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Financial Feasibility and Operational Readiness for Developing a Tempeh-Chip Microenterprise in Samarinda

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Abstract. This study examines whether the documented evidence of UMKM Cemilan Aldy99, a tempeh-chip microenterprise in Samarinda, supports a proposed Rp7,000,000 investment in new slicing and frying equipment. The design is a documentary single-case reanalysis: the primary data (observation, owner interviews, and business documentation) were collected in the original undergraduate thesis research, and no new fieldwork was conducted. Financial indicators were independently recalculated, sensitivity and switching-value analyses were performed, and non-financial claims were coded by evidence type, corroboration, and verification status. The enterprise-level reference model yields an NPV of Rp14,520,450, an IRR of 67.4%, a PI of 2.015, a payback of 1.12 years, and an annual break-even point of about 2,019 packs of 250 g (Rp30.27 million), correcting the previously reported PI, IRR, and break-even values. However, NPV becomes negative if revenue falls by about 6.9% or expenditure rises by about 8.1%, and the cash flows are historical whole-business surpluses rather than incremental machine benefits. The evidence therefore supports the conclusion that the existing business appears financially viable, but not that the machinery investment is financially feasible. The study contributes a with-versus-without incremental appraisal framework and shows that the machine must generate at least Rp2.91 million in additional annual net cash flow over three years (about 376 additional packs) to break even.

Keywords: Business Feasibility, Microenterprise, Capital Budgeting, Incremental Cash Flow, Sensitivity Analysis

1 Introduction

Investment in production equipment is an important managerial decision for a food microenterprise because expenditure is committed before the resulting benefits are known. An owner may experience fatigue, uneven output, or difficulty fulfilling occasional orders while still lacking evidence that an additional machine will generate sufficient cash. These circumstances create two related but different questions: whether the existing business produces an operating surplus, and whether a proposed investment

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improves its future cash position. Treating the answers as interchangeable can lead to a financially attractive description of an enterprise without an adequate appraisal of the proposed expenditure. Tempeh-based enterprises in Indonesia range from village production clusters to exporters of tempeh chips [1], [2], [3], [4], and micro, small, and medium enterprises make up a large part of the business population of East Kalimantan and Samarinda [5], [6].

ALDY99 provides a relevant case for examining this distinction. The documented business operates in Bukuan, Palaran, Samarinda, and produces tempeh chips using a small workforce and predominantly manual processes. Its case record describes sales through neighborhood retailers, markets, bazaars, and messaging-based orders, as well as distribution beyond Samarinda. Production capacity and the owner's concentration of managerial responsibilities are recurring concerns. The business is therefore situated at a practical development threshold: additional equipment may address a production constraint, but its usefulness also depends on orders, workforce readiness, working capital, and the organization of production.

The principal empirical source is Ramadhani's [7] undergraduate thesis, which provides a business description, financial tables, and a summarized interview appendix. The source records an existing capital amount of IDR 7.3 million and a planned machinery expenditure of IDR 7 million. It also reports three operating surpluses and several investment indicators. However, the cash-flow narrative identifies the surpluses with 2022–2024, while the investment presentation places them in a three-period evaluation. The relationship between historical performance and future investment outcomes consequently requires explicit treatment. A later research proposal motivates development of the same enterprise but does not establish that the proposed intervention has occurred.

The research problem is an evidence gap between enterprise-level profitability and project-level investment justification. Sector studies establish the relevance of financial appraisal, non-financial assessment, and mechanization, but these strands do not by themselves resolve whether the documented ALDY99 surpluses represent additional cash generated by the proposed machine. Broader research also links investment appraisal to firm performance [8] and emphasizes information acquisition under uncertainty [9]. Their implications require examination at the level of the records and operational constraints available to an individual microenterprise.

Three connected gaps guide this case analysis. The measurement gap concerns the boundary between existing business surplus and incremental investment cash flow. The robustness gap concerns whether favorable baseline indicators survive explicit adverse revenue and expenditure assumptions. The implementation gap concerns how demand, production capability, and managerial practices support the cash-flow assumptions. These are unresolved questions in the ALDY99 evidence, not a claim that previous scholarship has ignored them universally. Accordingly, the study asks: what conclusions remain after consistent financial reconstruction; how sensitive are those conclusions to adverse assumptions; and what operational evidence is needed before an investment recommendation can be justified?

The objective is to connect these questions through a transparent documentary reanalysis. Its contribution is a case-based analytical framework that distinguishes

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computational consistency, project relevance, downside exposure, and operational readiness. Novelty rests in demonstrating how these dimensions interact in the same decision, rather than in applying familiar financial formulas to a new location. The framework explains why correcting a ratio can strengthen the numerical result without validating a machinery purchase. It offers an auditable basis for further fieldwork and investment preparation; it does not estimate a causal machinery effect or establish an optimal equipment choice.

