



**ANALYSIS OF PURPLE CRISPY ROLL PRODUCTION PROCESS AND
FEASIBILITY: A SNACK INNOVATION BASED ON PURPLE POTATO
(IPOMOEA BATATAS L.) IN MANADO CITY**

Hanasya Glorya Asyera Tampi¹
Politeknik Negeri Manado, Manado, Indonesia
hanatampi27@gmail.com

Juliet Pauladel Truly Makinggung²
Politeknik Negeri Manado, Manado, Indonesia
julietmakinggung@gmail.com

Jemmry Recy Winokan³
Politeknik Negeri Manado, Manado, Indonesia
jemrywinokan@gmail.com

Abstract

This study aims to analyze the production process, capacity, resource requirements, and operational feasibility of the Purple Crispy Roll business, an innovative snack made from purple sweet potato (*Ipomoea batatas* L.) wrapped in crispy spring roll skin. The method used is descriptive quantitative with a case study approach on the pioneering business of Manado State Polytechnic students. Primary data includes production plans, raw material requirements, equipment, labor, and operational costs; while secondary data includes demographic data of Mapanget District and literature related to purple sweet potato processing. The results show that the initial production capacity is 72,720 pcs/year with a production capital per session of Rp 526,000 and a total annual operational cost of Rp 1,200,000. The production process consists of three main stages: making purple sweet potato filling, rolling, and frying to a standard golden brown texture. Production projections show a growth of $\pm 9\%$ per year so that by 2030 the target is to reach 103,620 pcs. With three direct workers and a total wage of Rp 43,200,000/year, this business has the potential to become a model for a sustainable local food-based agro-industry in North Sulawesi.

Keywords: Snack Production; Purple Sweet Potato; Purple Crispy Roll; Agro-Industry; Manado MSMEs



INTRODUCTION

The locally sourced food industry continues to grow as public awareness of healthy, natural, and nutritious products increases (Ministry of Health of the Republic of Indonesia, 2020). One local food commodity with significant potential but underutilized is purple sweet potato (*Ipomoea batatas* L.). Purple sweet potato is known to be rich in anthocyanin, a flavonoid compound that functions as a natural antioxidant. It also contains fiber, vitamin B6, potassium, and beta-carotene, which are beneficial for digestive health and the immune system (Jusuf et al., 2008; Ginting et al., 2011).

The use of purple sweet potatoes in the snack industry holds strategic value in the context of developing micro, small, and medium enterprises (MSMEs). In North Sulawesi, particularly in Manado City and Mapanget District, demand for healthy snacks continues to rise, but is not matched by the availability of innovative, locally sourced food products (BPS Manado, 2024). This situation creates a market gap that can be filled by creative young entrepreneurs.

Purple Crispy Roll is a solution to this opportunity. This product is an innovative snack made from purple sweet potato, processed into a creamy filling with a touch of cheese spread and chocolate filling, then wrapped in crispy spring roll pastry for a crispy texture on the outside and soft on the inside. This product was developed by students of the D4 Business Management Study Program at Manado State Polytechnic as part of the applied entrepreneurship program.

This research focuses on the production aspects of the Purple Crispy Roll business, including the production process, capacity planning, raw material requirements, equipment, labor, and operational costs. The objectives of the research are: (1) to systematically describe the Purple Crispy Roll production process; (2) to analyze the production plan and capacity for the next five years; (3) to identify production resource requirements; and (4) to calculate the efficiency of production costs per unit. The results of this research are expected to be a reference for MSMEs and academics in developing agro-industry based on local food ingredients.

LITERATURE REVIEW

Purple Sweet Potato as a Raw Material for Functional Food

Purple sweet potato (*Ipomoea batatas* L. var. *ayumurasaki*) is a tuber plant that contains anthocyanins with the highest concentration compared to



other sweet potato varieties, ranging from 110–210 mg/100 g dry weight (Suda et al., 2003). Anthocyanins are natural pigments of the flavonoid class that not only provide a deep purple color but also function as powerful antioxidants that can ward off free radicals and reduce the risk of degenerative diseases (Lila, 2004).

In addition to anthocyanins, purple sweet potatoes contain dietary fiber (3.2 g/100 g), vitamin C, vitamin B6, potassium, and beta-carotene, all of which are essential for health (USDA, 2022). The lower glycemic index of purple sweet potatoes compared to yellow sweet potatoes makes them a more friendly choice for people with diabetes (Rimbawan & Siagian, 2004). These characteristics make purple sweet potatoes an ideal raw material for developing functional food products that are in demand by modern, health-conscious consumers.

