

PAPER

Tropikies: Coconut Shell-Based Cookie Innovation to Support the Circular Economy

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ABSTRACT

Tropikies is an innovative healthy snack product in the form of cookies that utilizes coconut dregs as the main raw material. This product was developed as a solution to the problem of food waste that is still found in the coconut processing industry. Utilization of coconut dregs not only reduces organic waste, but also produces products of high economic value that are rich in fiber and environmentally friendly. This research aims to develop the Tropikies business model through the Business Model Canvas (BMC) approach to create a sustainable and competitive business. The methods used include observation of market trends, simple interviews with prospective consumers, competitor analysis, as well as the application of the Design Thinking approach in product development. The results of the research show that Tropikies has a promising market potential as the community's awareness of healthy and sustainable consumption patterns increases. Business Model Canvas analysis shows that the main advantage of the product lies in the utilization of organic waste into value-added food products, the use of environmentally friendly packaging, and an effective digital marketing strategy. In addition to providing economic benefits, Tropikies also contributes to the reduction of food waste and supports the implementation of a circular economy. Thus, Tropikies has the opportunity to develop as an innovative product capable of providing a positive impact on the environment, society, and local economy.

KEYWORDS

Coconut dregs; Cookies; Circular Economy; Food Innovation; Business Model Canvas

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1. INTRODUCTION

The problem of food waste has become one of the global issues that has received serious attention in the last few years. According to a United Nations Environment Program (UNEP) report, around 1.05 billion tons of food is wasted every year around the world, which is equivalent to almost 20% of the total food available to consumers [1]. This condition not only causes great economic losses, but also has a negative impact on the environment through increased greenhouse gas emissions, inefficient land use, and waste of natural resources [2].

Indonesia as an agrarian country and one of the largest coconut producers in the world also faces similar challenges in the management of agricultural and agro-industrial waste. Coconut is a strategic commodity that is widely used as a raw material for the food and beverage industry. However, the process of processing coconuts into coconut milk and other derivative products produces a large amount of coconut dregs. Most of the coconut dregs have not yet been utilized optimally and are often only used as livestock feed or even discarded as waste [3].

However, various studies show that coconut pomace still has a high enough content of food fiber, protein, and fat that it has the potential to be used as a raw material for value-added food products [4]. The use of coconut dregs as an alternative raw material is not only able to reduce the volume of organic waste, but can also create new economic opportunities through the development of innovative products that suit the needs of the modern market [5].

On the other hand, there is a change in consumer behavior that increasingly pays attention to aspects of health and environmental sustainability in the decision to purchase food products. Today's consumers not only consider the taste and price of the product, but also the nutritional content, food safety, and the environmental impact produced during the production process [6]. This phenomenon encourages the emergence of sustainable consumption trends and increased demand for healthy, natural, and environmentally friendly food products [7].

The development of the trend opens up great opportunities for the development of alternative raw material-based snack products. One of the products that has high potential is cookies. Cookies are one of the types of snacks that are popular among various age groups because they have a variety of flavors, are easy to consume, and have a relatively long shelf life [8]. However, most of the cookie products circulating in the market still use conventional raw materials and not many have integrated the concept of sustainability in their production process.

Based on the observation of the various healthy snack products available in the market, it was found that most products still focus on the aspect of taste and nutritional content without providing a solution to the problem of food waste. In addition, the utilization of raw materials resulting from upcycling food or the reprocessing of food waste into economically valuable products is still relatively limited. This condition shows that there is a gap (research and market gap) between the increasing consumer demand for sustainable products and the availability of innovative products that are able to answer those needs [9].

In an effort to answer the challenge, Tropikies was developed, which is an innovation of cookies based on coconut dregs that adopts circular economy principles. The circular economy concept emphasizes the reuse of resources that were previously considered waste to produce new products that have higher economic value [10]. Through this approach, coconut dregs that previously had low economic value can be processed into healthy snack products, worth selling, and environmentally friendly.

Tropikies not only offers cookies with a special coconut taste and high fiber content, but also provides social and environmental benefits. From an environmental aspect, this product contributes to the reduction of organic waste. From an economic aspect, Tropikies is able to create added value from raw materials that were not used optimally before. Meanwhile, from a social aspect, this product can increase community awareness of the importance of sustainable consumption and responsible food waste management.

