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Capacity Strategy Planning for Frozen Corndog Business: A Decision Tree and TELOS Framework Approach

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Abstract

Capacity planning is a critical challenge for micro, small, and medium enterprises (SMEs), especially in Indonesia, where the frozen food sector is experiencing rapid growth. This study examined Enci Corndog, a micro-sized B2B frozen corndog business in Karawang, Indonesia, which faced a significant capacity gap: current production was 8,736 units per year, while projected demand reached 29,782 units by 2030 under a strong growth scenario, resulting in capacity utilization of 340.91%. Three strategic alternatives were analyzed: (A1) investment in new machines, (A2) outsourcing dough production, and (A3) extending working hours. A mixed-method approach combining Decision Tree financial analysis, including Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (BCR), with TELOS feasibility assessment was applied. The results showed that Alternative 1 provided the highest Expected Value (Rp370,700,493), with an NPV of Rp414,620,498, an IRR of 240.46%, and a BCR of 12.05 under the strong growth scenario, along with the highest TELOS feasibility score (3.15 out of 4.00). The study concluded that investment in new machines was the most feasible and profitable capacity expansion strategy. This alternative increased annual production capacity to 31,200 units through 2030. However, outsourcing and extended working hours remained viable options only as short-term capacity supplement.

INTRODUCTION

The frozen food industry in Indonesia has experienced rapid growth in recent years. The market reached an estimated value of IDR 200 trillion (USD 3.4 billion) in 2024 and is projected to grow to USD 4.71 billion by 2030 (Mordor Intelligence, 2025). This growth has been supported by the expansion of modern retail, e-commerce platforms, and the increasing adoption of household freezers in Indonesian homes (Agitha et al., 2023; Dewi & Lusikooy, 2023; Lestari et al., 2024; Steculа et al., 2024; Suriansha, 2025). Millennials and Generation Z consumers are increasingly relying on frozen ready-to-eat meals, driven by urbanization and the convenience-oriented lifestyles adopted by these demographic groups. This trend has further accelerated demand for frozen snacks and processed food products (Jakpat, 2023).

Although the frozen food market opportunity in Indonesia continues to expand, small and medium-sized enterprises (SMEs) in the sector often face difficulties in scaling their production capabilities. Common challenges include small production batches, heavy dependence on manual labor, and limited process standardization (Prasanna et al., 2019). These operational constraints frequently prevent SMEs from expanding their businesses and increasing production capacity to meet growing market demand.

Enci Corndog represents one example of such a business. The company primarily operates in the B2B segment and currently produces 8,736 frozen corndogs annually using home-based production equipment. Demand projections indicate that the company's

requirements will exceed its current production capacity by 2026, with capacity utilization expected to reach 128.60% and increase to 340.91% by 2030 under a strong growth scenario. The gap between existing production capacity and projected market demand represents the primary business problem addressed in this study.

Three strategic alternatives were proposed to address this capacity constraint: (1) investment in new production machines, (2) outsourcing part of the production process to third-party providers, and (3) extending working hours (Arif & Farmaciawaty, 2025). However, each alternative involves different costs, scalability potential, risks, and implications for operational sustainability. Therefore, selecting the most appropriate strategy requires a comprehensive evaluation framework that considers both financial performance and broader feasibility dimensions.

Previous studies have extensively examined capacity planning strategies across various industrial contexts. Ghamat et al. (2018) explored optimal capacity investment and pricing decisions in duopoly markets, demonstrating that strategic capacity investments can generate competitive advantages. Similarly, Lee et al. (2015) investigated the relationship between manufacturing practices and firm performance, highlighting that machinery investment can significantly improve productivity and operational efficiency. In relation to outsourcing, Kotabe and Mol (2009) and Sardar et al. (2016) found that while outsourcing can reduce capital expenditure, it may also introduce dependency risks and reduce long-term profitability. Kumar and Saini (2022) further demonstrated that outsourcing may increase costs and reduce quality control, particularly when vendor costs exceed the benefits gained from external production. Regarding extended working hours, Niedhammer et al. (2023) and Muller and Torsten (2023) identified workforce sustainability risks, including declining quality performance and health-related issues, particularly in small-scale production teams. Arif and Farmaciawaty (2025) applied Decision Tree analysis and the TELOS framework in large-scale manufacturing contexts, demonstrating the effectiveness of these combined approaches for evaluating capacity expansion alternatives. Furthermore, Putri et al. (2025), Chumaidiyah et al. (2025), and Kilari (2019) applied similar methodologies in SME contexts, particularly for technology adoption and investment decision-making. Moeini and Coates (2025) examined technology adoption barriers in SME production systems, emphasizing cost, complexity, and integration challenges as major constraints.

