

**INVESTMENT AND RESILIENCE OF THE AGRICULTURAL SECTOR FACING THE COVID 19 CRISIS****Arman<sup>1\*</sup>, Asep Saefuddin<sup>2</sup>, Fathia Anggriani Pradina<sup>1</sup>, and Sri Yusnita Burhan<sup>1</sup>**<sup>1</sup>Trilogi University, South Jakarta, Indonesia<sup>2</sup>Bogor Agricultural University, Bogor, Indonesia\*Correspondence Email: [arman@universitas-trilogi.ac.id](mailto:arman@universitas-trilogi.ac.id)

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**ABSTRACT**

The Covid 19 pandemic appeared suddenly and caused a global crisis that threatens the food security of various countries. The economy was paralyzed, 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 Covid-19 pandemic crisis, (2) analyze the level of investment efficiency in the growth of the agricultural sector before and during the Covid 19 pandemic crisis, and (3) formulate a policy solution for the agricultural sector facing the crisis. The research method uses Incremental Capital Output Ratio (ICOR) and descriptive methods. We are of the view that the agricultural sector has the resilience to face the Covid 19 crisis marked by positive growth, the second largest employment absorption, increased farmer exchange rates and exports. The performance of the agricultural sector was still efficient in the 2012-2019 range even though the ICOR value relatively rose and growth tended to decline. 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. Diversification of food, industry 4.0, high-quality seeds and food supply chain as part of mitigation and adaptation needs to be supported by technology, human resources and strong institutions. The agricultural sector has proven to play a vital role in economic resilience.

**Keywords:** *agricultural, economic, resilience investment***BACKGROUND**

The agricultural sector showed its resilience in facing the Covid 19 crisis while continuing to grow positively when other sectors (industry, trade, construction, mining and transportation) experienced contractions to the point of mines. During the first quarter – fourth quarter (y-o-y) of 2020 positive growth was successive, namely 0.01%, 2.20%, 2.16%, and 2.59% so in aggregate it grew 1.77% (BPS, 2020a). The export value of the agricultural sector reached US\$ 4,119.0 million, growing 14.02% with a net weight of 5,677.9 thousand tons throughout 2020. In detail, the development of agricultural commodities is presented in Table 1.

**Table 1.** Production Value of Agricultural Commodities in 2013-2020

Year	Netto (thousand ton)	Value (Million US\$)	Exchange Value (%)
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 there will be food shortages and emergencies due to the Covid 19 pandemic (FAO, 2020). The resilience of the agricultural sector is reflected in increased labor absorption and an increase in food exports by 14.02% during the Covid 19 pandemic. In 2020, the agricultural sector absorbed a workforce of 15.4%, the second highest after the wholesale and retail trade sector, which was 20.9%. In 2019, the population working in the agricultural sector was around 34.58 million or around 27.33% of the workforce structure which increased to 38.23 million (29.76%). The number of unemployed increased from 5.29% in 2019 to 7.07% in 2020 (BPS, 2020b). The number of informal sector workers increased significantly during that year, namely 55.9%, increasing to 60.5% (BPS, 2020b). An increase in informal sector workers, unskilled and temporary workers has also occurred in parts of European countries, namely Italy (Cortignani et al., 2020). BPS (2020c) the agricultural sector absorbs quite a large number of immigrant workers (from cities to villages). This has also happened in China, where the number of rural-migrant workers in the agricultural sector has increased since the country was hit by the Covid 19 outbreak (Huang, 2020).

The value of Domestic Investment (PMDN) and Foreign Investment (PMA) is dynamic throughout the year. The peak of PMDN investment in the agricultural sector occurred in 2019, namely Rp. 53,213 billion, then decreased to Rp. 33,824.9 in 2020 and rose again to Rp. 37,249 in 2021. Furthermore, the lowest point of FDI occurred in 2019, namely US\$ 1,037.3 million, then increased to US\$ 1.275 million in 2020 and will decrease again to US\$ 1,009.2 in 2021 (Ayuni et al., 2022).

The prices of several agricultural commodities experienced an increase as well as the inflation from the fourth quarter of 2019 to the fourth of 2020. The change in the inflation rate during that year ranged from 0.49% to 1.07%. Anugrah et al. (2020) rice, granulated sugar and shallots are food commodities whose prices have increased due to supply constraints. An important lesson is that supply constraints lead to dramatic increases in prices that impact the urban poor. This suggests the need to build a sustainable agricultural supply chain system in developing countries (Kumar et al, 2021). Willy et al. (2020) the Covid 19 pandemic has spread widely throughout the country that it has disrupted production, productivity, planting season, supply chain of fertilizers and seeds so it has an impact on the prices of agricultural inputs.

