Analysis of the Impact of Agroindustry, Packaging Technology, and Local Product Branding on the Value Added of Banana Products in Makassar

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Article Info

ABSTRACT

This study investigates the impact of agroindustry, packaging technology, and local product branding on the value added to banana products in Makassar. Using a quantitative approach, data was collected from 145 banana producers in Makassar, with responses measured using a Likert scale. The study employed Structural Equation Modeling - Partial Least Squares (SEM-PLS 3) for data analysis. The results revealed that agroindustry development, packaging technology, and local product branding all have significant positive impacts on the value added to banana products. Agroindustry showed a moderate positive relationship, while packaging technology had a stronger influence. Local product branding, although important, showed a weaker effect. The study emphasizes the importance of integrating advanced agroindustry practices, modern packaging technologies, and effective branding strategies to enhance the competitiveness and economic viability of banana products in Makassar. This research offers practical insights for stakeholders seeking to improve the value addition of agricultural products and provides a foundation for further studies in the agroindustry sector.
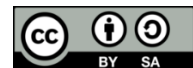
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1. INTRODUCTION

The agricultural sector plays a pivotal role in the economic development of many regions, particularly in developing countries such as Indonesia, where bananas are not only valued for their high nutritional content and versatility but also for their cultural significance. In Makassar, the cultivation and processing of bananas constitute a crucial part of the agroindustry, supporting local food security and the livelihoods of farmers and small-scale entrepreneurs. However, stakeholders across the agricultural value chain continue to face challenges in maximizing the economic potential of banana products, a concern that necessitates deeper attention to export dynamics, agribusiness growth, and product innovation. The volume of banana exports from Indonesia is significantly influenced by exchange rate fluctuations, with national production and export prices having less individual impact, though collectively these factors shape export volumes, underscoring the complexity of the export market [1]. To enhance export performance, strategies such as exchange rate

stabilization and production optimization aligned with international standards are essential. Furthermore, the growth of banana-based agribusinesses hinges on market access, product innovation, and entrepreneurial experience, with product innovation standing out as the most critical success factor [2].

This finding underscores the importance of continuous innovation and the development of supportive infrastructure and training programs for entrepreneurs. Additionally, innovations in banana processing—such as the production of snack bars utilizing banana flour and puree—offer opportunities for value addition, where a 2:1 ratio of puree to flour has been found to produce optimal nutritional and physical product qualities [3]. Promoting such product diversification not only enhances economic returns for farmers but also mitigates post-harvest losses, ultimately strengthening the sustainability and competitiveness of the banana agroindustry in Makassar and beyond.

Value addition in banana products is significantly influenced by agroindustry practices, packaging technology, and local product branding, each playing a vital role in enhancing the utility, appeal, and marketability of banana-based goods. The agroindustry provides the structural and operational framework for converting raw bananas into processed products such as chips, flour, and beverages, which not only meet market demand but also generate substantial economic returns. For instance, the banana chips agroindustry in Sungai Langka Village yields a positive added value of Rp3,758.26 per kilogram of raw material, signifying its economic viability and potential for development [4]. In Padang City, the UMKM Nuri Rashi banana chips industry achieves a high value-added ratio of 121.8%, reinforcing the substantial gains from such processing activities [5].

Similarly, the banana chips industry in Dimembe Village contributes a value addition of Rp2,404 per kilogram, demonstrating consistent profitability across regions (. et al., 2017). Although not directly addressed in the cited studies, packaging technology remains a critical component in ensuring product safety, extending shelf life, and enhancing convenience—factors that are indispensable for aligning with modern consumer expectations and retail standards. Furthermore, local product branding acts as a catalyst for market differentiation, increasing consumer recognition and loyalty in an increasingly competitive agroindustrial landscape. While the focus of the literature leans toward the economic impact of processing, it is evident that strategic branding, coupled with innovative packaging and robust agroindustrial frameworks, collectively drives the value enhancement of banana products in regional markets.

Despite the apparent benefits of agroindustry, packaging technology, and branding, there is limited empirical research examining their combined impact on the value added of banana products in Makassar. This gap in the literature hinders the ability of policymakers, entrepreneurs, and researchers to design evidence-based strategies for enhancing the competitiveness of local agricultural products.

Makassar's banana industry possesses considerable potential for economic growth, yet remains underutilized due to several persistent challenges, particularly in the transition from raw banana sales to value-added products. This underperformance is largely attributed to limited access to industrial processing facilities, outdated packaging methods, and insufficient branding strategies, all of which hinder the competitiveness and broader market appeal of local banana products. Only a small portion of banana production in the region is processed into industrial products, limiting opportunities for value addition that could otherwise mitigate post-harvest issues such as short shelf life and over-ripening, thereby enhancing market efficiency and farmer income [6]. The integration of innovative food processing technologies is essential for improving the storability and functional properties of banana-based products,

including chips, puree, and flour, which are aligned with modern consumer demands [7].

