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مقارنة تحليل الاستثمار باستخدام القيمة الحالية الصافية (NPV) مع معدل العائد الداخلي (IRR) في شركات مسالخ المواشي في جيرالدتون، أستراليا

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COMPARISON OF INVESTMENT ANALYSIS USING NET PRESENT VALUE (NPV) with INTERNAL RATE RETURN (IRR) in LAMB ABATTOIR BUSINESSES in GERALDTON, AUSTRALIA

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الملخص:

تبحث هذه الدراسة في جدوى الاستثمار في مشروع مسلخ الضأن في جيرالدتون بأستراليا، باستخدام طريقتين شائعتي الاستخدام لتقييم الاستثمار: القيمة الحالية الصافية ومعدل العائد الداخلي. وقد تم جمع البيانات من خلال تحليل التقارير المالية التاريخية، والمقابلات المتعمقة مع أصحاب المصلحة، ومراجعة أدبيات الصناعة والمنشورات الحكومية. يتم استخدام توقعات التدفق النقدي لمدة خمس سنوات لحساب القيمة الحالية الصافية ومعدل العائد الداخلي، مع مراعاة العوامل الخارجية مثل تقلبات أسعار السوق والسياسات الحكومية. تظهر نتائج تحليل الاستثمار أن طريقة القيمة الحالية الصافية تسفر عن قيمة 3,741,422 دولار أسترالي، بينما يبلغ معدل العائد الداخلي 47.1%. تشير هذه النتائج إلى أنه في حين تشير كلتا الطريقتين إلى جدوى الاستثمار، فإن طريقة القيمة الحالية الصافية توفر دقة ومرونة أكبر في تقييم مخاطر المشروع والقيمة المطلقة. وتؤكد النتائج على أهمية اختيار طرق التقييم المناسبة لاتخاذ قرارات استثمارية مستدامة ومستنيرة. تقدم هذه الدراسة رؤى متعمقة للمستثمرين وأصحاب المصلحة في قطاع الأعمال الزراعية وتسلط الضوء على الحاجة إلى إدارة فعالة للمخاطر.

كلمات مفتاحية: جدوى الاستثمار، مسلخ الضأن، القيمة الحالية الصافية، معدل العائد الداخلي، الأعمال الزراعية.

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Abstract:

This study investigates the feasibility of investing in the lamb abattoir business in Geraldton, Australia, utilizing two widely used investment evaluation methods: Net Present Value (NPV) and Internal Rate of Return (IRR). Data were collected through the analysis of historical financial reports, in-depth interviews with stakeholders, and a review of industry literature and government publications. Five-year cash flow projections are used to calculate NPV and IRR, considering external factors such as market price fluctuations and government policies. The investment analysis results show that the NPV method yields a value of AUD 3,741,422, while the IRR is 47.1%. These results suggest that, while both methods indicate investment feasibility, the NPV method provides greater accuracy and flexibility in assessing project risk and absolute value. The findings underscore the importance of choosing suitable evaluation methods for sustainable and well-informed investment decision-making. This study provides in-depth insights for investors and stakeholders in the agribusiness sector and highlights the need for effective risk management.

Keywords: Investment Feasibility, Lamb Abattoir, Net Present Value, Internal Rate of Return, Agribusiness.

INTRODUCTION

Investing in the agribusiness sector, particularly in the abattoir industry, significantly impacts local economic growth and food security. In Australia, the lamb abattoir industry is a strategic sector that can enhance productivity and efficiency within the lamb meat supply chain. The urgency of this research lies in the need for a thorough and precise analysis to ensure investment viability in this sector, especially in regions like Geraldton, which have high potential but also face significant challenges.

The current research gap is the lack of in-depth comparative studies on the use of the Net Present Value (NPV) and Internal Rate of Return (IRR) methods to evaluate the feasibility of investments in lamb abattoir in Australia. Previous studies often generalize investment evaluation methods without accounting for the specific industry and location contexts. For instance, a study conducted by Smith et al., (2020) in the "Journal of Agricultural Economics" only discusses general investment analysis without emphasizing the unique characteristics of the lamb abattoir sector. Similarly, a study by Jones & Brown, (2019) published in the "Agricultural Finance Review" fails to provide a clear comparison between NPV and IRR within the context of agribusiness.

