

The Effect of Lean Six Sigma Supply Chain And Sustainability Disclosure On Poultry Farming Issuers

¹Muzayyanah Jabani, ²Jibria Ratna Yasir, ³Agung Zulkarnain

^{1,2}Fakultas Ekonomi dan Bisnis Islam Universitas Islam Negeri Palopo, Indonesia

Email: muzayyanahjabani@uinpalopo.ac.id¹, jibria_ratnayasir@uinpalopo.ac.id^{2,3}

Correspondence Authors: muzayyanahjabani@uinpalopo.ac.id

Article history: Received October 02, 2025; revised November 06, 2025; accepted December 05, 2025

This article is licensed under a Creative Commons Attribution 4.0 International License



ABSTRACT

This study aims to analyze the effect of Lean Six Sigma Supply Chain disclosure and sustainability disclosure on company performance among poultry farm issuers listed on the Indonesia Stock Exchange. Lean Six Sigma practices within the supply chain are regarded as capable of enhancing operational efficiency through waste reduction, quality improvement, and optimization of material and information flows. Concurrently, stakeholders increasingly demand sustainability disclosure as an indicator of a company's commitment to economic, social, and environmental considerations. This study employs a quantitative methodology, utilizing frame analysis and content analysis of annual reports and sustainability reports to assess the extent of disclosure for both variables. Furthermore, the data were analyzed using SEM Partial Least Squares (PLS), as this method is suitable for complex models involving numerous variable indicators and constructs, with the objective of evaluating the predictive model. Overall, the findings indicate that, the disclosure of Lean Six Sigma Supply Chain practices has increased among PT CPIN, PT Malindo, and PT Sierad. PT Malindo demonstrated a consistent increase in sustainability report disclosure, whereas PT CPIN exhibited slight fluctuations in sustainability disclosures. PT Sierad showed an increase, although from 2017 to 2019, it maintained the same disclosure index value. These results highlight the significance of integrating operational efficiency practices with sustainability transparency as a strategy to improve the competitiveness and long-term value of poultry farming.

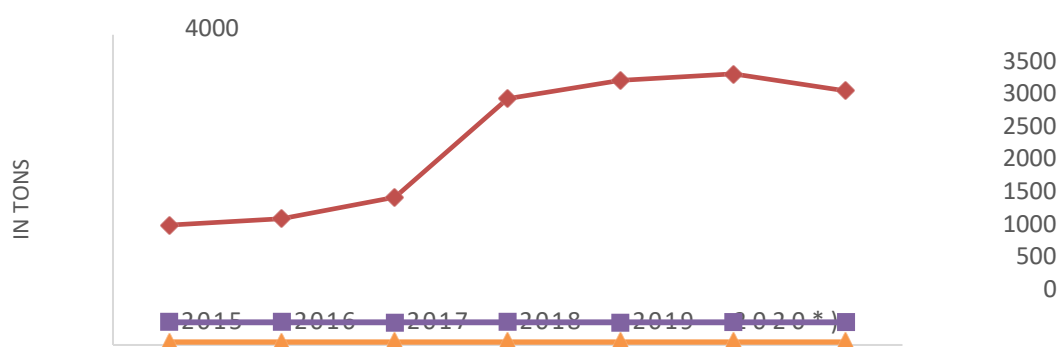
Keywords: Lean Six Sigma, Sustainability, Supply Chain, Company Performance, Poultry Farming Company

INTRODUCTION

The agricultural sector was the second-largest contributor to Indonesia's Gross Domestic Product (GDP) of IDR 1,355 trillion in 2019. The agricultural sector's GDP showed an increasing growth rate, with a 3.64% increase from the previous year in 2019. The livestock sub sector also plays a role in contributing to the agricultural sector's GDP of 167.7 trillion and can absorb 12.22% of the workforce or as many as 4,327,632 people in 2019. The Ministry of Agriculture (Kementan, 2020) stated that the poultry farming industry contributed the highest Domestic Investment (PMDN) in the livestock sub sector, with an investment value of 83.19% of the total livestock PMDN in 2019.

The poultry industry is a significant sector with high economic value, contributing to GDP per capita growth of up to 55%. Poultry products have supplied 65% of the protein needs of Indonesians people (Ferlito and Respatiadi, 2018). Indonesia's increasing population growth is expected to lead to a higher public consumption of poultry meat. This increase in poultry consumption is also driven by growing public awareness of the importance of adequate animal protein for body growth. A study by the Ministry of Trade (Kemendag, 2016) stated that increasing public income also plays a role in increasing demand for poultry meat.

The national poultry population is on the rise. Broiler chicken population continues to grow, reaching over 3 billion heads (Ministry of Agriculture, 2020; Nugroho, 2020), with an average annual increase of 20.42%. Broiler chicken meat production reached 3.27 million tons in 2020 (provisional figures), which is, significantly higher than tof native chickens and ducks. Broiler chickens have the advantage of a relatively fast growth rate compared with other poultry products (Jaelani et al., 2013; Fitriani et al., 2014). Poultry meat production levels are shown in Figure 1.



2014

Broiler Chicken YEAR Free Range Chicken Duck

Figure 1: Poultry meat production (Ministry of Agriculture 2020)

A corresponding increase in poultry meat consumption has not accompanied a continued increase in broiler chicken production. In 2019, Indonesian public consumption of broiler chickens was approximately 6 kg/capita/year (Ministry of Agriculture, 2020). The Central Statistics Agency (BPS, 2018) has reported a protein deficiency of 47 g/capita/day in Indonesian protein consumption. This figure is lower than that of other Southeast Asian countries, such as Malaysia, Thailand, Singapore, and the Philippines (Saptana & Yofa, 2016; Ferlito & Respatiadi 2018). The growth in broiler chicken meat consumption in Indonesia from 2014 to 2019 increased only by an average of 9.48% (Figure 2). The continued increase in poultry production, compared to the relatively low level of public consumption, indicates that Indonesia is currently able to meet domestic poultry product needs. The data on broiler chicken meat consumption are presented in Figure 2.

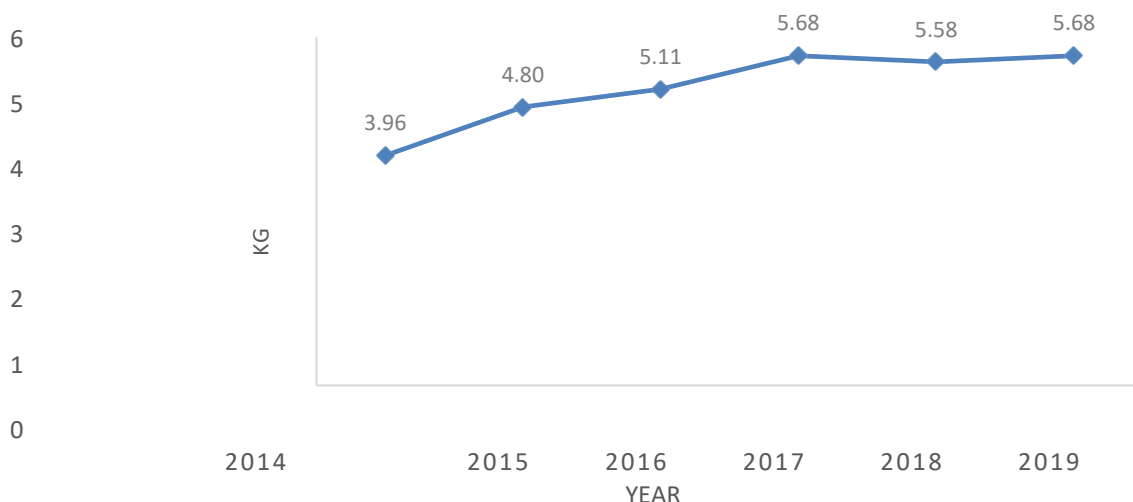


Figure 2: Broiler chicken meat consumption per capita per year (Ministry of Agriculture 2020)

Excess chicken production has caused live chicken prices for farmers to fall below the cost of old goods (HPP). However, consumer prices vary with market dynamics (Adi, 2019). Ferlito and Respatiadi (2018) noted that chicken prices in Indonesia are constantly fluctuating, reaching their highest levels in Southeast Asia, especially during religious holidays. Profits come mainly from the last two stages of the supply chain: wholesalers and slaughterhouses (RPA) (Purwaningsih et al., 2016). This imbalance between supply and demand, along with profit disparities among supply chain actors, has led to issues within the poultry supply chain.

The poultry industry is facing several additional challenges. As reported by the Food and Agriculture Organization (FAO 2006), livestock farming, including poultry farming accounts for 18% of the world's greenhouse gas emissions each year (Goodland and Anhang 2009; Steinfeld et al., 2006). Specifically, Rachmawati (2000) noted that chicken farming generates waste such as wastewater, feces, and unpleasant odors, along with greenhouse gas emissions and fuel leaks (Barth and Melin 2018). It also produces spilled feed, feathers, and bedding wastes (Shamsuddoha 2015). To mitigate this environmental impact, Indonesia has implemented regulations and programs that align with its primary sustainable development efforts.

Large corporations are also encouraged to submit sustainability reports, that typically adhere to the guidelines established by the Global Reporting Initiative (GRI). Only 6% of the entities within the agricultural sector publish sustainability reports (Hardian and Fahmi 2015; OJK 2017). Sustainable development endeavors to foster sustainable economic, social, and environmental growth (BPS 2016). The issue of sustainability in the poultry industry has garnered global attention owing to diminishing resources and escalating demand for poultry products (Harris 2013).

Sustainability principles have been extensively adopted across various industries to facilitate sustainable business operations (Sajjad 2015). The integration of the economic, social, and environmental dimensions is vital for achieving sustainable industrial profitability (Shamsuddoha 2015). Genuine sustainability is attainable when the entire supply chain adheres to uniform principles (Villena and Gioia 2018). Industrial efforts to minimize waste and resource consumption are also prioritized to attain efficiency. Methodologies such as Lean and Six Sigma are employed to reduce waste, decrease inventory levels, enhance profitability, and satisfy consumer needs. Lean Six Sigma (LSS) has been effectively utilized across diverse industrial sectors worldwide, with empirical evidence demonstrating its capacity to reduce rework and improve financial outcomes in the food industry, as well as to increase awareness of consumer requirements within public organizations (Antony et al. 2017). The implementation of LSS along with sustainability practices positively influences organizational performance (Cherrafi et al. 2016).

Standardization serves as an effective tool for facilitating the execution of lean methodologies. It can be applied to production processes and corporate governance practices, including risk management and supply chain management.

Publicly listed poultry farms have adopted ISO 9001 and ISO 22000 standards for quality management and food safety assurance, respectively. Rigid standardization guarantees product quality and promotes sound corporate governance (GCG).

Organizational governance, commitment, policies, and innovation constitute essential components of an organization's strategic management framework (Nawaz and Bhatti 2018). Details concerning corporate governance and management are documented in annual reports, which are mandated by law and regulated by the Financial Services Authority (OJK) (Law 2012; OJK 2016a, 2016b). The annual report functions as a communication channel for disseminating corporate activities to stakeholders (Garcia and Greenwood 2013).

This study examines the influence of LSS disclosure on sustainability practices in the annual reports of poultry farm issuers through framing analysis. Additionally, this study employs content analysis techniques to assess the extent of sustainability disclosure in corporate annual reports. The use of framing and content analyses for evaluating annual reports is recognized as a standard research methodology.

