IJTB VOLUME 1(3) 2025
Indonesian Journal of Tropical Biology
https://journals.widhatulfaeha.id/index.php/ijtb

Original Research Paper

Aren Palm-Based Product Development Strategy to SupportAgrotourism in Kekait, West Nusa Tenggara, Indonesia

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Article Info

Recived: December 2, 2025
Revised: December 4, 2025
Accepted: December 9, 2025
Published: December 17, 2025

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Number Hp: 087856699137

ISSN 3108-9801
ESSN: 3109-0842
DOI: 10.65622/ijtb.v1i3.181

Abstract

Palm sap (*Arenga pinnata*) plays a crucial role in sustaining local livelihoods and preserving cultural identity in Kekait Village, West Lombok. However, the development of this commodity remains limited by low product quality, inadequate processing technology, and weak integration with the village's agrotourism sector, resulting in suboptimal economic benefits for the local community. This study aims to formulate a comprehensive development strategy for palm sap–based products to increase value-added and strengthen sustainable agrotourism. A narrative review method was applied by synthesizing primary data from field observations, semi-structured interviews, and community empowerment activities with secondary literature. The data were analyzed descriptively using SWOT analysis to examine key internal and external factors influencing the sector. The results show that technological interventions, such as the use of cabinet dryers and the application of Good Food Handling Practices, significantly enhance product shelf life and compliance with market standards. In addition, institutional strengthening, digital marketing, and the integration of cultural-based educational tourism are effective in expanding market access and improving competitiveness. The scientific contribution of this study lies in offering a holistic upstream–downstream development model grounded in community empowerment, positioning palm sap products not only as economic commodities but also as drivers of cultural preservation, environmental sustainability, and improved community welfare within agrotourism-based rural development.

Keywords: Agrotourism; Community empowerment; Palm sap; Product development

INTRODUCTION

Sugar palm commodities have high economic value and promising future prospects, driven by the increasing trend of domestic and export market demand (Septiyana et al., 2019; Wijayamti et al., 2021). Palm sugar, as a diversification of palm sap products in granulated form, also offers advantages compared to molded sugar, such as being more durable, easier to package and distribute, and having a higher selling price (Kurniawan et al., 2018; Mirza et al., 2022). The majority of communities in Kekait Village, including farmer groups such as Maju Bersama, rely on palm sap processing as their primary source of livelihood (Sulastri et al., 2018). Therefore, the sugar palm sector plays a strategic role in strengthening rural-based economies and supporting regional development.

Conceptually, the sugar palm industry has the potential to become an integrated economic system through upstream downstream value chain optimization, value-added product diversification, and the strengthening of community-based agro-industry and agro-tourism activities. Kekait Village in Gunungsari District, West Lombok, is recognized as one of the main sugar palm production centers in the region. Data from the Statistics Agency of West Nusa Tenggara Province (BPS, 2015) recorded sugar palm production reaching 211.3 tons, with Kekait Village contributing significantly as the largest producer of palm sap (Faresta et al., 2020). In response to its strategic potential, the regional government through the Department of Industry has initiated the development of the Sugar Palm Agrotourism Village program in Kekait (Ita Selvia & Idiatul Fitri Danasari, 2024).

However, despite the existing potential and government support, several critical issues continue to hinder the productivity and competitiveness of palm sugar products in Kekait Village. These include low product quality, limited production technology, and weak downstream strategies related to marketing, institutional capacity, and commercial distribution (Ita Selvia & Idiatul Fitri Danasari, 2024; Chatra et al., 2025). Previous research has also tended to focus only on technical aspects, such as product quality and equipment (Kurniawan et al., 2020), or on strengthening institutional systems (Ita Selvia & Idiatul Fitri Danasari, 2024), yet holistic and integrated strategies linking the upstream to downstream processes within the agro-tourism context remain limited. This research therefore aims to address the gap through a more comprehensive approach that aligns production, human

Citacion: Amaro, M & Fatimah, AIF. (2025). Strategy for Developing Palm Oil-Based Products to Support Agrotourism in the NTB Region. *Indonesian Journal of Tropical Biology*, 1(3), 116-121. https://doi.org/10.65622/ijtb.v1i3.181

resources, technology, and market development simultaneously.

