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**ARTICLE**

# Agricultural Sector Companies in Indonesia: Is Their Profitability Affected by COVID-19?

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## ABSTRACT

The COVID-19 pandemic is the largest exogenous shock of the 21st century, simultaneously impacting both micro and macroeconomic structures. The pandemic created an anomaly in Indonesia's agricultural landscape: while many sectors contracted, the agricultural sector demonstrated resilience. This study examines this phenomenon using Spearman Correlation, Kruskal-Wallis, and Theil Regression approaches to understand how COVID-19 impacted four key profitability indicators: Gross Profit Margin (GPM), Net Profit Margin (NPM), Return on Assets (ROA), and Return on Equity (ROE). The study sampled eleven companies through purposive sampling. Data were collected quarterly from Q1 2019 to Q3 2022, covering 165 observations. The results indicate that GPM, NPM, ROA, and ROE are influenced by COVID-19-related variables. This suggests a structural difference between operational performance and equity-based financial performance in companies' responses to the crisis. The results of this study suggest that companies need to enhance asset management, non-operational cost efficiency, and digital-based marketing innovation to increase competitiveness in global value chains. Long-term government policy formulation is

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necessary, including incentives for local food production, ensuring agricultural input supply security, and strengthening downstream industries and logistics distribution.

***Keywords:*** Agricultural Sector Companies; COVID-19; GPM; NPM; ROA; ROE

# 1. Introduction

Profitability refers to a company's ability to generate profits. High profitability signifies strong financial health and the ability to generate substantial earnings. Profitability is also used to measure operational efficiency, determine effective business strategies, identify areas for improvement, evaluate a company's ability to generate returns on investment, and compare its performance with other companies in the same industry. By calculating profitability, companies can increase profits, optimize resources, make more informed business decisions, and enhance competitiveness.

The agricultural sector is a part of the economy involved in the production, processing, and distribution of agricultural products, such as plants, animals, and other natural products. Agricultural sector companies can include those engaged in crop production (agriculture), livestock farming, agricultural product processing, distribution, and export and import. Agricultural sector companies are essential for supplying food and raw materials to the community, as well as contributing to the national economy. Therefore, the probability in this sector is very important. Agricultural companies can increase profitability by optimizing resource use (land, water, fertilizer), improving production efficiency, diversifying products, developing effective marketing strategies, and effectively managing risks. By increasing profitability, agricultural companies can enhance competitiveness and improve the welfare of farmers and other stakeholders.

On March 2, 2020, the Indonesian Government announced its first two positive COVID-19 cases. Meanwhile, the WHO declared the coronavirus a global pandemic on March 11, 2020, which led to a weakening of economic activity and a shift in the country's economic system, not only in Indonesia but also throughout the world. This pandemic has significantly impacted the business world in industries more vulnerable to the coronavirus, as well as the government's response policies [1]. The economic downturn leads most companies to reallocate limited resources away from environmental sustainability. Gazi et al. [2] state that there has been a decline in profitability in the banking sector of Bangladesh. Likewise, Augeraud-Véron and Boungou [3], who utilized data from 5474 banks across 23 OECD countries, stated that COVID-19 affected profitability.

The COVID-19 pandemic triggered a swift, unexpected global crisis with widespread effects [4]. It has significantly altered the organizational culture, replacing symbols like open-plan offices and social rituals, such as water cooler conversations, with protective measures like Perspex screens and PPE [5]. This crisis is likely to cause disruptions in global governance and may accelerate trends towards economic nationalism, authoritarian populism, and private governance [6]. As a global issue, COVID-19 affects the entire food supply chain, which is both complex and fragile, and poses operational challenges due to the pandemic [7, 8].

COVID-19 has spread globally, causing a crisis in public health and sustainable development [9]. In response to this pandemic, Kumar and Babu [10] recommend boosting the immune system through improved nutrition to combat COVID-19. They emphasize that nutrition is closely linked to the agricultural sector. Disruptions to the agricultural food supply chain due to the pandemic have led to supply and demand shocks, adversely affecting the four pillars of food security [11]. During COVID-19 and associated lockdowns, food insecurity increased in rural Africa [12]. Similarly, Ceballos et al. [13] noted that COVID-19 affected household income and eating habits. Meanwhile, Blažková et al. [14] found that small family farms show resilience against COVID-19. Overall, disruptions in agricultural supply chains have challenged national food availability and security [15].

COVID-19 has affected labor availability in agricultural businesses. According to Preusse et al. [16], 66% of farming households reduced their daily labor during

the lockdown, averaging nearly 40% less than before. Similarly, Ragasa et al.[17] found that 51% of households in their study experienced income loss due to disruptions in their livelihood activities. Households that did not own land were the most severely affected by this crisis, mainly due to the loss of employment opportunities in both the agricultural and non-agricultural sectors, as well as the negative impacts on companies in rural areas.

However, the COVID-19 pandemic also brought some positives. It has altered entrepreneurial opportunities in the United States[18]. Some companies view it as an opportunity to enhance their environmental strategies[19]. To address the social problems caused by COVID-19, many companies are taking action to create solutions that benefit the public interest, without regard to their initial motives–for example, manufacturers are producing plastic shields and ventilators, while distilleries are making in-demand hand sanitizers, often at lower costs[20]. Research by Höhler and Lansink[21] indicates that cumulative profits increased during the COVID-19 outbreak. In the subsequent phase, riskier shares receive a higher yield discount.

The COVID-19 pandemic has had a significant impact on the business sector[22]. During this period, companies with robust and sustainable performance tend to be more resilient, experiencing smaller declines in financial performance compared to less sustainable companies. However, the positive impact of profitability on sustainability is diminishing[23]. Rumors about COVID-19 can sway investor decisions. Conversely, debunking alarming rumors tends to generate a positive market response, whereas dismissing reassuring rumors does not provoke a notable reaction[24].

The COVID-19 pandemic has affected the profitability of agricultural companies in various ways, including supply chain disruptions, difficulties in obtaining raw materials, fertilizers, and equipment, decreased demand, changes in consumption patterns and decreased income, labor constraints: labor shortages due to mobility restrictions, additional costs such as implementing health and safety protocols, and price fluctuations in the form of changes in commodity prices due to changes in demand and supply. However, some agricultural companies have also found opportunities to improve production efficiency with digital technology, develop products that better align with market needs, and increase online sales and delivery.

The agricultural sector is essential for food security[25]. The role of farmers is enormous. Small farmers are more resistant to the shock of COVID-19[26]. According to information from Mediaindonesia.com, in 2021, the agricultural sector in Indonesia is expected to be the only sector experiencing positive growth during the pandemic, with overall growth of 1.75%. Even in the first quarter of 2021, the figure continued to increase to 2.95%. The distribution of labor in the agricultural sector increased from 27.53% in 2019 to 29.76% in 2020[27]. Country-level analysis shows that the EU's agricultural sector has remained relatively resilient throughout the COVID-19 pandemic[28]. Daglis et al.[29] examined the impact of COVID-19 on the agricultural sector, finding that both wheat commodities and the wheat market were affected. Hamulczuk and Skrzypczyk[30] investigated the impact of COVID-19 on prices in the agri-food sector and found no significant correlation between variations in the export/import ratio and price changes during the second and third quarters of 2020. However, the results of research from Živkov et al.[31], who examined the impact of milk prices due to COVID-19, found that the cost of all milk fell by 8%.

Many financial and non-financial factors influence profitability in the agricultural sector. Jisha and Palakkeel[32] evaluated the profitability of the agricultural industry and found that the evaluation of predicted farmer profitability revealed that the very high and shallow credit categories were more widely spread out compared to the medium credit category. Profitability (ROA) is greatly affected by CAPI, EXPI, and DVL[33]. So that the business world can prevent future pandemics and maintain prosperity in the future, the business world must be aware of the growth limitations of alternative temporalities that do not contrast the relationship between short-term and long-term processes, and how local phenomena interact within the global system, and points of influence that can reduce the impact of the pandemic—a system of deep-rooted social inequality[34].

GPM, or gross profit margin, also known as gross margin, is a financial metric that indicates how effectively a business manages its operations. This ratio reflects a company's sales performance relative to the efficiency of its production process. In the COVID-19 situation, the company's sales performance will also be affected, which will impact the gross profit margin figure. Research examining the influence of COVID-19 on GPM was conducted by Lowardi and Abi [35], who investigated the property sector, Periokaite and Dobrovolskiene [36], who studied the transportation sector in Lithuania, Sari and Dura [37] on the pharmaceutical sector, and Rahmadani [38] in the service sector. They proved that COVID-19 affects GPM, while research from Agustina [39], who examined the automotive sector, and Rosita et al. [40] in the health sector showed different results, namely, COVID-19 did not affect GPM

NPM, or net profit margin, is a profitability ratio that indicates the percentage of net revenue or sales that is generated from business operations. It considers all costs incurred by the business, not just the cost of goods sold. Research examining the influence of COVID-19 on NPM was carried out by Lowardi and Abdi [35] in the property sector, Periokaite and Dobrovolskiene [36] in the transportation sector in Lithuania, Sari and Dura [37] in the pharmaceutical sector, Rahmadani [38] in the services sector, Mulianto and Kelly [41] who took samples from the consumer goods sector, Adawiyah [42], Fauzi [43] (banking sector in Indonesia and Vietnam), Budiningsih et al. [44] (automotive), Hafiz [45] (food and beverage), and Ugut et al. [46] (banking) all concluded that COVID-19 had an impact NPM. Different results were shown based on research by Agustina [39], who examined the automotive sector, Rosita et al. [40] in the health sector, and Pratama et al. [47] in the retail sector, indicating that COVID-19 did not affect NPM.

ROA indicates how effectively a company's assets can produce net profits. Research examining the effect of COVID-19 on ROA was conducted by Lowardi and Abdi [35] in the property sector, Periokaite and Dobrovolskiene [36] in the transportation sector in Lithuania, Sari and Dura [37] in the pharmaceutical sector, Rahmadani [38] in the services sector, Adawiyah [42] in the banking sector, Budiningsih et al. [44] in the automotive sector, Hafiz [45] in the food and beverage sector, Pratama et al. [47] in the retail sector, Devi et al. [48] in all sectors on IDX, Nguyen et al. [49] on real estate in Vietnam, Manurung and Silaen [50] on hotels, Utami et al. [51] on consumer goods, Evany et al. [52] on Kompas 100 companies, Putri and Yulfiswandi [53] in the health sector and sectors, Qiancheng et al. [54] in the education sector in China, Junaidi and Susanto [55] in the consumer goods sector, and Xu et al. [56] in banking. They all concluded that COVID-19 had an impact on ROA. Different results were shown based on research from Agustina [39], who examined the automotive sector, and Rosita et al. [40] in the health sector, Fauzi [43] in the banking sector in Indonesia and Vietnam, Ugut et al. [46] in the banking sector showed results that COVID-19 does not affect ROA.

