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Characteristics and Business Feasibility of Fresh Noodles Product from Sweet Potato Flour with Moringa Leaves

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ABSTRACT

Moringa leaves added to fresh noodles made from sweet potato flour significantly increase nutritional content and improve the texture and flavor of the noodles, thereby enhancing their market value. This study aims to determine the best treatment combination for producing wet noodles made from white sweet potato flour with the addition of moringa leaf puree, analyze the organoleptic characteristics of the resulting wet noodles, as well as their chemical characteristics, particularly ash content and this study aims to assess the financial feasibility. The method used was an experiment varying the composition of moringa leaves (25 grams; 37,5 grams; and 50 grams) on organoleptic characteristics and ash content, along with a business feasibility evaluation conducted through financial analysis. The results showed that F3 (50 g moringa leaf puree) was the best formulation, with 1,19% ash content and 94% yield, meeting the SNI 01-2987-1992 standard. Moringa leaf puree significantly affected color, taste, and aroma ($p<0,05$), but not texture. Financial analysis showed a profit margin of 82%, B/C ratio of 5,43, payback period of 2,8 years, and break-even selling price of Rp2.764 per package, indicating that the product is economically feasible for small and medium-scale production.

Crossref

A. INTRODUCTION

Wet noodles, as one of Indonesia's staple foods, have become an inseparable part of Nusantara cuisine. However, in recent years, consumers have increasingly demanded food products that are not only delicious but also healthy and nutritious. The idea of combining moringa leaves and sweet potatoes in wet noodle production emerged from the desire to create food products that are not only tasty but also offer added nutritional and health benefits. Wet noodles made from white sweet potato flour with the addition of moringa leaf puree are expected to become an innovative food product that meets consumer needs for healthy and nutritious food options.

The existing wet noodle industry remains highly dependent on imported wheat flour, making it vulnerable to fluctuations in price and availability. Conventional noodles are generally high in carbohydrates but low in dietary fiber, protein, vitamins, and minerals, and therefore do not adequately support a functional-food-based diet. White sweet potatoes and moringa leaves are abundant, highly nutritious local resources, however, their use in processed products such as noodles remains limited, and they have not yet been combined synergistically.

Moringa leaves is a local plant known as a superfood because it is rich in nutrients such as protein, calcium, iron, vitamins A, C, and antioxidants. The addition of Moringa leaves in food products, including wet noodles, aims to enhance nutritional value, especially in terms of vitamins and minerals. Furthermore, Moringa leaves can provide a natural green color and a distinctive aroma that increases the product's appeal. According to Trigo et al., (2023), Moringa leaves is very potential to be used in functional food formulations because it can improve nutritional value without significantly altering the sensory characteristics of the product. Thus, the combination of white sweet potato flour and Moringa leaves can produce wet noodles that are not only economically valuable but also highly nutritious and in line with current functional food trends.

White sweet potato is one of the local food ingredients with great potential to be used as a substitute for wheat flour. White sweet potato contains high carbohydrates, a good source of energy, and dietary fiber that can help maintain digestive system health (Aghnia et al., 2025). In addition, white sweet potato flour has good water-binding capacity, which can improve the texture of processed products such as wet noodles. According to Purba et al., (2014), white sweet potato flour can be used as a substitute ingredient in noodle making, resulting in a fairly elastic texture, attractive color, and higher fiber content compared to noodles made from pure wheat flour.

Previous studies have examined moringa leaves and sweet potatoes separately, therefore the effects of combining these two ingredients on the nutritional quality, texture, and sensory acceptability of wet noodles remain unknown. Arni et al., (2024) reported that the addition of moringa leaf flour at various concentrations resulted in significant differences in the physical characteristics, specifically gel strength chemical characteristics, particularly moisture content; and sensory attributes including texture, taste, aroma, and color—of tilapia dumplings. Wetri et al., (2022) reported that, based on organoleptic tests of four sensory attributes, a significant effect (p-value < 0,05) was observed only for aroma and aftertaste, whereas color and texture did not show statistically significant differences (p-value > 0,05). Paramita et al., (2024) investigated the effect of adding moringa leaf flour (Moringa oleifera L.) to white chocolate as an alternative snack for preventing anemia among adolescent girls.

