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Strengthening Indonesian Agribusiness: Rural Development and Global Market Linkages

IPB International Convention Center, Bogor - Indonesia,
25 - 26 April 2016

Editors :
Amzul Rifin
Meine Pieter van Dijk
Diederik P. de Boer
Huub Mudde
Johan van Rooyen
Siti Jahroh

Organized by
Department of Agribusiness, Faculty of Economics and Management,
Bogor Agricultural University - Indonesia
in collaboration with
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FOREWORD

With deep satisfaction I was writing this foreword to the Proceedings of International Conference with the theme of **Strengthening Indonesian Agribusiness: Rural Development and Global Market Linkages** held in IPB International Convention Center, Bogor Agricultural University, Indonesia, on 25 -26 April 2016. This conference marked the end of the NICHE Project which started in 2011.

Diverse papers and discussion represent the thinking and experiences of mixed and various scholars of their particular interest and fields. Of valuable was the presence of prominent scholars who brought their newest findings out of their research works. Their contributions helped to make the conference as outstanding as it has been.

Special thanks are due to the invited speakers Prof. Meine Pieter van Dijk (Maastricht School of Management (MSM) Netherlands), Dr. Daniel Sherrard (Earth University, Costarica), Dr. Nunung Kusnadi (Agribusiness Department, Bogor Agricultural University), Oliver Olson, MBA (Director Global Education Programs at Maastricht School of Management), Huub Mudde, M.Sc (Agricultural Counselor, Embassy of the Kingdom of the Netherlands), Prof. Johan van Rooyen (Agricultural economics at Stellenbosch Univeristy, South Africa), Ir. Wildan Mustofa, MM (Hikmah Farm, Pangalengan West Java), Joshua Bray, M.Sc (Sydney University, Australia) and Dr. Nerlita M. Manalili (Managing director NEXUS Agribusiness Solutions, Philippines and SEARCA Consultant Agribusiness). We would like also to thank the editor of the proceeding, Dr. Amzul Rifin, Prof. Meine Pieter van Dijk, Diederik P. de Boer, PhD, Huub Mudde, M.Sc, Prof. Johan van Rooyen, Siti Jahroh. Phd, Triana Gita Dewi, M.Sc, M. Rizqy Mubarok, M.Si, and Hamid Jamaludin, SE for the layout of the proceeding.

It is my hope that this proceeding will contribute to the development of agriculture and rural development in the world and in Indonesia especially.

Dr. Dwi Rachmina
Head of
Department of Agribusiness
Faculty of Economics and Management
Bogor Agricultural University

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THE FINANCIAL FEASIBILITY OF COFFEE FARM TECHNOLOGIES IN LAMPUNG PROVINCE

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ABSTRACT

Coffee is an important export commodity in Indonesia. It is developed by three types of the plantation, namely smallholder, state and private plantations. Unfortunately, the productivity of smallholder plantations is still very low due to the high number of old plants. Thus, replanting and rehabilitation are important to be conducted immediately to make sure there will be no loss in the export opportunities in the future. This study was aimed to compare the feasibility of coffee farming based on technologies (existing, replanting and rehabilitation). This study used primary data obtained from interviews with stakeholders in Tanggamus and West Lampung Regency. The analysis instruments used to answer the aim of this research were qualitative and quantitative analysis. In quantitative analysis, this research used Net Present Value (NPV), Internal Rate of Return (IRR), Net Benefit-Cost Ratio (Net B/C) and Payback Period. The results showed that the financial aspect of existing condition was not feasible while it was feasible in replanting and rehabilitation scenario. Nonetheless, rehabilitation condition resulted in the highest profits compared with that of replanting. Strategy development of coffee farming can be done by performing the improvement of farming management according to SOP to increase the productivity or by applying replanting and rehabilitation of plantation.

***Keywords**: coffee, replanting, rehabilitation*

INTRODUCTION

Cultivation of coffee in Indonesia is generally managed by the three estates, namely smallholder plantation, Public Plantation and Private Plantation. The largest total land area of the coffee plantation is cultivated by smallholders (96.2 percent of total area) while public plantation and private plantation only manage to cultivate 1.8 percent and 2.0 percent, respectively. From total land area, 82 percent is planted with robusta coffee and 18 percent with arabica coffee (Direktorat Jenderal Perkebunan, 2014).

