



Building Farmer Loyalty Through Marketing Mix and Brand Image of Tomato Seeds: The Mediating Role of Satisfaction Using PLS-SEM Approach

Muhammad Khoirudin^{1*}, Mimin Aminah¹, Irni Rahmayani Johan¹

¹Institut Pertanian Bogor, Bogor, Indonesia

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Corresponding Author:

Muhammad Khoirudin

05muhammad@apps.ipb.ac.id

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Abstract: Seed manufacturers face market share erosion due to fragmented execution. While prior studies partially evaluate inputs, integrated 7Ps and brand image frameworks remain scarce. This study evaluates structural relationships and satisfaction's mediating role in the hybrid vegetable seed sector. Data were gathered from 171 tomato smallholders across 14 sub-districts in Cianjur Regency via a purposive sampling technique and analyzed using PLS-SEM. The model revealed that farmer satisfaction was strongly explained ($R^2 = 0.599$), where brand image had the most dominant direct effect ($\beta = 0.60$, $p < 0.00$), followed by the marketing mix ($\beta = 0.330$, $p < 0.00$). Conversely, loyalty registered low variance ($R^2 = 0.15$). Bootstrapping confirmed that satisfaction directly drove loyalty ($\beta = 0.24$, $p = 0.00$). The core novelty lies in integrating high-dimensional 7Ps with an empirical screening filter for multi-brand retention. Mechanistically, satisfaction fully mediates the marketing mix ($\beta_{\text{indirect}} = 0.08$, $p = 0.01$) and partially mediates brand image ($\beta_{\text{indirect}} = 0.15$, $p = 0.00$). Managerially, firms must shift from mass-branding to localized high-touch agronomic support to secure loyalty.

Keywords: Brand image; Farmer loyalty; Partial least squares; Satisfaction.

Introduction

The success of high-value vegetable sectors like tomatoes heavily depends on hybrid seed adoptions to optimize productivity and farming efficiency (Bahtiar et al., 2024; Mahardhika et al., 2024; Riwu Kaho et al., 2025). Consequently, seed producers must complement genetic innovations with adaptive marketing strategies and robust brand ecosystems. As an industry pioneer since 1983, PT BISI International Tbk with its "Cap Kapal Terbang" brand commands a long-standing national reputation (PT. BISI, 2024). However, premium branding remains suboptimal without aggressive penetration in major agribusiness hubs like Cianjur Regency, a critical logistics buffer contributing 13% of West Java's tomato production (BPS, 2024).

Paradoxically, a commercial anomaly occurs in this strategic market. Out of Cianjur's 145 kg annual fresh tomato seed capacity in 2024, Cap Kapal Terbang captured only 15 kg (a 10% market share), falling far short of its 25% corporate target; meanwhile, competitors like Cap Panah Merah, Bintang Asia, and Global Seed dominate the remaining 90%. This drastic discrepancy signals structural bottlenecks in field marketing execution. In highly contested agrarian markets, failure to dynamically counter rivals' aggressive marketing mixes risks permanent market share erosion (Ibrahim & Harrison, 2019). Within this ecosystem, smallholders' purchasing decisions are driven by distribution accessibility, technical guidance intensity, and real-time field performance over generic brand reputation (Wossen et al., 2022). While aligned marketing baurans drive input loyalty, objective field

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utility anchors brand trust, particularly since smallholders often harbor high suspicions regarding seed quality (Michelson et al., 2023). Furthermore, empirical evidence demonstrates that smallholders' grassroots transaction choices are heavily dictated by localized services, supply chain infrastructure, and direct economic tradeoffs rather than broad macro policies (Argade et al., 2021).

However, integrated structural models within the hybrid vegetable seed sector remain scarce; prior literature focuses partially on specific crops like chili (Melania, 2023) or corn (Rustam et al., 2025), or relies on retail experiments restricted to partial attributes and discounts (Rutsaert et al., 2024). To bridge these empirical gaps, the novelty of this research is twofold. First, it synthesizes the comprehensive 7Ps marketing mix and high-dimensional brand image within a singular structural framework under real socio-economic dynamics. Second, it introduces a methodological screening filter utilizing farmers' multi-brand retention and switching dynamics (Maredia et al., 2019) to scientifically validate respondents' cognitive capacities before executing advanced multivariate analysis a step consistently overlooked in contemporary literature.

