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Digital Green Strategies Driving Sustainable Competitive Advantage in Agripreneurial SMEs

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ABSTRACT

Achieving Sustainable Competitive Advantage (SCA) for green agricultural products in demanding international markets, particularly Europe, requires strategic integration beyond conventional marketing approaches. Although green branding and digital marketing have been widely recognized, the synergistic mechanism through which digital strategies, green value propositions, and market penetration collectively strengthen SCA remains underexplored. **This study aims** to develop and validate an integrated model that explains how Digital Traffic Management, Green Product Value, and Market Penetration contribute to SCA while supporting sustainability-oriented business growth. This study employs Structural Equation Modeling (SEM) because it provides stronger analytical robustness than conventional regression through latent variable estimation, construct validation, and comprehensive goodness-of-fit evaluation. The **findings** show that Market Penetration is the strongest predictor of SCA ($\beta = 0.44$), indicating that market expansion through digital channels significantly enhances long-term competitiveness. The results also reveal a positive reinforcement cycle between Green Product Value and SCA, demonstrating a virtuous loop of continuous improvement, digital adaptability, and green competitiveness. Furthermore, Market Penetration and Digital Traffic Management support SDG 8, SDG 9, and SDG 17 by encouraging sustainable economic growth, technology-based innovation, collaborative business ecosystems, and stronger digital partnerships for SMEs. **This study provides** a robust empirical foundation and strategic blueprint for SMEs, policymakers, and digital marketers to enter and grow in international markets while strengthening sustainable competitiveness and contributing meaningfully to a greener future.

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1. INTRODUCTION

The global marketing landscape has undergone a fundamental transformation with the rise of technopreneurship in the agricultural sector, where enterprises leverage digital technologies to create innovative value and achieve sustainability [1, 2]. In the current era, social media has evolved beyond a mere promotional channel into a strategic ecosystem, enabling narratives of sustainability and agricultural product innovation to be

communicated directly to global consumers [3]. Short-form video platforms, such as TikTok and Instagram Reels, have been shown to significantly boost engagement, generating interaction rates 2.5 times higher than traditional content formats [4]. This presents an unparalleled opportunity for agricultural Small and Medium-sized Enterprises (SMEs) to build their brands and narrate their sustainable farming practices through compelling visual content [5].

Despite this significant potential, the implementation of government regulations, such as Indonesia's Trade Minister Regulation No. 31 of 2023 concerning Business Licensing, Advertising, Development, and Supervision of Business Actors in Electronic System Trading (PMSE) [6], has inadvertently reduced consumer transaction interest and sales on social media platforms, specifically impacting TikTok Shop's operations [7]. This context highlights a critical research gap: while the general influence of social media on purchasing decisions is well-documented with 78% of decisions influenced by online content [8]. there is a limited understanding of how sustainable agricultural SMEs can strategically leverage social media traffic to build a SCA, particularly for penetrating highly selective markets like Europe.

This research is crucial for bridging this gap by integrating the concepts of technopreneurship and sustainable marketing. While prior research indicates that trust built through peer-to-peer recommendations on social media can yield conversion rates 3-5 times higher [9] how this trust translates into the preferences of European consumers for digitally traceable and sustainable agricultural products remains poorly understood [10]. This is where initiatives like the Agricultural Technology Transformation (ATT) become central [11]. ATT emphasizes technology-driven business growth, and this study will directly support its mission by providing insights into how social media traffic can not only drive sales but also foster agricultural innovation and build brand equity aligned with global sustainability standards [12].

Therefore, this research aims to comprehensively analyze how agricultural SMEs can build a SCA through the strategic utilization of social media [13]. The primary focus is to facilitate market penetration and expansion into European territories, which exhibit high demand for green agricultural products(DG Agriculture and Rural Development [14]. The findings are expected to yield an actionable framework for SMEs specializing in sustainable agricultural products and for relevant stakeholders in formulating more effective, technology based agricultural export policies, thereby contributing to the achievement of ATT's objectives [15].

