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KOPETE: Sustainable Non-Caffeinated Coffee Innovation from Local Buton Pete as a Green Entrepreneurship Model Supporting Sustainable Tourism

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ABSTRACT

The increasing global demand for sustainable tourism and healthy lifestyle products has encouraged the emergence of innovative, locally based entrepreneurial initiatives. This study introduces KOPETE, a non-caffeinated coffee alternative derived from locally sourced pete (Parkia speciosa) in Buton, Indonesia and examines its role as a sustainable tourism-supporting innovation. Unlike conventional coffee products, KOPETE is developed as a caffeine-free beverage that promotes health-conscious consumption while enhancing the economic value of local biodiversity. The study aims to examine the innovation process, value creation strategy, and its potential role as a green entrepreneurship model supporting sustainable tourism development. Using a qualitative descriptive approach, data were collected from 12 informations consisting of local farmer (n=4), Kopete producers (n=3), tourism stakeholders (n=3) and community distributors (n=2). The research analyzes local resource utilization, community-based production practices, and market positioning strategies. The findings reveal that KOPETE generates three interconnected value dimensions: (1) economic value through income diversification and value-added processing; (2) environmental value through low-emission production and waste reuse practices; and (3) socio-cultural value through strengthening local identity and culinary heritage. Empirical evidence shows that controlled roasting reduces sulfur odor, one of the main barriers to consumer acceptance, while community-based production enhances local participation. KOPETE demonstrates strong potential to become a sustainable culinary tourism product that enhances destination branding and visitor experience in Buton. The study concludes that integrating local food innovation with green entrepreneurship principles can contribute significantly to sustainable tourism development while empowering local communities.

Keywords: *Sustainable entrepreneurship, Local resource innovation, Non-caffeinated beverage, Green economy, Sustainable tourism*

1. INTRODUCTION

Sustainable tourism has become a key paradigm in the development of global destinations, emphasizing the integration between economic growth, environmental protection, and socio-cultural well-being [1], [2]. Within this framework, tourism products that elevate local culture and biodiversity contribute significantly to the competitiveness of destinations through the creation of authentic and value-added experiences [3], [4]. Local food and beverage product innovation is increasingly recognized as a strategic instrument in strengthening the image of destinations as well as improving the quality of the tourist experience [5]. Global trends show that modern travelers are increasingly interested in products that are not only unique, but also sustainable and health-oriented.

In recent years, functional beverages and non-caffeinated coffee alternatives have experienced significant growth as consumer awareness of health and environmental sustainability impacts has increased [14], [16]. Reliance on conventional coffee faces a variety of challenges, including climate change, supply chain instability, and fluctuations in commodity prices. Therefore, the development of local resource-based coffee substitutions is a strategic opportunity in product diversification while supporting regional economic resilience [14], [15]. Alternative beverage products that utilize local raw materials also open up competitive niche market opportunities at the national and international levels.

Parkia speciosa (petai) is one of the typical Southeast Asian biological resources that has bioactive content and antioxidant potential that has been scientifically researched [17]–[19]. So far, the use of

petai has been largely limited to fresh consumption as a traditional food. The transformation of petai into value-added processed beverage products is still relatively rarely studied in the academic literature. In fact, the bioeconomic approach emphasizes the importance of increasing the added value of biological resources through product innovation and the development of local value chains [11], [12].

Green entrepreneurship theory emphasizes that business innovation should not only be oriented towards economic gain, but also create environmental and social value [6], [7]. Sustainable business models integrate the principles of the triple bottom line—economic, environmental, and social—into the system of value creation and distribution [8], [10]. The integration of local entrepreneurship with sustainability principles has been proven to strengthen regional economic resilience while supporting the development of sustainable tourism [20].

In this context, KOPETE, which is an alternative to non-caffeinated coffee made from Buton local petai, represents a form of biodiversity-based innovation that has the potential to be developed as a green entrepreneurship model. By utilizing local resources and implementing sustainable production practices, KOPETE not only increases the economic value of petai products, but also strengthens the narrative of sustainable tourism through regional culinary identity. This study aims to analyze KOPETE as a green entrepreneurship model that supports the development of sustainable tourism through the creation of integrated economic, environmental, and social values.

