**ARTICLE**

# The Role of Sustainability Performance to Improve Green Competitive Advantage in the Agriculture Sector Manufacturing Industry in Indonesia

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## ABSTRACT

This study aimed to analyze how Sustainability Performance enhanced Green Competitive Advantage through Environmental Consciousness and Green Intellectual Capital in Indonesia's agricultural manufacturing sector. The Natural Resource-Based View (NRBV), Stakeholder, and Knowledge-Based theories were integrated to address a literature gap on this mediation mechanism in developing countries. A quantitative, explanatory causality method was adopted to collect data through surveys of 183 senior and middle managers from relevant companies listed on the Indonesia Stock Exchange. The study used a cross-sectional time horizon and individual unit of analysis, then, data were processed using Structural Equation Modeling with AMOS software. The results showed that both Environmental Consciousness and Green Intellectual Capital significantly positive influence on Sustainability Performance, thereby enhancing Green Competitive Advantage. Furthermore, Sustainability Performance fully mediated the relationships between Environmental Consciousness and Green Competitive Advantage, as well as

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between Green Intellectual Capital and Green Competitive Advantage. These results showed that Sustainability Performance was important for converting environmental awareness and intellectual resources into competitive advantage by improving resource efficiency, stimulating green innovation, and enhancing corporate image. This study contributes theoretically by expanding NRBV and Stakeholder theories through incorporating Sustainability Performance as a mediator. It was practically recommended that companies should internalize Environmental Consciousness through training, develop Green Intellectual Capital, and implement sustainability management systems like ISO 14001. For regulators, the results supported policies promoting ESG transparency and green practice incentives. This study also addressed global challenges, such as the EU's CBAM, showing the need to adapt to sustainability standards for the maintenance of market competitiveness.

*Keywords:* Green Intellectual Capital; Sustainability Performance; Environmental Consciousness; Green Competitive Advantage

# 1. Introduction

Environmental conditions are significantly affected by economic and technological progress, which are often associated with inefficient industry management, resource overuse, and environmental degradation[1]. Waste and resource consumption are major issues in the industry[2,3], contributing 20% of global carbon emissions[4], 54% of world energy consumption[5], and 25% of B3 waste[6,7], as well as contributing to greenwashing[8]. According to Zailani et al.[7], Linnenluecke and Griffiths[9], and Yusliza et al.[10], there is a need to increase the quality of instruction within the educational setting. Furthermore, Zailani et al.[11] and Wong and Wong[12] claimed that strategic roles are crucial for enhancing performance and accomplishing organisational objectives. Investing in real estate is also considered an excellent way for individuals to benefit[13].

Green competitive advantage is crucial in markets that compete on price, quality, and environmental performance, as consumers and investors are increasingly selective toward companies that apply green practices[14–16]. Jiao et al. reported that a sustainable business model could increase companies' performance, energy efficiency, and social well-being[17]. Companies also possess intangible assets that support corporate sustainability[18,19]. These intangible assets combine environmental awareness and ecological health to form green intellectual capital[20–22]. A previous study reported that environmental consciousness showed the internalization of environmental awareness into business culture and strategy[23]. Therefore, companies invested in environmentally friendly technologies, energy efficiency, and waste recycling[24], becoming strategic resources that drive green innovation[25]. This investment directly influenced business operations, sustainability performance, and increased competitive advantage[13,26–28].

This study is highly motivated by its effort to combine environmental issues, business strategies, and competitive advantage within a single analytical framework. The majority of previous investigations examined how environmental consciousness and green intellectual capital affect corporate performance independently[14,25]. In this study, both factors were integrated into a single model to explore the interaction in shaping green competitive advantage, an area that remains underexplored in the literature. The benefits of green competition include enhanced efficiency and innovation across various domains[16,28]. Sustainability performance is frequently examined as an outcome rather than as a mediator[13,29]. Previous evidence showed that unexplored gaps in the literature could catalyze corporate greening[16]. Therefore, this present study addresses this gap and offers a novel framework to comprehensively understand sustainability performance as a mediator by thoroughly examining the indirect mechanisms and relationships, as well as establishing a connection between green competitive advantage and green intellectual capital.

Despite the existing empirical study, the Indonesian context remains underrepresented and does not adequately reflect the realities of developing countries.

Therefore, further studies are required to fully comprehend the manufacturing industry of the Indonesian agriculture sector. First, the country has adopted sustainability disclosure requirements and green certification (ISO 14001), consistent with IFRS S1 and S2 as part of its transition phase, making studies on this topic essential[30]. Second, market demand for green products and regulatory pressures are increasingly influencing the agriculture sector manufacturing industry[31]. Third, there is a scarcity of empirical data on environmental protection in the sector[32]. Fourth, delays in adapting to global green standards pose a risk of export market losses[33], such as the threat to Indonesia's steel exports due to the EU's CBAM tariff of 35% imposed on high-emission products[34]. Fifth, although 68% of agriculture sector manufacturing companies claim to have environmental policies, only 12% allocate budgets for green R&D[35], and just 120 out of 3,500 (8%) companies have green certification[33]. Sixth, green intellectual capital remains limited, as 75% of manufacturing workers lack training in green practices and investment in low-carbon technologies represents only 0.5% of GDP[4].