Investigating this phenomenon is critical based on several logical justifications. From an economic and supply chain security perspective, hybrid tomato cultivation is a high-risk, capital-intensive venture; since Cianjur serves as a vital food buffer for Greater Jakarta, seed supply bottlenecks or crop failures directly jeopardize regional food logistics stability and smallholders' livelihoods (Yeasmin et al., 2024).

By deploying a Partial Least Squares Structural Equation Modeling (PLS-SEM) framework, this study specifically aims to evaluate respondents' socioeconomic homogeneity and multi-brand retention behavior to justify sample cognitive capacity, examine the direct path coefficients of the marketing mix and brand image toward farmer satisfaction and loyalty while measuring outer loadings, and analyze the structural mediating role of farmer satisfaction in bridging marketing stimuli and brand reputation to establish sustainable loyalty based on total effect parameters.

Method

Research Design and Location

This quantitative study integrates descriptive and explanatory survey designs to empirically test causal relationship paths and structural mediating mechanisms among latent constructs within the research model (Creswell & Creswell, 2018). The research location was established purposively in Cianjur Regency, West Java

Province, chosen for its strategic position as a primary tomato production hub and a vital food logistics buffer zone for the Greater Jakarta (Jabodetabek) metropolitan area. Primary data collection was executed utilizing structured questionnaires administered throughout the period from November 2025 to January 2026.

Population and Sampling Procedure

Primary data were gathered using a structured questionnaire designed on a five-point Likert scale. Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), executed through a two-phase evaluation framework consisting of the measurement model (outer model) and the structural model (inner model). The measurement model assesses latent construct reliability and validity, where convergent validity requires outer loadings and Average Variance Extracted (AVE) values to exceed 0.70 and 0.50, respectively. Discriminant validity is evaluated using the Fornell-Larcker criterion or Heterotrait-Monotrait Ratio (HTMT < 0.90), while construct reliability requires Cronbach's Alpha and Composite Reliability (CR) scores above 0.70. Subsequently, the structural model evaluates the significance of direct causal relationships and mediating effects based on path coefficients, bootstrapping-derived p-values ($p < 0.05$), and the coefficient of determination (R^2).

Results and Discussion

Evaluation of Sample Cognitive Capacity and Multivariate Data Eligibility

Based on the data tabulation of the 171 farmer respondents across 14 sub-districts in Cianjur Regency, the majority of the sample is characterized by productive-aged farmers (31–50 years old; 68.42%) with a mature accumulation of agricultural experience exceeding three years (73.7%). From a multivariate modeling perspective, the dominance of these traits provides a robust empirical justification regarding the cognitive capacity of the sample. The respondents possess highly mature field competence to objectively comprehend, evaluate, and report the operational indicators of the marketing mix and brand image. Consequently, this cognitive readiness minimizes the potential risk of common method bias and data distortion during questionnaire completion.

An economic standpoint, the sample structure is heavily dominated by smallholder farmers with landholdings under 0.5 hectares (80.7%). This structural limitation in production assets logically drives farmers to be highly sensitive toward primary input efficiency. Therefore, estimating the loyalty model via PLS-SEM becomes highly relevant; for resource-constrained

smallholders, the precise selection of a hybrid variety directly determines harvest certainty amidst intense competitor penetration. This vulnerability is clearly mirrored in the respondents' market behavior, which reveals a highly competitive pattern of multi-brand usage. While the entire sample (100%) has experience cultivating the Comodor variety from *Cap Kapal Terbang*, they also actively grow rival products, most notably *Cap Panah Merah* (91.81%) and *Bintang Asia* (63.74%). Such a high rate of brand switching behavior strongly justifies the urgency of deploying a multivariate causal model to

structurally isolate which specific latent variables are most critical in securing exclusive farmer loyalty.

Evaluation of the First-Order Measurement Model and Indicator Purification

The first-order measurement model evaluation began with iterative indicator purification, systematically eliminating items with outer loadings below 0.70 to secure satisfactory convergent validity (AVE > 0.50) and robust composite reliability. The initial path model estimation is presented in Figure 1.