This research entails a focused analysis that integrates specific cash flow projections for the lamb abattoir business in Geraldton with the utilization of two popular investment evaluation methods, namely NPV and IRR. Therefore, this study not only addresses existing gaps in the literature but also offers more precise practical guidance for stakeholders in the agribusiness sector.

The research employs a quantitative method approach, utilizing both primary and secondary data to analyze investment in the lamb abattoir business in Geraldton, Australia. Primary data were gathered through in-depth interviews and surveys of stakeholders, including sheep farmers, workers, and experts in the agribusiness sector. Secondary data were sourced from company financial reports, agribusiness industry case studies, and relevant academic literature. This approach ensures that the data used are comprehensive and relevant to the research context.

This research uses cash flow projections for five years based on market research, historical data, and consultation with experts. The NPV calculation discounts future cash flows at a discount rate that reflects the project's cost of capital, providing a clear nominal value of the investment. The IRR calculation identifies the discount rate that equates the present value of cash inflows and outflows, offering a percentage measure of return. Comparative analysis of these metrics under different scenarios highlights the robustness and sensitivity of each method to changing market conditions.

METHOD

Capital budgeting analysis is often used to solve very important problems faced by management, namely finding or creating investment projects with higher rates of return than investments in general. With capital budgeting calculations as a method for decision-making, especially for projects involving large funds and medium to long periods, the capital budgeting approach can aim to maximize the value of the firm by making the right investment decisions (Shapiro, 2005).

1) Investment Theory and Project Evaluation

Net Present Value (NPV) is an investment evaluation method that calculates the difference between the present value of cash inflows and the present value of cash outflows over the investment period. NPV is used to determine whether an investment will produce net added value. This theory is supported by research that emphasizes the importance of considering the time value of money in investment decisions (Brealey et al., 2020).

Net Present Value is the difference between the present value of cash inflows and cash outflows related to a project. If the NPV shows a number greater than zero then the investment is profitable so it can be

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accepted. If the NPV shows a number equal to zero then the decision maker can accept or reject the investment because the investment will produce the exact number equal to the required rate of return. Meanwhile, if the NPV is less than zero then the investment should be rejected (Wahyuningsih, 2023).

Net Present Value (NPV) can also be defined as the present value of future cash flows, discounted by the appropriate cost of capital, then deducted from the initial project outlay. Projects with positive NPV results become feasible and accepted, and projects with negative NPV results become unfeasible and rejected. If two projects are mutually exclusive, the higher NPV will be acceptable. This method uses calculations from cash flow and the time value of money (Shapiro, 2005). The Net Present Value (NPV) formula is as follows (Hillier et al., 2019).

$$NPV = \sum_{t=1}^{n} \left(\frac{C_t}{(1+r)^t} \right) - C_0$$

Where:

C_t = Net cash flow per annum for the year of t

r = Discounted level

C_0 = Initial investment

t = period

n = no of periods

Internal Rate of Return (IRR) is a discount rate that equates the present value of cash inflows with the present value of cash outflows, resulting in an NPV of zero. IRR is used to evaluate investment efficiency based on return percentage. Research by Garrison et al., (2019) highlights the use of IRR in project analysis that requires comparison of relative rates of return.

Internal Rate Return is a discount rate which is a set of the present value of a project equal to the investment value. or, IRR is the discount rate that results in NPV being zero. The NPV and IRR methods are similar in that they have an accepted or rejected decision except when the projects are mutually exclusive. When a dispute arises, it will return to the NPV method (Shapiro, 2005).

Another narrative states that the Internal Rate of Return is the discount rate that makes the NPV of all cash flows from a particular investment equal to zero. IRR provides the expected rate of return on investment, and a project is considered viable if the IRR exceeds the expected rate of return. The IRR formula is as follows (Hillier et al., 2019):

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$$= \sum_{t=1}^{n} \frac{C_t}{(1 + IRR)^t} - C_0$$

Where:

C_t	= Net cash flow per annum for the year of t
IRR	= discount rate
C_0	= initial investment
t	= period
n	= No of periods

2) Risk Management in Agribusiness Investment

Risk management, both in the banking and corporate sectors, is an essential structured approach to identifying, measuring, managing, and monitoring risks that may be faced (Purnomo, 2024).

