

Research Article

# Strengthening the Rambak Cracker Industry as an Instrument for Local Economic Development in Penanggulan Village, Pegandon District, Kendal Regency

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**Abstract:** This study investigates the strategic strengthening of the rambak cracker industry as an instrument for local economic development in Penanggulan Village, Pegandon District, Kendal Regency. Rural agro-processing enterprises have increasingly been recognized as territorially embedded production units capable of generating value-added outputs and absorbing surplus labor within localized economic systems. Field-based empirical observations reveal that rambak production in the village operates through household-managed processing systems characterized by traditional production techniques, informal managerial practices, and limited digital marketing adoption despite contributing significantly to community income generation. Data obtained from expert respondents were analyzed using the Analytical Hierarchy Process to identify strategic priority determinants influencing industrial competitiveness and sustainability. The results indicate that product innovation and quality improvement constitute the primary strategic priority, followed by digital marketing development and institutional partnership strengthening, while production capacity expansion remains comparatively less influential in enhancing market competitiveness. These findings suggest that adaptive innovation and digitally enabled commercialization pathways function as critical mechanisms for improving value-chain integration and expanding market accessibility among rural food-processing industries. Strengthening innovation ecosystems within the rambak sector may therefore contribute to employment creation, income diversification, and sustainable community-based economic transformation in rural production clusters.

**Keywords:** Agro-Processing SMEs; Digital Marketing; Local Economic Development; Rambak Industry; Rural Innovation.

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## 1. Introduction

The rapid transformation of global food consumption patterns driven by the proliferation of digital marketplaces, evolving logistics infrastructures, and the platformization of micro-enterprise ecosystems has fundamentally altered the competitive landscape for traditional agro-based small industries in developing economies, particularly those operating within rural production clusters whose market access remains structurally mediated by informal distribution networks rather than digitally enabled supply chains. Contemporary discourse in development economics increasingly recognizes that small-scale agro-processing industries constitute not merely subsistence-oriented productive units but rather critical nodes within territorially embedded economic systems capable of generating employment elasticity, fostering endogenous growth, and reinforcing localized industrial resilience when supported by adaptive institutional and technological frameworks (Kementerian Perindustrian, 2024).

Empirical inquiries into rural small and medium enterprises have consistently demonstrated that localized home industries especially those engaged in food processing serve as significant engines of micro-level economic accumulation through their capacity to absorb surplus labor and create value-added agricultural outputs; nevertheless, such industries frequently exhibit persistent productivity constraints associated with inefficient production

techniques, limited technological adoption, and weak market integration mechanisms that inhibit their capacity to scale competitively beyond local consumption markets (Widyanti et al., 2020; Syaipudin & Awwalin, 2023). Studies on kerupuk-based industries, including those utilizing cattle skin as primary raw material inputs, further reveal that technological interventions in production processes, such as alternative drying systems, can substantially improve output consistency and operational efficiency, yet such improvements often fail to translate into proportional increases in market penetration due to downstream distribution bottlenecks (Wibowo & Wahyuningsih, 2016).

Interventions targeting capacity building among rural enterprises have likewise emphasized production efficiency enhancement as a principal strategy for improving industrial viability; however, investigations conducted within the micro-enterprise ecosystem of Penanggulan Village indicate that production-oriented empowerment programs alone have produced limited long-term impact in the absence of integrated managerial and marketing reforms capable of synchronizing supply-side efficiency with evolving consumer demand structures (Fahmi & Arifan, 2016). Complementary research examining product labeling and packaging practices similarly highlights that improved product presentation may increase consumer trust and perceived quality, yet the absence of digital marketing competencies constrains the ability of such improvements to expand sales channels beyond traditional retail environments (Artaya et al., 2021; Mufarokhah et al., 2021).

The emergent body of literature on digital platform utilization among micro-enterprises increasingly underscores the transformative potential of e-commerce integration in overcoming spatial market limitations that traditionally confine rural industries to geographically proximate demand zones; nevertheless, evidence from Indonesian urban contexts suggests that the effectiveness of digital commercialization strategies remains contingent upon the digital literacy levels of enterprise actors, thereby rendering technological adoption uneven and often exclusionary in semi-rural production clusters (Ilyas, 2024). Value chain analyses of comparable processed snack industries further demonstrate that downstream commercialization inefficiencies frequently stem from fragmented coordination among production, packaging, and marketing subsystems, which collectively reduce the adaptive responsiveness of micro-enterprises to demand-side fluctuations in broader consumer markets (Jannah et al., 2019).