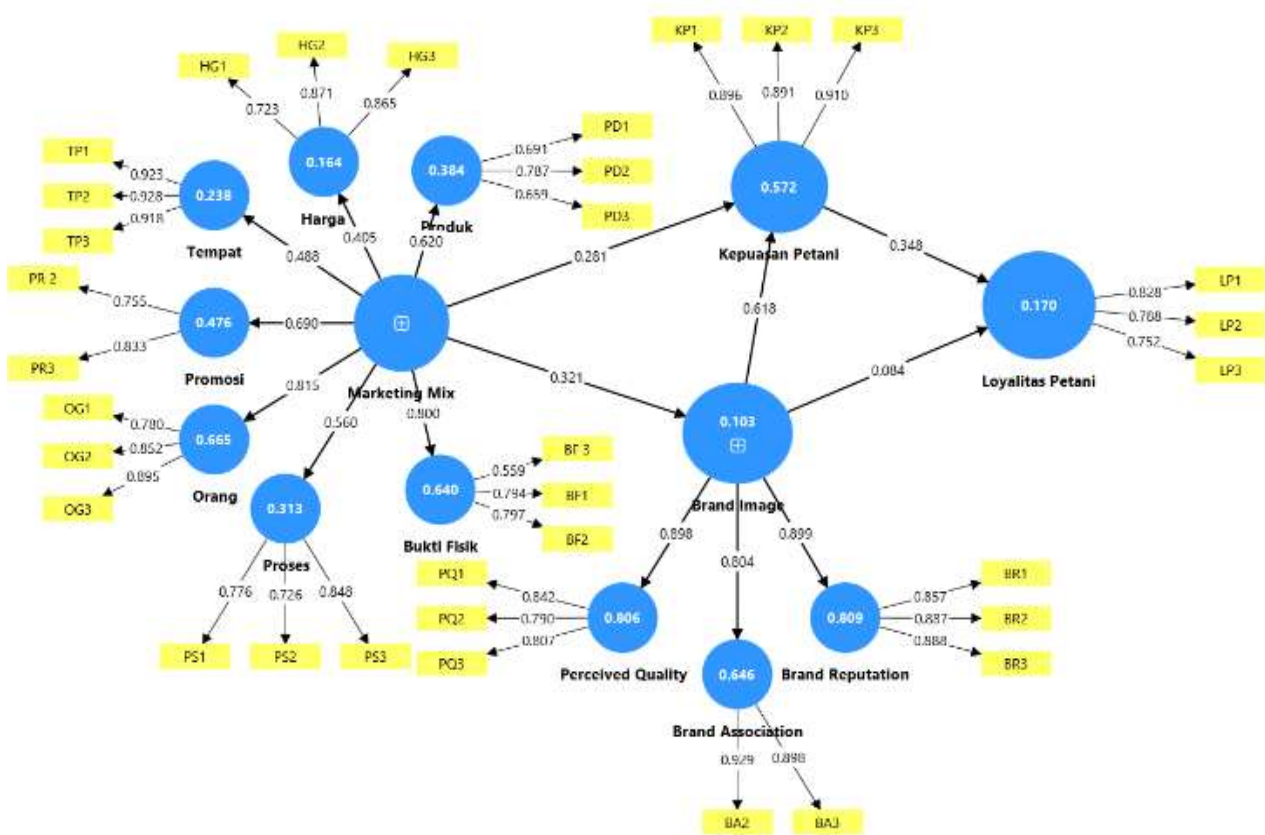


Figure 1. Path Coefficients and Outer Loadings of the Initial First-Order Measurement Model Evaluation

As illustrated in Figure 1, several indicators failed to satisfy the critical outer loading threshold of 0.70: HG2 (0.571) in price, PR2 (0.559) in promotion, BF1 (0.559) in physical evidence, and PQ1 (0.642) in perceived quality. These low-loading indicators severely deflated the structural contributions of their respective lower-order components, causing weak reflective coefficients from the overarching Marketing Mix construct to the price (0.405) and product (0.384) dimensions. Consequently, indicator purification was strictly executed to ensure all convergent validity standards were rigorously satisfied before advancing to the structural evaluation. This data refinement process directly aligns with Simba et al.,

(2025), who confirm that systematically excluding items with low factor loadings is a vital prerequisite to protect construct validity and ensure measurement model unidimensionality within PLS-SEM frameworks.