This study is theoretically rooted in the Resource-Based View (RBV), which provides a logical basis for understanding companies in order to gain SCA. RBV argues that competitive advantage stems from Valuable, Rare, Inimitable, and Non-substitutable (VRIN) resources and capabilities of a company [16]. In the context of green agricultural products, these resources are manifested in sustainable production practices, a credible green brand image, and a unique green competitive position. However, RBV alone does not fully explain how these internal resources are activated and translated into market power in the digital age [17]. The novelty of this study lies in the proposed digital green synergy model, where Digital Traffic Management and Social Media Technology Integration function as dynamic capabilities that activate green resources into SCA through Market Penetration mechanisms. The novelty contribution of this study lies in this theoretical synergy. The authors position digital green marketing, including digital traffic management and social media integration, as crucial dynamic capabilities [18]. These capabilities are not merely promotional tools, but strategic mechanisms that actualize, amplify, and monetize the company's green resources, ultimately resulting in effective market penetration and building SCA. Based on this argument, this study develops an integrated model that offers a more holistic and contextual perspective on value creation in the modern green economy.

2. LITERATURE REVIEW

2.1. Market Penetration Traffic

Market penetration strategy is an approach used to measure how effectively a product or service reaches its target market Recent studies further emphasize that digital driven market penetration strategies supported by social media analytics, consumer engagement metrics, and sustainable branding significantly improve market expansion capability and long term customer retention in SMEs operating within green industries [19]. This concept refers to the percentage of the total potential market that has used the product or service. Market Penetration involves various marketing strategies aimed at increasing market share, such as competitive pricing, intensive promotions, and the development of effective distribution channels [20]. The success of Market Penetration is measured not only by sales volume but also by the ability to maintain and sustainably expand the customer base [21]. "Traffic" is derived from Traffic Flow Theory, which involves measurement,

statistical distribution, modelling, and information processing. It examines essential traffic flow characteristics, including speed, flow, and concentration [22]. Additionally, models that consider travel time as a variable are studied. Insights related to traffic information can aid decision making, although control actions are generally limited to directional and acceleration control [23]. Market Penetration Traffic indicates how successfully a product or service enters the market and gains a share. This concept is essential for evaluating the effectiveness of marketing strategies and a company's ability to reach its target consumers. It considers factors such as th [24]

In the context of sustainable development, Market Penetration Traffic must be evaluated beyond mere speed and volume [25]. This strategy must include how a product enters the market in a sustainable manner, in line with SDG 12's call for Responsible Consumption and Production. This means that successful market penetration not only captures market share, but also promotes products that support sustainable economic growth as mandated in SDG 8 (Decent Work and Economic Growth). In this way, companies can ensure long-term market health rather than short term exploitation, creating market flows that are not only fast but also ecologically and socially responsible.

2.2. Green Competitive Position

A Green Competitive Position refers to a company's strategic advantage gained by adopting environmentally friendly practices across all operations. This position highlights the company's capability to incorporate environmental considerations into its business strategy, enhancing its market competitiveness [26]. As consumer awareness of environmental and health issues grows, having a Green Competitive Position has become increasingly important [27]. Additionally, ecological sustainability regulations encourage companies to produce green products and operate more eco-friendly. Business units that successfully establish this position demonstrate a commitment to reducing their operations' environmental impact, developing eco-friendly products and services, optimizing resource use, and implementing sustainable business practices [20]. Several indicators can measure success in establishing a Green Competitive Position [28]. These include a company's ability to produce environmentally friendly products while enhancing customer quality and value. Additionally, business units should focus on improving resource and energy efficiency to help reduce operational costs [29]. Furthermore, innovation in production processes and product design that considers environmental considerations is essential. Another important indicator is the ability to communicate ecological commitments to stakeholders effectively [30].

A strong green competitive position offers advantages in the short term and establishes a solid foundation for long term business sustainability. This approach allows companies to meet the demands of an increasingly environmentally conscious market while maintaining profitability and fostering business growth [31]. Building a Green Competitive Position is a direct contribution to SDG 9 which aims to build resilient infrastructure, promote sustainable and inclusive industrialization, and foster innovation [32]. By adopting environmentally friendly practices and optimizing resource use, companies not only increase their market competitiveness but also actively participate in the global agenda for sustainable industrialization [33]. Furthermore, this position is instrumental in achieving SDG 12 (Responsible Consumption and Production) as it encourages the production of environmentally friendly goods and reduces waste, thereby creating a more sustainable production cycle [34].

2.3. Green Brand Image

Green Brand Image represents consumer perceptions of environmental commitments and practices implemented through a brand or company's approach. This is a crucial aspect of brand positioning that reflects an organization's environmental awareness and responsibility, and a green brand image is a vital strategic asset [35]. Business units that successfully build a strong green image are seen as profitable business entities and organizations responsible for environmental sustainability. This image is formed through various business initiatives and practices consistent with sustainability principles [36]. The development of a Green Brand Image involves several key elements, Transparent communication about the company's environmentally friendly practices to the public, Tangible implementation of environmental commitments in every aspect of business operations, Product and service innovation that considers ecological impact, Active involvement in environmental conservation initiatives and sustainability programs [37].