ROE is an indicator of a company's performance, calculated by comparing its net profit to total capital. Research examining the effect of COVID-19 on ROE was conducted by Lowardi and Abdi [35] in the property sector, Periokaite and Dobrovolskiene [36] in the transportation sector in Lithuania, Sari and Dura [37] in the pharmaceutical sector, Rahmadani [38] works in the service sector, Adawiyah [42] is involved in banking, Budiningsih et al. [44] in the automotive sector, Hafiz [45] focuses on food and beverage, Pratama et al. [47] operate in retail, Manurung and Silaen [50] in hotels, Utami et al. [51] for consumer goods, Evany et al. [52] for Kompas 100 companies, Qiancheng et al. [54] for the education sector in China, Esomar and Christianty [57] for service sector companies, Xu et al. [56] on banking, Wibowo et al. [58] for transportation, Energy and Telecommunications companies, and Kurniawan and Purnamawati [59] in the retail trade subsector. They all concluded that COVID-19 affected ROE. Different results were shown based on research from Agustina [39], who examined the automotive sector, and Rosita et al. [40] in the health sector, Fauzi [43] in the banking sector in Indonesia and Vietnam, and Ugut et al. [46] in banking showed results that COVID-19 does not affect ROE.

According to previous studies, there are still gaps in the research results. Some studies suggest that COVID-19 has impacted profitability, while others do not. Based on the research cited earlier, Indonesian researchers have not yet explored how COVID-19 has af-

fected profitability in the agricultural sector. This research is the only research in Indonesia that focuses on the agricultural industry. This makes this research more recent. Additionally, another update is that previous research only used two different samples, before the pandemic and after the pandemic. This study examines four periods of the COVID-19 pandemic in Indonesia: before the pandemic, during it, the new normal era, and the post-pandemic phase. The new normal era only exists in Indonesia. This also adds to the novelty of this research.

Understanding COVID-19's impact on profitability in agricultural sector companies is crucial because: (1) Anticipating risks that may arise and taking steps to reduce negative impacts.; (2) Helping optimize business strategies such as adjusting production, prices, and marketing; (3) Managing finances more effectively, such as managing costs, managing debt, and increasing revenue; (4) Making the right decisions, such as deciding whether to continue production, reduce production, or change business strategies; (5) Increasing resilience to market and economic changes, so that they can survive and thrive over the long term; (6) Informing stakeholders such as investors, creditors, and customers, about the company's financial condition. Therefore, understanding how COVID-19 has affected the profitability of companies in the agricultural sector is crucial for enhancing the company's resilience and success in navigating market and economic changes.

This study aims to evaluate whether the COVID-19 pandemic influenced the profitability of agricultural sector companies in Indonesia across four phases: before the pandemic, during the pandemic, the new normal era, and after the pandemic. The research questions include: (1) Is there a relationship between COVID-19 and the profitability of agricultural sector companies, and what is the nature of this relationship? (2) Does COVID-19 affect the profitability of Indonesian agricultural companies? (3) Does the impact differ among profitability measures such as GPM, NPM, ROA, and ROE? (4) What are the economic and theoretical implications of the impact of COVID-19 on profitability?

This study's findings help various stakeholders understand how COVID-19 has affected the profitability of companies in the agricultural sector, namely: (1) Company owners, namely to make strategic decisions and manage the company effectively; (2) Company management, namely to develop appropriate strategies and business plans; (3) Investors who own shares or invest in agricultural sector companies, namely to make appropriate investment decisions; (4) Creditors who issue loans to companies in the agricultural sector mainly evaluate the company's capacity to repay debts; (5) Government, namely to develop appropriate policies to support the agricultural sector and increase food security; (6) Farmers and workers, namely to understand market and economic conditions that affect their work; (7) Customers who buy agricultural products, namely to understand market conditions and product availability; (8) Financial analysts and economic researchers, namely to conduct accurate analysis and research. Therefore, understanding how COVID-19 affected the profitability of companies in the agricultural sector is very important for various interested parties to make the right decisions and develop effective strategies.

# 2. Literature Review

## 2.1. Agency Theory

Agency theory explains that parties such as shareholders and company management interact within a firm. Introduced by Jensen and Meckling in 1976, Jensen described an agency relationship as one where principals (shareholders) employ agents (management) to perform services and delegate decision-making authority. This theory was developed to address issues arising from asymmetric information in contracts[60]. The conflict suggests that shareholders' interests are closely tied to management, as reflected in the company's annual performance. Currently, COVID-19 significantly impacwhether shareholders' interests are achieved optimally, given its substantial influence on company performance.

Agency theory was originally developed and widely applied in research within the fields of management, accounting, and corporate finance. Nevertheless, its core principles are equally relevant to a wide range of disciplines, including the agricultural sector. In this con-

text, the principal may refer to landowners, agribusiness shareholders, or government entities that provide subsidies, while the agent encompasses agricultural managers, contract farmers, or sharecroppers who are responsible for day-to-day operations. Potential conflicts of interest between principals and agents may arise due to information asymmetry, moral hazard, adverse selection, or agency-related costs. Information asymmetry occurs when principals or owners encounter challenges in monitoring the actual performance of workers. Moral hazard may be evident when agents sell produce to third parties without authorization or redirect subsidies for personal benefit. Agency costs, on the other hand, involve expenditures on monitoring systems, technology adoption, or incentive schemes designed to align agents' actions with principals' objectives.

The COVID-19 pandemic has become a critical factor in determining whether shareholders' interests can be optimally achieved, given its substantial impact on business performance. This global crisis has generated significant external shocks to the principal–agent relationship through disruptions in supply chains, volatility in commodity prices, restrictions on mobility, and shifts in market demand [61]. These disruptions intensify the likelihood of information asymmetry, as mobility restrictions hinder principals from conducting direct oversight, making it more difficult to validate the accuracy of performance reports submitted by agents. Furthermore, economic pressures stemming from the pandemic may encourage moral hazard, such as off-contract sales of agricultural products or misappropriation of subsidized inputs [62]. The altered business landscape has also increased agency costs, for instance, through the necessity of implementing remote monitoring technologies or covering higher logistical expenses.

Agency theory can be related to profitability and COVID-19 in several ways, namely: (1) Agency theory emphasizes the importance of risk management in reducing agency costs. In the context of COVID-19, agricultural companies need to manage risks associated with market, demand, and operational changes to maintain profitability; (2) Agency theory emphasizes the importance of supervision and control in reducing agency costs. In the context of COVID-19, agricultural companies must enhance supervision and control to ensure operational security and safety, while maintaining profitability. (3) Agency theory emphasizes the importance of incentives and motivation in improving agent performance. In the context of COVID-19, agricultural companies must provide suitable incentives and motivation to enhance employee performance and maintain profitability. Thus, agency theory can help agricultural companies understand how to manage risks, enhance supervision and control, and provide appropriate incentives and motivation to maintain profitability in unexpected situations, such as the COVID-19 pandemic.

## 2.2. Signaling Theory

Signaling Theory was initially proposed by Spence in 1973. It highlights how effectively management communicates signals of success or failure to the owner (principal). The theory also explains that these signals are employed by company management to minimize asymmetric information. The application of signaling theory is linked to profitability; high profitability serves as a positive signal for investors, indicating strong financial performance. This can attract investment, ultimately increasing the value of their shares.

Signaling theory also posits that parties possessing greater information (signal senders) transmit signals to those with limited information (signal receivers) to reduce information asymmetry and influence decision-making. In the context of the agricultural sector, signal senders may include agribusiness managers, contract farmers, or farm operators who have detailed knowledge of internal conditions, whereas signal receivers comprise investors, creditors, buyers, or government agencies that have limited access to such internal information.

Signaling theory can be related to profitability and COVID-19 in several ways, namely: (1) Signaling theory emphasizes the importance of information transparency in reducing information asymmetry. In the context of COVID-19, agricultural companies must provide transparent and accurate information about their products, operations, and finances to enhance consumer and investor confidence and maintain profitability. (2) Signaling theory emphasizes the importance of effec-

tive communication in sending the right signals to consumers and investors. In the context of COVID-19, agricultural companies must develop effective communication strategies to provide consumers and investors with relevant and timely information, while maintaining profitability. (3) Signaling theory emphasizes the importance of reputation and trust in increasing company value. In the context of COVID-19, agricultural companies must maintain their reputation and foster trust among consumers and investors by providing high-quality products, as well as increasing transparency and effective communication. Thus, signaling theory can help agricultural companies understand how to enhance information transparency, effective communication, and reputation to maintain profitability in unexpected situations, such as the COVID-19 pandemic.

## 2.3. COVID-19

SARS-CoV-2, the virus causing COVID-19, is a new variant transmitted through the respiratory system. It was first identified in Wuhan, China, in late December 2019 and subsequently spread worldwide, including Indonesia. The WHO declared COVID-19 a global pandemic on March 11, 2020. Indonesia reported its first two confirmed cases on March 2, 2020. By June 14, 2020, confirmed cases in Indonesia totaled 38,277. The government has sought to control the virus by imposing Large-Scale Social Restrictions (PSBB), limiting inter-regional mobility, and conducting mass testing with Rapid PCR tests. After two months of PSBB in several regions, Indonesia began implementing a new normal policy. Wiku Adisasmita, Chair of the Expert Team for the Indonesian COVID-19 Acceleration Task Force, explains that the new normal entails resuming usual activities with additional health protocols to prevent COVID-19 transmission [63]. The New Normal era in Indonesia begins on June 1, 2020, and unfolds in five stages. Stage 1 (June 1) allows industry and service operations following COVID-19 health protocols, with malls closed except for shops selling masks and health facilities. Stage 2 (June 8) permits shops, markets, and malls to open under health guidelines. Stage 3 (June 15) keeps malls open but evaluates the reopening of salons, spas, and other establishments; schools reopen with shifts and health protocols in place. Stage 4 (July 6) involves reopening economic activities with ongoing evaluations, including restaurants, cafes, bars, and similar venues, which operate under strict hygiene protocols [64]. Worship activities are allowed with limited attendees. Stage 5 (July 20–27) assesses all previous stages and opens large-scale economic and social venues, with full financial activities expected to resume by early August 2020. During this period, the Indonesian government imposed community restrictions (PPKM); however, these ended on May 23, 2022 [65].

