

DEVELOPMENT AND DIVERSIFICATION OF BANANA-BASED PROCESSED PRODUCTS IN HAYA-HAYA VILLAGE, WEST LIMBOTO DISTRICT, GORONTALO REGENCY

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Abstract

Bananas represent one of Indonesia's most widely cultivated commodities, yet their economic potential remains underutilized due to limited product diversification, inadequate processing technology, and weak financial management among rural enterprises. This study aimed to enhance the performance and sustainability of banana-based microenterprises in Haya-Haya Village, Gorontalo Regency, through participatory interventions focused on production innovation and managerial strengthening. Using a qualitative participatory approach, the program involved field evaluations, focus group discussions, technical workshops, and financial mentoring with two women led community groups. Results demonstrated a 90% increase in production capacity (from 50 kg to 95 kg per week), a 50% reduction in processing time, and a decline in product failure rates from 15% to 2%. Diversification into five new product variants increased raw material utilization from 65% to over 90%. On the managerial side, turnover and net profit grew by 30%, supported by improved financial literacy, credit access, and healthier financial ratios. These findings suggest that integrated technical and managerial interventions can strengthen competitiveness, sustainability, and socio-economic impact of local agro based enterprises.

Keywords: *Banana-based Products; Banana Processing; Development; Diversification; Micro-Enterprise*

INTRODUCTION

Bananas are more than just a beloved fruit in Indonesia, they're a cornerstone of agriculture, grown across the archipelago with vast scale and impact. National output hits millions of tons yearly, highlighting their role not only as a staple food source but also as a critical income generator for rural farmers (Ok & Murwanti, 2024). Rich in carbohydrates, fiber, and essential vitamins like A, B, and C, bananas offer more than just great taste they serve as a valuable raw material for high-value processed goods (Supriadi et al., 2023).

In Haya-Haya Village, part of West Limboto District in Gorontalo Regency, about 100 hectares of land are dedicated to banana farming, yielding an estimated 1,200 tons annually (Adiati & Nikmatin, 2024). The region is known for three distinct varieties: Kepok, Ambon, and Nangka each with its own unique flavor, texture, and suitability for different types of

processing (Nikmatin et al., 2023). These local varieties have inspired community-driven initiatives, including Tunas Hijau, a women-led farming group, and Sukses Selalu, a collective of female entrepreneurs. Their active involvement highlights the growing spirit of economic independence and self-sufficiency within the village (Agusty et al., 2022).

Despite high yields, farmers often earn very little due to reliance on middlemen who control pricing. The selling price can drop as low as IDR 5,000 per kilogram. Most products remain basic banana chips, made using simple, outdated methods and lacking consistent quality. This limits their market value, even though the potential for innovation is considerable (Widowati, 2023).

Underlying challenges go beyond prices and market access. There is a lack of information on modern processing techniques, food safety standards, consumer preferences, and farm management systems (Forsman, 2011). Many groups want to expand but face barriers such as insufficient training, limited technical expertise, and restricted access to financing. Without financial support, upgrading production equipment stays out of reach (Vepo do Nascimento Welter et al., 2020). Additionally, coordination between local cooperatives and village-level authorities is weak, which hampers the implementation of training and assistance programs (Rocha et al., 2022).

To unlock real growth, a more dynamic and forward-thinking strategy is essential. One promising direction is making the most of the diverse local banana varieties (Anzules-Falcones & Novillo-Villegas, 2023). Kepok bananas, with their firm texture and low moisture, are ideal for producing crunchy, shelf-stable chips that meet consumer demand. Raja bananas, naturally sweet and aromatic, are perfect for crafting premium jams that need little to no added sugar. Meanwhile, Tanduk bananas high in starch have strong potential as a gluten-free flour alternative, with applications not only in food industries but also in pharmaceuticals (Tanti & Situmorang, 2023).

Innovation in product development should also reflect shifting lifestyle trends. By blending bananas with other ingredients, new and appealing products can emerge such as natural banana brownies made without artificial additives, no-sugar frozen banana ice cream, savory and healthy banana crackers, or nutritious banana nuggets designed for children (Thilakam, 2016). These options are not just creative ideas; they align with rising consumer interest in clean-label, healthy, and eco-friendly food choices (Prasetyo et al., 2024).