Product Innovation in the Snack Industry

The snack industry in Indonesia is growing rapidly, with a market value reaching IDR 65 trillion in 2023 and projected to grow at 7.5% annually until 2028 (Euromonitor International, 2024). Key trends driving growth are the increasing demand for healthy snacks, products made from natural ingredients, and attractive and informative packaging (Nielsen, 2023). Product innovations that combine traditional values (local ingredients) with modern presentations (crispy textures, premium filling combinations) have been shown to increase the competitiveness of food MSMEs (Kusuma & Rahayu, 2021).

The concept of crispy spring rolls or lumpia has long been known in the Southeast Asian market. Deep-frying at 170–180°C produces a crispy crust with low moisture content, extending shelf life and enhancing consumer sensory acceptance (Moreira, 2001). The combination of spring roll skin with tuber-based filling is an underexplored segment in the Indonesian snack market, giving Purple Crispy Roll a strong differentiation.

Food MSME Production Management

Production management in micro and small businesses includes production capacity planning, raw material control, process quality standards, and labor efficiency (Heizer & Render, 2016). Good production planning begins with estimating market demand and then breaks it down into annual, monthly, and daily production plans. For food MSMEs, production capacity is heavily influenced by the number of workers, equipment availability, and effective working hours per day (Mukti, 2019).

Production cost efficiency is key to the sustainability of MSMEs. Competitive cost of goods sold (COGS) can be achieved through optimizing raw



material composition, reducing waste in the production process, and selecting equipment with appropriate capacity (Mulyadi, 2015). In the context of purple sweet potato-based products, potential efficiency also lies in the proximity of local raw material sources, which can reduce logistics costs and maintain ingredient freshness (Ginting et al., 2011).

RESEARCH METHOD

This research uses a quantitative descriptive method with a case study approach on the Purple Crispy Roll startup located in Mapanget District, Manado City, North Sulawesi. The observation period covers the business plan for 2026 with a five-year projection (2026–2030).

Primary data was collected through official Business Plan documentation verified by a supervisor at Manado State Polytechnic, direct observation of the production process, and in-depth interviews with the business management team. Secondary data was obtained from population data from Mapanget District (BPS Manado City, 2024), scientific literature on purple sweet potatoes, and national food industry reports.

Data analysis was conducted through: (1) mapping the production process flow using the Process Flow Diagram (PFD) approach; (2) calculating production resource requirements and costs; (3) projecting production capacity with an assumed growth of $\pm 9\%$ per year; and (4) calculating the cost of production per unit. All financial figures are presented in Rupiah (IDR) and have been validated through data triangulation.

RESULTS AND DISCUSSION

Purple Crispy Roll Product Description

Purple Crispy Roll is an innovative spring roll snack filled with purple sweet potato combined with cheese spread and chocolate filling, then wrapped in spring roll pastry and fried until golden brown. This product is characterized by a crispy texture on the outside and a soft, creamy inside, with the natural purple filling becoming the product's distinctive visual identity.

In terms of brand identity (branding), the Purple Crispy Roll logo is designed with a dominant purple color that represents the main raw material of purple sweet potato, a risol image that reflects the transparency of the product, and the tagline 'Crispy on the Outside, Melting on the Inside' that accurately describes the consumer's sensory experience. The packaging used is transparent



mica with a logo sticker, allowing consumers to see the product directly before purchasing.

Purple Crispy Roll Production Process

The Purple Crispy Roll production process consists of three main stages, each carried out sequentially to ensure consistent product quality. Here's a description of each stage:

Step 1: Making the Purple Sweet Potato Filling

1. Peel the purple sweet potato, wash it clean, then steam it for ± 20 –25 minutes until soft.
2. Mash the steamed sweet potatoes until smooth using a fork or food masher.
3. Sweetened condensed milk (SKM), margarine, and a little salt are added to obtain a sweet and savory taste and optimal creamy texture.
4. Chocolate filling is cut into pieces and cheese spread is prepared as an additional premium filling.
5. A thin solution of wheat flour and water is prepared as an adhesive to cover the roll.

Stage 2: Rolling (Assembly)

1. Ready-to-use spring roll skins are spread out on a clean surface.
2. Take enough purple sweet potato mixture, place it in the center of the spring roll skin.
3. Add chocolate filling pieces and spread cheese on top of the purple sweet potato mixture.
4. Roll the spring roll pastry tightly and fold the left and right sides so that the filling doesn't leak out.
5. Seal the ends of the roll using the flour solution and press gently.