The Covid 19 pandemic has made the whole country aware of the security and reliability of the food system. Hobbs (2020) the speed of the food supply chain that can adapt to the shocks of the

Covid-19 crisis causes food security and supplies to be fulfilled. A sustainable food value chain reduces the negative impact of Covid 19.

The Covid 19 crisis brought shocks to agricultural input prices, agricultural commodity prices, social interactions and lockdowns between regions. The prices of some food commodities rose accompanied by an increase in the exchange rate for farmers in 2020. In general, the exchange rate increased from 102.09 in 2020 to 108.34. The people's plantation commodity has increased the most, namely from 111.8 in 2020 to 131.46 in 2021. However, the food exchange rate fell from 100.34 to 99.88 (BPS, 2021d).

The cause of the significant increase in the exchange rate for plantation sector farmers was the increase in world palm oil prices from \$752/mt in 2020, rising to \$1.131/mt in 2021 (World Bank, 2022). Furthermore, through Regulation of the Minister of Energy and Mineral Resources (ESDM) Number 12 of 2015 stipulates the use and mixing of 30% biofuel (palm oil) and 70% diesel oil (biodiesel) as vehicle materials, hereinafter referred to as B30. The use of B30 (mandatory policy) drives the price of palm biofuel to follow world prices. Forthmore, the exchange rate for food farmers fell behind the increase in the exchange rate for plantation farmers. The reason is that the price index received by farmers (109.24) is lower than the price paid by farmers (109.35). Furthermore, the increase in the index paid by farmers (Ib) was due to an increase in the Household Consumption Index (IKRT) by 2.12% and Production Costs and Additional Capital Goods (BPPBM) by 2.86% (BPS, 2021d).

OECD countries increased budget allocations to the agriculture and food sector 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 requires improvement in the agricultural and food sectors and food supply chains (Gruere and Brooks, 2020). Kementerian Keuangan (2020) allocates social protection financing through the National Economic Recovery (PEN) program to strengthen the demand side. The business fields that receive the most social assistance and financing are farmers at 18.4% compared to work groups and other businesses.

Lioutas and Charatsari (2021) explain three important policy factors that must be considered to strengthen the resilience of the agricultural sector (1) crisis management planning and farmer capacity building, (2) promoting marketing channels and (3) implementing smart technology and big data can help farmers solve the problem. Institutional support through the formal rules of the game and the play of the game greatly determines the success of the policy (Williamson et al., 2008). Dudek and Spiewak (2021) institutional procedures have weaknesses overcoming socio-economic and food supply chain crises during the Covid 19 pandemic. High input prices during the pandemic indicate that regulations have not fully protected farmers. The government needs to revive collective action through institutional strengthening of farmer groups (Ostrom, 1990). The level of institutional adaptation becomes strong if it is based on values and collective action.

The agrifood chain institutional system must adapt to various kinds of crises by implementing Good Agricultural Practices (GAP). Agri-food chain processing is part of the mitigation and adaptation of handling the price crisis and food supply. Infrastructure development, farmer education, application of technology 4.0, transportation, institutions and food diversification policies are ways of mitigating and adapting to national food security (De Clercq et al., 2018).

Multifunctionality agriculture is an agricultural cultivation and diversification activity that is not based on one type of commodity and pays attention to environmental sustainability and food

security. Agus et al. (2006) multifunctionality of agriculture maintains the conservation of water resources and prevents soil erosion and has a very vital function 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)

The Covid 19 pandemic has provided invaluable lessons about food security and agriculture in general. The first lesson is that agriculture is a formidable sector capable of saving the national economy during the Covid 19 pandemic crisis. The second lesson is that the government should pay attention to the skills and welfare of farmers. The third lesson learned is that the government needs to organize the role of investment in the agricultural sector and food supply chain to increase food production and national food security.

Based on the description above, the Covid 19 pandemic has caused several sectors to experience contraction, but the agricultural sector is still growing positively, absorbing the second highest workforce, increasing the exchange rate for farmers and increasing the value of commodity exports. This study aims to (1) the role of the agricultural sector during the Covid 19 pandemic crisis, (2) analyze the relationship between investment and agricultural sector growth during the Covid 19 pandemic crisis, and (3) the way out of the agricultural sector facing the crisis.

## RESEARCH METHODS

Harrod (1948) developed the idea of the role and relationship of saving, investment and economic growth and 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 in turn increases the demand for labor and national income (Harrod, 1973). ICOR assumptions that changes in output are solely caused by changes in capital/investment. Other factors besides investment, such as the use of labor, application of technology and entrepreneurial abilities are held constant (BPS, 2017).

