasil Survei Angkatan Kerja Nasional. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2021a). Analisis Komoditas Ekspor 2013-2020; Sektor Pertanian Industri dan Pertambangan. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2021b). Analisis ICOR Provinsi Jawa Tengah Tahun 2016-2020. Badan Pusat Statistik. Jawa Tengah
- [BPS] Badan Pusat Statistik. (2021c). Ekspor Menurut Kelompok Komoditi dan Negara. Buletin Statistik Perdagangan Luar Negeri. Badan Pusat Statistik. Indonesia
- Cortignani, R., Carulli, G., & Dono, G. (2020). COVID-19 and labour in agriculture: Economic and productive impacts in an agricultural area of the Mediterranean. *Italian Journal of Agronomy*, 15(2), 172-181.
- De Clercq, M., Vats, A., & Biel, A. (2018). Agriculture 4.0: The future of farming technology. *Proceedings of the World Government Summit, Dubai, UAE*, 11-13.
- Dudek, M., & Śpiewak, R. (2022). Effects of the COVID-19 Pandemic on Sustainable Food Systems: Lessons Learned for Public Policies? The Case of Poland. *Agriculture*, 12(1), 61.
- Easterly, W. (1997). *The ghost of financing gap: how the Harrod-Domar growth model still haunts development economics* (No. 1807). World Bank Publications.
- Grùère, G., & Brooks, J. (2021). Characterising early agricultural and food policy responses to the outbreak of COVID-19. *Food Policy*, 100, 102017.
- Harrod, R. F. (1948). *Towards a Dynamic Economics: Some recent developments of economic theory and their application to policy*. MacMillan and Company, London.
- Harrod, R. (1973). *Economic dynamics*. Springer

- Hausmann, R., Rodrik, D., & Velasco, A. (2008). Growth diagnostics. *The Washington consensus reconsidered: Towards a new global governance*, 2008, 324-355.
- Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroéconomie*, 68(2), 171-176.
- Huang, J. K. (2020). Impacts of COVID-19 on agriculture and rural poverty in China. *Journal of Integrative Agriculture*, 19(12), 2849-2853.
- Jaafari, A. (2001). Management of risks, uncertainties and opportunities on projects: time for a fundamental shift. *International journal of project management*, 19(2), 89-101.
- Jhingan, M. L. (2003). Ekonomi Pembangunan dan Perencanaan [Economic Development and Planning]. *Jakarta: PT Raja Grafindo Persada*.
- Kementerian Keuangan (2020). Biaya Penanggulangan Covid-19. <https://www.kemenkeu.go.id/media/15368/biaya-penanganan-covid.pdf>
- Kumar, P., Singh, S. S., Pandey, A. K., Singh, R. K., Srivastava, P. K., Kumar, M., ... & Drews, M. (2021). Multi-level impacts of the COVID-19 lockdown on agricultural systems in India: The case of Uttar Pradesh. *Agricultural Systems*, 187, 103027.
- Lioutas, E. D., & Charatsari, C. (2021). Enhancing the ability of agriculture to cope with major crises or disasters: What the experience of COVID-19 teaches us. *Agricultural Systems*, 187, 103023.
- Hayuningtyas, M., & Yuliasih, I. (2020). Peningkatan Kinerja, Mitigasi Risiko Dan Analisis Kelembagaan Pada Rantai Pasok Cabai Merah Di Kabupaten Garut. *Jurnal Teknologi Industri Pertanian*, 30(1).
- Nugroho, I., Pramukanto, F. H., Negara, P. D., Purnomowati, W., & Wulandari, W. (2016). Promoting the rural development through the ecotourism activities in Indonesia. *American Journal of Tourism Management*, 5(1), 9-18.
- Osorio, C. G., Abriningrum, D. E., Armas, E. B., & Firdaus, M. (2011). *Who is benefiting from fertilizer subsidies in Indonesia?*. The World Bank.
- Ostrom, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press, 1990.
- Qintharah, Y.N. (2016). Perancangan Penerapan Manajemen Resiko Studi Kasus pada UMKM Saripakuan (CV Jarwal Maega Buana). *Tesis*, Program Magister Akuntansi, Universitas Indonesia. Jakarta.
- Rodrik, D. (1999). *The new global economy and developing countries: making openness work* (Vol. 24). Washington, DC: Overseas Development Council.
- Van Huylbroeck, G., Vandermeulen, V., Mettepenningen, E., & Verspecht, A. (2007). Multifunctionality of agriculture: a review of definitions, evidence and instruments. *Living reviews in landscape research*, 1(3), 1-43.
- Williamson, O. E., Brousseau, E., & Glachant, J. M. (2008). New institutional economics, a guidebook. *New Institutional Economics*, 181-202.
- Willy, D. K., Yacouba, D., Hippolyte, A., Francis, N., Michael, W., & Tesfamicheal, W. (2020). COVID-19 Pandemic in Africa: Impacts on agriculture and emerging policy responses for adaptation and resilience building. *Technol. Afr. Agric. Transform*, 1-15.