Looking ahead, the focus should shift toward premium, high-impact products with strong market potential (Novikova & Cabrera, 2022). Items such as banana paste, banana powder, or banana-based energy bars could represent promising options (Nino Sampe Tindih Sitohang & Ibelala Gea, 2023). Banana paste, banana powder, and banana-based energy bars are promising candidates that could reach urban consumers, wellness markets, and even international export opportunities especially when produced under international quality standards and presented with appealing packaging (Aurore et al., 2009).

By combining the unique strengths of local banana varieties, creative product development, and targeted capacity building for local entrepreneurs, transforming banana-based industries in Haya-Haya is no longer just a vision. It is a practical and achievable pathway toward economic empowerment (Mohapatra et al., 2011). With strong community

collaboration and leadership from women-led groups, this approach offers a clear route toward a more resilient, sustainable, and competitive local economy (Budiantara et al., 2023).

LITERATURE REVIEW

Product Development

According to Crawford & Di Benedetto (2025), emphasize, this process is far more than just technical execution it demands a keen awareness of consumer trends, the ability to connect innovative ideas with practical technological solutions, and the strategic planning needed to bring products to market successfully. This holistic view is supported by of Brzeziński (2024), who sees enterprise development as a strategic journey aimed at building stronger organizational capabilities, deepening market influence, and refining internal operations. Within this broader context, product development stands as a key operational force that drives transformation and enables businesses to evolve in response to changing conditions.

Furthermore, the research of Sumin (2024), highlights innovation as a core driver of competitiveness and long-term growth in modern enterprises. From this standpoint, innovation does not only mean improving products it also involves optimizing internal workflows, boosting efficiency, and strengthening a company's edge in the marketplace. The framework proposed by Crawford and Di Benedetto thus proves highly relevant: product development acts as a dynamic engine of innovation, enabling firms to respond to shifting consumer tastes, streamline internal processes, and foster collaboration with external partners such as research labs or industry stakeholders. This integration of internal and external efforts accelerates the path from idea to successful launch. Altogether, viewing product development through this lens provides a solid foundation for understanding how innovation efforts are embedded within corporate strategy and growth objectives.

According to Ulrich (2016), offers a complementary perspective, defining product development as a structured sequence of activities that starts with identifying real consumer needs and ends with delivering products that meet market demands. This definition underscores that product development is not simply about artistic or technical brilliance it is a disciplined, stage-by-stage process involving design, testing, refinement, and implementation. Success depends on striking the right balance between creative exploration and systematic management, ensuring each phase adds value and pushes the project toward meaningful, competitive outcomes.

This definition aligns with the research conducted by Liu (2020), whose research on developing a computer-based vocabulary evaluation system demonstrates the power of user-centered design. By focusing on core user needs such as fast feedback, comprehensive insights, and an intuitive interface the project delivered a tool that not only met practical requirements but also enhanced learning effectiveness. This example reflects the principle advocated by Ulrich and Eppinger: effective product development begins with empathy for the user, followed by design choices that are both functional and impactful.

Building on this foundation by (Zhang & Le, 2021), urther illustrate how successful product development requires the integration of multiple management dimensions strategic planning, decision-making, technology oversight, and intelligent use of digital tools. When these elements are combined effectively, organizations can not only spot promising product

opportunities more reliably but also manage the development process with greater control and speed, reducing time-to-market. These findings confirm that innovation in product development is not just about ideas or design it also hinges on organized, collaborative, and value-driven process management. As such, the framework by Ulrich and Eppinger is not just theoretical: it is proven in practice. When applied rigorously, it leads to innovations that are not only competitive but also built to last.

Product Diversification

Kotler & Keller (2021), product diversification represents a deliberate strategic move by companies to broaden their product portfolios or penetrate new market segments, primarily aimed at boosting profitability and reinforcing their competitive edge. Far from being merely a tactic for revenue growth, this approach also serves as a safeguard against over-reliance on a single product or market, thereby enhancing organizational resilience. In today's dynamic business environment, diversification often emerges as a responsive strategy to shifting consumer preferences, fluctuating demand patterns, and rising competitive pressures. By introducing a wider range of offerings, businesses can better adapt to diverse customer needs while securing long-term operational stability, even amid market volatility.

Empirical evidence supports this strategic value, Fatmawati & Hariyana (2024) found that product diversification significantly influences consumer behavior specifically, it enhances consumer trust and drives more confident purchasing decisions. These outcomes align with Kotler and Keller's (2016) framework, which underscores that expanding product lines is not just about increasing sales, but also about building stronger market positions by responding more effectively to evolving consumer expectations.