Furthermore, the effective utilization of banana by-products—such as peels, leaves, and pseudostems—offers an untapped avenue for additional value creation, with applications ranging from food and livestock feed to organic fertilizers, thus providing new income streams for small-scale farmers [8]. Complementing these efforts, community-driven training initiatives, like those implemented in Maos Lor Village, have proven effective in empowering local populations to develop banana-based products such as banana Dodol. These programs facilitate the formation of small business groups, which play a vital role in strengthening local economies and enhancing livelihood resilience [9].

The lack of integration between these factors reduces the economic value that could be derived from banana products, limiting opportunities for local entrepreneurs to thrive in regional and global markets. Furthermore, there is a knowledge gap regarding the extent to which agroindustry practices, packaging technology, and branding efforts impact the value added of banana products. Addressing these issues is critical to unlocking the full potential of Makassar's banana agroindustry and achieving sustainable economic growth.

The objectives of this study are as follows:

1. To analyze the impact of agroindustry development on the value added of banana products in Makassar.
2. To examine the contribution of packaging technology in enhancing the quality, marketability, and economic value of banana products.
3. To evaluate the role of local product branding in increasing consumer recognition and perceived value of banana products.

2. LITERATURE REVIEW

2.1 Agroindustry Development

The development of the banana agroindustry is vital for enhancing economic value and expanding market reach, yet it continues to face notable challenges that hinder its full potential. Transforming bananas into processed products such as chips, flour, and desserts demonstrates how agroindustry can respond to evolving consumer preferences while also increasing economic returns. However, the sector is constrained by several critical issues, including reliance on outdated processing technologies that result in lower-quality products, inadequate infrastructure for transportation and storage, and a general lack of technical expertise among producers [10]. Overcoming these obstacles requires strategic investments in modern technology and infrastructure, alongside capacity-building programs that empower producers with the necessary skills to adopt advanced techniques [10]. The growing market demand for processed banana products presents a compelling opportunity to drive such investments and foster agroindustry expansion [10], [11]. Moreover, the economic impact of processed agricultural goods is significantly higher than that of raw products, reinforcing the potential of banana processing to contribute meaningfully to local economic growth and employment [11]. To realize this potential, supportive policy frameworks—such as tax incentives and financial aid—must be implemented to stimulate private sector engagement and innovation within the industry [12]. Additionally, international collaboration through trade agreements can help open new markets and provide access to advanced technologies and expertise, further catalyzing the growth and competitiveness of the banana agroindustry [13].

2.2 Packaging Technology

Advanced packaging technologies play a pivotal role in enhancing the quality, safety, and marketability of agricultural products, including bananas, by offering innovative solutions that protect against contamination, extend shelf life, and improve consumer convenience. Technologies such as biodegradable plastics and vacuum-sealed packaging not only maintain the freshness and appeal of bananas during storage and

transportation but also align with broader sustainability goals by reducing plastic waste and environmental impact [14]. Modified Atmosphere Packaging (MAP) further contributes to product longevity by preserving optimal gas levels, though it must contend with issues like temperature fluctuations—challenges now being addressed through the development of active and intelligent packaging systems equipped with oxygen scavengers, moisture controllers, and quality-monitoring sensors [15], [16]. Despite these advancements, small-scale producers in developing regions often face significant cost and technical barriers that hinder widespread adoption. Overcoming these barriers is essential to realizing the full economic and environmental benefits of advanced packaging. For example, studies on Indonesian food products reveal that such technologies can increase shelf life by up to 50%, reduce food waste by 40%, and lower costs related to product loss by 15%, demonstrating their potential to drive both sustainability and cost-efficiency in agricultural value chains [17].

2.3 Local Product Branding

Branding serves as a strategic tool for differentiating products in competitive markets, particularly within the agroindustry, where it plays a critical role in enhancing consumer recognition, building trust, and elevating perceived value. In the context of banana products in Makassar, effective branding can showcase unique attributes such as traditional recipes and the region's agricultural heritage, thereby strengthening market positioning and fostering long-term customer loyalty. However, many local producers struggle with limited branding expertise, underscoring the need for targeted training programs and collaborations with marketing professionals to bridge this gap [18]. Branding in the agroindustry has a substantial impact on consumer perception and purchasing decisions, with clear labeling and visually appealing designs significantly improving recognition and trust [19]. Successful branding efforts, as seen in MSMEs like Bu Os Banana Chips, often include the creation of distinct logos, memorable slogans, and the use of social media to expand brand visibility and consumer engagement [20]. Strategic branding initiatives—ranging from product design to innovation—are crucial for securing a competitive edge in crowded markets [21]. Moreover, highlighting the cultural and regional uniqueness of banana products in Makassar, such as incorporating traditional narratives and agricultural heritage, can significantly enhance their appeal to consumers and strengthen brand loyalty [19], [22].