Based on the problems identified, this study is urgently needed to formulate an integrated upstream–downstream development strategy for palm sugar products in Kekait Village. The research aims to increase the quantity and quality of palm sap derivative products through applied research and appropriate technology innovation, improve human resource capacity for farmers and micro-enterprises through systematic training and mentoring, and strengthen institutional collaboration to enhance commercialization and value chain performance. Ultimately, this strategic framework is expected to support the successful development of Kekait Agrotourism Village and ensure sustainable community-based economic empowerment (Nuraini et al., 2019; Ita Selvia & Idiatul Fitri Danasari, 2024).

RESEARCH METHODS

Time and place

This research was conducted from January to June 2025 in Kekait Village, Gunungsari District, West Lombok Regency, West Nusa Tenggara (NTB) Province, Indonesia. The research site was selected based on its status as one of the main production centers of palm sap and a strategic location for the development of sugar palm–based agrotourism.

Research design

This study employed a qualitative approach using a *field-based literature review* design. This approach was selected to understand real field conditions and identify the internal and external factors influencing the development of the palm sugar industry through comprehensive analysis of primary and secondary data (Syahid, et.al., 2023). The design enabled a deeper exploration of factors that contribute to the formulation of sustainable development strategies.

Population and research sample

The study population included all actors and stakeholders involved in the production chain of palm sugar in Kekait Village, consisting of palm sugar tappers, palm sugar producers, farmer groups such as *Maju Bersama*, and village authorities. The research sample was selected using *purposive sampling*, based on the respondents' involvement in production and business activities (Septiyana et al., 2019). Data collection was carried out through field surveys and direct observation of traditional production processes, semi-structured and in-depth interviews with key respondents (Ita Selvia & Idiatul Fitri Danasari, 2024), and the *Participatory Rural Appraisal (PRA)* method involving stakeholders related to palm sugar development (Asriati et al., 2025; Ita Selvia & Idiatul Fitri Danasari, 2024). Supporting data were also collected through empowerment and training activities in community service programs (PKM). Research variables included internal factors (strengths and weaknesses) and external factors (opportunities and threats) related to palm sugar business development, while instruments included interview guides, observation sheets, documentation tools, and product quality testing equipment such as an oven for moisture content measurement (Kunyati & Radianti, 2024).

Research procedure

The research procedure consisted of several stages: (1) preliminary study and identification of potentials and problems within the palm sugar business sector in Kekait Village; (2) collection of primary data through field observations, interviews with farmers and entrepreneurs, and PRA sessions with stakeholder groups; (3) implementation of empowerment and technological transfer activities to improve production performance; (4) testing product quality through moisture content measurements before and after technological intervention; and (5) compiling, organizing, and synthesizing collected data into the formulation of development strategies.

Research data analysis

A literature review of palm sap-based product development strategies in Kekait Village, West Lombok, demonstrates a strong synergy between technological interventions, human resource capacity building, and the formulation of integrated market strategies to support agrotourism. This discussion focuses on initial conditions, key interventions, and achieved results, supported by primary data from relevant sources. A fundamental challenge faced by palm sugar artisans in Kekait Village is low product quality, particularly related to moisture content and shelf life.

An initial analysis of the composition of palm sugar produced by the partner group in Kekait indicates that the product does not meet the Indonesian National Standard (SNI), particularly in terms of water content. High water content is the main cause of palm sugar being easily damaged, clumping quickly, and having a short shelf life (Hai, et al., 2025). The nutritional composition of palm sugar produced by Maju Bersama partners can be seen in Table 1.

RESULTS AND DISCUSSION

A literature review of palm sap-based product development strategies in Kekait Village, West Lombok, demonstrates a strong synergy between technological interventions, human resource capacity building, and the formulation of integrated market strategies to support agrotourism. This discussion focuses on initial conditions, key interventions, and achieved results, supported by primary data from relevant sources. A fundamental challenge faced by palm sugar artisans in Kekait Village is low product quality, particularly related to moisture content and shelf life.