Second-Order Construct Analysis and Structural Model Power Evaluation

The second-order construct analysis was executed to evaluate the stabilized hierarchical structures. This model measures secondary path coefficients and coefficients of determination (R²) to capture the predictive capacity of the high-level constructs. The final

path diagram processed via the SmartPLS algorithm is presented in Figure 2.

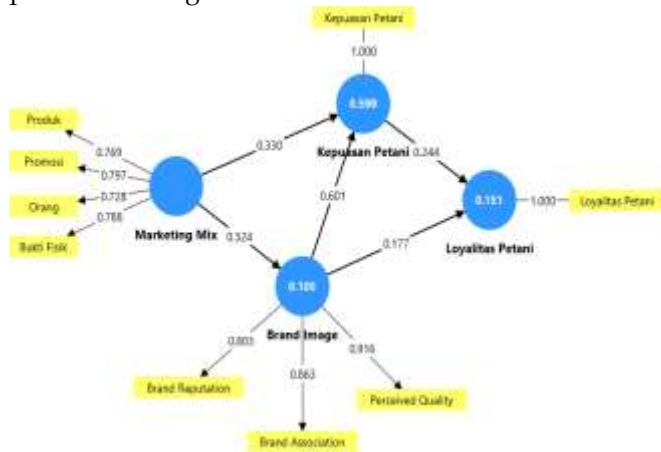


Figure 2. Structural Parameters and Path Coefficients of the Final Second-Order Structural Model

The path visualization in Figure 2 illustrates the finalized model reconstruction, confirming that the higher-order Marketing Mix construct is validly reflected by four dominant lower-order dimensions: Promotion (0.797), Physical Evidence (0.788), Product (0.769), and People (0.728). Concurrently, the structural assessment reveals a stark contrast in predictive strength. The Farmer Satisfaction construct registers a robust coefficient of determination ($R^2=0.599$), establishing that 59.9% of the variance in tomato farmer satisfaction across Cianjur Regency is strongly explained by the synchronous interplay of the marketing mix and corporate Brand Image. Conversely, the Farmer Loyalty construct yields an (R^2) value of merely 0.151 (15.1%), indicating that dominant external determinants outside the research framework heavily dictate exclusive farmer retention in the field. As argued by Yaseen et al., (2021), smallholders' post-adoption behavior and channel utilization are multidimensional, which are significantly restricted by socio economic disparities such as operational farm size variations, micro-credit availability, and educational constraints. This structural context explains why securing long-term behavioral allegiance among high-risk tomato cultivators in Cianjur Regency remains highly dependent on external retail environment dynamics and physical constraints outside standard marketing mix configurations.

Based on the explicit path coefficients in Figure 2, Brand Image exerts the most robust influence on triggering Farmer Satisfaction ($\beta=0.601$), followed by the direct impact of the Marketing Mix ($\beta=0.330$). An intriguing structural phenomenon is the negligible and statistically insignificant direct path from the Marketing Mix to Farmer Loyalty ($\beta=0.004$). This path is exceptionally weak compared to the indirect effect ($\beta=0.244$) channeled through Farmer Satisfaction,

empirically confirming that the technical and emotional satisfaction derived from cultivating the Comodor variety acts as a mandatory gateway (full mediation) to anchor long-term loyalty.

This structural mechanism and the deflated loyalty variance ($R^2=0.151$) align with the dual-loyalty marketplace framework by Feeney et al. (2022), which demonstrates that manufacturer-driven branding and quality signals are structurally disconnected from directly locking repeat purchasing behavior. This divergence occurs because grassroots input loyalty among agricultural producers is heavily dictated by dealer network dependencies, retail service quality, and localized supply accessibility. This operational reality is validated by Gao et al. (2023), who identified that localized customer service, interpersonal relational benefits, and personal trust anchor behavioral allegiance in the agricultural seed and input market. Additionally, Wisnujati et al. (2025) emphasize that firm-level operational support and tailored business policies are far more critical in securing long-term commitment than generic national marketing programs. Consequently, the insignificance of the direct marketing mix-to-loyalty path confirms that while Cap Kapal Terbang successfully satisfies farmers through technical crop utility ($R^2=0.599$), the final conversion into long-term brand loyalty remains strictly conditional upon downstream retail market dynamics.