Such analytical trajectories expose a persistent conceptual gap within the existing scholarship, wherein the majority of development-oriented studies prioritize either production optimization or entrepreneurial empowerment without systematically interrogating the interdependence between localized cultural commodities and digitally mediated commercialization pathways that increasingly define contemporary market competitiveness. Earlier investigations into the rambak cracker industry in Pegandon District predominantly concentrate on product development dimensions while overlooking the structural implications of marketing asymmetries that limit the industry's integration into regional and national market circuits (Firmanto, 2017).

Preliminary field interviews with local entrepreneurs conducted as part of this study reveal that approximately 70% of rambak cracker sales in Penanggulan Village continue to be executed through conventional distribution mechanisms, including traditional marketplaces and direct purchase arrangements, while only a marginal proportion of producers utilize digital platforms such as Shopee or TikTok Shop for online transactions, reflecting a relatively low level of digital literacy among enterprise actors and indicating that the latent potential of online consumption trends in snack products remains substantially underexploited from a market expansion perspective (from the results of interviews with local business actors).

The persistence of these commercialization constraints acquires heightened significance when situated within the socio-cultural embeddedness of rambak crackers as both an economic commodity and a symbolic representation of Kendal's localized culinary heritage, whose continued viability depends not solely upon profit maximization but also upon the preservation of community-based production identities that reinforce social cohesion and cultural continuity within rural industrial landscapes.

This study aims to examine the strategic strengthening of the rambak cracker industry as an instrument for local economic development in Penanggulan Village by formulating an integrative development framework capable of aligning production efficiency, cultural value preservation, and digitally enabled marketing strategies through a structured analytical approach that contributes both theoretically to the discourse on rural industrial resilience and methodologically to the operationalization of localized economic development models within micro-enterprise ecosystems.

## **2. Preliminaries or Related Work or Literature Review**

### **2.1. Local Economic Development and Cluster-Based Rural Industrialization**

The conceptualization of local economic development (LED) has progressively shifted from macro-institutional growth paradigms toward territorially embedded production systems that emphasize endogenous resource mobilization, knowledge spillovers, and localized innovation networks as primary drivers of sustainable competitiveness within rural economies. Within this analytical framework, the cluster-based perspective advanced by Porter (1998) posits that geographically proximate industries generate cumulative competitive advantages through shared infrastructure, labor specialization, and inter-firm collaboration mechanisms that enhance productivity beyond what isolated enterprises can achieve independently. In labor-intensive rural contexts, institutional support structures such as vocational training and productivity enhancement programs have demonstrated measurable impacts in reducing structural unemployment by improving workforce adaptability and enterprise-level efficiency, as evidenced by Sinaga's (2024) analysis of vocational productivity institutions. These insights imply that strengthening agro-processing industries like rambak cracker production may function as a spatially anchored growth catalyst when integrated into localized industrial ecosystems capable of reinforcing cumulative economic linkages at the village level.

### **2.2. Endogenous Innovation and Digital Transformation in Rural Agro-Processing Industries**

The theoretical foundation of endogenous technological change articulated by Romer (1990) underscores the centrality of innovation accumulation and knowledge diffusion in sustaining long-term productivity growth within microeconomic production units, particularly those operating in resource-constrained environments where technological stagnation often impedes value-added expansion. In the context of rural food-processing enterprises, digital technology adoption has emerged as a critical determinant of adaptive capacity, enabling micro-industries to transcend spatial market limitations through digitally mediated commercialization pathways aligned with Industry 4.0 dynamics (Rifai & Mychelisda, 2023). Empirical investigations into marketing strategies within rambak cracker enterprises further illustrate that the integration of SWOT-based digital marketing frameworks significantly enhances competitive positioning by enabling firms to identify internal capability gaps alongside external market opportunities in evolving consumer environments (Harsono & Sukma, 2024). These findings suggest that digital transformation constitutes not merely an operational upgrade but a structural mechanism through which localized industries may internalize technological progress as a driver of endogenous growth.

### **2.3. Cultural Commodification and Value-Added Resource Utilization in Creative Rural Economies**

The increasing recognition of creative economy paradigms within rural development discourse reflects a growing emphasis on the commodification of localized cultural assets as strategic economic resources capable of generating both monetary and socio-cultural value within community-based production systems. Creative economy models grounded in local wisdom demonstrate that traditional food-processing industries can achieve sustainable competitiveness when technological adaptation is harmonized with culturally embedded production practices that preserve community identity while enhancing product differentiation in broader markets (Murtiana et al., 2025). This dynamic is particularly evident in the utilization of livestock-derived byproducts within home-based rambak cracker industries, where the transformation of animal skin waste into consumable products not only contributes to household income diversification but also reinforces circular economic practices within rural production chains, as documented by Ridha et al. (2025). The integration of culturally informed resource utilization with market-oriented innovation thus represents a theoretically significant pathway through which traditional agro-processing industries may simultaneously advance economic resilience and socio-environmental sustainability.

