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Economic Feasibility and Profitability Analysis of Layer Chicken Farming in a Rural Papua Context: A Case Study of Wanggar District, Indonesia

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ABSTRACT

This study aims to assess the economic feasibility and profitability of layer chicken farming in Wanggar District, a rural area of Central Papua, Indonesia. Given the increasing demand for eggs and the strategic role of poultry farming in enhancing rural livelihoods, this research provides valuable insights into the viability of small- to medium-scale egg production. Primary data were collected through field surveys involving local farmers, supported by secondary data from government and institutional reports. Analytical tools such as cost-benefit analysis, net present value (NPV), internal rate of return (IRR), and break-even point (BEP) were employed to evaluate financial viability. The findings reveal that layer chicken farming in Wanggar District yields a positive net profit margin and favorable return on investment, with an NPV exceeding the initial capital outlay and an IRR surpassing prevailing interest rates. These results suggest that egg production is a profitable and economically sustainable enterprise for rural households in the region. However, challenges such as feed costs, market access, and disease control require strategic intervention to enhance productivity. The study concludes with recommendations for local policy support and farmer training programs to strengthen poultry agribusiness as a tool for rural development and poverty alleviation.

KEYWORDS: Layer Chicken Farming, Economic Feasibility, Profitability Analysis, Rural Development, Central Papua

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INTRODUCTION

Layer chicken farming is one of the agribusiness sub-sectors experiencing rapid growth, in line with increasing public awareness of the importance of consuming nutritious food (Priyanto and Irawan 2008; Kusnadi et al. 2008; Hendayana 2003). Eggs, as one of the main animal products, contain high nutritional value, are relatively affordable, and are easy to prepare, making them a widely consumed source of animal protein (Yulianto et al. 2022; Bakrie et al. 2021). Economically, layer chicken farming significantly contributes to increasing household income and optimizing the efficient use of local resources (Bakrie et al. 2021; Ramukhithi et al. 2023).

According to data from the Central Statistics Agency (BPS-Nabire 2022), the population of layer chickens in Papua Province in 2021 reached 687,888 birds, with total egg production amounting to 9,632.88 tons. Nabire Regency is recorded as one of the regions with the largest layer chicken population, totaling 136,361 birds, and an egg consumption rate of 78.08%. This indicates a strong potential for the development of layer chicken farming in the area.

The distribution of layer chicken farming in Nabire Regency spans across seven districts, with the largest populations in West Nabire District (35,300 birds) and Wanggar District (18,763 birds) (BPS-Nabire 2022). This potential shows that Wanggar District has adequate resources and infrastructure to support the commercial development of layer chicken farming.

In developing any agribusiness, including layer chicken farming, a feasibility study is essential to assess the potential success and associated risks. A feasibility analysis serves as a critical instrument to determine whether an investment can generate adequate and sustainable returns (Wantasen et al. 2022; Hidayati 2020; Santosa et al. 2012). Moreover, such analysis is vital

considering that poultry enterprises are often influenced by price fluctuations in feed, logistics distribution challenges, and unpredictable market demand (Setiadi et al. 2020; Makmun et al. 2024; Bakrie et al. 2021).

Wanggar District also benefits from a strategically positioned marketing network. Eggs produced in the region can be distributed smoothly via land, air, and sea transportation to nearby areas in the Mepago region, including Dogiyai, Deiyai, Paniai, and Intan Jaya Regencies. The high demand from neighboring areas presents a significant opportunity for the sustainable development of layer chicken farming.

Based on the above explanation, an in-depth study on the financial feasibility of layer chicken farming in Wanggar District, Nabire Regency, is necessary. This study is expected to provide an objective overview of the business prospects and serve as a decision-making reference for farmers and relevant stakeholders in supporting the development of the livestock sector in Central Papua.