The reviewed studies address complementary levels of analysis: sector cases assess enterprises or facilities; equipment studies examine technical implementation; and broader firm-level studies investigate appraisal, management, and performance. Their findings justify combining financial and operational evidence, but neither returns from another enterprise nor general associations answer the ALDY99 investment question. The present study occupies that case-specific intersection. It reconstructs a common financial basis, tests its conditional robustness, and maps missing operational evidence to the assumptions required for an incremental appraisal. This is a targeted thematic review rather than an exhaustive systematic review; the proposed decision sequence remains an analytical contribution requiring prospective validation.

2 Literature Review

2.1 Financial Feasibility and the Investment Boundary

Financial feasibility concerns whether specified benefits justify the resources committed under an explicit time horizon and required return. NPV measures discounted net value, IRR identifies the discount rate at which that value becomes zero, and PI expresses the present value of future inflows relative to the initial outlay. Payback addresses recovery time, whereas break-even analysis addresses operating cost coverage. These measures answer different questions and should be interpreted together rather than counted as independent confirmations of feasibility [10]. For an equipment decision, the relevant cash flows are incremental: the difference between the firm's cash flows with and without the project. Sunk or previously committed expenditures are excluded, and existing assets enter the appraisal only at their opportunity cost [10]. For ALDY99, the critical issue therefore precedes the choice of indicator: the cash-flow series must correspond to the managerial decision being evaluated.

Purnamasari and Adriza [8] compare capital-budgeting techniques and financial performance using data from 500 Indonesian firms over 2011–2020. Their analysis distinguishes conventional measures from discounted appraisal techniques and reports support for the relevance of the latter in robustness checks. This firm-level evidence motivates careful use of NPV, IRR, and PI, but does not validate the inputs of an individual machinery proposal. Adopting sophisticated measures and constructing a decision-relevant cash-flow series are separate tasks. The present case examines the latter by making the treatment of historical capital, operating surpluses, and evaluation timing explicit.

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Novitasari and Hidayat [11] evaluate production-facility improvement in a tempeh-chip enterprise using investment criteria. Isa and Zuhriyah [12] connect financial feasibility in a cassava-chip enterprise with marketing and fluctuations in demand and supply. These studies provide sector-relevant comparisons, but their numerical returns cannot be transferred directly to ALDY99. Enterprise scale, evaluation horizon, investment definition, and cash-flow construction affect the results. A comparison based only on whether each study reports a positive net present value would overlook the mechanisms that determine financial viability.

2.2 Uncertainty and the Interpretation of Attractive Returns

Charoenwong et al. [9] connect capital budgeting under uncertainty with information acquisition and investment plans that respond to future conditions. Their firm-level evidence and investment model provide a rationale for treating appraisal as a process of learning and conditional planning. This study draws on that logic without transferring their aggregate estimates to ALDY99 or claiming to value a real option. Reconciliation of records, demand validation, and a process trial are proposed as information-gathering steps before commitment; sensitivity analysis identifies assumptions for which that information is especially consequential. Darmansyah, Ali, and Parveen [13], using data from 590 Indonesian firms over 2014–2023, examine sophisticated capital-budgeting decisions, financial performance, and risk management. Their reported results distinguish the management of solvency risk from liquidity risk, for which the techniques appear less effective. This distinction matters for a microenterprise: a favorable discounted total does not ensure that cash is available when materials, wages, and maintenance must be paid. The study therefore interprets the reference NPV alongside adverse scenarios and recognizes collection timing and working capital as unresolved implementation requirements, rather than assuming that a high return eliminates financing pressure.

Sensitivity analysis here is a diagnostic device. Its role is to reveal how a conclusion changes when an explicitly stated assumption changes, not to attach a probability to business failure. A revenue reduction with expenditure held constant represents a different mechanism from a volume decline that also reduces variable costs. The scenario definition must consequently accompany the numerical result. For this case, the robustness question is whether the recorded surplus provides room for adverse revenue realization or increased expenditure within the reference model. A prospective project forecast would additionally require plausible joint changes, seasonality, and incremental operating costs.

2.3 Operational Readiness and Evidence from Food Enterprises

Related research has already combined financial and nonfinancial assessments in Indonesian food enterprises. Dewi, Sarwono, and Widanti [14] examine food-processing enterprises in Boyolali using interviews and observation alongside investment indicators. Their work establishes that an integrated financial and nonfinancial perspective is not itself a new methodological contribution. The present case instead focuses on the

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consistency of the evidence used to connect those perspectives and on the limits of an investment recommendation when recorded operating results do not identify additional machinery benefits.

