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Financial analysis and contribution of arabica coffee for sustainable coffee farming in Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency

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Abstract. Coffee is one of the leading plantation commodities which has an important role in the economy. Coffee acts as a provider of employment, a source of income, and foreign exchange through exports. However, in carrying out coffee farming, farmers experience obstacles that can affect the level of income contribution from coffee farming which ultimately affects family income and the sustainability of coffee farming. The purpose of this study was to determine the financial feasibility of Arabica coffee farming and to determine the contribution of Arabica coffee agribusiness income to family income and sustainability of Arabica coffee farming. The determination of the research area was carried out by purposive sampling (sampling with a specific purpose) because Sitolu Bahal Village has the largest land area in Lintongnihuta Subdistrict. The analytical method used was the feasibility analysis, namely the analysis of NPV, Net B/C, and IRR methods, and the analysis of the proportions (contribution of family income) method. The research results showed that the NPV value was IDR 10,682,488.69, the Net B/C value was 28.85, and the IRR value was 44.24%. The contribution of Arabica coffee farming income to family income was 13%. This high contribution shows that the farming business is sustainable.

1. Introduction

So far, the achieved development results in Indonesia contribute great results that greatly benefit the agricultural sector development as well. It is an undeniable fact that the development of agricultural businesses is supported and provided by many opportunities. It is due to the fairly large natural resource wealth capital owned by Indonesia. The provided opportunities are also beneficial for coffee farming, as one of the smallholders' plantation crops. Coffee plantations are different from other plantations which are mostly managed and controlled by companies and government plantation businesses, coffee plantations are mostly handled by smallholders [1].

As coffee is one of the superior plantation crops to be exported, coffee farming has a crucial role, not only in supporting the regional economy and society but also in supporting the environment as a sustainable farming option. Farming and other businesses related to coffee act as a source of income, a provider of employment, and a source of foreign exchange through exports, especially for smallholders and small-medium enterprises. According to the Indonesian Coffee Export and Industry Association [2] of the total coffee production, about 67 per cent is exported, while the remaining 33 per cent is to meet domestic needs.

Coffee production in Indonesia in 2022 reached 793,193 tons. The formation of coffee cherries due



to the favourable weather for flowering has caused this rising in production. Moreover, the level of national coffee production depends on weather changes and conditions as dominant factors. Generally, farmers in Indonesia produced two types of coffee to be cultivated commercially, specifically Robusta coffee and Arabica coffee. Of the total coffee production of 793,193 tons in 2022, arabica coffee produced around 150,000 tons from an area of 250,000 hectares, while Robusta coffee produced around 600,000 tons from an area of 1.05 million hectares [3].

This type of Arabica coffee from North Sumatra has a smooth coffee texture, a heavy and specific taste, a floral taste, good viscosity, and balanced acidity. North Sumatra Province is known as one of the largest Arabica coffee producers in Indonesia [1]. Arabica coffee is one of the export commodities, this can be seen from the amount of product produced by each regency in North Sumatra, especially Humbang Hasundutan.

Humbang Hasundutan Regency is an arabica coffee plantation area that has good potential if managed properly by improving the quality of plant cultivation and land area of the plant. Based on this information, Humbang Hasundutan Regency was chosen as the research area with the hope that the area can become one of the centres of Arabica coffee production in the future through cooperation between all parties involved in efforts to develop Arabica coffee commodities.

Humbang Hasundutan Regency has 10 subdistricts, Lintongnihuta Subdistrict is one of several Arabica coffee-producing subdistricts in Humbang Hasundutan Regency. The harvested area and production of each subdistrict are different [4]. Lintongnihuta Subdistrict is one of the other coffee-producing areas. In Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency, currently all farmers in the area are farming coffee. However, in running a coffee farming business, farmers experience various obstacles which in turn will affect the quality and quantity of coffee produced. Various obstacles faced by coffee farmers in Sitolu Bahal Village can affect the level of income contribution from coffee farming, which in turn affects family income. Until now, there has been no research on coffee farming in Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency.

2. Research methods

2.1 Determination of sample area

The research area was determined *purposively*, meaning that the research area was chosen based on a specific purpose [5]. Sitolu Bahal Village was determined as the research area since this village is the village with the largest land area in Lintongnihuta Subdistrict. The time of study was carried out from February to March 2021.

2.2 Determination of sampling

The total population of farmers in this study was 345. Based on calculations using the Slovin formula, the sample value was 58 coffee farmers as the respondents who were considered to be representative of all farmers in the population of 345 farmers. The method used in determining samples was the Simple random sampling method. As a sampling technique, Simple Random Sampling is a method in which the samples are chosen randomly from members of the population regardless of the existing strata in the population. A considered homogeneous population member is one of the considerations in choosing this method [6].