This study incorporates perspectives from departmental, resource-unit, and resource-based views, underpinned by the Natural Resource-Based View (NRBV)[36]. There is currently no unified theoretical model that explains how sustainability can be achieved through green competitive advantage. NRBV provides a theoretical foundation, showing the contribution of circular economy and Industry 4.0 to competitive advantage through environmentally sound strategies. Stakeholder engagement influences performance outcomes serve as both a mediator between market demands and environmental regulations and as a consequence of these pressures[37,38]. Therefore, companies ensure the reliability of sustainability performance measurements using the Social, Environmental, and Governance (ESG) framework[39], as well as green intellectual capital[40], which serve as empirical tools to evaluate green practices in the agricultural sector manufacturing industry.

The theoretical contribution of this study is to introduce Sustainability Performance as a full mediator variable that bridges the relationship between Environmental Consciousness and Green Intellectual Capital, thereby enhancing Green Competitive Advantage. This enables the focus on the value of strategies that combine psychological motivators (environmental awareness) and human resources (green intellectual capital). An integration model that combines psychological elements (awareness), knowledge (intellectual capital), performance (sustainability), and competitive outcomes (advantage) in one complete analytical framework was developed. The dominance of similar studies is still concentrated in the context of developed countries and the service sector. Therefore, the results focus on the agricultural sector manufacturing industry in Indonesia, as a developing country that makes valuable and contextual empirical contributions. The main contribution is stakeholder and knowledge-based induction. It also offers practical guidance on how companies can improve green competitive advantage through the implementation of sustainability reporting, the internalization of green technologies, and management training.

## 2. Literature Review and Hypothesis Development

### 2.1. Literature Review

The strategic conceptual framework integrates three major comprehensive theories and addresses existing literature gaps. The primary theoretical foundation used is NRBV[36], as it provides a macro-strategic discourse and a vehicle for explaining the transformation of green resources into a competitive advantage. NRBV examines Sustainability Performance not merely as an outcome, but as a manifestation of three core capabilities, namely pollution prevention, product stewardship, and sustainable development[16,25]. In this model, Sustainability Performance functions as a central mediating mechanism that transforms the natural resource-based capabilities into a tangible Green Competitive Advantage. To explain the mechanisms at the micro-variable level, the study integrates two supporting theories. First, Stakeholder Theory was used to explain the external origins of Environmental Consciousness[37,41], which arises in response to pressures from stakeholders, such as regulators, consumers, and communities who increasingly demand sustainable business practices[42–44].

Second, the Knowledge-Based View serves as the theoretical basis for understanding Green Intellectual Capital as a critical[45], rare, and difficult-to-imitate intangible asset. Green Intellectual Capital is regarded as a reservoir of knowledge that enables companies to pursue green innovation and operational efficiency. These three theories are interconnected and operate synergistically. Stakeholder Theory and Knowledge-Based View explain the inputs and processes (external pressures and internal knowledge), while NRBV captures the strategic output (sustainable competitive advantage).

## 2.2. Hypothesis Development

The difference between centralised and green capital may be explained by the NRBV's presumptions[36]. Knowledge with an environmental focus is an essential starting point for developing green capital because it fosters system development, sustainable consumption, and commitment to the integration[23]. The creation of eco-friendly systems and technology, collaborations with sustainable suppliers and consumers, and staff training on green practices are all motivated by an organization's strategic goal to be environmentally conscious[10]. An empirical study conducted by Yusliza et al. supported this theory by showing that environmental awareness had a substantial impact on the development of the three components of green intellectual capital[10] . Similarly, Latan et al. showed that the main factor transforming conventional knowledge into green intellectual capital was environmental consciousness ingrained in company culture[28]. However, most existing studies are still limited to developed countries and the service sector. Based on this explanation, the following hypothesis was formulated:

**H1.** *Environmental consciousness has a positive effect on green intellectual capital.*

Stakeholder Theory can explain the connection between sustainability performance and environmental awareness[41]. Investment decisions related to sustainability practices are strategically influenced by environmental consciousness, which shows the organization's awareness of environmental challenges[23]. Businesses with high levels of environmental awareness integrate these principles into their business strategies, leading to the realization of sustainability's value in terms of social, economic, and environmental growth[46]. According to the NRBV hypothesis, sustainability goals directly reinforce this focus by supporting strategies such as pollution control and product stewardship[16,36]. The intensity of this focus also impacts the social and economic well-being of organizations. Huang et al.[47] showed how green supply chain management fostered business growth. Wijethilake et al. reported that environmental consciousness could reduce waste by 30% and save energy by 15% within a two-year period[48]. Moreover, Latan et al.[28] argued that the main element in accomplishing sustainability objectives was incorporating environmental consciousness into company culture. Based on this description, the following hypothesis was formulated:

