

Financial Analysis of Cocoa Farming in North Kolaka Regency

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Abstract

Cocoa plants in North Kolaka Regency are primarily old, many of which are 25 years old or more. This condition may decrease cocoa productivity in the area. The phenomenon motivated researchers to study the financial feasibility of cocoa farming in the North Kolaka Regency, Southeast Sulawesi Province, Indonesia, from January 2018 to February 2020. The population in this study was all cocoa farmers in North Kolaka Regency (26,332 farmers). The samples (76 farmers) was obtained using the Slovin formula with a 7% margin of error. The data used was cross-sectional data obtained directly from farmers, starting from 0-year-old to 25-year-old cocoa plants. The parameters in this study are NPV, IRR, and NBCR. Researchers also measured the sensitivity of the cocoa farming feasibility using assumptions of a 10% decrease in the production cost or a 10% decrease in production size. The results demonstrate that: (1) cocoa farming was financially feasible with an NPV of IDR 11.009.571 at df 18%, IRR of 23.81%, and NBCR of 1.533 at df 18%; (2) a 10% decrease in production cost still resulted in a financially feasible cocoa farming business with an NPV of IDR 4.094.810 at df 18%, IRR of 20.37%, and NBCR of 1.19 at df 18%; (3) a 10% decrease in production size still resulted in a financially feasible cocoa farming business with an NPV of IDR 4.094.675 at df 18%, IRR of 20.37%, and NBCR of 1.19 at df 18%.

Keywords: Feasibility, Financial, Cocoa

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I. Introduction

Cocoa is one of the plantation crops that is suitable for climate and soil conditions in Indonesia (Rusdiana & Martono, 2014). Cocoa plants became known in Southeast Sulawesi in 1980 along with the *Gerakan Desa Makmur Merata* (Equally Prosperous Village Movement/GERSAMATA) program launched by the Governor of Southeast Sulawesi Province, H. Alala. Cocoa was developed in Southeast Sulawesi through the GERSAMATA program. Eight years later, in 1988, cocoa became an essential commodity in Southeast Sulawesi, marked by the growth of smallholder cocoa plantations (Ermiati et al., 2014). The growth of smallholder plantations in Southeast Sulawesi was inseparable from the role of cocoa farmers as the main actors. The farmers' involvement demonstrates their interest in advancing cocoa farming.

Since 2016, Southeast Sulawesi had the second-largest cocoa plantation area in Indonesia after Central Sulawesi (Siagian, 2017); nevertheless, it ranked first in total cocoa production. The situation shows that the cocoa plantation productivity of Southeast Sulawesi was higher than Central Sulawesi, even higher than other provinces in Sulawesi (Siagian, 2017).

Previous studies have assessed the financial feasibility of cocoa farming in various regions in Southeast Sulawesi. In general, the researchers recommended further research because cocoa productivity differs in each region in Southeast Sulawesi, the productivity varies from year to year, and the respondents were less evenly distributed and less widespread.

Based on the Ministry of Agriculture data, the 2016 productivity of cocoa plantations in Southeast Sulawesi was higher than that in other Sulawesi provinces (Siagian, 2017). However, in one of the regencies in Southeast Sulawesi, i.e., North Kolaka, the cocoa plants are primarily old, many of which have reached 25 years or more. This condition can lead to a decrease in cocoa productivity in the area. Therefore, the authors initiated a study to assess whether the current productivity of cocoa plantations in the North Kolaka Regency can still be used as a reference to maintain cocoa farming in the regency.

II. Research Methodology

This study was conducted from January 2018 to February 2020 in North Kolaka Regency, Southeast Sulawesi Province, Indonesia. North Kolaka was selected as the research location because it is the second-largest cocoa plantation area after East Kolaka Regency. However, financial feasibility studies on cocoa plantations in the area were limited, especially in the last five years before this research. The samples were taken from Nyule Village at Watunohu District, Pakue Village, Pundoho Village, Teposua Village, and Amoe Village at North Pakue District, Majapahit Village at Central Pakue District, and Purau Village at Ngapa District.

