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Financial Feasibility of Smallholder Closed-House Broiler Probiotic Farm

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Abstract:
Broiler meat has the highest protein consumption and contributes significantly to protein needs. However, the broiler farming business in Indonesia is dominated by smallholders who have not implemented appropriate maintenance management, followed by technology application, and taking health into account. The purpose of this study is to find out the financial feasibility of smallholder closed-house broiler probiotic farms. This study use qualitative approach, with interviews as primary data. Financial feasibility will be analysed using payback period, Net Present Value (NPV), and Internal Rate of Return (IRR), and the risk will be assessed using sensitivity analysis and scenario analysis. The result shows that the project is financially feasible to be executed, with payback period of 2.16 years, positive value of net present value (NPV) of IDR 180,155,939, and internal rate of return (IRR) of 36%, which is higher than the weighted average cost of capital (WACC) of 6.62%. Furthermore, four variables have been identified as sensitive variables: chicken price per kg, average chicken weight sold, Cost of Goods Sold (COGS)feed, and Cost of Goods Sold (COGS)Day-Old Chick (DOC) and the project are not feasible to be executed in the worst-case scenario.

Keywords: *Financial feasibility, capital budgeting, broiler farming business*

1. Introduction

The agricultural sector is the primary sector in national economic development, accounting for the second-largest Gross Domestic Product (GDP) contributor and increasing by 5.33% from the previous year. The agricultural sub-sector that plays a role in food security's success as a food provider in fulfilling protein is the livestock sub-sector, contributing 12.37% of the agricultural sector's total GDP. The livestock sub-sector phenomenon that enhances GDP is an increase in poultry production and the supply of broilers. Broiler has the highest protein consumption and the domestic market's preference for white meat over red meat pushes market demand for the broiler to rise more rapidly (BPPP KEMENDAG, 2014). However, the increasing demand is not proportional to existing production. In 2019, broiler chicken consumption was 5.68 kg per capita per year. Individual nutrient intake is low compared to other countries' per capita consumption. Indonesia already made chicken meat self-sufficient in 2011. However, this is insufficient for domestic needs.

Animal husbandry in Indonesia is dominated by smallholder livestock businesses run by households that are still far from modern business principles (BPS, 2013). Only a small portion of smallholder businesses have implemented appropriate maintenance management followed by a technology application due to the lack of knowledge of breeders in conducting business feasibility (Fatah, 1994). Most breeders in Indonesia use an open cage, which causes an inadequate response when the weather conditions are not favourable. The closed-house system is a technological innovation effort to deal with weather variations which can reduce harmful influences from outside the cage. The purpose of adopting a closed-house system is to establish a controlled microclimate in the cage, to boost productivity, area, and labour efficiency, and to ease the breeders controlling and managing maintenance.

Another frequent issue is the high rate of animal mortality or depletion. Antibiotics are commonly administered to reduce mortality, stimulate growth, and enhance feed efficiency. Antibiotics, on the other hand, can cause the emergence of bacteria resistant to antibiotics. Although antibiotics are legally permitted, recently, there have been new developments against their use. Some countries have banned the use of antibiotics due to toxic residues and create resistant microorganisms in humans and livestock (Daud, 2005). Probiotics came out as opposed to antibiotics. Broiler probiotics are broilers raised organically, using probiotics and herbal herbs which result in no chemical residues and produce healthy meat that is safe for consumption.

Concerning technological development and health concern is necessary in developing broiler farming business. The broiler probiotic farming business using closed-house system sustainability is determined by the breeder's knowledge of business feasibility. The objective of this study is to find out the financial feasibility of a smallholder closed-house broiler probiotic farm and the risk that will be faced if the project is executed.

2. Literature Review

2.1. Financial Feasibility

Financial feasibility is an analytical tool to evaluate an investment's economic viability. Financial feasibility is a tool for examining expected return and expected risk as the financial decision (Fabozzi & Peterson, 2003). Financial feasibility is assessed using capital budgeting which analyses changes that will have long-term effects that will vary over time (Christensen, 2000).

