

Factors influencing success of the cocoa (*Theobroma cacao*) product certification program in tropical areas

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Abstract

Cocoa is one of the leading national commodities after rubber, palm oil, coffee, and tea. Cocoa has a significant impact on the economy in Central Sulawesi, especially in terms of creating new jobs and sources of income for farmers. The decline in cocoa productivity and quality will affect farmers' income in rural areas. In recent years, several cocoa industry and cocoa trading companies such as Mars Inc., Mondelez International, Cargill, Barry Callebaut, and JB Cocoa have begun to focus on developing product certification programs for selling by allocating several CSR (Corporate Social Responsibility) funds to conduct training and technical assistance in cultivation (pruning, fertilizing, frequent harvesting and sanitation) for cocoa. Therefore, several socializing requirements or compliance standards must be met by farmers who are members of the certification program, namely the CoC (Code of Conduct) established by certification bodies such as UTZ. The purpose of this study was to analyze the factors that influence the success of the cocoa certification program in Central Sulawesi. 80 families were chosen as number of samples. A logistic regression model was used to answer the research objectives. The results showed that the land area, farmer's age, level/year of farmer's education had very small influence on the success of the certification program in Central Sulawesi. The linkage of debt with traders considerably influences the success of product certification programs. Cocoa production, income factors, traders' domicile, and merchant service patterns have a significant influence on the success of the certification program.

Keywords: Cocoa, Certification, Farmers, Productivity, Quality.

Abbreviations: CSR_Corporate Social Responsibility; GAP_Good Agriculture Practice; CoC_Code of Conduct.

Introduction

Cocoa is one of the leading national commodities after rubber, palm oil, coffee and tea. Cocoa has a significant impact on the Indonesian economy, especially in terms of creating new jobs, sources of income for farmers, regional development, agro-industry development and foreign exchange earners for the country (Gustiana and Irwanto, 2017; Maulana and Kartiasih, 2017; Puspita et al, 2015).

Indonesia only ranks fourth as the largest producer of cocoa beans in the world after Ivory Coast, Ghana and Ecuador with a production volume of only about 6% of the world's cocoa production of 4.79 million tons. The area of cocoa plantations in Indonesia before 2018 tends to show a decrease of around 0.21 to 3.63 percent per

year. Indonesia's cocoa plantation area in 2014 was recorded at 1.73 million hectares, decreased to 1.65 million hectares in 2017 or a decline of 4.62% (Ditjenbun, 2019; BPS, 2018).

The decrease in planted area has an impact on the decreasing number of cocoa production in Indonesia, including Central Sulawesi, which has been the largest cocoa supplier for Indonesia. In 2016, cocoa bean production from Central Sulawesi was 125 thousand tons or about 18.97% of Indonesia's total production which reached 658.94 thousand tons. In 2018 the production of Central Sulawesi cocoa beans only reached 101 thousand tons or around 17.13% of Indonesia's total production, which reached 589.61

thousand tons. In addition to the above factors, other factors that also affect the decline in cocoa bean production are the relatively old age of cocoa plants (more than 25 years), high pest and disease attacks, low technology adoption, and lack of fertilizer inputs for cocoa plantations (BPS, 2018; Millaty, 2017).

From the aspect of world cocoa consumption needs, demand for cocoa will continue to increase along with the increasing number of world population. Data shows chocolate consumption for 10 (ten) European countries in 2019 reached 6.2 kg/capita/year where the consumption was dominated by chocolate consumption in Switzerland (8.2 kg/capita/year), Germany (7.9 kg./capita/year) and England and Ireland with each consumption reaching 7.4 kg/capita/year), while Indonesia only reached 0.3 kg/capita/year. This increase in demand is also offset by increasingly stringent requirements that must be met by producers, in this case cocoa farmers. One of the requirements that must be met for the cocoa exported to European and American countries is certification. The context of the certification is usually referred to implementation of environmental friendly cocoa cultivation practices (GAP-Good Agriculture Practice), reducing deforestation, avoiding child labor and having traceability of product results (Dirjenbun, 2019; CSP, 2016).