Evidence from equipment implementation is equally relevant but serves a different purpose. Ibrohim, Pramono, Budijono, and Kurniawan [15] report improved slicing performance and production capacity after introducing a tempeh-slicing machine. That finding supports investigating mechanization as a practical option. It does not establish that ALDY99 will achieve the same improvement or sell all additional output. Technical feasibility and commercial feasibility must therefore be connected through case-specific measurements rather than assumed from another producer's performance. Maiman et al. [16] similarly design the moving components of an automatic slicer intended to raise productivity in tempeh-chip MSMEs; such engineering evidence describes potential capacity, not realized commercial benefit.

McKenzie and Woodruff [17] examine business practices in micro and small firms across seven developing countries. Practices in marketing, stock-keeping, record-keeping, and financial planning are associated with firm outcomes, while panel evidence links better practices with subsequent survival and sales growth. These associations support examining managerial routines alongside physical equipment; they do not establish that any specific practice causes an improvement at ALDY99. Here, readiness is defined as the documented ability to produce saleable output, reach customers, collect revenue, and organize the resources assumed in an investment forecast. It is a qualitative decision construct, not a validated numerical scale.

The literature thus suggests a concrete relationship between operational conditions and financial assumptions. Demand evidence supports the volume and realized-price assumptions; process capability supports saleable output and unit cost; stock and payment routines support working- capital estimates; and managerial responsibilities support implementation and maintenance. This relationship is an analytical synthesis used in the present study. It prevents a favorable description of market access or equipment capacity from being treated as a cash benefit before the relevant mechanism is demonstrated.

3 Research Method

This study uses a documentary single-case reanalysis design [18]; it is not a primary field study. The primary data on UMKM Cemilan Aldy99 were collected by Ramadhani [7] during the undergraduate thesis research through observation of the production process, interviews with the owner, and business documentation. Those materials, particularly the thesis's financial tables, business descriptions, and interview-summary appendix, constitute the data analyzed here. The April 2026 research proposal and an earlier draft article on the same enterprise were used only for cross-document consistency checks, not as independent observations, because they draw on the same underlying case. No new interviews, questionnaires, machine trials, or external financial audit were conducted for this reanalysis. Accordingly, descriptions in the Results of production schedules, sales channels, staffing, and legal status are reported as claims

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contained in the case record, not as observations made by the present authors. The thesis identifies the owner as its interview informant; the number of employees described in the business profile is not treated as the number of research participants. The analysis does not assert a new research-ethics approval and excludes personal identifiers unrelated to the enterprise assessment.

Two financial models are distinguished. **Model A**, the enterprise-level reference model, reproduces the source calculation solely to test its arithmetic and robustness. It retains the reported outlay of Rp14,300,000 (Rp7,300,000 of existing capital in equipment and raw materials plus Rp7,000,000 of planned machinery) and the three operating surpluses of Rp12,854,000, Rp12,130,000, and Rp10,781,000. Because the source associates these surpluses with whole-business operations in 2022–2024, placing them in evaluation periods one to three is an explicit hypothetical timing assumption. Model A therefore describes the viability of the existing business, not the return on new machinery. **Model B**, the incremental machinery model, follows the with-versus-without principle: the relevant cash flows are the differences between the enterprise's expected cash flows with and without the new equipment. In Model B, only the machinery outlay and any associated installation, training, and incremental working capital enter the initial investment; the previously committed Rp7,300,000 is excluded unless it can be shown to have an alternative use, in which case only that opportunity cost would be included. Because the case record contains no equipment quotation, capacity measurement, or attributable sales, Model B is not populated with invented values. Instead, the minimum incremental annual net cash flow required for NPV ≥ 0 is calculated as the machinery outlay divided by the annuity factor and translated into equivalent additional packs using the unit contribution margin.

Indicators are recalculated from a common series as follows:

$$\mathrm{NPV} = \Sigma_t \, \mathrm{CF}_t / (1 + r)^t - \mathrm{I}_0 \tag{1}$$

$$\mathrm{PI} = [\Sigma_t \, \mathrm{CF}_t / (1 + r)^t] / \mathrm{I}_0 \tag{2}$$

where $\mathrm{CF_t}$ is the net cash flow in year t, r is the discount rate, and I_0 is the initial outlay. IRR is the rate at which NPV equals zero, solved iteratively (Brent's root-finding method, checked by evaluating NPV at the solution) rather than by linear interpolation, because interpolation across a wide interval overstates the root of a convex NPV profile. Simple and discounted payback are computed from cumulative cash flows. The 12 percent discount rate and three-year horizon are retained as reference assumptions rather than independently estimated capital costs or verified equipment life. No terminal value is added, and missing tax, depreciation, working-capital, and disposal detail is not replaced with invented values. Break-even is computed on an annual basis as

$$\text{BEP (units)} = \text{Annual fixed cost} / (\text{Price} - \text{Variable cost per unit}) \tag{3}$$

This calculation uses the 250-g pack (Rp15,000) and a variable cost of Rp7,250 per pack (Rp29,000 per kg divided by four packs). The single-product assumption is disclosed, and the 1-kg pack is reported as an alternative. All monetary values are in Indonesian rupiah, with rounding only for presentation.