Despite the growing body of research on capacity planning, several critical gaps remain. Financial evaluation tools such as Decision Tree analysis have been applied across various industrial settings; however, their application to micro-sized frozen food SMEs in Indonesia remains limited. Existing studies have primarily focused on large-scale manufacturing or general SME contexts without adequately considering the operational limitations, restricted capital availability, and specific production characteristics of micro-sized frozen food businesses operating in B2B markets. Similarly, while the TELOS framework has been applied for feasibility assessment across different sectors, its integration with Decision Tree financial analysis has not been extensively explored in the context of Indonesian frozen food SMEs. Previous research has also tended to evaluate capacity expansion alternatives individually rather than providing comprehensive comparisons that simultaneously consider financial viability, operational feasibility, and implementation sustainability. Limited attention has been given to frozen food SMEs experiencing rapid demand growth while lacking sufficient capital

and technical readiness for large-scale expansion. These research gaps are particularly relevant for businesses such as Enci Corndog, where limited operational scale and financial resources require careful evaluation of trade-offs among multiple strategic alternatives.

The novelty of this research lies in applying a combined Decision Tree and TELOS framework to a micro-sized frozen food SME in Indonesia. This approach integrates quantitative financial analysis, including Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (BCR), with qualitative feasibility assessment within a unified analytical framework to provide a comprehensive evaluation of capacity expansion strategies. This study contributes to the limited empirical research on capacity expansion within the Indonesian frozen food sector by providing practical insights for SME owners and policymakers regarding structured decision-making under resource constraints. Furthermore, it extends the application of Decision Tree and TELOS frameworks to frozen food production by addressing operational characteristics such as perishability, cold chain requirements, and demand fluctuations.

This study addressed the following research question: Which capacity expansion strategy was the most feasible and profitable for Enci Corndog in responding to projected demand growth from 2026 to 2030? The objectives were: (1) to evaluate the current production process and quantify the existing capacity gap, and (2) to compare alternative capacity expansion strategies using Decision Tree financial analysis and the TELOS feasibility framework. The findings are expected to provide practical benefits for Enci Corndog's owners in selecting the most appropriate capacity expansion strategy, serve as a reference for other micro-sized frozen food SMEs in Indonesia facing similar capacity constraints, and provide insights for policymakers and business development institutions in designing targeted SME capacity-building programs. Additionally, this study contributes to academic literature by demonstrating the integration of Decision Tree and TELOS frameworks within the context of frozen food SMEs and providing a replicable methodology for future research on capacity planning in resource-constrained business environments.

METHOD

Research Design

This research employed a mixed-method approach combining quantitative financial analysis and qualitative feasibility assessment. The quantitative analysis utilized Decision Tree analysis with financial indicators, including Net Present Value (NPV), Internal Rate of Return (IRR), and Benefit-Cost Ratio (BCR), to evaluate the financial feasibility of each alternative. The qualitative analysis applied the TELOS framework to assess broader feasibility factors. This integrated methodology aligned with previous studies on SME capacity planning (Putri et al., 2025; Chumaidiyah et al., 2025).

Data Collection

Data used in this study were collected from internal records of Enci Corndog from January to December 2025. Data includes production capacity reports, equipment specifications, depreciation data, and operating cost. Sales forecasts for 2026–2030 developed mainly from 2025 historical sales data and the company's strategic growth targets. Demand probability scenarios are strong growth ($p = 0.75$) and weak growth ($p = 0.25$). Demand scenarios were derived from eight years of BPS Indonesia data on average per-capita weekly

spending on fried food (makanan gorengan), yielding six strong-growth years and two weak-growth years.

Financial Analysis Methods

The financial analysis applies three standard capitals in budgeting metrics. NPV measures the total of discounted future cash flows minus the initial investment. IRR identifies the discount rate at which NPV equals zero. BCR is calculated as the ratio of total discounted benefits to total discounted costs (Gitman & Zutter, 2015). A 12% annual discount rate was used in line with the business's internal financial policy. All alternatives were assessed over a five-year horizon (2026–2030).