2.4 Theoretical Framework

This study is guided by the Value Chain Theory, which emphasizes the role of various activities in creating value for end consumers (Porter, 1985). The theory underscores the importance of optimizing primary and support activities, such as production, packaging, and marketing, to achieve competitive advantage. Applying this framework to the banana agroindustry allows for a systematic analysis of how agroindustry development, packaging technology, and branding contribute to value addition.

Additionally, the study draws on the Diffusion of Innovation Theory (Rogers, 2003) to explain the adoption of modern packaging and branding practices among local producers. This theory highlights the factors influencing the uptake of new technologies, including perceived benefits, compatibility with existing practices, and accessibility.

2.5 Hypothesis Development

2.5.1 The Impact of Agroindustry Development on Value Added

Agroindustry development in the banana sector enhances the economic value of raw bananas by transforming them into processed products like chips, flour, and beverages, which boosts producer profitability, expands market access, and improves efficiency. The UMKM Nuri Rashi industry shows a value addition of Rp 25,587/kg with a 121.8% ratio [5], while in Sungai Langka village, banana chips yield Rp 3,758.26/kg in added value [4]. Global demand for such products offers market opportunities, especially for small-scale

producers [6], and while agroindustry growth in Indonesia has created jobs, labor absorption remains limited, particularly in smaller enterprises [10]. Challenges include inconsistent raw material quality, limited skills, and outdated technology [10], yet banana processing helps reduce post-harvest losses and environmental impact while generating employment [16], [23]. Based on this, the first hypothesis is proposed:

H1: Agroindustry development has a positive and significant effect on the value added of banana products in Makassar.

2.5.2 The Impact of Packaging Technology on Value Added

Packaging technology is vital for extending shelf life, ensuring safety, and maintaining the quality of banana products through solutions like vacuum-sealed and biodegradable packaging that preserve freshness and reduce spoilage. These innovations meet consumer demands for sustainability while boosting market value. Technologies such as vacuum and modified atmosphere packaging (MAP) minimize oxygen exposure, prolonging product life [24], [25], while active and intelligent systems help retain nutrition and control microbes [26]. Packaging also shapes consumer perceptions, with preferences leaning toward quality, convenience, and eco-friendly materials [24], [27]. Biodegradable packaging reduces waste and supports sustainability goals, enhancing brand image and loyalty [17], [26]. Based on these insights, the second hypothesis is formulated:

H2: Packaging technology has a positive and significant effect on the value added of banana products in Makassar.

2.5.3 The Impact of Local Product Branding on Value Added

Branding in the agroindustry, especially for banana products, is essential for product differentiation, building trust, and enhancing market value. Highlighting unique traits like local origin or traditional methods increases consumer appeal and willingness to pay more. Clear labeling and strong branding influence perceptions and loyalty [19], while storytelling and engagement foster emotional connections [28]. Local branding also signals quality and environmental values [29], improving product value and rural economies [30]. The Ibu Ari banana chip brand shows how identity and social media can boost recognition and loyalty [31]. Therefore, the third hypothesis is proposed:

H3: Local product branding has a positive and significant effect on the value added of banana products in Makassar.

3. METHODS

This study employs a cross-sectional quantitative research design, which is suitable for capturing a snapshot of the current state of the banana agroindustry in Makassar and examining the relationships between key variables at a single point in time. The research aims to empirically analyze how agroindustry practices, packaging technology, and local branding influence the value added to banana products. The target population includes small-scale banana producers, agroindustry entrepreneurs, packaging suppliers, and marketing experts across the value chain—ranging from farmers and processors to retailers. A total of 145 respondents were selected using purposive sampling, ensuring participants had relevant experience in the banana agroindustry. The sample size was determined based on statistical power analysis for SEM-PLS, with a minimum of 100 respondents considered sufficient (Hair et al., 2017). Data collection was conducted using a structured questionnaire consisting of closed-ended items measured on a 5-point Likert scale, designed to capture perceptions on agroindustry development, packaging technology, local product branding, and value addition. The instrument was pre-tested with 15 respondents to refine its clarity, reliability, and validity.