In addition, the development of Tropikies is also in line with several goals in the Sustainable Development Goals (SDGs), especially goal number 8 on decent jobs and economic growth, goal number 12 on responsible consumption and production, and goal number 13 on handling climate change [11]. Thus, this innovation is not only oriented towards economic profit, but also provides a wider positive impact for society and the environment.

Based on the description, the purpose of this article is to analyze the development of Tropikies as an innovation of cookies based on coconut dregs in supporting the implementation of a circular economy through the utilization of food waste into value-added products, as well as designing a sustainable business model using the Business Model Canvas approach.

2. METHOD

2.1 Research Approach

This research uses a qualitative descriptive approach with a product development approach that is combined with the concept of Design Thinking and Business Model Canvas (BMC). This approach was chosen because it was able to identify consumer needs, develop innovative solutions, and design a sustainable business model [12].

The development of Tropikies is carried out through several stages starting from the identification of the coconut waste problem, analysis of market needs, product development, to the preparation of a business model. The approach makes it possible for the products produced to be not only technically qualified, but also have high market potential and are able to provide a positive social and environmental impact.

2.2 Data Collection Methods

The data used in this research was obtained through observation, interviews, and literature studies. The three methods are used to obtain information on market trends, consumer preferences, raw material potential, and business model development opportunities.

2.2.1 Observation

Observations were made on various cookies and healthy snack products that have been circulating in the market, both through retail stores and digital platforms such as marketplaces and social media. The purpose of observation is to identify the characteristics of competitor products which include:

- Composition of raw materials.
- Nutritional content.
- Selling price of the product.
- Packaging design.
- Promotional strategy.
- Distribution channels.

The results of observation show that most of the cookie products in circulation still use conventional raw materials and not many use food waste as the main ingredient. In addition, the aspect of sustainability has not yet become the main selling point of most of the observed products.

2.2.2 Interviews

Interviews were conducted in a semi-structured manner to prospective potential consumers consisting of students, office workers, and housewives as Tropikies' main target market. The interview aims to obtain information about:

- Habits of snack food consumption.
- The level of concern for health.
- Perception of food waste-based products.

- d. Product price preferences.
- e. Interest in environmentally friendly products.

The information obtained from the interview is used as a basis in determining product characteristics, marketing strategies, and the preparation of value propositions that suit consumer needs.

2.2.3 Literature Study

To establish a solid theoretical and practical foundation, a comprehensive literature review was systematically conducted across a wide spectrum of academic and institutional sources. This process involved retrieving and analyzing peer-reviewed scientific journals, authoritative books, strategic reports from international organizations, and pertinent government regulatory documents. The scope of the review targeted key thematic domains, specifically the circular economy framework, sustainable food waste management practices, innovative food product development, and the principles of sustainable entrepreneurship. Beyond serving as a conceptual framework for the architectural and operational design of Tropikies, this synthesis critically identifies global best practices and technological benchmarks in upcycling food waste into high-value products [13].

2.3 Product Development Method

The product development framework for Tropikies was executed through a human-centered Design Thinking approach, structured across five iterative stages: Empathize, Define, Ideate, Prototype, and Test [14]. This methodology was selected to ensure that the resulting product directly addresses validated consumer pain points while aligning with market sustainability demands. In the Empathize stage, primary insights regarding food waste perception and consumer preferences were gathered, which were subsequently synthesized during the Define phase to articulate core problem statements. The Ideate phase fostered cross-disciplinary solutions for value-added product formulations, leading to the rapid creation of functional Prototypes. Finally, rigorous Testing iterations were conducted with key stakeholders to evaluate product acceptability, sensory profiles, and overall viability before final deployment.

2.3.1 Empathize

The first stage is done by understanding the needs and problems faced by consumers as well as the environmental conditions behind the emergence of innovation. At this stage, two main problems were found, namely:

- a. The high amount of coconut dregs that has not been used optimally.
- b. Increasing consumer demand for healthy and environmentally friendly snack products.

The findings are the basis for the development of solutions that are oriented towards market needs and sustainability principles.

2.3.2 Define

The Define stage aims to formulate the problem specifically so that the right solution can be developed. The problems identified are:

- a. Coconut waste has a low economic value.
- b. There are not many snack food products that integrate the circular economy concept.
- c. Consumers need healthy snack alternatives that are safe and nutritious.

