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Sensitivity Analysis on the Financial Feasibility of CV Dewi Makmur's Herbal Tea Bag Agroindustry in Bantul, Yogyakarta

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ABSTRACT

Herbal tea bags have become a major trend in the functional food industry, with increasing domestic demand. CV Dewi Makmur, a producer of herbal tea bags established in 2008 that produces more than 4,000 units per month, faces challenges due to fluctuations in raw material prices caused by seasonal and weather changes. These fluctuations have the potential to affect the company's profitability and long-term sustainability. Therefore, this study aims to analyze the impact of changes in raw material prices on the feasibility of the herbal tea bag agroindustry at CV Dewi Makmur through sensitivity analysis. This research employs a descriptive method with a quantitative approach and a case study design. The respondent selection was conducted using purposive sampling, utilizing both primary and secondary data sources. Data collection techniques included Focus Group Discussions (FGD), observations, and documentation. The data analysis involved calculating the Sensitivity Payback Period (PP), Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index (PI). The results indicate that the herbal tea bag agroindustry at CV Dewi Makmur remains financially feasible and is not sensitive to an 8% increase in raw material prices. This is supported by a Payback Period of 2 years, 3 months, and 3 days; a Net Present Value (NPV) of IDR 172,860,981; an Internal Rate of Return (IRR) of 58.47%; and a Profitability Index (PI) of 1.20. The study concludes that despite the rise in raw material prices, the business remains profitable and resilient.

INTRODUCTION

The agricultural-based industrial sector, commonly referred to as agroindustry, holds strategic potential as a source of national foreign exchange and income for farmers and workers. Agroindustry plays a vital role in creating employment opportunities, increasing the added value of agricultural products, and supporting national economic growth. One of the significant subsectors is the herbal tea bag agroindustry, which is not only a major trend in the functional food industry but also demonstrates consistently growing domestic demand. According to data from the Statistics Indonesia (2021) the average per capita consumption of tea bags per week reached 2.79 grams in September 2021, an increase of 0.72% compared to 2.77 grams in March 2021. This trend indicates growing consumer interest in herbal tea products as part of a healthy lifestyle. Moreover, herbal tea is recognized as a functional food with health benefits, such as antioxidant content that can prevent degenerative diseases (Yamin & Furtuna Ayu, 2017).

Financial analysis evaluates costs and benefits to determine whether a business generates profit over its operating period. A business project feasibility study is an assessment of whether a business project can be successfully implemented (Husnan & Suwarsono, 2014). According to Umar Husein (2000), feasibility refers to the projection of whether a project will be able or unable to generate acceptable profits once it is operational. Sulistiyowati (2019) states that business feasibility analysis provides several important benefits, including mitigating risk, supporting effective business planning, facilitating business implementation, and strengthening monitoring and control through continuous evaluation and supervision.

The success of agroindustry depends heavily on the availability of suitable raw materials. A stable supply not only ensures operational sustainability but also significantly affects profitability. However, CV Dewi Makmur, a herbal tea bag agroindustry in Bantul, Yogyakarta, faces challenges due to fluctuations in raw material prices caused by seasonal and weather changes. Although the company procures raw materials year-round, quantities and prices fluctuate based on seasonal factors.

From a theoretical perspective, the continuity of raw material supply and sound financial management are key determinants of agroindustrial sustainability. Basic economic theory suggests that fluctuations in raw material prices affect production costs, profit margins, and overall business feasibility. In this context, sensitivity analysis serves as a tool to evaluate how changes in raw material prices influence financial performance (Gittinger, 2008). Despite numerous studies on agroindustrial feasibility, research specifically applying sensitivity analysis to medium-scale herbal tea bag agroindustries facing seasonal constraints remains limited. Most previous studies focus on static feasibility indicators without adequately examining the responsiveness of financial performance to dynamic changes in input prices.

Therefore, this study addresses this gap by analyzing the financial feasibility of CV Dewi Makmur through a sensitivity analysis approach. By examining the responsiveness of key financial indicators to input price fluctuations, this research provides a comprehensive understanding of the business's financial resilience. The novelty of this research in the application of sensitivity analysis to small-scale herbal tea businesses, which is expected to contribute to the academic literature and offer practical insights for stakeholders in supporting the growth of herbal tea agroindustries.