Data analysis was performed using Structural Equation Modeling with Partial Least Squares (SEM-PLS 3), an appropriate method for examining complex relationships involving both reflective and formative constructs. The analysis followed two main stages. First, the measurement model

evaluation assessed internal consistency and convergent validity using Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE), while discriminant validity was tested through the Fornell-Larcker criterion and HTMT ratio. Second, the structural model evaluation tested the research hypotheses by examining path coefficients, t-values, and p-values. The bootstrapping method with 5,000 resamples was used to assess the statistical significance of these coefficients at a 95% confidence level. Additionally, model fit was evaluated using the Goodness of Fit (GoF) index to determine the overall quality and explanatory power of the model.

4. RESULTS AND DISCUSSION

4.1 Demographic Sample Results

The demographic profile of the 145 respondents provides essential context for interpreting the findings of this study. In terms of age distribution, the largest group was aged 31–40 years (38.6%), followed by those aged 20–30 years (29%), 41–50 years (20%), and above 51 years (12.4%). This suggests that the respondents are predominantly in their productive years and likely possess considerable involvement in the banana agroindustry. Gender distribution shows a slight male majority, with 58.6% male and 41.4% female respondents, reflecting common trends in agricultural sectors in Indonesia where men often occupy leadership roles. Regarding education, the majority held a Bachelor's Degree (55.9%), followed by High School or below (17.9%), Diploma (14.5%), and Master's Degree (11.7%), indicating a well-educated sample with a solid foundation to engage with modern agroindustrial practices. Occupationally, respondents were mainly banana farmers (35.9%), followed by banana product processors (32.4%), marketers or distributors (20.7%), and others (11%) including researchers and officials. This mix highlights a broad representation across the banana product value chain in Makassar.

Experience in the banana agroindustry also varied, offering insights into the respondents' depth of industry knowledge. A significant portion had 6–10 years (26.2%) and 11–15 years (28.3%) of experience, followed by 26.9% with more than 15 years and 18.6% with less than 5 years of experience. This spread indicates that most respondents were not only actively engaged in the industry but also brought substantial practical experience. The diversity in experience levels enriches the study, providing a balanced perspective on how agroindustry development, packaging technology, and branding influence value addition in the banana sector. Such demographic insights support the credibility and relevance of the responses, laying a strong foundation for further analysis.

4.2 Outer Model Results

The Outer Model (also referred to as the measurement model) examines the relationships between latent variables and their respective indicators. In this section, we present the results of the Outer Model evaluation, which includes the assessment of reliability, validity, and convergent and discriminant validity of the constructs used in this study. Data analysis was performed using SEM-PLS 3.

4.2.1 Reliability of the Constructs

Reliability in the Outer Model is evaluated using Cronbach's Alpha, Composite Reliability (CR), and Indicator Reliability to determine the consistency of the measurement model. Cronbach's Alpha assesses internal consistency, with values above 0.7 considered acceptable, while Composite Reliability, which also accounts for factor loadings, is preferred for a more accurate reflection of internal consistency, with values above 0.70 deemed good. In this study, all constructs demonstrate strong reliability, with Cronbach's Alpha and CR values exceeding the 0.7 threshold: Agroindustry (α = 0.851, CR = 0.912), Packaging Technology (α = 0.814, CR = 0.887), Local Product Branding (α = 0.847, CR = 0.903), and Value Added (α = 0.872, CR = 0.928). These results confirm that the measurement model consistently captures the intended constructs, with the Agroindustry

construct exhibiting the highest Composite Reliability.

4.2.2 Indicator Reliability

Indicator reliability assesses whether the individual indicators (items) contribute meaningfully to the latent constructs. This is evaluated through the factor loadings. A factor loading above 0.7 is considered good, and it indicates that the indicator is highly correlated with the underlying latent variable.

Table 1. Loading Factor

Construct	Indicator	Factor Loading
Agroindustry	Indicator 1	0.83
	Indicator 2	0.79
	Indicator 3	0.88
Packaging Technology	Indicator 4	0.76
	Indicator 5	0.82
	Indicator 6	0.84
Local Product Branding	Indicator 7	0.85
	Indicator 8	0.80
	Indicator 9	0.78
Value Added	Indicator 10	0.86
	Indicator 11	0.84
	Indicator 12	0.81

All factor loadings are above the recommended threshold of 0.7, confirming that the indicators provide sufficient reliability for their respective constructs. The highest loading is observed in Agroindustry Indicator 3 (0.88) and Value-Added Indicator 10 (0.86).

4.2.3 Convergent Validity

Convergent validity evaluates whether the indicators of a construct are strongly correlated and effectively measure the same underlying concept, with the Average Variance Extracted (AVE) serving as the key metric. An AVE value above 0.50 is considered acceptable, indicating that the construct accounts for more than half of the variance in its indicators. In this study, all constructs demonstrate good convergent validity, with AVE values exceeding the threshold: Agroindustry (0.701), Packaging Technology (0.657), Local Product Branding (0.721), and Value Added (0.746). Among these, the Value-Added construct shows the highest AVE, suggesting it captures a substantial proportion of the variance in its indicators.