## **3. Proposed Method**

This study adopts an empirical research design grounded in a qualitative approach that is systematically enriched through data quantification in order to strengthen analytical objectivity without compromising contextual depth. The research was conducted in Penanggulan Village, Pegandon District, Kendal Regency, which serves as a local production hub for rambak crackers and represents a relevant locus for examining the role of small-scale

agro-processing industries in local economic development. The study population comprises all stakeholders directly associated with the rambak cracker industry, including business owners, village officials responsible for economic development, and representatives from relevant government agencies. Given the limited and heterogeneous characteristics of actors within this localized industry ecosystem, a purposive sampling technique was employed to select five expert respondents with substantial knowledge of production systems, managerial practices, labor utilization, marketing strategies, and institutional support mechanisms. Primary data were obtained through semi-structured interviews and structured questionnaires, while secondary data were derived from government reports, statistical publications, and prior empirical studies. The operationalization of variables was structured around key developmental dimensions, including production capacity, product innovation, technological utilization, human capital, financial access, marketing digitalization, and institutional partnership support, each of which was treated as a strategic determinant influencing industry competitiveness and sustainability.

Measurement and analytical procedures were conducted using the Analytical Hierarchy Process (AHP) to transform qualitative judgments into structured numerical priorities. Pairwise comparisons were employed to assess the relative importance of each criterion and strategic alternative based on Saaty's nine-point preference scale, allowing the decomposition of complex decision-making structures into hierarchical components consisting of goal, criteria, and alternatives. The resulting comparison matrices were normalized to derive eigenvector values representing priority weights across all decision elements. Statistical consistency of expert judgments was subsequently evaluated through the Consistency Index (CI) and Consistency Ratio (CR), with a threshold value of  $CR \leq 0.10$  indicating acceptable logical coherence among responses. This procedure ensures that the synthesized priority rankings reflect internally consistent expert evaluations, thereby enhancing the robustness of strategic recommendations formulated for strengthening the rambak cracker industry as a driver of localized economic growth.

## 4. Results and Discussion

### 4.1. Empirical Assessment of the Rambak Cracker Industry in Penanggulan Village in Terms of Production, Business Management, and Marketing Dimensions

Field observations indicate that the rambak cracker industry in Penanggulan Village has developed through intergenerational household production practices that rely on localized processing knowledge and traditional production techniques. From the results of interviews with rambak entrepreneurs, this agro-processing activity operates within a small-to-medium production scale while simultaneously contributing to employment absorption within the village economy (Galuh, 2024). Such structural characteristics reflect the operational patterns of rural home-based industries that function through informal labor arrangements and family-managed production systems (Widyanti et al., 2020). The spatial proximity among producers facilitates labor exchange and input distribution efficiency within localized production ecosystems, which aligns with Porter's (1998) cluster-based competitiveness framework. From the results of interviews with village officials, the rambak processing sector is institutionally recognized as a strategic contributor to household income generation despite production constraints associated with resource availability (Endah, 2020).

From the results of interviews with entrepreneurs, production continuity is strongly influenced by the availability and structural characteristics of animal hide raw materials whose thickness determines the texture and market acceptance of processed rambak products (Ridha et al., 2025). Empirical observations indicate that buffalo hide sourced from interregional trade networks produces higher-quality output relative to locally available cattle hide. Variations in sourcing patterns demonstrate the integration of rural processing units into broader commodity chains that remain vulnerable to supply volatility and logistics costs (Widowati & Nurfitriani, 2023). Production planning therefore tends to be adaptive rather than systematic in response to fluctuating input prices and material scarcity (Syaipudin & Awwalin, 2023). Such localized technological adjustment mechanisms are consistent with endogenous growth theory emphasizing innovation through experiential production learning (Romer, 1990).

From the results of interviews with rambak processors, production efficiency may be empirically assessed through the material conversion ratio between raw hide inputs and final dried cracker output generated after boiling and sun-drying procedures (Wibowo &

Wahyuningsih, 2016). Field observations reveal measurable shrinkage during processing stages that contributes to value-added transformation within rural agro-processing chains (Charnita et al., 2022). Standardized packaging subsequently enhances marketability and supports consumer trust in product consistency (Mufarokhah et al., 2021). Experiential knowledge regarding conversion ratios enables producers to informally forecast production capacity and profitability. This tacit managerial competence has developed through prolonged engagement with localized production practices (Maftuh et al., 2024).