Additionally, research on Product Diversification and Company Size further reinforces Kotler and Keller's (2016) argument that diversification enhances both profitability and competitive strength. Study by (Raxmonov, 2024) found that product diversification exerts a positive and significant impact on profitability. This demonstrates that the introduction of new product lines, accompanied by innovation to differentiate from competitors, can make a tangible contribution to a company's financial performance.

Expanding beyond product-focused definitions, Hitt et al. (2017), frame diversification as a broader corporate strategy involving entry into either related (related diversification) or unrelated (unrelated diversification) industries or market segments. Their perspective emphasizes the creation of synergies, long-term performance improvement, and value generation through cross-sectoral opportunities. This view positions diversification as a strategic management tool rather than just a product development activity.

This broader interpretation is reinforced by Raxmonov, (2024) in the context of tourism, where diversification is driven by the need for economic resilience, environmental sustainability, and cultural preservation. Case studies from Spain, Thailand, and Japan illustrate how diversifying tourism offerings such as eco-tours, cultural festivals, and wellness retreats has not only enriched visitor experiences but also stimulated local economies and contributed to sustainable development.

Additional research by Issara et al. (2024) confirms that diversification positively shapes consumer trust and purchase intent, further validating its role as a strategic lever for market expansion and competitiveness. Similarly, studies on herbal products highlight that

diversification through transforming raw materials into powders, extracts, tablets, and capsules can elevate quality and shelf life when produced according to WHO guidelines. These innovations not only amplify health benefits for consumers but also strengthen brand reputation and long-term market acceptance.

RESEARCH METHOD

This research employed a qualitative participatory methodology, which emphasizes active involvement of the community and stakeholders in the problem-identification and decision-making process. The implementation began with evaluation and strategic planning through field visits, in-depth interviews, and focus group discussions (FGDs) involving the Tunas Hijau and Sukses Selalu groups, the village head, and the local agricultural office (Issara et al., 2024). These activities were conducted to identify production conditions, challenges, and community aspirations. The results then served as the foundation for an action plan, which included product diversification, technical training, and marketing strategies (Kumari, 2023).

Implementation was carried out through practical workshops at the village hall, covering topics such as post-harvest processing techniques, basic food safety (light HACCP), product formulation, packaging, and branding (Agusty et al., 2022b). The workshops were supported with technical manuals, instructional videos, and expert mentorship to ensure knowledge transfer and practical application (Novikova & Cabrera, 2022b).

In the research and development phase, consumer needs assessments were conducted alongside formulation experiments in a community laboratory, testing variations in ingredients, temperature, and processing time. Pilot trials with farmer panels were organized to gather iterative feedback for continuous product refinement. All data, photographs, and reports were systematically documented to serve as references for the development of future product variants as well as accountability reporting to program sponsors.

RESULT AND DISCUSSION

Result

Production Aspects

1) Increased Production Capacity

In the implementation phase, which served as the intervention period, the production capacity of banana-based products increased significantly, rising from an average of 50 kg per week at the initial stage to 95 kg per week by the end of the program. This 90% growth demonstrates the successful application of standardized production techniques and the improved skills of the human resources involved. Daily production records further show that this progress was not only quantitative but also qualitative, as stricter quality standards were adopted, enabling the final products to compete effectively in regional markets.

2) Efficiency in Production Time

In the implementation phase, cycle time analysis indicated that the processing duration for 10 kg of bananas was reduced from 8 hours to 4 hours, reflecting a 50% decrease at each workflow stage.

Figure 1. Banana slicer machine



This improvement resulted from the application of an automatic slicer and more efficient frying techniques, which reduced reliance on manual labor and minimized process variability. Consequently, daily productivity increased, and production schedules became more responsive to fluctuating market demand.

3) Reduction in Production Failure Rate

Prior to the program, the rate of production failure (products not meeting quality standards) was recorded at 15%. Following training and the implementation of quality control procedures, this figure declined sharply to 2%. This reduction demonstrates that the newly introduced standard operating procedures (SOPs) successfully fostered consistency across all stages of production, from raw material preparation to final packaging.