2.2. Capital Budgeting

Capital budgeting is a method to analyse and evaluate the project or long-term investment feasibility according to the company's objective to maximize the owner's wealth over a period of time (Clark, Hindelang, & Pritchard, 1989; Gitman & Zutter, 2015).

2.3. Capital Budgeting Technique

Several techniques are available for performing an analysis to evaluate a project's merit and rate competing for investments. The preferred techniques are integrated time value procedures and risk and return consideration. Capital budgeting is based on analysing the result of cash flows and the cost by using the decision rule of payback period, net present value (NPV), and internal rate of return (IRR) (Menya & Gichinga, 2013).

The Payback period offers a rough measure of the investment's liquidity (Bierman & Smidt, 2007; Fabozzi & Peterson, 2003). The company subjectively determines the maximum length of acceptable payback time based on project type, product circumstances, and project perceived risk(Gitman&Zutter, 2015).

NPV determines how much value the undertaking investment is created or added (Ross, Westerfield, & Jordan, 2003).NPVis calculated by subtracting the present initial investment project from its cash inflows, discounted at a rate equal to the company's cost of capital (Gitman & Zutter, 2015).

IRR is the discount rate that makes a zero NPV of the investment, as well as the company rate of return that would generate if only the project investment received the required cash inflows (Gitman & Zutter, 2015; Ross et al., 2003; Van Horne & Wachowicz, 2008).

2.4. Capital Budgeting Risk

Risk in capital budgeting is defined as uncertainty regarding the cash flows that will be generated by the project or the degree of cash flow variability (Gitman & Zutter, 2015). The analytical techniques to determine and predict risk and risk influence are sensitivity analysis and scenario analysis (Karanovic, Baresa, & Bogdan, 2010).

Sensitivity analysis is uncertainty analysisby altering variables assumed from a base-case to evaluate how they affect the measured results of the project(Van Horne & Wachowicz, 2008). If theNPV is shown to be highly sensitive to relatively small changes in the projected value, the forecast risk involved with the variable is significant(Ross et al., 2003).

Scenario analysis is a behavioural technique which uses multiple potential alternate results to assess the returns measured variability by NPV when asking what-if questions (Gitman & Zutter, 2015; Ross et al., 2003). The commonly used scenario approach to estimate NPV is along with pessimistic (worst), most likely (base), and optimistic (best) cash inflow estimates (Brigham & Houston, 2009; Gitman & Zutter, 2015; Ross et al., 2003).

2.5. Weighted Cost of Capital (WACC)

Weighted average cost of capital (WACC) expects the average future cost of capital over time by weighing certain types of capital costs with the company's capital structure proportion (Gitman & Zutter, 2015). WACC is also the suitable discount rate for the company's overall cash flows.

2.6. Previous Study

(Fatoni, 2020)conducted a business feasibility analysis and the advantages of using medical herbs in broiler farms. The study used 30 respondents of a breeder in Malang Regency, which consists of 15non-herbal broiler farms and 15 medicinal herbal broiler farms with a farm population of 1000 to 5000. The study calculated NPV, payback period, IRR, and Net Benefit Cost Ratio (Net B/C) to analyse the feasibility. The results showed that both non-herbal broiler farms and medicinal herbal farms were feasible to run. However, the value of the benefit of medical herbs broiler farms was higher.

(Santoso, Sarjana, &Setiadi, 2018)assessed the performance and income of a closed-house broiler farm that was owned by the Faculty of Animal and Agricultural Sciences, Diponegoro University and PT Cemerlang Unggas Lestari as a partnership, with11,000 population. The study evaluated broiler performance, production costs, revenue, income, NPV, and Benefit-Cost Ratio (BCR). According to the findings, closed-house broiler farm produced more income than open-house broiler farm.