Despite increasing attention to sustainable tourism and functional beverage innovation, limited studies have explored the transformation of underutilized local biodiversity into non-caffeinated coffee alternatives within a green entrepreneurship framework, particularly in small island contexts.

This study addresses this gap by examining KOPETE as a localized innovation model. It offers three key contributions: (1) conceptualizing a non-caffeinated coffee substitute derived from *Parkia speciosa* within sustainable tourism discourse; (2) integrating green entrepreneurship and bioeconomy perspectives into a community-based product innovation model; and (3) proposing a replicable framework for sustainable tourism development in peripheral regions.

2. LITERATURE REVIEW

2.1. Sustainable Tourism Framework

Sustainable tourism is defined as tourism that fully considers its current and future economic, social, and environmental impacts while addressing the needs of visitors, industry, environment, and host communities [1]. The triple bottom line framework (economic, environmental, and social sustainability) has become a dominant paradigm in sustainable tourism studies [7].

From an economic perspective, tourism should generate inclusive local income and reduce leakage. From an environmental perspective, tourism must minimize ecological degradation. From a socio-cultural perspective, tourism must preserve local identity and cultural heritage. Local food and beverage innovation has increasingly been recognized as a strategic instrument to operationalize these sustainability dimensions [8].

Recent studies emphasize that destination competitiveness is strongly influenced by authentic local products integrated into tourism experiences [9]. Culinary-based tourism not only increases visitor satisfaction but also enhances place, branding, and destination differentiation in a highly competitive global tourism market.

2.2. Green entrepreneurship and sustainable business models

Green entrepreneurship extends beyond profit-making activities; it integrates ecological responsibility and social value creation into core business strategies [4]. Schaltegger and Wagner [10] argue that sustainable entrepreneurs act as change agents who identify market failures related to environmental degradation and transform them into business opportunities.

Sustainable business models differ from conventional models because they incorporate environmental efficiency, resource circularity, and stakeholder value creation [6]. The circular economy approach emphasizes waste reduction, reuse, and local resource optimization. In rural and island regions, green entrepreneurship contributes significantly to local resilience by reducing dependency on external supply chains.

Furthermore, sustainable entrepreneurship aligns with the Sustainable Development Goals (SDGs), particularly SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). Small-scale food innovation enterprises in developing regions demonstrate strong potential to support these global agendas [11].

2.3. Local resource valorization and bioeconomy

Valorization refers to increasing the economic and functional value of local resources through innovation and processing [12]. In the context of bioeconomy, agricultural biodiversity can be transformed into high-value functional products. The transition from raw commodity sales to processed goods enhances local economic multipliers and strengthens value chains.

Parkia speciosa (pete) has traditionally been consumed as a vegetable in Southeast Asia. However, its potential as a processed functional beverage ingredient remains underexplored. The roasting and grinding of

non-coffee plant materials as coffee substitutes have been documented in several cultures, such as chicory-based beverages and barley coffee [5]. These products respond to increasing consumer awareness of caffeine-related health concerns.

By positioning KOPETE as a non-caffeinated functional beverage, the product enters the expanding global market for healthy and specialty drinks. This strategic positioning increases its relevance beyond local consumption and opens export-oriented opportunities

3. METHOD

Research Design

This study employed a qualitative descriptive research design to explore the development of KOPETE as a green entrepreneurship model based on local biodiversity. A qualitative approach was chosen because the research aims to understand processes, value creation mechanisms, and contextual socio-economic dynamics rather than to test statistical hypotheses. The descriptive design enables comprehensive examination of innovation practices, production systems, and tourism integration within their natural setting.

The study adopted a case study strategy focusing on KOPETE development in Buton, Southeast Sulawesi, Indonesia. The case study approach allows in-depth investigation of a contemporary phenomenon within its real-life context, particularly when the boundaries between phenomenon and context are not clearly evident [13].