Managerial practices within the rambak processing sector remain predominantly informal with ownership structures embedded within family-based labor arrangements and decision-making processes. From the results of interviews with entrepreneurs, financial recording practices are often conducted through approximative calculations rather than standardized accounting systems (Violinda, 2018). Income variability is influenced primarily by fluctuating market demand rather than production capacity limitations (Fahmi & Arifan, 2016). Institutional facilitation provided by local government bodies is generally limited to administrative assistance and initial capital support. The absence of continuous managerial training programs potentially constrains productivity optimization and long-term competitiveness (Ilyas, 2024).

Production duration varies across boiling, drying, and frying stages due to environmental conditions and energy input availability that ultimately influence production output levels. From the results of interviews with entrepreneurs, sun-drying constitutes the most time-intensive phase due to dependence on weather variability that cannot be institutionally controlled. Production scheduling is frequently postponed during prolonged rainfall periods which results in output volatility and delayed market supply (Ridha et al., 2025). This infrastructural limitation illustrates the technological constraints associated with home-based processing systems reliant on natural drying techniques (Wibowo & Wahyuningsih, 2016). Institutional training interventions in technological drying alternatives have been suggested as potential mechanisms for improving operational resilience (Sinaga, 2024).

From the results of interviews with producers, product pricing structures are formulated based on production costs and perceived consumer purchasing power within regional markets (Harsono & Sukma, 2024). Relative price stability across packaging sizes indicates informal coordination among producers to maintain equilibrium within localized distribution channels (Artaya et al., 2021). Price fluctuations primarily occur during periods of raw material scarcity as reported by entrepreneurs during interviews. Packaging simplicity remains acceptable to consumers due to emphasis on product authenticity and taste quality (Murtiana et al., 2025). These findings reflect market behavior typical of community-based agro-processing industries operating within traditional consumption patterns (Firmanto, 2017).

From the results of interviews with rambak entrepreneurs, marketing strategies are predominantly conducted through direct sales to local retailers and consumer networks while limited adoption of digital platforms has been initiated through social media applications. Observational data indicate that marketing channel diversification remains uneven across enterprises due to varying levels of digital literacy (Rifai & Mychelida, 2023). Dependence on relational marketing networks suggests transitional movement toward digitally mediated market expansion (Ilyas, 2024). Institutional partnerships facilitate product distribution beyond village boundaries despite limited production capacity among certain enterprises (Kementerian Perindustrian, 2024). Strengthening marketing capabilities therefore remains essential for enhancing competitiveness within rural food-processing clusters (Porter, 1998).

From the results of interviews with village administrators, the rambak processing sector generates measurable socio-economic impacts by increasing household income levels and supporting local employment opportunities. The following table summarizes key empirical production characteristics obtained from field surveys and interviews with entrepreneurs and village officials.

**Table 1.** Socio-Economic and Production Characteristics of the Rambak Cracker Industry in Penanggulan Village.

Indicator	Empirical Findings
Production Unit Distribution	Concentrated in Dusun Kauman
Primary Raw Material	Buffalo and cattle hide
Material Conversion Ratio	1 kg raw hide → ±300 g dried rambak

Indicator	Empirical Findings
Average Drying Duration	±5 days (weather-dependent)
Monthly Income (Selected Units)	± IDR 10,000,000 or variable
Marketing Channels	Direct sales and limited social media utilization

The concentration of production units within a single hamlet reflects the emergence of informal industrial clustering patterns capable of facilitating resource sharing and collective learning (Porter, 1998). Raw material dependency on external supply chains highlights structural vulnerabilities within localized production systems (Widowati & Nurfitriani, 2023). Income variability observed among producers corresponds with fluctuating demand conditions reported during interviews (Fahmi & Arifan, 2016).

From the results of interviews with village officials, the absence of specialized training programs remains a significant constraint affecting managerial and technological capacity within the rambak industry. Limited institutional intervention may reduce opportunities for productivity enhancement and product diversification (Sinaga, 2024). Community empowerment strategies emphasizing endogenous resource mobilization could support the sustainability of rural processing enterprises (Endah, 2020). Local economic development initiatives are therefore required to strengthen value-chain integration and technological adaptation. These findings reinforce the importance of localized industry support in achieving sustainable rural economic transformation (Galuh, 2024).

From the results of interviews with entrepreneurs, the rambak cracker industry demonstrates strong potential as a locally embedded economic instrument capable of generating value-added agricultural output and supporting village-level economic resilience. The persistence of traditional processing techniques alongside gradual marketing adaptation reflects a transitional development phase within rural micro-enterprise ecosystems (Violinda, 2018). Strengthening institutional support and technological innovation may enhance production efficiency and market reach (Rifai & Mychelida, 2023). Diversification of local food products has been identified as a strategic approach for improving rural economic sustainability (Widowati & Nurfitriani, 2023). These empirical findings substantiate the role of rambak processing activities as a viable instrument for localized economic development within Penanggulan Village (Firmanto, 2017).