(Sunarya, Abidin, &Kalsum, 2016) performed financial feasibility and sensitivity analysis of probiotic chicken farm at Chicken Farmer Group (KPA)Berkat Usaha Bersama with a population of 1000. The data was collected between June and Julyof 2015. The study methodology is NPV, Net B/C, Gross Benefit-Cost Ratio (Gross B/C), IRR, payback period, Return on Investment (ROI), and sensitivity analysis. The findings showed that the probiotic chicken farm at KPA Berkat Usaha Bersama was feasible to be sustained and sensitivity occurs when the feed prices increased by 6% and production decreased by 5%.

(Purnomo &Santosa, 2007) examined the investment feasibility of a closed-house broiler farm partner of PT Gema Usaha Ternak. The study approach included NPV, Profitability Index (PI), discounted payback period, and IRR. The study

also assessedthe sensitivity analysis by changing the financing structure. The result indicated that the investment is feasible. However, the sensitivity analysis tends to be more feasible in investment if portion of owner equity is larger.

3. Methodology

This study is classified as applied research that collects information to evaluate the long-term feasibility and acceptability of project. Data are collected using primary data and secondary data. Primary data was obtained through interviews with Mr. Tita Tarsita as subarea head of Palembang, Mr. Arthur Beni as farm technical service, and Mr. Rianto as a farmer partner of PT Charoen Pokphand Indonesia Tbk and Mr. Pratikno as an independent farmer of a smallholder closed-house broiler probiotic farm. The secondary data is to support the interview that is obtained from several sources, including financial historical data of smallholder closed-house broiler probiotic farm as the benchmark company for years 2018-2021, historical chicken prices, 10 years price of Jakarta Stock Exchange (JKSE) and PT Charoen Pokphand Indonesia Tbk (CPIN), 10 years Government Bond Yield by Indonesia Bond Pricing Agency (IBPA), and related literature review from textbooks, journals, and research.

The data analysis is divided into four steps. The first step is to construct pro forma financial statements, which consist of each account assumption determined and transforming into pro forma financial statements. Depreciation is computed by usingstraight-line method.The second step is to calculateWACC, which will be applied to calculate NPV of the project and as the discount rate. The third step is to conduct the feasibility analysis using payback period, NPV, and IRR. The fourth step is to perform the risk assessment. Although the project can be evaluated in step 3 based on its feasibility, the risk needs to be considered to deal with the uncertainty of the assumptions made. The risk assessment will be calculated using sensitivity analysis by changing the variable input with the minimum and maximum value in the range of 5% and scenario analysis by creating three scenarios: pessimistic, most likely, and optimistic.

4. Data Analysis and Discussion

The initial investment will occur by the time the expenditure is made or at time zero, which represents thefund that is required to implement the project. The initial investment is 196,970,000, which clustered into land, building, and equipment. The project will use 100% owner equity as the fund source. Assumptions were made based on interviews and relevant secondary data.

- The project lifetime is 5 years.
- The capacity of the farm is 5000.
- The main product is live chicken weighing 1.45 kg with a mortality rate of 0.02%.
- The price of live chicken is assumed to be fixed based on the market price when this research was conducted at IDR 21,500 per kg for 5 years.
- The secondary product is husk at IDR 5,000 per sack.
- There are a total of 8 production cycles a year. Each production cycle lasts for 6 weeks.
- All of the input prices are constant.

Income Statement						
	0	1	2	3	4	5
Sales Revenue	-	1,227,660,000	1,227,660,000	1,227,660,000	1,227,660,000	1,227,660,000
Less: COGS	-	1,043,086,616	1,043,086,616	1,043,086,616	1,043,086,616	1,043,086,616
Gross Profits	-	184,573,384	184,573,384	184,573,384	184,573,384	184,573,384
Less: Operating Expenses		-	-	-	-	-
Salary Expense	-	66,000,000	66,000,000	66,000,000	66,000,000	66,000,000
Utility Expense	-	12,320,000	12,320,000	12,320,000	12,320,000	12,320,000
Maintenance Expense	-	1,680,000	1,680,000	1,680,000	1,680,000	1,680,000
Depreciation Expense	-	13,521,250	13,521,250	13,521,250	13,521,250	13,521,250
Total Operating Expense	-	93,521,250	93,521,250	93,521,250	93,521,250	93,521,250
Earnings Before Interest and Taxes (EBIT)	-	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134
Net Profit	-	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134