LITERATURE REVIEW

Numerous prior investigations have examined the implementation of corporate sustainability, as disclosed in sustainability reports or incorporated into annual reports. Additionally, several studies have explored the application of lean principles across various industrial sectors and their integration with Six Sigma. Other studies have investigated the relationship between ISO implementation and the application of Lean Six Sigma (LSS) methodologies, as well as the development of sustainability models for LSS implementation and their application within supply chain contexts. The existing body of research that aligns with this study serves as a foundation for guiding further inquiries.

Mazelfi (2018) conducted a study titled "Analysis of Differences in Disclosure of Aspects Before and After the Application of the Materiality Principle in the Preparation of Sustainability Reports (Study on Perusahaan Gas Negara)." This study analyzed the annual reports of the Perusahaan Gas Negara from 2011 to 2016. This study was motivated by the observation that relatively few companies in Indonesia have provided sustainability reports adhering to GRI standards. The focus was on analyzing the differences in disclosure practices within sustainability reports, utilizing GRI G3, GRI G4, and other standard guidelines. Employing a qualitative descriptive methodology with content analysis, this study incorporated primary (obtained through interviews) and secondary data (annual reports from PGN). The findings indicated that reports following the GRI G4 guidelines tended to be shorter but often omitted significant information.

Garcia and Greenwood (2013) conducted a study entitled Visual Framing Analysis of US Multinational Companies." Annual reports serve as strategic marketing and communication tools for corporations. This study examines differences in Corporate Social Responsibility (CSR) framing through visual content (images) in the annual reports of 12 multinational American companies. Data from the years 2009-2010 were analyzed. Variables included environmental sustainability, image subject matter the relationship between people and the company, image location, orientation (horizontal or vertical), and camera distance. The study was based on CSR categories outlined in Carol's framework, which delineates CSR into economic, legal, ethical, and philanthropic categories. The results demonstrate that companies communicate environmental sustainability through images of employees, social sustainability through consumer-related visuals, and economic sustainability through images of products and services.

Tasdemir and Gazo (2018) conducted a study titled "A Systematic Literature Review for Better Understanding of Lean-Driven Sustainability," examining the relationship between lean, sustainability, and lean supply chain management. Motivated by globalization, which contributes to climate change and resource constraints threatening corporate sustainability, this study analyzed 477 articles from 1990 to 2018. The findings reveal a strong synergy between leanness and sustainability, supported by tools such as JIT, LCA, Six Sigma, and TQM. Companies can enhance sustainability by adopting ISO 14000 standards, improving quality, safety, and health management, implementing lean practices, and using sustainability reporting systems such as GRI. Standardization plays a key role in enabling lean implementation at both micro and macro levels, fostering continuous improvement and operational resilience. The authors argue that lean is fundamental to building a sustainable framework, and that both approaches can generate genuine sustainability. Effective integration requires collaboration across the supply chain, with success depending on the framework and measurement methods. In particular, JIT boosts supply chain competitiveness and facilitates ISO 14000 certification.

Shamsuddoha (2015) studied the Integrated Supply Chain Model for Sustainable Manufacturing: A System Dynamics Approach," focusing on Bangladesh's largest poultry farms. The industry faces challenges, such as the lack of a structured supply chain, excessive waste, and sustainability issues. This study aimed to integrate sustainable poultry production through forward supply chain (FSC) and reverse logistics (RL) models to address value chain problems and reduce waste. FSC is designed to improve profitability, while RL promotes recycling to lessen the environmental impact and add value. Aiming to develop an integrated and sustainable poultry supply chain, this study examined variables such as Parent Stock, eggs, DOC, brokers, farmers, broiler chickens, feathers, workforce, and hatcheries using the System Dynamics method. The results indicate that supply chain integration that leverages FSC and RL is essential for sustainable growth, which can also enhance community well-being, economic performance, and company efficiency.

Sobral et al. (2013) explored the Green Benefits from Adopting Lean Manufacturing: A Case Study From the Automotive Sector," analyzing a Brazilian manufacturing firm certified with ISO 9001 and ISO 14000. Using interviews with managers from the production and environmental sectors, the study found that lean implementation facilitates ISO certification and positively affect environmental performance. Lean principles help reduce waste, support continuous improvement, and promote environmental sustainability. Key tools included 5S, kaizen, Total Productive Maintenance

(TPM), Continuous Improvement (CI), supply chain collaboration, inventory reduction, and poka yoke. The 5S system enhances standard procedures and cleanliness, and reduces waste and resource use. Poka-yoke minimizes accidents and supports CI, whereas supply chain collaboration improves environmental efficiency, particularly in transportation (Simpson and Power, 2005, in Sobral et al. 2013). The study identified that the literature frequently emphasizes VSM, JIT, environmental indicators, and employee training. Leadership has emerged as a crucial factor for successful integration, with a clear understanding of the model necessary to avoid fragmented efforts and suboptimal results. Varsei et al. (2014) conducted a literature study titled Framing Sustainability Performance of Supply Chains with Multidimensional Indicators. This study explored sustainability and its applications within the supply chain. Utilizing optimization techniques, this study assessed the sustainable performance of supply chains. The goal of this study was to develop a framework for sustainable supply chain management. These findings suggest that supply chain sustainability can be achieved through collaborative efforts and participatory governance. The theoretical frameworks employed include resource based theory (RBT), institutional theory, stakeholder theory, and social network perspective. The study measures the (TBL) aspects: economic (tangible and intangible), environmental (waste, GHG emissions, hazardous materials, energy use), and social (employee performance, Human Rights (HAM), social activities, product responsibility). Supply chain activities negatively impact the environment and society, highlighting the need to optimize the entire chain from upstream to downstream. Success factors include strong internal resources, external pressures, stakeholder satisfaction, collaboration, and effective information sharing.

This integration framework proposes 15 models, most of which employ methods such as 5S, Kaizen, VSM, cellular manufacturing, work standardization, visual management, JIT, SMED, supply chain relationships, poka yoke, Six Sigma, statistical process control, analytical tools, and plant layout design. Using unsuitable tools may lead to suboptimal outcomes; for instance, in some sectors, JIT elevates GHG emissions.

Asmudi et al. (2018) conducted a study titled "Operational Strategies for Start-up Business of Peking-ducks Poultry Integrated to Eco-green," which focused on duck farming companies in Indonesia. Owing to its high productivity and large target market, duck farming remains a competitive industry. Enhancing competitiveness involves improving efficiency, adopting eco-friendly practices, and fostering partnerships. The factors affecting duck farming performance include feed and maintenance standards, seed quality, research and technology, business systems, financial analysis, biosecurity, and marketing.

This research employed the lean six sigma (LSS) methodology with DMAIC tools. The definition phase involved creating an SIPOC diagram; the measure phase used VSM and run charts, the analysis used Pareto analysis and FIFO systems, the improved phase applied FMEA, and the control phase involved continuous improvement coupled with FMEA. These findings indicate that eco-green practices combined with LSS can boost efficiency and enhance product quality.

Hypothesis

Based on the previous description, there are several propositions, namely the implementation of ISO 31000 standardization can help monitor risks in the supply chain (de Oliveira et al. 2017), the implementation of ISO 28000 can provide security in the supply chain (Piao and Wang 2016), supply chain collaboration affects the achievement of TBL (Varsei et al. 2014), economic sustainability affects environmental sustainability performance and social sustainability affects environmental sustainability performance (Fernández 2015).

These propositions can then form a research hypothesis to be tested for its truth, namely, the influence of the implementation of risk management disclosure standards and supply chain security management system disclosures in the implementation of sustainability and supply chain collaboration, explained as follows:

- H1 :There is an influence of the implementation of risk management disclosure on the disclosure of supply chain collaboration.
- H2 :The implementation of the supply chain security management system disclosure influences the disclosure of supply chain collaboration.
- H3a :There is an influence of disclosure of supply chain collaboration on economic sustainability performance.
- H3b :There is an influence of disclosure of supply chain collaboration on environmental sustainability performance.
- H3c :There is an influence of disclosure of supply chain collaboration on social sustainability performance.
- H4 :There is an influence of economic sustainability performance on environmental sustainability performance.
- H5 :There is an influence of social sustainability performance on environmental sustainability performance.

RESEARCH METHODS

This study analyzed secondary data from annual reports of Indonesian poultry issuers from 2014 to 2019. The list of poultry issuers was compiled from observations of the Indonesia Stock Exchange (IDX, 2019). These reports were sourced from the official websites of each poultry issuer and the IDX. According to the OJK Circular Letter No. 30 of 2016 (OJK

2016), poultry issuers must publish annual reports in both printed and electronic formats.

The population in this study included all poultry farm issuers listed on the IDX from 2014 to 2019, namely PT CPIN, PT Japfa, PT Malindo, and PT Sierad. These four companies were selected because of their large market share and ease of access to data. Data collection began in 2014 because the IDX website only provided data for the last five years. The end point of 2019 was chosen because the COVID-19 pandemic in 2020 caused significant changes in issuer data, making focused research on supply chains and sustainability issues relevant to the pandemic.

Company annual reports were retrieved either by direct download from the IDX website or from companies' official websites. Frame analysis in media communication typically involves counting specific keywords or noting their presence or absence. This study constructed a framework for standardization, supply chain collaboration, and sustainability. The standardization frame used keywords from the SNI ISO 31000 and SNI ISO 28000. Supply chain collaboration employs keywords from the SNI Award 2020 and previous research. Sustainability also uses keywords from the SNI Award 2020 and from prior studies.

Frame analysis often includes content analysis techniques, that are used to extract information from sustainability disclosures in the annual reports of livestock issuers. This method is commonly used in similar studies (Cornelissen and Werner 2014; Kumar et al. 2017; Tran 2017). Data collection via content analysis applied indicators from the GRI G4 guidelines.

This study integrates the application of Lean Six Sigma (LSS) principles with the standards of SNI ISO, aligned with sustainability principles by employing the Structural Equation Model Partial Least Squares (SEM PLS) methodology. Among the models utilized in supply chain sustainability research SEM, has been employed to examine the relationships between various factors (Emamisaleh et al., 2018). The SEM approach offers a user-friendly means of analyzing the interrelations among variables.

This SEM equation model employs a single indicator to represent each latent variable, specifically variables related to risk management disclosure, supply chain security management system disclosure, supply chain collaboration disclosure, social sustainability, and environmental sustainability. The use of a single indicator to measure these variables is deemed to most accurately reflect the underlying latent constructs. Hayduk and Littvay (2012) contended that employing one to two indicators is preferable and more reliable for capturing the essence of latent variables than using more than three indicators, owing to differences in scale. The economic sustainability variable is measured using three indicators, which are considered sufficiently informative (Hayduk & Littvay, 2012). The selection of three indicators is regarded as optimal for representing latent variables and is commonly adopted in the measurement of economic variables. the SEM research model pertaining to the poultry farming industry and the developed research model, Figures 7 and 8.

This analytical approach was tailored to fulfill the research objectives. The impact of implementing integrated LSS principles within the supply chain to enhance sustainability was analyzed using SEM, beginning with a frame analysis. Content analysis techniques were employed to assess the level of sustainability disclosure in annual reports. Additionally, a descriptive analysis was conducted to provide further understanding of the data set.

Frame analysis was initially introduced by Burke in 1937 and by Bateson in 1955/1972, and was further popularized by Goffman in 1974 (Cornelissen & Werner, 2014). It is a methodological approach used to analyze media content (Rodriguez, 2013), with extensive application in social sciences, such as linguistics, sociology, cognitive psychology, anthropology, and behavioral economics. Subsequently, frame analysis has been incorporated into management studies and organizational theory, with a significant focus on organizational strategic management (Cornelissen & Werner, 2014; Nawaz & Bhatti, 2018).