#### 4.2. Strategic Priority Determinants in Enhancing the Competitiveness of the Rambak Cracker Industry for Local Economic Advancement

Empirical findings derived from field interviews with respondents representing business actors, local government authorities, and institutional stakeholders reveal heterogeneous strategic priorities in strengthening the rambak cracker industry in Penanggulan Village. Quantitative synthesis using the Analytical Hierarchy Process indicates that innovation-oriented development strategies tend to exhibit higher global weights compared to purely operational improvements from the perspective of most institutional respondents. Data from interviews with Muhammad Munir (business owner respondent) demonstrate that product innovation and quality improvement attained a global priority value of 0.2348, suggesting its perceived influence on enhancing competitive positioning within local market structures. These findings align with previous studies emphasizing the significance of value-added product differentiation in sustaining rural-based food industries (Harsono & Sukma, 2024). The emphasis on innovation as a principal strategic variable also reflects endogenous growth assumptions that technological refinement at micro-industrial levels may contribute to productivity enhancement (Romer, 1990).

Variations in stakeholder priorities were also evident from the responses obtained from the Department of Industry and Manpower respondent, in which institutional collaboration strategies recorded a global priority score of 0.2320 from interview-based AHP assessments. This preference indicates that public sector actors tend to conceptualize industry strengthening within a broader governance and cluster-based development framework rather than focusing solely on firm-level technical adjustments. The interpretation of this pattern corresponds with the cluster theory perspective suggesting that localized cooperation networks function as essential enablers of regional competitiveness (Porter, 1998). Findings from interviews with village government respondent Ali Muqtava further indicate that innovation and digital marketing were prioritized with values of 0.2555 and 0.2477

respectively. Such results reinforce the role of local institutional leadership in facilitating creative economic initiatives rooted in technological adoption (Murtiana et al., 2025).

An aggregated interpretation of expert respondent judgments was conducted through the synthesis of eigenvector-based priority values, revealing measurable disparities in strategic emphasis among stakeholders. Interviews with Pak Muhtadin as a business respondent indicate that human resource competency development obtained the highest local weight of 0.2334, suggesting internal capability constraints at the enterprise level. The orientation toward labor skill enhancement corresponds with empirical findings demonstrating the influence of vocational training on productivity in small-scale industries (Sinaga, 2024). Meanwhile, government-oriented respondents perceived partnership strengthening as a more effective intervention for sustaining market integration processes. This distinction illustrates the multidimensional nature of development priorities in household-based agro-processing enterprises (Ridha et al., 2025).

The synthesized outcomes from expert-based pairwise comparisons can be further interpreted through the averaged global priority rankings presented in Table 2 below within the analytical narrative.

**Table 2.** Aggregated AHP Priority Ranking of Strategic Alternatives for Rambak Cracker Industry Development in Penanggulan Village.

Strategic Alternative	Average Global Priority	Final Ranking
Product Innovation and Quality Improvement	±0.222	1
Digital Marketing Development	±0.205	2
Institutional Partnership Strengthening	±0.204	3
Human Resource Competency Enhancement	±0.193	4
Production Capacity and Efficiency Improvement	±0.176	5

The quantitative aggregation presented in Table 2 derived from interviews with five expert respondents demonstrates that innovation-based strategies consistently occupy the highest priority position in strengthening local rambak cracker enterprises. Digital marketing initiatives also attained substantial weighting due to their perceived ability to expand market accessibility through technological platforms (Ilyas, 2024). Institutional collaboration remained closely ranked, suggesting its complementary role in facilitating resource exchange across local production networks. These findings align with value chain perspectives indicating that downstream integration enhances market resilience in micro-enterprises (Jannah et al., 2019). The relatively lower prioritization of production efficiency implies that technological upgrading may follow rather than precede market-oriented innovation processes (Rifai & Mychelisda, 2023).

Interview-based evidence from Retno Kusumawati as a representative of the Department of Trade, Cooperatives, and SMEs further emphasizes the perceived importance of product differentiation through packaging and labeling innovation. AHP results indicate that product quality improvement received a global priority score of 0.2774, reflecting market competitiveness considerations at the regional level. Packaging enhancement initiatives have previously been shown to increase income potential among small-scale cracker producers (Mufarokhah et al., 2021). Complementary training programs in product labeling were also identified as mechanisms for enhancing consumer trust and brand recognition (Artaya et al., 2021). These interventions contribute to strengthening competitive advantage among micro and small enterprises operating within localized food processing sectors (Violinda, 2018).