RESEARCH METHODOLOGY

This study employs a descriptive quantitative approach with a case study research design. Sugiyono (2008) explains that quantitative methods, rooted in the philosophy of positivism, are used to study specific populations or samplestypically selected randomly. Data are collected using research instruments and analyzed statistically to test predetermined hypotheses. The selection of respondents in this study employed a non-probability sampling technique using the purposive method, where subjects are intentionally chosen based on specific characteristics (Morissan, 2012). The respondents include the heads and staff of the marketing, HR, accounting, and production departments at CV Dewi Makmur.

The study utilizes both primary and secondary data. Data collection techniques include observation, Focus Group Discussions (FGD), documentation, and record-keeping. The primary data analysis technique is sensitivity analysis, which involves calculating several investment criteria, including:

Payback Period (PP)

$$NPV = \sum_{t=0}^{n} \frac{Bt - Ct}{(1+i)^t}$$

The evaluation criteria for the Payback Period (PP) are as follows:

a. If the Payback Period is shorter than (<) the project's economic life, the business is considered feasible.
b. If the Payback Period is longer than (>) the project's economic life, the business is not considered feasible.

Net Present Value (NPV)

$$NPV = \sum_{t=0}^{n} \frac{Bt - Ct}{(1+i)^t}$$

Explanation:

Bt = Revenue (Benefit) in year t (Rupiah)

Ct = Cost in year t (Rupiah)
n = Economic life of the project (Years)
i = Interest rate/Discount rate (Percent)
t = Year

The evaluation criteria for Net Present Value (NPV) are as follows:
a. If NPV > 0, the business is financially feasible and should be accepted.
b. If NPV < 0, the business is not financially feasible and should be rejected.

Internal Rate of Return (IRR)

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} x\ (i_2 - i_1)$$

Explanation:
i_1 = Interest rate 1 (the discount rate that results in NPV_1)
i_2 = Interest rate 2 (the discount rate that results in NPV_2)
NPV_1 = *Net Present Value* 1
NPV_2 = *Net Present Value* 2

The evaluation criteria for the Internal Rate of Return (IRR) are as follows:
a. If the IRR > expected rate of return (discount rate), the investment is considered feasible.
b. If the IRR < expected rate of return (discount rate), the investment is not considered feasible.
(Gray et al., 1991).

Profitability Index (PI)

$$PI = \frac{\Sigma\ PV\ Kas\ Bersih}{\Sigma\ PV\ Investasi}\ x\ 100\%$$

The evaluation criteria for the Profitability Index (PI) are as follows:
a. If PI > 1, the investment is accepted
b. If PI < 1, the investment is rejected.
(Kasmir & Jakfar, 2003)

Sensitivity Analysis

This analysis is conducted by identifying the "switching value" of specific parameters to observe their impact on the acceptability of an investment alternative (Gittinger, 2008). In this study, the sensitivity analysis assumes an 8% increase in raw material prices, while sales volume and other operational costs remain constant.

RESULTS AND DISCUSSION

Investment Costs, Operational Costs, Total Costs, and Benefits

Investment costs refer to capital expenditures on activities with a relatively long time frame across various business sectors. In this analysis, operational costs comprise fixed and variable costs incurred by CV Dewi Makmur for the production of herbal tea bags over a three-year period (2020–2022). Total cost is derived from the sum of investment and operational costs incurred during this period. Meanwhile, benefit analysis pertains to the revenue generated from the sales of nine herbal tea bag variants.

The assumed change in input is an 8% increase in raw material prices, while other operational costs, sales volume, and revenue are assumed to remain constant. This sensitivity analysis is conducted to determine the impact of price and cost fluctuations on the project's viability. The analysis aims to identify the threshold where the business reaches a break-even point in present value terms, specifically where: The Net Present

Value (NPV) equals zero; The Internal Rate of Return (IRR) equals the 12% discount rate; and The Payback Period aligns with the project's three-year lifespan.

Based on the analysis results, the investment costs incurred by CV Dewi Makmur amounted to IDR 858,883,925, comprising licensing fees and the purchase of fixed assets. Operational costs over the three-year period (2020–2022) totaled IDR 2,141,305,005, with an annual average of IDR 713,768,335. Fixed costs at CV Dewi Makmur include the depreciation of fixed assets based on their respective economic lifespans. Meanwhile, variable costs include expenses for raw materials, labor, utilities (water and electricity), packaging, maintenance and repairs, transportation, marketing, taxes, and other miscellaneous costs. The total cost incurred by CV Dewi Makmur over three years amounted to IDR 3,000,188,930, with an annual average of IDR 1,000,062,977. Benefits (revenue) obtained during the same period totaled IDR 3,277,470,000, with an annual average of IDR 1,092,490,000.