However, the coffee production of public plantation provides the highest productivity which reaches 0.611 tons/ha while smallholders and private plantation only reach 0.54 tons/ha and 0.59 tons/ha, respectively. One of the factors that led to the low productivity of smallholder coffee is the old coffee trees. Most coffee trees in smallholder plantation were planted decades ago. Thus, replanting program is important to do. Replanting program is urgent to conduct because about 60 percent of the total coffee area (1.3 million ha) are planted by old trees (Direktorat Jenderal Perkebunan, 2012). The old coffee trees lead to the low productivity. Thus, it is important to conduct replanting or rehabilitation in order not to lose the export opportunity in the future.

Actually, replanting and rehabilitation program of coffee plantation have been conducted since 2012/2013. Based on data from the Ministry of Agriculture, during that year, the government has been rehabilitating some coffee plantation. For Arabica coffee, replanting and rehabilitation conducted in 12 provinces covering 26 districts with a total area of 5,299 ha. While for robusta coffee, replanting and rehabilitation conducted in five provinces that cover 7 districts with a total area of 447 ha.

Beside age, another factor of low productivity of smallholder coffee plantation is the inappropriate cultivation with Good Agricultural Practice (GAP) which made intensification was not applied well. Therefore, it is important to analyze the feasibility of smallholder plantation development through intensification, replanting and rehabilitation of coffee plantation.

Lampung Province is a center of coffee production in Indonesia, contributing to the national total area of the coffee plantation for

around 19.45 percent (Direktorat Jenderal Perkebunan Kementerian Pertanian, 2014). Compared with its potential, the average productivity of coffee in Lampung Province is very low, those are around 0.701 tons/ha for robusta coffee and 0.716 ton/ha for Arabica coffee (Dinas Perkebunan Lampung, 2015) while the potential coffee productivity is 2-4 tons/ha. Reasons for low productivity are 1) farmers do not fully implement the GAP and 2) the physical condition of the coffee trees is not good enough since most of the trees are already more than 20 years old.

One effort that can be done to improve the productivity of coffee is an intensification of coffee farming. Moreover, replanting or rehabilitation of coffee plantations is also able to be carried out. This replanting is important to do to prevent the decline of robusta coffee production, both locally and nationally. The central government has allocated budget through the state budget for replanting and rehabilitation. However, assistances for replanting or rehabilitation are not provided for all coffee plantations.

Another problem of replanting or rehabilitation program is not all farmers want to do this program because it will take at least 2-3 years to harvest. On the other hand, the coffee price incentives received by farmers make them still want to produce coffee from the old plantation. Based on that problem, are the replanting and rehabilitation of coffee plantations feasible both financially and non-financially? How changes in coffee prices and other factors influence the feasibility of coffee plantation? Therefore, this paper aims to analyze the feasibility of coffee plantation development based on replanting and rehabilitation technology.

LITERATURE REVIEW

Suandi (2014) showed that in Kerinci district, farm management of arabica coffee was simple without fertilizer and herbicide application to increase its production. Average farmers' income was Rp 5,607,551.00/year, or only Rp 467,295.00/month. The analysis stated that the value of R/C ratio was more than 1 and the value of π/C Ratio equal to 45.9%. Labor productivity was Rp 312,000. It was greater than the wages in the research area namely Rp 50,000.00/day/person. Revenue BEP was Rp 2,680,000.00 and net income earned was Rp 4,619,560.00. Thus, arabica coffee plantation in this study area was very feasible and prospective to be developed; however, it was still important to keep the intensity and better farm productivity to increase farmer's revenue and income.

Research of organic and non-organic coffee plantation in five districts in South Sulawesi declared that based on the defects value and quality, organic coffee was better than non-organic coffee; however, the productivity of organic arabica coffee was lower than the non-organic coffee. The analysis showed that the organic coffee had NPV of Rp 7,229,949.00, while the non-organic coffee was Rp 10,846,510.00. BCR of organic and non-organic coffee were 6.9365 and 3.1654, respectively. Thus, both types were feasible to be developed. BSD was used to evaluate the comparative advantages of coffee plantation by domestic resource cost analysis. BSD of organic and non-organic coffee were 0.3004 and 0.4932, respectively. Thus, both types were profitable (Laode Asrul et al., 2006).