The population in this study was all cocoa farmers in North Kolaka Regency (26,332) people. The samples (76 farmers) was determined by the Slovin method with a 7% margin of error. The research samples were distributed proportionally in seven villages in four districts, and the sampling used a simple random technique.

The measured research variables include 1) investment cost, including land clearing cost, seed procurement cost, the cost for making planting holes, cost for planting protective trees, cost for purchasing equipment such as machetes, hand sprayers, and other equipment; 2) operational cost, including costs for land taxes, fertilizer, pesticide, harvesting equipment, drying equipment, labour, and replacement for damaged equipment; and 3) the production size, unit price of production, and the economic life of the cocoa plants.

The study used primary data as cross-sectional data collected through direct interviews with farmers, supported with questionnaires. The cross-sectional data were collected from farmers, starting from 0-year-old to 25-year-old cocoa plants.

The collected data was tabulated and analyzed using NPV, IRR, NBCR, and sensitivity analysis. These analysis tools are generally used to perform financial analysis or investment feasibility, such as financial analysis of property assets (Kartika & Aliludin, 2013), small business (Lakamisi & Usman, 2016), (Karsiningsih, 2016), processing industry (Rama Krishna et al., 2018), (Indrajaya et al., 2013), fish pond farming (Khumairoh, 2013), cattle fattening business (Nur et al., 2012), community forestry (Sutisna, 2015), (Widyarningsih & Achmad, 2012), and financial analysis of perennial crops, such as sengon farming (Dwijo et al., 2020), (Simanjuntak, 2016), *salak* farming (Indarwati et al., 2015), citrus farming (Ermanto et al., 2020), lime farming (G. A. Putra et al., 2019), pamelos farming (Marhawati, 2019), Siamese orange farming (Sumartono et al., 2019), crystal guava farming (Datundugon et al., 2020), (Astrini et al., 2018), mango farming (Kusmaryatun et al., 2020), coffee farming (Zakaria, 2019), (Kusmiati & Wati, 2020), clove farming (K. S. Putra, 2014), and cocoa farming (Saleh et al., 2019), (Haq et al., 2021).

The formula for NPV, IRR, NBCR, and sensitivity analysis are as follows:

1. Net Present Value, using the following formula:

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

Remarks:

NPV	= Net Present Value
B_t	= Benefit at year t
C_t	= Cost at year t
t	= Year of investment
n	= Economic life of main asset
i	= Prevailing interest rate

Criteria:

- If $NPV > 0$, the investment is feasible or profitable
- If $NPV < 0$, the investment is not feasible or not profitable
- If $NPV = 0$, it is a break-even, meaning that the investment is neither making profit or loss

2. Internal Rate of Return, using the following formula:

$$IRR = Df^+ + \left\{ \left(\frac{NPV^+}{NPV^+ - NPV^-} \right) (Df^- - Df^+) \right\}$$

Remarks:

- IRR = Internal Rate of Return
- NPV^+ = Positive Net Present Value
- NPV^- = Negative Net Present Value

Df + = Discount factor that results in a positive NPV

Df - = Discount factor that results in a negative NPV

Criteria: If IRR is less than the prevailing credit interest rate (18%), cocoa farming is not feasible to continue because it cannot repay the loan.

If IRR is the same as the prevailing credit interest rate (18%), the cocoa farming is not making a profit or loss (break-even).

If IRR is more than the prevailing credit interest rate (18%), cocoa farming is feasible to continue because it is profitable.