A strong Green Brand Image provides various benefits to companies, including increased customer loyalty, more apparent brand differentiation, and premium pricing potential for environmentally friendly products [38]. Moreover, an authentic green image helps companies build deeper relationships with ecologically

conscious consumers while creating sustainable value for all stakeholders [39]. A strong Green Brand Image is key to advancing SDG 12, as it directly influences consumer behavior towards more sustainable choices. When consumers perceive a brand as truly committed to environmental responsibility, this encourages responsible consumption patterns [40]. In turn, this supports SDG 8 by creating market demand for sustainable products, which drives economic growth through innovation and job creation in green sectors [41]. Thus, Green Brand Image is not only a strategic marketing asset, but also a tool to drive an economic transition that is aligned with global development goals.

2.4. Reciprocal of Value Product

Reciprocal relationships represent the mutual relationship or interaction between products [42]. They serve not only as predictors but also as outcomes of other variables. These relationships create a continuous feedback cycle, where changes in one product influence other products and generate sustained impacts. Reciprocal relationships can optimize business unit development strategies holistically [43]. Product value is a fundamental aspect reflecting the benefits and satisfaction consumers derive from a product. It becomes a crucial element contributing to a company's competitive advantage [44]. The product's physical quality measures this value and encompasses customers' perceived functional, emotional, and social aspects. High value product reciprocal relationships must meet or exceed customer expectations, provide practical solutions to their needs, and create positive usage experiences [45]. This reciprocal product value can develop and enhance the business unit's product value to maintain customer loyalty and strengthen its competitive position in the market [46].

The concept of reciprocal value product takes on new meaning when viewed through the lens of sustainability [47]. The "value" of a product is now increasingly defined by its environmental and social impact, in line with the promotion of sustainable products in SDG 12. This creates a reciprocal relationship where consumer demand for sustainable products (SDG 12) drives innovation in business development (SDG 9), and these innovative and sustainable products in turn strengthen consumer loyalty and sustainable lifestyles [48]. Thus, the reciprocal value of products is no longer solely about functional benefits but also about collective contributions to a more responsible market ecosystem, ultimately supporting inclusive and sustainable economic growth in line with SDG 8 [49].

2.5. Sustainable Competitive

SCA represents a company's ability to maintain and develop a superior position in business competition sustainably. This concept emphasizes creating long-term value that competitors find difficult to imitate and providing consistent benefits to stakeholders. SCA focuses not only on financial superiority but also on social and environmental dimensions [50]. Companies that successfully build SCA can integrate sustainability into their business strategy, create unique and sustainable value for customers, and maintain their competitive position in the market. The formation of SCA involves several critical components, The development of valuable, rare, difficult to imitate, and non substitutable resources and capabilities [51]. Innovation in products, services, and business processes, Business units' ability to adapt to changes in the business environment, Effective relationship management with all stakeholder and SCA enables companies to achieve superior long term performance, not only in financial aspects but also in their contribution to sustainable development [52].

A strong SCA helps companies build resilience when facing various business challenges while continuing to create value for customers and society. SCA becomes increasingly crucial in an era of intensifying global competition and growing sustainability demands. Companies need to continuously evaluate and strengthen their SCA foundation to ensure business relevance and sustainability in the future [53]. The concept of SCA is intrinsically linked to the core principles of the SDGs. A company's ability to build SCA is now fundamentally tied to its contribution to global goals [54]. For example, integrating sustainability into business strategy directly targets SDG 9 by encouraging innovation and sustainable industrial practices. Innovation in products and processes, a key component of SCA, is the primary driver for achieving SDG 12 by creating more responsible consumption and production solutions [55]. Ultimately, companies that achieve SCA by aligning their operations with these goals not only ensure their long term profitability but also contribute significantly to SDG 8, which is to foster inclusive and sustainable economic growth. Thus, SCA in the modern era is no longer an option but a strategic imperative that is in line with the global development agenda [56].

3. METHOD

3.1. Research Design and Approach

This research adopts an interpretive paradigm to explore the complex phenomenon of building a SCA through social media traffic within its natural context [57]. This paradigm is chosen as it allows for a deep, contextualized understanding of the subjective experiences, motivations, and strategies of industry players [58]. The study employs an exploratory qualitative approach, specifically utilizing a phenomenological design to understand the lived experiences of agricultural SME actors and stakeholders in navigating the challenges and opportunities of the digital marketplace [59]. This design is instrumental in uncovering rich, detailed data on the intricate interactions between technopreneurship, social media strategy, and sustainability goals.