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Table 1. Nutritional composition of palm sugar from partner products

No	Nutrients	Amount	SNI Limits for Palm Sugar (SNI:3743:2021)
1	Calories	4040.87 cal/g	-
2	Water	4.77%	Maximum 3.0%
3	Ash	1.69%	Maximum 2.5%
4	Fat	0.71%	-
5	Protein	4.33%	-

*Source : (Sulastri et al., 2018)

The high water content of 4.77% far exceeds the maximum limit set by SNI No. 3743-2021 for Palm Sugar

(maximum 3.0%). Traditional drying processes that rely solely on sunlight make the product highly dependent on weather conditions and pose a high risk of contamination.(Septiyana et al., 2019; Fathi et al, 2022).

Palm Sap-Based Product Development Strategy for Agrotourism

The development strategy in Kekait Village is focused on improving product quality to meet standards, strengthening institutions, technology transfer, and market integration.A SWOT analysis of the palm sugar business in Kekait identified several strengths, weaknesses, opportunities, and threats. The SWOT analysis of the palm sugar business in Kekait can be seen in Table 2.

Table 2. SWOT Analysis of Palm Sugar Business in Kekait Village

Strength	Weakness
Abundant availability of raw palm sap Local knowledge about product diversification (results of academic training), The existence of active business groups (KUM Maju Bersama, UMKM Arza), Village policy as an agrotourism village that opens up opportunities for infrastructure and technology funding flows	Sugar palm productivity is decreasing due to the age of the plants and minimal rejuvenation. Limited knowledge of cultivation and climate adaptation Low business capital (money, appropriate technology, processing facilities) The processing process is still simple, the product shelf life is only 3–4 weeks Product competitiveness is relatively low
Opportunity	**Threat (Treat)**
Funding and program support from central/regional governments for palm sap cultivation and processing The designation of Kekait as an agrotourism village facilitates integration with the tourism and home industry sectors. Opportunities for trading processed palm sap products as a superior village commodity Potential collaboration with academics for research on increasing productivity, product diversification, and digital marketing	Tight competition with palm sugar products from other regions Increasing demands for food quality and safety standards Climate uncertainty and natural disaster risks Dependence on external assistance if local capacity is not increased.

*Source: (Ita Selvia & Idiatul Fitri Danasari, 2024).

Based on table 2, there are four main types of strategies that can be applied, namely: 1) SO Strategy, 2) ST Strategy, 3) WO Strategy, and 4) WT Strategy. SO (Strength-Opportunity) Strategy is a competitive strategies are approaches that emphasize leveraging internal strengths to seize external opportunities (Fred, 2016).. In the context of palm sugar development in Kekait Village, this strategy is aimed at optimizing the existing capabilities of farmers and business owners and capitalizing on market opportunities so that the formulated strategy can be implemented effectively. Therefore, it is necessary to prepare a palm sugar agribusiness planning document as a reference for implementing the program in a focused and sustainable manner. This document includes identification of product development potential, analysis of farming and palm sugar business feasibility, and a complete development program with its implementation period and a mapping of stakeholders involved in each activity (Ita Selvia and Idiatul Fitri Danasari, 2024).

ST (Strength–Threat) strategies are formulated by leveraging the internal strengths of Kekait Village to mitigate external threats. One of the main emerging threats is increasingly intense business competition from similar palm sugar producers in other regions and from larger-scale industries. However, Kekait Village possesses a unique cultural tradition in the process of tapping and processing palm sugar, which can be used as added value to enhance the competitiveness of local products. Nevertheless, these strengths alone are not sufficient to fully offset all external threats. Therefore, ST strategies that can be implemented include: (1) strengthening place and product branding by highlighting Kekait's unique cultural icons related to palm sugar production; (2) expanding marketing channels through more modern systems, such as digital marketing and collaboration with agrotourism networks; and (3) providing continuous education and capacity building for farmers and business actors regarding the impacts of climate change on palm sugar cultivation and processing, as well as appropriate adaptation measures (Ermawati et al., 2023).