## 2.4. COVID-19 and Gross Profit Margin (GPM)

Gross profit margin is a ratio that indicates the percentage of gross profit earned from sales. A higher GPM signifies more profit from each sale. The higher the Gross Profit Margin, the healthier the company's operational state. This suggests that the cost of goods sold is relatively lower compared to sales. Conversely, a low Gross Profit Margin indicates poor company operations. When a pandemic occurs, the selling price will affect the profit generated. The greater the selling price of a product, the higher the company's profits will be. The increased demand for essential goods and services during the pandemic has led to a rise in sales volume. Changes in sales volume directly impact profitability. Generally, higher sales volumes result in greater profits for the company. Additionally, COVID-19 has affected the company's gross profit margin (GPM). This is based on research from Lowardi and Abi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], and Rahmadani [38].

In relation to agency theory, the influence of Gross Profit Margin (GPM) on COVID-19 can be explained in several ways, namely: (1) Related to cost management, agency theory emphasizes the importance of cost management in increasing GPM. In the context of COVID-19, companies in the agricultural sector must manage production and operational costs effectively to maintain GPM. (2) Related to supervision and control, agency theory emphasizes the importance of supervision and control in reducing agency costs. In the context of COVID-19, companies in the agricultural sector need to strengthen their supervision and control to ensure that production and operational costs are managed ef-

fectively. (3) In relation to incentives and motivation, agency theory emphasizes the importance of incentives and motivation in improving agent performance. In the context of COVID-19, companies in the agricultural sector must offer suitable incentives and motivation to improve employee performance and maintain GPM. Thus, agency theory can help agricultural sector companies understand how to manage costs, increase supervision and control, and provide appropriate incentives and motivation to maintain GPM amidst the challenges posed by COVID-19.

Related to signal theory, the impact of Gross Profit Margin (GPM) on COVID-19 is described as follows: (1) Signal theory emphasizes the importance of accurate and transparent financial performance signals in influencing investor and stakeholder decisions. In the COVID-19 context, companies in the agricultural sector must deliver precise and transparent financial performance signals about GPM to influence investor and stakeholder decisions; (2) Signal theory highlights the significance of production efficiency signals in showcasing a company's capacity to control production costs and enhance profitability. During the COVID-19 pandemic, agricultural sector companies must deliver clear signals of production efficiency that demonstrate their ability to manage costs and sustain operations. GPM; (3) Signal theory also emphasizes the importance of trust signals in influencing investor and stakeholder decisions. During COVID-19, agricultural companies must demonstrate reliable trust signals to show their ability to sustain GPM and manage pandemic-related challenges. (4) Signal theory highlights that transparency in conveying accurate and trustworthy signals is crucial. In the context of COVID-19, agricultural sector companies must provide transparent information about their GPM and the company's strategy for dealing with the pandemic. Thus, signaling theory can help agricultural sector companies understand how to provide accurate and transparent signals about GPM,while also maintaining the trust and credibility of investors and stakeholders amid the challenges faced due to COVID-19.

Based on the description above, the hypothesis formulated is:

**H1.** *COVID-19 affects Gross Profit Margin (GPM).*

## 2.5. COVID-19 and Net Profit Margin (NPM)

The Net Profit Margin is a metric that indicates the percentage of profit earned from net sales. Net profit is obtained from reducing profit before tax and income tax expense. In essence, this ratio measures net income (sales minus all expenses, including taxes) as a percentage of sales or income. A high net profit margin indicates that the company has a stronger ability to generate greater profits. This allows investors to evaluate the company's profitability effectively. The COVID-19 pandemic has increased sales transactions within the company, resulting in high profits. The size of business profits depends on sales income and the size of business expenses. In the case of certain business expenses. Profit margins can be enlarged by increasing sales or by maintaining a certain level of sales; profit margins can also be enlarged by reducing operational costs. COVID-19 affects company NPM as proven by research from Lowardi and Abdi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], Rahmadani [38], Mulianto and Kelly [41], Adawiyah [42], Fauzi [43], Budiningsih et al. [44], Hafiz [45], and Ugut et al. [46].

The impact of Net Profit Margin (NPM) on COVID-19 aligns with agency theory in multiple aspects: (1) Cost management, particularly in the context of COVID-19, agricultural sector companies need to manage production and operational costs effectively to maintain NPM; (2) Supervision and control, within the context of COVID-19, agricultural sector companies need to increase supervision and control to ensure that production and operational costs are managed effectively; (3) Incentives and motivation, within the context of COVID-19, agricultural sector companies need to provide appropriate incentives and motivation to improve employee performance and maintain NPM; (4) Risk management, within this context, involves identifying, assessing, and prioritizing potential risks to minimize their impact on the project or organization COVID-19, agricultural sector companies need to manage risks associated with the pandemic, such as the risk of decreased demand and the risk of increased costs. Thus, agency theory can help agricultural companies understand how to manage costs, improve oversight and control, provide appropriate incentives and motivation, and manage risks to main-

tain NPM amidst the challenges faced by COVID-19. Regarding the influence of NPM on COVID-19, agency theory can help explain how agricultural companies can maintain NPM by managing costs and increasing efficiency, thereby enhancing the company's ability to survive and grow amidst the crisis.

Related to signaling theory, the impact of Net Profit Margin (NPM) on COVID-19. Occurs in several ways, namely: (1) Financial performance indicators. Amid COVID-19, agricultural companies must deliver accurate data and transparent financial performance signals about NPM to influence investor and stakeholder decisions; (2) Operational efficiency signals. In the context of COVID-19, agricultural companies need to provide strong operational efficiency signals about the company's ability to manage costs and maintain NPM; (3) Trust signals. In the context of COVID-19, agricultural companies must provide strong trust signals about their capacity to sustain NPM and address pandemic-related challenges. (4) Transparency signals, in the context of COVID-19, agricultural companies need to provide transparent information about NPM and company strategies to deal with the pandemic. Thus, signal theory can help agricultural companies understand how to provide accurate and transparent signals about NPM, while also maintaining the trust and credibility of investors and stakeholders amid the challenges posed by COVID-19.

From the description above, the hypothesis formulated is:

**H2.** *COVID-19 affects Net Profits Margin (NPM).*

## 2.6. COVID-19 and Return on Assets (ROA)

Return on Assets (ROA) measures a company's efficiency in generating profits from its total assets. It is calculated by dividing earnings before interest and taxes by the total assets. This ratio can better measure a company's profitability because it displays management's effectiveness in using assets to generate profits. A higher ROA indicates better organizational performance because it shows the company can maximize its operational use of total assets. To boost ROA, companies can enhance profit margins while maintaining steady asset turnover, or they can improve asset turnover while maintaining profit margins, or increase both simultaneously. During this pandemic, the performance of company management is of great concern, as they strive to utilize assets to maximize profits. COVID-19 affects the company's ROA, as proven by research from Lowardi and Abdi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], Rahmadani [38], Adawiyah [42], Budiningsih et al. [44], Hafiz [45], Pratama et al. [47], Devi et al. [48], Nguyen et al. [49], Manurung and Silaen [50], Utami et al. [51], Evany et al. [52], Putri and Yulfiswandi [53], Qiancheng et al. [54], and Junaidi and Susanto [55].

Agency theory examines how Return on Assets (ROA) influences COVID-19 considerations related to asset management, emphasizing the importance of effective asset management in enhancing ROA. During the COVID-19 pandemic, agricultural companies must efficiently manage their assets to sustain operations and ROA. The main relation is in terms of supervision and control: agency theory emphasizes the importance of supervision and control in reducing agency costs and increasing ROA. During the COVID-19 pandemic, companies in the agricultural sector must enhance supervision and control to ensure effective asset management. Third, in Incentives and motivation: agency theory emphasizes the importance of incentives and motivation in improving agent performance and ROA. In the context of COVID-19, agricultural sector companies need to provide appropriate incentives and motivation to improve employee performance and maintain ROA. Finally, regarding asset risk management, agency theory emphasizes its crucial role in enhancing ROA. During the COVID-19 pandemic, agricultural companies must effectively manage risks associated with their assets, including the risk of asset impairment and the risk of asset failure. Thus, agency theory can help agricultural companies understand how to manage assets, improve oversight and control, provide appropriate incentives and motivation, and manage asset risk to maintain ROA amidst the challenges faced by COVID-19.

Signal theory examines the impact of Return on Assets (ROA) on COVID-19 through performance signals. Signal theory emphasizes the importance of accurate and transparent performance signals in influencing investor and stakeholder decisions. In the context of

COVID-19, agricultural companies need to provide accurate and transparent performance signals regarding ROA to influence investor and stakeholder decisions. Next are trust signals. Signal theory also emphasizes the importance of trust signals in influencing investor and stakeholder decisions. In the context of COVID-19, agricultural companies need to provide strong trust signals about their ability to maintain ROA and face the challenges associated with the pandemic. The third link is efficiency signals. Signal theory emphasizes the importance of efficient signals in demonstrating a company's capacity to effectively manage its assets. In the context of COVID-19, agricultural companies need to provide strong efficiency signals about their ability to manage assets and maintain ROA—finally, transparency signals. Signal theory emphasizes the importance of transparency in delivering accurate and trustworthy signals. In the context of COVID-19, agricultural companies need to provide transparent information on ROA and their strategies for dealing with the pandemic. Therefore, signaling theory can help agricultural companies understand how to provide accurate and transparent signals about ROA and maintain investor and stakeholder trust and credibility amidst the challenges faced by COVID-19.

Based on the description above, the hypothesis formulated is:

**H3.** *COVID-19 affects Return on Assets (ROA).*

## 2.7. COVID-19 and Return on Equity (ROE)

ROE is a metric indicating a company's ability to generate profit from its capital. It measures net profit against shareholder equity and is commonly used to assess the return on common stock or shareholder investments. Understanding the factors that boost ROE can help companies, through financial lenders, enhance profits by maximizing their return on capital. This not only benefits shareholders with better dividends but also informs their investment decisions when committing significant capital to the company. COVID-19 affects the company's ROE as proven by research from Lowardi and Abdi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], Rahmadani [38], Adawiyah [42],Budiningsih et al. [44], Hafiz [45], Pratama et al. [47], Manurung and Silaen [50], Utami et al. [51], Evany et al. [52], Qiancheng et al. [54], Esomar and Christianity [57], Wibowo et al. [58], and Kurniawan and Purnamawati [59].