Table 1. Investment, Operational, and Total Costs with Associated Benefits

Year	Period	Investment Costs (IDR/Year)	Operational Costs (IDR /Year)	Total Costs (IDR /Year)	Benefit (IDR /Year)
1	2020	858.883.925	745.102.313	1.603.986.238	1.200.510.000
2	2021		833.455.695	833455695	1.401.960.000
2	2022		562.746.997	562746997	675.000.000
Total		858.883.925	2.141.305.005	3.000.188.930	3.277.470.000
Average		858.883.925	713.768.335	1.000.062.977	1.092.490.000

Source: Primary Data Analysis, 2023

Table 2. Sensitivity Analysis Results of Net Present Value (NPV) for CV Dewi Makmur's Herbal Tea Bag Agroindustry

Year	Period	Benefit (IDR /Year)	Total Cost (IDR /Year)	Net Benefit (IDR /Year)	DF (12%)	Present Value (IDR /Year)
1	2020	1.200.510.000	1.603.986.238	-403.476.238	0,893	-360.246.641
2	2021	1.401.960.000	833.455.695	568.504.305	0,797	453.208.151
3	2022	675.000.000	562.746.997	112.253.003	0,712	79.899.470
Total		3.277.470.000	3.000.188.930	277.281.070		172.860.981
Average		1.092.490.000,00	1.000.062.977	92.427.023,33		57.620.326,84

Source: Primary Data Analysis, 2023

Table 3. Sensitivity Analysis Results of the Internal Rate of Return (IRR) for CV Dewi Makmur's Herbal Tea Bag Agroindustry

Year	Period	Net Benefit (Rp/Year)	DF (58%)	Present Value (Rp/Year)	DF (60%)	Present Value (Rp/Year)
1	2020	-403.476.238	0,633	-255.364.708	0,625	-252.172.649
2	2021	568.504.305	0,401	227.729.653	0,391	222.071.994
3	2022	112.253.003	0,254	28.459.463	0,244	27.405.518
Total		277.281.070	PV Positive	824.409	PV Negative	-2.695.136
Average		92.427.023,33		274.802,83		-898.378,77

Source: Primary Data Analysis, 2023

Sensitivity of Net Present Value (NPV)

The table presents a detailed calculation of the Net Present Value (NPV) for CV Dewi Makmur's herbal tea bag agroindustry, assuming an 8% increase in raw material prices and a 12% discount rate. The analysis includes several key components: the Period, representing operational years from 2020 to 2022; Benefit (IDR/year), showing annual revenue; Total Cost (IDR/year), including both fixed and variable costs; Net Benefit (IDR/year), calculated as total benefits minus total costs; the Discount Factor (DF 12%), accounting for the time value of money; and the Present Value (PV), obtained by multiplying the net benefit by the discount factor.

The analysis reveals that in 2020, the company recorded a negative net benefit of IDR -403,476,238, as costs exceeded revenue. However, in 2021 and 2022, CV Dewi Makmur achieved positive net benefits, indicating a significant financial recovery. Over the three-year period, the total NPV is IDR 172,860,981. Since the NPV is greater than zero, the project remains financially viable, demonstrating the business's resilience despite the increase in raw material costs.

Sensitivity of Internal Rate of Return (IRR)

The Internal Rate of Return (IRR) assesses the business's annual percentage of profit and demonstrates its ability to repay loans. The table presents the sensitivity analysis results for the Internal Rate of Return (IRR) of CV Dewi Makmur's herbal tea bag agroindustry, assuming an 8% increase in raw material prices. It outlines the annual net benefits from 2020 to 2022 and the Net Present Values (NPV) calculated using two trial discount rates: 58% and 60%. In 2020, the net benefit was negative (-IDR 403,476,238), resulting in negative present values at both discount rates. However, the company achieved positive net benefits in 2021 and 2022, leading to a significant recovery in present values.

$$IRR = i_1 + \frac{NPV_1}{NPV^1 - NPV_2} x\ (i_2 - i_1)$$

$$IRR = 58\% + \frac{824.409}{824.409 - (-2.695.136)} x\ (60\% - 58\%)$$

$$IRR = 58\% + \frac{824.409}{3.519.545} x\ (2\%)$$

$$IRR = 58\% + 0{,}23\ x\ 2\%$$

$$IRR = 58{,}47\%$$

The calculation yielded a positive NPV of IDR 824,409 at a 58% discount rate and a negative NPV of -IDR 2,695,136 at 60%. Based on these results, the Internal Rate of Return (IRR) for CV Dewi Makmur is 58.47%. Since this IRR significantly exceeds the 12% expected discount rate, the business remains highly profitable and capable of fulfilling its investment obligations. This confirms the financial resilience and viability of the herbal tea bag agroindustry, even when faced with rising raw material costs.