Table 1: Income Statement
Sources: Author Analysis

	0	1	2	3	4	5
Assets						
Cash	-	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134
Total Current Assets	-	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134
Land	72,000,000	72,000,000	72,000,000	72,000,000	72,000,000	72,000,000
Building	84,000,000	75,600,000	67,200,000	58,800,000	50,400,000	42,000,000
Equipment	40,970,000	35,848,750	30,727,500	25,606,250	20,485,000	15,363,750
Less: Accumulated Depreciation	-	(13,521,250)	(13,521,250)	(13,521,250)	(13,521,250)	(13,521,250)
Total Fixed Assets	196,970,000	169,927,500	156,406,250	142,885,000	129,363,750	115,842,500
Total Assets	196,970,000	260,979,634	247,458,384	233,937,134	220,415,884	206,894,634
Liabilities and Stockolders' Equity						
Paid-in Capital	196,970,000	169,927,500	156,406,250	142,885,000	129,363,750	115,842,500
Retained Earnings	-	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134
Total Stockholders' Equity	196,970,000	260,979,634	247,458,384	233,937,134	220,415,884	206,894,634
Total Liabilities and Stockholders' Equity	196,970,000	260,979,634	247,458,384	233,937,134	220,415,884	206,894,634

Table 2: Balance Sheet
Sources: Author Analysis

	0	1	2	3	4	5
Cash Flow from Operating Activities						
Net Profits	0	91,052,134	91,052,134	91,052,134	91,052,134	91,052,134
Land	(72,000,000)	0	0	0	0	0
Building	(84,000,000)	0	0	0	0	0
Equipment	(40,970,000)	0	0	0	0	0
Depreciation	0	13,521,250	13,521,250	13,521,250	13,521,250	13,521,250
Cash Provided by Operating Activities	(196,970,000)	104,573,384	104,573,384	104,573,384	104,573,384	104,573,384
Cash Flow from Investment Activities						
Increase in Gross Fixed Assets	0	0	0	0	0	0
Cash Provided by Investment Activitie	0	0	0	0	0	0
Cash Flow from Financing Activities						
Changes in Stockholders' Equity	196,970,000	0	0	0	0	0
Cash Provided by Financing Activities	196,970,000	0	0	0	0	0
Net Increase in Cash	-	104,573,384	104,573,384	104,573,384	104,573,384	104,573,384
Cash at the Beginning of Period	0	0	104,573,384	209,146,768	313,720,152	418,293,536
Cash at the End of Period	0	104,573,384	209,146,768	313,720,152	418,293,536	522,866,920

Table 3: Cash Flow
Sources: Author Analysis

Cost of equity is calculated using the Capital Asset Pricing Model (CAPM) with data of compound annual growth rate of JKSE daily return in the past ten years for market return, government bond of 10 years from IBPA for risk-free rate, and beta value from calculation of comparable companies, CPIN. The result of the cost of equity is 6.62%. As a result, the WACC with100% of the equity weight is 6.62%.

WACC is used as the discount rate. Payback period is 2.16 years, with NPV of IDR 180,155,939 and IRR of 36%. Payback period is less than the projection duration of 5 years. The positive NPV indicates the project is feasible to be executed. The IRR is higher than the WACC. In conclusion, the project is feasible to be executed because all the results met the criteria.

Technique	Value	Acceptance Criteria	Result
Payback Period	2.16 years	Before the project's lifetime (5 years)	Accept
NPV	180,155,939	Positive NPV (NPV > 0)	Accept
IRR	36%	Higher than WACC (IRR > 6.62%)	Accept

Table 4: Feasibility Analysis
Sources: Author Analysis

According to the feasibility analysis, the project appears feasible since all of the results met the criteria. However, the feasibility analysis is based on the assumption of the current condition, which may change in the future.Thus, a risk assessment is performed. Sensitivity analysis is performed for 10 account assumptions in the pro forma statement by changing 5% lower and higher than the actual value and comparing the NPV change percentage to the assumption account

percentage change. Based on the 10 variables input, 4 variables are classified as the sensitive variables: chicken price per kg, average chicken weight sold, Cost of Goods Sold (COGS) Feed, and COGS Day-Old Chick (DOC).