This research is important because it supports food diversification based on local resources to strengthen national food security. It also contributes to the development of functional foods by combining sweet potatoes as a source of complex carbohydrates and dietary fiber with moringa leaves as a source of protein, vitamins, and antioxidants. Furthermore, this study is expected to create a value-added product with nutritional advantages, a natural color, and a distinctive aroma, while providing an empirical scientific basis for understanding the interaction between these two ingredients in a wet-noodle system. The findings may serve as a reference for the development of similar products in the future.

Financial analysis is an important part of this research. Analysis of production costs, selling price, and break-even point is expected to provide a clear picture of the economic feasibility of producing this innovatif wet noodles. In addition, financial analysis can also be used to identify market potential and appropriate marketing strategies for this product. The benefits of this research can be experienced by various stakeholders. Consumers will have access to a healthier and more nutritious alternative to conventional wet noodles. Farmers and small and medium-sized enterprises (SMEs) will have opportunities to increase the economic value of local commodities through the diversification of processed products. The scientific community will benefit from additional literature on the synergistic use of local ingredients in food formulations.

Furthermore, this research can support national food policies by promoting the utilization of local food resources, reducing wheat flour imports, and contributing to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2, which focuses on zero hunger, food security, and improved nutrition, and SDG 12, which promotes responsible consumption and production. This study aims to determine the best treatment combination for producing wet noodles made from white sweet potato flour with the addition of moringa leaf puree. It also aims to analyze the organoleptic characteristics of the resulting wet noodles, including color, aroma, taste, texture, and overall acceptability, as well as their chemical characteristics, particularly ash content. In addition, this study aims to assess the financial feasibility of producing wet noodles from white sweet potato flour with the addition of moringa leaf puree.

B. METHODS

The equipment used for white sweet potato flour production includes a knife (1 unit), cabinet dryer (1 unit), flour milling machine (1 unit), and basins (2 units). The equipment used for wet noodle production includes a noodle extruder machine (1 unit), knife (1 unit), and basin (1 unit). The equipment for moringa leaf puree preparation includes a blender (1 unit), knife (1 unit), and beaker glass (1 unit). The equipment for ash content testing includes porcelain crucible, furnace, mortar, analytical balance, oven, and beaker glass. The equipment for organoleptic testing includes assessment forms and pens.

The ingredients used for making white sweet potato flour consist of white sweet potatoes. The ingredients used for making wet noodles include white sweet potato flour, moringa leaf puree, salt, water, lye water, egg yolk, and cooking oil. The ingredients for ash content and organoleptic testing are samples of wet noodles. The formulation or composition of the ingredients for making wet noodles can be seen in Table 1.

Table 1. Wet Noodle Formulation

Ingredient	Amount			
	F1	**F2**	**F3**	**K**
White sweet potato flour (gram)	250	250	250	0
Moringa leaf puree (gram)	25	37,5	50	0
Wheat flour (gram)	0	0	0	250
Salt (gram)	2	2	2	2
Water (ml)	100	100	100	100
Lye water (ml)	4	4	4	4
Egg yolk (pcs)	1	1	1	1

Notes :
K = Control
F1 = Formulation 1
F2 = Formulation 2
F3 = Formulation 3

This research method is designed using an experimental approach with a Completely Randomized Design (CRD) to optimize the product formulation and evaluate its financial feasibility. The study encompasses stages of raw material preparation, noodle formulation, physicochemical and sensory quality analysis, as well as cost-benefit-based financial calculations.

a) Work Procedure for White Sweet Potato Flour Production (Purba et al., 2014)

White sweet potatoes are washed and peeled, then sliced to approximately 2-3 mm thickness. The sliced sweet potatoes are placed into a cabinet dryer and dried at 80°C for 3 hours. Subsequently, the dried sweet potatoes are ground using a milling machine.