Insights obtained from interviews with village administrative respondent Ali Muqtava indicate that innovation-based diversification remains essential for expanding product acceptance within broader consumer markets. This perspective aligns with community empowerment frameworks emphasizing the mobilization of local resources for economic development (Endah, 2020). Diversification in food processing industries has also been recognized as an effective strategy for improving food security resilience at the local level (Widowati & Nurfitriani, 2023). Technological support mechanisms may subsequently enhance production effectiveness once market demand has been established (Maftuh et al., 2024). Localized innovation processes therefore function as catalysts for sustainable industrial growth in rural economies (Charnita et al., 2022).

Evidence from interviews with Pak Muhtadin suggests that labor competency enhancement remains a significant determinant of operational sustainability in household-based production units. Previous empowerment programs targeting rambak producers in Pegandon demonstrated measurable productivity improvements through technical training interventions (Fahmi & Arifan, 2016). Similar studies have identified production skill limitations as a primary barrier to output expansion in small-scale agro-processing industries (Widyanti et al., 2020). The use of alternative drying technologies such as cowskin ovens has also been shown to improve production consistency among rambak manufacturers (Wibowo & Wahyuningsih, 2016). Internal capability development therefore constitutes a critical intermediate variable in enterprise strengthening initiatives (Galuh, 2024).

Aggregated stakeholder responses also indicate that production efficiency strategies obtained the lowest global priority weighting in comparative decision matrices. This finding suggests that technical capacity improvements are perceived as contingent upon prior development of market access and innovation capabilities. Empirical studies on home industry production systems similarly demonstrate that output expansion is frequently demand-driven rather than resource-driven (Syaipudin & Awwalin, 2023). Observations derived from interviews with local respondents confirm that operational improvements tend to follow successful product differentiation initiatives. This sequencing reflects adaptive strategic behavior in micro-industrial development contexts (Firmanto, 2017).

Digital marketing development emerged as the second-highest aggregated priority based on averaged global weights from expert respondents interviewed in this study. Adoption of online promotional platforms has been shown to accelerate technological diffusion within locally based food processing industries (Rifai & Mychelisda, 2023). Market-oriented digital strategies may therefore function as transitional mechanisms linking traditional production systems with contemporary distribution channels. The integration of local creative economic practices with technological innovation further enhances industry resilience (Murtiana et al., 2025). Digital transformation consequently supports the sustainability of rural small-scale industries operating within competitive regional markets.

Institutional partnership strengthening recorded a global priority ranking of third position in the combined AHP assessment results derived from respondent interviews. Collaborative industrial ecosystems facilitate knowledge exchange and access to financial resources among micro-enterprises (Porter, 1998). Previous governmental reports have indicated that small and medium industries significantly contribute to national industrial output when supported by coordinated institutional frameworks (Kementerian Perindustrian, 2024). Partnerships with local cooperatives and trade agencies therefore enhance enterprise stability and market penetration. These interactions ultimately reinforce the structural role of rambak cracker industries as instruments of localized economic development in Penanggulan Village.

#### **4.3. Strategic Development Pathways for Strengthening the Rambak Cracker Industry as a Local Economic Growth Instrument**

Empirical findings derived from the Analytical Hierarchy Process (AHP) demonstrate that the strategic trajectory of the rambak cracker industry in Penanggulan Village is shaped by multidimensional internal and external determinants that simultaneously influence competitiveness and production sustainability within localized agro-industrial ecosystems. Field-based decision synthesis involving five expert respondents revealed that product innovation and quality enhancement attained the highest aggregated priority weight of approximately 0.222, followed by digital marketing development with a value approaching 0.205, which indicates that adaptive capability constitutes a central mechanism of micro-industrial resilience in rural economies. This pattern substantiates endogenous growth assumptions emphasizing the primacy of knowledge-driven productivity expansion through technological and creative learning processes within small-scale industries (Romer, 1990). Production efficiency and human capital competencies were comparatively weighted at lower positions, suggesting that structural competitiveness in rural home industries emerges primarily from differentiation and market access rather than capital intensification alone. Such empirical ordering reinforces cluster-based competitiveness theory which argues that innovation capacity embedded in geographically concentrated industries determines long-term productivity trajectories (Porter, 1998).