Figure 2. Banana flour production machine



4) Procurement and Utilization of New Equipment

Investments in modern equipment including an automatic slicer, an oil-draining device, and a packaging sealer had a direct impact on both product quality and efficiency. The automatic slicer ensured uniform banana slices with a thickness of approximately 2 mm, while the oil-draining device reduced fat content in fried products from 12% to 8%. Meanwhile, the

sealing machine guaranteed airtight packaging, extending product shelf life up to 30 days without compromising organoleptic quality.

Figure 3. Vacum Fryer



5) Diversification of Banana-Based Products

Through recipe exploration and market testing, five new banana-based product variants were developed: banana sponge cake, banana cookies, banana pie, banana brownies, and banana nuggets. Each variant was designed to maximize the use of different parts of the banana ripe flesh, peel, and starch thereby increasing raw material utilization from 65% to over 90%. This diversification not only expanded the product portfolio but also opened access to previously untapped market segments.

Figure 4. Diversification of Banana Products



Management Aspect

1) Facilitation of Access to Capital

The financial mentoring program consisted of three main stages: (a) socialization of products and market prospects to financial institutions, (b) systematic preparation of daily and

monthly financial reports, and (c) training on credit proposal writing in accordance with Islamic banking standards. Over the final two months, local financial consultants assisted each business group in preparing the required documents, making the credit application process more structured and accountable.

2) Enhanced Entrepreneurial Empowerment in Accessing Credit

After receiving mentoring, partners reported a substantial improvement in their ability to manage businesses independently. According to the end-of-program survey, 80% of respondents expressed greater confidence when negotiating with lenders. This directly contributed to their success in securing formal credit, which had previously been almost unattainable.

3) Increased Recorded Turnover and Profit

Financial data collected during the program indicated that, following management training, the average monthly sales turnover (revenue) per partner increased from IDR 8 million to IDR 10.4 million, representing a 30% growth. Net profit also rose from an average of IDR 1.2 million to IDR 1.56 million per month (a 30% increase). These financial records, compiled into monthly reports, provided tangible evidence to financial institutions that the enterprises were capable of generating stable and profitable income.

4) Improved Financial Ratios

A simple financial ratio analysis demonstrated consistent improvement throughout the implementation phase. The debt-to-equity ratio (DER) declined from 1.8 to 1.2, not as a result of limited access to formal credit, but rather due to a reduction in consumptive debt and the shift toward more productive financing sources. In this study, consumptive debt refers to short-term, non-productive borrowing such as household consumption loans, high-interest informal credit, or other debts unrelated to business expansion. At the same time, the current ratio increased from 1.1 to 1.5, indicating that businesses had strengthened their capacity to meet short-term obligations without jeopardizing operational continuity.

Discussion

The expansion in production capacity from 50 kg per week to 95 kg per week highlights a major leap in the operational efficiency of banana-based enterprises. This growth, nearly doubling output, goes beyond mere volume increase it reflects improvements in production quality and consistency. The integration of standardized production processes and stricter quality control protocols has enabled the products to meet market standards and compete effectively within regional supply chains. These outcomes mirror those observed in the community partnership program (PkM) in Dharma Bhakti Village, Bengkayang Regency, where the Sedayung banana processing group achieved substantial progress after receiving training. Post-training assessments showed a 75% improvement in financial literacy and a 70% rise in digital marketing skills. The group also expanded its product line to include more than ten different banana-based items. These results clearly show that education-driven initiatives and mentorship support not only boost production output but also enhance the long-term viability and competitive edge of local enterprises.

In line with this, research by Yusnidar & Ameliany, (2023) found that combining product innovation with digital marketing strategies significantly boosts the economic well-

being of rural communities. The Asset-Based Community Development (ABCD) model has proven effective in unlocking local potential by fostering innovation and digital outreach, leading to higher income levels and improved living standards. Recommendations from Sejas & Silva, (2020) further underline the value of advanced training, diversification, and smarter digital marketing practices that remain essential for the sustainability of banana processing ventures across various regions.

Furthermore, the study by Saptaningtyas & Nurwidayat (2020) demonstrated that a systematic processing method involving washing, blanching, soaking in saline solution, slicing, color stabilization treatment, sesame oil coating, drying, and microwave baking produces goods with superior nutritional content compared to traditional techniques. This method also extends shelf life dramatically, making the products more suitable for modern market demands that prioritize both quality and longevity. These findings emphasize that increasing production capacity must be matched with technological upgrades in processing to ensure that products meet high consumer expectations in terms of taste, health, and durability.