3.2. Sampling Technique and Respondent Profile

To ensure the depth and relevance of the data, this study utilized a purposive sampling technique [60]. This non-probability sampling method was deemed most appropriate as it allows for the intentional selection of participants who possess specific knowledge and experience relevant to the research objectives [61]. The selection criteria included, owners, founders, or senior marketing managers of agricultural SMEs in Indonesia that have actively used social media for market expansion, industry experts, including digital marketing consultants specializing in the agribusiness sector.

To expand the reach and identify key informants who are difficult to access, the snowball sampling technique was used as an additional technique, in which initial participants recommended other potential respondents. To provide a clearer understanding of the conceptual relationships among the research variables, the subsequent section presents the Structural Equation Modeling (SEM) framework used to evaluate the interaction between digital strategies, green product value, market penetration, and SCA. The SEM model visualization serves as an analytical bridge connecting the theoretical framework with the empirical findings discussed.

4. DISCUSSION

Green marketing theory emphasizes the importance of integrating business interests with environmental sustainability. This model effectively illustrates how companies can achieve competitive advantage through environmentally responsible marketing approaches. Each variable in the model contributes to forming a comprehensive green marketing strategy, where sustainable product value, a strong competitive position in the green market, and a positive brand image work together to create effective market penetration and SCA.

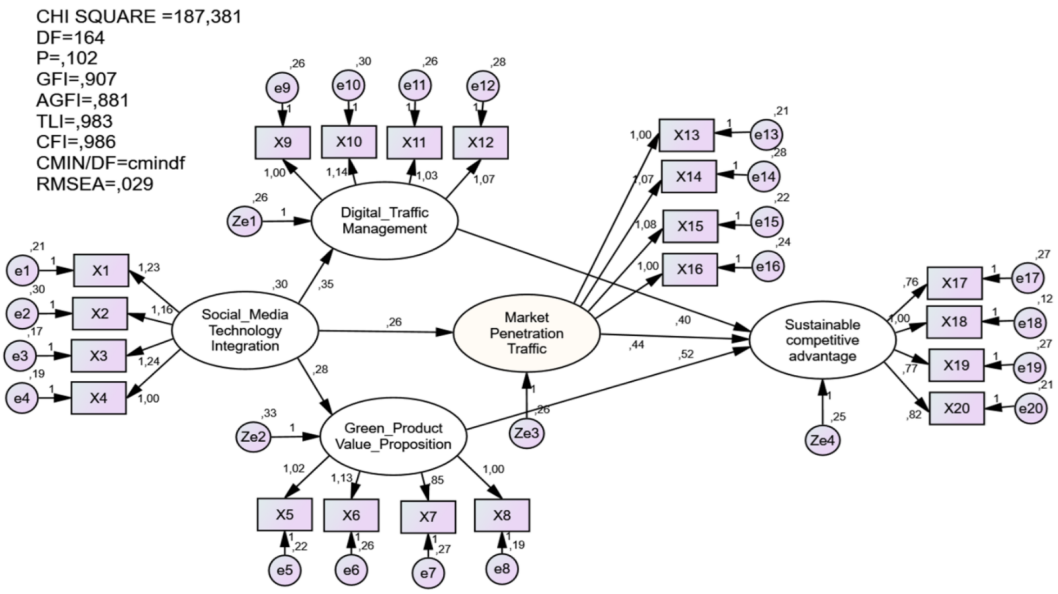

Figure 1. Results of Research Model Development

Structural Equation Modeling (SEM) Analysis refers to Figure 1. This model exhibits satisfactory fit statistics, with $\chi^2 = 187.381$, $DF = 164$, $P = 0.102$, $GFI = 0.907$, $AGFI = 0.881$, $TLI = 0.983$, $CFI = 0.986$, $CMIN/DF < 1$, and $RMSEA = 0.029$.

4.1. Social Media Technology Integration

This construct is measured by indicators X1 through X4, which are influenced by the observation variables e1 through e4. X1 (loading 0.29) is influenced by e1, X2 (loading 0.19) is influenced by e2, X3 (loading 0.34) is influenced by e3, and X4 (loading 0.00) is influenced by e4. Indicator X3 has the highest loading factor compared to the other indicators, indicating that it most strongly reflects the Social Media Technology Integration construct, while X4 appears to have a minimal contribution.