## INVESTMENT AND RESILIENCE OF THE AGRICULTURAL SECTOR IN FACING THE COVID-19 CRISIS

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Arman Arman<sup>1\*</sup>, Asep Saefuddin<sup>2</sup>, Fathia Anggriani Pradina<sup>3</sup>, Sri Yusnita  
Burhan<sup>4</sup>

<sup>1</sup>Program Studi Agribisnis Universitas Trilogi, Jl. TMP Kalibata, Jakarta Selatan  
12760, Indonesia

<sup>2</sup>Dept Statistika Fakultas MIPA Institut Pertanian Bogor, Jl. Raya Dramaga, Jawa  
Barat 16680, Indonesia

<sup>3</sup>Program Studi Manajemen Universitas Trilogi, Jl. TMP Kalibata, Jakarta Selatan  
12760, Indonesia

<sup>4</sup>Program Studi Ekonomi Pembangunan Universitas Trilogi, Jl. TMP Kalibata,  
Jakarta Selatan 12760, Indonesia

Corresponding author: [arman@universitas-trilogi.ac.id](mailto:arman@universitas-trilogi.ac.id)

### ABSTRACT

The Covid-19 caused a global crisis that threatened food security, food availability and disrupted the supply chains of various countries, but this did not happen to the agricultural sector in Indonesia. This study aims to (1) examine the role of the agricultural sector during the pandemic, (2) analyze the level of investment efficiency on the growth of the agricultural sector before and during the pandemic and (3) formulate policy solutions for the agricultural sector to face the crisis. The research method uses the Incremental Capital Output Ratio (ICOR) analysis and a literature study approach sourced from journals, government agency reports and government policies. The performance of the agricultural sector is still efficient in the 2012-2019 range, although the ICOR value during that period is relatively increasing and growth tends to decline. The resilience of the agricultural sector was marked by positive growth while other sectors experienced contraction. The agricultural sector faces food supply chain constraints, food loss and loss of added value. The triggers are long distribution chains, technology, high input costs, road and transportation infrastructure. The government and industry must support the provision of supporting infrastructure; namely technology, infrastructure, human resources, and institutional strengthening. Food diversification, industry 4.0, superior seeds and the food supply chain are part of mitigation and adaptation that need to be supported by strong human and institutional resources. Farmers have proven to play a vital role in food supply and security during the pandemic.

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**Keywords:** *agriculture, investment, resilience*

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## BACKGROUND

The Covid-19 pandemic provides valuable lessons about food security and agriculture in general. First, agriculture is a strong sector that can save the national economy during the pandemic. Second, the government should pay attention to the skills and welfare of farmers. Third, the government needs to regulate the role of investment in the agricultural sector and the food supply chain to increase food production and national food security. This study aims to (1) the role of the agricultural sector during the Covid-19 pandemic crisis, (2) to analyze the relationship between investment and the growth of the agricultural sector before and during the Covid-19 pandemic crisis, and (3) the way out of the agricultural sector to face the crisis.

The agricultural sector has shown its resilience to face the Covid-19 crisis by continuing to grow positively when other sectors (industry, trade, construction, mining and transportation) decreased to the minus point. Throughout 2020, growth during the first quarter - fourth quarter (y-o-y) grew positively, respectively, namely 0.01 percent, 2.20 percent, 2.16 percent and 2.59 percent so that in aggregate it grew by 1.77 percent.

The export value of the agricultural sector increased to US\$ 4,119.0 million throughout 2020, or an increase of around 14.02 percent when compared to 2019. Furthermore, various agricultural commodities experienced an increase in exports including seasonal crops, annual plants, ornamental plants, capture fisheries, aquaculture and animal husbandry- and other agricultural commodities.

Table 1. Production value of agricultural commodities in 2013-2020

Year	Netto (Thousand ton)	Value (Million US\$)	Value change (%)
2013	2,462.2	3,598.5	0.02
2014	2,777.3	3,373.3	-6.26
2015	3,621.5	3,726.5	10.47
2016	3,453.0	3,354.8	-9.97
2017	4,177.6	3,671.0	9.43
2018	4,345.4	3,431.0	-6.54
2019	4,981.7	3,612.4	5.29
2020	5,677.9	4,119.0	14.02

Source BPS (2021a)

The Food and Agriculture Organization (FAO) predicts that there will be a food shortage and emergency due to the Covid-19 pandemic. Indonesia can maintain domestic food security and increase the export value of food commodities by 14.02 percent. The agricultural sector is resilient to overcome the Covid-19 crisis when other sectors are experiencing contractions. The increase in the value of exports and production led to positive growth in the agricultural sector.

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In Indonesia, the resilience of the agricultural sector is reflected in the increase in labor absorption during the Covid-19 pandemic. In 2020, the agricultural sector absorbs labor by 15.4 percent, the second highest after the wholesale and retail trade sector at 20.9 percent. In 2019, the population working in the agricultural sector was around 34.58 million or around 27.33 percent of the workforce structure. During the Covid-19 pandemic in 2020, the population working in the agricultural sector increased to 38.23 million people, around 29.76 percent. In the same year the number of unemployed increased from 5.29 percent in 2019 to 7.07 percent in 2020 (BPS, 2020a). The number of informal sector workers increased significantly in that year, namely 55.9 percent, increasing to 60.5 percent.