Based on the results of the identification, a solution was formulated in the form of the development of cookies based on coconut dregs with the concept of sustainability.

2.3.3 Ideate

At this stage, the process of developing various alternative product ideas that can be produced from coconut dregs is carried out. Some of the alternatives considered include:

- a. Chips made from coconut dregs.
- b. Granola based on coconut dregs.
- c. Coconut husk flour.
- d. Cookies made from coconut dregs.

After conducting an analysis of market eligibility, production facilities, and business development potential, cookies products with the Tropikies brand were selected as the most potential solution.

2.3.4 Prototype

The Prototype stage is done by making trial products using a formulation of ingredients consisting of coconut dregs, flour, granulated sugar, eggs, margarine, vanilla, baking powder, and salt. The production process includes:

- a. Drying coconut dregs to reduce water content.
- b. Mixing raw materials to form a homogeneous dough.
- c. Forming the dough into cookies.
- d. Roasting at a certain temperature until it produces a crispy texture.
- e. Refrigeration and storage of products.

In addition to the development of physical products, at this stage, brand identity planning and packaging design that highlights the concept of sustainability is also carried out. The production stages of Tropikies are planned to ensure that product quality is maintained and produce cookies that are safe and suitable for consumption. The product production flow can be seen in Figure 1.

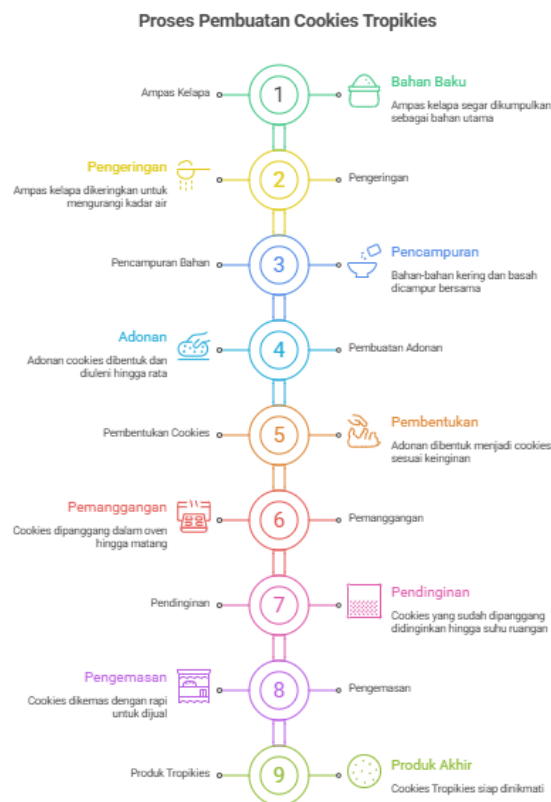


Figure 1. Production Flow of Tropikies Based on Coconut Shell

2.3.5 Test

The Test stage is done through product trials to prospective consumers to obtain feedback on taste, texture, aroma, packaging, and product price. The input obtained is used to improve the quality of the product so that it is in line with market preferences before being produced on a larger scale. To ensure that the products that are developed are in line with consumer needs and have high innovation value, the Tropikies development process is carried out using the Design Thinking approach which consists of five main stages as shown in Figure 2.

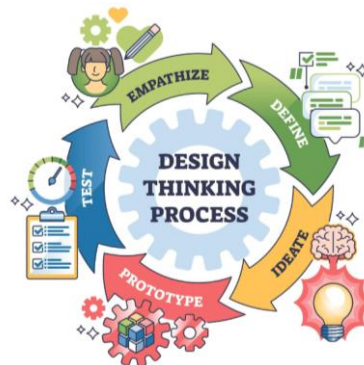


Figure 2. Stages of Design Thinking in Tropikies Product Development

2.4 Business Model Canvas Implementation

Tropikies business model planning is done using the Business Model Canvas approach developed by Osterwalder and Pigneur [15]. This model is used to map the nine main elements of business which consist of: Customer Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structure. Business Model Canvas implementation is done through four main stages as follows.

- a. Preparation Stage: The preparation stage covers business opportunity identification, market analysis, resource mapping, and business strategy planning.