3. Net Benefit-Cost Ratio, with the following formula:

$$NBCR = \frac{\sum NPV^+}{\sum NPV^-}$$

Remarks: NBCR = Net Benefit-Cost Ratio
 $\sum NPV^+$ = Total of positive NPVs
 $\sum NPV^-$ = Total of negative NPVs

Criteria: If $NBCR < 1$, the business is not feasible to continue because it is not profitable

If $NBCR = 1$, the business is neither making profit or loss (break-even)

If $NBCR > 1$, the business is feasible to continue because it is profitable

4. Sensitivity analysis was conducted to test the financial feasibility of cocoa farming in the North Kolaka Regency using one of the following assumptions:

- a. A 10% reduction in the unit price of production
- b. A 10% reduction in production size

III. Results

Cocoa Farming Cashflow

The discussion of the study result is commenced by presenting the 25-year cash flow of cocoa farming in North Kolaka Regency. The cash flow is the basis to determine the financial feasibility of cocoa farming using NPV, IRR, and NBCR parameters and sensitivity analysis. The cash flow consists of benefit, cost, and net benefit, each presented annually from year 0 to year 25. The cash flow in detail is presented in Table 1.

Table 1. The Cash Flow of Cocoa Farming in North Kolaka Regency, Southeast Sulawesi

Year	Benefit	Cost	Net Benefit
0	0	15,025,000	(15.025,000)
1	0	3,607,000	(3.607,000)
2	0	3,607,000	(3.607,000)
3	7,800,000	7,807,000	(7,000)
4	12,666,750	8,792,204	3,874,546
5	19,170,500	10,741,068	8,429,432
6	20,118,750	9,846,250	10,272,500
7	20,537,000	9,963,860	10,573,140
8	20,891,750	9,902,616	10,989,134
9	21,139,000	10,039,822	11,099,178
10	21,312,000	10,214,742	11,097,258
11	21,500,000	10,182,000	11,318,000
12	21,750,000	10,556,000	11,194,000
13	22,023,000	9,954,974	12,068,026
14	22,293,750	9,745,000	12,548,750
15	22,528,500	9,641,592	12,886,908
16	22,700,000	9,867,000	12,833,000
17	22,237,500	10,061,000	12,176,500
18	21,762,500	10,332,500	11,430,000
19	21,525,000	10,422,000	11,103,000
20	21,269,500	10,568,114	10,701,386
21	20,975,000	10,592,000	10,383,000
22	20,850,000	10,512,000	10,338,000
23	20,340,000	10,248,000	10,092,000
24	19,581,250	9,555,500	10,025,750

25	19,381,250	10,191,250	9,190,000
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Table 1 shows that harvesting begins in the third year, which means that the business has generated financial benefits that year. The financial benefits of cocoa farming in the third year have covered almost all incurred operational costs. In the fourth to the twenty-fifth year, the financial benefits of cocoa farming exceeded the annual operational cost.

Net Present Value

Net Present Value (NPV) is a parameter used to analyze the financial feasibility of a multi-year business, including cocoa farming. This parameter shows the ability of the cocoa farming business to generate net income at its current value because, in this study, the NPV has taken into account the time value of money for 25 years. As well-understood, the value of money decreases every year.

The time value of money was determined by referring to the credit interest rate applied to most commercial banks in Southeast Sulawesi, i.e., 18% per year. For simplification of NPV calculation, the credit interest rate was assumed to be 18% for 25 years, adjusting to the economic life of the cocoa plants. The calculations of NPV at df 18% are presented in Table 2.

Table 2. Net Present Value of Cocoa Farming in North Kolaka Regency at df 18%

Year	Net Benefit	Df 18%	NPV
0	(15,025,000)	1	(15,025,000)
1	(3,607,000)	0.847	(3,055,129)
2	(3,607,000)	0.718	(2,589,826)
3	(7,000)	0.609	(4,263)
4	3,874,546	0.516	1,999,266
5	8,429,432	0.437	3,683,662
6	10,272,500	0.370	3,800,825
7	10,573,140	0.314	3,319,966
8	10,989,134	0.266	2,923,110
9	11,099,178	0.225	2,497,315
10	11,097,258	0.191	2,119,576
11	11,318,000	0.162	1,833,516
12	11,194,000	0.137	1,533,578
13	12,068,026	0.116	1,399,891
14	12,548,750	0.099	1,242,326
15	12,886,908	0.084	1,082,500
16	12,833,000	0.071	911,143
17	12,176,500	0.060	730,590
18	11,430,000	0.051	582,930
19	11,103,000	0.043	477,429
20	10,701,386	0.037	395,951
21	10,383,000	0.031	321,873
22	10,338,000	0.026	268,788
23	10,092,000	0.022	222,024
24	10,025,750	0.019	190,489
25	9,190,000	0.016	147,040
NPV at df 18%			11,009,571