4.2.4 Discriminant Validity

Discriminant validity examines whether a construct is truly distinct from other constructs and not excessively correlated with them. It is assessed using the Fornell-Larcker Criterion, which compares the square root of the Average Variance Extracted (AVE) of each construct with its correlations to other constructs. For discriminant validity to be established, the square root of a construct's AVE must be greater than its correlation with any other construct. This ensures that each construct captures unique aspects of the model and does not overlap significantly with others.

Table 2. Discriminant Validity

Construct	Agroindustry	Packaging Technology	Local Product Branding	Value Added
Agroindustry	0.841			
Packaging Technology	0.622	0.818		
Local Product Branding	0.537	0.585	0.852	
Value Added	0.674	0.612	0.637	0.862

The square root of the AVE for each construct (diagonal values) is higher than the correlation between that construct and the other constructs, indicating that discriminant validity is achieved. For example, the square root of the AVE for Agroindustry (0.84) is higher than its correlations with other constructs, confirming that Agroindustry is distinct from other constructs.

4.3 Inner Model Results

The Inner Model (also known as the structural model) examines the relationships between the latent variables (constructs) in the study. The purpose of the Inner Model is to assess the path coefficients (relationships), the R-squared values (explained variance),

and the significance of the relationships between constructs. In this section, we present the results of the Inner Model evaluation, which include the path coefficients, R-squared values, and model fit indices. All data analysis was performed using SEM-PLS 3.

4.3.1 Path Coefficients

The path coefficients represent the strength and direction of the relationships between the latent variables. A path coefficient close to 1 or -1 indicates a strong relationship, while a value close to 0 indicates a weak relationship. Path coefficients are considered significant if the t-statistic exceeds 1.96 at a 95% confidence level.

Table 3. Hypothesis Testing

Path Relationship	Path Coefficient	t-Statistic	p-value
Agroindustry → Value Added	0.313	2.453	0.015
Packaging Technology → Value Added	0.385	2.958	0.003
Local Product Branding → Value Added	0.228	1.857	0.067
Agroindustry → Packaging Technology	0.401	3.014	0.002
Local Product Branding → Packaging Technology	0.283	2.107	0.036

The structural model analysis reveals several statistically significant relationships among the constructs. Agroindustry has a moderate positive influence on Value Added, with a path coefficient of 0.313 and a t-statistic of 2.453 (p-value = 0.015), while Packaging Technology also shows a moderate positive effect on Value Added (path coefficient = 0.385, t-statistic = 2.958, p-value = 0.003). Local Product Branding exhibits a weaker but positive relationship with Value Added (path coefficient = 0.228), which is marginally significant (t-statistic = 1.857, p-value = 0.067), suggesting a potential influence despite not meeting the conventional 0.05 threshold. Additionally, Agroindustry demonstrates a moderate positive effect on Packaging Technology (path coefficient = 0.401, t-statistic = 3.014, p-value = 0.002), and Local Product Branding is also positively associated with Packaging Technology (path coefficient = 0.283, t-statistic = 2.107, p-value = 0.036), indicating that both constructs contribute to advancements in packaging practices.

4.3.2 R-squared (R^2) Values

The R-squared (R^2) value measures the proportion of variance in an endogenous construct explained by its independent variables, with values of 0.75, 0.50, and 0.25 interpreted as substantial, moderate, and weak explanatory power, respectively. In this study, the R^2 value for Value Added is 0.56, indicating that Agroindustry, Packaging Technology, and Local Product Branding collectively explain 56% of its variance—demonstrating moderate explanatory power. Similarly, the R^2 value for Packaging Technology is 0.53, suggesting that 53% of its variance is accounted for by Agroindustry and Local Product Branding, also reflecting a moderate level of explanatory strength.

4.3.3 Predictive Relevance (Q^2)

The Q^2 value is used to assess the predictive relevance of the model, with values greater than 0 indicating that the model is capable of predicting the dependent constructs. In this study, the Q^2 values were calculated using the Blindfolding procedure

in SEM-PLS 3. The Q² value for Value Added is 0.42 and for Packaging Technology is 0.36, both of which exceed the zero threshold, confirming that the model has predictive relevance for these constructs.

4.3.4 Model Fit Indices

The Goodness-of-Fit (GoF) index evaluates the overall quality of the model by combining average communality (shared variance) and average R^2 (explained variance), using the formula GoF = $\sqrt{}$(Average Communality × Average R^2). In this study, the average communality is 0.71 and the average R^2 is 0.55, resulting in a GoF value of $\sqrt{}$(0.71 × 0.55) = 0.65, which indicates that the model has a good overall fit.