Easterly (1997) the Harrod-Domar growth model is actually very strategic for measuring short-term economic performance through investment. Domar assumes production capacity is proportional to capital stock and measures the capital-output ratio in food sector investment to food sector growth output 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 method of analysis in this study is 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 using published data sources from BPS, Bappenas and the Ministry of Finance of the Republic of Indonesia. Quantitative techniques use 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 between investment and the growth of the agricultural sector and the way out of facing the Covid 19 crisis. The data is used to measure the level of investment efficiency and investment performance in the agricultural sector before the Covid-19 outbreak (2012-2019) 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 the output of the agricultural sector are;

$$\text{ICOR} = \frac{\Delta K}{\Delta Y} = \frac{I}{\Delta Y}$$

Information:

ICOR : ICOR Value

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

$\Delta Y$  : Changes in agricultural sector output

I : Agricultural sector investment

Equation above can then be simplified to relate investment to changes in output. Mathematically as follows:

$$\text{ICOR} = \frac{I}{\text{PDB}_t - \text{PDB}_{t-1}}$$

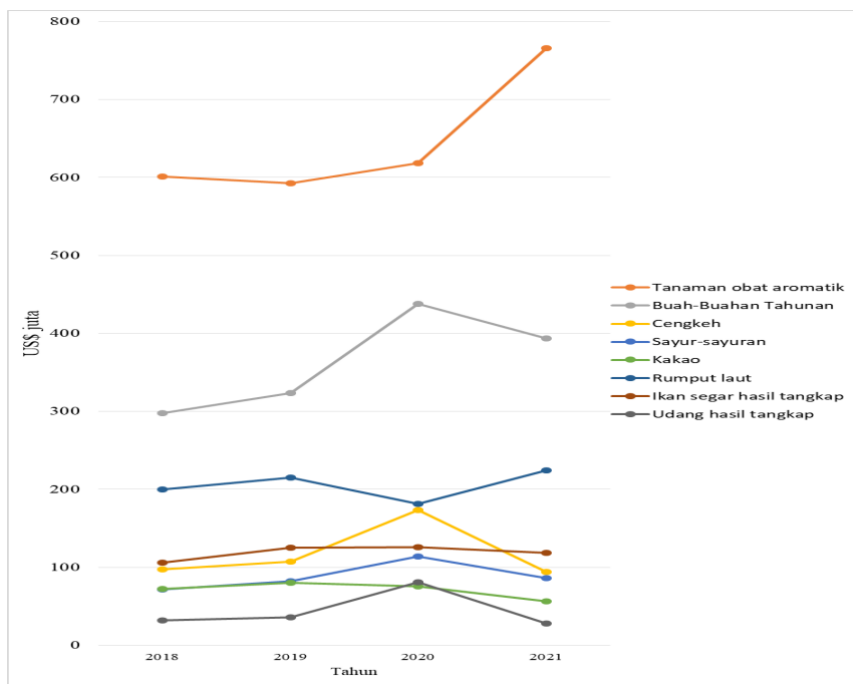
## RESULT AND DISCUSSION

The Covid 19 pandemic crisis, even though the growth of the agricultural sector has decreased but still has positive growth, namely 1.77% in 2020 and 1.84% in 2021. Meanwhile, growth in the industrial, service and other sectors has experienced a contraction (negative growth). The agricultural sector saved Indonesia from the impact of the Covid 19 crisis. Not only in terms of growth, the agricultural sector was able to absorb the informal sector and maintain food security, supply and security (Ayuni et al., 2022).

The trigger for the positive growth in the agricultural sector was due to the increase in the export value of most agricultural commodities. For Indonesian medicinal, aromatic and spice plants, the export value of these commodities increased by 4.38% to US\$618.5 million in 2020. In 2021, the export value increased again by 23.79% to US\$ 765.7 million. Furthermore, the annual export value of fruit commodities increased by 8.63% in 2019 and 35.4 in 2020, reaching US\$ 323.5 million and US\$ 438.1 million respectively. Even though the value of fruit commodities decreased in 2021, it was still greater than in 2019.

Furthermore, the export value of cloves increased by 3.54% in 2019 to US\$107.1 million and increased significantly by 61.72% in 2020 to reach US\$ 173.2 million. The vegetable commodity has increased 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 the swallow's nest commodity in 2019 amounted to US\$369.98 million, a significant increase of 48.47% to US\$ 540.4 million in 2020 (BPS, 2021c).