BPS (2020b) between 1 in 5 migrant workers in 2019 and 2020 has a main job in the wholesale and retail trade sector. The agriculture, forestry, and fisheries sectors absorb (15 percent in 2020 and 13 percent in 2019) quite a large immigrant workforce. Migration of people from cities to villages choose to work in the agricultural sector. Formal sector workers who experience layoffs (PHK) or who resign, choose to work in the agricultural sector. The agricultural sector is strong and able to reduce the Covid-19 crisis. The absorption of energy comes from the informal sector in the short term to maintain economic resilience and stability at the micro and macro levels of the agricultural sector. An increase in temporary workforce to increase the availability of food, fruits and vegetables during the Covid-19 pandemic in Europe, namely Italy. Subsequent increases in the use of unskilled and temporary workers in the livestock breeding sector (Cortignani et al, 2020). Huang (2020) migrant-rural workers to the agricultural sector have also increased since the country was hit by the Covid-19 outbreak and is expected to return to non-agricultural workers after the Covid-19 outbreak is under control.

### **Food Supply Chain**

Prices of several agricultural commodities experienced an increase and inflation in the fourth quarter of 2019 to the fourth quarter of 2020. The change in the value of inflation in that year's range, which was 0.49 percent, rose to 1.07 percent. On the other hand, commodity prices for local markets have increased so that the prices received by farmers also increase. Anugrah et al (2020) rice, sugar and shallots are food commodities that have been identified as experiencing an increase. An important lesson from supply shortages in several cities in India is that dramatic price increases have impacted on the urban poor. This implies the need for the development of sustainable agricultural development systems in developing countries (Kumar et al, 2021). Willy et al (2020) the Covid-19 pandemic has spread widely in African countries causing disruptions to production, productivity, planting season, supply chain of fertilizers and seeds so that it has an impact on prices of agricultural inputs. On the demand side, it disturbs farmers' income, unemployment and political instability.

The Covid-19 pandemic has made all countries aware of the security and reliability of the food system. Hobbs (2020) food supply chains sourced from local

suppliers can be more agile than larger supply chains. The speed of the food supply chain which can adapt to the shocks of the Covid-19 crisis has resulted in food security and supplies being met. Dudek and Spiewak (2022) reduce the negative impact of the crisis through the implementation of the fork strategy's principle, namely ensuring a sustainable food value chain.

The Covid-19 pandemic has changed the behavior of consumers in Indonesia a lot. When the government implemented social distancing and large-scale social restrictions (PSBB), many supermarkets and shopping centers were closed to reduce the risk of the soaring number of people affected by the Covid-19 virus. Consumers turned to smaller stores through online purchases for food and other products. This accelerates agricultural and agrifood supply chains.

Innovation technology and industry 4.0 can help mobilize the flow of goods, on the other hand maintain the mobility of people to go out shopping, especially in urban areas. The government continues to provide flexibility for the mobility of food commodities that come from villages to meet the food needs of urban communities. The weakness of the logistics system is not being able to estimate the dynamics of demand and supply in real time. Industrial technology 4.0 can provide real-time information related to logistics system information that is the focus of food supply chain management.

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### Farmer's Exchange Rate

Even though the price of agricultural products rose, the farmer's exchange rate fell in 2020, again in 2021. The Covid-19 crisis brought shocks to agricultural input prices, agricultural commodity prices, social and inter-regional interaction locks. Large-scale social restrictions (PSBB) and lockdown policies hinder the flow of goods from the demand and supply side, thus affecting input and output prices to be more expensive. The price of some food commodities during Covid-19 rose but the farmer's exchange rate fell in 2020. The reason is that the price of agricultural production inputs increases, thereby increasing farm production costs. In detail, the Farmer's Terms of Trade (NTP) is presented in Figure 1.

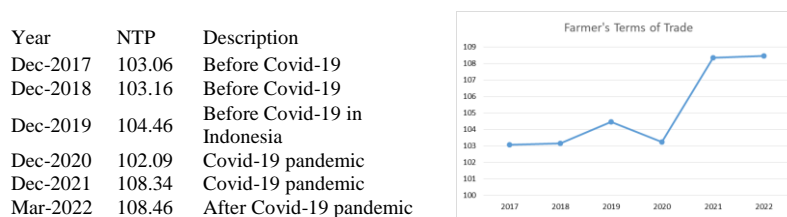


Figure 1. Farmer's exchange rate Source BPS, processed

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The main reason for the increase in food prices is the management of the food supply chain on a local and national scale. The distribution of goods is

constrained due to social restrictions and farmers' concerns about the deadly virus Covid-19. Fortunately, the exchange rate of farmers has increased again in 2021, the main trigger being the rising price of palm oil in the global market. Oil palm plantations, which are mostly located on the islands of Sumatra and Kalimantan, affect the increase in the FTT of oil palm farmers. The government needs to support the stability of NTP by strengthening the food supply chain.

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### Agricultural Sector Policy

OECD countries increased budget allocations to the agriculture and food sectors during and after the Covid-19 crisis. Most of the budget was to meet domestic food assistance, support for agriculture and food supply chains. Furthermore, the crisis is driving changes that require future improvements in agriculture and food and food supply chains (Gruère and Brooks, 2020). The Ministry of Finance (2020) allocates social protection financing through the National Economic Recovery (PEN) program to strengthen the demand side. Groups that are vulnerable to Covid-19 and have a strategic role in the economy are of concern to the government, especially farmers. The business sector received social assistance and farming financing by 18.4 percent, the largest compared to other working groups and businesses. Government assistance to private sector workers, construction workers, factory workers, communication sector workers, fishermen, mining sector workers and electricity and gas workers, respectively, amounted to 4.20 percent, 3.40 percent, 3.30 percent, 1.30 percent, 0.90 percent, 0.30 percent and 0.10 percent. In detail, business field assistance and business protection for handling the Covid-19 crisis are presented in Figure 2.