4.2. Digital Traffic Management

This construct is measured by indicators X9 through X12, which are influenced by the observation variables e9 through e12. X9 (loading 0.36) is influenced by e9, X10 (loading 0.30) is influenced by e10, X11 (loading 0.36) is influenced by e11, and X12 (loading 0.28) is influenced by e12. Two indicators, X9 and X11, both have the highest loading factor (0.36), indicating that they are the strongest indicators for Digital Traffic Management.

4.3. Green Product Value Proposition

This construct is measured by indicators X5 to X8, which are influenced by the observed variables e5 to e8. X5 (loading 0.22) is influenced by e5, X6 (loading 0.58) is influenced by e6, X7 (loading 0.27) is influenced by e7, and X8 (loading 0.19) is influenced by e8. Indicator X6 has the highest loading factor (0.58), indicating that it makes the greatest contribution to measuring the Green Product Value Proposition.

4.4. Sustainable Competitive Advantage (SCA)

This construct is measured by indicators X13 through X20, which are influenced by the observation variables e13 through e20. X13 (loading 0.21) is influenced by e13, X14 (loading 0.17) is influenced by e14, X15 (loading 0.25) is influenced by e15, X16 (loading 0.20) is influenced by e16, X17 (loading 0.79) is influenced by e17, X18 (loading 0.40) is influenced by e18, X19 (loading 0.55) is influenced by e19, and X20 (loading 0.85) is influenced by e20. Indicator X20 has the highest loading factor (0.85), followed by X17 (0.79), indicating that these two indicators most strongly reflect the SCA construct.

4.5. Relationships Between Constructs

The relationships between constructs in this study describe how each variable contributes to strengthening market performance and sustainable competitive advantage. The path coefficient values indicate the level of influence among constructs, showing whether the relationship is weak, moderate, or strong. These results provide an overview of the strategic role of social media technology integration, digital traffic management, green product value proposition, and market penetration in supporting business sustainability.

- Social Media Technology Integration → Digital Traffic Management: The path coefficient of 0.30 indicates a moderate positive influence.
- Social Media Technology Integration → Market Penetration: The SEM results consistently demonstrate that Market Penetration functions as the primary mediating mechanism connecting digital capability and green product value to SCA. The relationships among constructs indicate a coherent strategic interaction rather than isolated direct effects.
- Digital Traffic Management → Market Penetration: The path coefficient of 0.33 indicates a moderately strong positive influence, slightly more robust than the previous relationship.
- Green Product Value Proposition → Market Penetration: The path coefficient of 0.23 indicates a moderately weak positive influence.
- Market Penetration → SCA: The path coefficient of 0.44 indicates a strong positive influence.
- Green Product Value Proposition → SCA: The path coefficient of 0.35 indicates a moderate positive influence.

The results show that Market Penetration has the strongest influence on Sustainable Competitive Advantage, indicating that broader market reach plays an important role in strengthening long-term business competitiveness. In addition, Digital Traffic Management and Green Product Value Proposition also contribute positively to Market Penetration and Sustainable Competitive Advantage. Therefore, companies need to optimize digital technology, improve traffic management strategies, and strengthen green product value to achieve sustainable growth and maintain competitiveness in the market.

4.6. Variabel Residual (Unexplained Variance)

This model also shows the residual variables (Zx) that represent the unexplained variance in the endogenous constructs:

- Ze1: Residual for Digital Traffic Management
- Ze2: Residual for Market Penetration
- Ze3: Residual for Sustainable Competitive Advantage

4.7. Goodness of Fit

The model demonstrates good fit statistics:

- Chi-Square = 187.381 with p-value = 0.102 (> 0.05), indicating a good model fit.
- GFI = 0.907 (> 0.90), indicating a good fit.
- AGFI = 0.881 (approaching 0.90), indicating a fair fit.
- TLI = 0.983 ((> 0.95), indicating an excellent fit.
- CFI = 0.986 ((> 0.95), indicating an excellent fit.
- CMIN/DF appears unclear (cmdinf), ideally < 3.
- RMSEA = 0.029 (< 0.05), indicating an excellent fit.