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Sensitivity analysis was performed on Model A. Because the source reports a constant projected annual revenue of Rp87,000,000 together with the three net cash flows, annual expenditure was derived as the residual (Rp74,146,000, Rp74,870,000, and Rp76,219,000). One-variable scenarios reduce revenue by 5% and 10% with expenditure held constant, representing a short-run price or revenue shock without corresponding cost adjustment, and raise the combined expenditure line by 5% and 10%; this line covers variable costs and other expenditure, not raw materials exclusively. Combined adverse scenarios apply both changes simultaneously. Switching values are the percentage change in one variable that reduces NPV to zero. Scenario magnitudes are analyst-selected stress tests without assigned probabilities and are not estimates of a proportional volume decline.

Non-financial evidence was coded systematically. Each substantive claim in the case record was extracted and assigned to one of five aspects: market and marketing, technical and operational, management and human resources, legal, and industry environment. Each claim was then coded on three attributes: (i) evidence type, namely a documentary record (e.g., a permit or financial table), an owner statement (interview summary), or a researcher interpretation (the thesis author's assessment); (ii) corroboration, namely whether the claim appears consistently across the thesis, proposal, and draft article, appears in only one document, or conflicts between documents; and (iii) verification status, namely whether a primary artifact such as a certificate copy, invoice, or sales record was available to the present authors. Because all documents derive from the same case, cross-document consistency was treated as internal consistency, not independent confirmation. Contradictory or unverified claims were retained but labeled, and they were not used as inputs to the financial models. Aspect-level judgments are expressed as "supported by documents", "reported but unverified", or "insufficient evidence" rather than as a binary feasible or infeasible verdict. Coding was performed by the first author and checked by the third author, with disagreements resolved by discussion; formal inter-coder reliability was not computed. Numerical and qualitative findings are integrated by identifying prerequisites for an investment decision, with no causal generalization beyond this case.

4 Results and Discussion

4.1 Market and Marketing

According to Ramadhani's case record [7], UMKM Cemilan Aldy99 has expanded from community-based, word-of-mouth and WhatsApp sales into a network of traditional markets, bazaars, and small shops across Samarinda. The owner also reports that by 2025 the product had reached retail shelves at Sarinah, Central Jakarta; because no supply agreement, invoice, or sales record for this channel was available, the claim is coded as an unverified owner statement. The thesis describes a Segmenting, Targeting, and Positioning (STP) approach: geographically, the business serves Samarinda and outside markets through consignment and courier delivery; demographically, it targets consumers aged 10–50, including children, students, employees, and housewives; and

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psychographically, it appeals to consumers who share snacks at family and community gatherings. Small shops (toko kelontong) are described as the primary target, with direct individual buyers as a secondary target. This description is consistent with Manggu and Beni [19], who show that a properly implemented STP strategy helps MSMEs allocate limited marketing resources more efficiently.

The product is sold in two package sizes, a 1-kg pack at Rp70,000 and a 250-g pouch at Rp15,000; these prices appear in the thesis financial tables and are the only market inputs coded as documentary. Reported daily production of 5–8 kg supports continuous availability, although the manual process is said to limit the response to demand surges during Eid al-Fitr, Eid al-Adha, and Christmas. The record does not report sales volumes by product or channel, unmet orders, or customer counts. The market evidence therefore indicates that demand exists at the current output level, but it does not demonstrate that additional output produced by new machinery could be sold. Digital marketing appears under-utilized relative to the offline distribution network.

4.2 Technical and Operational

The case record describes production in the owner's home kitchen from 06:00 to 15:00 daily, a temporary arrangement while a dedicated production facility is under construction. The process comprises seven sequential stages: processing soybeans into tempeh, slicing, coating with tapioca flour and seasoning, deep frying, draining and cooling, packaging into 1-kg or 250-g formats, and storage before distribution. All stages are reported as manual, which keeps fixed costs low and allows direct quality control but constrains capacity and increases the risk of operator fatigue when orders spike. The record attributes declining efficiency to aging equipment, but it contains no measurement of throughput per hour, downtime, frying-oil consumption, or reject rates, and no specification of the proposed slicing and frying machines. These gaps are material because capacity and unit cost are the mechanisms through which equipment would change cash flow.