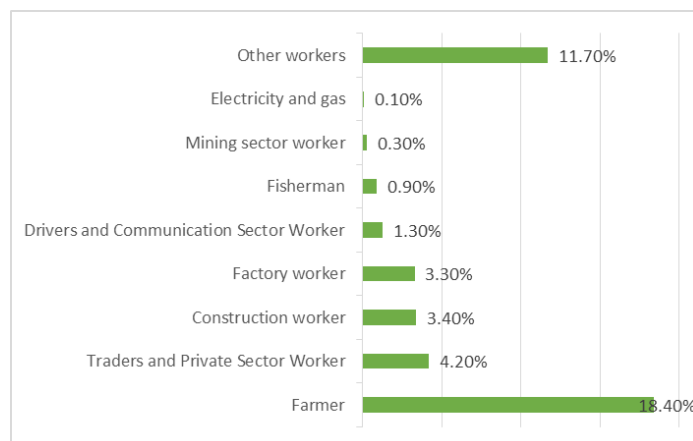


Figure 2. Assistance and protection for the handling of the Covid-19 crisis  
Source: Ministry of finance (2020)

The government realizes that farmers maintain food availability and security. During Covid-19, the price of production inputs rose so that it was

relatively less affordable for farmers. On the other hand, food supplies are threatened because the PSBB policy disrupts the food supply chain, which has implications for rising food prices. This social assistance helps farmers to ease the financing of production inputs so that farming activities can be more productive. Provision of facilities and infrastructure, market access and smooth supply chain is an integral part of this policy. The implications of the policy result in (1) achieving food security, (2) food availability and (3) food affordability. Even though there was an increase in prices, the government was still relatively able to control it.

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Armed with the experience of Covid-19, the government needs to make a risk register as a way out of overcoming the food crisis (Qintharah, 2016). Jaafari (2001) farmers and institutions need to understand the analysis of risk approaches including (1) price, market and volume risks, (2) technical and financial risks, (3) organizational and operational risks, (4) environmental and political risks and (5) force majeure. Farmers and institutions have a risk register accompanied by solutions for handling it. Indeed, the relationship that is built between farmers and partners is not only profit sharing but must consider risk sharing. Often the risk is more burdened by upstream activities, so the risks that arise have a greater impact on farmers. Market, price, volume and financial risks are often the burden of upstream activities. The risk register is an instrument to describe the risks borne between stakeholders and the solutions. This can strengthen the resilience of the agricultural sector to face various risks. Good risk management helps food security, availability, affordability and accessibility.

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Lioutas and Charatsari (2021) describe three important policy factors that must be considered to strengthen the resilience of the agricultural sector (1) crisis management planning and capacity building for farmers, (2) promoting marketing channels and (3) implementation smart technology and big data can help farmers solve the problem. The institutional support through the formal rules of the game and the play of the game will determine the success of the policy (Williamson et al., 2008). Dudek and Spiewak (2021) institutional procedures have weaknesses in overcoming the socio-economic crisis and the food supply chain during the Covid-19 pandemic. One of the weaknesses is related to the formal rules of the game which have not been able to protect farmers. The protection of farmers in terms of input and output has not been optimal. High input prices during the pandemic show that regulations have not fully protected farmers. The government needs to revive collective action through institutional strengthening of farmer groups (Ostrom, 1990). Institutions as a cognitive framework (rules, norms, values) that give birth to collective action. The level of institutional adaptation becomes strong if it is based on values and collective action.

The Agri Food Chain institutional system must adapt to various kinds of crises by implementing Good Agricultural Practices (GAP). The reason for the increase in local food prices during the Covid-19 crisis was the unintegrated management of the Agri Food Chain. The processing of the Agri Food Chain is part of the mitigation and adaptation of crisis management so that prices and food supply are stable. Infrastructure development, farmer education, technology provision, transportation and institutions are ways to mitigate and adapt to national food security. Farming requires the support and use of digital technology to produce good, diversified and healthy food at an efficient cost (De Clercq et al., 2018).

Control in terms of inputs and outputs of agricultural cultivation and marketing is largely determined by food chain management. Food security requires formulas and farming systems, technology and institutions into food chain management. The formula invites farming groups to develop multifunctionality that is integrated with technology and the food chain. Multifunctionality agriculture is an agricultural cultural activity that does not rely on one type of commodity and pays attention to environmental sustainability. Agus et al (2006) multifunctionality of agriculture maintains the conservation of water resources and prevents soil erosion and functions very vitally as food security, environment, ecological agriculture and cultural heritage preservation (Huylenbroeck et al., 2007; Baharsjah, 2006). Its role at the same time is village development through the promotion of ecotourism and entrepreneurship (Nugroho et al., 2016)

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## RESEARCH METHOD

Harrod (1948) developed the notion of the role and relationship of saving, investment and economic growth. Harrod-Domar stated that additional investment increases one unit of output. The higher the output value for each additional investment, the more efficient the investment (Jhingan, 2003). This further increases the demand for labor and national income (Harrod, 1973). The ICOR assumption is that changes in output are solely caused by changes in capital/investment. Factors other than investment such as the use of labor, application of technology and entrepreneurial capabilities are held constant (BPS, 2021b).