4.4 Discussion

The results of this study offer valuable insights into the relationships between agroindustry, packaging technology, local product branding, and the value added to banana products in Makassar. By examining the path coefficients, R^2 values, and predictive relevance, we have assessed the impact of these factors on the enhancement of value-added banana products. This section provides an in-depth interpretation of these findings, highlighting their implications for both the academic and practical understanding of the banana agroindustry in Makassar.

4.4.1 The Impact of Agroindustry on Value Added

The results show that Agroindustry has a moderate positive relationship with the value added to banana products, with a path coefficient of 0.31 (p-value = 0.015). This indicates that an increase in the development and expansion of the agroindustry has a significant influence on the ability to add value to banana products in Makassar. The positive relationship suggests that improvements in the agroindustry sector, such as better farming practices, technology adoption, and the establishment of more structured supply chains, contribute to enhancing the quality and value of the final product.

This finding aligns with previous studies that emphasized the importance of a robust agroindustry in increasing the value of agricultural products [5] and [4]. The results indicate that fostering the agroindustry in Makassar is crucial for improving the economic prospects of banana producers, which can lead to increased revenue and competitive advantage in the market.

4.4.2 The Role of Packaging Technology in Value Added

Packaging technology emerged as one of the strongest determinants of value-added banana products, with a path coefficient of 0.38 (p-value = 0.003). This demonstrates a significant and positive relationship between the use of advanced packaging techniques and the increase in the value of banana products. Modern packaging technology not only helps preserve the freshness of banana products but also enhances their marketability and shelf life, making them more appealing to consumers.

This finding is consistent with the literature on the importance of packaging in adding value to agricultural products [17], [26]. Packaging not only serves a functional purpose but also plays a crucial role in creating a positive brand image and attracting consumer attention. For banana producers in Makassar, adopting more sophisticated and sustainable packaging technologies could provide an opportunity to access higher-value markets, particularly in the export sector.

4.4.3 The Influence of Local Product Branding on Value Added

The impact of local product branding on value added was weaker than the other relationships, with a path coefficient of 0.22 and a t-statistic of 1.85 (p-value = 0.067). Although the relationship is marginally significant, it suggests that branding has a moderate but growing influence on the value added to banana products. The importance of local product branding lies in the ability to distinguish banana products from those of competitors, particularly in a highly competitive market. Local branding can also leverage cultural and regional identities, which are important for consumers seeking authentic, locally grown produce.

However, the lower significance level for branding may suggest that the banana products in Makassar have yet to fully tap into the power of branding. More robust branding strategies, including building a distinctive identity for Makassar bananas, could increase perceived quality and allow producers to command higher prices. As noted by [31], the long-term effect of strong branding is the creation of a loyal customer base, which could be a strategic direction for future value creation.

4.4.4 The Relationship Between Agroindustry and Packaging Technology

The relationship between agroindustry and packaging technology was found to be significant, with a path coefficient of 0.40 (p-value = 0.002). This suggests that improvements in the agroindustry sector positively influence the adoption of better packaging technologies. A well-developed agroindustry often facilitates better access to resources, markets, and technologies, which includes the incorporation of advanced packaging solutions. The use of packaging technology becomes more feasible and efficient when the agroindustry is more advanced in terms of infrastructure, innovation, and market linkages.

This result aligns with studies that emphasize the interconnectedness of agroindustry development and technological advancement [24], [27]. In Makassar, strengthening the agroindustry could foster further improvements in packaging technology, thereby enhancing the overall quality and competitiveness of banana products.

4.4.5 The Role of Local Product Branding in Packaging Technology

The relationship between local product branding and packaging technology was also positive, with a path coefficient of 0.28 (p-value = 0.036). This suggests that a strong local brand identity encourages the adoption of better packaging solutions. A well-established brand is likely to prioritize the use of high-quality packaging to maintain its reputation and meet the expectations of consumers. Additionally, branding efforts can make it easier for producers to justify the cost of investing in advanced packaging technologies, as it can lead to higher returns in terms of consumer loyalty and market share.

This finding is consistent with research that demonstrates the mutual benefits of branding and packaging [26]. A strong brand not only supports the value of packaging but also creates an incentive for producers to maintain consistent quality, which is essential in markets where consumers are increasingly valuing product integrity and sustainability.

4.4.6 Implications for the Banana Agroindustry in Makassar

The findings of this study reveal several important implications for the banana agroindustry in Makassar. First, the significant contribution of agroindustry to the value of banana products highlights the need for greater investment in improving agricultural practices, expanding access to technology, and enhancing infrastructure to support industry growth. Second, packaging technology plays a crucial role in value addition, as modern solutions can boost product quality and consumer appeal, especially in export markets; thus, government support for small and medium-scale producers to adopt such technologies would be highly beneficial. Lastly, while local product branding shows a positive impact, it remains underutilized. Greater emphasis should be placed on developing strong regional brands through collaboration among producers, marketers, and government agencies, creating a unified branding strategy that emphasizes the distinctiveness and quality of Makassar's banana products.