**H2.** *Environmental consciousness has a positive effect on sustainability performance.*

Combining knowledge-based and natural resource-based methods helps in comprehending the connection between sustainability performance and green intellectual capital. An uncommon, priceless, hard-to-replicate, and irreplaceable intangible asset was green intellectual capital. This asset is a strategic instrument that helps companies succeed in the long run. It also equips companies with the capabilities to optimize the natural productivity narrative[49]. Consequently, green intellectual capital facilitates the development, dissemination, and utilization of green knowledge. This process enhances sustainability performance by reducing waste and emissions, lowering costs, increasing revenues, and improving stakeholder well-being. According to Liu et al.[50] green intellectual capital improves sustainability, with green structural capital having the greatest influence. Investment in green capital enhances both social performance and human capital. Based on this description, the following hypothesis was formulated:

**H3.** *Green intellectual capital has a positive effect on sustainability performance.*

The NRBV and Stakeholder Theory were used to show the connection between sustainability performance and green competitive advantage. According to Jeurissen, sustainability performance comprises three primary components: social, economic, and environmental[48]. These elements provide a foundation for gaining a competitive edge in the green market. Corporate reputation and social legitimacy serve as key mechanisms that reinforce the organization's position in the market[51]. It also enhances the satisfaction of various stakeholders, thereby contributing to the establishment of a lasting green competitive edge. The results of this study supported the assertion by Hu et al. that green competitive advantage was influenced by sustainability performance[52]. Similarly, a study by García-Sánchez et al. showed that high sustainability performance increased market share and profitability by 18% and 12%, respectively, compared to competitors[53]. Sustainability performance is also a strong predictor of green competitive advantage, with an average effect size of 0.41[54]. Based on these results, the following hypothesis was formulated:

**H4.** *Sustainability performance has a positive effect on green competitive advantage.*

Combining Knowledge-Based Theory with the NRBV can strengthen sustainable competitive advantage. Environmental awareness is the recognition and active response to climate change issues[23]. As a strategic driver, it fosters the adoption of sustainable practices, thereby supporting competitive marketing advantage. Businesses that show strong environmental consciousness apply eco-friendly strategies, such as pollution control, sustainable development, and product stewardship. According to the NRBV, these practices provide a competitive edge that rivals competitors cannot easily replicate[36]. Additionally, normative pressures from stakeholders prompt environmentally conscious enterprises to comply with sustainability standards. This compliance enhances reputation, strengthens market legitimacy, and supports product differentiation, which are factors essential for establishing a green competitive advantage[51]. Environmental awareness has a direct effect on green competitive advantage, particularly through green innovation and stakeholder engagement, as confirmed by recent results[52]. García-Sánchez et al. reported that companies with higher environmental awareness scores achieved a 15% increase in market share and a 20% improvement in brand loyalty compared to competitors[55]. Based on this evidence, the following hypothesis was proposed:

**H5.** *Green competitive advantage benefits from environmental consciousness.*

A deeper understanding of green competitive advantage can be achieved by integrating knowledge-based resource methods with sustainability-oriented intellectual assets. These assets include financial, human, structural, and relational dimensions, and are valuable, scarce, and difficult to replicate[49]. The Knowledge-Based View of Grant identified product differentiation, energy efficiency, and sustainable innovation, anchored in the intellectual dimensions, as the primary drivers of green competitive advantage[14,45]. Furthermore, green intellectual capital enables companies to develop environmentally friendly production methods, reduce costs through resource efficiency, and establish a strong green brand in the marketplace. According to Huang et al. green intellectual capital is a major contributor to green competitive advantage[56], and green flexible capital shows the highest resilience. A previous study reported that false brand loyalty and a larger market share of green goods were related to a lack of investment in green human capital[10]. Joshi et al.[57] showed that green intellectual capital may accurately predict green competitive advantage. Based on these results, the following hypothesis was formulated:

**H6.** *Green intellectual capital has a positive effect on green competitive advantage.*

## 2.3. Study Model

**Figure 1** presents study model used to analyze how Sustainability Performance enhanced Green Competitive Advantage through Environmental Consciousness and Green Intellectual Capital in Indonesia's agricultural manufacturing sector.
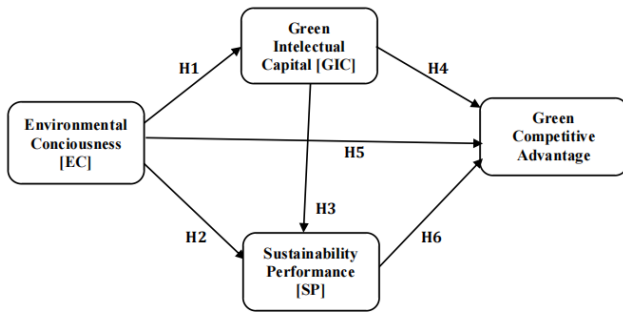
**Figure 1.** Study model.