WT (Weakness-Threat) Strategy is an important strategy because it focuses on mitigating internal weaknesses while responding to external threats. Efforts include enhancing partnerships and collaboration between stakeholders and establishing cooperative relationships with various institutions. Collaboration with universities through research and community service activities is expected to improve human resource competency and encourage the application of appropriate technology in production, cultivation, and marketing processes. Furthermore, collaboration with government institutions can open access to funding and broader networks. This synergy will support improvements in product quality and quantity, strengthen business institutions, and optimize marketing, thereby strengthening the local economy and improving the welfare of the Kekait Village community (Parhuniarti et al., 2025; Subianto, et al.,2025).

WO (Weakness-Opportunity) Strategyis directed at utilizing external opportunities to improve internal weaknesses still faced by palm sugar entrepreneurs in Kekait Village. Weaknesses such as limited access to technology, low post-harvest processing capabilities, and suboptimal business management need to be addressed through support from market opportunities, tourism trends, and empowerment programs from various parties. The opportunity for the development of the agro-tourism sector and the increasing demand for natural-based food products are the main basis for improving internal conditions. Therefore, the WO strategy includes: (1) increasing human resource capacity through technical and managerial training in product processing and marketing; (2) establishing a collective business unit as a forum for more structured production and distribution management; and (3) utilizing mentoring programs and equipment assistance from the government and partner institutions to encourage the diversification of value-added palm sugar products such as palm sugar, hygienic palm sap drinks, and various other derivative products. Through this series of steps, the institutional structure and production quality are expected to improve, thereby being able to capture

maximum market opportunities and accelerate the strengthening of the local economy (Ita Selvia & Idiatul Fitri Danasari, 2024; Octari et al., 2024; Parhuniarti et al., 2025).

Production technology and quality improvement strategy

The main strategy upstream is improving the quality of palm sap and processed products to meet higher market standards, including:

Implementation of dryer (cabinet dryer)

As a solution, a rack-type drying tool (cabinet dryer) was introduced to the ant sugar craftsman group.(Kurniawan et al., 2020).. The main objective of this introduction is to improve the quality of the production process, especially drying, so as to extend the shelf life of the product during packaging and storage (Septiyana et al., 2019; Fadiji, et al.,2023). Comparison of the water content of palm sugar before and after drying using a dryer can be seen in table 3.

Table 3. Comparison of the Water Content of Ant Sugar Before and After Drying Using a Dryer

Condition	Water content	Drying Duration	Average temperature	SNI Status
Before drying	5.20%	0 hours	-	Does not meet the standart
After drying	2.49%	3 hours	51.50oC	Fulfil the standart

Test results showed that the use of a cabinet dryer for 3 hours at an average temperature of 51.50°C significantly reduced the water content from 5.20% to 2.49%. This final water content meets the Indonesian National Standard for Palm Sugar (maximum 3.0%). This mechanical drying overcomes the problems of weather dependence and the risk of contamination, which are the main obstacles of traditional methods (Barzigar, et al., 2025). Kurniawan et al., 2020 reported that the water content of palm sugar decreased during drying. The decrease in the water content of palm sugar can be seen in Figure 1.