2.3 Data collection

A few sets of data consisting of primary and secondary data were collected in this study to be analysed. Farmers who cultivate Arabica coffee were a source of the primary data obtained in this study. The farmers, as the research samples, were interviewed using a list of questions, hence the data was obtained by direct interviews and documentation. While secondary data were obtained from the BPS-Statistics of North Sumatra Province, the Plantation Office of Humbang Hasundutan Regency, the Village Head, literature, books, and internet media in accordance with this study.

2.4 Data analyses

To analyse the feasibility of Arabica coffee farming, the analytical tools were the analysis of the NPV, the Net B/C, and the IRR methods [7] by observing the cash flow from the farm. Net Present Value (NPV) is the benefit obtained during a project period which is measured at a certain interest rate. If $NPV \geq 0$, then the farm business is feasible. The formula is as in equation (1).

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

Information:

NPV = Value of money now and at a certain time

$B_t - C_t$ = Net income in year t

i = Applicable interest rate

t = Term (year t)

I = Initial investment of business

Internal rate of return (IRR) is the value of the rate of return on investment, calculated when the NPV is equal to zero. The formula is as in equation (2).

$$IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} (i_2 - i_1) \quad (2)$$

If $IRR \geq (i)$, farm business is said to be feasible. If $IRR < (i)$, farm business is said to be unfeasible.

The benefit-cost ratio (B/C) is the level of comparison between revenue and costs, specifically between all positive values and the net profit flow each year (month) after discounting the total negative value. The formula is as follows in equation (3).

$$\text{Net } \frac{B}{C} = \frac{\sum_{t=1}^n \frac{B_t - C_t}{(1+i)^t}}{\sum_{t=1}^n \frac{C_t - B_t}{(1+i)^t}} \quad (3)$$

Information:

B_t = Farming benefits in year t

C_t = Farming costs in year t

n = Economic life

t = Term (year t)

i = The prevailing interest rate

If the net $B/C > 1$, then coffee farming is feasible. And vice versa, if the net $B/C < 1$, then coffee farming is not feasible to carry out.

To analyse how big the proportion of Arabica coffee farm income is to the total family income, which is called the family income contribution, an analytical tool used was the proportion analysis method. The proportion analysis was determined using the formula in equation (4) [8].

$$Y = \frac{A_i}{B_i} \times 100\% \quad (4)$$

Information:

Y = Proportion of income/revenue contribution

A = Total Arabica coffee farm income

B = Farmer's household income (total family income)

i = 1,2,3, n

If the Arabica coffee farming income contribution is $> 50\%$, it is said as a big contribution. If the Arabica coffee farming income contribution is $< 50\%$, it is said as a low contribution. The total income of farming families was obtained by adding up farm income and non-farming income from both the agricultural sector and the non-agricultural sector.

3. Results and discussion

3.1 Financial analysis of arabica coffee farming

Farming financial analysis was used to determine the level of the farmers' financial feasibility in carrying out their farming. To see whether or not Arabica coffee farming was done finely by coffee farmers in Sitolubahal Village, a financial feasibility analysis could be used. In financial analysis, some criteria must be met, among others are NPV (Net Present Value), IRR (Internal Rate of Return) and B/C Ratio.

3.1.1 Net Present Value (NPV). From the results of the analysis, it could be seen that with the discount factor (bank interest rate) of 15%, a positive NPV value of IDR 821,730 for one year was obtained. Thus, the NPV value is greater than zero, which means that coffee farming in Sitolu Bahal Village is feasible. Through NPV analysis, then it is known that coffee farming in Sitolu Bahal Village is feasible to be developed.

3.1.2 Internal Rate of Return (IRR). The results of the IRR value calculation for coffee farming were 44.24%. The value is greater than the prevailing market interest rate of 15% per year. This shows that even if interest rates increase close to 44.24%, coffee farming is still feasible. This situation is a good opportunity for coffee farmers in Sitolubahal Village to develop coffee farming more optimally.

3.1.3 Benefit Cost-Ratio (B/C). The calculation of the B/C ratio value of coffee farming in Sitolubahal Village was obtained by comparing the present value of the benefits (profits) for 13 years with the present value of costs incurred for 13 years. The results of the analysis obtained were a B/C ratio value of 28.85. The B/C ratio of 28.85 obtained gives an illustration that every sacrifice or cost of IDR 1,000 will be able to provide a benefit or profit of IDR 28,850. This means that the development of coffee farming in Sitolubahal Village can provide greater benefits than any costs incurred within a period of 15 years.

Table 1. Financial feasibility criteria for arabica coffee farming in Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency.

No.	Financial Eligibility Criteria	The calculation results	Conclusion
1.	Net Present Value	$NPV \geq 0$	Worthy
2.	Internal Rate of Return	$IRR \geq i$	Worthy
3.	Benefit Cost-Ratio	$B/C > 1$	Worthy

Source: Processed primary data analysis, 2021

The results of the calculation of the three Financial Eligibility Criteria are shown in table 1. From table 1, it can be concluded that Arabica coffee farming in Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency, is financially feasible to cultivate. In other words, the hypothesis can be accepted.