Variable	Decreas in Input		Increase in Input	
	Variable Swing	NPV Swing	Variable Swing	NPV Swing
Chicken Price per kg	-5.00%	-151.74%	5.00%	151.74%
Chicken Weight Sold	-5.00%	-146.90%	5.00%	146.90%
COGS Feed	-5.00%	81.94%	5.00%	-81.94%
COGS DOC	-5.00%	35.87%	5.00%	-35.87%
Depletion	-5.00%	2.87%	5.00%	-2.87%
COGS Husk	-5.00%	1.29%	5.00%	-1.29%
COGS Vitamin	-5.00%	0.73%	5.00%	-0.73%
Husk Price per Sack	-5.00%	-0.64%	5.00%	0.64%
Maintenance Expense	-5.00%	0.19%	5.00%	-0.19%
COGS Probiotic	-5.00%	0.08%	5.00%	-0.08%

Table 5: Sensitivity Analysis
Sources: Author Analysis

Scenario analysis is performed by changing the 10 assumptions to be 5% lower and higher than the actual value into three scenarios: pessimistic, most likely, and optimistic. The pessimistic scenario results towards the 5 years or more payback period is longer than the expected period, the NPV is negative, and the IRR cannot be calculated because the calculation requires a positive number. The pessimistic scenario concludes that all criteria are not met, the project is not feasible to be executed. The optimistic scenario results that the payback period is 0.94 years, which is less than the expected period. The NPV indicates positive value and the IRR is 104%, which is higher than the WACC. The optimistic scenario concludes that all criteria met, the project is feasible to be executed.

	Pessimistic	Base Case	Optimistic
Payback Period	> 5 years	2.16 years	0.96 years
Net Present Value (NPV)	(296,249,946.40)	180,155,939.02	657,078,315.41
Internal Rate of Return (IRR)	*not applicable*	36%	102%

Table 6: Scenario Analysis
Sources: Author Analysis

5. Conclusions and Recommendations

5.1. Conclusions

With a total investment of IDR 196,970,000, the payback period is 2.16 years, which is less than the project lifetime, with a positive NPV of IDR 180,155,939, and the IRR is 36%, which is higher than the WACC. Since all the criteria met, it concluded that the smallholder closed-house broiler probiotic farm is financially feasible to be executed. However, the risk assessment identifies four sensitive variables: chicken price per kg, average chicken weight sold, COGS feed, and COGS DOC and the worst-case scenario is not feasible to be executed.

5.2. Recommendations

The result recommends the project be executed. To mitigate the sensitive variables, they were classified into two categories based on their cause, external risk and internal risk. Chicken price per kg, COGS feed, and COGS DOC will be classified as external risk and average chicken weight sold will be classified as internal risk.

- External Risk
  The chicken price per kg, COGS feed, and COGS DOC fluctuate according to the market price. To stabilize and minimize volatile pricesit can be done by forming partnerships. The price in the partnership is determined by the contract price agreed upon at the beginning of the partnership and not influenced by the market price.
- Internal Risk
  The average chicken weight sold depends on the farm's performance. To mitigate the risk, farmers must make chickens as comfortable as possible in order to achieve weight according to the standard of the set targeted. The farm management can create a Standard Operating Procedure (SOP) which consists of those points:
  - Provide feed content nutritional value and nutrients that meet the daily nutritional needs.
  - The supply of feed and drinking water is always in ad libitum condition (always available).
  - Chicken feed and drink places are always in a state of as clean as possible to maintain chicken appetite.
  - Make the cage conditions free of ammonia odors and the air ventilation circulation must be as comfortable as possible for the chickens.
  - Add probiotics to boost the performance of chicken weight.

The scenario analysis shows the pessimistic scenario is not feasible to be executed. However, if the project can reach the most likely or optimistic condition, the project is feasible to be executed.

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