Karo H (2010) analyzed the coffee plantation in Simpang empat, Karo District. This result stated that the production factor affecting coffee production in this study area were organic and non-organic fertilizers and labor use. Average farmers' income was Rp 13,062,700/ farmer or Rp 18,850,597.22/hectare. This coffee farming was financially feasible with NPV>0 (Rp 8,386,247.80), IRR>i (16.95%) and B/C>1 (30.80).

Apriyanto et al. (2014) who conducted research about Feasibility Analysis of Smallholder Coffee plantation in Jember stated that most technical aspects such as location determination, production area, technology use, production layout and farming activities, already met the minimum standards. Thus, its farm in Jember district was feasible to be developed. From financial aspect, this research declared that it has fulfilled the eligibility criteria such as ARR, NPV, IRR, net B/C, gross B/C and PP. The value of

sARR, NPV, IRR, net B/C and gross B/C were 187.35 percent, Rp 12,177,566.27; 13.54 percent; 1.24 and 1.17, respectively. Those values indicated that the farm was feasible. Productive period of coffee plant was 15 years old while based on the payback period calculation, the coffee plantation can return all investment cost for 11 years and 1 month 8 days or 7 years and 5 months and 2 days if it use net benefit value, which is faster than the productive period of the coffee plant. Thus, based on payback period, the farm was financially feasible.

Analysis of financial feasibility and economic value of land (land rent) on the replacement of the coffee plantation into rubber plantation in Way Kanan Regency, Lampung was conducted by Kaisan, et al. (2013). This research stated that the NPV, IRR, Net B/C, Gross B/C and payback period of those plantations were still profitable and financially feasible to be developed, yet rubber plantation was more profitable than coffee plantation. In coffee plantation, feasibility and land surplus in intercropping farming is higher than that in monoculture coffee plantation. The additional revenue which was not obtained by monoculture coffee farmers was Rp 5,998,631.00/year, while the additional revenue unable to be received by intercropping coffee farmers was Rp 5,523,921.00/year.

Soetriono (2007) conducted a research about strategies for improving agribusiness robusta coffee competitiveness with a competitiveness model of tree five. This research was done in in three regions such as Tanggamus (Lampung), Malang and Jember. The result showed that the plantations were feasible, both financially and economically, to be cultivated and even to be implemented for 25 years, for both monoculture and diversification cultivation. The five criteria for investment feasibility i.e. NPV, Net B/C, Gross B/C, IRR and PP are listed in Table 2. In addition, there was still divergence between the value of financial and economic feasibility.

De Rosary, et al. also examined the pattern of coffee farming and conducted financial analysis in Sikka regency, East Nusa Tenggara with result that coffee farming was feasible to be developed based on the B/C ratio, NPV and IRR (5.67; Rp 87,498,645; 39 percent, respectively).

METHODS

DATA COLLECTION

This research was conducted in Lampung Province especially West Lampung and Tanggamus districts as these two regions are considered as coffee centers in Indonesia. This research process was conducted for 7 (seven) months, started from June to December 2015.

Table 1. Financial and Economic Feasibility Analysis of Agribusiness Robusta Coffee

Region	Investment Criteria	Financial Analysis	Economic Analysis	Divergences
Lampung	NPV (Rp)	40,612,524	16,095,104	24,517,420
	Net B/C	3.63	2.42	1.21
	Gross B/C	2.05	1.81	0.24
	IRR (%)	32.77	42.48	-10
	PP (year)	3.93	3.4	0.57
Malang	NPV (Rp)	4,005,956	9,083,712	- 5,077,756
	Net B/C	1.78	2.61	- 0.83
	Gross B/C	1.25	1.64	-0.39
	IRR (%)	20.93	33.61	-12.68
	PP (year)	9.81	4.81	5.00
Jember	NPV (Rp)	4,402,512	5,455,124	- 1,052,612
	Net B/C	1.90	1.91	- 0.01
	Gross B/C	1.28	1.61	- 0.33
	IRR (%)	20.81	31.52	-11
	PP (year)	11.59	5.0	6.64

Data (quantitative and qualitative) source collected in this study consisted of primary and secondary data. Primary data were obtained from interviews with coffee farmers. Besides, farmers also conducted the Focus Group Discussion (FGD) with Dinas Perkebunan Provinsi dan Kabupaten, Dinas Perdagangan, BPTP, PT. Nestle and PT Indo Cafco. Secondary data were obtained from Badan Pusat Statistik (BPS), Dinas Pertanian dan Perkebunan, Dinas Perindustrian dan Perdagangan, Bappeda, AEKI and other relevant kind of literatures.