Agribusiness Risk Management: Investments in agribusiness are subject to unique risks, including weather risks, market prices, and regulatory changes. Research by Davis et al., (2022)) explains the importance of effective risk management to ensure the success of agribusiness investments.

Risk and Sensitivity Analysis: The use of risk and sensitivity analysis to evaluate the impact of variations in cash flow projection assumptions on Net Present Value (NPV) and Internal Rate of Return (IRR) is crucial for informed investment decision-making. A study by Clark and White (2023) illustrates how sensitivity analysis assists in identifying key variables that influence investment outcomes.

3) Characteristics of the Agribusiness and Abattoir Sectors

Abattoir Industry Specifications: Abattoirs, or slaughterhouses, possess operational and financial characteristics that distinguish them from other industries. Research conducted by Jones and Brown (2019) outlines the factors that affect slaughterhouse profitability, including operational efficiency and supply chain management.

Sustainability and Compliance: The aspects of sustainability and regulatory compliance play a significant role in the long-term success of agribusiness investments. Brown and Green (2021) emphasize the necessity of integrating sustainability principles into agribusiness investment planning and operations.

4) Assumptions used

To conduct investment analysis using NPV and IRR, several important assumptions must be identified and explained:

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a. Discount Rate: The discount rate used in this analysis is approximately 10%, which is based on the weighted average cost of capital (WACC) of similar agribusiness companies and relevant academic literature (Chen & Young, 2020).

b. Revenue: Revenue is projected by integrating historical trend analysis with external factors. Historical trends are analyzed using a company's financial data from the past several years to identify patterns and fluctuations in revenue. Next, industry projections from market publications and reports are utilized to understand how market demand and commodity prices are likely to develop in the future. External factors, such as changes in consumer preferences and global economic conditions, are also considered to ensure comprehensive and realistic projections.

c. Operating Costs: Operating cost projections are based on an analysis of historical trends and anticipated changes in the costs of key inputs, such as raw materials and labor. Historical cost data is examined to identify patterns and trends that can be used to project future costs. Additionally, information from industry reports and government publications is employed to understand external factors that may affect operational costs, such as new regulations or changes in transportation costs. Thus, operational cost projections reflect expected changes in input costs and relevant external factors.

d. Capital Investment: Capital investment projections are based on the company's identified expansion and capacity improvement plans. A company's business strategy, which encompasses long-term plans for growth and increased production capacity, serves as the foundation for these projections. An investment needs analysis is conducted to assess the capital requirements necessary to meet expansion goals, which may include new equipment, production facilities, and advanced technology. Approved investment plans are utilized to ensure that capital investment projections align with the company's business strategy and identified investment needs.

e. External Factors: Assumptions regarding market price fluctuations and government policies are sourced from industry reports and relevant government publications. Industry reports provide analyses and forecasts concerning commodity market prices and other pertinent economic factors, while government publications offer information on policies that influence the agribusiness industry. Analysis from economists is also used to understand the impact of changes in policies and market conditions on the agribusiness sector. Consequently, financial projections reflect market price fluctuations and anticipated changes in government policy.

f. Depreciation: The method of depreciation employed is the straight-line method, adhering to applicable accounting standards and general practices within the agribusiness industry. The

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depreciation expense is calculated based on the economic life of the fixed assets invested in (Jones, 2018).

g. Cash Flow Projections: Projected cash flows are based on a historical analysis of the company's financial data, including revenues, operating expenses, and anticipated capital investments. This assumption also encompasses external factors such as market price fluctuations and government policies that influence the agribusiness sector. (Smith & Brown, 2019).

5) Data Analysis Techniques

The steps used in conducting data analysis are as follows:

a. Collection of Financial Data

b. Identify External Factors

c. 5-year Cash Flow Projection

d. Determination of the Discount Rate (Weighted Average Cost of Capital - WACC)