# 3. Method

## 3.1. Study Design

Volunteers contributed to Green Competitive Advantage at the Indonesian Stock Exchange. Based on IFRS S1 and S2 transition data, this study explored the perceptions of senior and mid-level employees in the manufacturing industry of the Indonesian agriculture sector regarding the continuation of ESG frameworks through explanatory causality. A field study was conducted using a survey to collect data, while considering sustainability performance for competitive advantage, market data, and primary data storage. The time horizon was ratio-based, and Individual managers served as the units of analysis. AMOS software was used for structural equation modeling. The results were validated through in-depth interviews using the dolphin method, as well as focus group discussions. The study subjects consisted of senior and intermediate managers in the agricultural sector of manufacturing companies, who served as sources of information.

## 3.2. Population, Sample Size, and Sampling Methods

The study population consisted of all manufacturing enterprises in the Indonesian agriculture sector listed on the IDX. These enterprises participated in operational consolidation, study and development, marketing support, human resources support, and environmental protection. The total population was 960, and the sample size was calculated using the method proposed by Hair et al.[58] and Diana et al.[59] with the number of indicators (n) multiplied by a factor of 5 to 10. Given that the total number of indicators was 35, the required

sample size ranged from 175 to 350 respondents. However, using the maximum likelihood estimate, the number of samples needed was between 100 and 200. The sampling method used was a proportional random sample based on the sub-sector of the agriculture company. The company's sub-sector consisted of plantation companies, agro-industry companies, and agriculture supporting industry companies.

## 3.3. Variable Operational Definition

Environmental awareness refers to the attitude of an individual or a company that recognizes the detrimental effects of commercial activities on the environment and is committed to reducing those effects. According to Mostafa and Kim and Choi, the concept included indicators, such as environmental concern, intention to act with environmental awareness, environmental responsibility, behavioral intention, and personal norms[60,61]. The measurement used a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Green intellectual capital represented comprehensive environmental knowledge that could be leveraged to support green innovation and enhance business edge over rivals. The measurement instrument for green intellectual capital, as used by Yusoff et al. and Chen, included indicators related to Green Human Capital, Green Structural Capital, and Green Relational Capital[27,62]. The measurement also used a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Sustainability performance referred to a company's success in achieving its sustainability goals by balancing economic, social, and environmental objectives. A sustainability performance measurement tool was developed by Jeurissen and GRI, with indicators including Environmental Performance, Social Performance, and Economic Performance[46,63]. This measurement used a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

A company's competitive advantage gained through eco-friendly strategies and practices is referred to as green competitive advantage. Measurement instruments developed by Porter and Kramer and Hart include dimensions such as green cost leadership, green differentiation, green market advantage, and green innovation capability[36,51]. The measurement scale used a Likert

scale ranging from 1 (strongly disagree) to 5 (strongly agree).

**Table 1** presents the measurement of variables from the following dimensions and indicators:

**Table 1.** Variable measurement.

| Variable | Dimension | Item Measurement |
|---|---|---|
| Environment Consciousness | Environmental Awareness<br>Environmental Concern<br>Environmental Responsibility<br>Behavioral Intention<br>Personal Norms | Knowledge of Environmental Issues; Industry's impact on environment<br>Concern for Environmental Impacts; Environmental conservation<br>A sense of responsibility; Sustainability paraactic responsibility<br>Intent to Act; Eco-friendly ideas<br>Personal Commitment; Implementation of sustainability values |
| Green Intellectual Capital | Green Human Capital<br>Green Structural Capital<br>Green Relational Capital | Green Knowledge; Green Skills; Green Commitment; Green Motivation<br>Green Systems & Procedures; Green database; Green Culture; Green Leadership<br>Customer Relations; Relationship with Suppliers; Relations with the Community & Regulator |
| Sustainability Performance | Environmental Performance<br>Social Performance<br>Economic Performance | Emission and Pollution Reduction; Resource Usage Efficiency; Sustainable Material Use<br>Occupational Health and Safety; Employee Development; Community Engagement<br>Reduction of operational costs; increased revenue; Access to Capital and Incentives; Brand Reputation and Loyalty |
| Green Competitive Advantage | Green Cost Leadership<br>Green Differentiation<br>Green Market Advantage<br>Green Innovation Capability<br>Green Cost Leadership | Lower Operating Costs; Savings from Incentives<br>Reputation & Brand Image; Uniqueness of Green Products; Hair Premium<br>Access to New Markets; Green Customer Satisfaction; Relationship with Stakeholders<br>Green Process Innovation; Green Product Innovation<br>Lower Operating Costs |

Source: Processed data.

## 3.4. Data Analysis

Data were analyzed using AMOS software through the structural freedom method. This AMOS software included structural modelling, route analysis, and confirmatory factor analysis. Several standards for model fit were given by Hair et al., including the chi-square test must be non-significant with positive degrees of freedom (DF), above the traditional cutoff ($p$ = 0.05) and the conservative level ($p$ = 0.10) [58]. The chi-square probability value must be greater than 0.05, and the CMIN/DF ratio should be less than 2. The incremental fit indices GFI, AGFI, TLI, and NFI should each exceed 0.90, and the RMSEA and RMR values should be less than 0.08.