Stage 3: Frying and Packaging

1. Cooking oil is heated in a pan at a temperature of 170 – 180°C (medium heat).
2. Put the Purple Crispy Roll into hot oil and fry for ± 3 –4 minutes.
3. The product is removed when the spring roll skin is golden brown and has a crispy texture.
4. The product is drained with an oil drainer for ± 2 minutes.
5. After the product temperature drops, it is packaged in transparent mica and a logo sticker is attached.

The entire production process is carried out with hygiene in mind, starting from the use of clean equipment, proper handling of raw materials, to tight packaging to maintain product quality and safety until it reaches consumers.



Production Plan and Capacity

Based on the operational capacity of the business with 3 direct workers and 6 working days per week (± 24 working days per month), Purple Crispy Roll sets an initial production capacity of 253 pcs per production session. With 6 production sessions per week, total weekly production reaches 1,515 pcs and annual production in 2026 is set at 72,720 pcs.

The production plan is designed with a projected annual growth of approximately 9%, taking into account market expansion and gradual increases in operational capacity. Table 1 presents details of the five-year production plan (2026–2030).

Table 1.
Purple Crispy Roll Production Plan 2026–2030

Year	Production Plan (pcs)	Growth (%)
2026	72,720	–
2027	79,740	+9.0%
2028	87,213	+9.4%
2029	95,164	+9.1%
2030	103,620	+8.9%

Source: Purple Crispy Roll Business Plan Data, processed (2026)

The data in Table 1 shows consistent production growth. In 2030, production volume is projected to reach 103,620 pcs, an increase of approximately 42.5% from the initial capacity in 2026. This growth is in line with the projected increase in market demand which will reach 1,470,276 pcs/year in 2030 (growth of $\pm 5\%$ per year from 1,209,600 pcs in 2026), with a consistent market share maintained at 20% of the available market opportunities.

4.4 Production Raw Material Requirements

The raw material requirements per production session (253 pcs) include 10 types of main materials with a total production capital of Rp 526,000. Table 2 details all raw material requirements along with estimated unit prices.

Table 2.
Raw Material Requirements per Production Session (253 pcs)

No	Raw material	Amount	Unit Price (Rp)	Total (Rp)
	Purple sweet potato	5.6 kg	15,000/Kg	84,000



	Spring Roll Skin	12 packs	7,000/pack	84,000
	Chocolate Filling	1 Kg	55,000/Kg	55,000
	Cheese Spread	1 Kg	75,000/Kg	75,000
	Sweetened condensed milk	1 can + 2 sachets	14,000 + 4,000	18,000
	Margarine	250 grams	14,000/250g	14,000
	Cooking oil	3 liters	18,000/liter	54,000
	Flour	0.5 Kg	13,000/Kg	7,000
	Packaging (Mica/Plastic)	253 pcs	300/pcs	100,000
	Logo Stickers	253 sheets	200/sheet	35,000
	Total Production Capital			526,000

Source: Purple Crispy Roll Business Plan (2026)

From Table 2, the Cost of Goods Sold (BPP) per unit can be calculated as $\text{Rp } 526,000 \div 253 \text{ pcs} = \text{Rp } 2,079/\text{pcs}$. With a selling price set at $\text{Rp } 5,000/\text{pcs}$, the gross margin is $\text{Rp } 2,921/\text{pcs}$, or approximately 58.4% of the selling price. This relatively high margin provides sufficient room for the business to cover additional operational costs (electricity, gas, transportation) and still generate a decent profit.

The main raw material, namely purple sweet potato, acts as a primary component that influences the color, taste, and nutritional content of the product. The selection of high-quality fresh purple sweet potato is a critical control point (CCP) in the raw material supply chain. Cheese spread and chocolate filling are premium ingredients that add value to the taste and increase consumer perceived value. With packaging costs (mica + stickers) reaching IDR 135,000 or 25.7% of the total production capital, this investment is in line with the product branding strategy. Transparent packaging allows consumers to see the product directly, which is proven to increase trust and purchasing decisions (Kotler & Keller, 2016).

Production Equipment Requirements

The Purple Crispy Roll production process requires nine types of kitchen equipment with a total investment of $\text{Rp } 715,000$. The equipment used was selected based on functionality, durability, and ease of maintenance. Table 3 presents a complete list of production equipment and its investment value.