Sensitivity of Payback Period (PP)

The Payback Period (PP) is calculated by comparing the total initial investment with the annual net cash flows (or net benefits).

$$PP = \frac{\sum Investment}{\sum Net\ Benefit/Year}$$

$$PP = \frac{858.883.925}{277.281.070}$$

$$PP = 3{,}09 = 3{,}1\ Month$$

Table 4. Sensitivity Analysis Results of the Payback Period for CV Dewi Makmur's Herbal Tea Bag Agroindustry

Year	Period	Investment (Rp/Year)	Net Benefit (Rp/Year)	Accumulation (Rupiah)
1	2020	858.883.925	-403.476.238	
2	2021		568.504.305	165.028.067
3	2022		112.253.003	277.281.070
Total		858.883.925	277.281.070	
Average		858.883.925	92.427.023,33	

Source: Primary Data Analysis, 2023

The table presents the sensitivity analysis results for the Payback Period (PP) of CV Dewi Makmur's herbal tea bag agroindustry. It outlines the investment, net benefit, and cumulative benefits from 2020 to 2022. In 2020, while the investment was IDR 858,883,925, the net benefit was negative (-IDR 403,476,238) due to high initial costs. However, the company achieved a positive net benefit of IDR 568,504,305 in 2021, which increased further to IDR 112,253,003 in 2022. This resulted in a total cumulative net benefit of IDR 277,281,070 by the end of 2022, with an annual average net benefit of IDR 92,427,023.

Based on the analysis, the payback period for CV Dewi Makmur's herbal tea bag agroindustry is 2 years, 3 months, and 3 days. This indicates that the business remains financially feasible, as the investment is recovered within the project's three-year economic life, despite an 8% increase in raw material prices and total expenditures of IDR 3,000,188,930 sourced from internal funds. Compared to a study by (Rohmah et al., 2020) on Robusta coffee processing, which reported a shorter payback period of approximately 1 year and 1.3 months due to a lower investment value, CV Dewi Makmur's agroindustry still demonstrates strong profitability through rapid revenue generation. This resilience is driven by stable demand and high consumption of herbal tea, particularly during the COVID-19 pandemic (2020–2021), which accelerated cash inflows. As noted by (Razak, 2016), stable market demand is a crucial factor in shortening the payback period by ensuring continuous revenue generation.

Sensitivity of Profitability Index (PI)

$$PI = \frac{\Sigma\, PV\ Net\ Cash}{\Sigma\, PV\ Investment}\ x\ 100\%$$

$$PI = \frac{172.860.981}{858.883.925}\ x\ 100\%$$

$$PI = 20{,}13\%$$

Based on the Profitability Index (PI) calculation, it is found that CV Dewi Makmur generates a PI of 1.20 following an 8% increase in raw material prices. This indicates that the Present Value (PV) of cash inflows exceeds the initial investment (PV of cash outflows) by 20.13%. In this context, a PI of 1.20 signifies that the herbal tea bag agroindustry at CV Dewi Makmur yields a surplus value of 0.20 for every 1.00 unit of currency invested, confirming the project's financial efficiency.

Sensitivity Rate

Overall, the sensitivity analysis for the four investment criteria is calculated based on the rate of change in financial performance relative to the fluctuations in input prices, using the following formula:

$$Sensitivity\ Rate = \frac{\frac{X_1 - X_0}{X'}}{\frac{Y_1 - Y_0}{Y'}}\ x\ 100\%$$

Explanation:

X_0 = PP/NPV/IRR/PI before the change

X_1 = PP/NPV/IRR/PI after the change

X' = Average change in PP/NPV/IRR/PI

Y_0 = Production costs before the change

Y_1 = Production costs after the change

Y' = Average change in production costs

Based on the analysis presented in Table 5, all investment evaluation criteria yield sensitivity values of less than one. This indicates that the rate of return for CV Dewi Makmur's herbal tea agroindustry is not highly sensitive to an 8% fluctuation in raw material prices. In this context, "not sensitive" implies that while changes in raw material prices do occur, they do not result in a disproportionately large impact on the project's overall feasibility. Although an 8% increase in raw material prices raises production costs, the business maintains its financial viability because its profit margins are robust enough to absorb these fluctuations without compromising the net present value (NPV) or internal rate of return (IRR). Conversely, a decrease in raw material prices would lower production costs, thereby potentially increasing the company's profit margin and overall investment efficiency.