Coffee farmer sampling was conducted purposively to obtain comprehensive information on coffee farming activities. Coffee plantations mapping for grafting and rehabilitation was conducted by interviewing the involved stakeholders such as Dinas Pertanian dan Perkebunan. Strategy for developing coffee plantation was done by interviewing the traders (including exporters), processors and the relevant agencies.

ANALYSIS

Investment criteria assessment for analyzing financial aspects are Net Present Value (NPV), Internal Rate of Return (IRR), Net Benefit-Cost Ratio (Net B/C) and Payback Period. Each criterion used the Present Value which has been discounted from the currents(?) of benefits and costs over the life of the project (Nurmalina et al., 2014).

Net Present Value (NPV)

Net Present Value is the difference between the total present value of benefits and the total present value of cost. NPV calculation was in units of currency (USD).
Mathematic formulation:

$$NPV = \sum_{t=1}^{n} \frac{Bt}{(1+i)^t} - \sum_{t=1}^{n} \frac{Ct}{(1+i)^t} = \sum_{t=1}^{n} \frac{Bt - Ct}{(1+i)^t}$$

Note:
Bt = benefit in year t
Ct = cost in year t
t = year of business activity (t=1,2,3, ..., n)
i = DR (percent)
If NPV > 0: business is profitable.
If NPV < 0: business is not feasible to run.

Internal Rate of Return (IRR)

Feasibility can be judged by how good the business returns on investment. It can be demonstrated by measuring the amount of Internal Rate of Return (IRR). IRR is the discount rate (DR) which generates NPV equal to 0. The unit of this calculation is a percentage (%).
Mathematic formulation:

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

Note:
i_1 = Discount rate generating positive NPV
i_2 = Discount rate generating negative NPV
NPV_1 = Positive NPV
NPV_2 = Negative NPV
If IRR > DR: business is profitable.
If IRR < DR: business is not feasible to run

Net Benefit-Cost Ratio (Net B/C)

Net B/C ratio is the ratio between the positive net benefits and negative net benefits. Mathematically, it can be expressed as:

$$\text{Net B/C} = \frac{\sum_{t=0/1}^{n} \frac{Bt - Ct}{(1+i)^t} \quad (B_t - C_t) > 0}{\sum_{t=o/1}^{n} \frac{Bt - Ct}{(1+i)^t} \quad (B_t - C_t) < 0} \quad \text{.....}$$

Note:
Bt = benefit in year t
Ct = cost in year t
i = discount rate (%)
t = year of business activity (t=1,2,3, ..., n)
If Net B/C > 1: business is profitable.
If Net B/C < 1: business is not feasible to run.

Pay Back Period (PBP)

This method measures how quickly the investment can be returned. Business with short or quick return period, most likely be selected. The main problem of this method is the difficulty of determining the maximum payback period to be used as a normative comparison. Normatively, there are no guidelines that can be used to determine the maximum payback. Practically, we can use payback period which generally happens in similar companies.

Other weaknesses of this method are (1) neglecting the time value of money and (2) neglecting the cash flow after payback period. To solve the first weakness, we can use discounted payback period. Payback Period is a complementary method of investment appraisal.

$$\text{Payback Period} = \frac{I}{Ab}$$

Note:
I = investment
Ab = net benefit per year

RESULT

Financial aspects of coffee plantation in Lampung Province were conducted in several scenarios namely existing condition, grafting and rehabilitation. In existing condition scenario, planting was started in the first year; thus, the coffee production began on the fifth year. Grafting technique was widely applied by farmers in Lampung Province when the plants had been old. Productivity of old plants (over 20 years) would decrease if they were not grafted or rehabilitated. Rehabilitation (destruction the old plants and planting the new plants) would require a fairly high cost and a long time waiting period. Thus, grafting technique became one of the alternatives for farmers. In rehabilitation scenarios, mechanical cultivation applied to the renewal program was the Good Agricultural Practice (GAP). The provision of production inputs came from local resources, such as waste coffee processing, waste or plant residues, manure and compost. Agricultural practices were started from land, planting material and planting preparation, planting, farm maintenance, harvest and post-harvest handling.