Research Site and Participants

The research was conducted in Buton Island, where pete (Parkia speciosa) is locally cultivated and traditionally consumed. Participants were selected using purposive sampling to ensure relevance and depth of information. A total of 12 informants were involved in this study, consisting of: 4 local pete farmers, 3 KOPETE producers (micro-scale entrepreneurs), 3 tourism stakeholders (local tourism office and café owners) and 2 community members involved in product distribution. Selection criteria included direct involvement in production, processing, or tourism-related activities. This composition allowed triangulation of perspectives across the value chain.

Technical Data Collection

Data were collected through multiple qualitative techniques to ensure triangulation and enhance validity:

1. Field Observation

Direct observations were conducted at production sites to examine: Raw material selection and handling; Drying and roasting techniques; Grinding and packaging processes and Waste management practices. Field notes documented production workflow, equipment use, hygiene standards, and sustainability practices.

2. Semi-Structured Interviews

Semi-structured interviews were conducted to gather insights into: Supply chain structure; Cost and revenue mechanisms; Innovation motivation; Market challenges and Perceived tourism potential. Open-ended questions allowed flexibility while maintaining thematic consistency. Interviews were recorded (with consent), transcribed, and coded for analysis.

3. Documentation Analysis

Supporting documents were analyzed, including: 1) Local tourism development plans; 2) MSME records and production reports; 3) Promotional materials and 4) Government policy documents. This analysis provided contextual understanding of institutional and market environments.

3.4 Research Procedure

The research procedure was conducted systematically through the following stages:

1. Identification of Local Pete Supply Chains

This stage mapped the upstream-to-downstream value chain of pete, including: Source of raw materials (local farmers); Harvesting cycles; Distribution channels and Price structure. Value chain mapping aimed to identify economic flows and stakeholder roles.

2. Analysis of Processing Techniques

The second stage analyzed technical processes involved in producing roasted pete powder, including: Seed cleaning and slicing; Sun-drying or oven-drying; Controlled roasting to reduce sulfur compounds; Grinding and sieving and Packaging. The sustainability dimension of each process was evaluated based on energy use, waste generation, and resource efficiency.

3. Evaluation of Business Model Components

Business model evaluation employed the Sustainable Business Model framework, integrating economic, environmental, and social dimensions. Analysis covered: Value proposition, Key activities, Key resources, Customer segments, Revenue streams and Cost structure. The Business Model Canvas (BMC) approach was adapted to incorporate sustainability considerations, including circular economy elements.

4. Assessment of Tourism Integration Potential

This stage evaluated KOPETE's role within the local tourism ecosystem by analyzing: Product compatibility with culinary tourism, Potential inclusion in tourism packages, Branding opportunities and Collaboration with hospitality businesses. The assessment considered destination branding theory and community-based tourism principles.

Data Analysis

Data analysis followed thematic coding techniques [13]. The process consisted of:

1. Data Reduction – Transcribed interviews and field notes were organized and filtered based on relevance.
2. Open Coding – Initial codes were assigned to key concepts related to economic value, environmental sustainability, and socio-cultural impact.
3. Axial Coding – Codes were grouped into broader thematic categories aligned with the triple bottom line framework.
4. Selective Coding – Core themes were synthesized to explain how KOPETE functions as a green entrepreneurship model supporting sustainable tourism.

Thematic categories included: Economic value creation, Environmental sustainability practices, Socio-cultural empowerment and Tourism competitiveness contribution. Triangulation between observation, interviews, and documentation enhanced credibility. Analytical rigor was maintained through iterative comparison and validation among data sources.

Data analysis followed Braun and Clarke's (2006) thematic analysis framework, ensuring systematic identification of patterns across qualitative data. Example of coding process: 1) Raw data: *"We reuse pete shells as compost to reduce waste"*; 2) Initial code: Circular practice; 3) Category: Environmental sustainability and 4) Theme: Circular economy implementation. This step strengthened analytical transparency and interpretative rigor.