3.2 Arabica coffee farming income contribution to total arabica coffee farmer family income

From the results of the study on 58 sample farmers, it was found that in addition to running Arabica coffee farming, coffee farmers also engaged in non-Arabica coffee farming, such as the farming of red chillis, vegetables, cabbages, corn, potatoes, cayenne peppers, sichuan peppers, tomatoes, and onions. In addition, some sample farmers were also engaged in other fields of work, such as trading, self-

employment, honorary teachers, civil servants, labourers, and retirees.

This was because pursuing other work outside of non-agriculture could improve the standard of living of the sample farmers' families. The average total income of sample farmers from Arabica coffee farming, non-Arabica coffee farming, as well as from other productive activities outside of farming during 2020 was IDR 22,642,216.017/year. This income was used by the sample farmers to meet the needs of their families as well as capital to continue the various fields of work occupied by the sample farmers. For more details regarding the contribution of each source of farmer income, we can observe in table 2.

Table 2. The contribution of each sample farmer's income source to the total sample farmers' income during 2020.

No	Type of Livelihood	Average Farmer Income (IDR)	Percentage (%)
1.	Arabica Coffee Farming	2,750,804.310	13
2.	Non-Arabica Coffee Farming	11,662,436.552	52
	Red Chili Farming	1,663,729.66	7
	Vegetable Farming	502,448.28	2
	Cabbage Farming	1,802,568.97	8
	Corn Farming	2,558,965.52	11
	Potato Farming	3,103,362.07	14
	Sichuan Pepper Farming	198,620.69	1
	Cayenne Pepper Farming	1,320,517.24	5.8
	Tomato Farming	534,568.97	2
	Pre Union-Farming	34,051.72	0.2
3.	Non-Farm Jobs	8,228,896.552	36
	Total	22,642,216.017	100

Source: Processed primary data analysis, 2021

Table 2 shows that the contribution of coffee farming to the family income was 13 per cent. This contribution was the largest compared to the contributions of other plants farming that was cultivated by farmers. Other plants farming provided an average income of 5.8 per cent. Only potato farming contributed higher than coffee, which was 14 per cent. This high contribution shows that the coffee farming business is a sustainable business. Especially when compared to the amount of labour used for coffee farming. Coffee farming can be done in between farming other crops, it is less intensive than potato farming. In some cases, other plants can be cultivated between coffee plants, where the spacing of coffee plants is sparser for planting other crops.

4. Conclusions

Based on the results of the study, it can be concluded that Arabica coffee farming in Sitolu Bahal Village, Lintongnihuta Subdistrict, Humbang Hasundutan Regency was feasible to be cultivated financially with an NPV value of IDR 10,682,488.69, a Net B/C value of 28.85, and an IRR value of 44.24%. The income of sample farmers from Arabica coffee farming has been able to provide a high contribution to the total income of farmers during 2020, which was 13%. This high contribution shows that the coffee farming business is sustainable. The sum of Income from non-Arabica coffee farming was only able to contribute as much as 52% and income from other productive activities outside of farming was able to contribute 36%. So, it can be concluded that the contribution of Arabica coffee farming is still very low on family income in Sitolu Bahal Village.

References

- [1] Pane T C and Khaliqi M 2022 Consumers' preferences for North Sumatera specialty coffees *IOP*

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- [2] Asosiasi Eksportir Kopi Indonesia (AEKI) [Indonesian Coffee Exporters Association] 2012 *Industri Kopi Indonesia [Indonesian Coffee Industries]* Available from: <http://www.aeki-aice.org>
- [3] Asosiasi Eksportir Kopi Indonesia (AEKI) [Indonesian Coffee Exporters Association] 2020 *Industri Kopi Indonesia [Indonesian Coffee Industries]* Available from: <http://aeki.aice.org>
- [4] Badan Pusat Statistik Provinsi Sumatera Utara [BPS-Statistics of Sumatera Utara Province] 2019 *Provinsi Sumatera Utara dalam Angka 2019 [Sumatera Utara Province in Figures 2019]* (Medan, Indonesia: Badan Pusat Statistik Provinsi Sumatera Utara [BPS-Statistics of Sumatera Utara Province])
- [5] Arikunto S 2006 *Prosedur Penelitian [Research Procedures]* (Jakarta, Indonesia: Rineka Cipta)
- [6] Ibrahim Y 2009 *Studi Kelayakan Bisnis [Business Feasibility Study]* (Jakarta, Indonesia: Rineka Cipta)
- [7] Sujarweni W 2014 *Metodologi Penelitian: Lengkap, Praktis, dan Mudah Dipahami [Research Methodology: Complete, Practical, and Easy to Understand]* (Yogyakarta, Indonesia: PT Pustaka Baru)
- [8] Mely G T 1997 *Masalah Perencanaan Penelitian [Research Planning Problems] Metode Penelitian Masyarakat [Community Research Methods]* (Jakarta, Indonesia: PT Gramedia Pustaka Utama)