e. NPV calculation

f. IRR calculation

g. Analysis of NPV and IRR Results

h. Making Investment Decisions

Picture 1 – Data Analysis Techniques
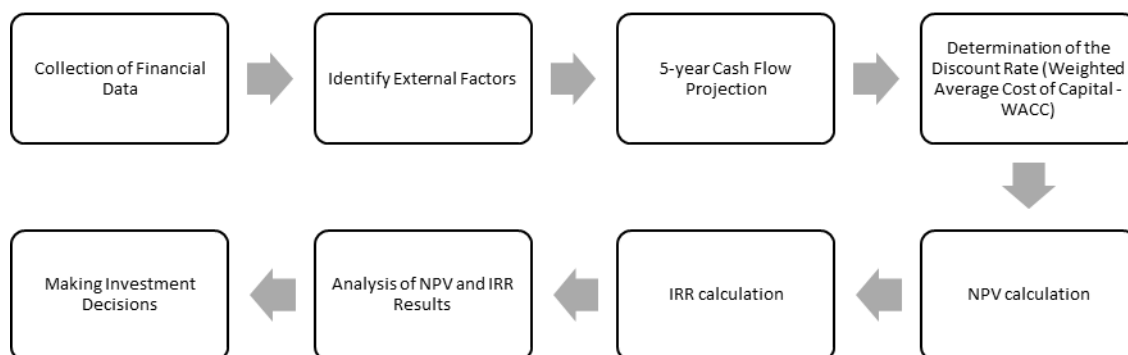
RESULT AND DISCUSSION

1) Economic, investment, inflation, and operational assumptions

Financial projections for investment feasibility analysis are based on various assumptions obtained from historical data, external conditions, and other relevant factors to estimate future conditions as accurately

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as possible. These assumptions are divided into five categories: economic factors, investment factors, operational factors, key factors, and financial projections.

The project investment in the lamb abattoir business utilizes internal investor funds in Australian dollars, amounting to AUD 3,000,000. Business income will also be denominated in Australian dollars, with all operational costs incurred in the same currency. However, this analysis considers various economic factors, such as the inflation rate.

The inflation assumption used is based on the inflation rates in Australia and Indonesia, sourced from theglobaleconomy.com, which projects inflation for both countries until 2028. The inflation rate assumed to exceed projections is set at 5% per year.

Assumptions in operational activities are categorized into 5 parts, including: production capacity, income, cost of production (direct costs), fixed costs, and other costs. This Geraldton lamb abattoir business has a maximum production capacity of 2,500 units per day. The capacity factor set is 80% so that the production that can be produced is 2000 units per day and the number of working days in 1 month is 22 working days.

2) Calculation of Financial Projections

The following are the results of the Financial Report projections for the next 5 years using assumptions that have been validated using data collected from both primary and secondary data.

Table 1 – Profit (Loss) Projection

in AUD (000)	Year 1	Year 2	Year 3	Year 4	Year 5
Net Sales	25,245	37,433	47,137	64,277	70,619
COGS	20,668	30,472	39,980	55,794	61,972
Gross Profit	4,577	6,971	7,156	8,483	8,647
Operating Expenses	3,365	3,902	4,930	5,680	5,971
EBIT	1,211	3,069	2,226	2,803	2,676
Corporate Income Tax	302	767	556	700	669
Earning After Tax	**909**	**2,302**	**1,670**	**2,103**	**2,007**

After preparing a profit and loss projection, a financial position projection for the next 5 year period is made. The following is the balance table:

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Table 2 – Balance Sheet Projection

in AUD (000)	Year 1	Year 2	Year 3	Year 4	Year 5
Current Asset					
Cash	1,778	4,068	5,628	7,496	9,274
Account Receivable	224	260	327	446	490
Inventory	952	952	952	952	952
Total Current Asset	**2,954**	**5,280**	**6,907**	**8,894**	**10,716**
Fixed Asset	990	970	1,030	1,160	1,350
Total Asset	**3,944**	**6,250**	**7,937**	**10,054**	**12,066**
Current Liabilities					
Account Payable	35	39	56	70	75
Equity					
Capital	3,000	3,000	3,000	3,000	3,000
Retained Earning	909	3,211	4,881	6,984	8,991
Total Liabilities & Equity	**3,944**	**6,250**	**7,937**	**10,054**	**12,066**

After making a financial position projection for the next 5 years, a cash flow projection is also carried out to calculate the net cash flow.