TELOS Feasibility Assessment

Eight indicators were evaluated using a 1–4 scale, with weights assigned according to their relative impact on the business decision. The weighted indicators are: Technical readiness (T1, w=0.15), Knowledge/skill readiness (T2, w=0.10), Cash flow output (E1, w=0.20), Funding availability (E2, w=0.05), Legal compliance (L, w=0.15), Resource readiness (O1, w=0.15), Resistance to change (O2, w=0.05), and Implementation timeline (S, w=0.15). Scores were calculated using the formula: Score = Σ(Weight × Scale). Scores were interpreted as: 1.0–2.4 = Not feasible; 2.5–3.0 = Partially feasible; 3.0–3.5 = Feasible with adjustments; 3.5–4.0 = Fully feasible.

RESULTS AND DISCUSSION

Current Capacity Analysis

Analysis of Enci Corndog's production process identified four workstations and their effective throughput rates (Table 1). The dough mixing part is the primary bottleneck, with a throughput of only 42 pcs/hour because of the limited capacity of the existing household mixer. With 208 operating hours per year (one shift, one day per week), the current system yields an annual capacity of 8,736 units.

Table 1. Current Production Capacity by Workstation

Workstation	Throughput (pcs/hr)	Bottleneck
Filling prep (cut + skewer)	250	No
Dough/batter mixing (mixer)	42	Yes (primary)
Portioning/shaping	120	Yes (secondary)
Freezing (freezer throughput)	100	Yes (secondary)

Source: Enci Corndog Internal Data (2025)

Under the strong growth scenario, capacity utilization is projected to reach 128.60% in 2026, and escalate to 340.91% by 2030. This is the main gap indicating that the current production system cannot support projected demand.

Capacity Simulation under Three Alternatives

Alternative 1 proposes the purchase of three machines: a 10kg mixer (Rp10,416,062), a dough divider (Rp16,000,000), and a 400L freezer (Rp8,000,000), in sum of Rp34,416,062. These machines will address each identified bottleneck and will raise annual production capacity to 31,200 units. It is a 257.14% improvement to meet projected demand through 2030.

Alternative 2 proposes outsourcing dough to a third party. It increases the bottleneck throughput from 42 to 102 pcs/hour, resulting in an annual capacity of 21,216 units. Even

though this eliminates the need for upfront machinery investment, it introduces dependency on a third-party supplier. Outsourcing also significantly increases COGS by approximately 30%. Capacity under this alternative falls short of demand projections from 2029 onward.

Alternative 3 proposes extending working hours by 2 hours per workday. It increases total annual operating hours from 208 to 312, making a capacity of 13,104 units. It is a 50% improvement from current capacity. This option can be implemented right away but it has risks of workforce fatigue and only satisfies demand for 2026, providing risk to no long-term solution.

Financial Analysis: Decision Tree Results

Table 2 presents the Expected Value (EV) for each strategy derived from the Decision Tree analysis, using strong growth probability (p = 0.75) and weak growth probability (p = 0.25).

Table 2. Decision Tree Expected Values by Strategy

Strategy	PV Strong Growth	PV Weak Growth	Expected Value (EV)
Do Nothing	Rp132,797,053	Rp36,777,421	Rp169,574,473
A1 (New Machinery)	Rp310,965,374	Rp59,735,119	Rp370,700,493
A2 (Outsourcing)	Rp151,858,184	Rp30,449,972	Rp182,308,156
A3 (Extended Hours)	Rp185,880,015	Rp40,817,293	Rp226,697,308

Source: Calculated by Author (2025)

Alternative 1 have the highest EV (Rp370,700,493), followed by A3 (Rp226,697,308), Do Nothing (Rp169,574,473), and A2 (Rp182,308,156). Notably, A2 produces a lower EV than doing nothing, primarily because outsourcing costs increase COGS by 30%, eroding profitability.

Detailed financial metrics for Alternative 1 further confirm its viability (Table 3).