Entman (1993) posited that text can serve as a means of communication with readers. Texts found in literary works, speeches, news articles, and reports encompass essential information through the processes of placement, repetition, and the association of text with specific symbols. Frame analysis facilitates the understanding of the information conveyed in the text. This method involves selecting various aspects that represent the entirety of reality and deriving meaning from them. Nordesjö (2020) contended that frame analysis entails the collective, interactive, and strategic constructions of meaning from these constructs. This meaning is interactional and can be utilized to inspire others within the organization. The frame analysis process includes diagnosing frames, identifying them, and examining the motivations underlying these frames. Units of analysis for framed texts may include particular keywords, phrases, images, sources of information, and sentences. Content analysis is frequently employed in conjunction with frame analysis to ascertain the true intent of messages.

A formative measurement model is a linear combination of indicators that form a construct. In this model, the evaluation was conducted by measuring the weights of the indicators. However, this model has the potential for instability in the indicator weights. Reflective measurement does not require internal consistency measurements to measure the formative model (Hair et al. 2011).

The second stage of SEM PLS applies the inner model. The structural model represents the relationship between the latent variables considered in the analysis based on substantive theory. Latent variables that function solely as independent variables are referred to as the exogenous latent variables. Latent variables that function as both independent and dependent variables are called endogenous latent variables (Sarstedt et al. 2014). The model was evaluated by examining the coefficient of determination (R^2), cross-validation redundancy (Q^2), and path coefficients. The most commonly used evaluations in SEM PLS are R^2 and path coefficients. The coefficient of determination (R^2) represents the amount of explained variance for each endogenous latent variable (Hair et al. 2012). The R^2 values ranged from 0 to 1, with higher values indicating a higher level of accuracy. As a general guideline, R^2 values of 0.75, 0.50, and 0.25 are considered

substantial, moderate, and weak, respectively (Sarstedt et al. 2014). Path coefficients indicate the quality of the inner model, and their significance must be assessed using a resampling procedure, which is assessed using the t-value or p-value. Path coefficients were considered significant at a 5% error rate if the t-value was greater than 1.96.

RESEARCH RESULT

The poultry industry in Indonesia began to develop in 1967, following the enactment of Law No. 1 of 1967 on Foreign Investment (PMA) and Law No. 6 of 1968 on Domestic Investment (PMDN). In 1987, the sector faced fluctuations in seed and feed prices, leading many small farmers to close their farms. From 1989 to 1990, the industry experienced rapid growth, primarily driven by large corporations. In 1996, a model of integration was introduced, in which large companies supported smallholder farmers, as outlined in the Decree of the Minister of Agriculture No. 472 of 1996 (Ministry of Trade 2016). By 2018, PMDN investments in the sector reached IDR 632.5 billion, and PMA investments hit US\$ 71.1 million, marking the highest figures among sectors. The surge in investment spurred the expansion of poultry farming businesses, which numbered 253 in 2019, as detailed in Table 6.

Table 6: Forms of poultry farming companies

Company Form	Percentage of Total
PT/CV/Firm	97.75
Foundation	1
State-Owned Enterprises	0.75
Cooperative	0.5

Source: (BPS 2019a)

Approximately 80% of companies operate with vertical integration from upstream to downstream, whereas 20% are independent poultry firms (Nugroho 2020). Leading publicly traded poultry firms include PT CPIN, PT Japfa, PT Malindo, and PT Sierad. Among these, CPIN holds the largest market share in animal feed and DOC, at 34% and 38%, respectively, followed by three other integrated companies and independent entities. The market share percentages for animal feed and DOC are shown in Figures 9 and 10, respectively.

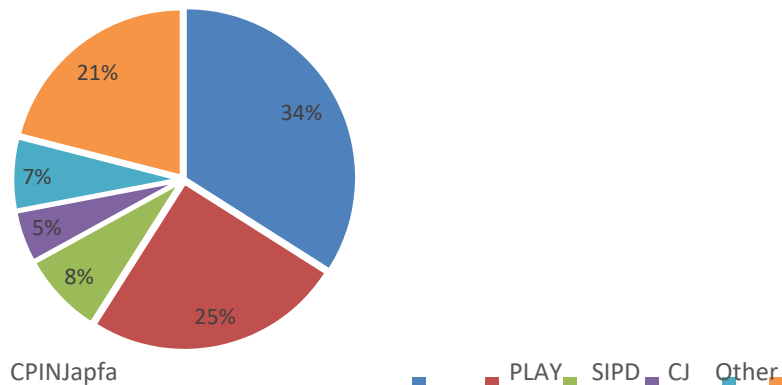


Figure 9 Market share of animal feed 2015 (Ferlito and Respatiadi, 2018)

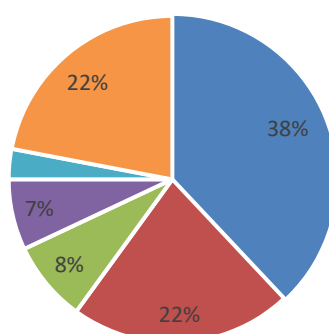


Figure 10 Market share of DOC production 2015 (Ferlito & Respatiadi 2018)

The primary challenge currently confronting the poultry sector is the limited availability of raw materials for animal feed. These raw materials constitute an essential element of industry, with the majority being predominantly imported. Specifically, Indonesia's import requirements for corn reach 12.5%, soybean meal 95%, fish meal 90-92%, and fish bone meal along with vitamins and feed additives is nearly 100% (Ministry of Trade 2016). The reliance on imports and elevated raw material costs inevitably results in increased production expenses, which are subsequently transferred to consumers. Despite restrictions on imports and initiatives, such as corn self-sufficiency programs, these measures have failed to satisfy the demands of livestock farmers. To mitigate this issue, integrated livestock enterprises are expanding their raw material storage capacities and augmenting the number of corn drying facilities. However, increased storage may elevate inventory costs and pose risks related to the deterioration of raw material quality owing to mold proliferation. Therefore, livestock companies are urged to utilize alternative raw materials derived from sources such as corn, palm oil, and poultry feather waste (Tangendjaja 2007; Hasan 2016), which, to date, have not been effectively optimized.

The burgeoning growth of the poultry industry has driven the adoption of advanced technologies to enhance livestock productivity. Additionally, breeding firms endeavor to improve efficiency through increased production, often without adequately considering the needs of the population or consumer demands. Such discordance led to the overproduction of day-old chicks (DOC) in 2014, resulting in surplus stock from 2016 to 2019. In 2019, this surplus reached 577,918 tons (Nugroho 2020), inflicting financial losses on both large-scale and independent farmers. The lack of coordination among supply chain stakeholders has contributed to industry inefficiencies. Larger integrated companies tend to maintain profitability compared to their smaller counterparts. An excess supply of live chickens does not automatically translate into lower consumer poultry prices, as market mechanisms chiefly determine prices. Indonesian chicken prices remain higher than those in Malaysia and Thailand, which is partly attributable to Indonesia's comparatively elevated poultry prices, rendering Indonesian poultry less competitive in the regional market.

The pursuit of sustainability within the Indonesian poultry sector remains an arduous endeavor, as evidenced by the persistently elevated air pollution levels recorded in 2017, amounting to 1,150,772 Gg CO₂e, with the agricultural sector contributing to 121,686 Gg CO₂e (BPS 2019b). Additionally, this sector has high energy and water consumption levels. Furthermore, no livestock companies have yet attained Green PROPER status, which signifies organizations that manage their environmental impact beyond the standards set by the Ministry of Environment (KLH). This status encompasses various aspects, including biodiversity preservation, environmental management systems, solid waste management following the 3R principles (Reduce, Reuse, Recycle), handling of B3 hazardous and toxic materials, emission reductions, water pollution mitigation, and energy efficiency. Although sustainability programs have been broadly adopted in numerous countries, such as the European Union and Germany (Shamsuddoha 2015), Indonesia continues to face significant challenges in this regard.

Indonesia's substantial population growth, exceeding 265 million (BPS 2019c), presents a notable opportunity for expansion of the poultry industry. However, demand for poultry products is, influenced by income levels and consumer preferences. The livestock industry concentration ratio increased from 2003 to 2012, reaching 54.81%, suggesting that only efficient companies can sustain operations in this sector (Ministry of Trade 2016). Company efficiency can be attained by integrating Lean Six Sigma (LSS) and sustainability practices. Such efficiency is anticipated to reduce operational costs, consequently lowering consumer prices and enhancing international competitiveness of Indonesian livestock products.

Outlier model analysis was employed to examine the relationship between latent variables and their indicators. The outer model evaluation involved assessing the convergent validity by measuring the outer loading values. The risk management disclosure variable was constructed from the risk management disclosure indicator, which had a loading factor of 1.00. The supply chain collaboration disclosure variable is similarly derived from its indicator, with a loading factor of 1.00. The supply chain security management system disclosure variable was formed from its respective indicator, with a loading factor of 1.00. The economic sustainability variable was developed from ROA, ROE, and NPM indicators, which had loading factors of 0.989, 0.993, and 0.996, respectively. The environmental sustainability variable was derived from the environmental sustainability indicator, with a loading factor of 1.00. The social sustainability variable was derived from the social sustainability indicator, which also had a loading factor of 1.00. Based on the measurement results obtained using SmartPLS, all loading factors were found to be greater than 0.50. A loading factor value greater than 0.50 can increase the reliability and validity of the construct. These results indicate that all indicators met the criteria and passed the validity test, therefore, no indicators were removed or eliminated. The results of the outer model calculations are shown in Figure 11.

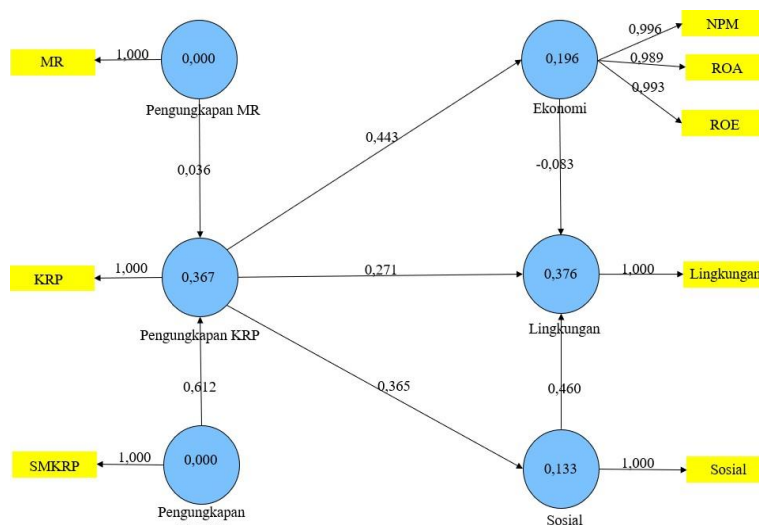


Figure 11 Standardized loading factor

The next stage involves analyzing the reliability of the outer model by examining the AVE, CR, and Cronbach's alpha values. Both the CR and Cronbach's alpha should exceed 0.70; the results confirm that all constructs have values above this threshold. Additionally, the AVE should be greater than 0.50; all constructs also meet this criterion. These findings indicate that all constructs were reliable and passed the reliability test. Detailed results are presented in Table 7.