Validity and Reliability

To ensure research trustworthiness, the study applied: Triangulation of data sources, Member checking with selected informants, Audit trail documentation and Peer review of coding process. These measures strengthened the reliability and credibility of findings.

4. FINDINGS AND DISCUSSION

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Figure 1. Copy product

4.1 Innovation process and product differentiation

The transformation of pete to KOPETE shows a *process of local resource-based innovation* that is in line with the concepts of sustainable entrepreneurship and circular business innovation [1], [4]. The controlled roasting stage functions not only as a processing technique, but also as an appropriate technological strategy to reduce the content of volatile sulfur compounds that have been the main obstacles to consumer acceptance. This finding is supported by empirical evidence from field interviews. One producer stated:

"At first, people rejected the smell of pete, but after controlled roasting, the aroma becomes more acceptable and even unique."

This indicates that technological adaptation plays a crucial role in improving product acceptability and market potential. This process-based innovation approach reflects the integration between technological innovation and product sustainability as discussed in the green innovation literature [5], [6].

Product differentiation is carried out through four main strategies. First, the determination of a caffeine-free position places KOPETE in a segment of the functional beverage market that is growing rapidly due to increasing global health awareness [9], [10]. Second, the narrative of local authenticity reinforces the symbolic value of the product as a representation of Buton's biodiversity, which in the context of sustainable tourism serves as a destination differentiation element [2], [3]. Third, eco-friendly packaging reflects a commitment to the principles of circular economy and waste reduction [6], [7]. This practice is further confirmed by an informant who emphasized: "We try to use all parts of the pete, including the waste, so nothing is wasted." This reflects the implementation of a closed-loop system, which is a core principle of circular economy and green entrepreneurship. Fourth, health-oriented branding expands the appeal of products beyond the local market and adapts to sustainable consumption trends [8].

In the context of sustainable innovation theory, KOPETE can be categorized as *sustainable product innovation* because it integrates economic, environmental, and social values in its value proposition [4], [5]. This puts KOPETE in line with the global trend of plant-based alternative beverages that emphasize health and sustainability [9].

4.2 Economic Sustainability Analysis

Economically, KOPETE shows a significant impact on strengthening local value chains. The transformation of raw commodities into value-added processed products is an important strategy in local economic development and community-based entrepreneurship [1], [3]. Increasing *value-added* through processing extends the shelf life of products and increases selling prices, as described in the literature on sustainable business model innovation [4].

Diversification of income for farmers creates better economic stability, especially in the season of

fluctuations in commodity prices, and strengthens the economic resilience of the community [2]. The growth of micro-enterprises based on local processing also reduces dependence on imported coffee commodities and expands economic opportunities based on domestic resources [6].

Vertical integration allows producers to control the process from raw materials to marketing, so that profit margins are more optimal. When associated with the tourism sector, the economic impact becomes multiplied through souvenir markets, cooperation with hotels and cafes, and the potential for agro-industry-based tour packages [1], [3]. This is consistent with the concept *of inclusive local economic development* in sustainable tourism [2].

4.3 Environmental Sustainability Assessment

From an environmental perspective, KOPETE shows low-emission production characteristics because it uses local raw materials, thus minimizing the carbon footprint of transportation [6], [7]. The agroforestry system in which pete grows naturally also supports biodiversity conservation and ecosystem stability, which are the main principles of the circular economy in the agro-industrial sector [5].

The use of leather waste and leftover production as compost reflects the application of *the principle of the closed-loop system* in the circular economy [6]. The production process with minimal additives reinforces the claim as an environmentally friendly product and is in line with *green entrepreneurship* practices [4].

When compared to conventional coffee production which often requires intensive inputs and land expansion, KOPETE has a relatively lower ecological footprint [7].

Compared to conventional coffee production systems, which often involve high land-use intensity and global supply chains, KOPETE demonstrates a significantly lower ecological footprint due to localized sourcing and low-input processing. This aligns with circular economy principles and reinforces its relevance as a sustainable alternative beverage. Thus, this product meets the criteria of *environmentally responsible entrepreneurship* as discussed in the sustainable entrepreneurship literature [1], [4].