Melista et al. [20] emphasize that an efficient production layout and consistent Good Manufacturing Practices (GMP) are essential for food safety and quality control in home-based food MSMEs. Ibrohim et al. [15] report improved slicing capacity after a tempeh-slicing machine was introduced in another enterprise. These studies make mechanization a reasonable option to investigate at ALDY99, but they do not establish the size of the improvement there. The technical aspect is therefore assessed as adequate for current operations, whereas the capacity effect of new equipment is coded as insufficient evidence.

4.3 Management and Human Resources

The thesis describes a simple line structure in which the owner directs planning, procurement, quality control, and marketing, while two employees carry out the technical stages of production. According to the owner, employees receive a daily wage adjusted to attendance and workload, seasonal bonuses during peak-demand periods, and BPJS registration; no payroll or BPJS records were available, so these statements are coded

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as reported but unverified. Such arrangements are consistent with Fitrianti [21], who associates fair wages and worker protection with higher MSME labor productivity.

The concentration of managerial functions in one person is efficient at the current scale but could constrain growth and the implementation of new equipment, which would require scheduling, maintenance, and operator training. A modest delegation of administrative and record-keeping responsibilities is therefore a precondition for, rather than a consequence of, the proposed investment.

4.4 Legal Aspect

The thesis reports that UMKM Cemilan Aldy99 holds a Business Identification Number (NIB), a Household-Industry Food Production Certificate (PIRT), and a Halal Certificate. Copies of these certificates were not examined in this reanalysis, so the legal status is coded as a documentary claim that is consistent across documents but not independently verified. The BPOM distribution license (BPOM RI MD) is reported as outstanding because it requires a production facility separated from the household, a condition that cannot be met until the dedicated production house is completed. The reported legal position is adequate for local and inter-regional sales through traditional channels; access to modern retail and export channels would depend on completing the facility and applying Good Manufacturing Practices for processed food (CPPOB).

4.5 Industry Environment

The Porter's Five Forces assessment in the thesis is a researcher interpretation based mainly on the owner interview. It characterizes the threat of new entrants as relatively high because capital and licensing barriers for small-scale chip production are low, a pattern also observed by Sondakh et al. [22] among food-industry SMEs in Surabaya. Supplier bargaining power is described as moderate because soybeans and cooking oil are bought from markets and agents, although cooking-oil prices fluctuate. Buyer bargaining power is described as low because resellers and individual customers rarely negotiate price; Ndzabukelwako et al. [23] note that clear product differentiation tends to support SME performance. Substitutes and intense rivalry among similar producers in Samarinda are acknowledged. However, the record contains no count of competitors, no competitor price data, and no customer-retention data, so these judgments are coded as insufficient evidence for quantitative use. The industry environment is best described as competitive, with the business's position resting on claimed, not yet measured, differentiation.

4.6 Evidence Status of the Non-Financial Assessment

Table 1 summarizes the coding of the principal non-financial claims. Of the nine claims, only the product prices are supported by documents that also enter the financial calculation, and the financial tables themselves are unreconciled. Most market, technical, and management claims are owner statements, and the industry assessment is a researcher interpretation. No direct contradictions were found in the non-financial

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claims, but several claims appear in only one document, and the timing of the financial series is internally inconsistent.

Table 1. Evidence Coding Matrix for the Non-Financial Assessment

Aspect	Key claim in case record	Evidence type	Corroboration	Verification status	Financial assumption affected
Market	Sales through shops, markets, bazaars, and WhatsApp	Owner statement; thesis description	Consistent (same case)	Reported, unverified	Sales volume, realized price
Market	Sarinah (Jakarta) retail listing since 2025	Owner statement	Single document	Unverified	Channel revenue
Market	Prices Rp70,000/1 kg and Rp15,000/250 g	Documentary (financial table)	Consistent	Supported by documents	Price, BEP
Technical	5–8 kg/day manual output; aging equipment lowers efficiency	Owner statement; researcher interpretation	Consistent	Unverified; no throughput data	Capacity, incremental output
Technical	Dedicated production house under construction	Owner statement	Consistent	Unverified; completion date unknown	Timing, GMP and BPOM access
Management	Owner plus two employees; daily wage; BPJS	Owner statement	Consistent	Unverified	Labor cost
Legal	NIB, PIRT, and Halal held; BPOM MD pending	Documentary claim in thesis	Consistent	Certificates not examined	Market access
Industry	Low buyer power, loyalty, intense rivalry	Researcher interpretation	Single document	Insufficient evidence	Price stability, demand

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Aspect	Key claim in case record	Evidence type	Corroboration	Verification status	Financial assumption affected
Financial	2022–2024 surpluses; Rp87 million projected revenue	Documentary (financial table)	Partly contradictory (historical vs. projected timing; cost check)	Unreconciled	All cash flows

Source: Authors' coding of Ramadhani [7], the April 2026 proposal, and the earlier draft article.