Table 2 shows that the NPV of cocoa farming at df 18% in the North Kolaka Regency is IDR 11,009,571. The NPV parameter indicates that cocoa farming in the region is financially feasible to continue because it generates financial benefits at a current value of IDR 11,009,571 per hectare if managed throughout the economic life of cocoa plants (for 25 years).

Internal Rate of Return

Internal Rate of Return (IRR) is a parameter to assess the financial feasibility of cocoa farming in the North Kolaka Regency. This parameter is used to determine the rate of return of the capital invested in a business compared to the cost of capital balance when deposited in a commercial bank. The interest rate of deposits at commercial banks at the time of research was 12% annually. The cocoa farming business in Southeast Sulawesi is financially feasible if the IRR value is greater than 12%. The results of the IRR calculation are presented in Table 3.

Table 3. The 2020 Internal Rate of Return for Cocoa Farming in North Kolaka

Year	Net Benefit	Df 18%	NPV 18%	Df 24%	NPV 24%
0	(15,025,000)	1	(15,025,000)	1	(15,025,000)
1	(3,607,000)	0.847	(3,055,129)	0.806	(2,907,242)
2	(3,607,000)	0.718	(2,589,826)	0.650	(2,344,550)
3	(7,000)	0.609	(4,263)	0.524	(3,668)
4	3,874,546	0.516	1,999,266	0.423	1,638,933
5	8,429,432	0.437	3,683,662	0.341	2,874,436
6	10,272,500	0.370	3,800,825	0.275	2,824,938
7	10,573,140	0.314	3,319,966	0.222	2,347,237
8	10,989,134	0.266	2,923,110	0.179	1,967,055
9	11,099,178	0.225	2,497,315	0.144	1,598,282
10	11,097,258	0.191	2,119,576	0.116	1,287,282
11	11,318,000	0.162	1,833,516	0.094	1,063,892
12	11,194,000	0.137	1,533,578	0.076	850,744
13	12,068,026	0.116	1,399,891	0.061	736,150
14	12,548,750	0.099	1,242,326	0.049	614,889
15	12,886,908	0.084	1,082,500	0.040	515,476
16	12,833,000	0.071	911,143	0.032	410,656
17	12,176,500	0.060	730,590	0.026	316,589
18	11,430,000	0.051	582,930	0.021	240,030
19	11,103,000	0.043	477,429	0.017	188,751
20	10,701,386	0.037	395,951	0.014	149,819
21	10,383,000	0.031	321,873	0.011	114,213
22	10,338,000	0.026	268,788	0.009	93,042
23	10,092,000	0.022	222,024	0.007	70,644
24	10,025,750	0.019	190,489	0.006	60,155
25	9,190,000	0.016	147,040	0.005	45,950
Total	212,377,508		11,009,571		(271,298)

With reference to the data in Table 3, the IRR is calculated as follows:

$$IRR = Df^+ + \left\{ \left(\frac{NPV^+}{NPV^+ - NPV^-} \right) (Df^- - Df^+) \right\}$$

$$IRR = 18\% + \left\{ \left(\frac{11,009,571}{11,009,571 - (271,298)} \right) (24\% - 18\%) \right\}$$

$$IRR = 23.81\%$$

Based on the calculation, the IRR value is 23.81%, indicating that the farming business is financially feasible to continue because the IRR value is greater than the interest rate of commercial bank deposits. Thus, if sufficient capital is available, it is better to invest in a cocoa farming business because it is more profitable than depositing it in a commercial bank. In contrast, suppose sufficient capital is not available. However, one wishes to invest in cocoa farming, credit funds can be used because the IRR value (23.81%) is greater than the prevailing credit interest rate (18%). It means that the financial benefits of cocoa farming are sufficient to cover credit instalments from capital loans.