The Product Value relationship to Green Competitive Position demonstrates green marketing variable relationships, where superior product value directly contributes to a company's competitive position, particularly from environmental aspects. Products with high ecological sustainability value, such as using environmentally friendly raw materials, energy efficient production processes, and recyclable packaging, strengthen the business unit's competitive position in the green market. The Green Competitive Position variable has a direct influence on Green Brand Image [13]. The argument is built on the premise that when business units successfully establish a strong position in the environmentally friendly product market, this naturally translates into forming a positive green brand image. The competitive position of business units based on the commitment to environmental sustainability can help build consumer perception of the brand as an environmentally responsible entity. Green's Competitive Position in this context is manifested through implementing strict organic certification standards and transparent product traceability systems. This approach provides quality assurance to consumers while building significant barriers to entry for competitors. Precision agricultural technology and regenerative farming practices further strengthen the competitive position by optimizing production efficiency while minimizing environmental impact.

The relationship between Green Brand Image and Market Penetration Traffic demonstrates how a strong green brand image can drive increased market penetration. Environmentally conscious consumers tend to be more attracted to brands with strong reputations in sustainable practices. The Green Brand Image of agricultural green products is built through authentic communication about sustainable practices and their benefits for health and the environment. Active involvement in consumer education and collaboration with local farming communities strengthens positive brand perception among consumers. Using environmentally friendly packaging and supply chain transparency further reinforces product positioning as a sustainable agricultural solution, resulting in increased traffic and higher market activity.

Business units can manage market entry like a traffic light system with three colours red, yellow, and green. These colours provide codes for business units to enter or stop entering the market. When competitor

products are abundant in the market, management can assign red or yellow codes to prevent oversaturation. Economic theory explains that as products become scarcer, demand increases, making product traffic management in the market crucial. Market Penetration Traffic correlates with consumer activities and interactions with green brands, contributing to deeper market penetration. In the context of green marketing, this reflects how consumer awareness and preferences for environmentally friendly products can translate into a larger market share.

Market Penetration Traffic serves as a catalytic agent in this relationship. Enhanced traffic patterns indicate elevated market acceptance levels, reinforcing the organization's competitive positioning. High volume traffic generates invaluable consumer preference insights, enabling organizations to continuously improve their product value proposition. Recent advances in artificial intelligence and machine learning enable SMEs to analyze consumer interaction patterns, predict market engagement behavior, and optimize traffic conversion strategies in real time. Furthermore, cybersecurity supported traceability systems and blockchain-based verification architectures strengthen transparency and consumer trust toward green agricultural products in international markets. Big-data driven digital analytics also support adaptive decision making by integrating consumer sentiment, market responsiveness, and sustainability indicators into a unified strategic framework. Furthermore, business units can strategically utilize market penetration traffic to execute promotional and marketing campaigns through social media platforms. This systematic interaction generates a symbiotic ecosystem where advancement in one dimension catalyzes progress in corresponding areas. When integrated with superior product value propositions, successfully maintaining high traffic volumes establishes a robust foundation for developing and sustaining long-term competitive advantage.

SCA manifests as the culmination of complex interrelationships among the variables above. Within the green marketing context, SCA transcends mere market position maintenance, encompassing the creation of enduring value for both environmental and societal stakeholders. SCA exemplifies the sophisticated integration of sustainable agricultural methodologies with competitive business strategies in the realm of green agricultural products. Implementation of this concept within the green agricultural sector necessitates a holistic framework that equilibrates environmental, social, and economic dimensions.

The model's Reciprocal product value demonstrates a bidirectional relationship between Green Competitive Position and Green Brand Image, illustrating the mutual reinforcement between these variables. A robust competitive position within the green market enhances a green brand image, while conversely, an intense green brand image facilitates the maintenance and advancement of competitive positioning. Regarding value creation, green agricultural products emphasize organic cultivation methodologies that eliminate hazardous chemical inputs. These practices yield dual benefits: ensuring consumer safety while sustaining soil fertility and agrarian ecosystem equilibrium. Crop rotation systems and efficient water management protocols constitute integral components of environmentally responsible production strategies. The formal version employs more sophisticated language and technical terminology while maintaining the core meaning and relationships described in the original text. Both versions accurately convey the reciprocal nature of the relationships and their importance in sustainable agricultural practices.