Table 3.
Equipment Requirements for Purple Crispy Roll Production

No	Tool Name	Amount	Total Price (Rp)
	Knife	2 pieces	50,000
	cutting board	1 piece	30,000
	Basin	2 pieces	40,000
	Digital scales	1 piece	100,000
	Frying pan	1 piece	150,000
	Gas stove	1 unit	250,000
	Spatula / Food Tongs	1 piece	20,000
	Oil Drain Strainer	1 piece	25,000
	Tray / Baking Pan	2 pieces	50,000
	Total Equipment Cost		715,000

Source: Purple Crispy Roll Business Plan (2026)

The equipment investment of Rp 715,000 is considered very affordable for an MSME production scale. A gas stove is the largest investment component (Rp 250,000 or 35%) as the main equipment for the frying process, followed by a frying pan (Rp 150,000 or 21%) and a digital scale (Rp 100,000 or 14%). Digital scales are an important investment to maintain the consistency of raw material measurements, a critical factor in food product standardization (Mulyadi, 2015). The low investment value of this equipment makes Purple Crispy Roll a business model with a low barrier to entry, making it reproducible by other young entrepreneurs.

Operating Costs (General Costs)

In addition to raw material costs and equipment investment, there are routine operational costs (overhead costs) that businesses must cover each month. These costs include utilities (electricity, LPG, internet), transportation, and unforeseen expenses. Table 4 provides a breakdown of general annual operational costs.



Table 4.
Details of Operational Costs (General Costs) per Year

No	Cost Description	Estimated Cost per Year (Rp)
	Electricity	300,000
	Internet	180,000
	LPG gas	300,000
	Transportation	240,000
	Unforeseen expenses	180,000
	Total General Costs Per Year	1,200,000

Source: Purple Crispy Roll Business Plan (2026)

The total annual operating costs of Rp 1,200,000 are considered very efficient for a business of this scale. Electricity costs (Rp 300,000/year) and LPG gas (Rp 300,000/year) are the largest components (each 25%) because they are directly related to the production process. Internet costs of Rp 180,000/year reflect the business's digital marketing strategy, which utilizes Instagram, Facebook, and WhatsApp platforms, which have proven effective in reaching young consumers in Manado City (Kominfo, 2023).

Converted to a per-unit cost, the total annual operating cost of Rp 1,200,000 for 72,720 units is equivalent to Rp 16.50 per unit. This very small figure indicates that overhead costs do not significantly impact COGS, making the Purple Crispy Roll business's cost structure lean and efficient.

Labor Requirements and Costs

The Purple Crispy Roll business requires two categories of labor: direct labor (directly involved in the production process) and indirect labor (management and administration). Table 5 presents the direct labor requirements.

Table 5.
Direct Labor Requirements

Activity	Number of Kindergartens	Wages/Day (Rp)	Weekdays/Year	Total Wages/Year (Rp)
Purple Sweet Potato Risol Production	3	50,000	288	43,200,000

Source: Purple Crispy Roll Business Plan (2026)



Direct labor wages of Rp 50,000/person/day on 288 effective working days per year (6 days/week × 48 weeks) results in a total wage expenditure of Rp 43,200,000/year for 3 people. This figure is equivalent to Rp 14,400,000/person/year or Rp 1,200,000/person/month, which is a reasonable wage level for a start-up business in the Mapanget District area, Manado City. Direct labor costs per unit of production are $\text{Rp } 43,200,000 \div 72,720 \text{ pcs} = \text{Rp } 594/\text{pcs}$.

For indirect labor, this business has three managerial positions held by the three founders: the Head & Finance Manager (salary Rp 2,000,000/month), the Production Manager (Rp 1,250,000/month), and the Marketing Manager (Rp 1,250,000/month). The total management salary reaches Rp 54,000,000/year, reflecting a proportionate human resource investment for the scale of the business at the startup stage.

Summary of Production Cost Structure

Based on all the cost components that have been analyzed, the following is a recap of Purple Crispy Roll's annual production cost structure in 2026:

Table 6.
Summary of Annual Production Cost Structure (2026)

No	Cost Components	Amount (Rp/Year)
	Production Raw Materials ($526,000 \times 288$ sessions)	151,488,000
	Direct Labor Costs	43,200,000
	Operational / General Expenses	1,200,000
	Management Fee (Indirect TK)	54,000,000
	Equipment Investment (first year)	715,000
	Pre-Operation Costs (first year)	436,000
	Total Operating Costs (Year 1)	251,039,000

Source: Data Analysis Results, processed (2026)

With a projected total sales revenue of Rp 363,600,000 ($72,720 \text{ pcs} \times \text{Rp } 5,000/\text{pcs}$) in 2026, and total production + operational costs (excluding management salaries and first-year investment) of Rp 195,888,000, this business has the potential to generate a gross profit of Rp 167,712,000 or a gross profit margin of 46.1%. This figure indicates good financial feasibility for a start-up business in the food MSME segment (Mulyadi, 2015; Heizer & Render, 2016).