Easterly (1997) Harrod-Domar's growth model has been very strategic to measure short-term economic performance through investment. Domar assumes that production capacity is proportional to capital stock and measures the capital-output ratio of investment in the food sector with output growth in the food sector in the short term. Boianovsky (2018) argues that development economists are aware that the Harrod-Domar growth model analyzes economic instability, not long-term economic projections.

The analytical methods in this study are literature review analysis, descriptive analysis and ICOR quantitative techniques. National and international scientific publications related to Covid-19 are a source of literature review. The literature review is integrated with descriptive analysis with data sources published by BPS, Bappenas and the Ministry of Finance of the Republic of Indonesia. The quantitative technique uses ICOR analysis to analyze the relationship between investment and the growth of the agricultural sector before and during the COVID-19 outbreak in Indonesia. This method is used to answer the research objectives, namely the role of the agricultural sector, the relationship of investment to the growth of the agricultural sector and solutions to the Covid-19 crisis. The data used to measure the level of investment efficiency and investment performance of the agricultural sector before the Covid-19 outbreak (2012-2019) and when the Covid-19 outbreak was still ongoing (2020-2021) sourced from BPS. The ICOR formula for analyzing the level of investment efficiency in the agricultural sector and changes in output in the agricultural sector are;

$$ICOR = \frac{\Delta K}{\Delta Y} = \frac{I}{\Delta Y} \dots\dots\dots (1)$$

Description:

ICOR = ICOR Value

I =  $\Delta K$  = Changes in agricultural sector capital

$\Delta Y$  = Changes in output in agriculture sector

I = Agriculture sector investment

Equation (1) can then be simplified to relate investment to changes in output. Mathematically as follows;

$$ICOR = \frac{i}{PDB_t - PDB_{t-1}} \dots\dots\dots (2)$$

## RESULT AND DISCUSSION

The Covid-19 pandemic crisis, although the growth of the agricultural sector decreased but still grew positively, namely 1.77 percent in 2020 and 1.92 percent in 2021. Meanwhile, the growth of the industrial, service and other sectors experienced a contraction (negative growth). The agricultural sector saved Indonesia from the impact of the Covid-19 crisis. Not only in terms of growth, but the agricultural sector was also able to absorb the informal sector and maintain security, supply, and food security.

The trigger for positive growth in the agricultural sector was the increase in the export value of most agricultural commodities. Indonesian medicinal plants, aromatics, and spices, the export value of these commodities increased 4.38 percent to US\$618.5 million in 2020. In 2021, the export value increased again by 23.79 percent to US\$765.7 million. Furthermore, the annual export value of fruit commodities increased by 8.63 percent in 2019 and 35.4 in 2020, to reach US\$323.5 million and US\$438.1 million, respectively. Although the value of fruit commodities declined in 2021, it was still higher than in 2019.

Furthermore, the value of clove exports increased by 3.54 percent in 2019 to US\$107.1 million and increased significantly by 61.72 percent in 2020 to reach US\$173.2 million. Vegetable commodities have increased very significantly over the last eight years. Exports of vegetable commodities were recorded at US\$ +85 million. In 2019, it increased to US\$113.9 million. In the livestock sector, the export value of wallet bird nest commodities in 2019 was US\$369.98 million, a significant increase of 48.47 percent to US\$540.4 million in 2020.

The fisheries sector has increased, especially in shrimp commodities. exports of captured shrimp commodities continued to increase to reach a value of US\$ 80.8 million and a weight of 3.2 thousand tons in 2020. Furthermore, the largest increase in the export value of fresh/chilled fish occurred in 2019 by 18.23 percent. In addition, there was a slight increase in the value in 2020, which was 0.56 percent, bringing the value to US\$125.8 million. Seaweed cultivation experienced a decline in export value in 2020 but increased by 23.5 percent in 2021. The export value of various agricultural commodities is presented in Figure 3.