This model also emphasizes the importance of a holistic approach in green marketing, where traditional market metrics and contributions to environmental sustainability and social responsibility measure success. This aligns with the fundamental principles of green marketing that emphasize the balance between profit, people, and the planet. Market Penetration Traffic and the reciprocal relationship of product value to SCA demonstrate complex dynamics in building SCA. In this context, Market Penetration Traffic is a key indicator that illustrates how effectively a product can penetrate and be accepted by the target market. The reciprocal relationship between product value and SCA creates a positive reinforcement cycle. When product value increases, it contributes to strengthening SCA. Conversely, a strong competitive advantage enables companies to enhance their product value through innovation and sustainable development. continuously

SCA in this industry is also supported by continuous innovation in cultivation techniques and the development of adaptive plant varieties. Empowering local farmers through knowledge transfer and sustainable supply chain development creates shared value for all stakeholders. This approach generates economic benefits and positively impacts the environment and farmer community welfare. The successful implementation of this strategy is reflected in increasing market demand, strong consumer loyalty, and the ability to maintain premium pricing.In addition, the successful implementation of sustainable digital-green strategies contributes significantly to strengthening corporate credibility and enhancing investor confidence. Transparent sustainability practices, digitally supported traceability systems, and consistent green branding provide measurable evidence

of organizational commitment toward environmental and social responsibility. These elements reduce information asymmetry between firms and external stakeholders, enabling investors to perceive agripreneurial SMEs as more reliable, resilient, and capable of maintaining long-term business sustainability. Furthermore, stronger corporate credibility increases opportunities for international partnerships, sustainable financing access, and long-term strategic investment, particularly in environmentally conscious global markets.

This study set out to develop and validate a model explaining how SCA is achieved for green agricultural products in the European market. The structural equation modeling (SEM) analysis yielded several significant findings that corroborate our hypotheses and reveal a complex interplay of factors. The most striking result is the paramount role of Market Penetration as the strongest direct predictor of SCA $\beta = 0.44$, establishing it as a critical mediating variable in the pathway from digital and green strategies to sustainable success. Furthermore, the model confirms that both Social Media Technology Integration and Green Product Value Proposition are significant antecedents, with the former operating primarily through Digital Traffic Management, and the latter exerting both direct and indirect effects on SCA. The identified reciprocal relationship between product value and SCA further underscores the dynamic, cyclical nature of building a sustainable market position.

To contextualize these findings and highlight the study's unique contribution, it is instructive to engage in a comparative analysis with prior seminal works in the fields of green marketing and digital strategy. First, our findings extend the traditional perspective grounded in Green Marketing Theory and the RBV. For instance, research by [62] established a direct and positive relationship between green product innovation and firm performance, positioning superior green attributes as a key resource for competitive advantage. While their work robustly demonstrated the value of "being green," it did not fully elucidate the market mechanisms through which this value is translated into a dominant market position. Our study bridges this gap by identifying Market Penetration as the crucial mediating construct. Demonstrate that a superior Green Product Value Proposition is a necessary but insufficient condition for SCA; it must be effectively activated through strategic market penetration. The unique contribution here is the empirical validation that in the contemporary European agricultural context, this activation is significantly amplified by Digital Traffic Management, a factor largely absent from earlier green marketing models. Move beyond the question of "if" green products are valuable to "how" that value is captured and sustained in a competitive digital marketplace.

Second, our research offers a nuanced perspective that contrasts with studies focusing primarily on digital marketing in broader,less-trust sensitive contexts. For example, [63] provided compelling evidence on how social media engagement drives brand loyalty and purchase intentions in the retail sector. However, their model does not fully account for the high involvement, high credibility demands of the green agricultural market, where consumer skepticism is high and certifications are paramount. Our findings contribute by integrating digital strategies not as a standalone driver of loyalty, but as a crucial enabler of market penetration within a holistic green framework. Demonstrate that for green agricultural products, social media's most potent role is not just engagement, but as a tool for managing market traffic and amplifying the credibility of green claims. The high loading factors for digital traffic indicators $\frac{X9}{X11}$ and the critical role of transparent traceability in building a Green Brand Image highlight this contextual difference. Therefore, while prior digital marketing research establishes the "what" (social media works), our research specifies the "how" and "why" it works in this specific, high stakes context, by building the trust necessary for market entry and by providing the data for optimizing that entry.

In synthesizing these comparisons, the primary novelty of this research lies in its integrative model of digital-green synergy. Demonstrate that SCA in the modern agricultural sector is not achieved by green practices or digital strategies in isolation, but through their dynamic interplay. The virtuous cycle between product value and SCA, fueled by digital enabled market penetration, represents a significant theoretical advancement. The findings suggest that agribusiness SMEs should integrate digital marketing and green branding strategies to improve market penetration and SCA. Companies are encouraged to strengthen product transparency, sustainability practices, and digital engagement to enhance consumer trust and competitive performance in international markets (like organic certification) into a sustained competitive advantage. It refines Green Marketing Theory by empirically positioning digital mediated market penetration as the central engine of contemporary green strategy, providing a more precise and actionable framework for both academics and practitioners navigating the complex landscape of sustainable commerce.