The total number of coffee plants per hectare is 1600 plants with row spacing of 2.5 x 2.5 m. Thus, the spacing between plants did not make the coffee plants grow too tightly as it generally happened.

ASSUMPTION

To analyze the financial condition, basic assumptions are required to simplify and clarify the calculation process. The basic assumptions used were:

1. Business period is 20 years. This business period is determined based on the productive period of coffee plants.
2. The entire capital used is farmer's own capital.
3. All input and output prices used in this analysis are from primary data.
4. All input and output prices used in this analysis are constant until the end of the business period. Prices used are the price in 2015.
5. Depreciation is calculated using the straight-line method:
$$Depreciation = \frac{purchasing\ value - residual\ value}{economic\ age}$$
6. Business tax applied is the Tax Law No. 46 Year 2013. There are several kinds of tax rates; the amount depends on how much the 'gross income':
   - If the gross income is less than Rp 4.8 billion, the tax rate is 1 percent of the gross income.
   - If gross income is more than Rp 4.8 billion and less than Rp 50 billion, the tax rate is {0.25 - (0.6 Billion/Gross Income)} multiplied by taxable income.
   - When gross income is more than 50 billion, the tax rate is 25 percent of taxable income.
7. The discount rate used is the interest deposit rate (6 percent per year)
8. In switching value analysis, it is assumed that other components are constant.
9. Coffee plantations are a monoculture.

INFLOW

The main income of coffee plantations was from the dried coffee bean sale. Dried coffee production pattern in each scenario was different. The pattern of the third production scenario which is shown in Figure 1 depicts that the rehabilitation scenarios results in the highest production. This was due to the reason that young plants and superior seeds were relatively used in this rehabilitation program.

The first harvest time of coffee plant in existing condition and rehabilitation were on the fifth and the third year, respectively. Unlike the

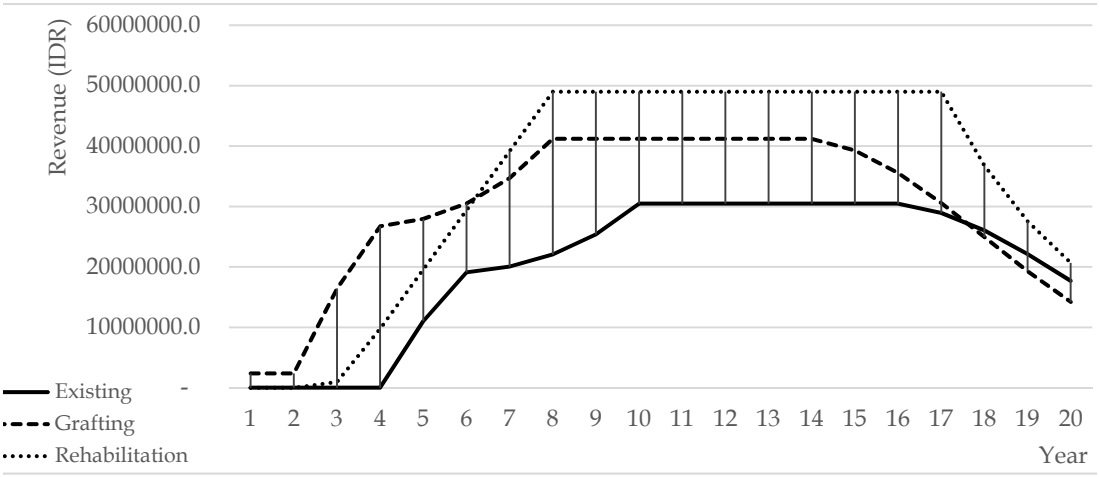

Figure 1. Revenue Pattern of Each Scenarios

existing condition and rehabilitation scenarios, coffee production in grafting scenario started from the first year. This is because the grafting process was gradually conducted started from the first until the third year.

OUTFLOW

Investment cost

The investment cost generally consisted of purchasing land, equipment and labor use for the process of preparation and planting. In the rehabilitation scenario, there was destruction cost of old coffee plants. In the grafting scenario, the purchased land was an old coffee plantation of 20 years old. Figure 2 shows the comparison of investment cost that must be prepared for different scenarios.