Agency theory relates to the impact of ROE on COVID-19 in several ways. First, equity management: Agency theory emphasizes the importance of equity management in improving ROE. In the context of COVID-19, agricultural companies need to manage equity effectively to maintain ROE. Second, Supervision and control: Agency theory emphasizes the importance of supervision and control in reducing agency costs and improving ROE. In the context of COVID-19, agricultural companies must enhance their supervision and control to ensure that equity is managed effectively. Third, Incentives and motivation: Agency theory emphasizes the importance of incentives and motivation in enhancing agent performance and return on equity (ROE). During the COVID-19 pandemic, agricultural companies need to provide appropriate incentives and motivation to improve employee performance and maintain ROE. Fourth, Equity risk management: Agency theory also emphasizes the importance of equity risk management in improving ROE. In the context of COVID-19, agricultural companies must manage risks associated with equity, including the risk of equity impairment and the risk of company failure. Thus, agency theory can help agricultural companies understand how to manage equity, improve oversight and control, provide appropriate incentives and motivation, and manage equity risk to maintain ROE amidst the challenges faced by COVID-19. In the context of the impact of ROE on COVID-19, agency theory can help explain how agricultural companies can maintain ROE by managing equity effectively and increasing efficiency, thereby enhancing the company's ability to survive and grow amidst the crisis.

Signal theory relates to the impact of ROE on COVID-19 in several ways. First, performance signals: Signal theory emphasizes the importance of accurate and transparent performance signals in influencing investor and stakeholder decisions. In the context of COVID-19, agricultural companies need to provide accurate and transparent performance signals about ROE to influence investor and stakeholder decisions. Second, trust signals: Signal theory also emphasizes the impor-

tance of trust signals in influencing investor and stakeholder decisions. In the context of COVID-19, agricultural companies must offer clear trust signals regarding their ability to sustain ROE and navigate pandemic-related challenges. Thirdly, transparency signals: Signal theory emphasizes the importance of transparency in providing accurate and trustworthy signals. In the context of COVID-19, agricultural companies need to provide transparent information about ROE and their strategies for dealing with the pandemic. Fourth, credibility signals: Signaling theory also emphasizes the importance of credibility in providing trustworthy signals. In the context of COVID-19, agricultural companies need to maintain strong credibility by providing accurate and transparent signals about ROE and company performance. Therefore, signaling theory can help agricultural companies understand how to provide accurate and transparent signals about ROE while maintaining investor and stakeholder trust and credibility amidst the challenges faced by COVID-19.

Based on the description above, the proposed hypothesis is as follows:

**H4.** *COVID-19 affects Return on Equity ( ROE ).*

Based on the description above, the framework for this research is illustrated in **Figures 1** and **2**.

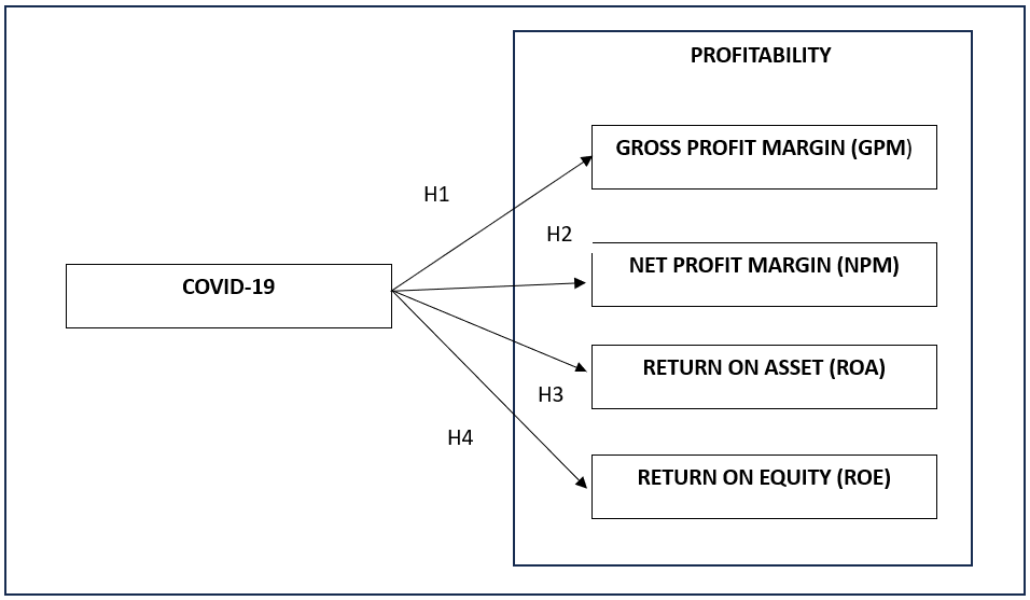


**Figure 1.** Conceptual framework: the effect of COVID-19 on profitability.

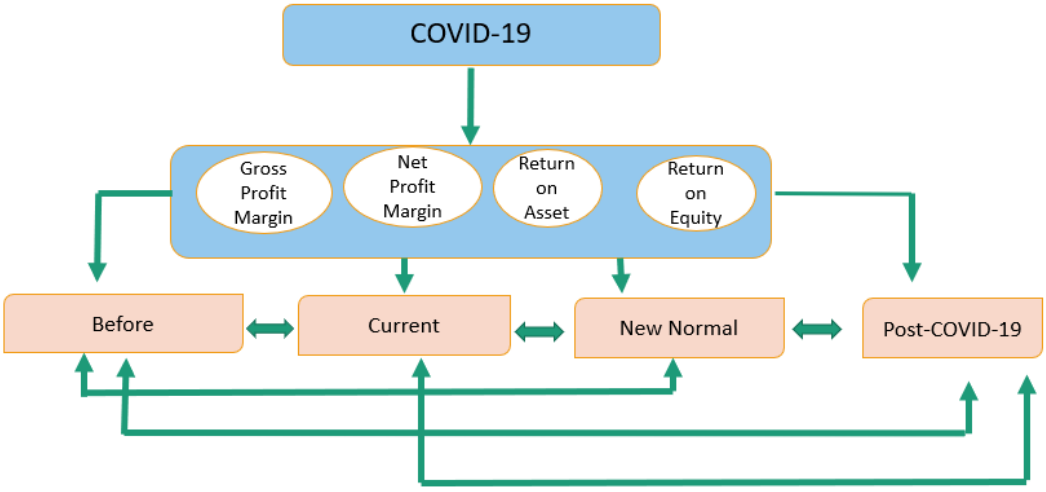


**Figure 2.** Conceptual framework: profitability differences in the COVID-19 phase.

# 3. Materials and Methods

## 3.1. Population and Sample

This study focuses on agricultural sector companies listed on the IDX. There are 28 such companies. Sampling was done purposively, selecting companies based on specific criteria: (1) they are agricultural sector companies listed on the Indonesia Stock Market Exchange, (2) Agricultural sector companies that publish quarterly financial reports starting from Quarter 1 of 2019 to Quarter 3 of 2022 in full, (3) Companies that present Financial Report data in Rupiah. 11 companies meet these criteria, totaling 165 observations.

## 3.2. Data Collection Method

This study employs a non-participant observation method, utilizing secondary data derived from the quarterly financial statements of agricultural sector firms listed on the Indonesia Stock Exchange (IDX) from 2019 to 2022. The observation period is categorized into four distinct phases to reflect the timeline of the COVID-19 pandemic: pre-pandemic, pandemic onset, new normal, and post-pandemic. The pre-pandemic phase comprises six quarters, spanning from Quarter 1, 2019, to Quarter 3, 2019. The pandemic onset phase covers two quarters, namely Quarter 1 and Quarter 2 of 2020. The new normal phase comprises five quarters: Quarter 3 of 2020, Quarter 1, Quarter 2, and Quarter 3 of 2021, as well as Quarter 1 of 2022. Finally, the post-pandemic phase encompasses two quarters: Q2 and Q3 of 2022.

## 3.3. Variable Measurement

Variables are measured based on **Table 1**.

## 3.4. Data Analysis Techniques

Quantitative data was collected by analyzing figures from the financial reports of sample companies. These figures, including Gross Profit Margin (GPM), Net Profit Margin (NPM), Return on Assets (ROA), and Return on Equity (ROE), were then divided into four categories: Before, During, New Normal, and Post-COVID-19. The categorized data was further analyzed, beginning with Descriptive Statistics Tests. These tests examined the data's components to gain a deeper understanding of its characteristics. The analysis revealed details such as the mean, standard deviation, maximum, and minimum values.

**Table 1.** Variable measurement.

| Variable | Definition | Measured with | Scale |
|---|---|---|---|
| Gross Profit Margin(GPM) | Gross Profit Margin indicates the percentage of gross profit earned from net sales. | GPM= $\frac{Gross\ Profit}{Sales}$ | Ratio |
| Net Profit Margin (NPM) | Net Profit Margin indicates how well the company can turn its total sales into net income. | NPM= $\frac{Net\ Profit}{Sales}$ | Ratio |
| Return On Asset (ROA) | Return on Assets is a financial ratio indicating the efficiency of a company's assets in generating profits. | ROA= $\frac{Net\ Profit}{Total\ Asset}$ | Ratio |
| Return On Equity (ROE) | Return on Equity measures a company's capacity to generate profit after tax using its total equity (own capital). | ROE= $\frac{Net\ Profit}{Total\ Equity}$ | Ratio |
| Before | It is the phase before the emergence of COVID-19, namely, before March 2020 | Given the number 1 | Ordinal |
| Current | This is the phase when COVID-19 occurred, namely between March 2020 and July 2020. | Given the number 2 | Ordinal |
| New Normal | This is a phase set by the Indonesian government with the slogan "Adaptation to New Habits," which is between July 2020 and April 2022. | Given the number 3 | Ordinal |
| Post-Covid-19 | This is the phase after COVID-19 is declared no longer exists, namely after May 2022. | Given the number 3 | Ordinal |

The second test is the Classical Assumption Test. This test will determine the appropriate hypothesis testing method. The first classical assumption test is the data normality test. In this study, the Shapiro-Wilk Test and the Kolmogorov-Smirnov Test were used to determine whether the data follow a normal distribution.