# 4. Result and Discussion

## 4.1. Results

### 4.1.1. Questionnaire Returns

A total of 300 questionnaires were distributed to senior and intermediate managers of the agriculture sector listed on the IDX to ensure data relevance. From the 300 questionnaires sent, 207 were returned, with 183 deemed valid for analysis. Therefore, 183 respondents

were obtained, representing 61% of the questionnaires distributed, which was considered sufficient for further analysis.

### 4.1.2. Respondent Demographics

**Table 2** presents the number and percentage of respondents based on a valid questionnaire.

**Table 2.** Description of respondents' characteristics.

| Information | Amount | Information | Amount |
|---|---|---|---|
| **Respondent Age** | | **Level of Education** | |
| 25–35 years | 10% | Diploma | - |
| 36–45 years | 60% | Bachelor [S1] | 15% |
| 46–55 years | 30% | Master [S2] | 85% |
| **Gender** | | **Position** | |
| Man | 65% | Operational Manager | 30% |
| Woman | 35% | Financial Manager | 25% |
| **Length of Work** | 35% | Environmental/CSR Manager | 30% |
| 5–10 years | 40% | Other Managers | 15% |
| 11–20 years | 50% | **Manufacturing Industry** | |
| > 20 years | 10% | Sector Agriculture | 100% |

Source: Processed data.

### 4.1.3. Normality Test

Data normality tests were conducted to ensure even distribution. According to AMOS standards, when

the critical ratio (CR) for each univariate and multivariate variable fell within the range of −1.96 to +1.96, the multivariate model was considered normally distributed. **Table 3** presents a detailed result of the normality test, including the data's typical pattern, a slope value of less than 1.96, and a CR of 1.372.

**Table 3.** Normality test.

| Variable | Min | Max | Skew | c.r. | Kurtosis | c.r. |
|---|---|---|---|---|---|---|
| Environment Consciousness/EC [X1] | 0.9200 | 1.6000 | 0.5642 | 1.0729 | 0.7724 | 1.036 |
| Green Intellectual Capital/GIC [Z1] | 1.2100 | 5.0000 | −0.4760 | −1.5927 | −0.2853 | −0.707 |
| Sustainability Performance/SP [Z2] | 2.0000 | 5.0000 | −0.4803 | −1.4161 | 0.0616 | 0.618 |
| Green Competitive Advantage [Y] | 2.0000 | 5.0000 | −0.4962 | −1.3029 | −0.5711 | −1.353 |
| Multivariate | | | | | 1.437 | 1.372 |

Source: Processed data.

### 4.1.4. Data Quality Test

Variable testing was conducted to evaluate validity and reliability using the loading factor value and composite reliability, respectively. A composite dependability value was deemed acceptable based on predetermined criteria when the loading factor was higher than 0.60 and the acceptance threshold was > 0.5 (**Table 4**). According to the results of the validity test, Cronbach's alpha values ranged from 0.8548 to 0.8972. In this analysis, 0.9038 was the highest composite reliability rating, while 0.8876 was the lowest.

**Table 5** shows the validity of the Fornell-Larcker Criterion discriminate, which compares the square root of AVE of a construct with the correlation between constructs. The square root of AVE must be greater than the correlation with other constructs.

**Table 4.** Data quality test.

| Variable | Cronbach's Alpha | Composite Reliability | Average Variance Extracted (AVE) |
|---|---|---|---|
| Environment Consciousness/EC [X] | 0.8972 | 0.8876 | 0.668 |
| Green Intellectual Capital/GIC [Z1] | 0.8548 | 0.9020 | 0.651 |
| Sustainability Performance/SP [Z2] | 0.8624 | 0.9038 | 0.704 |
| Green Competitive Advantage [Y] | 0.8632 | 0.8892 | 0.672 |

Source: Processed data.

**Table 5.** Discriminant validity Fornell-Lacker criterion.

| Construct | EC | GIC | SP | GCA |
|---|---|---|---|---|
| Environment Consciousness/EC [X] | **0.817** | | | |
| Green Intellectual Capital/GIC [Z1] | 0.621 | **0.807** | | |
| Sustainability Performance/SP [Z2] | 0.505 | 0.733 | **0.839** | |
| Green Competitive Advantage/GCA [Y] | 0.554 | 0.685 | 0.854 | **0.873** |

Source: Processed data.

### 4.1.5. Statistics Descriptive

**Table 6** presents the results of the descriptive statistics, as well as the attitudes of intermediate and senior managers regarding green competitive advantage. The initial descriptive data showed that companies possessed a strong sense of environmental awareness. However, the knowledge and competence in understanding and applying green intellectual capital were relatively limited. Since green competitive advantage provided a limited indication of overall competitive advantage, further development of environmental accounting methodologies was required. Addressing this gap was essential for improving sustainability performance.