4.4 Socio-Cultural and Tourism Branding Impact

Socio-culturally, KOPETE plays a role in revitalizing local identity. The transformation of traditional food into modern products shows that innovation can be an instrument of cultural preservation as well as economic empowerment [2], [3]. This approach is in line with the principle of *community-based tourism* which places the community as the main actor [1].

In *experiential tourism*, narrative has a central role in shaping tourists' perceptions and memories [10]. The story "From traditional pete to sustainable coffee alternative" creates emotional differentiation that strengthens the imagery of the destination as an innovative and environmentally friendly destination [2].

Community involvement in the production process strengthens social cohesion and creates a more equitable distribution of economic benefits [1], [3]. This supports integration between green entrepreneurship and sustainable destination development.

4.5 SWOT Analysis

Strength

The uniqueness of decaffeinated products and strong local identity provide competitive differentiation. The continued availability of raw materials supports production stability, while health-based positioning is in line with global trends.

Disadvantages

Consumer awareness is still limited, especially towards the concept of pete-based coffee. The small scale of processing technology limits production capacity. Functional claims also still require more comprehensive scientific validation.

Opportunities

The growth of the global functional beverage market opens up export potential. The trend of sustainable tourism expands the opportunity for product integration in tour packages. Government support for MSMEs is also a strengthening factor.

Threats

Skepticism of non-conventional coffee products can hinder market penetration. Competition with established herbal drinks is also a challenge. Food regulations and certifications can become administrative obstacles if not met.

The SWOT analysis shows that KOPETE's strengths and opportunities are relatively more dominant than weaknesses and threats, especially if supported by a sustainable innovation strategy.

4.6 Conceptual Model of KOPETE Green Entrepreneurship

The findings of this study can be synthesized into a conceptual model illustrating how KOPETE operates as a green entrepreneurship system supporting sustainable tourism (Figure 2).

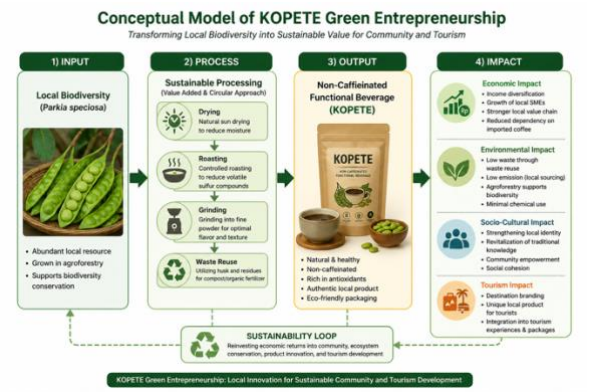


Figure 2. Conceptual Model of KOPETE Green Entrepreneurship

The model consists of four main components: 1) Input: Local biodiversity (*Parkia speciosa*); 2) Process: Sustainable processing (drying, roasting, grinding, waste reuse); 3) Output: Non-caffeinated functional beverage (KOPETE); dan 4) Impact: Economic (income diversification), Environmental (low waste, low emission), Socio-cultural (identity strengthening) dan Tourism (destination branding)

This model highlights the integration between bioeconomy and sustainable tourism through community-based entrepreneurship.

5. CONCLUSIONS

This study demonstrates that KOPETE represents a bioeconomy-driven green entrepreneurship model that integrates economic, environmental, and socio-cultural value creation. Unlike conventional product innovation, KOPETE emphasizes local resource valorization and community-based production, making it particularly relevant for small-island sustainable tourism development.

Theoretically, this study contributes by bridging sustainable tourism, green entrepreneurship, and bioeconomy within a single analytical framework. Practically, it offers a scalable model for developing local-based functional products that enhance destination competitiveness.

From a policy perspective, the findings support the promotion of local biodiversity-based innovation as part of regional sustainable development strategies.

Future research should incorporate quantitative validation, including consumer perception analysis and life cycle assessment (LCA), to further strengthen the commercialization potential of KOPETE.

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