Table 7: Relationship between latent variables and indicators

Variables	AVE	CR	Cronbach Alpha
Economy	0.98559	0.99515	0.99273
Disclosure of supply chain security management systems	1.00000	1.00000	1.00000
Risk management disclosure	1.00000	1.00000	1.00000
Supply chain collaboration disclosure	1.00000	1.00000	1.00000
Environment	1.00000	1.00000	1.00000
Social	1.00000	1.00000	1.00000

Source: Processed data (2020)

The inner model was evaluated by examining the coefficient of determination (R^2) and path coefficient, both of which were assessed using a test. The results depicted in Figure 11 indicate that the values for the economic and social variables were 0.19 and 0.13, respectively. These values suggest that only 19% of the variation in economic variables and 13% of the variation in social variables were explained by the model, with the remaining proportions accounted for by factors outside the model. According to Sarstedt et al. (2014), these R^2 values are classified as weak. Conversely, the R^2 values for the supply chain collaboration and environmental disclosure variables were 0.36 and 0.37, respectively. This indicates that 36% of the variance in supply chain collaboration disclosures and 37% of the variance in environmental variables are explained by the model, with the residual variance attributed to external factors. According to Sarstedt et al. (2014), these R^2 values are considered moderate.

Path coefficients were evaluated by comparing the calculated t-value with the critical t-value from the t-table. This comparison facilitates the testing of the research hypotheses. If the calculated t-value exceeds 1.96, the hypothesis was accepted; otherwise, it was rejected. In the SEM PLS, hypothesis testing was conducted using the bootstrapping method. The analysis demonstrates a positive relationship between supply chain collaboration disclosure and environmental, social, and economic sustainability. Additionally, disclosure of the supply chain security management system exhibits a positive association with supply chain collaboration disclosure, as evidenced by a t-value exceeding 1.96. Conversely, risk management disclosure has a negative relationship with supply chain collaboration disclosures. Similarly, economic sustainability exhibited a negative relationship with environmental sustainability, as indicated by a t-value below 1.96.

The t-test results are shown in Figure 12.

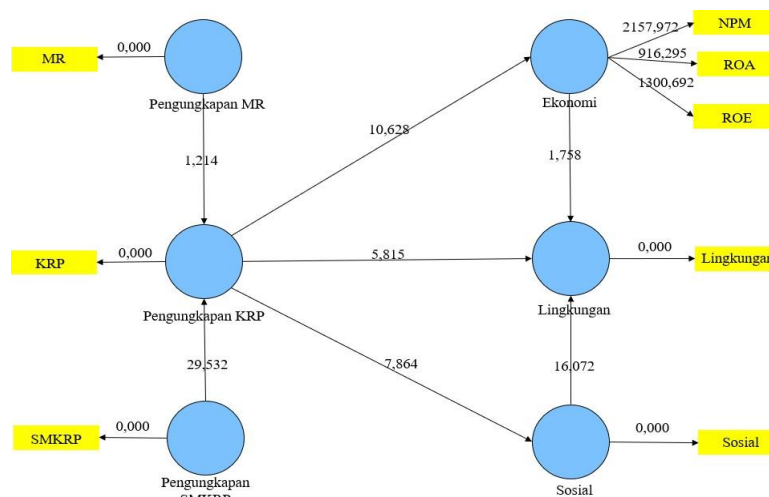


Figure 12 T-test

Table 8 present the results of the hypothesis tests.

Table 8 Hypothesis Testing

Hypothesis	T-count	Conclusion
Supply chain security management system disclosure-> Supply chain collaboration disclosure	29,532	Significant
Risk management disclosure-> Supply chain collaboration disclosure	1,214	Not Significant
Supply chain collaboration disclosure -> Economy	10,626	Significant
Supply chain collaboration disclosure -> Social	7,864	Significant
Social -> Environment	16,072	Significant
Economy -> Environment	1,758	Not Significant
Supply chain collaboration disclosure -> Environment	5,815	Significant

Source: Processed data (2020)

These findings suggest that increased transparency in supply chain collaboration can enhance corporate sustainability disclosure. Additionally, the results underscore a strong correlation between the disclosure of labor standards (LSS) and sustainability within the supply chain. The disclosure of LSS through a supply chain security management system and collaborative practices is crucial for an integrated approach, as integration lies at the heart of sustainability principles. Furthermore, this study demonstrates the inseparable nature of these two principles in the context of supply chain management.

Risk management disclosure does not influence the extent of supply chain collaboration disclosure, a result that contrasts with prior research indicating a positive relationship (Lalonde & Boiral, 2012; de Oliveira et al., 2017). This discrepancy may be attributed to the fact that the current study used secondary data, whereas previous studies relied on primary data. Secondary data, in the form of company annual reports, comprise information publicly provided by organizations, whereas primary data reflects the perceptions of respondents. Economic sustainability is negatively associated with environmental sustainability. However, social sustainability has a positive relationship with environmental sustainability. This finding aligns with existing research that frequently identifies a trade-off between economic and environmental sustainability (Fizza & Chaudhary, 2020).

PT CPIN's risk management disclosure is commendable, with an average score of 16, whereas its supply chain collaboration disclosure is relatively low, with an average score of 5. Similarly, PT Japfa's risk management disclosure is strong, averaging 16, However its supply chain collaboration disclosure is modest, with an average score of 6. PT Japfa delineates its procurement system for goods and services differently from PT CPIN, which does not disclose such information. PT Japfa provides a detailed account of its procurement procedures for goods and services utilized in its production processes, thereby demonstrating its commitment to maintaining the quality of chicken meat products.

PT Malindo's risk management disclosure has an average score of 13; however, its disclosure concerning supply chain collaboration is commendable, with an average score of 13. Conversely, PT Sierad's risk management disclosure has an

average score of 14, yet its supply chain collaboration disclosure is the lowest, with an average score of 4. PT Sierad demonstrates superior risk management disclosure compared to PT Malindo, explicitly elaborating on its risk management process in its annual report, whereas PT Malindo does not disclose this process. PT Malindo effectively disclosed its supply chain collaboration, emphasizing the company's commitment to maintaining cooperation and good relationships with suppliers. By contrast, PT Sierad predominantly focuses on its procurement system and efforts to comply with product standards. These findings indicate no significant correlation between risk management and supply chain collaboration disclosures.

All poultry industry issuers are committed to maintaining high-quality meat through rigorous biosecurity measures. Additionally, all issuers possess compartment and NKV certificates; however, not all operating units have these certifications. Implementing poultry standards constitutes an integral part of companies' strategies to meet stakeholder expectations and enhance their competitiveness.

Among other strategic initiatives, issuers employ closed-house systems (closed pens) and Internet of Things (IoT) technology, and provide training and education to their personnel. The adoption of closed houses, supported by IoT, helps maintain livestock quality according to weight and age standards, and reduces livestock mortality rates. In 2019, Sierad utilized IoT as a system to control product supply and demand. PT Japfa utilized the IoT to enhance production efficiency, quality, marketing strategies, and support sustainability initiatives. PT Malindo leverages IoT for marketing purposes, whereas PT CPIN offers limited disclosure on the role of IoT in its annual report.

PT Sierad, PT Malindo, and PT Japfa offer 5S training as a foundational element to enhance employee work quality. PT Japfa further supplements its training with modules such as Kaizen, Gemba, and Total Productive Maintenance (TPM). The 5S methodology, akin to certification procedures, aims to create a lean work environment (Barth and Melin, 2018). Similarly, kaizen, gemba, and TPM are frequently employed in lean implementation. IoT, in the context of Industry 4.0, functions as an aid to facilitate lean practices, and the closed house system, which adheres to product standards and minimizes defects, aligns with Lean Six Sigma (LSS) principles. Nevertheless, all issuers have yet to fully adopt lean principles with robust forecasting systems, which has resulted in oversupply issues of Days of Capacity (DOC) and feed stock (FS) since 2015. Consequently, poultry issuers should consider increasing the number of NKV certificates and compartments across all operational units, and strengthen supply chain collaboration.

PT CPIN's environmental sustainability disclosure is relatively low, with an average score of 4. However, its economic performance, indicated by the Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM), has shown annual growth. PT Japfa excelled in environmental sustainability, achieving the highest score of 9. Despite this, its economic performance is below that of PT CPIN, mainly because of CPIN's comprehensive upstream-to-downstream strategy. Additionally, CPIN's larger operational scope and increased number of business units lead to higher profits, but also higher transportation costs.

PT CPIN's sustainability disclosure covers its environmental commitments and efforts to maintain a good work environment. PT Japfa demonstrates strong dedication to environmental sustainability, meeting all sustainability indicator disclosures. Since 2015, PT Japfa has published an annual report, combined with its sustainability report. Its effective environmental initiatives are supported by good supply chain collaboration, and assessing suppliers' environmental commitments helps PT Japfa maintain sustainability.

PT Malindo has an average environmental sustainability disclosure score of 5, with fluctuating economic performance. PT Sierad scores an average of six for sustainability disclosures, as well as fluctuating economic results. In 2017, PT Sierad improved its sustainability disclosure, as shown in its annual report, highlighting its increased commitment to various programs and winning an environmental housekeeping award. PT Malindo emphasizes environmental disclosure, focusing on environmental commitments and fostering a conducive work environment. Its economic performance surpasses that of PT Sierad partly because PT Sierad lacks a strategy in the upstream sector. Feed production, which as the highest expense, highlights the need for integrated upstream-to-downstream planning to improve efficiency. A fragmented strategy hampers efficiency. PT Sierad prioritizes market penetration, developing new DOC FS products, and advancing technology but neglects root cause resolution, which is crucial in lean principles. Poorly targeted strategies continue to cause problems and hinder the performance.

Discussion

All issuers adhere to POJK No. 29 and SEJK No. 30 of 2016, which govern the publication of annual reports and their contents. Companies may incorporate sustainability reports, including Corporate Social Responsibility (CSR), in to their annual reports (integrated) or present them separately. This approach aligns with the criteria established by the Asian Ratings Agency (ARA) in 2018, which stipulates that a comprehensive annual report should encompass corporate governance (GCG), management analysis, financial information, and CSR components. All issuers disclose their sustainability reports within their annual reports; however, since 2018, PT Japfa has published a dedicated sustainability report.

Hardian and Fahmi (2015) indicate in their research that the tendency towards corporate sustainability reporting is on the rise, albeit from a relatively low baseline. Variations in disclosure practices among issuers' sustainability reports result from the absence of government regulations mandating separate publication of such reports. The guidelines employed in preparing these sustainability reports predominantly conform to Global Reporting Initiative (GRI) standards (OJK 2017). Since 2015, PT Japfa has utilized the GRI G4 guidelines, although its sustainability report has been compiled in an integrated manner. Conversely, other livestock issuers relied solely on OJK guidelines and relevant legislation when

preparing their annual reports.

An evaluation of the disclosure index for issuer sustainability reports based on the GRI G4 guidelines from 2014 to 2019 reveals an upward trend. The 2019 disclosure index values were as follows: PT CPIN, 18.68%, PT Japfa, 50.54%, PT Malindo, 37.36%, and PT Sierad, 21.98%. The disclosure index is illustrated in the accompanying figure 13.

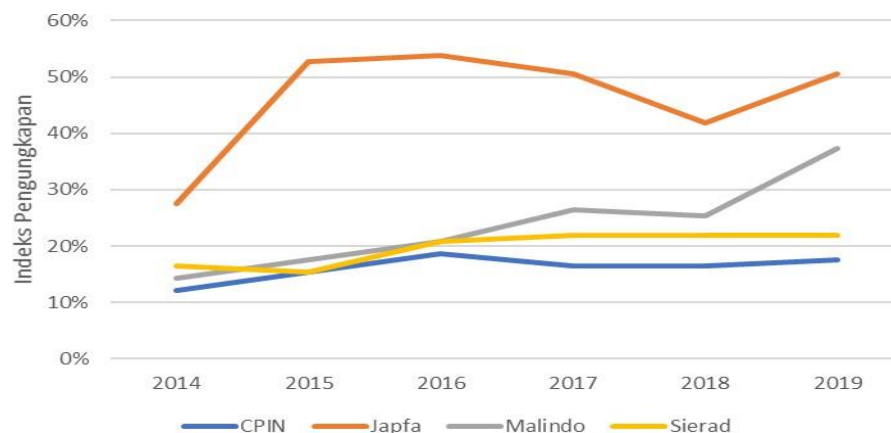


Figure 13 Results of sustainability reports of poultry farm issuers 2014-2019

Figure 13 shows that livestock issuers are advancing their sustainability reporting performance. PT Japfa, followed by PT Malindo, PT Sierad, and PT CPIN, exhibit the highest levels of disclosure in sustainability reports. The average disclosure index for PT Japfa, 15%, for PT Malindo, 63% for PT Sierad at 78%, and 85% for PT CPIN.