5. MANAGERIAL IMPLICATIONS

The empirical findings of this study provide a strategic roadmap that requires a coordinated approach involving various stakeholders to transform sustainable practices into market success. For agricultural MSMEs, the main priority is to integrate digital and green strategies into a cohesive core, with the main focus being market penetration to prove their green claims through strict certification and transparent traceability to build consumer trust. On the other hand, policymakers must create a supportive environment by investing in rural digital infrastructure, simplifying and subsidizing green certification frameworks, and aligning economic in centives such as tax breaks and grants with sustainable production to lower barriers to entry and encourage national green branding. This strategy is reinforced by digital marketers, who must transform from specialists focused on engagement to architects of green brand narratives, leveraging data to manage conversion oriented traffic, and acting as strategic intelligence hubs that translate market insights into implementable product and business innovations. Ultimately, this study shows that achieving SCA is not a singular effort, but rather a collaborative ecosystem where authentic green value, supported by enabling policies and reinforced through sophisticated digital strategies, creates a resilient path to international market success and contributes directly to global sustainable development. The empirical findings of this study provide a strategic blueprint that necessitates a coordinated, multi stakeholder approach to translate sustainable practices into market success. For agricultural SMEs, the imperative is to integrate digital and green strategies into a cohesive core, prioritizing market penetration while substantiating their green claims through rigorous certification and transparent traceability to build consumer trust.

Concurrently, policymakers must create an enabling environment, a task made complex yet critical by evolving digital trade regulations such as Indonesia's Permendag No. 31/2023. While this regulation aims to foster a safer digital ecosystem that enhances Green Brand Image, its compliance burden could inadvertently stifle the very Market Penetration vital for SME success. Therefore, advocate for a nuanced policy response, including tiered licensing schemes for small producers, subsidized compliance assistance, and the strategic integration of digital verification with existing green certification standards to create a unified framework of trust. This strategy is amplified by digital marketers, who must evolve from engagement focused specialists to architects of the green brand narrative, leveraging data to drive conversion-oriented traffic management, serving as strategic intelligence hubs, and ensuring all digital activities are compliant, thereby turning legal constraints into a framework for building authentic brand communication. Ultimately, the study demonstrates that achieving a SCA is not a solitary endeavor but a collaborative ecosystem where authentic green value, enabled by supportive policy and amplified through sophisticated digital strategy, creates a resilient pathway to international market success.

6. CONCLUSION

This research concludes that the integration of Market Penetration Traffic and Green Competitive Position is a key factor in building sustainable competitive advantage for green agricultural products in the European market. The SEM model shows that Social Media Technology Integration, Digital Traffic Management, and Green Product Value Proposition positively influence Market Penetration and Sustainable Competitive Advantage. Market Penetration demonstrates the strongest influence on Sustainable Competitive Advantage, confirming the importance of digital strategies and green product value in strengthening long term competitiveness.

The reciprocal relationship between product value and Sustainable Competitive Advantage supports sustainable growth, while Green Brand Image strengthens consumer trust and market penetration. The integration of digital technologies also supports consumer communication, market monitoring, and changing consumer preferences. Sustainable competitive advantage in green agricultural products requires a balance between environmental, social, and economic dimensions while contributing to SDG 12, SDG 9, and SDG 8.

This study provides a robust empirical model for achieving sustainable competitive advantage in the green agricultural sector, although the focus on SMEs and the cross sectional design may limit generalizability. Future research should test this model in multinational corporations and other sustainability driven sectors using longitudinal or qualitative approaches. Thus, this study offers a blueprint for achieving commercial success while contributing to a more sustainable and equitable world.

7. DECLARATIONS

7.1. About Authors

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7.2. Author Contributions

Conceptualization: AA; Methodology: FF; Software: VF; Validation: VF and NL; Formal Analysis: AA and FF; Investigation: NL; Resources: AA; Data Curation: VF; Writing Original Draft Preparation: AA and CP; Writing Review and Editing: CP and NL; Visualization: AA; All authors, AA, FF, VF, NL, and CP, have read and agreed to the published version of the manuscript

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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The authors confirm that this manuscript followed all ethical practices during writing. No data sets were generated or analyzed during this study, so data sharing or availability cannot be applied.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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