On this basis, the earlier classification of the business as "non-financially viable" is withdrawn. The evidence supports a narrower statement: the record describes a functioning enterprise with established offline channels and reported basic registrations, while demand for additional output, equipment capacity, and competitive position remain unverified. These unverified items are carried forward as verification needs in the incremental appraisal below (Table 4).

4.7 Financial Aspect: Recalculated Enterprise-Level Reference Model

The source evaluates an initial outlay of Rp14,300,000, comprising Rp7,300,000 of existing working capital (production equipment and raw materials) and a planned machinery expenditure of Rp7,000,000. Variable cost is Rp29,000 per kilogram of tempeh chips (four 250-g packs), annual fixed cost covering wages, transport, and utilities is Rp15,640,000, and projected annual revenue is Rp87,000,000. Net cash flows of Rp12,854,000, Rp12,130,000, and Rp10,781,000 are the operating surpluses that the source's cash-flow narrative associates with 2022–2024. As explained in the Method, these figures are used here only in Model A, which tests the arithmetic of the source and the robustness of the existing business; they are not interpreted as cash flows generated by the proposed machine.

Discounted at 12%, the present values of the three inflows are Rp11,476,786, Rp9,669,962, and Rp7,673,703, totaling Rp28,820,450. The NPV of Rp14,520,450 reported in the source is confirmed. The reported PI of 1.015, however, equals NPV/I_0 (14,520,450/14,300,000), not the conventional ratio of discounted inflows to the initial outlay; the correct PI is 28,820,450/14,300,000 = 2.015. For the IRR, NPV is Rp2,854,815 at 50% and −Rp982,426 at 75%; linear interpolation between these points gives 68.6%, but because the NPV profile is convex, interpolation over a 25-percentage-point interval overstates the root. The exact iterative solution is 67.4%, at which NPV is zero. Simple payback is 1.12 years (1 + 1,446,000/12,130,000) and discounted payback is 1.29 years. Table 2 compares the reported and recalculated values.

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Table 2. Reported and Recalculated Indicators of the Enterprise-Level Reference Model (Model A)

Indicator	Criterion	Reported in source	Recalculated	Note
Net Present Value (NPV, 12%)	NPV > 0	Rp14,520,450	Rp14,520,450	Confirmed
Internal Rate of Return (IRR)	IRR > 12%	68.6% (interpolation, 50–75%)	67.4% (iterative)	Interpolation bias of 1.2 points
Profitability Index (PI)	PI > 1	1.015	2.015	Source reported NPV/I0
Simple payback	< 3 years	1.1 years	1.12 years	Confirmed
Discounted payback	< 3 years	Not reported	1.29 years	Added
Break-even point (annual, 250-g pack)	Below expected sales	163 units / Rp2,440,000	2,019 packs / Rp30.27 million	Source figure not reproducible

Source: Authors' recalculation from Ramadhani [7]. I0 = Rp14,300,000; cash flows Rp12,854,000, Rp12,130,000, and Rp10,781,000; r = 12%.

The source's break-even point of 163 units (Rp2,440,000) cannot be reproduced from its own cost data. With a variable cost of Rp7,250 per 250-g pack, the contribution margin is Rp7,750 per pack, so annual fixed cost of Rp15,640,000 implies a break-even of 2,018.1, or about 2,019 packs, equivalent to Rp30.27 million in sales (about 505 kg). If all output were sold in 1-kg packs (contribution margin Rp41,000), break-even would be about 382 kg or Rp26.70 million. The reported 163 units is close to a monthly break-even (Rp1,303,333/Rp7,750 ≈ 168 packs), which suggests that monthly and annual bases were mixed, but the source does not show its derivation. Against projected revenue of Rp87 million (about 5,800 pack-equivalents), the annual break-even implies a margin of safety of roughly 65%.

A cost-consistency check also reveals an unreconciled gap. If the projected revenue were generated entirely by 250-g packs, variable cost would be about Rp42.05 million and total cost about Rp57.69 million, whereas the expenditure implied by the source's cash flows is Rp74.15–76.22 million. The difference of Rp16.5–18.5 million per year cannot be explained from the record and is one reason the source statements require reconciliation before they support an investment decision.