### 4.1.6. Hypotheses Testing

**Table 7** shows that environmental awareness, green intellectual capital, and sustainability performance had a significant influence on green competitive advantage.

**Table 6.** Descriptive statistic.

| Variable | N | Minimum | Maximum | Mean | Std Deviation |
|---|---|---|---|---|---|
| Environment Consciousness/EC [X] | 183 | 2.50 | 5.00 | 4.05 | 0.68 |
| Green Intellectual Capital/GIC [Z1] | 183 | 2.00 | 5.00 | 3.45 | 0.72 |
| Sustainability Performance/SP [Z2] | 183 | 2.75 | 5.00 | 4.00 | 0.65 |
| Green Competitive Advantage [Y] | 183 | 2.25 | 5.00 | 3.50 | 0.70 |

Source: Processed data.

**Table 7.** Hypothesis testing.

| Variable | Estimate | S. E | C. R | P | Description |
|---|---|---|---|---|---|
| EC → GIC | 0.386 | 0.082 | 4.757 | 0.002 | H1 Accepted |
| EC → SP | 0.255 | 0.093 | 2.783 | 0.003 | H2 Accepted |
| GIC → SP | 0.458 | 0.071 | 6.431 | 0.001 | H3 Accepted |
| GIC → GCA | 0.526 | 0.062 | 8.67 | 0.008 | H4 Accepted |
| EC → GCA | 0.307 | 0.075 | 4.297 | 0.012 | H5 Accepted |
| SP → GCA | 0.601 | 0.051 | 12.005 | 0.000 | H6 Accepted |
| **Intervening Testing** | **Estimate** | **Direct** | **Indirect** | **P** | **Description** |
| EC → GIC → SP | 0.290 | 0.072 | 0.190 | 0.04 | Accepted |
| EC → GIC → GCA | 0.410 | 0.091 | 0.310 | 0.02 | Accepted |
| EC → SP → GCA | 0.340 | 0.000 | 0.240 | 0.01 | Accepted |
| GIC → SP → GCA | 0.410 | 0.091 | 0.310 | 0.02 | Accepted |

| | |
|---|---|
| Square Multiple $R^2$ | Chi-Square = 11.23 |
| Sustainability Performance = 0.538 | P sig. = 0.581 [Fit above 0.05] |
| Green Competitive Advantage = 0.729 | RMSEA = 0.02; GFI = 0.9988 |
| Covarian determinant matrix = 0. 0643 | TLI = 0.9762; CFI = 0.9777 |

Source: Processed data.

## 4.2. Discussion

Hypothesis testing 1 proves that Environmental Consciousness significantly and positively influences Green Intellectual Capital. This result shows the importance of instilling environmental awareness at the manager and organizational levels as a crucial first step. Support managers are generally within a productive and strategic age range, demonstrating strong cognitive capacity for environmental consciousness and green intellectual capital. Decision-making positions are predominantly held by men, with knowledge of both business practices and environmental issues. This awareness serves as a driver for strategic investment in building green knowledge of employees, developing environmentally friendly systems and procedures, and fostering strong relationships with green-oriented stakeholders. The implications reinforce the proposition that the path to green competitive advantage starts with a sustainable mindset. These results support the NRBV theory that environmental awareness is a strategic foundation for developing scarce and valuable resources [36], thereby triggering companies to build green knowledge, systems, and relationships that are the basis for sustain-

able competitive advantage. This result is consistent with the report of Yusliza et al. [10] on the development of three components of green intellectual capital. Therefore, it becomes a corporate culture as the main catalyst for the change of conventional knowledge to green intellectual capital [28]. The allocation of 30 percent to green employee training and sustainable technology development investments was affected [25].

Hypothesis testing 2 states that Environmental Consciousness has a positive effect on Sustainability Performance. This result demonstrates that environmental awareness is not just a Corporate Social Responsibility discourse, but a strategic foundation for internalizing awareness into culture, core values, and strategic decision-making processes. Internalization ensures that environmental commitment extends beyond awareness to implementation in concrete actions, impacting waste reduction, resource efficiency, employee well-being, and long-term profitability. Support managers who are representative of a productive and strategic age, have high cognitive capacity, are competent, and understand business practices and environmental issues. These results are consistent with the integration of Stakeholder Theory and NRBV theory, providing a comprehensive ex-

planation that spans from external pressures to internal performance [36,41]. Furthermore, the results are consistent with the report by Wijethilake et al., which indicates that environmental consciousness reduces waste by 30% and saves energy by 15% [48]. This reduction is achieved due to the integration of environmental consciousness into the corporate culture [28]. The implications will increase business growth and sustainability performance [56].