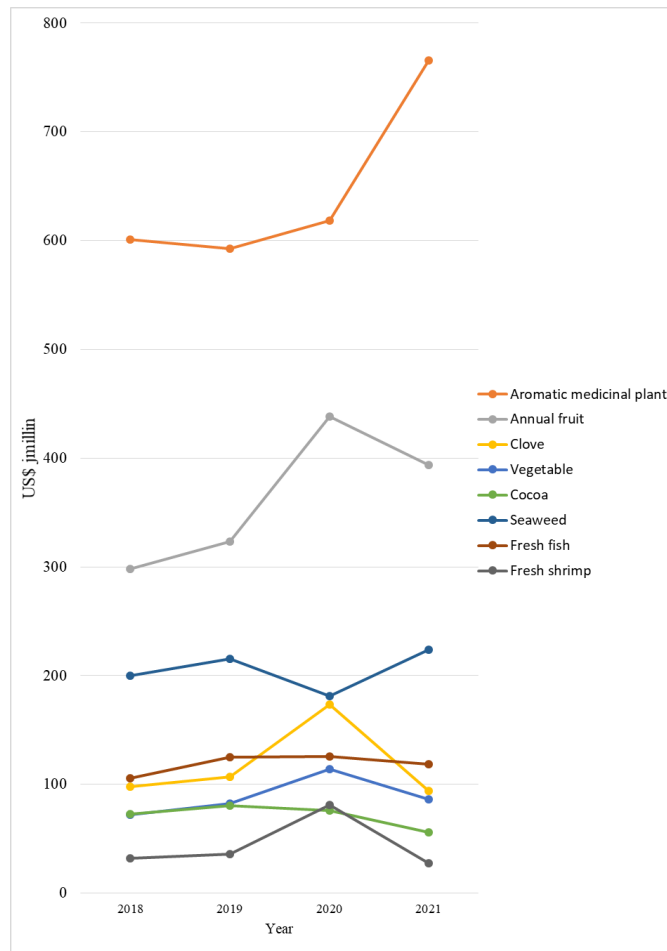


Figure 3. Export value of agricultural commodities, BPS (2021c), after processing

The Covid-19 crisis has caused world commodity prices to increase, especially in 2020. Global food demand is triggered by the concerns of various world countries regarding food conditions. This has caused global food demand to increase as part of guaranteeing food availability during the Covid-19 crisis. On the other hand, global supply chain constraints due to lock down policies in various countries have hampered the flow of food commodities. At the same time, agricultural production inputs have increased in price. Supply chain shocks increase the prices of local (Indonesian) food commodities, on the other hand, causing the prices of agricultural inputs to rise.



Food-producing countries also maintain domestic supplies and supplies, thereby limiting exports of these commodities. This situation brought global food prices to their highest point. The highest export value of food commodities in Indonesia is crude palm oil (CPO). This industry increased by 18.4 percent in 2020 to US\$18,444 million and rose again by 54.6 percent in 2021 to US\$28,516 million. Contribution to foreign exchange reserves of CPO reached a record high in the history of the palm oil industry in Indonesia. This shows the role of the agricultural sector is very strategic in maintaining national economic stability during Covid-19. The export value of several agricultural commodities will again decline in 2021, although global food prices are still high. Only medicinal plants and seaweed commodities experienced an increase in export value.

The growth of the agricultural sector in the period 2012-2016 tends to decrease, namely 4.59 percent in 2012 and 3.36 percent in 2016. The amount of investment needed to produce an output of Rp. 1 trillion is Rp. 3.36 trillion in 2016. In 2017, the agricultural sector growth returned. rose to 3.93 percent but declined again in 2018 and 2019 to 3.88 percent and 3.61 percent, respectively. During the 2013-2017 period, investment growth in the agricultural sector reached 56.7 percent or 14.2 percent annually. Unfortunately, the increase in investment has not been accompanied by the performance of economic growth. The ICOR value continued to increase from 2012-2016, namely 0.57, 0.62, 0.92, 1.01 and 1.15. The increase in ICOR is still considered reasonable because its value is still lower than economic growth.

In 2017, the increase in investment was accompanied by a 3.93 percent growth in the agricultural sector and a decrease in the ICOR value to 0.97. Unfortunately, the growth of the agricultural sector again fell to 3.88 percent, accompanied by an increase in the ICOR value to 1.23 in 2018. In 2019, the economic growth of the agricultural sector fell again to 3.66 percent with the ICOR value rising to 1.43. The agricultural sector experienced a trade-off, namely investment growth that was increasing but growth was decreasing and the ICOR value was increasing in 2012-2019. The agricultural sector is still efficient but the level of efficiency is decreasing, which is indicated by the investment value increasing but the ICOR value rising and growth decreasing.

In 2020, the world experienced economic shocks due to the Covid-19 virus outbreak, so several sectors experienced contractions, except for the agricultural sector. This shock causes the ICOR value to rise and growth to fall beyond the ICOR value. When the Covid-19 virus broke out in 2020, the growth of the agricultural sector was only 1.7 percent while the ICOR value was 2.16. In 2021, the growth of the agricultural sector will increase by 1.84 percent with an ICOR value of 1.92 percent. During the Covid-19 crisis, the agricultural sector tended to be less efficient, which was marked by a higher ICOR value than economic growth. Rising raw material (input) prices, activity restrictions, supply chain constraints and uncertainty due to the COVID-19 crisis caused agricultural sector output to decline and investment performance was not optimal. In detail, the development of ICOR and the growth of the agricultural sector is presented in Figure 4.