- b. Education and Training Stage: At this stage learning about entrepreneurship, digital marketing, business financial management, and circular economy concepts to support Tropikies business development.
- c. Mentoring Stage: The mentoring stage is carried out during the production process, marketing, and the preparation of the business model to ensure that all activities run in accordance with the goals that have been set.
- d. Evaluation Stage: Evaluation is done by measuring the level of consumer acceptance of the product, the effectiveness of the marketing strategy, as well as the sustainability potential of the business model that has been planned. The results of the evaluation are used as a basis for improvement and business development at the next level.

3. RESULT AND DISCUSSION

3.1 Product Development Results

The results of product development show that coconut dregs can be used as an alternative raw material in the manufacture of cookies that have a good taste, texture, and nutritional value. The product produced is named Tropikies, which are coconut dregs-based cookies developed with the concept of sustainability and circular economy.

The use of coconut dregs as the main raw material provides added value to waste that previously had low economic value. In addition to reducing food waste, the use of coconut dregs also increases the fiber content in the product so that it can be a healthier snack alternative compared to conventional products [16]. Based on the development process that has been carried out, Tropikies has several main characteristics as follows:

- a. Using coconut dregs as the main raw material.
- b. Contains natural dietary fiber.
- c. Has a special taste of coconut.
- d. Produced using readily available materials.
- e. Using packaging that supports the environmentally friendly concept.
- f. Have affordable prices for various consumer segments.

These characteristics make Tropikies not only a snack product, but also a form of real implementation of circular economy principles in the food industry.

3.2 Market Opportunity Analysis

Changes in consumer behavior in the last few years show an increase in interest in healthy and sustainable food products. According to the Global Sustainable Consumption Report, younger generation consumers tend to prefer products that have a positive impact on the environment compared to conventional products [17]. The results of observations and interviews conducted show that the majority of potential consumers are interested in products that have the following characteristics:

- a. Contains natural ingredients.
- b. Has health benefits.
- c. Using attractive packaging.
- d. Produced with an environmentally friendly concept.
- e. Have an affordable price.

The findings show that Tropikies has a considerable market opportunity because it is able to meet several consumer needs at the same time, namely the need for healthy snacks, innovative products, and products that support environmental sustainability. In addition, the increasing trend of green consumerism provides an opportunity for food waste-based products to expand more widely in the national and international markets [18].

In order to find out the competitive position of Tropikies in the market, observations were made on some of the cookie products that have been circulating. The observation results are shown in Table 1.

Table 1. Comparison of Tropikies with Competitor Products

Aspect	Product A	Product B	Product C	Product D
Sustainable raw materials	No	No	Partly	Yes
High fiber	Medium	Low	Medium	High
Circular economy concept	No	No	No	Yes
Environmentally friendly packaging	No	Partly	Partly	Yes
Affordable price	Yes	No	Yes	Yes

3.3 Business Model Canvas Analysis

The Business Model Canvas is used to comprehensively describe Tropikies' business model. This analysis helps identify the relationship between customers, value offered, resources, and business strategies used [15].

3.3.1 Customer Segments

Tropikies' main customer segments consist of: Student, Employees, Housewife, The community cares about the environment, Consumers with a healthy lifestyle, Vegetarians and vegans.

The segment was chosen because it has a high level of concern for health and environmental issues.

3.3.2 Value Proposition

The key values that Tropikies offers include:

- Healthy cookies based on coconut dregs.
- Rich in natural fiber.
- Support the reduction of food waste.
- Affordable price.
- Innovative local products.
- Environmentally friendly.

This added value is the main differentiating factor compared to conventional cookie products circulating in the market.

3.3.3 Channels

The distribution channels used include: Instagram, TikTok, WhatsApp Business, Marketplace, UMKM Bazaar, Entrepreneurship Exhibition, Local souvenir shops. The use of digital channels was chosen because it is able to reach consumers more widely with relatively low promotional costs [19].

3.3.4 Customer Relationships

Relationships with customers are built through: Social media interaction, Education on sustainability, Programs, customer loyalty, Customer testimonials, Responsive service through digital platforms. The strategy aims to increase customer engagement while building trust in the Tropikies brand.

3.3.5 Revenue Streams

Sources of income come from: Sales of Tropikies products, Sale of hamper packages, Reseller program, Cooperation with souvenir shops, Cooperation with cafes and culinary UMKM. Diversification of income sources is expected to increase the sustainability of the business in the long term.