The overall mean disclosure index for sustainability reports in 2014 was 58%, with 16 of 91 indicators disclosed. The minimum disclosure involved 11 indicators, whereas the maximum involved 25 indicators. The standard deviation was 22, which was below the mean, indicating data homogeneity. In 2015, the average disclosure index increased to 25.27%, with 23 disclosed indicators. The minimum number of indicators disclosed was 14, and the maximum was 48. The standard deviation was 16.69, which was below the average value, suggesting data consistency.

In 2016, the average disclosure index was 28%, with 26 indicators disclosed. The minimum disclosed indicators were 17, and the maximum was 49. The standard deviation was 36, below the mean, indicating homogeneity in the data. The 2017 average disclosure index is 84%, with 26 indicators disclosed. The minimum number of indicators disclosed was 15, and the maximum was 38. The standard deviation was 67, which was below the mean, indicating data homogeneity. In 2018, the average disclosure rate was 37%, and 24 indicators were disclosed. The minimum and maximum number of indicators were 15, and 38, respectively. The standard deviation was 90, which was below the mean and reflected data homogeneity. The 2019 average disclosure index is 86%, with 27 indicators disclosed. The minimum number of indicators disclosed was 16, and the maximum was 46. The standard deviation was 13.40, which was below the mean value, indicating data homogeneity.

PT Japfa disclosed the most material aspects, with 49 indicators in 2016. PT Malindo disclosed the most material aspects, with a total of 34 indicators in 2019. PT Sierad disclosed the highest number of material aspects, numbering 20 indicators, from 2017 to 2019, while PT CPIN disclosed the most material aspects, with 17 indicators in 2016. PT Japfa increased its disclosure of material aspects starting in 2015, influenced by the management's commitment to conducting sustainable operations. This subsequently influenced the management to follow the GRI G4 reporting guidelines, which are considered easier to convey sustainability aspects. Based on the company's management discussion, management stated its commitment to the sustainability program as an internal strategy within the organization. The company's sustainability program is communicated in its annual report. The preparation of the sustainability report begins by determining which material aspects are considered significant in representing a company's economic, social, and environmental impacts. These material aspects have become management priorities for disclosures in annual reports. In 2018, PT Japfa began publishing sustainability reports that were not only integrated but also separately published. This transition to changing reporting methods led the management to focus more on certain material aspects. In 2019, PT Japfa again incorporated the material aspects discussed in the annual report, following management's refocus on the company's sustainability program and its stakeholders.

Disclosure of Sustainability Report Economic Category

The economic category comprises four aspects and nine indicators. From 2014 to 2019, only the economic category has the highest disclosure value. The average disclosure value for this category also demonstrated an annual increase, reaching a score of 7 in 2019. The aspect most frequently addressed by issuers was economic performance, indicating that all issuers prioritized this category because of their relevance to their long-term performance.

In 2014, beyond economic performance, issuers emphasized the disclosure of indirect economic impacts and procurement practices, whereas indirect economic impacts received comparatively less attention. The distribution of data across each disclosure category was homogeneous, as evidenced by the standard deviation values below the mean. Specifically, the standard deviations for economic performance, market presence, indirect economic impact, and procurement practices are 0, 0, 0.58, and 0.58, respectively.

In 2015, the focus of economic disclosures remained largely consistent; however, PT Japfa and PT Malindo began to disclose their market presence. The data distribution for economic performance and impact was not uniform; nonetheless, market presence and procurement practices exhibited above-average standard deviations of 0.58.

In 2016, emphasis on economic disclosure intensified, particularly regarding indirect economic impacts, whereas attention to procurement practices and market presence diminished. PT Japfa reduced its focus on market presence and procurement practices, whereas PT CPIN increased its emphasis on indirect economic impacts. The analysis indicated a homogeneous data range for economic performance and indirect economic impacts during the year.

In 2017, the disclosure focus was similar to that of the previous year. However, PT CPIN reduced its disclosure by one indicator. The other three issuers added an indicator to their annual reports. This variation led to an increase in the overall average disclosure of economic aspects. The standard deviations for economic performance and indirect economic impact were 0.5 each, indicating data homogeneity, as they were below the mean. Conversely, the standard deviations for market presence and procurement practices exceeded the average, indicating heterogeneity.

In 2018, the emphasis on economic performance remained consistent with that of the previous year. However, there was an increase in market presence and a decrease in indirect economic impact disclosures. PT CPIN lessened its focus on indirect economic impacts, while PT Japfa intensified its focus on market presence. The distribution of data for market presence and procurement practices was heterogeneous, whereas that for economic performance and indirect economic impacts was homogeneous.

In 2019, there was a heightened emphasis on economic category disclosures, resulting in more homogeneous data distributions. PT CPIN, PT Japfa, and PT Malindo each include one additional indicator in their annual reports. Meanwhile, PT Sierad decided not to add new disclosure indicators. The disclosure trends in issuer categories from 2014 to 2019 are summarized in Table 9.

Table 9 Disclosure of issuer economic categories in 2014-2019

Economic Category	Number of Issuers Disclosing					
	2014	2015	2016	2017	2018	2019
Economic Performance Aspects						
G4-EC1	4	4	4	4	4	4
G4-EC2	4	4	4	4	4	4
G4-EC3	4	4	4	4	4	4
G4-EC4	0	0	1	0	0	1
Aspects of Market Presence						
G4-EC5	0	1	1	2	2	3
G4-EC6	0	1	0	0	1	1
Economic Impact Aspects						
Indirect						
G4-EC7	2	1	3	3	2	3
G4-EC8	4	4	3	4	4	4
Procurement Practice Aspects						
G4-EC9	2	2	1	2	2	2

Source: Processed data (2020)

The analysis results demonstrate that all issuers prioritize the disclosure of aspects related to economic performance, utilizing three primary indicators: EC1 (economic value), EC2 (financial implications and risks), and EC3 (scope of organizational obligations). Indicator EC4 (financial assistance received from the government) was not the focus of disclosure in the annual reports.

Market presence, as measured by the indicator EC5 (standard employee wage ratio), emerges as the most frequently disclosed metric among issuers; however, not all issuers opt to disclose this information. Conversely, EC6 (the ratio of senior management employed relative to the public) appears to be less emphasized, potentially because issuers have not yet recognized its significance and impact on the company's sustainability initiatives.

The indirect economic impact, represented by indicator EC8 (indirect economic impact), receives greater attention from issuers than does EC7 (development and investment impact). This suggests that issuers are more inclined to communicate the company's economic influence on stakeholders. Such disclosures have the potential to enhance positive stakeholder perceptions of the company's performance throughout the reporting period.

Procurement practices, including indicator EC9 (local supplier purchasing ratio), are yet to garner comprehensive

attention from all issuers. One notable entity that consistently discloses procurement practices is the CPIN. PT Japfa disclosed the EC9 indicator during the years 2014-2015 and 2017-2019 but omitted it in 2016. Disclosure of procurement practices can serve as an evaluative tool for issuers engaged in sustainable practice operations.

Environmental Category Sustainability Report Disclosure

Environmental disclosures encompassed 12 aspects and thirty-four indicators. During the period from 2014 to 2019, only eight indicators, namely EN4 (energy consumption outside the organization), EN7 (energy demand reduction), EN12 (impact on biodiversity), EN17 (GHG emissions), EN18 (GHG emission intensity), EN20 (ODS emissions), EN21 (NOx, SOx, and significant emissions), and EN27 (product impact mitigation level), were not disclosed by issuers in their annual reports.

PT Japfa exhibited the highest level of environmental disclosure among the issuers, with a peak index of 61.8% between 2015 and 2017. In the current year, PT Japfa published an integrated sustainability report, but no separate sustainability report was issued. The highest environmental disclosure index for PT CPIN was 6% in 2016. For PT Malindo, the highest index value was 18% in 2017 and 2019. PT Sierad achieved its peak index of 15% between 2016-2019.

In 2014, the aspects disclosed by the issuers included energy, effluent and waste, products and services, compliance, transportation, and other categories. PT Japfa disclosed the most environmental information relative to the other issuers. The standard deviation of the disclosure values exceeds the mean, indicating heterogeneity within the data distribution.

In 2015, disclosures comprised aspects such as materials, energy, water, biodiversity, effluent and waste, products and services, and compliance PT Japfa has continued to lead to environmental disclosures through its sustainability reports. The standard deviation for water and other aspects was lower than the average, suggesting homogeneous data, whereas the other aspects exhibited standard deviations exceeding the average, indicating heterogeneity.

In 2016, the aspects disclosed by issuers showed no significant differences from those in 2015; however, PT Sierad and PT Malindo expanded their disclosures to include effluent and waste aspects. The range of the disclosure data remained substantial, with standard deviations exceeding the average.

In 2017, the aspects disclosed were similar to those disclosed in 2015. Notably, PT Malindo has increased its emphasis on energy disclosure. PT Malindo and PT Japfa recorded comparable sustainability index scores, whereas PT CPIN reduced the focus on other aspects. The distribution of disclosure data remained broad, with values exceeding the average, primarily because of inconsistent yearly disclosures of the same aspects by issuers.

In 2018, the disclosed aspects showed slight variations from those of the previous year. PT Japfa and PT Malindo decreased their emphasis on effluent and waste, supplier assessments, and energy disclosures, likely because of the relatively lower impact of these aspects on their sustainability activities. PT Japfa's reduced disclosures in this regard are attributable to the publication of a separate sustainability report. The standard deviation of the disclosures in 2018 was higher than average, reflecting data heterogeneity.

In 2019, disclosure by issuers increased in areas such as compliance, effluent, and emissions. PT Japfa and PT Malindo enhanced their focus on environmental sustainability disclosures, whereas PT CPIN and PT Sierad did not. The broad range of disclosure data was maintained at a high level, driven by the differences in the material aspects emphasized by each issuer. A comprehensive overview of environmental disclosures by issuers from 2014 to 2019 is presented in Table 10.