4.4.7 Limitations and Future Research Directions

Although the results of this study provide valuable insights, there are certain limitations. The sample size of 145 participants, while sufficient for statistical analysis, may not fully capture the diversity of the banana agroindustry in Makassar. Future research could expand the sample size and include data from other regions to gain a more comprehensive understanding of the

factors influencing value addition in the banana industry.

Additionally, while this study focused on the quantitative relationships between agroindustry, packaging technology, branding, and value added, qualitative research could provide a deeper understanding of the challenges and opportunities faced by banana producers in Makassar. Interviews with key stakeholders, such as producers, marketers, and consumers, could provide valuable insights into the practical application of these strategies.

5. CONCLUSION

This study highlights the significant role of agroindustry, packaging technology, and local product branding in adding value to banana products in Makassar. The findings suggest that fostering the development of the agroindustry sector is crucial for improving the quality and marketability of banana products. Furthermore, investing in advanced packaging technology enhances product appeal and preserves quality, while local branding contributes to distinguishing Makassar's banana products in competitive markets. The positive relationships observed between these factors underscore the need for integrated strategies that combine technological innovation and marketing efforts to enhance the value of agricultural products. Policymakers and industry stakeholders should prioritize these areas to drive economic growth, support sustainable practices, and improve market access for banana producers in Makassar. Future research could explore the implementation challenges and further refine strategies for value addition in the banana agroindustry.

REFERENCES

[1] N. Fitriyani, E. Daris, and N. Rusydiana, "Pengaruh Produksi, Harga Ekspor, dan Nilai Tukar Rupiah Terhadap Volume Ekspor Pisang Indonesia," *Sharia Agribus. J.*, vol. 2, no. 1, pp. 21–32, 2022.

[2] E. Lestari, A. Wibowo, and P. Rahayu, "Social Cultural Dynamics in the Development of a Banana Center Leading to Sustainable Agricultural Development," in *1st International Conference on Sustainable Agricultural Socio-economics, Agribusiness, and Rural Development (ICSASARD 2021)*, Atlantis Press, 2021, pp. 104–110.

[3] R. Ekafitri, A. Sarifudin, and D. N. Surahman, "Pengaruh penggunaan tepung dan puree pisang terhadap karakteristik mutu makanan padat berbasis-pisang," *Penelit. Gizi dan Makanan (The J. Nutr. Food Res.*, vol. 36, no. 2, pp. 127–134, 2013.

[4] S. Salsabilla, D. Haryono, and Y. A. Syarief, "Analisis Pendapatan dan Nilai Tambah Agroindustri Keripik Pisang di Desa Sungai Langka Kecamatan Gedong Tataan Kabupaten Pesawaran," *J. Ilmu Ilmu Agribisnis J. Agribus. Sci.*, vol. 7, no. 1, pp. 68–74, 2019.

[5] R. M. Fiana, S. A. Raihan, and S. Santosa, "Analysis of Added Value in Banana Chips Agro-Industry (Case Study of UMKM Nuri Rashi in Padang City)," *Andalasian Int. J. Soc. Entrep. Dev.*, vol. 4, no. 01, pp. 10–14, 2024.

[6] R. Singh, R. Kaushik, and S. Gosewade, "Bananas as underutilized fruit having huge potential as raw materials for food and non-food processing industries: A brief review," *Pharma Innov. J.*, vol. 7, no. 6, pp. 574–580, 2018.

[7] D. Mohapatra, S. Mishra, C. B. Singh, and D. S. Jayas, "Post-harvest processing of banana: opportunities and challenges," *Food bioprocess Technol.*, vol. 4, pp. 327–339, 2011.

[8] B. S. Padam, H. S. Tin, F. Y. Chye, and M. I. Abdullah, "Banana by-products: an under-utilized renewable food biomass with great potential," *J. Food Sci. Technol.*, vol. 51, pp. 3527–3545, 2014.

[9] S. Susanti, "PELATIHAN OLAHAN PISANG MENJADI DODOL PISANG DI DESA MAOS LOR KECAMATAN MAOS KABUPATEN CILACAP," *Adi Widya J. Pengabdi. Masy.*, vol. 5, no. 2, pp. 39–47, 2021.

[10] N. Supriyati and E. Suryani, "Peranan, Peluang dan Kendala Pengembangan Agroindustri di Indonesia. Forum Penelitian Agro Ekonomi, 24 (2), 92." 2016.