Facing such market demand in recent years, a number of cocoa industry and cocoa trading companies such as Mars Inc., Mondelez international, Cargill, Barry Callebout and JB Cocoa have begun to focus on developing a certification program by allocating a number of CSR (Corporate Social Responsibility) funds to conduct training and technical assistance in cultivation (Pruning, Fertilization, Frequent Harvesting and Sanitation) for cocoa farmers and socialize a number of requirements or compliance standards that must be met by farmers who are members of the certification program, namely the CoC (Code of Conduct) established by certification bodies such as UTZ. The training is facilitated by institutions or organizations such as Swisscontact or facilitated directly by staff from local traders who are partners of exporters. A number of areas targeted for the development of the certification training program are Central Sulawesi, South Sulawesi, Southeast Sulawesi, West Sulawesi and East Nusa Tenggara. The problem faced so far is the lack of attention by many farmers. It seems that they are not interested in the certification program and do not sell to certified collectors (SCPP, 2017).

Another issue that is equally important is that cocoa productivity at the farmer level is still quite low even though the government and the private sector have made a number of programs to support farmers in terms of seed preparation, fertilization support, collaboration with local traders (buying stations) to further shorten

the market chain, so that farmers can get a better price and also get a premium from every sale made to the existing market chain.

A number of existing problems, potentials and opportunities related to cocoa have been studied previously, such as the role of the UTZ certification program in increasing cocoa production and farmer income in Jembrana Regency, Bali Province, and the role of key farmers (Cocoa Doctor) in adopting cocoa production improvement packages. The purpose of this study is to analyze the factors that influence the success of the cocoa certification program in tropical areas such as Maliwowo Village, Angkona District, East Luwu Regency, South Sulawesi Province.

Results and Discussion

Feasibility of the Logistics Regression Model

The feasibility test of the logistic regression model was carried out using several methods including the Omnibus Test, Hosmer and Lemeshow Test, and the Likelihood Test (Table 1).

Table 1 shows that the significance value is $0.00 < 0.05$ at the 5% level. It shows that H_0 is rejected and there is a significant effect of the eight independent variables (X) on the dependent variable (Y) so that the model is quite fit to be used.

Hosmer and Lemeshow Test can also be done to analyze whether H_0 is accepted or rejected and whether the existing regression model can be used to explain the relationship between the independent variable and the dependent variable and there is no difference between the model and the observed value. Hosmer and Lemeshow test results and contingency tables are presented in Tables 2 and 3.

Based on Table 2, it can be seen that the significance value is $0.982 > 0.05$ at the level of 5%. It also shows that H_0 is accepted and the logistic regression model can be used to explain the relationship between the independent variable and the dependent variable.

Table 3 shows that there is no difference between the expected value and the observed value, so H_0 is accepted, meaning that the logistic regression model can be used to explain the relationship between the independent variable and the dependent variable.

The magnitude of the contribution of the independent variable to the dependent variable in the logistic regression model above can be seen in the Nagelkerke R Square value in Table 4.

Based on Table 4, the Nagelkerke R Square value is 0.853 which indicates that the independent variable is able to explain the dependent variable of 85.3% while the remaining 14.7% is explained by other independent variables outside the existing logistic regression model.

Table 1. Results of the “Omnibus Test” from the Logistics Regression Model.

		Chi-square	χ^2 (8, 0.05)	Df	Sig
Step 1	Step	81.627		8	0.000
	Block	81.627		8	0.000
	Model	81.627	14.067	8	0.000

Source: Own calculations.

Table 2. Hosmer and Lemeshow Test Results from the Logistics Regression Model.

Step	Chi-Square	χ^2 (8, 0.05)	df	Sig
1	1.971	14.067	8	0.982

Source: Own calculations.

Table 3. Contingency Table for Hosmer and Lemeshow Test.