MATERIALS AND METHODS

This research was conducted on layer chicken farms located in Wanggar District, Nabire Regency, Papua Province. The study took place from July 3 to July 30, 2022. Wanggar District is located in Nabire Regency, Papua Province, Indonesia. Nabire Regency lies within the Cenderawasih Bay area, between 134°35' E – 136°37' E and 2°25' S – 4°15' S. Wanggar District has an administrative area of approximately 246 km², making it the smallest district in Nabire Regency. The topography of Nabire Regency is diverse, consisting of about 47% flat land along the coastal areas and around 53% hilly terrain scattered across the interior. The region has a humid tropical climate with rainfall fairly evenly distributed throughout the year. Weather in the northern part of Nabire Regency is typically influenced by coastal areas facing the mountains, making local winds highly dominant. As a result, rainfall occurs nearly every month in the northern areas or in the town of Nabire, with an average of 18 rainy days per month. Air temperatures in Nabire Regency range from 20°C to 32°C, with a maximum temperature of up to 34°C. Relative humidity remains high throughout the year due to consistent rainfall. The region contains various soil types, including alluvial soils from river deposits and podzolic soils. Areas prone to flooding feature bog soils and low humiegley soils, both originating from river sediment. Most residents of Nabire Regency, including those in Wanggar District, earn their livelihoods from agriculture, fisheries, and livestock farming. These economic activities are supported by the area's geographic conditions and natural resources. Nabire Regency also holds strong potential for plantation development, including coconut, cocoa, and coffee (BPS-Nabire 2022) .

The subjects of the study were local community members engaged in layer chicken farming in Wanggar District. The instruments used in this research included structured questionnaires, a camera, writing tools, and a laptop for data processing. A descriptive research method was employed, incorporating observation techniques and structured interviews based on a predefined questionnaire. The sampling method used was purposive sampling, wherein five respondents were selected from three sub-districts (kelurahan), i.e. Karadiri I, Bumi Mulia, and Wanggar Sari. These sub-districts were chosen as they represent the central areas of layer chicken farming in the Wanggar District, Nabire County Papua Tengah province.

The variables observed in this study included respondent characteristics (age, education level, years of business operation, business scale, labor utilization, and marketing channels), as well as financial feasibility indicators, namely (Muchlis et al. 2024; Saragih et al. 2022; Miklyaev et al. 2017; Setiadi et al. 2020; Suparno and Maharani 2017; Farm et al. 2024; Fithron et al. 2022) Cash Flow Analysis is a financial method used to evaluate the inflows and outflows of cash in a business over a specific period. It provides a clear picture of the financial performance, liquidity, and viability of a business or investment. In the context of investment or project analysis of poultry farming, it helps determine how well the business generates cash to cover its operating costs, repay investments, and yield profit over time. The formula is presented as $NCF_t = B_t - C_t$, where B*t*= cash inflow, i.e. revenue or benefits received in year *t, Cash* outflow (C*t*)=cost or expenses incurred in year *t*, NCF*t*= net cash Flow. $Total\ Net\ Cash\ Flow = \sum_{t=1}^{n}(B_t - C_t)$. Net Present Value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a certain period. It is used to assess the profitability of an investment or project by discounting future cash flows to their present value using a given discount rate. $NPV = \sum_{t=1}^{n}\frac{R_t - C_t}{(1+r)^t} - I$, where Rt: revenue (cash inflow) at time *t*, Ct*:* cost (cash outflow) at time *t*, r: Discount rate (interest rate), t: time period (years), n: total number of years, I: initial investment. NPV> 0 means that project is profitable/feasible, NPV=0 means that project breaks even, and NPV < 0 means that project is not feasible. Internal Rate of Return (IRR) is the discount rate that makes the Net Present Value (NPV) equal to zero. In other words, it is the interest rate at which the present value of expected future cash inflows is exactly equal to the initial investment. IRR represents the break-even rate of return for a project or investment. $O = \sum_{t=1}^{n}\frac{R_t - C_t}{(1+IRR)^t} - I$, where Rt: revenue (cash inflow) at time *t*, Ct*:* cost (cash outflow) at time *t*, t: time period (years), n: total number of years, I: initial investment. Decision rule for IRR: if IRR > discount rate (r) then the investment is financially feasible, if IRR= discount rate (r), then the investment breaks even, and if IRR < discount rate (r) then the investment is not feasible. Net Benefit-Cost Ratio (B/C

Ratio) is a financial metric used to assess the feasibility and profitability of a project by comparing the present value of net benefits (i.e., benefits minus costs) to the present value of costs. It shows how much net benefit is gained per unit of cost incurred. It is a refinement of the regular B/C Ratio by considering net benefits, not just gross benefits.