The fishery sector has increased, especially in the shrimp commodity. exports of caught shrimp commodities continued to increase to 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 caught fish occurred in 2019 by 18.23%. In addition, there was a slight increase in value in 2020, namely by 0.56%, bringing the value to US\$125.8 million. Seaweed cultivation experienced a decline in export value in 2020 but increased by 23.5% in 2021 (BPS, 2021c). The export value of various agricultural commodities is presented in Figure 1.



**Figure 1.** Export Value of Agricultural Commodities

Source: BPS, 2021c

The Covid 19 crisis has caused world commodity prices to increase, especially in 2020. Global food demand was triggered by concerns in various world countries about food conditions. This causes 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 caused obstacles to the flow of food commodities. At the same time, agricultural production inputs experienced an increase in prices. Supply chain shocks increase local (Indonesian) food commodity prices, on the other hand causing farm input prices to rise.

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

The growth of the agricultural sector in the 2012-2016 period tended to decrease, namely 4.59% in 2012 and 3.36% in 2016. The amount of investment needed to produce an output of Rp. 1 trillion was Rp. 3.36 trillion in 2016. In 2017, the growth of the agricultural sector returned increased to 3.93% but decreased again in 2018 and 2019 to 3.88% and 3.61% respectively. During the 2013-2017 period, investment growth in the agricultural sector reached 56.7% or 14.2% annually. Furthermore, the increase in investment has not been accompanied by a performance of economic growth. ICOR values continued to increase from 2012-2016, namely 0.57, 0.62, 0.92, 1.01 and 1.15.

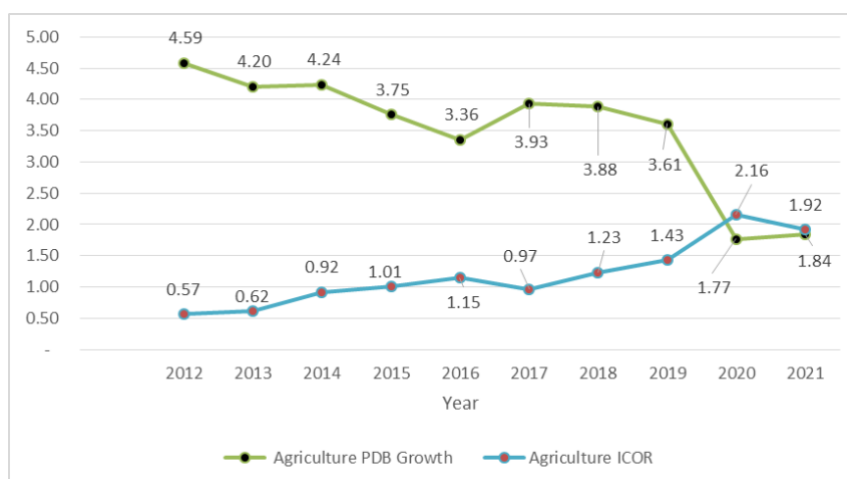
The increase in ICOR is still considered reasonable because its value is still lower than economic growth.

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

The decline in the growth of the agricultural sector since 2012-2019 was due to the lower Total Factor Productivity (TFP) which was indicated by the lack of use of more modern technology. Furthermore, most of the farmers have low education and are getting older (unproductive). Generations of farmers are less interested in continuing family farming because they perceive agriculture as lacking in future. Thus the government has 2 main tasks, namely encouraging agricultural development with the support of technology (including digitalization) and strengthening human resources.

In 2020, the world experienced an economic shock due to the Covid 19 virus outbreak so that 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% while the ICOR value was 2.16. In 2021, the growth of the agricultural sector will increase by 1.84% with an ICOR value of 1.92%. Even though the ICOR index value tends to increase until 2020, the value is still relatively small. This is because most of the agricultural sector's business fields are not capital intensive, but labor intensive.

Throughout the Covid 19 crisis, the ICOR value of the agricultural sector was greater than the economic growth of the agricultural sector. Investment in the agricultural sector has not produced optimal output during a pandemic due to government policies that limit people's mobilization and stipulate work from home. The supply of agricultural commodities is experiencing problems for most industries because the industry has reduced its production capacity due to the Covid 19 outbreak. The supply of agricultural raw materials to industry has decreased, on the other hand exports of several plantation commodities, medicinal plants, fruits and cloves have experienced an increase in exports in 2021 (in aggregate) grew 14.02% thus causing the agricultural sector to continue to grow even though it was low. Furthermore, activity restrictions, supply chain constraints and uncertainty due to the Covid 19 crisis caused the output of the agricultural sector to decline and investment performance was not optimal. In detail, the development of ICOR and the growth of the agricultural sector are presented in Figure 2.