Table 10 Environmental category disclosures of issuers in 2014-2019

Environmental Category	Number of Issuers Disclosing					
	2014	2015	2016	2017	2018	2019
Material Aspects						
G4-EN1	1	0	1	1	1	1
G4-EN2	0	1	2	2	2	2
Energy Aspects						
G4-EN3	0	1	1	1	1	0
G4-EN4	0	0	0	0	0	0
G4-EN5	0	0	1	1	0	0
G4-EN6	1	1	1	2	1	1
G4-EN7	0	0	0	0	0	0
Water Aspect						
G4-EN8	0	1	1	1	1	0
G4-EN9	0	1	1	1	0	2
G4-EN10	0	1	1	1	1	1

Table 10 Environmental category disclosures of issuers 2014-2019 (continued)

Environmental Category	Number of Issuers					
	Disclosing					
	2014	2015	2016	2017	2018	2019
Biodiversity Aspects						
G4-EN11	0	1	1	0	1	1
G4-EN12	0	0	0	0	0	0
G4-EN13	0	1	1	1	0	1
G4-EN14	0	1	1	0	0	0
Emission Aspects						
G4-EN15	0	1	1	1	0	0
G4-EN16	0	1	1	1	0	1
G4-EN17	0	0	0	0	0	0
G4-EN18	0	0	0	0	0	0
G4-EN19	0	1	1	1	0	3
G4-EN20	0	0	0	0	0	0
G4-EN21	0	0	0	0	0	0
Effluent and Waste Aspects						
G4-EN22	0	1	1	1	1	2
G4-EN23	1	1	3	3	3	3
G4-EN24	0	1	0	1	1	0
G4-EN25	0	1	1	1	0	0
G4-EN26	0	1	1	1	1	1
Product and Service Aspects						
G4-EN27	0	0	0	0	0	0
G4-EN28	1	1	1	1	1	1
Compliance Aspects						
G4-EN29	1	1	1	0	0	1
Transportation Aspects						
G4-EN30	1	0	0	2	1	1
Other Aspects						
G4-EN31	2	3	4	3	3	3
Supplier Assessment Aspects of the Environment						
G4-EN32	0	1	1	1	0	0
G4-EN33	0	1	0	0	0	0
Aspects of Environmental Complaint Mechanisms						
G4-EN34	0	0	1	2	2	1

Source: Processed data (2020)

The analysis results show that the indicators most frequently disclosed by issuers are EN6 (reduced energy consumption), EN9 (significant water sources), EN23 (total waste weight), EN31 (total investment expenditure), and EN34 (environmental complaint mechanisms). Not all aspects and indicators in GRI G4 were disclosed by the issuers. This indicates that the focus and material aspects that influence the impact of issuers' sustainability activities vary.

Disclosure of Sustainability Report Social Category

The disclosure of social categories comprises four subcategories, encompassing 30 aspects and 48 indicators. During the period from 2014 to 2019, specific indicators were used, specifically LA4 (minimum notification period), HR5 (child exploitation by suppliers), HR6 (forced labor by suppliers), HR8 (number of incidents related to customary rights), HR11 (negative human rights impacts on suppliers), SO3 (number of corruption risks), SO5 (corruption incidents), SO6 (value of political contributions), PR1 (percentage of products with significant impacts), PR2 (total incidents of product non-compliance), PR4 (total incidents of label non-compliance), PR7 (total non-compliance), PR8 (total complaints), and PR9 (value of fines). The subcategories most frequently disclosed by issuers were labor and community practices. Conversely, subcategories related to human rights and product responsibility are not widely disclosed.

Between 2014 and 2019, a noticeable upward trend was observed in disclosures related to labor and community practices. Specifically, labor practices were the most frequently discussed subcategories by the four poultry issuers. This differs from the findings of Kumar et al. (2017), who observed that labor practices were not extensively disclosed among Indian banks. This suggests that labor practices continue to be a sensitive issue in Indonesia, necessitating increased attention to enhance transparency and improve stakeholder communication.

For instance, PT Japfa placed substantial emphasis on disclosing labor practices; however, in its separately published sustainability reports for 2018 and 2019, the frequency of such disclosures decreased. For the other three issuers, the frequency fluctuated, but showed an overall increasing trend. Consequently, the overall volume of labor practice disclosure data remains relatively limited.

Indonesian poultry issuers do not prioritize human rights disclosure. This subcategory offers insight into how organizations implement or violate human rights, as well as how stakeholders advocate for change. The analysis indicated that only PT Japfa disclosed human rights information in its sustainability reports from 2015 to 2017. This may be attributable to the perception that human rights issues exert a limited influence on an organization core activities. Despite their significance in the international stage, human rights issues have not yet emerged as critical concerns impacting organizational performance within the Indonesian poultry sector, resulting in limited disclosure 11.

Table 11 Disclosure of social categories of issuers in 2014-2019

Social Category	Number of Issuers					
	Disclosing					
	2014	2015	2016	2017	2018	2019
Sub-Category: Employment Practices and Work Comfort						
Personnel Aspects						
G4-LA1	2	3	4	3	3	4
G4-LA2	0	1	1	1	1	1
G4-LA3	0	0	0	0	1	1
Industrial Relations Aspects						
G4-LA4	0	0	0	0	0	0
Occupational Health and Safety Aspects						
G4-LA5	1	2	3	2	2	3
G4-LA6	2	2	3	2	3	3
G4-LA7	0	0	1	0	0	0
G4-LA8	2	2	2	1	1	1
Training Aspects and Education						
G4-LA9	0	1	1	0	0	1
G4-LA10	4	4	4	4	4	4
G4-LA11	4	4	4	4	4	4

Table 11 Disclosure of social categories of issuers 2014-2019 (continued)

Social Category	Number of Issuers Disclosing					
	2014	2015	2016	2017	2018	2019
Aspects of Diversity and Equal Opportunity						
G4-LA12	3	4	4	4	4	4
Aspects of Equal Remuneration for Women and Men						
G4-LA13	2	2	2	2	2	2
Supplier Assessment Aspects of Labor Practices						
G4-LA14	0	0	0	1	0	1
G4-LA15	0	0	0	0	0	1
Aspects of the Complaint Mechanism for Employment Issues						
G4-LA16	4	4	4	4	4	4
Human Rights Sub-Category						
Investment Aspects						
G4-HR1	0	0	0	1	1	2
G4-HR2	0	0	0	1	1	1
Non-Discrimination Aspect						
G4-HR3	0	1	1	0	0	0
Aspects of Freedom of Association and Collective Labor Agreements						
G4-HR4	0	0	1	0	0	1
Child Labor Aspects						
G4-HR5	0	0	0	0	0	0
Aspects of Forced or Compulsory Labor						
G4-HR6	0	0	0	0	0	1
Aspects of Security Practices						
G4-HR7	1	1	1	1	1	1
Customary Aspects						
G4-HR8	0	0	0	0	0	0
Assessment Aspects						
G4-HR9	1	1	0	2	2	2
Supplier Assessment Aspects of Human Rights						
G4-HR10	0	1	1	1	0	0
G4-HR11	0	0	0	0	0	0

Table 11 Disclosure of social categories of issuers 2014-2019 (continued)

Social Category	Number of Issuers Disclosing					
	2014	2015	2016	2017	2018	2019
Aspects of the Complaint Mechanism for Human Rights Issues						
G4-HR12	1	0	1	1	1	2
Community Sub-Category						
Local Community Aspects						
G4-SO1	4	4	4	4	4	4
G4-SO2	0	1	0	0	0	0
Anti-Corruption Aspect						
G4-SO3	0	0	0	0	0	0
G4-SO4	1	2	3	3	4	4
G4-SO5	0	0	0	0	0	0
Public Policy Aspects						
G4-SO6	0	0	0	0	0	0
Anti-Competitive Aspects						
G4-SO7	0	0	3	3	3	2
Compliance Aspects						
G4-SO8	1	3	3	3	3	3
Supplier Assessment Aspects of Impact in society						
G4-SO9	0	0	0	1	0	1
G4-SO10	0	0	0	0	0	1
Aspects of the Complaint Mechanism Impact on the Community						
G4-SO11	1	1	1	1	1	2
Product Liability Sub-Category						
Customer Health and Safety Aspects						
G4-PR1	0	0	0	0	0	0
G4-PR2	0	0	0	0	0	0
Product and Service Labeling Aspects						
G4-PR3	1	1	1	0	1	2
G4-PR4	0	0	0	0	0	0
G4-PR5	1	1	0	2	1	2
Marketing Communication Aspects						
G4-PR6	0	0	0	0	0	0
G4-PR7	0	0	0	0	0	0
Customer Privacy Aspects						
G4-PR8	0	0	0	0	0	0
Compliance Aspects						
G4-PR9	0	0	0	0	0	0

Source: Processed data (2020)

The analysis results indicate that the most frequently disclosed indicators by issuers are LA1 (total employees), LA6 (employee sickness rate), LA10 (skills program), LA11 (employee performance review), LA12 (composition of governance body), LA16 (employment complaints), SO1 (community involvement), and SO4 (anti-corruption training). Based on the research findings, poultry issuers in the period 2014-2016 primarily concentrated on economic disclosures rather than social and environmental disclosures, aiming to attract investors. In the period 2017-2019, there was a shift

towards emphasizing social and environmental disclosures. Poultry issuers have demonstrated an increased awareness of stakeholder concerns, which necessitates the enhancement of social and environmental initiatives.

A sustainability disclosure report delineates a company's dedication and outlook toward sustainability. Companies that prepare sustainability reports provide stakeholders with information regarding their sustainability initiatives. These reports may also assist companies in enhancing waste management and in assessing their environmental impacts. Moreover, sustainability reports serve as tools for identifying resource waste within a company, thereby facilitating lean implementation.

Sustainability disclosure influences stakeholder behavior. Investors often exhibit irrational financial behavior when investing in a company. The dissemination of sustainability information can bolster investor confidence in evaluating a company's commitment to sustainability programmes. Investors can thus perceive the benefits of sustainability reports. Additionally, sustainability disclosures can impact consumer behavioral economics, thereby fostering greater consumer confidence in continuing to purchase a company's products. Sustainability activities undertaken by a company can provide behavioral insights that positively influence society and the environment. Furthermore, social sustainability in employment practices can enhance employee well-being, which may subsequently lead to increased engagement and productivity.

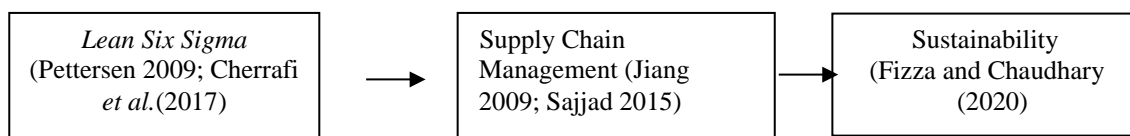


Figure 7 Research model of the poultry farming industry

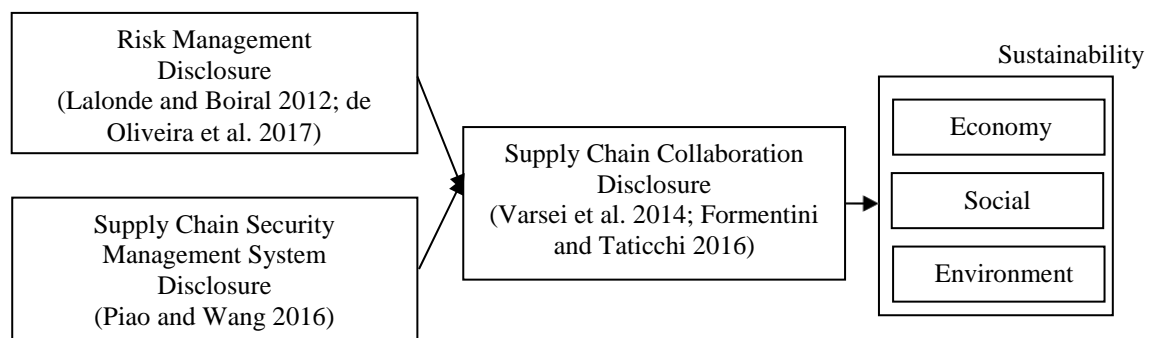


Figure 8: The research model developed.