Hypothesis testing 3 states that Green Intellectual Capital has a positive effect on Sustainability Performance. This result provides a sustainability strategy that green organizations are a strategic imperative. Companies should invest in improving employees' green competencies, building strong green systems, procedures, and culture, and knitting strategic partnerships with green-oriented stakeholders. Strategic investments in these three pillars will empower organizations with the capabilities needed to meet sustainability demands, but also to excel in economic, social, and environmental performance, thereby providing a sustainable competitive advantage. The support of experienced managers who are representative with a high quality of education is very appropriate to assess the relationship between knowledge and performance. These results are consistent with the integration theory of the Knowledge-Based View and the NRBV, providing a theoretical framework that serves as a mechanism for transforming theoretical knowledge into practical capabilities to achieve sustainable performance [36,45]. The results also support the conclusion that the dominance of green structural capital increases sustainability, and as a positive driver for the competitive advantage of companies, which is realized through improved sustainable performance [20,58]. However, investment in green human capital improves environmental, social, and market performance [10].

Hypothesis test 4 states that Sustainability Performance has a positive effect on the Green Competitive Advantage received. This result provides a strategy in an increasingly competitive green economy. Sustainability Performance is no longer a cost center, but a producer of competitive advantage (a profit center). Companies view sustainability not just as compliance but as a core strategy to win the market. Environmental ef-

forts include waste reduction and energy efficiency. Social initiatives focus on employee well-being and community engagement. Economic gains arise from lower costs and stronger reputation. These dimensions jointly contribute to a green competitive advantage that is authentic, durable, and difficult for rivals to replicate. The support of managers who are representative as environmental/CSR and Financial Manager is a combination of the creator of sustainability performance and a measure of its competitive and financial impact. These results support the integration theory of NRBV and Stakeholder Theory, which provide a comprehensive explanation, ranging from internal capabilities to external recognition [36,41]. These results are consistent with the report of García-Sánchez et al. that sustainability performance increases market share and profitability by 18% and 12%, respectively, compared to competitors [53]. Therefore, sustainability performance is a strong predictor of green competitive advantage [52].

Hypothesis test 5 states that Environmental Consciousness has a positive effect on Green Competitive Advantage received. This result demonstrates that environmental awareness is a strategic investment that provides real competitive returns. Companies must internalize environmental awareness into organizational culture, decision-making processes, and core business strategies. Therefore, the company develops unique and hard-to-replicate green capabilities, creates product differentiation, improves operational efficiency, and builds a strong brand reputation, which collectively form a sustainable green competitive advantage in an increasingly competitive green economy. The support of managers in a productive and strategic age group, with strong cognitive capacity, experience in business practices, and understanding of environmental issues, strengthens this process. These results are consistent with NRBV theory that environmental awareness is internalized in organizational culture [36], allowing companies to develop strategic capabilities based on natural resources, thereby creating a competitive advantage. The result is consistent with the report by Sánchez et al. [55] which indicates that implementing environmental awareness will experience a 15% increase in market share and brand loyalty by 20% compared to competitors. This arises due to green

innovation and stakeholder engagement[52], as well as green behavior[54].

Hypothesis test 6 confirms that Green Intellectual Capital has a positive effect on Green Competitive Advantage. The result shows that in the green economy, intellectual capital functions as the new currency for competitiveness. Companies invest in three pillars, namely (1) developing employees' green competencies through continuous training and development programs, (2) building green knowledge infrastructure through systems, procedures, and organizational culture that support sustainable practices, and (3) strengthening green relationships with stakeholders. This investment equips companies with knowledge capabilities that support product differentiation, operational efficiency, continuous innovation, and brand reputation, leading to a sustainable green competitive advantage. Strong theoretical support comes from the Knowledge-Based View, integrated with the NRBV theory[36,45]. The integration forms a comprehensive framework where Green Intellectual Capital acts as a knowledge infrastructure that enables the development of unique green capabilities to achieve Green Competitive Advantage. These results are consistent with studies showing that green structural capital contributes significantly to green competitive advantage[60,63]. Other studies also showed that investment in green human capital correlates with growth in the market share of sustainable products[10].

The sustainability performance variable functions as the main mediator and plays a role in transforming environmental consciousness and green intellectual capital into green competitive advantage. Environmental consciousness and green intellectual capital have a direct influence on green competitive advantage, but the effect is stronger when mediated by sustainability performance. This result indicates that companies need environmental awareness and green knowledge[25], as well as real implementation through sustainable performance, to achieve a competitive advantage. This result is consistent with the NRBV theory, which posits that sustainable performance is a difficult strategic resource for competitors to replicate[36]. It also extends Stakeholder Theory by showing that pressures, such as green regulations and consumer demand, push companies to enhance sustainability performance, thereby strengthening green competitive advantage[41].

## 4.3. Study Results

Despite the challenges of transitioning to a green economy, studies have shown that environmental awareness and green intellectual capital are key elements of a green competitive advantage in production. However, sustainability is the foundation for turning green intellectual capital and environmental awareness into economic benefits. According to this study, sustainability performance substantially moderates the relationship between environmental consciousness and green intellectual capital to competitive advantage. A relationship was found between environmental care and green competitive advantage. Sustainability performance, which includes resource allocation, social responsibility, and waste reduction, has a major influence on green competitive advantage. Freeman and Hart demonstrated that the individual applications of NRBV, Stakeholder Theory, and the Knowledge-Based View exhibit clear patterns[36,41]. These theories highlight investments in the green economy, sustainable intellectual capital development, the adoption of environmental awareness, and the advancement of fundamental, social, and economic principles as a whole[10,50].