To Structural Model Estimation, Direct Pathways, and Mediation Analysis

To rigorously evaluate the statistical significance of the hypothesized direct pathways and structural mediating effects within the inner model, a non-parametric *resample bootstrapping* procedure was executed with 5,00 subsamples. This resampling approach enables hypothesis testing without relying on the assumption of multivariate data normality. The significance of each structural path was determined based on the critical threshold of *t-statistics* (> 1.96) or the parameter significance of *p-values* (< 0.05) at a 5 percent significance level. The comprehensive graphical output of the bootstrapping significance parameters is displayed in Figure 3.

The hypothesis testing results illustrated in Figure 3 provide robust empirical evidence validating the proposed agribusiness loyalty model, as the bootstrapping procedure confirms all structural paths are statistically significant. Specifically, the pathways from the Marketing Mix to Brand Image ($p < 0.00$), Marketing Mix to Farmer Satisfaction ($p < 0.00$), Brand Image to Farmer Satisfaction ($p < 0.00$), Farmer Satisfaction to Farmer Loyalty ($p < 0.00$), and Brand Image to Farmer Loyalty ($p < 0.00$) are all highly

between corporate identity and grassroots functional satisfaction.

The Dominance of Brand Image on Satisfaction and Loyalty (H3 & H4)

Brand Image exerts the most dominant direct influence on Farmer Satisfaction ($\beta=0.60, p<0.00$), indicating that for smallholders in Cianjur, brand reputation functions as a critical quality assurance proxy providing psychological peace of mind. Farmers derive satisfaction not only from physical harvest yields but also from the security of deploying an input brand perceived to maintain premium standards. Although the direct impact of Brand Image on Farmer Loyalty is weaker ($\beta=0.18, p = 0.04$), reputation still establishes a robust psychological bond. This mechanism aligns with Hijami et al. (2024); Hussain et al. (2021); Tahir et al. (2024), who argue that a prominent corporate reputation minimizes perceived agricultural risks, instills reliability, and anchors long-term brand loyalty among smallholders.

Furthermore, this structural phenomenon strongly aligns with Febrianti et al. (2024), demonstrating that smallholders' strategic decisions and technology adoptions are dictated by experiential risk mitigation and functional security rather than formal educational attributes. To optimize this risk-reduction behavior, the agrarian cognitive evaluation of brand guarantees can be viewed through the innovative knowledge transfer framework by Sinuraya et al. (2024). Their model posits that conceptual trust is built when decision-makers engage in interactive problem-solving and direct observation. Consequently, under intense field uncertainties, a premium brand image paired with interactive education serves as a vital cognitive safeguard, effectively anchoring initial behavioral allegiance and minimizing psychological dissonance before full harvest outputs materialize.

The Role of Satisfaction in Shaping Farmer Loyalty (H5)

Structural Structural model testing validates H5, confirming that farmer satisfaction directly drives tomato farmer loyalty ($\beta=0.24, p< 0.00$), implying that superior seed performance fortifies reuse intentions. In agribusiness, satisfaction constitutes a rational economic evaluation of yield success rather than an emotional response view satisfaction as a transaction-to-relation catalyst, Syahlani et al. (2022), who argue that field-proven satisfaction locks in repurchase intentions while minimizing brand-switching.

Furthermore, this transition toward long-term loyalty echoes (Humaidi et al., 2025; Wibowo et al., 2025), whose frameworks confirm that smallholders' post-adoption behavior, economic welfare, and continuous commitment are heavily dictated by cumulative satisfaction derived from technical field utilities. When pragmatic financial expectations are secured by high-performing inputs, short-term contentment matures into enduring allegiance. Consequently, delivering consistent field quality serves as a strategic imperative to secure grassroots loyalty and insulate the brand from market-switching dynamics.

In Cianjur Regency, tomato smallholder loyalty depends heavily on yield stability and disease resistance, where consistent varietal success acts as a risk-reduction mechanism against real agroclimatic constraints (Mahardhika et al., 2024; Yana & Rahima, 2023). Ultimately, these localized agronomic outcomes shape cumulative satisfaction, serving as the primary behavioral filter that transforms transactional contentment into long-term repurchase intentions and active brand advocacy. To evaluate these mechanisms further, the structural analysis assessed indirect pathways to verify the mediating role of Farmer Satisfaction Table 2.