The Equation (1) used in the Kolmogorov-Smirnov test is as follows:

$$D = \max|F(x) - S(x)| \quad (1)$$

Description:

D : Kolmogorov-Smirnov statistic

F(x): Theoretical cumulative distribution function (hypothesized distribution)

S(x): Empirical cumulative distribution function (observed data distribution)

Max: Maximum value of the difference between F(x) and S(x)

If the D value is greater than the critical value or the *p*-value is less than the specified significance level (0.05), then the null hypothesis that the data follows a certain distribution can be rejected. This means that the data does not follow the hypothesized distribution/is not normal.

The Equation (2) used in the Shapiro-Wilk test is as follows:

$$W = (\sum a\_i\ x\_(i))^2 / \sum (x\_i - \bar{x})^2 \quad (2)$$

Description:

W: Shapiro-Wilk statistic

a_i : Coefficient obtained from the Shapiro-Wilk table

x_(i): Sorted data values

$\bar{x}$: sample mean

$\sum$: summation symbol

If the W value is close to 1, the data tends to follow a normal distribution. If the W value is far from 1, the data tends not to follow a normal distribution. A *p*-value smaller than the specified significance level (0.05) indicates that the data does not follow a normal distribution.

If the data is normally distributed, the next classical assumption test, the heteroscedasticity test, will proceed. A multicollinearity test is not necessary because there is only one independent variable, COVID-19. An autocorrelation test is also not necessary because the data is panel data. If the data is not normally distributed, the next classical assumption test will not proceed.

Hypothesis testing also depends on the results of the normality test. If the data is normally distributed, parametric tests will be used, namely the Pearson Correlation Test and the MANOVA Test. The regression Equation (3) is a simple linear regression as follows:

$$Y_i = \beta_0 + \beta_1 Xi \quad (3)$$

Meanwhile, if the data is not normally distributed, data analysis will use the Spearman Correlation Test and the Kruskal-Wallis Test. The regression equation uses the Theil method. The Theil method is a nonparametric regression estimation method that estimates the slope coefficient of the regression line by finding the median slope of all pairs of points of the variables X and Y, with no X values being the same[66, 67] The way to find the slope is by using Equation (4) as follows:

$$\text{Slope} = (y2 - y1)/(x2 - x1) \quad (4)$$

After obtaining the slope value, find the intercept value using Equation (5) as follows:

$$\text{Intercept} = \text{median}\ (y) - \{\text{median}\ (\text{slope}) * \text{median}\ (x)\} \quad (5)$$

Regression Equation (6):

$$Y = \beta_0 + \beta_1 \text{Before} + \beta_2 \text{Current} + \beta_3 \text{New Normal} \quad (6)$$

$\beta_{0:}$ Median Slope Post-COVID-19

To test the correlation, interpret the test results using the Interpretation of Correlation Coefficient Values from Guilford[68] (**Table 2**).

**Table 2.** Interpretation of correlation coefficient.

| Correlation Coefficient | Suggested Interpretation |
|---|---|
| Less than 0.20 | Slight correlation; almost negligible relationship |
| 0.20–0.40 | Low correlation; definite but small relationship |
| 0.40–0.70 | Moderate correlation; substantial relationship |

**Table 2.** *Cont.*

| Correlation Coefficient | Suggested Interpretation |
|---|---|
| 0.70–0.90 | High correlation; marked relationship |
| 0.90–1.00 | Very high correlation; very dependable relationship |

**Source:** Guilford [68].

# 4. Results

## 4.1. Descriptive Test Results

Judging from **Table 3**, GPM has a positive average value. This means that, in all phases of the COVID-19 pandemic, the average gross profit is generated. So, the influence of COVID-19 on GPM is positive. The minimum GPM value occurred in the pre-COVID-19 era, and the maximum was observed during the new normal period. NPM has a negative average value. This means that in all phases of the COVID-19 pandemic, the company's average net profit was negative, resulting in a loss. So, the influence of COVID-19 on NPM is negative. The minimum NPM value occurs during the new normal period, and the maximum value also occurs during this period. ROA has a negative average value. This means that, in all phases of the COVID-19 pandemic, the company's average net profit was negative, resulting in a loss. So, the effect of COVID-19 on ROA is negative. The minimum ROA value occurred before COVID-19, and the maximum value occurred post-COVID-19. ROE has a negative average value. This means that, in all phases of the COVID-19 pandemic, the company's average net profit was negative, resulting in a loss. So, the effect of COVID-19 on ROE is negative. The lowest ROE value occurred before the COVID-19 pandemic, while the highest was observed after it.

According to **Table 4**, the average GPM increased by 38% from the pre-COVID-19 period, by 48% during the COVID-19 period to the new normal phase, and by 25% from the new normal to the post-COVID-19 period. The new normal NPM average increased by 227% from the new normal to the post-COVID-19 period. Average ROA decreased by 21% from pre-COVID-19, increased by 1000% from COVID-19 to New Normal, and decreased by 90% from New Normal to Post-COVID-19. Average ROE fell by 32% from before the COVID-19 period, rose 30% from the time of COVID-19 to the new normal, and fell by 600% from the new normal to post-COVID-19.

## 4.2. Classical Assumption Test Results

### Normality Test Results

Based on the results of both the Kolmogorov-Smirnov and Shapiro-Wilk tests, the significance values were found to be below the 0.05 threshold, indicating that the data did not follow a normal distribution (**Table 5**). This conclusion is further supported by the observation that the standard deviation exceeded the mean, reflecting a high degree of data variability. Considering the non-normal distribution of the data, a non-parametric analysis approach was adopted, namely the Spearman's Correlation Test, the Kruskal-Wallis Test, and the Theil Regression Test.

## 4.3. Hypothesis Test Results

### 4.3.1. Spearman Correlation Test Results

**Table 6** represents the results of the Spearman correlation test.

### 4.3.2. Statistical Test Results

**Table 7** represent the statistical test results.

### 4.3.3. Theil Test Results

**Table 8** represents the Theil test result.

Regression Equations (7)–(10):

$$\text{GPM} = 0.207929 - 0.08712 \text{ Before} - 0.05987 \text{ Current} - 0.00928 \text{ New Normal} \quad (7)$$

$$\text{NPM} = 0.076511 - 0.0708 \text{ Before} - 0.07611 \text{ Current} - 0.03326 \text{ New Normal} \quad (8)$$

$$\text{ROA} = 0.036889 - 0.03616 \text{ Before} - 0.03674 \text{ Current} - 0.02218 \text{ New Normal} \quad (9)$$

$$\text{ROE} = 0.60336 - 0.05916 \text{ Before} - 0.06 \text{ Current} - 0.03151 \text{ New Normal} \quad (10)$$

**Figure 3** illustrates the median profitability trend, which demonstrates a consistent increase in all financial ratios throughout the observation period.

**Table 3.** Descriptive statistics.

| | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| GPM | 165 | 0.129301 | 0.27106 | −1.08693 | 0.575055 |
| NPM | 165 | −0.10498 | 0.37316 | −2.22646 | 0.39785 |
| ROA | 165 | −0.00053 | 0.04543 | −0.2528 | 0.10263 |
| ROE | 165 | −0.06404 | 0.22793 | −1.38039 | 0.208242 |

**Source:** SPSS version 26 output.

**Table 4.** Average value growth.

| | Before–Current | Current–Newnormal | New Normal–Post-COVID-19 |
|---|---|---|---|
| GPM | 0.389618 | 0.485002 | 0.255691 |
| NPM | −0.2324 | −0.53438 | 22.273467 |
| ROA | −0.21854 | 10.60578 | 0.973445 |
| ROE | −0.32902 | 0.308315 | −6.94017 |

**Source:** SPSS version 26 output.

**Table 5.** Normality test results.

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | Df | Sig. | Statistic | Df | Sig. |
| GPM | 0.230 | 165 | 0.000 | 0.703 | 165 | 0.000 |
| NPM | 0.299 | 165 | 0.000 | 0.679 | 165 | 0.000 |
| ROA | 0.179 | 165 | 0.000 | 0.848 | 165 | 0.000 |
| ROE | 0.296 | 165 | 0.000 | 0.568 | 165 | 0.000 |

**Source:** SPSS version 26 output.

**Table 6.** Spearman correlation test results.

| Indicator | Sig. (2-Tailed) | Spearman r (p) | Suggested Interpretation |
|---|---|---|---|
| GPM | 0.000 | 0.335 | Low correlation; definite but small relationship |
| NPM | 0.000 | 0.331 | Low correlation; definite but small relationship |
| ROA | 0.000 | 0.356 | Low correlation; definite but small relationship |
| ROE | 0.000 | 0.333 | Low correlation; definite but small relationship |

**Source:** SPSS version 26 output.

**Table 7.** Statistical test results.

| | GPM | NPM | ROA | ROE |
|---|---|---|---|---|
| Kruskal-Wallis H | 14.983 | 17.765 | 23.620 | 19.154 |
| Df | 3 | 3 | 3 | 3 |
| Asymp. Sig. | 0.002 | 0.000 | 0.000 | 0.000 |
| a. Kruskal-Wallis Test | | | | |
| b. Grouping Variable: CONDITION | | | | |

**Source:** SPSS version 26 output.

**Table 8.** Theil test result.

| | | Before ($\beta_1$) | Current($\beta_2$) | New Normal($\beta_3$) | Post-COVID-19 ($\beta_0$) |
|---|---|---|---|---|---|
| GPM | Median Slope | 0.120807 | 0.148055 | 0.198651 | 0.207929 |
| | Intercept (β) | −0.08712 | −0.05987 | −0.00928 | |
| NPM | Median Slope | 0.005707 | 0.000405 | 0.043251 | 0.076511 |
| | Intercept (β) | −0.0708 | −0.07611 | −0.03326 | |
| ROA | Median Slope | 0.000733 | 0.000149 | 0.014714 | 0.036889 |
| | Intercept (β) | −0.03616 | −0.03674 | −0.02218 | |

**Table 8.** *Cont.*

| | | Before ($\beta_1$) | Current($\beta_2$) | New Normal($\beta_3$) | Post-COVID-19 ($\beta_0$) |
|---|---|---|---|---|---|
| ROE | Median Slope | 0.001181 | 0.000338 | 0.028831 | 0.060336 |
| | Intercept (β) | −0.05916 | −0.06 | −0.03151 | |