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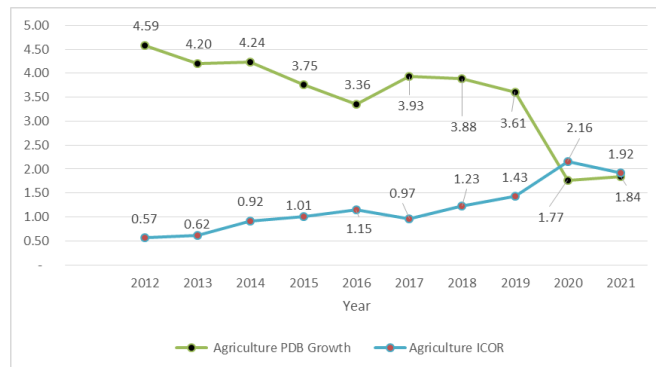


Figure 4. ICOR development and agricultural sector growth

Osorio et al (2011) 40 percent of large farmers/are capable of accessing subsidized fertilizers by 60 percent. Subsidized fertilizers that should be allocated to small and poor farmers are only able to access 40 percent of subsidized fertilizers. Furthermore, the allocation of subsidized fertilizers only meets 40 percent of the need for subsidized fertilizers (Bappenas, 2021). The government's limitation in providing subsidized fertilizer is due to limited budget considerations. The supply of subsidized fertilizers is unable to meet the market demand for subsidies, thus triggering a shortage of subsidized fertilizers and causing subsidized fertilizer prices to rise. Fertilizer investment becomes ineffective and inefficient because it creates price distortions, scarcity and the price of subsidized fertilizer exceeds the price set by the government. On the other hand, agricultural inputs become more expensive.

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Food supply chain constraints are due to long distribution chains (many intermediaries involved), transportation problems, storage and processing infrastructure, high water content and input costs and road infrastructure. The extended distribution chain causes the margin and added value received by farmers to be smaller. Limited storage technology (cold chain) affects the durability of post-harvest results so that the quality is low and easily damaged. Limited drying technology causes low product quality. The road infrastructure network is not yet supported so transportation costs are expensive. The input of expensive fertilizers and seeds affects the financing of farming businesses. These various obstacles result in high food loss and expensive transportation costs so that farming business margins are low. The risk becomes greater because the Covid-19 outbreak creates uncertainty on the demand and supply sides, thus creating a shock to the agricultural sector.

Hayuningtyas and Yuliasih (2020) mitigating food loss and added value in the food supply chain that needs attention include (1) objective elements including added value, supply chain, price guarantees, facilities and infrastructure and Good Agriculture Practice (GAP), (2) elements constraints include cropping patterns, price fluctuations and capacity building, (3) institutional elements include farmer groups, business groups and cooperatives, (4) benchmark elements include market

access, information disclosure, guaranteed supply and packaging and (5) change elements include regulation appropriate cropping pattern and minimum price, product quality and technology application.

Implementation of these various elements through collective action and institutional strengthening. The development of the food supply chain has to move to a digital 4.0 basis. Efforts to mitigate and adapt to food security, such as technology and road infrastructure, food diversification, farmer education, technology provision and transportation must be digital based so that food supply chain control is integrated. De Clercq et al (2018) about 33-55 percent of the world's food is never eaten due to weak food supply chains and human awareness. Hausmann et al (2008) countries that can carry out economic diagnostics to overcome binding constraints can produce better profit cycles and production capacity (Rodrik 1999). Therefore, digitizing the food supply chain must be a priority for investment policies to strengthen the resilience of the agricultural sector.

### **CONCLUSION**

The role of the agricultural sector during the COVID-19 crisis was very strategic and had very strong resilience. The role of the agricultural sector in resilience includes the value of export commodities of various agricultural products increasing rapidly, food security protecting Indonesia from the threat of hunger, absorbing labor, increasing foreign exchange and increasing the exchange rate of farmers. The performance of the agricultural sector is still efficient in the 2012-2019 range of investment. Unfortunately, the ICOR value during that period was relatively increasing, while growth tended to decrease, indicating that the level of efficiency was decreasing (but still efficient). The resilience and resilience of the agricultural sector were marked by positive growth while other sectors experienced contraction during the Covid-19 crisis.

The agricultural sector faced food supply chain constraints during the Covid-19 crisis, causing food loss and loss of added value. The triggers are long distribution chains, storage and processing infrastructure, high water content and input costs, road and transportation infrastructure. The government and industry must support farmers by providing supporting infrastructure, namely technology and infrastructure. No less important is providing skilled human resources and institutional strengthening. Food diversification, industry 4.0, superior seeds and food supply chains are part of mitigation and adaptation that need to be supported by skilled human resources and strong institutions. Farmers have proven to play a vital role in food supply and security during the COVID-19 pandemic.