Interview-based qualitative narratives from local producers revealed that limited product diversification and packaging sophistication have historically constrained the market penetration of rambak crackers beyond district-level distribution channels, particularly when

competing with standardized commercial snack products. These observations resonate with earlier findings identifying technological stagnation as a major impediment in rambak cracker microenterprises operating within Pegandon District (Firmanto, 2017). Capacity-building interventions implemented through production efficiency training programs in the same locality were previously shown to enhance output stability yet failed to significantly improve value-added characteristics of final products (Fahmi & Arifan, 2016). The relative prioritization of innovation in the present AHP synthesis therefore signals a shift from efficiency-oriented survival strategies toward market-oriented competitiveness models. Evidence from comparative home industry studies further indicates that packaging innovation contributes directly to increased consumer trust and willingness to pay within processed food markets (Widyanti et al., 2020). Similar dynamics were observed in fish cracker microenterprises where labeling improvements significantly elevated income levels among rural producers (Mufarokhah et al., 2021).

Value chain constraints identified through expert assessments also revealed that weak integration between upstream raw material suppliers and downstream distribution networks has impeded industrial scaling potential among rambak producers. Earlier analyses of aloevera cracker SMEs demonstrated that fragmented value chain structures reduce operational efficiency and limit product standardization across production clusters (Jannah et al., 2019). Technological modernization initiatives such as the adoption of controlled drying equipment were shown to improve production quality consistency among cowhide cracker producers operating in small enterprise settings (Wibowo & Wahyuningsih, 2016). Product innovation strategies must therefore be interpreted not solely as creative differentiation but as a structural adjustment mechanism capable of improving value chain integration. Evidence from local SWOT-based marketing strategy studies further indicates that quality consistency significantly influences brand positioning in rambak cracker enterprises (Harsono & Sukma, 2024). Institutional strengthening was ranked third with a global priority of approximately 0.204, which underscores the importance of collaborative governance arrangements in sustaining local industrial ecosystems.

The expansion of digital marketing capabilities ranked second in the AHP synthesis aligns with emerging literature on the strategic importance of digital adoption within food and beverage SMEs operating under Industry 4.0 frameworks (Rifai & Mychelisda, 2023). Survey responses indicated that online marketplace integration remains limited among rural rambak producers despite increasing consumer demand for digitally distributed snack products. Evidence from platform-based SME development initiatives demonstrates that digitalization significantly enhances business scalability by reducing transaction costs and expanding customer reach beyond local geographic boundaries (Ilyas, 2024). Institutional training programs conducted by vocational productivity centers have similarly shown measurable impacts in reducing unemployment through skill-based entrepreneurship development (Sinaga, 2024). Digital transformation must therefore be conceptualized as a labor absorption mechanism in rural industrial contexts rather than solely as a marketing instrument. Sectoral employment analyses further suggest that micro-industrial expansion contributes positively to local labor absorption capacity when supported by technological learning processes (Galuh, 2024).

Community empowerment frameworks grounded in local resource utilization have been identified as essential drivers of rural economic diversification, particularly in agro-processing sectors (Endah, 2020). Rambak cracker production relies extensively on cowhide waste generated by livestock processing activities, which creates an opportunity for circular economy integration within village-level industrial systems. Socio-economic analyses conducted in Trusmi Wetan identified home-based rambak processing as a viable strategy for converting animal skin waste into income-generating food commodities (Ridha et al., 2025). Creative economy development models similarly emphasize the importance of combining local wisdom with technological innovation to achieve sustainable rural enterprise growth (Murtiana et al., 2025). Food diversification initiatives also highlight the socio-cultural significance of traditional snack industries in strengthening local food security systems (Widowati & Nurfitriani, 2023). These structural linkages illustrate the developmental relevance of innovation-driven rambak cracker enterprises within broader rural transformation processes.

The following empirical synthesis derived from national small industry performance data illustrates structural parallels between local rambak enterprises and broader Indonesian IKM dynamics discussed in sectoral policy frameworks.

**Table 3.** Contribution of Small and Medium Industries (IKM) to Indonesia's National Economy.

Indicator	Indonesian IKM Sector Value
Number of IKM Units	4.52 million enterprises
Employment Contribution	± 13 million workers
GDP Contribution	± 20% manufacturing output

Source: Kementerian Perindustrian (2024)

Integration of these macro-level indicators into village-level industrial planning reveals that strengthening rambak cracker innovation ecosystems may generate scalable employment opportunities consistent with national SME development trajectories. Entrepreneurial competitiveness within micro-industrial sectors has previously been linked to innovation-led strategic positioning in local markets (Violinda, 2018). Educational technology management frameworks further indicate that digital learning platforms can significantly enhance operational efficiency within skill-based production environments (Maftuh et al., 2024). Production optimization strategies applied in mineral-based home industries have similarly demonstrated positive impacts on omzet growth through strategic planning interventions (Syaipudin & Awwalin, 2023). Comparative agro-industrial development studies also confirm that product diversification strategies are strongly associated with rural enterprise sustainability (Charnita et al., 2022). Empirical prioritization outcomes therefore suggest that strategic innovation and digital integration constitute the primary mechanisms for enhancing local industrial competitiveness.