**Source:** Processing with Microsoft Excel.

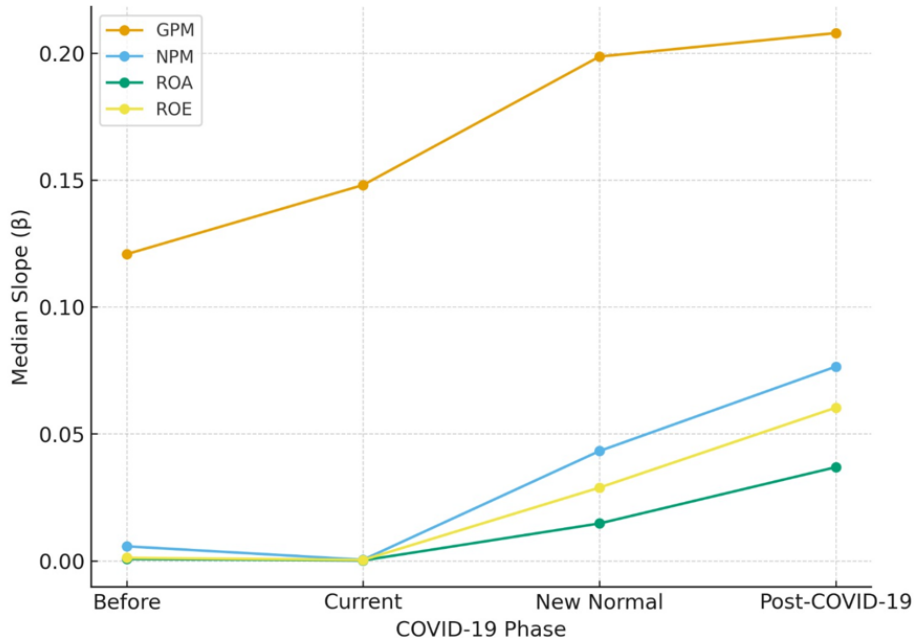


**Figure 3.** Median slope trend of profitability of agricultural sector companies (Before – Current – New Normal – Post-COVID-19).

Referring to **Tables 6**, **7**, **8**, and **Figure 3**, the statistical analysis of data from agricultural companies in Indonesia reveals a consistent increase in all profitability indicators across the Before, New Normal, and After phases of the COVID-19 pandemic. The median Gross Profit Margin (GPM) increased from 0.1208 in the Before phase to 0.19865 in the New Normal phase, then to 0.20793 in the After phase. The Net Profit Margin (NPM) also experienced a significant increase, from 0.0057 to 0.04325, and then to 0.07651. Return on Assets (ROA) rose from 0.00073 to 0.01471, then to 0.03689, while Return on Equity (ROE) rose from 0.00118 to 0.02883, ending at 0.06034 in the After phase. The Spearman correlation test confirmed that all profitability indicators—Gross Profit Margin (GPM), Net Profit Margin (NPM), Return on Assets (ROA), and Return on Equity (ROE)—had a positive, low correlation with the development phase of the COVID-19 pandemic. This means that, over time, from the Before to the New Normal to the After phase, all four profitability ratios consistently increased.

Based on the Theil test results, the profitability dynamics of the agricultural sector in Indonesia throughout the four phases of the pandemic—before, the COVID-19 period, the new normal era, and post-COVID-19—show a consistently positive growth pattern, albeit with varying intensity for each indicator. In general, all profitability ratios, as measured by the median slope β, tended to increase towards the post-pandemic phase, reflecting the sector's adaptability and resilience amid significant external pressures.

For GPM, the correlation coefficient of 0.335 indicates a low relationship between the pandemic recovery phase and the increase in gross profit margin. The median trend, which rose from 0.1208 in the Before phase to 0.19865 in the New Normal phase, and then to 0.20793 in the After phase, reflects that production cost efficiency and selling price control were important factors supporting gross profitability during the recovery process.

This improvement in gross margin then formed the

basis for NPM, which showed a positive correlation of 0.331. Despite experiencing pressure in the initial phase of the pandemic due to high non-operating costs, the company was able to adjust, resulting in a significant increase in net margin in subsequent phases. The median increase in NPM from 0.0057 (Before) to 0.04325 (New Normal) and 0.07651 (After) indicates improved expense management, which has a direct impact on net profit.

This improvement in net profit, indicated by NPM, also drove an increase in ROA, which had the highest coefficient of 0.356 among the four indicators. This indicates that asset utilization is the most responsive factor to changes in the pandemic phase. The jump in median ROA from 0.00073 (Before) to 0.01471 (New Normal) and 0.03689 (After) indicates that previously less productive assets are being optimally utilized to generate income.

Improved ROA performance then contributed to an increase in ROE, with a correlation coefficient of 0.333. The increase in median ROE from 0.00118 (Before) to 0.02883 (New Normal) and 0.06034 (After) confirms that improved operational efficiency, asset optimization, and expense control ultimately benefit shareholders through higher returns on capital.

Overall, these Spearman results demonstrate a clear correlation between profitability indicators. Production cost efficiency (GPM) drives increased net profit margin (NPM), which in turn improves asset utilization (ROA), ultimately resulting in a higher return on capital for shareholders (ROE). These four ratios moved in sync with the economic recovery pattern during and after the pandemic, illustrating that the relevant sectors were able not only to survive but also to optimize their performance under challenging conditions.

The Kruskal–Wallis test indicates significant differences between phases ($p \leq 0.002$) across all indicators, thereby strengthening the evidence that the changing economic conditions resulting from the pandemic have had a significant impact on profitability.

## 4.4. Results of the Difference Test Between COVID-19 Phases on GPM, NPM, ROA, ROE

### 4.4.1. Mean Rank Test results

As shown in **Table 9**, the average GPM during the post-COVID-19 period exceeds that of the new normal period. The new normal is higher than when and as long as it is higher than before. The average post-COVID-19 NPM value exceeds the new normal. The new normal is lower than the Current, and the Current is higher than before. The average post-COVID-19 ROA value is higher than the new normal. The new normal is higher than the Current, and the Current is lower than before. The average post-COVID-19 ROE is higher than the new normal. The new normal is higher than the Current, and the Current is lower than before.

### 4.4.2. Pairwise Comparison Results

**Table 10** shows that significance values below 0.05 are observed between the Before and New Normal periods, as well as between the Before and Post-COVID-19 periods. The difference in GPM lies in the Before and New Normal phases, as well as the Before and Post-COVID-19 phases.

**Table 9.** Ranks value.

| Condition | | N | Mean Rank |
|---|---|---|---|
| GPM | Before | 66 | 68.20 |
| | Current | 22 | 78.00 |
| | New Normal | 55 | 92.63 |
| | Post-COVID-19 | 22 | 108.32 |
| | Total | 165 | |
| NPM | Before | 66 | 68.99 |
| | Current | 22 | 71.09 |
| | New Normal | 55 | 92.74 |
| | Post–COVID-19 | 22 | 112.59 |
| | Total | 165 | |

**Table 9.** *Cont.*

| Condition | | N | Mean Rank |
|---|---|---|---|
| ROA | Before | 66 | 68.87 |
| | Current | 22 | 64.18 |
| | New Normal | 55 | 93.50 |
| | Post–COVID-19 | 22 | 117.95 |
| | Total | 165 | |
| ROE | Before | 66 | 70.89 |
| | Current | 22 | 64.45 |
| | New Normal | 55 | 92.43 |
| | Post–COVID-19 | 22 | 114.32 |
| | Total | 165 | |

**Source:** SPSS version 26 output.

**Table 10.** Pairwise comparisons of condition–GPM.

| Sample 1–Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig. [a] |
|---|---|---|---|---|---|
| Before – Current | −9.795 | 11.761 | −0.833 | 0.405 | 1.000 |
| Before – New Normal | −24.423 | 8.722 | −2.800 | 0.005 | 0.031 |
| Before – Post-COVID-19 | −40.114 | 11.761 | −3.411 | 0.001 | 0.004 |
| Current – New Normal | −14.627 | 12.052 | −1.214 | 0.225 | 1.000 |
| Current – Post-COVID-19 | −30.318 | 14.405 | −2.105 | 0.035 | 0.212 |
| New Normal – Post-COVID-19 | −15.691 | 12.052 | −1.302 | 0.193 | 1.000 |

**Source:** SPSS version 26 output.

**Table 11** shows that those with a significance level of less than 0.05 are between the Before and New Normal, Before and Post-COVID-19, and current and post-COVID-19 periods. The difference in NPM lies in the phases before and the New Normal, specifically before and post-COVID-19, as well as current and post-COVID-19.

**Table 11.** Pairwise comparisons of condition–NPM.

| Sample 1–Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig. [a] |
|---|---|---|---|---|---|
| Before – Current | −2.098 | 11.761 | −0.178 | 0.858 | 1.000 |
| Before – New Normal | −23.744 | 8.722 | −2.722 | 0.006 | 0.039 |
| Before – Post-COVID-19 | −43.598 | 11.761 | −3.707 | 0.000 | 0.001 |
| Current – New Normal | −21.645 | 12.052 | −1.796 | 0.072 | 0.435 |
| Current – Post-COVID-19 | −41.500 | 14.405 | −2.881 | 0.004 | 0.024 |
| New Normal – Post-COVID-19 | −19.855 | 12.052 | −1.647 | 0.099 | 0.597 |

**Source:** SPSS version 26 output.

**Table 12** shows that significance values below 0.05 exist between the Current and Post-COVID-19 periods, as well as between the Before and New Normal and Before and Post-COVID-19 periods. This indicates that the differences in ROA occur during these phases, specifically between the Current and Post-COVID-19 phases, the Before and New Normal phases, and the Before and Post-COVID-19 phases.

**Table 12.** Pairwise comparisons of condition–ROA.

| Sample 1–Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig. [a] |
|---|---|---|---|---|---|
| Before – Current | 4.689 | 11.761 | 0.399 | 0.690 | 1.000 |
| Before – New Normal | −29.318 | 12.052 | −2.433 | 0.015 | 0.090 |
| Before – Post-COVID-19 | −53.773 | 14.405 | −3.733 | 0.000 | 0.001 |
| Current – New Normal | −24.629 | 8.722 | −2.824 | 0.005 | 0.028 |
| Current – Post-COVID-19 | −49.083 | 11.761 | −4.173 | 0.000 | 0.000 |
| New Normal – Post-COVID-19 | −24.455 | 12.052 | −2.029 | 0.042 | 0.255 |

**Source:** SPSS version 26 output.

**Table 13** shows that companies with a significance level of less than 0.05 are in the Current and Post-COVID-19 periods, as well as the Before and Post-COVID-19 periods. Therefore, differences in ROE exist in the Current and Post-COVID-19 periods, as well as the Before and Post-COVID-19 periods.