Based on Figure 2, it can be seen that the biggest investment cost was found in rehabilitation scenarios. This was due to the cost for destructing the old plants and planting the new plants. The lowest cost was found in the existing condition scenario.

Operational Cost

Operational cost consisted of labor and non-labor cost. Labor cost consisted of labor cost for fertilizing, weeding, pest and disease control, harvest and post-harvest while non-labor cost consisted of urea, TSP, NPK, pesticide, herbicide and insecticide cost. In general, the highest operational cost was the labor cost. In existing condition and grafting scenario, labor cost was 8 times higher than that of the non-labor cost. This

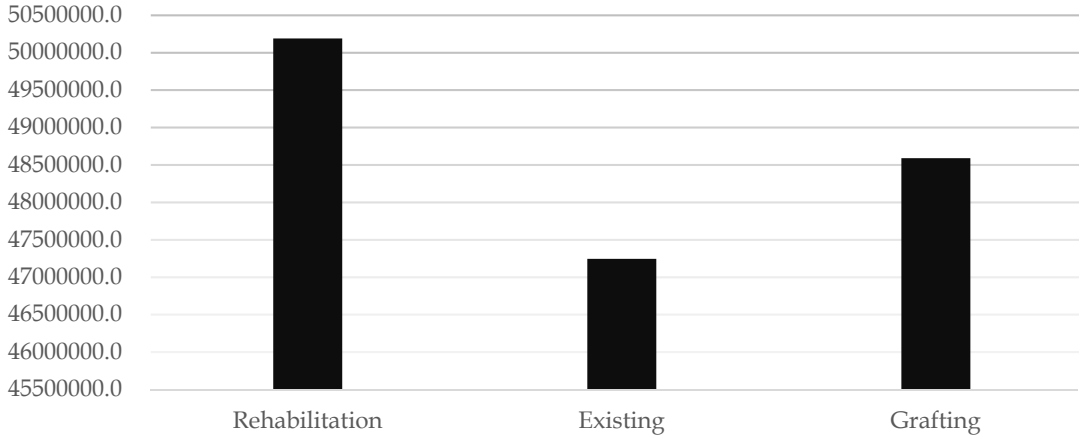

Figure 2. Investment Cost of Each Scenario

Table 2. Investment Criteria

Feasibility Criteria	Existing Condition	Grafting	Rehabilitation
NPV (Rp)	-102.222.937,12	48.161.754,07	114.342.872,77
IRR (%)	-	0,16	0,22
Net B/C	0,78	1,82	2,73
Payback period (year)	>20	9,47	7,97
	Not feasible	**Feasible**	**Feasible**

could be due to the less intensive of input use and inefficient labor use. In rehabilitation scenario, the maintenance of the coffee plant was applied intensively. In this scenario, labor cost can be 2-3 times higher than that of non-labor cost.

FEASIBILITY

Based on the financial feasibility calculation, the existing condition scenario was not feasible to be applied. This was caused by the low productivity of coffee plants. Further, rehabilitation scenario achieved the highest value of NPV, IRR, Net B/C and PP. This result was due to the high productivity of coffee plants. Thus, based on feasibility analysis, rehabilitation scenarios were very feasible to be applied. However, the constraint of this rehabilitation program was the high investment costs needed to be used by farmers before planting.

SWITCHING VALUE

The risk caused by changes in some important components had to be calculated. The analysis used switching value method. This analysis was conducted to see the maximum limit of price and operational cost changes which were still tolerated. Based on Table 1, grafting scenario was more sensitive to price changes while rehabilitation scenario was more sensitive to operational cost changes. This was due to the high productivity found in the rehabilitation scenario.

Table 3. Switching Value

Changes	Grafting	Rehabilitation
Decreasing coffee prices	24%	44%
Increasing operational cost	50%	27%

CONCLUSION AND RECOMMENDATION

CONCLUSION

1. Feasibility calculations showed that the development of existing coffee plantations in Lampung province was not feasible. Nevertheless, the rehabilitation and grafting scenarios indicated that the plantation was feasible.
2. Rehabilitation scenario results in the largest benefit.

RECOMMENDATION

1. Cultivation of the coffee plantations needs to be conducted by agriculture intensification. It is intended to increase the productivity. Thus, farmers do not need to extend their land.
2. The grafting or rehabilitation also have to be conducted because most coffee plants are old enough and have low productivity.

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