3.3.6 Key Resources

The main resources owned include: Coconut dregs as raw material, Production equipment, Business management team, Tropikies brand, Digital marketing platform.

3.3.7 Key Activities

The main business activities consist of: Procurement of raw materials, Production of cookies, Product packaging, Digital marketing, Product distribution.

3.3.8 Key Partnerships

The main partners in business development include: Coconut processing businesses, Packaging suppliers, Marketplace, Environmental communities, local UMKM. This partnership plays an important role in maintaining the sustainability of the supply chain and expanding market access.

3.3.9 Cost Structure

The main cost structure consists of: Raw material costs, Production costs, Packaging costs, Promotion costs, Distribution costs. Cost efficiency is one of the important factors to maintain product competitiveness in the market.

3.4 SWOT Analysis

SWOT analysis is used to identify internal and external conditions that affect the development of the Tropics.



Figure 3. Tropical SWOT Matrix

The results of the analysis show that the opportunities and strengths of Tropikies are greater than the weaknesses and threats faced so that this business has quite good development prospects.

3.5 Economic, Social, and Environmental Impact

3.5.1 Economic Impact

Tropikies provides added economic value through the utilization of coconut dregs which previously did not have a significant selling value. This product has the potential to create a new source of income for coconut processing businesses and the surrounding community. In addition, business expansion has the potential to open up new jobs in the production, marketing, and distribution sectors.

3.5.2 Social Impact

Tropikies contributes to raising public awareness of the importance of sustainable consumption and responsible food waste management. This product can also be an educational medium for the community about the importance of applying the circular economy in everyday life.

3.5.3 Environmental Impact

From an environmental point of view, the utilization of coconut dregs can reduce the amount of organic waste that has the potential to pollute the environment if not managed properly. This approach is in line with the principle of zero waste and the circular economy which is currently the focus of sustainable development in various countries [20].

3.6 Contribution to Sustainable Development Goals (SDGs)

The development of Tropikies contributes to several sustainable development goals (Sustainable Development Goals), namely:



Figure 4. Contribution of the Tropics to SDGs 8, SDGs 9, SDGs 12, and SDGs 13

Through the utilization of food waste into value-added products, Tropikies shows that business innovation can provide economic benefits while supporting environmental and social sustainability.

4. CONCLUSION

Tropikies is a food product innovation that utilizes coconut dregs as the main raw material in making cookies that are healthy, economically valuable, and environmentally friendly. The development of this product is motivated by the high amount of coconut dregs waste that has not been optimally utilized and the increasing need of the community for food products that support health and environmental sustainability. Through a circular economy approach, Tropikies succeeded in turning food waste into value-added products that have promising market potential. The results of the analysis show that Tropikies has a competitive advantage that lies in the combination of aspects of health, environmental sustainability, and product innovation. The use of coconut dregs as the main raw material not only contributes to reducing organic waste, but also produces products that are rich in fiber and are in line with the growing trend of healthy consumption in the community. In addition, a digital-based marketing strategy and the application of the Business Model Canvas provide a clear business framework in support of business continuity. Analysis of the Business Model Canvas shows that all Tropikies business elements are mutually integrated in creating value for customers. The main value offered is in the form of healthy cookies based on food waste that are reprocessed into high quality products. The support of strategic partners, the utilization of digital technology, as well as accurate market segmentation are important factors in increasing business competitiveness. From the economic side, Tropikies has the potential to create new sources of income through the utilization of waste that previously had low economic value. From a social point of view, this product is able to raise public awareness of the importance of sustainable consumption and responsible food waste management. While from the environmental side, the utilization of coconut dregs contributes to the reduction of organic waste and supports the implementation of the zero waste principle in the food industry. Tropikies development is also in line with sustainable development goals (Sustainable Development Goals), particularly SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). This shows that business innovation is not only able to generate economic profit, but is also able to have a

positive impact on society and the environment. As a recommendation, the expansion of Tropikies in the future can be done through the diversification of flavor variants, increasing production capacity, strengthening product certification, developing more innovative packaging, as well as expanding the distribution network through cooperation with various business partners. In addition, the utilization of digital technology and sustainability-based marketing strategies need to be continuously improved so that Tropikies is able to reach a wider market and strengthen its position as an innovative product that supports the circular economy in Indonesia.



Figure 6. Tropikies Product

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