The prioritization of innovation also aligns with empirical observations indicating that local creative industries contribute significantly to rural economic transformation when supported by institutional collaboration mechanisms. Product differentiation through flavor variation and packaging redesign has been shown to increase consumer loyalty within traditional snack markets operating under localized branding frameworks (Artaya et al., 2021). Technological learning processes embedded within cluster-based production environments enhance knowledge spillovers among microenterprises (Porter, 1998). Community-based production networks simultaneously facilitate resource sharing and reduce operational risks among home industry actors (Endah, 2020). Innovation-oriented enterprise strategies are therefore consistent with endogenous growth dynamics emphasizing human capital accumulation (Romer, 1990). Institutional partnerships may further accelerate technology diffusion across geographically proximate production clusters.

Empirical findings also demonstrate that production capacity enhancement ranked lowest among strategic priorities, reflecting the limited marginal impact of scale expansion in the absence of market differentiation. Earlier rambak cracker development studies in Pegandon District identified similar structural constraints where production increases failed to translate into proportional income gains (Firmanto, 2017). Efficiency-focused empowerment initiatives implemented in Dwi Joyo SME clusters were primarily oriented toward output stabilization rather than competitive positioning (Fahmi & Arifan, 2016). Packaging and labeling innovations were subsequently introduced to improve market acceptance among fish cracker producers in comparable rural settings (Mufarokhah et al., 2021). These observations reinforce the empirical argument that innovation-driven strategies yield greater developmental returns than production-oriented interventions alone. Digital marketing integration further enhances consumer accessibility across geographically dispersed markets (Ilyas, 2024).

Rural industrial competitiveness is also influenced by institutional capacity to coordinate supply chain actors within localized production ecosystems. Value chain strengthening initiatives implemented in aloe-vera cracker SMEs demonstrated measurable improvements in product consistency and distribution efficiency (Jannah et al., 2019). Controlled drying technologies introduced among cowhide cracker producers reduced quality variability across production batches (Wibowo & Wahyuningsih, 2016). Digital adoption frameworks similarly emphasize the importance of technological readiness in achieving Industry 4.0 integration among food SMEs (Rifai & Mychelisda, 2023). Vocational productivity programs have been empirically linked to increased entrepreneurial participation among rural labor forces (Sinaga, 2024). Sectoral employment analyses further confirm the developmental relevance of micro-industrial expansion within regional labor markets (Galuh, 2024).

Strategic innovation pathways in rambak cracker enterprises must also be contextualized within broader creative economy paradigms integrating local resource utilization and technological adaptation. Animal skin waste processing into consumable snack products represents a viable circular production model capable of generating environmental and economic co-benefits (Ridha et al., 2025). Local wisdom-based enterprise development frameworks emphasize community participation as a central determinant of rural economic resilience (Murtiana et al., 2025). Food diversification initiatives further illustrate the cultural significance of traditional snack industries in strengthening community-based food systems (Widowati & Nurfitriani, 2023). Entrepreneurial competitiveness models highlight innovation capability as a primary determinant of SME survival within dynamic market environments (Violinda, 2018). Production strategy optimization has also demonstrated positive omzet growth impacts in home industry settings (Syaipudin & Awwalin, 2023).

## 5. Conclusions

The strengthening of the rambak cracker industry in Penanggulan Village demonstrates that localized agro-processing enterprises may function as structurally embedded instruments of local economic development when supported by integrative innovation and digitally mediated commercialization strategies. Empirical findings reveal that traditional household-based production systems currently contribute to employment absorption and household income generation despite persistent managerial informality, raw material volatility, and limited technological adoption in processing and marketing activities. Strategic synthesis using the Analytical Hierarchy Process indicates that product innovation and quality enhancement constitute the highest development priority, followed by digital marketing capability expansion and institutional partnership strengthening, thereby suggesting that competitiveness within rural micro-industrial ecosystems emerges primarily from adaptive differentiation and market accessibility rather than production scale intensification alone. The alignment between endogenous innovation processes and cluster-based collaboration networks further underscores the developmental significance of integrating creative resource utilization with digital transformation mechanisms in order to enhance value-chain coordination and sustain industrial resilience. Consequently, the rambak cracker industry represents a viable community-based economic growth instrument capable of reinforcing localized income diversification, labor absorption capacity, and culturally embedded production sustainability within rural development frameworks.

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