**Table 13.** Pairwise comparisons of condition –ROE.

| Sample 1–Sample 2 | Test Statistic | Std. Error | Std. Test Statistic | Sig. | Adj. Sig. [a] |
|---|---|---|---|---|---|
| Before – Current | 6.432 | 11.761 | 0.547 | 0.584 | 1.000 |
| Before – New Normal | −27.973 | 12.052 | −2.321 | 0.020 | 0.122 |
| Before – Post-COVID-19 | −49.864 | 14.405 | −3.462 | 0.001 | 0.003 |
| Current – New Normal | −21.541 | 8.722 | −2.470 | 0.014 | 0.081 |
| Current – Post-COVID-19 | −43.432 | 11.761 | −3.693 | 0.000 | 0.001 |
| New Normal – Post-COVID-19 | −21.891 | 12.052 | −1.816 | 0.069 | 0.416 |

**Source:** SPSS version 26 output.

# 5. Discussion

The increase in the median slope of profitability in agricultural companies during and after the COVID-19 pandemic reflects the strong adaptability of these companies, supported by relatively favorable external factors. Spearman and Kruskal–Wallis correlation tests indicate that changes in the economic environment due to the pandemic significantly impacted all profitability indicators: GPM, NPM, ROA, and ROE.

A positive average GPM ratio reflects good company performance and is considered capable of controlling production costs and the cost of goods sold. During the pandemic, the average GPM for agricultural companies increased. This was due to increased sales volume resulting from public interest in necessities for maintaining physical fitness amid the escalating pandemic. The minimum GPM value occurred in the pre-COVID-19 era because people were still purchasing agricultural products according to their needs. When COVID-19 hit, people sought out agricultural products, which served as reserves during the COVID-19 pandemic. Meanwhile, the supply of agricultural products remained normal, so total agricultural product sales during the COVID-19 period were still considered normal. With the surge in demand, agricultural companies increased their production to meet public needs during the COVID-19 pandemic. Purchasing agricultural products for food reserves will continue into the new normal era. Therefore, GPM was at its highest point in the new normal era. GPM returned to normal (decreased) after COVID-19 was declared gone. The highest average increase in GPM occurred as COVID-19 progressed into the new normal era. This aligns with the highest GPM figures during the new normal era, when demand for agricultural products experienced a significant surge, allowing customers to build up reserves. The hypothesis test results indicate that COVID-19 had an impact on the GPM of agricultural companies. This finding aligns with research by Lowardi and Abi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], and Rahmadani [38].

The increase in the Median Slope of GPM from 0.1208 in the Before phase to 0.20793 in the post-COVID-19 phase demonstrates the company's ability to maintain production efficiency and control the cost of goods sold despite supply chain disruptions at the start of the pandemic. From a micro perspective, strategies adopted include optimizing local raw materials, streamlining distribution, and implementing precision agriculture to reduce production losses. At a macro level, domestic demand for food products increased significantly during the pandemic, driven by changes in household consumption patterns. The agricultural sector even continued to record positive growth (+2.19% in Q2 2020), even as national GDP contracted [69], thereby maintaining gross margins.

Companies in the Indonesian agricultural sector experienced a decline in their net profit margin, which is calculated by dividing net profit by total sales. This decline indicates management's ability to manage revenue and non-operating costs to generate net profit, as companies are deemed less efficient in balancing production, operational, and non-operating expenses. Companies need to be more effective in reducing non-operating

costs, which are deemed to add no value to the products sold, to increase their NPM. Companies are also unable to generate non-operating income above their non-operating expenses. Interestingly, the NPM trend in the agricultural sector shows a positive shift. The lowest NPM was recorded in the pre-COVID-19 era, primarily due to a decline in sales as people continued to rely on foreign exchange reserves from the New Normal era. However, the highest NPM was recorded in the New Normal era, indicating a significant sales recovery. This change in NPM dynamics highlights the strength of the agricultural sector and its growth potential. The most striking observation is the remarkable increase in NPM from the New Normal to the post-COVID-19 era, exceeding 200 percent. This surge in NPM is a testament to the agricultural sector's ability to rebound and effectively manage its losses, reflecting a positive outlook for the sector's future. The difference in test results indicates variations in NPM across the phases of COVID-19 studied. For NPM, these differences are found in three phases, namely: (a) before and the new normal era; (b) before and after COVID-19; (c) during and after COVID-19. This aligns with the statistical test results and the observed decline in NPM during the COVID-19 period. The difference supports the hypothesis that COVID-19 impacts NPM. These findings are consistent with previous research by Lowardi and Abdi[35], Periokaite and Dobrovolskiene[36], Sari and Dura[37], Rahmadani[38], Adawiyah[42],Budiningsih et al.[44], Hafiz[45], Pratama et al.[47], Devi et al.[48], Nguyen et al.[49], Manurung and Silaen[50] Utami et al.[51], Evany et al.[52], Putri and Yulfiswandi[53], Qiancheng et al.[54], and Junaidi and Susanto[55].

The median NPM slope showed a sharper increase, from 0.0057 to 0.07651. This indicates that companies have not only successfully maintained operational efficiency but also managed non-operational expenses. At the micro level, measures such as debt restructuring, reducing administrative costs, and utilizing tax incentives were key factors in achieving this goal. At the macro level, government policies such as food security programs, price stabilization, and production support[69] provided companies with room to maintain their net margins. This finding aligns with an IMF study (2024), which stated that fiscal intervention in the food sector can accelerate profitability recovery by up to 15%.

Agricultural companies saw a decrease in ROA, which is calculated by dividing net profit by total assets. During the pandemic, the average ROA of these companies varied, as their ability to use total assets to generate profits declined. This decline in ROA was caused by companies' ineffectiveness in managing costs, particularly non-operating expenses. Therefore, although gross profit was positive, net profit and returns were also lower. Declines in net profit and total assets also contributed to this decline. The results showed that ROA values fluctuated across different phases of the pandemic. The minimum ROA was observed during the pre-COVID-19 period, while the maximum ROA occurred after the COVID-19 pandemic. This may be because pre-COVID-19 profits were smaller compared to those post-COVID-19. Interestingly, the highest ROA was not recorded during the "new normal" era, which could be due to companies' strategic decisions to invest in assets aimed at preventing the spread of COVID-19, impacting their financial performance. The highest average increase in ROA occurred between the new normal and post-COVID-19 periods. As previously discussed, during the COVID-19 pandemic, demand for agricultural products surged sharply, prompting companies to increase production to meet public demand. This increased ROA by up to 1,000 percent. The t-test results revealed differences in ROA across the studied COVID-19 phases. This difference was found in ROA in two phases: (a) before and after the new normal era, and (b) before and after COVID-19. This supports the hypothesis test results, which indicated that COVID-19 impacts ROA. The findings are consistent with those of Lowardi and Abdi[35], Periokaite and Dobrovolskiene[36], Sari and Dura[37], Rahmadani[38], Adawiyah[42], Budiningsih et al.[44], Hafiz[45], Pratama et al.[47], Devi et al.[48], Nguyen et al.[49], Manurung and Silaen[50], Utami et al.[51], Evany et al.[52], Putri and Yulfiswandi[53], Qiancheng et al.[54], and Junaidi and Susanto[55].

The median ROA slope also jumped from 0.00073 to 0.03689, reflecting efficiency in asset utilization. At the micro level, this increase was driven by improved land productivity, modernization of agricultural equip-

ment, and the use of data for production optimization. At the macro level, the recovery in exports of leading commodities such as coffee and palm oil [70] helped increase the utilization of production assets. However, structural risks such as aging oil palm plantations and the need for replanting remain threats that must be anticipated through long-term investment.

Agricultural companies saw a drop in ROE, which is calculated by dividing net profit by total equity. During the pandemic, there was a noticeable difference in the average ROE among these companies, reflecting a reduced ability to use shareholder equity to generate profits. A higher ROE indicates a better company value because it means more net profit per rupiah of invested equity, and vice versa. This decline was caused by the poor performance of many agricultural firms during the pandemic, as well as lower profit margins resulting from rising costs. The lowest ROE was recorded before the COVID-19 pandemic, while the highest was after, as pre-pandemic profits were smaller than those following. Profit generation also influences retained earnings, which are part of equity. Throughout the COVID-19 periods studied, there was no increase in ROE from the pre-pandemic to the COVID-19 period, from the COVID-19 period to the new normal, or from the new normal to the post-COVID-19 period. The decline between the new normal and the post-COVID-19 period reached 600 percent. This was due to the absence of significant stock trading activity during the COVID-19 era, resulting in an increase in equity. This aligns with the results of the hypothesis test, which shows the influence of COVID-19 on ROE, which is supported by the difference test showing variations in ROE between the COVID-19 phases studied. For ROE, differences were found in three phases, namely: (a) before and during the new normal era; (b) before and after COVID-19; (c) during and after COVID-19. This is in line with the results of the statistical tests conducted. The impact of COVID-19 on ROA is consistent with research by Lowardi and Abdi [35], Periokaite and Dobrovolskiene [36], Sari and Dura [37], Rahmadani [38], Adawiyah [42], Budiningsih et al. [44], Hafiz [45], Pratama et al. [47], Manurung and Silaen [50], Utami et al. [51], Evany et al. [52], Qiancheng et al. [54], Esomar and Christianity [57], Wibowo et al. [58], and Kurniawan and Purnamawati [59].

The median ROE slope increased from 0.00118 to 0.06034, which can be explained through DuPont analysis as a result of increased NPM, improved asset turnover, and effective leverage management. From a micro perspective, this demonstrates management's success in managing capital structure, avoiding overleverage, and optimizing financing at a low cost of capital. At the macro level, the recovery of capital markets and increased investor confidence in the agricultural sector following the pandemic facilitated access to affordable funding. Stable fiscal and monetary policies helped keep financing costs under control.

Overall, the upward trend in all profitability ratios post-pandemic is a combination of mutually reinforcing internal adaptation strategies and external policies. Going forward, maintaining this momentum requires mitigating the risks of climate change, commodity price volatility, and the need for long-term investment in the upstream sector. Synergy between public policy and corporate strategy will determine the sustainability of the agricultural sector's performance in facing global challenges.