From a microeconomic perspective, a sensitivity value of less than one suggests that the agroindustry has a low degree of operating leverage regarding raw material inputs. This resilience can be theoretically linked to the concept of cost absorption capacity, where the value-added margin of processed herbal tea is high enough to cushion the impact of rising input prices. Furthermore, this low sensitivity indicates an inelastic relationship between production costs and overall business feasibility. According to the theory of the firm, companies operating with differentiated products—such as functional herbal teas—often possess greater pricing power or more stable margins compared to raw commodity traders. As long as the marginal benefit of production remains higher than the marginal cost despite the 8% price hike, the firm continues to operate at an efficient frontier, maintaining its long-term investment attractiveness.

Table 5. Sensitivity Rate Analysis of the Herbal Tea Bag Agroindustry at CV. Dewi Makmur for the Year 2023

Criteria	Before	After	Average	Sensitivity Rate	Description
PP (Year)	2,4	2,3	2,35	-5,03	Not Sensitive
NPV (Rp)	187.448.157	172.860.981	180.154.569	-9,56	Not Sensitive
IRR (%)	62,92	58,47	60,70	-8,66	Not Sensitive
PI	1,22	1,20	1,21	-1,95	Not Sensitive

Source: Primary Data Analysis, 2023

The resilience of the herbal tea bag agroindustry to price fluctuations is also influenced by several external factors, including dependence on raw materials, seasonal conditions, and global market dynamics. Agroindustries relying on agricultural inputs are often vulnerable to price volatility due to weather patterns and climatic changes that can reduce crop yields. This phenomenon aligns with the law of demand and supply, a fundamental concept in economics explaining the relationship between price and quantity. As noted by (Mankiw, 2014), price levels are dictated by the relationship between the quantity demanded and supplied under ceteris paribus conditions; where a reduction in supply due to adverse weather typically drives prices upward. By understanding these dynamics, CV Dewi Makmur can better anticipate shifts in the economic landscape that might affect their cost structure.

When a company has a high level of dependence on specific raw materials, it may face negative impacts such as continuous increases in production costs and supply constraints. If the company is unable to adjust its product selling prices in line with rising costs, profit margins will inevitably decrease, adversely affecting overall profitability. To mitigate these risks, CV Dewi Makmur can implement several strategic measures, including diversifying raw material sources, seeking alternative inputs, and establishing long-term partnerships with reliable suppliers to ensure price stability. Additionally, implementing effective production planning and maintaining operational efficiency are essential to ensure business sustainability. By closely monitoring market trends and maintaining product quality, the company can protect its investment from the risks associated with market fluctuations and ensure continued financial success.

CONCLUSION

The sensitivity analysis indicates that the herbal tea bag agroindustry at CV Dewi Makmur remains financially viable and resilient against an 8% increase in raw material prices. This is evidenced by a Payback Period of 2 years, 3 months, and 3 days, which is well within the project's economic life. Furthermore, the Net Present Value (NPV) of IDR 172,860,981 remains positive, and the Internal Rate of Return (IRR) of 58.47% significantly exceeds the 12% expected discount rate, demonstrating the project's high capacity for capital return. The Profitability Index (PI) of 1.20 further confirms that the investment generates a 20% surplus over the total present value of costs, reinforcing that the business is not highly sensitive to the tested price fluctuations. Based on these findings, it is recommended that CV Dewi Makmur enhance its production and sales performance by designing targeted marketing strategies that align with consumer behavior to sustain and grow total revenue. To mitigate the risks associated with raw material price volatility, the company should implement strategic measures such as diversifying raw material sources to reduce dependency on single suppliers and exploring alternative inputs. Additionally, establishing long-term contracts with suppliers and improving operational efficiency will be crucial in maintaining stable profit margins and ensuring the long-term sustainability of the herbal tea bag agroindustry.

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