b) Procedure for Moringa Leaf Puree Preparation (Khasanah & Astuti, 2019)

Moringa leaves are collected and separated from their petioles, then washed. The moringa leaves are weighed to 100 grams. Water amounting to 100 ml is added to the moringa leaves. The moringa leaves are blended until smooth and form a puree.

c) Procedure For Wet Noodle Production (Purba et al., 2014)

All ingredients are weighed according to the treatments applied. White sweet potato flour, salt, water, egg yolk, ash water, and puree are mixed until homogeneous. Moringa leaves are added to the basin. The dough is stirred with a spatula and then kneaded by hand until smooth. The dough is rested for 10 minutes, covered with a damp cloth. The dough is then formed into sheets. It is subsequently cut or shaped using a noodle-making machine. Cooking oil is applied to prevent the dough from sticking. The noodles are then boiled for approximately 3 minutes. Once cooked, the noodles are drained and coated with oil again to prevent sticking.

d) Data Analysis of Ash Content Testing Procedure (Lasmono et al., 2024)

The wet noodle sample is weighed to 100 grams and then dried using an oven at 105°C for 2-3 hours. The dried sample is ground using a mortar until it becomes a fine powder. The fine sample is weighed to 1-2 grams and placed into a porcelain crucible. The sample is incinerated using a hotplate until the incineration process is complete (no more smoke is emitted). The incinerated sample is placed into a furnace at 550-600°C for 5-6 hours. The resulting ash is weighed, and the ash content is calculated using the formula:

$$\text{Ash Content (\%)} = \frac{\textit{Weight of porcelain test (g) – final weight}}{\textit{Weight of sampel}} \text{ X 100 \%}$$

e) Organoleptic Testing (Hapsari et al., 2024)

The tests conducted include hedonic preference testing and scoring. The parameters observed in the organoleptic testing are taste, aroma, texture, color, and the panelists' overall preference level. The number of panelists participating in this test is 30 people, who fill out the assessment forms. The organoleptic testing procedure involves preparing the wet noodle samples to be tested and assigning them codes. The author provides instructions to the panelists regarding the testing procedure and form completion. The panelists taste the wet noodle samples and then record the results and comments in the hedonic and scoring test forms. The author collects the data and performs ANOVA analysis.

f) Financial Analysis (Kusuma, 2025)

Calculations are performed using the following formulas:

- *Profit Margin* = $\frac{gross\ profit}{receipts}$ x 100 %
- *Payback period* (hari) = $\dfrac{Investment\ value}{\frac{net\ profit}{\text{12 month x number of production days during one month}}}$
- *B/C Ratio* = $\frac{Total\ revenue}{Total\ costs\ production}$
- BEP (Break Even Poin) selling price = $\frac{Total\ production\ costs\ per\ year\ (Rp)}{Total\ production\ per\ year\ (Pcs)}$
- BEP (Break Even Poin) volume production = $\frac{Total\ production\ costs\ per\ year\ (Rp)}{selling\ price\ of\ the\ product\ (Rp/Psc)}$

C. RESULT AND DISCUSSION

1. Ash content

Ash content is an important parameter in proximate analysis that indicates the total amount of inorganic minerals remaining after the organic material in the sample is burned at high temperature. According to Matakupan et al., (2022), ash content in food materials is related to mineral content and can be used to estimate the amount of inorganic nutrients stored in the product. The ash content in wet noodles made from white sweet potato base with the addition of moringa leaf puree showed the following results: 1,39% (Control), 0,93% (F1), 0,98% (F2), and 1,19% (F3) (Figure 1).