Table 2. Results of Indirect Influence Hypothesis Testing (Indirect Effects/Mediation)

Hypothesis	Path Coefficient	Original Sample (O)	t-statistics (O/STDEV)	p-values	Decision
Ha	Brand Image -> Farmer Satisfaction -> Farmer Loyalty	0.15	0.66	0.00	Accepted
Ha	Marketing Mix -> Brand Image -> Farmer Satisfaction -> Farmer Loyalty	0.05	2.08	0.02	Accepted
Ha	Marketing Mix -> Brand Image -> Farmer Satisfaction	0.19	3.49	0.00	Accepted
Ha	Marketing Mix -> Farmer Satisfaction -> Farmer Loyalty	0.08	2.25	0.01	Accepted
Ha	Marketing Mix -> Brand Image -> Farmer Loyalty	0.06	1.43	0.08	Rejected

Source: Primary data processed (2026)

Results in Table 2, a systematic mechanism of loyalty formation was identified, in which farmer satisfaction plays a central role as a mediator.

The Mediation of Satisfaction in the Relationship between Brand Image and Loyalty

The mediation test results indicate that farmer satisfaction serves as a significant mediating variable in linking brand image to loyalty ($\beta = 0.15$, $p = 0.00$). This implies that a strong brand reputation does not automatically guarantee farmer loyalty unless it is directly validated by actual experiences of functional satisfaction in the field. This key structural finding strongly aligns with the empirical PLS-SEM model of Sari & Harito (2025), which confirms that cumulative customer satisfaction acts as an indispensable behavioral bridge that converts perceptual brand evaluation and positive trust into persistent long-term loyalty. Within the agricultural context, this process closely mirrors the behavioral framework identified by Murning et al. (2024), which establishes that strategic branding elements and quality signals do not automatically yield long-term behavioral loyalty among smallholders unless they successfully fulfill practical performance expectations and field-level satisfaction. When a positive corporate image successfully encounters high product performance that meets farmers' pragmatic needs, brand adherence is firmly established. Consequently, brand equity acts as an initial signal of quality, but field-level satisfaction remains the definitive determinant required to sustain grassroots relational loyalty and prevent brand-switching behaviors among tomato smallholders.

The Mediation of Satisfaction in the Relationship between Marketing Mix and Loyalty

Testing the path from the marketing mix to loyalty through the mediation of satisfaction also proved to be significant ($\beta = 0.08$, $p = 0.01$). This demonstrates that marketing mix strategies such as product quality and technical assistance provided by field officers will only result in loyalty if they succeed in creating functional satisfaction for the farmers. Supporting research from (Mittal et al., 2023) as well as reinforces that service quality and product efficiency are the primary pillars of satisfaction, which subsequently transform into long-term repurchase intentions.

Furthermore, this structural mechanism is highly consistent with the agribusiness frameworks established by Pratiwi et al. (2025); Setiawati et al. (2025). Their respective PLS-SEM models confirm that operational marketing mix configurations and commercial stimuli do not directly secure continuous consumer adherence; rather, their capacity to anchor long-term customer loyalty is strictly contingent upon optimizing

intermediate functional satisfaction and value perceptions at the post-adoption stage

Rejected Mediation Path: Marketing Mix through Brand Image to Loyalty

The mediation path of the marketing mix through brand image to loyalty was found to be insignificant ($\beta = 0.06$, $t = 1.43$, $p = 0.08$) and thus rejected. This phenomenon provides strong empirical field evidence that commercial marketing strategies focusing solely on building a prestigious brand image or aggressive top down promotions without ensuring that farmers are satisfied with actual product performance in the field will fail to retain customers.

Within horticultural and agribusiness marketing frameworks, this structural boundary is strongly supported by Suhendra et al. (2025), who demonstrate in the fresh vegetable sector that upstream marketing executions and high-level image positioning fail to directly secure long-term behavioral outcomes unless they are filtered through intermediate evaluative stages within the consumer's pragmatic experience. This structural limitation also aligns with the consumer behavior perspectives of Rehman & Elahi (2024), which conceptualize that external stimulus inputs and brand image configurations do not automatically translate into permanent relational adherence; instead, continuous behavioral loyalty requires direct reinforcement from functional utility and perceived product quality.