CONCLUSION

Based on these research findings, companies should consider incorporating Lean Six Sigma (LSS) into their comprehensive strategic framework and rigorously evaluate their sustainability disclosure practices. This study examines the relationship between the integration of LSS principles through standardization and sustainability, as framed by the analysis, and assesses the extent of sustainability disclosures by livestock issuers. The results indicate that disclosures related to standardization may influence sustainability outcomes. Moreover, this study demonstrates that economic sustainability does not affect environmental sustainability, whereas social sustainability exerts an influence. It further emphasizes disparities in sustainability report disclosures among poultry issuers, with those adhering to the GRI G4 guidelines providing more extensive disclosures. Governments should establish regulatory frameworks concerning corporate sustainability disclosure guidelines to ensure consistency in of information dissemination. Future research could examine the factors influencing disclosure in annual reports, potentially employing alternative methodologies such as logit regression, and incorporating variables such as company size and age.

REFERENCES

- Adi T. 2019. Keadilan Bagi Peternak Unggas. *Harian Kontan, Analisis*.<http://www.kontan.co.id>. [diunduh 2019 Februari 20].
- Agustia D. 2020. Pengungkapan Laporan Keberlanjutan dan Mekanisme Tata Kelola Perusahaan Terhadap Kinerja Saham. *Rubrik Cakrawala*. <http://news.unair.ac.id>. [diunduh 2021 Maret 3].
- Allegretti G, Talamini E, Schmidt V, Bogorni PC, Ortega E. 2018. Insect As Feed: An Emergy Assessment Of Insect Meal As A Sustainable Protein Source For The Brazilian Poultry Industry. *Journal of Cleaner Production*. 171: 403–412. DOI:10.1016/j.jclepro.2017.09.244.
- Alolayan S. 2014. An Assessment Of Quality Management System Indicators For The ISO 9001:2008 Certified Work Organizations In Kuwait [tesis]. Dublin: Dublin City University.
- Antony et al. 2017. Lean Six Sigma: Yesterday, Today And Tomorrow. *International Journal of Quality and Reliability Management*. 34(7): 1073– 1093. DOI:10.1108/IJQRM-03-2016-0035.

- Asmudi S, Rahmat STY, Nofi E. 2018. Operational Strategies for Start Up Business of Peking Ducks Poultry Integrated to Eco Green. *RJOAS*. 8(August): 160–166. DOI:10.18551/rjoas.2018-08.50.
- Asrol M. 2019. *Rekayasa Model Pengambilan Keputusan Cerdas Penyeimbangan Risiko Dan Nilai Tambah Untuk Rantai Pasok Berkelanjutan Agroindustri Gula Tebu* [tesis]. Bogor: IPB.
- Bahri S. 2018. *Metodologi Penelitian Bisnis*. Yogyakarta: Andi.
- Banawi A, Bilec MM. 2014. A Framework To Improve Construction Processes: Integrating Lean, Green And Six Sigma. *International Journal of Construction Management*. 14(1): 45–55. DOI:10.1080/15623599.2013.875266.
- Barth H, Melin M. 2018. A Green Lean Approach To Global Competition And Climate Change In The Agricultural Sector A Swedish Case Study. *Journal of Cleaner Production*. Elsevier Ltd. 204: 183–192. DOI:10.1016/j.jclepro.2018.09.021.
- Cherrafi A, Elfezazi S, Chiarini A, Mokhlis A, Benhida K. 2016. The Integration of Lean Manufacturing, Six Sigma and Sustainability: A Literature Review and Future Research Directions for Developing a Specific Model. *Journal of Cleaner Production*. 139: 828–846. DOI:10.1016/j.jclepro.2016.08.101.
- Cherrafi A, Elfezazi S, Govindan K, Garza-Reyes JA, Benhida K, Mokhlis A. 2017. A Framework For The Integration Of Green And Lean Six Sigma For Superior Sustainability Performance. *International Journal of Production Research*. 55(15): 4481–4515. DOI:10.1080/00207543.2016.1266406.
- Cornelissen JP, Werner MD. 2014. Putting Framing in Perspective: A Review of Framing and Frame Analysis Across the Management and Organizational Literature. *Academy of Management Annals*. 8(1): 181–235. DOI:10.1080/19416520.2014.875669.
- Costa LBM, Godinho Filho M, Fredendall LD, Gómez Paredes FJ. 2018. Lean, Six Sigma And Lean Six Sigma In The Food Industry: A Systematic Literature Review. *Trends in Food Science and Technology*. Elsevier Ltd. 82: 122–133. DOI:10.1016/j.tifs.2018.10.002.
- de Oliveira UR, Marins FAS, Rocha HM, Salomon VAP. 2017. The ISO 31000 Standard in Supply Chain Risk Management. *Journal of Cleaner Production*. 151(October): 616–633. DOI:10.1016/j.jclepro.2017.03.054.
- Emamisaheh K, Rahmani K, Iranzadeh S. 2018. Sustainable Supply Chain Management Practices and Sustainability Performance in the Food Industry. *The South East Asian Journal of Management*. 12: 1–19.
- Entman RM. 1993. Framing: Toward Clarification of a Fractured Paradigm. *Journal of Communication*. 43(4): 51–58. DOI:10.1111/j.1460-2466.1993.tb01304.x.
- Everaert P, Bouten L, Liedekerke L Van, Moor L De, Christiaens J. 2007. Voluntary Disclosure of Corporate Social Responsibility by Belgian Listed firms: A Content Analysis of Annual Reports. Brussel.
- Ferlito C, Respatiadi H. 2018. Policy Reform on Poultry Industry in Indonesia. Center for Indonesian Policy Studies. (January). DOI:10.35497/271878.
- Fernández CS. 2015. *Extending Sustainable Practices Along The Supply Chain* [tesis]. Barcelona: Universitat Ramon Llull.
- Fitriani A. 2014. *Dampak Konsentrasi Industri Terhadap Kinerja Dan Kesejahteraan Masyarakat Di Industri Broiler Indonesia* [tesis]. Bogor: IPB.
- Fitriani *et al.* 2014. Struktur, Perilaku, Dan Kinerja Industri Broiler Indonesia: Pendekatan Model Simultan. *Jurnal Agro Ekonomi*. 32(2): 167–186.
- Fizza Y, Chaudhary MA. 2020. Sustainable Development: Economic, Social, And Environmental Sustainability In Asian Economies. *Forman Journal of Economic Studies*. 15(100551): 87–114. DOI:10.32368/fjes.2019150.
- Formentini M, Taticchi P. 2016. Corporate Sustainability Approaches And Governance Mechanisms In Sustainable Supply Chain Management. *Journal of Cleaner Production*. Elsevier Ltd. 112: 1920–1933. DOI:10.1016/j.jclepro.2014.12.072.
- Freeman RE, Phillips R, Sisodia R. 2018. Tensions in Stakeholder Theory. *Business and Society*. 00(0): 1–19. DOI:10.1177/0007650318773750.
- Freeman RE, Wicks AC, Parmar B. 2004. Stakeholder Theory And “The Corporate Objective Revisited.” *Organization Science*. 15(3). DOI:10.1287/orsc.1040.0066.
- Frost S, Burnett M. 2007. Case study: The Apple iPod in China. *Corporate Social Responsibility and Environmental Management* 14: 103–113. DOI:10.1002/csr.146.
- Frost S, Burnett M. 2007. Case study: The Apple iPod in China. *Corporate Social Responsibility and Environmental Management*. 14(2): 103–113. DOI:10.1002/csr.146.
- Garcia MM, Greenwood K. 2013. Visualizing CSR: A visual Framing Analysis of US Multinational Companies. *Journal of Marketing Communications*. 21(3): 167–184. DOI:10.1080/13527266.2012.740064.
- Garza-Reyes JA. 2015. Green lean and the need for Six Sigma. *International Journal of Lean Six Sigma*. 6(3): 226–248. DOI:10.1108/IJLSS-04-2014-0010.
- Goodland R, Anhang J. 2009. Livestock And Climate Change: What If The Key Actors In Climate Change Are..Cows, Pigs, And Chickens? *World Watch*. (December): 10–19.
- GRI. 2013. *Pedoman Pelaporan Keberlanjutan G4*. Global Reporting Initiative. GRI. 2021. Gri G4 Sektor.
- Hadrawi HK. 2019. The Impact Of Firm Supply Performance And Lean Processes On The Relationship Between Supply Chain Management Practices And Competitive Performance. *Uncertain Supply Chain Management*. 7(2): 341–350. DOI:10.5267/j.uscm.2018.7.003.
- Hair JF, Ringle CM, Sarstedt M. 2011. PLS-SEM: Indeed A Silver Bullet. *Journal of Marketing Theory and Practice*. 19(2): 139–152. DOI:10.2753/MTP1069-6679190202.