## REFERENCES

- Agus, F., Irawan, I., Suganda, H., Wahyunto, W., Setiyanto, A., & Kundarto, M. (2006). Environmental multifunctionality of Indonesian agriculture. *Paddy and Water Environment*, 4(4), 181-188.
- Anugrah, I. S., Saputra, Y. H., & Sayaka, B. (2020). Dampak Pandemi Covid-19 pada Dinamika Rantai Pasok Pangan Pokok. *Jurnal Sosial Ekonomi Pertanian*.
- Baharsjah, S. (2006). Multifunctionality Of Agriculture The Indonesian Case. [Bappenas] Badan Perencanaan dan Pembangunan Nasional. (2021). Kebijakan Nasional Penyediaan Pupuk Pertanian. Bahan Paparan Focus Group Discussion (FGD); Mencari Solusi Kebijakan Pupuk Nasional yang Efektif dan Efisien, PT Pupuk Kaltim, 14-15 Juli 2021, Jakarta.
- Boianovsky, M. (2018). Beyond capital fundamentalism: Harrod, Domar and the history of development economics. *Cambridge Journal of Economics*, 42(2), 477-504.
- [BPS] Badan Pusat Statistik. (2020a). Keadaan Ketenaga Kerjaan Indonesia. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2020b). Analisis Mobilitas Tenaga Kerja; Hasil Survei Angkatan Kerja Nasional. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2021a). Analisis Komoditas Ekspor 2013-2020; Sektor Pertanian Industri dan Pertambangan. Badan Pusat Statistik, Indonesia
- [BPS] Badan Pusat Statistik. (2021b). Analisis ICOR Provinsi Jawa Tengah Tahun 2016-2020. Badan Pusat Statistik. Jawa Tengah
- [BPS] Badan Pusat Statistik. (2021c). Ekspor Menurut Kelompok Komoditi dan Negara. Buletin Statistik Perdagangan Luar Negeri. Badan Pusat Statistik. Indonesia
- Cortignani, R., Carulli, G., & Dono, G. (2020). COVID-19 and labour in agriculture: Economic and productive impacts in an agricultural area of the Mediterranean. *Italian Journal of Agronomy*, 15(2), 172-181.
- De Clercq, M., Vats, A., & Biel, A. (2018). Agriculture 4.0: The future of farming technology. *Proceedings of the World Government Summit, Dubai, UAE*, 11-13.
- Dudek, M., & Śpiewak, R. (2022). Effects of the COVID-19 Pandemic on Sustainable Food Systems: Lessons Learned for Public Policies? The Case of Poland. *Agriculture*, 12(1), 61.
- Easterly, W. (1997). *The ghost of financing gap: how the Harrod-Domar growth model still haunts development economics* (No. 1807). World Bank Publications.
- Grùère, G., & Brooks, J. (2021). Characterising early agricultural and food policy responses to the outbreak of COVID-19. *Food Policy*, 100, 102017.
- Harrod, R. F. (1948). *Towards a Dynamic Economics: Some recent developments of economic theory and their application to policy*. MacMillan and Company, London.

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- Harrod, R. (1973). *Economic dynamics*. Springer
- Hausmann, R., Rodrik, D., & Velasco, A. (2008). Growth diagnostics. *The Washington consensus reconsidered: Towards a new global governance*, 2008, 324-355.
- Hobbs, J. E. (2020). Food supply chains during the COVID-19 pandemic. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroéconomie*, 68(2), 171-176.
- Huang, J. K. (2020). Impacts of COVID-19 on agriculture and rural poverty in China. *Journal of Integrative Agriculture*, 19(12), 2849-2853.
- Jaafari, A. (2001). Management of risks, uncertainties and opportunities on projects: time for a fundamental shift. *International journal of project management*, 19(2), 89-101.
- Jhingan, M. L. (2003). *Ekonomi Pembangunan dan Perencanaan [Economic Development and Planning]*. Jakarta: PT Raja Grafindo Persada.
- Kementerian Keuangan (2020). Biaya Penanggulangan Covid-19. <https://www.kemenkeu.go.id/media/15368/biaya-penanganan-covid.pdf>
- Kumar, P., Singh, S. S., Pandey, A. K., Singh, R. K., Srivastava, P. K., Kumar, M., ... & Drews, M. (2021). Multi-level impacts of the COVID-19 lockdown on agricultural systems in India: The case of Uttar Pradesh. *Agricultural Systems*, 187, 103027.
- Lioutas, E. D., & Charatsari, C. (2021). Enhancing the ability of agriculture to cope with major crises or disasters: What the experience of COVID-19 teaches us. *Agricultural Systems*, 187, 103023.
- Hayuningtyas, M., & Yuliasih, I. (2020). Peningkatan Kinerja, Mitigasi Risiko Dan Analisis Kelembagaan Pada Rantai Pasok Cabai Merah Di Kabupaten Garut. *Jurnal Teknologi Industri Pertanian*, 30(1).
- Nugroho, I., Pramukanto, F. H., Negara, P. D., Purnomowati, W., & Wulandari, W. (2016). Promoting the rural development through the ecotourism activities in Indonesia. *American Journal of Tourism Management*, 5(1), 9-18.
- Osorio, C. G., Abriningrum, D. E., Armas, E. B., & Firdaus, M. (2011). *Who is benefiting from fertilizer subsidies in Indonesia?*. The World Bank.
- Ostrom, Elinor. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press, 1990.
- Qintharah, Y.N. (2016). Perancangan Penerapan Manajemen Resiko Studi Kasus pada UMKM Saripakuan (CV Jarwal Maega Buana). *Tesis*, Program Magister Akuntansi, Universitas Indonesia. Jakarta.
- Rodrik, D. (1999). *The new global economy and developing countries: making openness work* (Vol. 24). Washington, DC: Overseas Development Council.
- Van Huylenbroeck, G., Vandermeulen, V., Mettepenningen, E., & Verspecht, A. (2007). Multifunctionality of agriculture: a review of definitions, evidence and instruments. *Living reviews in landscape research*, 1(3), 1-43.
- Williamson, O. E., Brousseau, E., & Glachant, J. M. (2008). New institutional economics, a guidebook. *New Institutional Economics*, 181-202.
- Willy, D. K., Yacouba, D., Hippolyte, A., Francis, N., Michael, W., & Tesfamicheal, W. (2020). COVID-19 Pandemic in Africa: Impacts on

agriculture and emerging policy responses for adaptation and resilience building. *Technol. Afr. Agric. Transform*, 1-15.

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