[11] C. C. da Costa, J. J. M. Guilhoto, and D. Imori, "Importância dos setores agroindustriais na geração de renda e emprego para a economia brasileira," *Rev. Econ. e Sociol. Rural*, vol. 51, pp. 787–814, 2013.

[12] S. U. Kant, "Agro-Processing Industries: Potential, Constraints and Task Ahead," Indian Institute of Management Ahmedabad, Research and Publication Department, 1989.

[13] E. A. C. Marín, "La agroindustria y viabilidad del sector agropecuario," *Rev. CES Med. Vet. y Zootec.*, vol. 2, no. 1, pp. 74–84, 2007.

[14] H. M. Lisboa *et al.*, "Innovative and sustainable food preservation techniques: Enhancing food quality, safety, and environmental sustainability," *Sustainability*, vol. 16, no. 18, p. 8223, 2024.

[15] E. Almenar, "Innovations in packaging technologies for produce," in *Controlled and modified atmospheres for fresh and fresh-cut produce*, Elsevier, 2020, pp. 211–264.

[16] P. Dubey, O. Yousuf, and A. Singh, "Advancement in packaging technologies for agri-food sector," in *Agri-Food 4.0: Innovations, Challenges and Strategies*, Emerald Publishing Limited, 2022, pp. 165–178.

[17] I. C. Dewi, R. Megavitry, R. Auliani, and E. K. Manik, "Food Packaging Innovation to Extend Shelf Life and Reduce

Food Waste in a Leading Company in Indonesia," 2023.

[18] T. Jahan, A. Jahan, M. Pallavi, M. Alekhya, and M. S. Lakshmi, "A study on importance of branding and its effects on products in business," *Int. Res. J. Adv. Eng. Manag.*, vol. 2, no. 04, pp. 656–661, 2024.

[19] S. Hukker, R. S. Ph, and M. N. Naveen Kumar, "Branding and Labelling in Agribusiness: The Influence on Consumer Perception and Purchase Intentions," *Int. Res. J. Adv. Eng. Manag.*, vol. 2, no. 09.

[20] B. Susanto, I. R. M. Rajagukguk, A. Octavia, M. Musnaini, S. Amin, and D. Dahmiri, "Strategi Branding pada Produk Keripik Pisang Bu Os," *EJOIN J. Pengabdi. Masy.*, vol. 2, no. 6, pp. 947–955, 2024.

[21] T. Sammut-Bonnici, "Brand and branding," 2014.

[22] A. J. Arora, "The Power Duo: Unveiling the Impact of Branding and Communications on Company performance," *J. Asia Entrep. Sustain.*, vol. 20, no. 1, pp. 102–128, 2024.

[23] L. R. B. A. Cordeiro[1] *et al.*, "Sistemas de produção da Musa spp. no Cariri cearense, Brasil: caracterização, indicadores de sustentabilidade e químicos do solo," *Rev. Bras. Geogr. Física*, vol. 16, no. 6, pp. 3380–3403, 2023.

[24] N. Emanuel and H. K. Sandhu, "Food packaging development: Recent perspective," *J. Thin Film. Coat. Sci. Technol. Appl*, vol. 6, pp. 13–29, 2019.

[25] S. D. Alam, R. Raja, V. Shirsath, A. K. Jain, S. A. Khan, and I. Ali, "Recent Research and Development in Food Packaging Technologies: A Review," *Biomater. Food Packag.*, pp. 121–135, 2022.

[26] M. R. Yan, S. Hsieh, and N. Ricacho, "Innovative food packaging, food quality and safety, and consumer perspectives," *Processes*, vol. 10, no. 4, p. 747, 2022.

[27] J. H. Han, "A review of food packaging technologies and innovations," *Innov. food Packag.*, pp. 3–12, 2014.

[28] P. Tripathy, "Food Brand Cultivation," in *Innovative Trends Shaping Food Marketing and Consumption*, IGI Global Scientific Publishing, 2025, pp. 243–260.

[29] D. Dentoni, G. T. Tonsor, R. J. Calantone, and H. C. Peterson, "The direct and indirect effects of 'locally grown'on consumers' attitudes towards agri-food products," *Agric. Resour. Econ. Rev.*, vol. 38, no. 3, pp. 384–396, 2009.

[30] O. Uzelac, M. D. Mijatović, and M. Lukinović, "The role of branding agricultural products in better market valorization," *Ekon. Poljopr.*, vol. 69, no. 2, pp. 613–625, 2022.

[31] D. Ameilia and S. Afriani, "Pengenalan Merek Pemasaran Pada Usaha Kripik Pisang Ibu Ari (Studi kasus di Jln. Puyang Sakti Kota Manna)," *J. Dehasen Mengabdi*, vol. 2, no. 2, pp. 177–182, 2023.