Tabel 3 – Cash Flow Projection

in AUD (000)	Pra-Ops	Year 1	Year 2	Year 3	Year 4	Year 5
Operating Cash Flow						
Net Income		909	2,302	1,670	2,102	2,007
Depreciation		110	120	140	170	210
Change in A/R		-224	-36	-67	-119	-44
Change in Inventory	-952					
Change in A/P		35	3	17	14	4
Subtotal	**-952**	**829**	**2,390**	**1,759**	**2,167**	**2,177**
Investing Cash Flow						
Purchase Fixed Asset	-1,100		-100	-200	-300	-400
Financing Cash Flow						
Capital	3,000					

Net Cash Flow	948	829	2,290	1,559	1,867	1,777
Beginning Balance	-	928	1,777	4,068	5,628	7,495
Ending Balance	948	1,777	4,068	5,628	7,495	9,273

This cash flow projection will be the basis for calculating NPV and IRR, but the author wants to provide a visualization of the financial projection calculation for the lamb abattoir business in Geraldton Australia in graphic format so that it helps in analyzing the feasibility of investing using either the NPV or IRR method.

**Grafik 1 – Net Income & Depreciation**
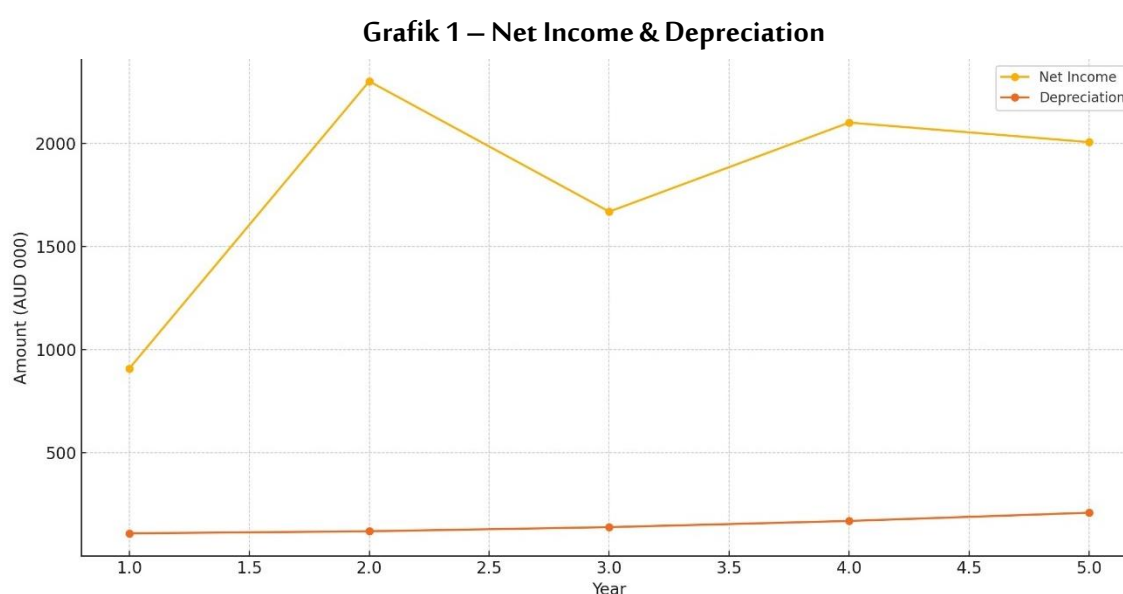
This graph shows the development of net income and depreciation from year 1 to year 5. Net Income tends to increase over time, while depreciation also increases but at a more moderate rate. A consistent increase in net profit shows that the business can generate stable profits over time. The increase in depreciation reflects ongoing investment in fixed assets required for lam abattoir operations. This is relevant to the research objective of evaluating the feasibility of investment because increasing net profit is a positive indication for investors