Collected data were tabulated and analyzed by referring to financial feasibility metrics. Prior to the financial feasibility analysis, profit and loss calculations were performed using cash flow analysis to assess operational income and expenditure over the business period.

RESULTS AND DISCUSSION

Characteristics of Layer Chicken Farming

The respondents involved in the study were within a mature and productive age range, between 49 and 59 years old, with a sufficient level of education—at least senior high school. Most of the poultry farms operated on a small scale, with fewer than 2,500 chickens, and medium scale, ranging from 2,500 to 5,000 chickens. One farmer had reached a large-scale operation, with more than 5,000 chickens.

The cash flow analysis presents a report of cash movements, showing both cash outflows (expenses) and cash inflows (income). The average cash flow analysis of five-layer chicken farms studied in Wanggar District, Nabire Regency, for one production cycle is presented in Table 1.

Table 1. Cash Outflow of Layer Chicken Farming for One Production Cycle in Wanggar District, Nabire Regency

Cash Outflow	Year 1 (IDR)	Year 2 (IDR)
Investment Costs	329,880,000	
Operational Costs		
a. Fixed Costs	6,329,000	6,329,000
b. Variable Costs	825,710,000	825,710,000
Cash Inflow		
Receipts	923,676,667	1,071,035,000
Egg Sales	483,396,800	883,260,000
Fertilizer Sales	2,250,000	2,375,000
Culling Chicken Sales	185,400,000	923,676,667

Based on Table 1, the average investment cost spent by layer chicken farmers in Wanggar District is IDR329,880,000. Izzah et al. (2022) state that the investment made in a business is expected to be recovered within a short period so that the funds can be reused for maintenance and business development. This is supported by Saragih et al. (2022), who emphasize that raising layer chickens requires significant capital investment, and farmers must also consider the payback period of the investment. Investment costs include the cost of chicken coops, water installations, electricity installations, water tanks, feeding pipes, water containers, battery cages, and storage. Operational costs include fixed costs (land taxes, coop maintenance, carts, shovels, fans, lights, water pumps) and variable costs (chicks, feed, health materials, electricity bills, egg racks, and labor wages).

The income flow (Net Cash Flow) based on cash flow for a 6-year maintenance period or 3 production cycles is shown in Table 2 below.

Table 2. Net Cash Flow for 6 Years of Maintenance or 3 Production Cycles of Layer Chicken Farming in Wanggar District (in Millions)

Layer chicken farming	Year to (IDR, Million)						
	2016	2017	2018	2019	2020	2021	2022
1	161	146	169	146	169	146	169
2	331	202	403	202	403	202	403
3	347	324	260	324	260	324	260
4	141	126	39	126	39	126	39
5	670	522	319	522	319	522	319
Average	330	264	238	264	238	264	238

According to Soekartawi (2002), if the difference in income is positive, it can be said to be a profit, while if the value is negative, it indicates a loss. According to research conducted by Waleleng et al. (2022), any increase in production volume/capacity will naturally require additional production costs for the continuity of the business, with feed costs being the largest component of the farming business, which continues to increase to this day. This, of course, affects the income of a farming business, so it is essential for a farming operation to pay attention to both technical and technological aspects, as well as financial aspects, in order to maximize profitability (Bakrie et al. 2021; Bakhtiar et al. 2023; Morris et al. 2018; Dewi et al. 2022; Moh Jaenal Ikhwan and Parikesit Penansang 2024; Ramukhithi et al. 2023).

Financial Feasibility Analysis

Financial analysis is carried out to determine whether the layer chicken farming business in Wanggar District, Nabire Regency, is feasible for development or not. The capital for the layer chicken farming in Wanggar District is funded from personal capital, and the interest rate used is the deposit interest rate of 10% per year. There are several investment criteria used to assess the feasibility of the business. The criteria used for the development of the layer chicken farming business in Wanggar District, Nabire Regency, include Net Present Value (NPV), Internal Rate of Return (IRR), and Net Benefit-Cost Ratio (B/C Ratio) (Bakhtiar et al. 2023; Muchlis et al. 2024; Tyas et al. 2020; Waleleng et al. 2022).