In the specific context of smallholder-firm interactions, this dynamic directly mirrors the structural findings of Hien & Kim (2024) in the agribusiness industry, which emphasize that formal corporate branding initiatives and top-down marketing channels fail to generate sustainable loyalty among cultivators if the technical quality of the relationship and operational satisfaction are compromised.

Interpreting this specific context for the pragmatic tomato farmers in Cianjur Regency, satisfaction with concrete harvest yields acts as the absolute primary filter. Tomato cultivation involves high capital risks, sensitive agroclimatic challenges, and vulnerability to pests, which naturally forces smallholders to evaluate input seeds based on tangible results rather than emotional corporate reputation. Therefore, our field analysis reveals that without passing through satisfaction with physical seed performance such as optimal vegetative growth, uniform fruit size, and strong disease resistance under real field conditions any form of corporate reputation, brand prestige, or intensive promotion will be completely unable to secure their relational loyalty permanently.

Managerial Implications

The empirical validation of this model provides actionable pathways for PT BISI International Tbk to aggressively reclaim the market share currently dominated by rivals in Cianjur Regency. Because the second-order marketing mix components operate primarily through farmer satisfaction, corporate interventions must shift from generic mass-branding toward localized, high-touch agronomic support. Given that tomato cultivation is a high-risk venture for smallholders managing less than 0.5 hectares, field officers must transform from traditional sales representatives into dedicated technical advisors stationed directly within key cluster sub-districts like Warungkondang and Cugenang. Providing real-time pest diagnostic counseling and precise dosage calendars directly on-farm serves as an institutional safety net that effectively converts field interaction into immediate functional satisfaction.

Furthermore, abstract product claims must be translated into visible, empirical proof before the seed purchasing window opens. Corporate marketing budgets should be aggressively redirected into widespread localized demonstration plots (demplots) positioned along high-traffic rural roads, showcasing the Comodor variety side-by-side with competitor seeds under identical agroclimatic constraints. During regional farmer gatherings (Temu Lapang), distributing heavy-duty, weather-resistant plastic seed bags will upgrade physical evidence while preventing humidity damage during kiosk storage. Finally, to eliminate brand switching caused by sudden stockouts, the company must establish an automated inventory replenishment system with local dealers. Ensuring that Cap Kapal Terbang seeds are physically present on shelves at the exact onset of the planting window closes the commercial loop, systematically eroding competitor dominance and locking in exclusive, long-term brand loyalty.

Conclusion

This research demonstrates that input brand loyalty among smallholders is driven by field-proven functional satisfaction rather than generic brand equity. Brand image serves as a critical quality assurance proxy that minimizes perceived agricultural risks, while the marketing mix is heavily anchored by localized promotion, physical evidence, technical crop utility, and field personnel support. The core novelty of this study lies in its high-dimensional integration of the 7Ps and brand image alongside a methodological screening filter for multi-brand retention. Theoretically, these findings expand agribusiness marketing frameworks by proving

that transactional marketing stimuli must pass through post-adoption functional satisfaction to secure long-term loyalty. Practically, it implies that localized agronomic support and visible empirical proof through roadside demplots are far more critical than national corporate scale alone. For firms like PT BISI International Tbk, this provides a vital roadmap to optimize supply chain fluidity and reclaim regional market share, while helping policymakers stabilize food buffer zones. Despite its contributions, this study is subject to distinct limitations, specifically its narrow cross-sectional geographical focus on Cianjur Regency and its exclusive evaluation of the hybrid tomato sector, which may limit direct generalizability. Future research should expand the geographic scope to cross-regional agribusiness hubs and incorporate longitudinal data. Additionally, future studies should integrate emerging variables such as digital technology adoption, localized dealer dependencies, and downstream supply chain trust to further refine the predictive boundaries of the input loyalty model.

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Author Contributions

Conceptualization, M. K., M. A., and I. R. J.; methodology, M. K. and M. A.; validation, M. A. and I. R. J.; formal analysis, M. K.; investigation, M. K.; resources, M. K.; data curation, M. K.; writing—original draft preparation, M. K.; writing—review and editing, M. A. and I. R. J.; visualization, M. K.; supervision, M. A. and I. R. J. 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 are no conflicts of interest regarding the publication of this article.

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