- Hair JF, Sarstedt M, Ringle CM. 2012. An Assessment Of The Use Of Partial Least Squares Structural Equation Modeling In Marketing Research. *Journal of the Academy of Marketing Science*. 40(3): 414–433. DOI:10.1007/s11747-011-0261-6.
- Hardian I, Fahmi I. 2015. Pengungkapan Corporate Social Responsibility Berdasarkan Global Reporting Initiative 3.1 di Indonesia. *Jurnal Aplikasi Manajemen*. 13: 98–103.
- Harris C. 2013. Could Green VAT Encourage Sustainable Consumption and Production? .
- Hasan A. 2016. Performan Pertumbuhan Ayam Pedaging Dengan Penggunaan Lumpur Sawit Fermentasi Dalam Ransum. *J. Agrisains*. 17(1): 47–53.
- Hassini E, Surti C, Searcy C. 2012. A Literature Review And A Case Study Of Sustainable Supply Chains With A Focus On Metrics. *International Journal of Production Economics*. Elsevier. 140(1): 69–82. DOI:10.1016/j.ijpe.2012.01.042.
- Hayduk LA, Littvay L. 2012. Should Researchers Use Single Indicators, Best Indicators, or Multiple Indicators in Structural Equation Models? *BMC Medical Research Methodology*. 12. DOI:10.1186/1471-2288-12-159.
- Jaelani *et al.* 2013. Analisis Kelayakan Usaha Peternakan Ayam Broiler Di Kecamatan Tapin Utara Kabupaten Tapin. *Jurnal Ilmu Ternak*. 13(2): 42–48.
- Janvier-James AM. 2012. A New Introduction to Supply Chains and Supply Chain Management: Definitions and Theories Perspective. *International Business Research*. 5(1): 194–207. DOI:10.5539/ibr.v5n1p194.
- Jiang B. 2009. The Effects Of Interorganizational Governance On Supplier's Compliance With SCC: An Empirical Examination Of Compliant And Non- Compliant Suppliers. *Journal of Operations Management*. 27(4): 267–280. DOI:10.1016/j.jom.2008.09.005.
- Kannan VR, Tan KC. 2005. Just In Time, Total Quality Management, And Supply Chain Management: Understanding Their Linkages And Impact On Business Performance. *Omega*. 33(2): 153–162. DOI:10.1016/j.omega.2004.03.012.
- [Kemendag] Kementerian Perdagangan. 2016. Kajian Kebijakan Persaingan Usaha di Sektor Perunggasan. Jakarta: Kementerian Perdagangan.
- [Kementan] Kementerian Pertanian. 2019. Buku Outlook Komoditas Peternakan Daging Ayam Ras Pedaging. Jakarta: Kementerian Pertanian.
- [Kementan] Kementerian Pertanian. 2020. Statistik Peternakan dan Kesehatan Hewan 2020. Jakarta: Kementerian Pertanian.
- Kim M, Yin X, Lee G. 2020. The Effect Of CSR On Corporate Image, Customer Citizenship Behaviors, And Customers' Long-Term Relationship Orientation. *International Journal of Hospitality Management*. Elsevier. 88(February): 102520. DOI:10.1016/j.ijhm.2020.102520.
- Klemencic E. 2006. Management of the Supply Chain – Case of Danfoss District Heating Business Area. Ljubljana University Faculty of Economics. Ljubljana: Ljubljana University.
- Krippendorff K. 2013. Conceptualizing Content Analysis. Content Analysis an Introduction to Its Methodology. Sage.
- Kumar R, Pande N, Afreen S. 2017. Developing A GRI G4 Based Persuasive Communication Framework For Sustainability Reporting (SR): Examining Top 10 Indian Banks. *International Journal of Emerging Markets*. 13(1): 136–161. DOI:10.1108/IJoEM-01-2017-0015.
- Kwak YH, Anbari FT. 2006. Benefits, Obstacles, And Future Of Six Sigma Approach. *Technovation*. 26(5–6): 708–715. DOI:10.1016/j.technovation.2004.10.003.
- Lalonde C, Boiral O. 2012. Managing Risks Through ISO 31000: A Critical Analysis. *Risk Management*. Nature Publishing Group. 14(4): 272–300. DOI:10.1057/rm.2012.9.
- Marques P, Requeijo J, Saraiva P, Frazao-Guerreiro F. 2013. Integrating Six Sigma With Iso 9001. *International Journal of Lean Six Sigma*. 4(1): 36–59. DOI:10.1108/20401461311310508.
- Marrugo E, Sierra C, Calderon D, Ferreira C. 2017. Integrated Management System Based on the OHSAS 18001: 2007 and ISO 28000: 2006 Standards for a Logistic Services Company. *International Journal of Engineering and Applied Sciences*. 4(7): 257410.
- Martens ML, Carvalho MM. 2016. Sustainability and Success Variables in the Project Management Context: An Expert Panel. *Project Management Journal*. 47(6): 24–43. DOI:10.1177/875697281604700603.
- Mazelfi I. 2018. Analisis Perbedaan Pengungkapan Aspek Sebelum dan Setelah Penerapan Prinsip Materialitas pada Penyusunan Laporan Keberlanjutan (Studi pada Perusahaan Gas Negara). *Journal Accounting & Business Information Systems*. 6(2).
- Miller G, Pawloski J, Standridge C. 2010. A case study of lean, sustainable manufacturing. *Journal of Industrial Engineering and Management*. 3(1): 11–32. DOI:10.3926/jiem.2010.v3n1.p11-32.
- Narimissa O, Kangarani-Farahani A, Molla-Alizadeh-Zavardehi S. 2020. Evaluation Of Sustainable Supply Chain Management Performance: Indicators. *Sustainable Development*. 28(1): 118–131. DOI:10.1002/sd.1976.
- Nawaz M, Bhatti GA. 2018. The Content Analysis of the Strategic Management Studies in the Last 15-Years: 2001–2015. *International Journal of Information, Business and Management*. 10(1).
- Nobanee H, Ellili N. 2016. Corporate Sustainability Disclosure In Annual Reports: Evidence From UAE Banks: Islamic Versus Conventional. *Renewable and Sustainable Energy Reviews*. Elsevier. 55: 1336–1341. DOI:10.1016/j.rser.2015.07.084.
- Nordesjö K. 2020. Framing Standardization: Implementing a Quality Management System in Relation to Social Work

- Professionalism in the Social Services. Human Service Organizations Management, Leadership and Governance. Routledge. 44(3): 229–243. DOI:10.1080/23303131.2020.1734132.
- Nugroho BA. 2020. Indonesia's Broilers Business Facing Oversupply Difficulties. IOP Conference Series: Earth and Environmental Science. 478(1). DOI:10.1088/1755-1315/478/1/012010.
- [OJK] Otoritas Jasa Keuangan. 2016a. Salinan Surat Edaran Otoritas Jasa Keuangan Nomor 30 /Seojk.04/2016 Tentang Bentuk Dan Isi Laporan Tahunan Emiten Atau Perusahaan Publik. Indonesia: OJK.
- [OJK] Otoritas Jasa Keuangan. 2016b. Peraturan Otoritas Jasa Keuangan Republik Indonesia Nomor 29/POJK.04/2016 Tentang Laporan Tahunan Emiten atau Perusahaan Publik. Indonesia: OJK.
- [OJK] Otoritas Jasa Keuangan. 2017. Infografis Lembaga Jasa Keuangan dan Emiten Penerbit Sustainability Report. Riset dan Statistik.
- Pampanelli AB, Found P, Bernardes AM. 2014. A Lean & Green Model for a Production Cell. Journal of Cleaner Production. Elsevier Ltd. 85: 19–30. DOI:10.1016/j.jclepro.2013.06.014.
- Pangesti R, Sumertajaya M, Sukmawati A. 2016. Partial Least Square Structural Equation Modeling (PLS-SEM) with Biner Data (Case Study: Knowledge Creation on Dairy Cooperative in Indonesia). Journal, International Engineering, Industrial. 6(4): 327–332.
- Penrose JM. 2008. Annual Report Graphic Use: A Review of the Literature. Journal of Business Communication. 45(2): 158–180. DOI:10.1177/0021943607313990.
- Pettersen J. 2009. Defining Lean Production: Some Conceptual And Practical Issues. TQM Journal. 21(2): 127–142. DOI:10.1108/17542730910938137.
- Piao H, Wang J. 2016. Constructing the Safety Management Systems for Food ColdChain Logistics Based on ISO 28000 Standard. Studies in System Science. 4:1–8.
- Purnomo R. 2017. Analisis Statistik Ekonomi dan Bisnis dengan SPSS. Ponorogo: CV Wade Grup.
- Purwaningsih R, Arief M, Rahmawati D. 2016. Analisis Rantai Pasok dan Distribusi Ayam Pedaging. Seminar Nasional Teknik Industri Universitas Gadjah Mada 2016 Yogyakarta, 27 Oktober 2016. Teknik Mesin dan Industri UGM, 176–183.
- Rachmawati S. 2000. Upaya Pengelolaan Lingkungan Usaha Peternakan Ayam. Wartazoa. 9(2): 73 – 80.
- Rodriguez N. 2013. Framing Analysis as a Tool for Science Officers: The Biofuel Debate Case in the Argentinean and British Press. TUDelft. Delft University of Technology.
- Sajjad A. 2015. Embedding Sustainability Into Supply Chain Management: A New Zealand Perspective. Massey University. 1(1): 1–425.
- Sakumoto *et al.* 2019. Using Lean Six Sigma to Increase Efficiency of a Grain Receipt Process of a Brazilian Agroindustry Cooperative. American Journal of Engineering and Applied Sciences. 12(2): 214–226. DOI:10.3844/ajeassp.2019.214.226.
- Salah S, Rahim A. 2019. An Integrated Company Wide Management System. An Integrated Company-Wide Management System. (December 2018). DOI:10.1007/978-3-319-99034-7.
- Saptana N, Yofa RD. 2016. Penerapan Konsep Manajemen Rantai Pasok Pada Produk Unggas. Forum penelitian Agro Ekonomi. 34(2): 143. DOI:10.21082/fae.v34n2.2016.143-161.
- Sarstedt M, Ringle CM, Hair JF. 2014. Partial Least Squares Structural Equation Modeling (PLS-SEM). Sage Publisher, 1–329.
- Sarwono Y. 2010. Pengertian Dasar Structural Equation Modeling (SEM). Jurnal Ilmiah Manajemen Bisnis Ukrida. 10(3): 98528.
- Satolo *et al.* 2016. Lean Production System: Evaluation In A Laying Poultry Farm. Espacios. 37(17).
- Setioningsih A. 2015. Analisis Perbandingan Tingkat Pengungkapan Tanggung Jawab Sosial Perusahaan Antar Industri Pada Perusahaan Yang Terdaftar Di Indeks Kompas 100 (Berdasarkan Pedoman Global Reporting Initiative G4) [tesis]. Yogyakarta: UGM.
- Shah R, Ward PT. 2007. Defining And Developing Measures Of Lean Production. Journal of Operations Management. 25(4): 785–805. DOI:10.1016/j.jom.2007.01.019.
- Shamsuddoha M. 2015. Integrated Supply Chain Model For Sustainable Manufacturing: A System Dynamics Approach. Sustaining Competitive Advantage Via Business Intelligence, Knowledge Management, and System Dynamics. 22B: 155–399. DOI:10.1108/s1069-09642015000022b003.
- Simons D, Zokaei K. 2005. Application Of Lean Paradigm In Red Meat Processing. British Food Journal. 107(4): 192–211. DOI:10.1108/00070700510589495.
- Siyoto S, Sodik A. 2015. Dasar Metodologi Penelitian. Yogyakarta: Literasi Media Publishing.
- Sobral MC, Sousa Jabbour ABL de, Chiappetta Jabbour CJ. 2013. Green Benefits From Adopting Lean Manufacturing: A Case Study From The Automotive Sector. Environmental Quality Management. 22(3): 65–72. DOI:10.1002/tqem.21336.
- Stanton P, Stanton J. 2002. Corporate Annual Reports: Research Perspectives Used. Accounting, Auditing & Accountability Journal. 15(4): 478–500. DOI:10.1108/09513570210440568.
- Steinfeld H, Gerber P, Wassenaar T, Castel V, Rosales M, Haan C de. 2006. Livestock's Long Shadow. FAO. Rome.

- Tangendjaja B. 2007. Inovasi Teknologi Pakan Menuju Kemandirian Usaha Ternak Unggas. *Wartazoa*. 17: 12–20.
- Tangendjaja B, Wina E. 2006. Limbah Tanaman dan Produk Samping Industri Jagung untuk Pakan. Balai Penelitian Ternak, Bogor. 427–455.
- Tasdemir C, Gazo R. 2018. A Systematic Literature Review For Better Understanding Of Lean Driven Sustainability. *Sustainability (Switzerland)*. 10(7). DOI:10.3390/su10072544.
- Tran TTM. 2017. Institutional Environment, Corporate Governance and Corporate Social Responsibility Disclosure: A Comparative Study of Southeast Asian Countries [tesis]. Huddersfield: The University of Huddersfield Business School.
- UU. 2012. Peraturan Pemerintah Republik Indonesia Nomor 47 Tahun 2012 Tentang Tanggung Jawab Sosial Dan Lingkungan Perseroan Terbatas. Indonesia: Kemenkum HAM RI.
- Varsei M, Soosay C, Fahimnia B, Sarkis J. 2014. Framing Sustainability Performance Of Supply Chains With Multidimensional Indicators. *Supply Chain Management*. 19(3): 242–257. DOI:10.1108/SCM-12-2013-0436.
- Villena VH, Gioia DA. 2018. On The Riskiness Of Lower-Tier Suppliers: Managing Sustainability In Supply Networks. *Journal of Operations Management*. Elsevier. 64(December 2018): 65–87. DOI:10.1016/j.jom.2018.09.004.
- WCED. 1987. Report of the World Commission on Environment and Development: Our Common Future Acronyms and Note on Terminology Chairman's Foreword. Report of the World Commission on Environment and Development: Our Common Future.
- Womack J, Jones D. 1996. Beyond Toyota: How to Root Out Waste and Pursue Perfection. *Harvard business review*. 74(5): 140.
- Yusuf S. 2015. PROPER 2015: Tingkat Kepatuhan Perusahaan Naik Jadi 74%. <https://ekonomi.bisnis.com/read/20151123/257/495084/proper-2015-tingkat-kepatuhan-perusahaan-naik-jadi-74> [diunduh 2021 Juli 18].
- Zhen Y. 2011. Food Safety And Lean Six Sigma Model. University of Central Missouri.