From a time management perspective, reducing processing time for 10 kg of bananas from eight hours to just four hours illustrates how simple yet effective tools like automatic slicers and optimized frying methods can greatly enhance productivity. Beyond speeding up production, these innovations decrease reliance on manual labor, offering greater flexibility in scheduling and enabling faster responses to shifting market demands.

Product diversification has emerged as a core strategy for long-term business sustainability and value creation. Through experimentation and market testing, five new banana-based products were successfully developed: banana sponge cake, banana cookies, banana pie, banana brownies, and banana nuggets. This expansion not only broadened the product range but also maximized the use of raw materials, achieving over 90% utilization of bananas. As a result, waste has been significantly reduced while competitiveness in regional markets has improved. Research consistently supports that diversification builds consumer trust, as customers recognize producers who actively respond to changing preferences and evolving market trends.

The financial impact of diversification is also substantial. Financial reviews indicate an average 30% increase in turnover after introducing innovative products and management training programs. This growth was matched by higher net profits, demonstrating that efficiency in production and effectiveness in marketing can coexist. These findings align with broader studies confirming that product diversification does more than just offer variety it directly contributes to profitability. In this light, diversification should not be seen as a mere creative exercise but as a strategic economic tool.

Beyond financial gains, diversification strengthens brand identity and market positioning. Companies that offer a diverse yet high-quality product line earn greater customer trust. Consumers appreciate not just variety but also the perception of being served by an innovative, forward-thinking business. This aligns with research showing that diversification plays a crucial role in shaping positive brand images and securing competitive advantages. Thus, it stands out as a vital component in achieving sustainable business success.

Additionally, diversification brings wider socio-economic benefits to the local community. Higher output and market reach have generated new job opportunities in both

production and distribution. This supports the broader goals of community-based enterprise development, which aim to deliver not only economic returns but also social prosperity. By combining modern processing technology, sound business practices, and strategic diversification, banana processing ventures can become powerful engines of local economic development sustainable, competitive, and inclusive.

The management side of these enterprises has also seen significant upgrades. Training in financial tracking, assistance with loan applications, and support in accessing capital have strengthened administrative capabilities. Entrepreneurs now show better control over their financial operations, reflected in average monthly turnover rising from IDR 8 million to IDR 10.4 million and net profit increasing from IDR 1.2 million to IDR 1.56 million about a 30% improvement. Financial ratios also improved, with the debt-to-equity ratio dropping from 1.8 to 1.2 and the current ratio rising from 1.1 to 1.5, signaling healthier financial structures and better liquidity. These changes make the businesses more resilient in the face of market fluctuations.

Improved management practices have directly enhanced operational governance. Entrepreneurs who once struggled with basic bookkeeping now regularly prepare simple financial reports, allowing for more structured performance monitoring and informed decision-making. The transparency brought by proper accounting not only supports internal planning but also strengthens credibility with external partners especially banks and investors. As a result, business management is no longer focused solely on production continuity but also on the disciplined use of financial data.

Furthermore, better skills in preparing credit applications have opened doors to formal financing. Several entrepreneurs have gained trust from financial institutions thanks to more professional documentation. This achievement underscores how financial literacy can bridge the gap between funding needs and available capital. Expanding access to finance allows businesses to scale sustainably, driving further growth and development.

CONCLUSION

The intervention program for developing banana-based enterprises successfully enhanced production performance, with capacity increasing by 90% from 50 kg to 95 kg per week. Processing efficiency improved by 50% through the use of automatic slicers and optimized frying techniques, while the production failure rate declined from 15% to 2% following the implementation of SOPs and quality control measures. Investments in modern equipment further enhanced product uniformity, reduced fat content to 8%, and extended shelf life up to 30 days. Meanwhile, diversification into five product variants raised raw material utilization from 65% to over 90%.

On the management side, financial access support—including market outreach, systematic financial reporting, and Islamic credit proposal training—boosted 80% of partners' confidence in negotiating with financial institutions. This translated into a 30% increase in average monthly turnover (from IDR 8 million to IDR 10.4 million) and a 30% rise in net profit (from IDR 1.2 million to IDR 1.56 million). Financial ratios also improved, with the debt-to-equity ratio decreasing from 1.8 to 1.2 and the current ratio increasing from 1.1 to 1.5. Collectively, these outcomes demonstrate that the synergy between technical production

improvements and managerial strengthening has effectively enhanced productivity, product quality, and the sustainability of banana-based microenterprises.

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