CONCLUSION

Based on the results of the analysis that has been carried out, several main conclusions can be drawn regarding the production aspects of the Purple Crispy Roll business:

1. The Purple Crispy Roll production process consists of three systematic stages of making purple sweet potato filling, rolling (assembly), and frying which can be standardized to maintain product quality consistency with a golden brown crispy texture on the outside and creamy on the inside.
2. The initial production capacity of 72,720 pcs/year (2026) with growth of $\pm 9\%$ per year is projected to reach 103,620 pcs/year in 2030, indicating well-planned business scalability.
3. The production capital per session is IDR 526,000 for 253 pcs, resulting in a Cost of Goods Sold (BPP) of IDR 2,079/pcs, with a gross margin of 58.4% of the selling price of IDR 5,000/pcs, reflecting an efficient and competitive cost structure.
4. An equipment investment of Rp 715,000 and annual operating costs of only Rp 1,200,000 make this business have a very low barrier to entry, while still being able to generate a decent gross profit for a budding entrepreneur.
5. The use of local purple sweet potato raw materials, which are rich in anthocyanins and fiber, provides a competitive advantage in terms of nutritional value and product differentiation, in line with the growing trend of the healthy snack market in Indonesia.

REFERENCES

- BPS Kota Manado (2024). Kota Manado dalam Angka 2024. Badan Pusat Statistik Kota Manado. Manado.
- Euromonitor International (2024). Packaged Food in Indonesia: Market Insights 2024. Euromonitor International Ltd. London.
- Ginting, E., Utomo, J. S., Yulifianti, R., & Jusuf, M. (2011). Potensi Ubijalar Ungu sebagai Pangan Fungsional. *Iptek Tanaman Pangan*, 6(1), 116–138.
- Heizer, J., & Render, B. (2016). *Operations Management: Sustainability and Supply Chain Management* (12th ed.). Pearson Education. Upper Saddle River, NJ.
- Isbahi, M. B., Zuana, M. M. M. ., & Mariana, E. R. . (2022). The Technology Strategy in Website Communication Media in Improving Business Activities. *Majapahit Journal of Islamic Finance and Management*, 1(2), 126–138. <https://doi.org/10.31538/mjifm.v1i2.17>



- Jusuf, M., Rahayuningsih, S. T., Ginting, E., & Widodo, Y. (2008). Ubijalar Ungu: Prospek dan Pengembangannya. *Buletin Palawija*, (15), 25–32.
- Kementerian Kesehatan RI (2020). *Pedoman Gizi Seimbang*. Kemenkes RI. Jakarta.
- Kominfo RI (2023). *Statistik E-Commerce dan Media Sosial Indonesia 2023*. Kementerian Komunikasi dan Informatika RI. Jakarta.
- Kotler, P., & Keller, K. L. (2016). *Marketing Management* (15th ed.). Pearson Education. Upper Saddle River, NJ.
- Kusuma, H., & Rahayu, S. (2021). Inovasi Produk UMKM Pangan Berbasis Kearifan Lokal: Studi Kasus di Yogyakarta. *Jurnal Manajemen Teknologi*, 20(3), 287–301.
- Lila, M. A. (2004). Anthocyanins and Human Health: An In Vitro Investigative Approach. *Journal of Biomedicine and Biotechnology*, 2004(5), 306–313.
- Moreira, R. G. (2001). Vacuum frying of potato chips. *Journal of Food Engineering*, 47(2), 77–83.
- Mulyadi (2015). *Akuntansi Biaya* (Edisi 5). UPP STIM YKPN. Yogyakarta.
- Mukti, A. (2019). *Manajemen Produksi Usaha Kecil dan Menengah*. Pustaka Belajar. Yogyakarta.
- Nielsen Company (2023). *Snacking Trends in Southeast Asia 2023*. The Nielsen Company. Singapore.
- Rimbawan, & Siagian, A. (2004). *Indeks Glikemik Pangan*. Penebar Swadaya. Jakarta.
- Suda, I., Oki, T., Masuda, M., Kobayashi, M., Nishiba, Y., & Furuta, S. (2003). Physiological functionality of purple-fleshed sweet potatoes containing anthocyanins and their utilization in foods. *Japan Agricultural Research Quarterly*, 37(3), 167–173.
- USDA (2022). Sweet potato, raw, unprepared (FDC ID: 168482). U.S. Department of Agriculture, Agricultural Research Service. <https://fdc.nal.usda.gov/fdc-app.html#/food-details/168482/nutrients>.