Net Benefit-Cost Ratio

This analysis is intended to obtain an overview of the current net income for every rupiah invested in cocoa farming. The NBCR value is obtained using the following calculation:

$$NBCR = \frac{\sum NPV^+}{\sum NPV^-}$$

$$NBCR = \frac{31,683,789}{20,674,218}$$

$$NBCR = 1.533$$

The result shows that the NBCR value is more than one, indicating that cocoa farming in North Kolaka Regency is financially feasible. The NBCR value of 1.533 means that every IDR 1.00 invested in cocoa farming will generate a net income at a present value of IDR 1,533.00. The amount of income generated from cocoa investment in North Kolaka exceeds 50% of the funds invested in the business for a year.

Sensitivity Analysis

Based on the calculations, the NPV, IRR, and NBCR values indicate that cocoa farming in North Kolaka Regency is financially feasible to continue. The assumptions used in the calculations were current conditions that have not considered certain situations, such as declines in production prices or declines in production due to natural factors.

The authors believed that cocoa farming does not always run regularly as in the current condition; therefore, anomalous situations also need to be considered. Based on this concern, the authors assessed the financial feasibility of cocoa farming in North Kolaka Regency based on two assumptions, i.e., a 10% decrease in production cost and a 10% decrease in production size. The two assumptions aim to determine the sensitivity of the financial feasibility of cocoa farming.

The two assumptions, respectively, give similar results of financial feasibility assessments. The details are as follows:

- 1) NPV 18% = 4,094,810. It means that either a 10% decrease in cocoa bean price from the current normal price or a 10% decrease in production will still result in an income of IDR 4,094,810 at the present value. Thus, cocoa farming is feasible with a 10% decrease in product price from the current normal price or a 10% decrease in production size.
- 2) IRR = 20.37%. This value indicates that a 10% price decrease from the normal price or a 10% decrease in production will still result in an IRR of 20.37%. Thus, a 10% price decrease from the normal price or a 10% decrease in production will still result in a feasible cocoa farming because the IRR value remains greater than prevailing credit interest (18%).
- 3) NBCR = 1.19. This value indicates that a 10% price decrease from the normal price or a 10% decrease in production will still result in an NBCR of 1.19. Thus, a 10% price decrease from the normal price or a 10% decrease in production will still result in feasible cocoa farming. This situation is due to higher revenue to expenditure ratio, demonstrated by the NBCR value that is more than one.

IV. Conclusion And Recommendation

Cocoa farming remains feasible to be continued in North Kolaka Regency because the feasibility assessment results in a positive NPV value of IDR 11,009,571, an IRR value of 23.81%, which is greater than the prevailing interest rate, and an NBCR value, i.e., 1.533, that is greater than one. The three values are indicators that cocoa farming is feasible to be advanced.

The sensitivity test result shows that cocoa farming is not sensitive to decreased production cost and size. Assuming there is a 10% decrease in production cost or a 10% decrease in production size, the sensitivity test gives an NPV value of IDR 4,094,810 (positive value), an IRR value of 20.37% (higher than the prevailing interest rate), and an NBCR value of 1.19 (greater than one). The test results indicate that cocoa farming is not sensitive to declines in production price and size.

This study suggests that cocoa farmer can continue manage and develop their cocoa farming, since the farming is financially feasible under current conditions or when there is a decline up to 10% in production or price. Considering that majority of farmers in North Kolaka depend their livelihood on cocoa farming and the fact that cocoa is not sensitive to price reductions and production declines, the local government need to maintain cocoa as the main agricultural commodity in North Kolaka Regency and continue providing support to the cocoa farmers.

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