# 5. Conclusion, Limitations, Recommendations, and Implications

## 5.1. Conclusion

In conclusion, the main force behind sustainability in the manufacturing agriculture sector is green competitive advantage. This excellence is achieved using green intellectual capital and environmental awareness. Green competitive advantage and protective behavior are also influenced by environmental awareness. In addition, sustainable construction is significantly influenced by green intellectual capital. The most important result is that the relationship between green competitive advantage and environmental awareness is mediated by sustainability performance. Green intellectual capital strengthens green competitive advantage. This advan-

tage supports sustainability by demonstrating that environmental awareness, intellectual resources, and sustainable performance are essential for driving green innovation, initiating change, and building a positive reputation.

## 5.2. Limitation

Despite the significance of this study, there are several limitations. First, the data were collected cross-sectionally, limiting the ability to investigate the dynamics of variable changes over an extended period. Second, the sample was restricted to managers in the manufacturing industry of Indonesia's agriculture sector. Therefore, caution is needed when generalizing the results to other developing countries or non-manufacturing industries. Third, although mediation was tested using SEM analysis, there was no thorough examination of moderator variables that might strengthen or weaken the relationships between variables, such as technical support or regulatory pressures. Fourth, while validity and reliability were evaluated, respondents' views were used to estimate sustainability performance and green intellectual capital, which might add bias. These limitations present opportunities for future studies using a longitudinal design, a broader sample, and an integration of contextual variables [58].

## 5.3. Recommendation

Based on the results of this study, key strategies for agriculture sector companies were recommended. First, internalizing environmental awareness through monthly workshops on waste management and energy efficiency. Second, build a solar panel installation for the energy supply of the plant. Third, the establishment of sustainability management system to gain market access by obtaining certification for each sub-sector of agricultural companies, namely the palm oil sub-sector with Roundtable on Sustainable Palm Oil (RSPO) or Indonesian Sustainable Palm Oil (ISPO) certification; cocoa sub-sector with Rainforest Alliance/UTZ or Fairtrade certification; coffee sub-sector with Organic (SNI 6729:2016/EU/NOP), Rainforest Alliance, or Fairtrade certification; as well as agro-industry sub-sectors with

ISO 14001 (Environmental Management System), FSSC 22000/ISO 22000 (Food Safety), and SMK3 (K3 Management System) certifications. Fourth, all agricultural companies carry out ESG performance disclosure and reporting through the publication of annual reports based on GRI and SASB standards. Fifth, future studies should be carried out by enriching the model with Moderator Variables, namely, regulatory pressure, technology support, and green transformational leadership. This will help in determining its influence on strengthening the relationship between variables. There is also a need to explore Additional Dependent Variables, such as Sustainable Finance and Corporate Reputation.

## 5.4. Theoretical and Managerial Implications

The study expands the use of NRBV and stakeholder theory by confirming sustainability performance as a critical mediator in the relationship between environmental consciousness, green intellectual capital, and green competitive advantage. It introduces an integrative framework that connects cognitive aspects, knowledge assets, performance outcomes, and competitive results, while providing empirical evidence from underexplored developing country contexts [10,16].

Managerial implications for companies include building environmentally oriented organizational culture and allocating resources for green innovation. Additional priorities include implementing ISO 14001 for environmental management and ISO 50001 for energy management, as well as disclosing annual reports in accordance with the GRI Standards or the SASB framework. For regulators, policies must be strengthened to promote the standardization of green practices and ensure transparency in sustainability reporting through the disclosure of emissions data required by external regulations, including Scope 1, 2, and 3 categories under CBAM. Standardization requires commodity-specific chain of custody certification, including RSPO and ISPO for palm oil, Rainforest Alliance, UTZ, or Fairtrade for coffee and cocoa, as well as FSC or SVLK for wood, to verify that products are produced without deforestation. Another priority is the development of digital product passports containing detailed information on carbon, water,

and social footprints, supported by commodity-specific certifications.

## Author Contributions

Conceptualization, M.F.A.A., A., N.D., M., M.B., and D.D.F.; methodology, M.F.A.A., A., and N.D.; validation, M.F.A.A., N.D., and D.D.F.; formal analysis, M.F.A.A., N.D., M., and M.B.; data curation, N.D. and D.D.F.; writing—original draft preparation, M.F.A.A., A., N.D., M., M.B., and D.D.F.; writing—review and editing, M.F.A.A., N.D., and M.B.; visualization, M.B. and D.D.F.; supervision, M.F.A.A. All authors have read and agreed to the published version of the manuscript.

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## Conflicts of Interest

The authors declare that there is no conflict of interest.

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