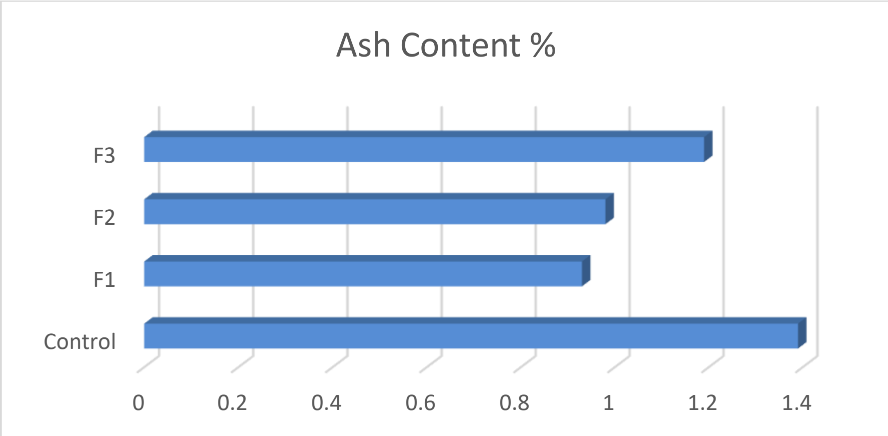

Figure 1. Ash Content

When compared to the ash content standard for wet noodles, which is a maximum of 3% (SNI 01-2987-1992), all samples still fall within the permitted limits. This indicates that the resulting noodle product is still acceptable in terms of ash content quality and safe for consumption based on this parameter. Ash content is influenced by differences in the composition of the constituent materials, particularly with the addition of *Moringa leaves* puree. *Moringa leaves* are indeed known to have high mineral content, such as calcium, potassium, and iron (Masitlha et al., 2024). According to Iswanto et al., (2019), ash content is also influenced by the purity level of the materials, processing techniques, and the possibility of mineral loss during boiling or heating. Differences in ash content between treatments also show that the level of moringa leaf puree addition plays a role in influencing the total mineral content in the final product. Increasing the addition does not necessarily increase the ash content, which indicates that mineral distribution does not only depend on the amount of material added, but also on the effectiveness of mineral binding and stability during the noodle-making.

2. Organoleptic Evaluation

Organoleptic evaluation utilized human senses as the primary assessment tool. Sensory evaluation focused on taste, aroma, texture, and color attributes. Results revealed significant differences in taste, aroma, and color, while texture showed no significant differences (Table 2). Taste represents a critical parameter in food products, determining consumer acceptance. Changes in taste from moringa leaves are influenced by bioactive compounds and flavor components from the added ingredient. Moringa leaves contain compounds such as flavonoids, saponins, and phenolic compounds that impart characteristic slightly bitter and astringent notes (Dellima et al., 2025).

Table 2. Organoleptic Evaluation

Sample	Category			
	Taste	Aroma	Texture	Color
F1	2,167a	4,267a	4,467a	5,200a
F2	3,867b	3,967a	4,433a	3,367b
F3	4,267b	3,867a	4,433a	2,867c
K	3,967b	2,167b	4,033a	2,133d

Note: Different symbols indicate significant differences

Noodle aroma is influenced by volatile compounds formed or present in the constituent ingredients. *Moringa leaves* possess a distinctive aroma derived from compounds like isothiocyanates, phenolic compounds, and essential oils. *Moringa* contains potent aromatic compounds detectable even in small quantities. During cooking, some volatile compounds may evaporate, but others persist within the noodle structure, imparting characteristic aroma. Thus, adding *Moringa leaves* puree to wet noodles increases aroma intensity compared to noodles without moringa addition (Yanti et al., 2020). Color differences in wet noodles result from added food ingredients containing natural pigments. Moringa leaves contain chlorophyll that produces green coloration; higher moringa usage results in greater green color intensity (Simarmata et al., 2025). Texture of white sweet potato wet noodles with varying moringa leaf puree showed no significant differences. This occurs because the ingredients used did not affect noodle texture. Wet noodle texture is determined by starch and protein content in the dough. White sweet potato flour has high starch content (amylose and amylopectin), while moringa leaves contain crude fiber and minimal protein (Moyo et al., 2011). Limited moringa puree additions (25 g, 37,5 g, and 50 g) were insufficient to significantly alter texture-forming ingredient ratios, resulting in no significant texture differences among samples (Lutfiani, 2025).