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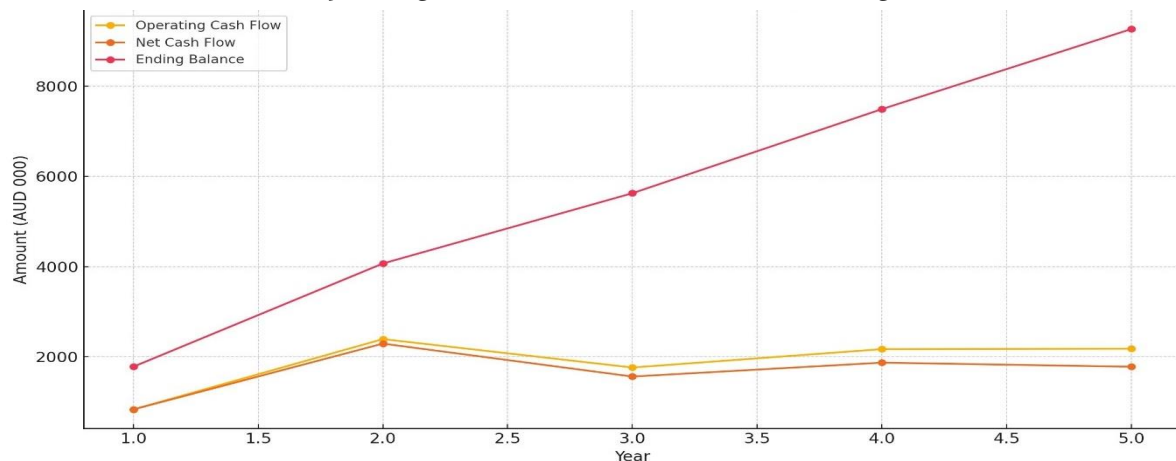/ **¹Devi Avianto Setiawan** * ,² **Hadi Purnomo** , ³ **Mulyadi**

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Grafik 2 – Changes in A/R, Inventory , and A/P
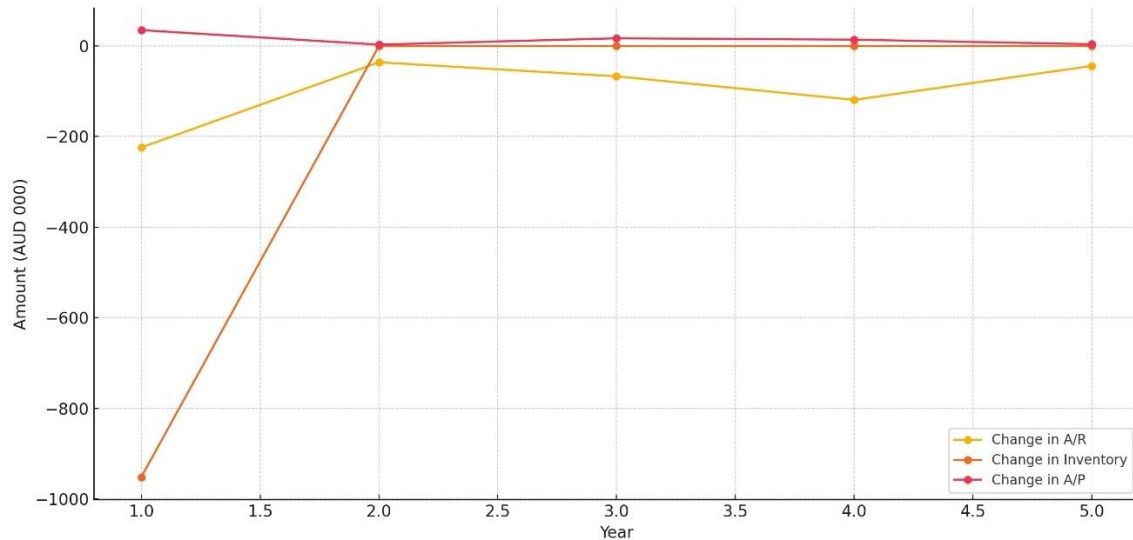
This graph illustrates the changes in accounts receivable (A/R), inventory, and accounts payable (A/P) during the same period. Changes in inventory were significant only in the first year, while fluctuations in accounts receivable and accounts payable remained minor throughout the entire period. The notable decrease in inventory during the first year reflects the initial purchase of large quantities of inventory to commence operations. The small changes in accounts receivable and accounts payable indicate effective working capital management, which is essential for maintaining liquidity and ensuring smooth operations. Connections to the research objectives can be observed in the effective management of working capital, which supports financial stability and investment feasibility.

Grafik 3 - Operating Cash Flow, Net Cash Flow and Ending Balance

This graph illustrates the operational cash flow, net cash flow, and ending cash balance of the company. Both operational cash flow and net cash flow tend to increase, reflecting the company's capacity to generate positive cash flow. The ending cash balance has shown significant growth, indicating effective cash management practices. An increase in both operational cash flow and net cash flow suggests that the business is not only turning a profit but also generating sufficient cash to support daily operations and facilitate further expansion. Furthermore, the rise in the ending cash balance underscores the effectiveness of cash management and the ability to build substantial cash reserves. This data supports the primary conclusion that this investment is feasible and has the potential to yield profitable returns.