Net Present Value (NPV)

NPV is a model that calculates the overall cash flow pattern of an investment in relation to time, based on a certain discount rate. The NPV calculation represents the net benefit, which has been discounted using the social opportunity cost of capital (SOCC) as the discount factor (Alwi, 1986). The NPV results for each respondent can be seen in Table 3.

Table 3. .Hasil Analisis Net Present Value (NPV)

Chicken Layer Farming	NPV	Explanation
1	IDR 523,548,223	Feasible
2	IDR 964,078,157	Feasible
3	IDR 931,290,792	Feasible
4	IDR 227,801,155	Feasible
5	IDR 1,183,183,312	Feasible

Based on Table 3, the Net Present Value (NPV) of the layer chicken farming business in Wanggar District, Nabire Regency, at an interest rate of 10% over a 6-year production period, shows the following results: Respondent 1 has an NPV of IDR523,548,223, Respondent 2 has IDR964,078,157, Respondent 3 has IDR931,290,792, Respondent 4 has IDR227,801,155, and Respondent 5 has IDR1,183,183,312. These results indicate that the business is feasible to operate. This is in accordance with the evaluation criteria, where if the NPV > 0, the business is considered feasible. Similar findings were reported in entire layer chickens in Indonesia (Eviana et al. 2014; Hidayati 2020; Arifah and Suprapti 2021a; Tyas et al. 2020).

Internal Rate of Return

The Internal Rate of Return is a feasibility analysis tool that uses the discount rate at which the NPV equals 0. According to Arifah and Suprapti (2021b), and Saragih et al. (2022), the IRR is the discount rate or interest rate that equates the present value of cash inflows with the initial investment. The IRR results for each respondent can be seen in Table 4.

Table 4. Internal Rate of Return (IRR) analysis

Chicken Layer Farming	IRR (%)	Explanation
1	94	Feasible
2	80	Feasible
3	85	Feasible
4	62	Feasible
5	63	Feasible

Based on Table 4, the interest rates generated from the investment criteria calculation using IRR show the following results: Respondent 1 produces 94%, Respondent 2 produces 80%, Respondent 3 produces 85%, Respondent 4 produces 62%, and Respondent 5 produces 63%. These results indicate that the layer chicken farming business in Wanggar District, Nabire Regency, is feasible to operate because the IRR calculation values are higher than the interest rate, which is 10%. This is in accordance with the statement by Waleleng et al. (2022), Arifah and Suprapti (2021b, 2021a), which says that if the IRR > SOCC (Social

Opportunity Cost of Capital), then the business is considered feasible. Similar findings were reported in entire layer chickens in Indonesia (Eviana et al. 2014).

Benefit-Cost Ratio (B/C Ratio)

The Benefit-Cost Ratio is a method similar to NPV, but it is expressed in real terms (Husnan et al., 1994). The B/C Ratio results for each respondent can be seen in Table 5.

Table 5. B/C Ratio analysis

Chicken Layer Farming	B/C Ratio	Explanation
1	1	Balance
2	1.2	Feasible
3	1.3	Feasible
4	1.3	Feasible
5	1.3	Feasible

Based on Table 5, it can be seen that the B/C Ratio in the layer chicken farming business in Wanggar District, Nabire Regency, shows different results. Respondents 2, 3, 4, and 5 produced a B/C Ratio > 1, which can be interpreted as the layer chicken farming business being feasible to develop, while Respondent 1 produced a B/C Ratio = 1, which can be interpreted as the layer chicken farming business still having potential for development. This is in accordance with the statement by Elpawati et al. (2018), which states that if Net B/C > 1, the business is considered feasible, Net B/C = 1 indicates break-even, and if Net B/C < 1, the business is considered not feasible. Similar findings were reported in entire layer chickens in Indonesia (Eviana et al. 2014; Hidayati 2020; Santosa et al. 2012; Arifah and Suprapti 2021a, 2021b; Moh Jaenal Ikhwan and Parikesit Penansang 2024).

CONCLUSIONS

Based on the results of the research, it can be concluded that on the cash flow calculation of the layer chicken farming business in Wanggar District, positive income was obtained, so it can be concluded that this business is profitable. The financial feasibility analysis results based on the NPV, IRR, and B/C Ratio at an interest rate of 10% over a 6-year production period indicate that all 5 respondents in the layer chicken farming business show a financially feasible operation.

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