Table 3. Financial Metrics for Alternative 1 (New Machinery)

Metric	Strong Growth Scenario	Weak Growth Scenario
Initial Investment	Rp34,416,062	Rp34,416,062
NPV	Rp414,620,498	Rp238,940,477
IRR	240.46%	161.20%
BCR	13.05	7.94

Source: Calculated by Author (2025)

NPV is strongly positive in both scenarios. IRR surpasses the 12% discount rate threshold, and BCR is well above 1.0 indicating that each 1 rupiah invested returns over Rp13 in benefit under the strong growth scenario.

TELOS Feasibility Assessment

Table 4 presents the TELOS scores for each alternative.

Table 4. TELOS Feasibility Scores by Alternative

Indicator (Weight)	Wt	A1	A2	A3	A1 Sc	A2 Sc	A3 Sc
T1 – Technical Readiness	0.15	2	4	4	0.30	0.60	0.60
T2 – Knowledge Readiness	0.10	3	2	4	0.30	0.20	0.40
E1 – Cash Flow Output	0.20	4	1	2	0.80	0.20	0.40
E2 – Funding Availability	0.05	2	2	3	0.10	0.10	0.15
L – Legal Compliance	0.15	4	3	2	0.60	0.45	0.30

Indicator (Weight)	Wt	A1	A2	A3	A1 Sc	A2 Sc	A3 Sc
O1 – Resource Readiness	0.15	3	3	1	0.45	0.45	0.15
O2 – Resistance to Change	0.05	3	4	1	0.15	0.20	0.05
S – Implementation Timeline	0.15	2	3	4	0.30	0.45	0.60
TOTAL SCORE	**1.00**				**3.15**	**2.35**	**2.65**

Source: Author's Analysis (2025); Wt = Weight, Sc = Weighted Score

Alternative 1 has the highest TELOS score (3.15). It is driven by the highest cash flow output score (4.0) and strong legal compliance (4.0). The primary weaknesses are technical readiness (score 2) due to the need for equipment installation and worker training, and implementation timeline (score 2) given the procurement and setup period required.

Alternative 2 has the score of 2.35. It is performing well on technical readiness and implementation speed but scoring critically low on cash flow output (1.0), reflecting the 30% COGS increase from outsourcing fees. Alternative 3 scores 2.65, imposed by very low resource readiness (1.0) and resistance to change (1.0) due to workforce fatigue and the unsustainability of extended labor hours in a small team.

The convergence of both the quantitative Decision Tree analysis and the qualitative TELOS assessment on Alternative 1 provides strong evidence that machinery investment is the optimal strategy for Enci Corndog. The IRR of 240.46% in strong growth scenario reach 12% discount rate, while even the weak growth scenario yields an IRR of 161.20%. Confirming robustness across market conditions. These results align with findings by Arif and Farmaciawaty (2025) in large-scale manufacturing and extend them to the SMEs context.

In Enci Corndog's case, using outsourcing can reach an increase of 30% for COGS and surpass the capacity gains. It results in low profit margins typical of frozen food SME. This finding supports Kumar and Saini (2022), who argues that outsourcing can lower long-term profitability over time especially when vendor costs are high relative to internal production.

The adding working hours alternative offers the lowest capacity increase and carries significant workforce sustainability risks even if it can be implemented right away. In a two to three person production team, quality deteriorates and health risks are more present (Niedhammer et al., 2023) make this option not optimal as a primary long-term strategy. However, it may serve as a useful bridging measure during machinery procurement and installation.

CONCLUSION

This study evaluated three capacity expansion strategies for Enci Corndog, a frozen food SME in Indonesia. The business faced a capacity gap of up to 340.91% by 2030. Using Decision Tree financial analysis and the TELOS feasibility framework, this study concluded that investment in new machines (Alternative 1) was the most feasible and profitable strategy across all evaluation dimensions. The proposed machine investment cost was Rp34,416,062 and was projected to increase annual production capacity from 8,736 to 31,200 units, which was sufficient to meet projected demand through 2030. The investment generated an NPV of Rp414,620,498, an IRR of 240.46%, and a BCR of 13.05 under the strong growth scenario, while remaining financially viable under weak growth conditions. The TELOS score of 3.15 indicated that the strategy was feasible with manageable adjustments. This study had several limitations. The analysis was based on a single SME case, and demand forecasts relied on

industry-level spending trends from BPS Indonesia data rather than firm-specific market surveys, which may have introduced estimation uncertainty. Future studies should incorporate primary demand research and extend the evaluation by considering additional factors, including supply chain performance and marketing strategies.

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