4.8 Sensitivity and Switching Values

Table 3 reports the sensitivity analysis of Model A. A 5% revenue reduction or a 5% expenditure increase leaves NPV positive, but a 10% change in either variable makes NPV negative and prevents recovery of the outlay within three years. Both combined adverse scenarios produce negative NPV. The switching values show that NPV falls to zero if revenue declines by 6.95% with expenditure unchanged, if expenditure rises by 8.06% with revenue unchanged, or if both move adversely by 3.73% simultaneously.

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Table 3. Sensitivity Analysis of the Enterprise-Level Reference Model (Model A)

Scenario	Net cash flow, years 1/2/3 (Rp thousand)	NPV (Rp)	IRR	PI	Payback
Base (reference)	12,854 / 12,130 / 10,781	14,520,450	67.4%	2.015	1.12 years
Revenue −5%	8,504 / 7,780 / 6,431	4,072,484	28.8%	1.285	1.74 years
Revenue −10%	4,154 / 3,430 / 2,081	−6,375,482	−19.1%	0.554	Not recovered
Expenditure +5%	9,147 / 8,386 / 6,970	5,513,507	34.5%	1.386	1.61 years
Expenditure +10%	5,439 / 4,643 / 3,159	−3,493,437	−4.1%	0.756	Not recovered
Combined: revenue −5%, expenditure +5%	4,797 / 4,036 / 2,620	−4,934,459	−11.3%	0.655	Not recovered
Combined: revenue −10%, expenditure +10%	−3,261 / −4,057 / −5,541	−24,389,369	Undefined	<0	Not recovered

Source: Authors' calculation. Revenue Rp87,000,000 per year; expenditure derived as revenue minus net cash flow; r = 12%; I0 = Rp14,300,000.

The high IRR and the fragility of NPV are consistent once the margin structure is considered. The operating surplus is only 12–15% of revenue, so a small percentage change in revenue or expenditure removes a large share of each year's cash flow. This supports the distinction drawn by Darmansyah et al. [13] between favorable discounted measures and liquidity risk: an attractive return on a small outlay does not ensure that the business can absorb modest price or cost shocks. Because the scenarios lack empirical probabilities, the switching values indicate model vulnerability, not a measured likelihood of loss.

4.9 Incremental Machinery Appraisal: With versus Without New Equipment

Model A does not answer the investment question for two reasons. First, its outlay includes Rp7,300,000 of capital that was already committed to the business; for a machinery decision this amount is not an incremental cash outflow unless it has an alternative use. Second, its inflows are historical surpluses of the whole business generated before any new machinery was acquired, so they cannot be attributed to the machine. Table 4 sets out the with-versus-without structure required for Model B and the status of each parameter in the case record.

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Table 4. Incremental Appraisal Framework for the Proposed Machinery (Model B)

Parameter	Without new machinery	With new machinery	Status in case record
Initial outlay	–	Rp7,000,000 planned; installation and training not stated	Partial; no quotation
Production capacity	5–8 kg/day (reported)	Not measured	Missing
Realized demand and additional sales	Current channels; volumes not reported	Not estimated	Missing
Selling price	Rp15,000/250 g; Rp70,000/1 kg	Assumed unchanged	Available
Variable cost	Rp29,000/kg	Oil, energy, and yield effects not measured	Partial
Labor effects	Owner plus two employees, daily wage	Labor saving not estimated	Missing
Maintenance and electricity	Within fixed cost (not itemized)	Not estimated	Missing
Incremental working capital	–	Not estimated	Missing
Taxes	Not documented	Not documented	Missing; MSME final-tax treatment to be confirmed
Equipment life and salvage value	–	Not stated	Missing
Minimum incremental net cash flow for NPV ≥ 0	–	Rp2,914,443/year (3 years); Rp1,941,868/year (5 years)	Computed (r = 12%)

Source: Authors' analysis of Ramadhani [7]. Minimum incremental net cash flow = Rp7,000,000 divided by the annuity factor at 12% (2.4018 for 3 years; 3.6048 for 5 years).

Because most parameters are missing, Model B cannot yet be estimated, and the article does not claim that the machinery investment is feasible. The framework can nevertheless indicate the size of the benefit required. Over a three-year horizon, the machine must generate at least Rp2,914,443 per year in incremental net cash flow, from additional sales, lower labor or material cost, or reduced rejects, for its NPV to be non-negative. At a contribution margin of Rp7,750 per pack, this is equivalent to about 376 additional 250-g packs per year (about 94 kg). If a five-year equipment life were verified, the threshold would fall to Rp1,941,868 per year, or about 251 packs (63 kg). These thresholds exclude installation, maintenance, and electricity costs, which would raise them. They are modest relative to the reported output of 5–8 kg per day, which makes the investment plausible enough to justify a structured trial, but plausibility is a hypothesis to test, not evidence of feasibility.