3) Calculation of NPV and IRR

The calculation results indicate that, with a discount rate of 10.75%, the project's Net Present Value (NPV) is AUD 3,741,422. This NPV result suggests that investing in the lamb abattoir business in Geraldton, Australia, is feasible. The calculation also incorporates an Internal Rate of Return (IRR) value of 47.1%, which is significantly higher than the discount rate, making this investment attractive.

Both the NPV and IRR analyses demonstrate that this investment is viable, as evidenced by a positive NPV and an IRR that exceeds the discount rate. Furthermore, the increase in net profit and operational cash flow indicates that this business can generate stable profits and cash flow.

4) Difference between NPV and IRR

NPV measures the difference between the present value of a project's cash inflows and outflows, discounted at a particular rate, while IRR represents the discount rate that equates the NPV to zero, reflecting the expected rate of return on investment. The following table outlines the differences between NPV and IRR:

Table 4 – Differences between NPV and IRR

Aspect	Net Present Value (NPV)	Internal Rate of Return (IRR)
Definition	Measures the difference between the present value of a project's cash inflows and outflows discounted at a specified discount rate	Measures the discount rate that makes the NPV equal to zero, that is, the expected rate of return on an investment.
Decision Criteria	If NPV > 0, the project is considered feasible because it produces positive added value.	If IRR > the expected rate of return, the project is considered feasible because it provides a higher rate of return.

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Focus	Calculating the absolute added value of the project.	Calculate the percentage rate of return on an investment.
Advantages	Provides a clear picture of the added value of the project and is easy to interpret in absolute terms.	It is easy to understand as a rate of return and useful to compare with the cost of capital.
Weaknesses	Sensitive to the discount rate used and does not provide a percentage rate of return.	It can give ambiguous results if there are multiple IRRs or whether the cash flows change signs several times.
Effect of Project Scale	It considers the scale of the project, so large projects with large NPV are preferred.	It does not consider the scale of the project, so small projects with high IRR can be preferred.
The usage	More suitable for projects with stable cash flows and when the discount rate is known and constant.	More suitable for projects with unconventional cash flows or when you want to know the project's rate of return.

5) Influencing factors

The factors that influence differences in determining the appropriate investment feasibility method for a lamb abattoir business can be seen in the table below.

Table 5 – Influencing factors

	NPV	IRR
1. Suitability of investment objectives	Shows added value in monetary terms, after taking into account capital costs	Easy to use to understand the project rate of return in percentage units
2. Project Complexity	Provides immediate results, so it does not provide confusion (ambiguity) to investors	Can provide ambiguous results if there are several changes in cash flows (multiple IRRs)

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2.	*Cost of Capital*	More flexible and can adjust to variations in the cost of capital.	If the cost of capital varies, IRR can be more difficult to apply, because it assumes the cost of capital is fixed.
3.	Ratio Analysis	Can be easily adapted for Monte Carlo simulations to account for uncertainty and variability	Does not explicitly account for project risk other than from a rate-of-return perspective

6) Previous research

The results of this research are also supported by previous research which states that "Net Present Value (NPV) is considered the most reliable method for evaluating investment projects as it directly measures the increase in value to the firm." NPV is the most reliable method for assessing investment projects because it directly measures the increase in value to the company (Brealey et al., 2020).

Damodaran, A. also stated that "Internal Rate of Return (IRR) provides a clear measure of the project's return and is particularly useful for comparing projects with different scales of investment." to compare projects with different investment scales (Damodaran Aswath, 2012).

CONCLUSION

Based on the research results, it can be concluded that Net Present Value (NPV) is a more appropriate method for evaluating the lamb abattoir business in Geraldton, Australia, for the following reasons:

1) NPV provides a clearer picture of the added value generated by the project in monetary terms, making it easier for investors to make informed decisions.

2) NPV can adapt to variations in the cost of capital and is more effective for risk analysis.

3) NPV does not encounter ambiguity issues, such as multiple Internal Rates of Return (IRRs), and it yields more accurate results across various financial conditions.

4) With high IRR results and a positive NPV, the lamb abattoir business in Geraldton demonstrates strong investment viability. However, because NPV offers a more direct and flexible assessment of a project's profitability, it remains the more appropriate method for evaluating the feasibility of this investment

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