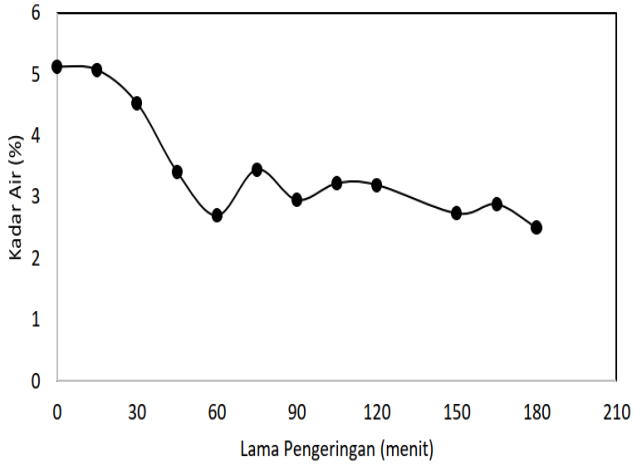

Figure 1. Changes in water content of ant sugar during drying using a dryer

content of palm sugar decreased as shown in Figure 1. The drying process is influenced by the drying air conditions, the internal properties of the material and the drying system applied(Kurniawan et al., 2020; Sun, et al., 2023).

In addition to the dryer, partners (e.g., the Ar Rahmah Family Welfare Movement) were also introduced to a palm sugar mixer/making machine. The partners demonstrated considerable skill in operating this machine and successfully produced palm sugar with satisfactory results.

Improving the Quality of Palm Sap

It is important to apply post-tapping sap quality control techniques, including efforts to prevent fermentation which causes the sap to become sour (Haryoso et al., 2020). Based on the Kekait context, sugar palm farmers have applied local wisdom in cultivating and maintaining sugar palm. In general, the technique of heating the sap to boiling point (pre-boiling) can maintain the sap's pH and prevent spoilage for at least 18 hours, which can be applied if it cannot be processed immediately (Roos & Victor, 2015; Hai, et al., 2025).

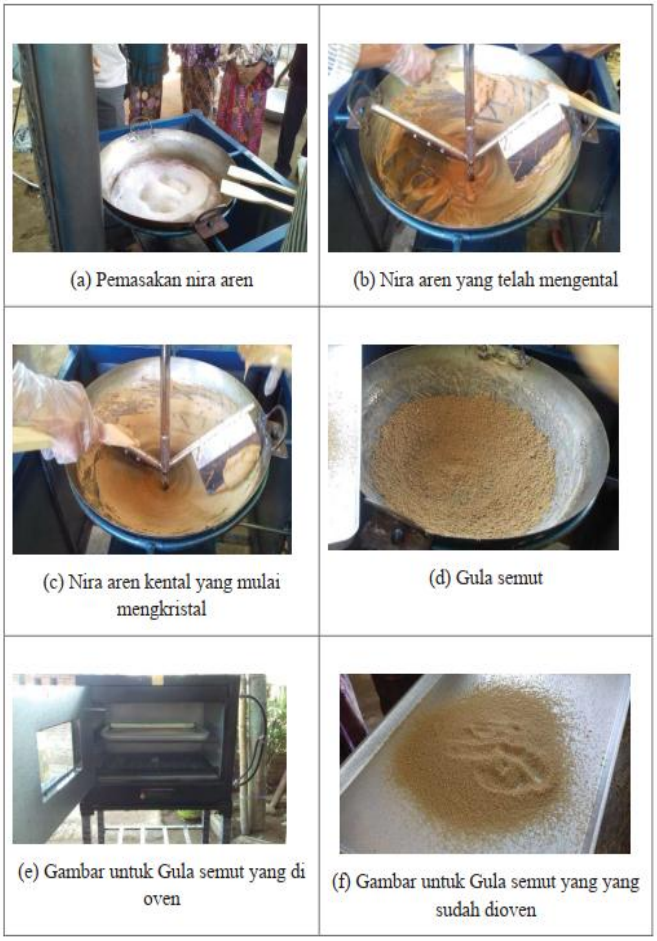

Figure 2. Making Palm Sugar with a Mixing Machine (Sulastri et al., 2018)

Implementation of Good Manufacturing Practice (GMP)

Intensive training and counseling on GMP must be carried out to ensure product cleanliness and hygiene, from raw material handling to final product, which is an important requirement for licensing and modern markets (Nandi, Sourhis, 2024; Al Azawei et al., 2025). The purpose of GMP is to increase partners' understanding and awareness of cleanliness and hygiene aspects, from raw material handling to final product so that the product is suitable and safe for consumption. The results of the activity show an increase in knowledge, understanding, and skills of partners, including in the use of standard processing equipment such as aprons, head coverings, masks or work shoes (Sulastri et al., 2018). With the development of the food industry that produces quality food that is safe for consumption, the public will be protected

from deviations in food quality and dangers that threaten health (BPOM, 2003).