Based on the analysis of internal responses and operational efficiency, from a micro perspective, agricultural companies demonstrated internal adaptation by controlling production costs, increasing sales volume, and utilizing assets efficiently. The increase in demand for agricultural products during the pandemic—due to basic consumption needs, panic buying, and a growing preference for healthy products—was the main driver of the rise in GPM. This increase indicates that companies were able to maintain gross profit margins despite supply and distribution pressures. However, the relatively lower NPM value indicates that net profit was still burdened by increased non-operational costs such as adapting to health protocols, digital distribution costs, and financing risks. Nevertheless, ROA increased significantly from the new normal phase to the post-pandemic phase. It reflects the company's capacity to optimize assets for operational profits and shows the flexibility of its resource allocation strategy. Conversely, ROE remained stagnant and statistically insignificant. This re-

flects weaknesses in the capital structure and the distribution value of to shareholders. This can be explained by the financial conservatism adopted by companies—such as dividend cancellations, profit retention, or weakening stock prices—as mitigating measures against capital market uncertainty during the pandemic.

From a broad and external view, the COVID-19 pandemic has not only impacted national supply and demand but also led to structural disruptions across the global food supply chain. The imported dependence on agricultural inputs, such as fertilizers, seeds, and feed ingredients, has been disrupted; however, this has simultaneously opened up opportunities for local substitution. Increased domestic demand, both from the general public and the processed food industry, along with government intervention policies such as the National Economic Recovery Program (PEN) and guaranteed food supplies, have strengthened the sector's resilience. This is reflected in the positive growth of the agricultural sector, which rose 1.75% in 2020 and increased to 2.95% in the first quarter of 2021. Furthermore, the agricultural sector has also benefited from shifts in global consumption patterns toward local and sustainable products, which have been accelerated by disruptions in international logistics. This creates opportunities for domestic agribusinesses to move up from local producers to strategic providers in the national food supply chain.

The agricultural sector is ideally expected to be highly resilient in the face of a crisis such as the COVID-19 pandemic. This expectation stems from the fact that agricultural products are directly linked to basic human needs. Under any circumstances, society continues to rely on essential agricultural goods. However, the findings of this study reveal that the pandemic phase had a significant impact on the profitability of companies in the agricultural sector. The impact of the pandemic on profitability has led to a decline in revenue, limited access to resources, increased inefficiencies, and heightened risks and uncertainties. Therefore, the agricultural sector must develop and implement resilience strategies to face future crises.

Strategic responses for the agricultural sector in preparing for future disruptions may include product diversification, digitalization, technological advancements, operational efficiency, and strong partnerships and collaborations. Diversification strategy entails producing not only a single type of product, but also engaging in end-to-end value chain activities — from seed cultivation to the production of processed agricultural goods. Today's agriculture is increasingly modern, utilizing technology to optimize labor efficiency, apply weather engineering, and adopt digital innovations in agricultural financing and marketing. Another crucial strategy is forging partnerships and collaborations, especially by strengthening cooperation with small and medium-sized enterprises (SMEs) and enhancing multi-stakeholder collaboration that involves government bodies, communities, and social institutions.

This study's findings are consistent with agency theory, which describes the relationship between the principal (the company owner) and the agent (company management). During the COVID-19 pandemic, agricultural company management may have adopted measures to improve efficiency and reduce costs, ultimately enhancing profitability. Company management may have taken proactive steps to respond to market and economic shifts caused by COVID-19, motivated by the goal of enhancing performance and boosting profitability. The asymmetry of interest between principals (company owners) and agents (company managers) can impact the profitability of the agricultural sector in the face of the COVID-19 pandemic. Asymmetries of interest that can occur are: (1) Prioritizing Occupational Safety vs. Profitability: Agents may prioritize occupational safety and employee health, while principals may prioritize company profitability; (2) Risk Management vs. Risk Taking: Agents may be more cautious in managing risks related to COVID-19, while principals may be more inclined to take risks to increase profitability; (3) Investment in Technology vs. Direct Costs: Agents may prioritize investment in technology to increase efficiency and reduce risk, while principals may prioritize direct costs to increase profitability. The impact of asymmetries of interest can impact the profitability of the agricultural sector in several ways: (1) Suboptimal Decisions: Asymmetries of interest can cause agents to make decisions that are not optimal for the principal, thereby

affecting the company's profitability; (2) Delays in Decision Making: Asymmetries of interest can cause delays in decision making, preventing companies from responding quickly to market changes; (3) Loss of Trust: Asymmetry of interest can lead to a loss of trust between the principal and agent, thus affecting the cooperative relationship and profitability of the company. To overcome the asymmetry of interest, the principal and agent must work together and maintain effective communication. Some ways to overcome the asymmetry of interest are: (1) Developing Common Goals: The principal and agent need to develop common goals and prioritize the interests of the Company; (2) Using Appropriate Incentives: The principal can use appropriate incentives to motivate the agent to make optimal decisions for the Company; (3) Effective Supervision: The principal needs to carry out effective supervision of the agent to ensure that the agent makes optimal decisions for the company. Thus, the asymmetry of interest between the principal and the agent can be overcome, and the profitability of the agricultural sector can be increased in the face of the impact of COVID-19.

This study's findings align with signaling theory, which suggests that companies communicate information about their performance and prospects to investors and stakeholders. Amid the COVID-19 pandemic, agricultural firms likely sent positive signals to showcase their resilience and ability to adapt to the market disruptions and economic uncertainties caused by the crisis. Signals of the impact of COVID-19 on profitability can be seen from several indicators, including: (1) Decrease in Profitability: Many companies experienced a decrease in profitability due to the COVID-19 pandemic due to a decrease in sales and revenue; (2) Changes in Cost Structure: Companies may need to make cost adjustments to deal with the decline in sales, such as reducing operational costs or implementing efficiencies; (3) Increased Credit Risk: The COVID-19 pandemic can increase credit risk for companies, especially if customers experience financial difficulties; (4) Changes in Consumption Patterns: The COVID-19 pandemic can change people's consumption patterns, so companies need to adjust their marketing and production strategies. By understanding these signals, companies can take strategic steps to deal with the impact of the COVID-19 pandemic on their profitability.

# 6. Conclusion

COVID-19 has significantly impacted the three main dimensions of profitability (GPM, NPM, ROA, ROE). The interaction between internal company factors and global external dynamics creates a new reality where companies must adapt simultaneously at two levels: operational and structural, as well as local and global. These findings confirm that financial resilience in an era of disruption can only be achieved through the integration of efficient and adaptive micro-strategies, as well as responsive and far-sighted macro-responses. In this context, the Indonesian agricultural sector has the potential to serve as a model of food-based national economic resilience in the face of global challenges.

Overall, there were differences in profitability between phases of the COVID-19 pandemic, but these were small in magnitude and only significant at a few points, such as an increase in GPM during the New Normal phase, an increase in ROA, and a decrease in ROE during the Post-COVID-19 phase. However, when compared to the strength of internal company variables, the direct influence of COVID-19 variables in the econometric model was minimal. This aligns with the relatively resilient nature of Indonesia's agricultural sector, as demand for agricultural products tended to remain stable despite the pandemic. Post-pandemic changes are likely the result of operational adjustments, cost efficiencies, or business restructuring rather than solely due to the direct pressures of the pandemic.

The findings highlight the importance of managing internal factors, like ROA, ROE, GPM, and NPM, to sustain profitability, even in times of crisis, including the pandemic. Key findings in this study indicate that the New Normal phase presents opportunities for agricultural companies to adapt to new market patterns, digitalization, and post-pandemic supply chain shifts. For policymakers, these findings suggest that policy support for the agricultural sector should focus on strengthening the financial fundamentals of companies to make them more resilient to external shocks. Furthermore, the ef-

fects of COVID-19 on the profitability of agricultural companies can be observed from multiple perspectives. (1) Increased Efficiency: Agricultural companies that can increase efficiency in the use of resources can increase profitability during the COVID-19 period; (2) Risk Management: Agricultural companies that can manage risks associated with COVID-19 can increase profitability by reducing losses and increasing revenue; (3) Diversification: Agricultural companies that can diversify their products and services can increase profitability by reducing dependence on one type of product or service; (4) Innovation: Agricultural companies that can innovate in products and services can increase profitability by increasing added value and increasing revenue; (5) Partnerships: Agricultural sector companies that can form partnerships with other parties can increase profitability by increasing access to resources and improving efficiency; (6) Human Resource Development: Agricultural sector companies that can develop human resources can increase profitability by improving employee capabilities and productivity; (7) Marketing Strategy: Agricultural sector companies that can develop effective marketing strategies can increase profitability by increasing revenue and increasing market share.

The implications of agency theory regarding COVID-19's effect on the profitability of agricultural companies can be observed from several perspectives aspects: (1) Risk Management: Agency theory can be used to explain how agricultural company management manages risks associated with COVID-19 and makes decisions to increase profitability; (2) Incentives: Agency theory can, additionally, help clarify how incentives provided to agricultural company management can influence their decisions to increase profitability during COVID-19; (3) Supervision: Agency theory can be used to explain how effective supervision can help agricultural companies increase profitability during COVID-19. Meanwhile, the implications of signaling theory for how COVID-19 affects agricultural companies' profitability can be understood from several angles: (1) Positive Signals: Signaling theory explains how agricultural companies communicate positive signals to investors and stakeholders regarding their capacity to boost profitability during the pandemic; (2) Credibility: It also elucidates how the credibility of agricultural companies can influence investor and stakeholder confidence in their ability to increase profitability; (3) Communication: Signaling theory explains how clear communication allows agricultural companies to send positive signals regarding their profitability to investors and stakeholders.

This study still has limitations, namely that the independent variables used are limited to internal financial ratios and COVID-19 dummies; other external factors, such as government policies, macroeconomic indicators, or commodity prices, have not been included in the model. The regression model is linear, so it does not capture the potential non-linear relationships between variables that may occur during a crisis. Further research is recommended to expand the independent variables, for example, by including external factors such as policy stimulus, commodity price volatility, and macroeconomic indicators. Analysis needs to be conducted in other sectors (e.g., manufacturing, services) to see whether the impact patterns of COVID-19 are similar or different from those in the agricultural sector. The research methodology can be developed with a non-linear approach or a dynamic panel data model to capture long-term effects and interactions between variables. Further research can also examine the adaptation mechanisms of companies during the New Normal phase more deeply, which have been shown to significantly increase profitability.

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## Conflicts of Interest

The authors declare no conflict of interest.

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