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4.10 Development Strategy

The findings support a staged and conditional development strategy rather than an immediate purchase. First, before buying equipment, the owner should obtain at least two supplier quotations specifying capacity, power requirement, maintenance, and expected life; record a four-week baseline of throughput, labor hours, oil use, rejects, and unmet orders; and populate Model B. The purchase is financially justified only if the expected incremental net cash flow exceeds the threshold in Table 4 under adverse assumptions. Second, completion of the dedicated production facility should be prioritized so that GMP can be applied and BPOM MD registration pursued. Third, digital marketing, through social-media content and simple e-commerce listings, should be developed to create the demand that additional capacity would require. Fourth, bookkeeping should be formalized on a monthly basis and reconciled with receipts and bank records, which would also resolve the cost gap identified above. Fifth, cooking-oil procurement should be planned with a modest buffer stock, given that a 10% expenditure increase eliminates the reference NPV. Pursued in this order, these steps would convert a description of a viable existing business into an evidence-based investment decision.

5 Conclusion and Recommendation

Independent recalculation confirms that the enterprise-level reference model is arithmetically positive, with an NPV of Rp14,520,450, an IRR of 67.4%, a PI of 2.015, a simple payback of 1.12 years, and an annual break-even point of about 2,019 packs (Rp30.27 million). The originally reported PI (1.015), IRR (68.6%), and break-even point (163 units) were computational errors and have been corrected. These results support a limited conclusion: on the basis of its recorded historical surpluses, the existing business appears financially viable. They do not support the stronger conclusion that the proposed machinery investment is financially feasible, because the cash flows are whole-business surpluses for 2022–2024 rather than incremental machine benefits, and because no equipment-specific data are available. The viability conclusion is also sensitive: NPV becomes negative with a revenue decline of about 6.9% or an expenditure increase of about 8.1%. The non-financial record describes a functioning enterprise with established offline channels and reported basic registrations, but most claims are owner statements that were not independently verified. The recommended decision is therefore conditional: the machinery should be acquired only after a quotation-based incremental appraisal shows incremental net cash flow above about Rp2.91 million per year (three-year horizon) under adverse scenarios.

As a single-case documentary reanalysis, the study cannot be generalized to all tempeh-chip or food MSMEs, and its conclusions are limited by the quality of the secondary record. The sensitivity analysis covers revenue and expenditure shocks but not seasonality, correlated shocks, or endogenous cost adjustment.

The evidence comes from a single documented enterprise and is not representative of the wider food-processing sector. Cross-document comparison does not create independent observations when documents draw on the same underlying case. The analysis does not establish interview saturation, inter-coder reliability, or documentary

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completeness. These limitations constrain the strength of the qualitative interpretation and prevent statistical generalization. The study instead offers analytical propositions for testing in better-documented investment settings.

The source financial statements have not been reconciled to receipts, bank records, inventories, or tax records. The operating-surplus series is used transparently as a reference, and the historical-to-evaluation timing assumption is not a validated forecast. The sensitivity scenarios lack empirical probabilities; consequently, the calculated switching values indicate model vulnerability rather than a measured likelihood of loss or a guaranteed operating safety margin.

Future work should establish a monthly baseline, document equipment specifications and quotations, and compare outcomes before and after an appropriately designed trial. Demand should be measured through realized orders and collections by product and channel. A prospective incremental appraisal can then incorporate installation, training, maintenance, working capital, and terminal value over a justified project horizon. Multiple-case comparison would help determine whether the decision sequence is useful across different types of microenterprises rather than merely plausible within ALDY99.

DECLARATIONS

Author Contributions

Conceptualization, Kiswanto and Jonkenedi; methodology, Rika; writing—review and editing, Kiswanto, Rika, and Jonkenedi. All authors have read and approved the final version of the manuscript.

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Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Data Availability Statement

The data supporting the findings of this study are derived from the undergraduate thesis cited as Ramadhani [7] and are available from the corresponding author upon reasonable request. All recalculated values are reported in the article.

Artificial Intelligence (AI) Disclosure

During the preparation of this manuscript, the authors used ChatGPT and Claude for language improvement, editorial assistance, and checking of the financial recalculations. The authors subsequently reviewed and revised all generated or modified content and take full responsibility for the final manuscript.

Research Ethics
Ethical review and approval were not required for this study because it is a reanalysis of existing documentary records and no new data were collected from human participants.

Informed Consent Statement
Not applicable; no new data were collected from human participants for this reanalysis.

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