Agrotourism Product Development and Integration Strategy (Downstream)

Palm sugar-based products should be promoted as superior local products integrated with the tourism sector in Kekait Village. Several strategies that can be implemented to develop palm sugar products to support agrotourism in Kekait include:

1. Diversification and Value-Adding: Strategies should include diversifying from molded/solid sugar to granulated sugar due to its higher selling value and promising prospects. Diversification can also be directed to other derivative products such as palm sugar syrup, caramel, and palm sugar candy (Rahayu et al., 2025). Processing palm sugar into palm sugar is reported to provide quite high added value, namely 51.01% ((Kurniawan et al., 2020).
2. Marketing and Branding Enhancement: The introduction of packaging technologies (e.g., vacuum technology) and informative labeling are needed to increase competitiveness (Lohita, et al., 2024). Obtaining a P-IRT permit is a crucial step in expanding marketing reach into the modern retail market and the tourism supply chain (hotels and restaurants) (Djakfar, et al., 2025).
3. Utilizing Cultural Attractions: Kekait Village should make the ritual of harvesting palm sap or cultivating sugar palm a unique tourist attraction. High-quality palm sugar products should be positioned as a regional specialty sold as souvenirs at tourist sites (Noerhatini, et al., 2025).

Institutional and Human Resource Strengthening Strategy

Sustainable growth requires a robust business ecosystem. Here are some strategies for strengthening institutions and human resources in Kekait Village to support the development of palm sugar products that promote agrotourism:

1. Improving Human Resources Quality: Continuous training and mentoring is needed for farmers and business actors (such as the Maju Bersama group) in business management, marketing techniques (including digital/online marketing to expand reach) (Ita Selvia et al., 2024; Gadanakis, 2024).
2. Multisector Collaboration (Pentahelix): Sustainable product development requires strong collaboration between the community (MSMEs), academics (UNRAM, for technology transfer/research), local governments (Agriculture Service, Industry Service, Tourism Service), and the private sector/investors (WT/WO Strategy). This collaboration is crucial to address capital issues and overcome competitive constraints (Craiut, et al., 2022).
3. Participatory-Based Planning: The use of participatory methods such as Participatory Rural Appraisal (PRA) is very important to actively involve local communities in identifying potential, problems, and formulating targeted agrotourism development strategies, so that the programs implemented are in accordance with their basic needs.

This recommended strategy aims to transform Kekait Village from a mere sugar-producing center into an agro-tourism destination offering superior cultural and culinary experiences based on highly competitive palm sap. This development is key to establishing Kekait Village as an independent and sustainable agro-tourism village.

CONCLUSION

The development of palm sugar–based products in Kekait Village is essential for building an independent and sustainable agro-tourism village. The ecological, economic, and cultural potential of palm sugar needs to be optimized through a planned upstream–downstream strategy focused on improving product quality and competitiveness. Technological interventions—such as mechanical drying and the implementation of Good Manufacturing Practices (GMP)—have proven effective in enhancing product quality to meet higher market standards. In addition, strengthening human resource capacity, business institutions, and modern marketing is fundamental for expanding market access and increasing community income. The success of this development is not only measured economically but also through community empowerment, ownership, and cultural preservation. Through multi-stakeholder collaboration and the integration of educational tourism activities, palm sugar products have strong potential to drive welfare improvement, environmental sustainability, and strengthen Kekait Village's identity as a leading agro-tourism destination in West Nusa Tenggara.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the support provided by Sustainable Agriculture Study Program, Postgraduate Program of Mataram University and Prof. Dr. Drs. Abdul Syukur, M.Si, throughout this research. We would also like to thank our colleagues and collaborators for their valuable insights and constructive feedback during the development of this study. All remaining errors are our own responsibility.

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