**Figure 2.** The Development of ICOR and The Growth of The Agricultural Sector

Another obstacle that causes the output of the agricultural sector is the allocation of subsidized fertilizers that is not yet targeted (suboptimal) for small farmers. Small and less well-off farmers are only able to access 40% of subsidized fertilizers. Furthermore, the allocation of subsidized fertilizers only meets 40% of the need for subsidized fertilizers (Bappenas, 2021). Limitations of the government providing subsidized fertilizer due to limited budget considerations. The supply of subsidized fertilizers is unable to meet subsidized market demand, 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 subsidized fertilizer prices that exceed the price set by the government. On the other hand, agricultural inputs become more expensive.

Food supply chain constraints are due to the long distribution chain (many middlemen are involved), transportation problems, storage and processing infrastructure, water content and high input costs and road infrastructure. The long distribution chain causes the margins and added value received by farmers to be smaller. The limitations of storage technology (cold chain) affect the durability of post-harvest products so that they are of low quality and easily damaged. Limited drying technology causes low product quality. The road infrastructure network does not yet support it so that transportation costs are expensive. Expensive fertilizer and seed inputs affect farming financing. These various constraints result in high food losses and expensive transportation costs so that farming margins are low. The risk is even greater because the Covid 19 outbreak creates uncertainty on the demand and supply sides, causing shocks to the agricultural sector.

Furthermore, the supply of agricultural output for industrial raw materials has decreased because most industries have reduced working hours and temporarily suspended business activities due to the Covid 19 outbreak. However, exports of raw materials for several commodities have increased, such as cloves, fruits, medicinal plants and fishery. Aggregate growth in agricultural commodity exports amounted to 14.02%. This growth affects the exchange rate of farmers (especially the exchange rate of plantation farmers) and employment. The agricultural sector is the second largest sector capable of absorbing labor after the trade sector. The agricultural sector is able to maintain/play a role in the resilience of the national economy, which is shown by positive growth, the second largest employment absorption, aggregate farmer exchange rates increase and exports grow significantly.



There are several obstacles that the government needs to pay attention to as a way out of overcoming the crisis. Hayuningtyas and Yuliasih (2020) mitigating food loss and added value in the food supply chain that need attention include (1) objective elements including added value, supply chain, price guarantee, 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 regulatory cropping pattern and reasonable 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 must have stepped into a digital 4.0 basis. Efforts to mitigate and adapt to food security, such as technology and road infrastructure, food diversification, farmer education, provision of technology and transportation must be digitally based so that food supply chain control is integrated. De Clercq et al. (2018) about 33-55% of the world's food is never eaten due to weak food supply chains and human awareness. Hausmann et al (2008) states that countries that are able to carry out economic diagnostics to overcome binding constraints can produce better profit cycles and production capacity (Rodrik, 1999). Economic diagnosis aims to identify the main constraints to the development and growth of the agricultural sector. Economic diagnosis can refer to the application of regulations, research, financial institutions and technology development. In general, the diagnosis of the agricultural sector due to the influence of the Covid 19 crisis includes costs of transportation, distribution, margins and added value and prices. Therefore, digitizing the food supply chain must be a priority for investment policy to strengthen the resilience of the agricultural sector.

## CONCLUSION AND SUGGESTION

The role of the agricultural sector during the Covid 19 crisis was very strategic and had very strong resilience. This resilience, the role of the agricultural sector includes the value of export commodities of various agricultural products increasing rapidly, absorbing labor, increasing the country's foreign exchange and increasing farmers' exchange rates. The performance of the agricultural sector is still efficient in the 2012-2019 range in terms of investment. Furthermore, the ICOR value during this period relatively increased, while growth tended to decline, thus reflecting a declining (but still efficient) level of efficiency. The resilience and resilience of the agricultural sector was marked by positive growth while other sectors experienced a contraction during the Covid 19 crisis. Most of the business fields in the agricultural sector were not capital intensive, but labor intensive. This is why the ICOR value is not large.

The ICOR index value tends to increase until 2020 but the value is still relatively small. This is because most of the agricultural sector's business fields are not capital intensive, but labor intensive. Investment is not always accompanied by a significant increase in average output due to low TFP and low human resources. 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 moisture content and input costs, roads and transportation infrastructure. The government and industry must support farmers by providing supporting

infrastructure, namely technology and infrastructure. Equally important is providing skilled human resources and institutional strengthening. Food diversification, industry 4.0, high quality seeds and food supply chains are part of the mitigation and adaptation that needs 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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