3. Financial Analysis

Yield represents the ratio of final product weight to initial raw material weight, expressed as a percentage. With an initial weight of 404 g and final weight of 378 g, Treatment 3 (50 g moringa leaf puree) achieved a 94% yield, indicating minimal material loss from total raw materials used. High yield is influenced by raw material characteristics, processing methods, and temperature/time stability. Lower material loss during processing signifies better processing efficiency. According to Widyaningsih (2022), high yield demonstrates that the treatment or method effectively retains primary material mass, producing maximum quantity with good quality.

Table 2. Financial Analysis

Description	Average
Yield (%)	94
Revenue	Rp. 140.400.000
Operational Costs	Rp. 25.871.236
Gross Profit	Rp. 114.528.764
Tax (0%)	-
Net Profit	Rp. 114.528.764
Profit Margin (%)	82
Paybac Period	2,8
Benefit Cost Ratio	5,43
Product Selling Price	Rp. 15.000
BEP Selling Price	Rp. 2.764
BEP Production Volume (Packages)	1.725

Financial analysis of white sweet potato wet noodle production with moringa leaf puree addition revealed strong economic potential and development feasibility. The 82% profit margin indicates substantial profit generation from total sales after deducting production and operational costs. High profit margin reflects raw material use efficiency and effective selling price strategy. Lubis, (2023) states that higher profit margins enhance business capacity to generate profit per sales rupiah, improving financial performance. The Payback Period (PP) of 2,8 years (26 production days) (Table 2) shows initial investment recovery within less than three years. This relatively short investment return period signifies low risk and rapid capital recovery. This aligns with Waluyo et al., (2026), who notes shorter payback periods indicate greater business feasibility due to reduced capital loss risk.

Break Even Point (BEP) calculation yielded minimum selling price of Rp2.764 per package and minimum production volume of 1,725 packages to reach break-even. Above Rp2,764 selling price and exceeding 1.725 packages sales volume generates profit. Results show high safety margin as Rp15.000 selling price significantly exceeds BEP. Rangkuti, (2017) emphasizes BEP analysis importance for determining minimum sales volume to avoid losses and supporting production/pricing strategy decisions.

A B/C ratio of 5,43 indicates every Rp1 expenditure yields Rp5,43 benefits. Values exceeding 1 confirm strong economic feasibility. Dewi et al., (2025) states higher B/C ratios produce greater profits per cost unit. The 5,43 value, supported by low PP and high profit margin, confirms this wet noodle business efficiency and high capital return potential. Financial analysis confirms white sweet potato wet noodle production with moringa leaf puree merits development. High profit margin, short payback period, low break-even point, and superior benefit-cost ratio demonstrate not only profitability but also high-value local food product potential. This business represents an economically viable, nutritious, and sustainable entrepreneurial opportunity.

D. CONCLUSION AND SUGGESTIONS

The research results indicate that the optimal outcome was achieved with formulation F3 (addition of 50 g of moringa leaf puree), yielding an ash content of 1,19% and a production yield of 94%; all wet noodle samples met the SNI 01-2987-1992 quality standard, with ash content remaining below the maximum limit of 3%. Organoleptic evaluation revealed that the addition of moringa leaf puree had a significant effect ($p<0,05$) on color, taste, and aroma attributes but did not significantly affect texture. Financially, the product demonstrates high business viability, featuring a profit margin of

82%, a Benefit-Cost (B/C) ratio of 5,43, a payback period of 2,8 years, and a break-even selling price of Rp2.764 per package. Consequently, it can be concluded that the combination of white sweet potato flour and moringa leaf puree has the potential to be developed into an alternative functional food product that not only meets quality standards and is sensorially acceptable but is also economically viable for production at the small and medium enterprise (SME) scale.

Suggetions that can be given are as follows future research should expand the scope by testing additional nutritional components (protein, fiber, and antioxidants), as well as conducting shelf-life and microbiological analyses to ensure product quality assurance and enhance commercial market potential. Alternative formulations should be explored, including different local flour varieties and varying moringa leaf puree concentrations. Additionally, product packaging and branding development is recommended to improve market appeal and competitiveness.

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