		Y0 = Not Selling		Y1= Sell		Total
		Observed	Expected	Observed	Expected	
Step	1	8	7.999	0	0.001	8
	2	8	7.986	0	0.014	8
	3	8	7.919	0	0.081	8
	4	8	7.340	0	0.660	8
	5	6	5.802	2	2.198	8
	6	1	2.174	7	5.826	8
	7	1	0.683	7	7.317	8
	8	0	0.061	8	7.939	8
	9	0	0.025	8	7.975	8
	10	0	0.11	8	7.989	8

Source: Own calculations.

Table 4 also obtained the value of -2 log likelihood or G = 29.277 and the value of $\chi^2_{(df,\alpha)} = 14,067$. It means that the value of $G > \chi^2_{(df,\alpha)}$ then reject H_0 means that there is at least 1 parameter $\beta_i \neq 0$ where 1 or more predictor variables have a significant effect on the response variable.

Factors affecting the success of the product certification program

Partial analysis results for each independent variable in the equation are described in Table 5.

Table 5 shows that land area of cocoa (X_1) has a significant effect on farmers' decisions in selling to certified traders ($\alpha = 15\%$) and has an Exp value (β) = 0.108. This shows that the land area factor has very little chance of influencing farmers' decisions in selling to certified traders. The results of previous studies showed that land area had a significant effect on increasing cocoa production (Antara and Effendy, 2009; Rinaldi et al., 2013; Effendy et al., 2018). In this study, it is assumed that the wider a person's land ownership, the more cocoa production will be and this will be a trigger factor for farmers to intend to sell their cocoa products to certified traders because they will get additional income that is much greater than before. The area of land owned by respondent farmers ranges from 0.5 to

2.0 ha. There are 35% of farmers with a land area of 1 ha or more than 1 ha who still sell to non-certified traders. Several factors have caused this such as farmers long time (some are more than 20 years) interaction with each other for buying and selling transactions so that there is an emotional bond between them. Traders apply the strategy of providing cash or cash loans whenever farmers need. The wider the farmer's land, the potential to get loan funds from traders is getting bigger and in relatively larger amounts. Conditions like this can be an obstacle to the success of the certification program, especially if the traders who have been partners with farmers are not certified traders. Cocoa production data of respondent farmers based on interview ranged from 97 - 1,251 kg per year. There are 77.5% of respondent farmers whose cocoa production in a year is < 500 kg/year and 22.5% of farmers whose production is > 500 kg/year. Cocoa production (X_2) shows the value of Exp (β) = 23.114. These results indicate that the cocoa production factor has a large enough opportunity to influence the decision of farmers to sell to certified traders by 23.114 times compared to sales to non-certified traders. Comparison with other factors shows that the cocoa production factor ranks fourth in terms of the magnitude of the opportunity value to influence the farmer's decision to sell to

certified traders. It means that the greater the farmers' cocoa production, the greater the opportunity to sell to certified traders.

The age of respondent cocoa farmers ranged from 30-76 years. Most of them are 36-55 years old which is the productive age category. The results of the partial analysis of the cocoa farmer age (X_3) showed the value of $\text{Exp}(\beta) = 0.918$. These results indicate that the age factor of farmers has very little chance to influence farmers' decisions in selling their cocoa products to certified traders by 0.918 times compared to selling to non-certified traders. Comparison with other factors shows that the age of farmers ranks sixth as a factor that has the opportunity to influence farmers' decisions in selling their cocoa products to certified traders. One of the components that support the results of this study is that the sales method used so far is divided into several categories, namely selling using their own motorbike, using motorcycle taxis, borne by themselves because the distance to the place of sale is quite close and or is picked up directly by the buyer. That's why the influence of the age factor is not significant because transportation facilities are well available.

The education level of the respondent farmers is mostly only elementary school graduation. A person's level of education will affect the decision-making process, which is related to the maturity of thinking in managing farming activities that are more effective and efficient and easier to receive information and new technology (Nurhidaya et al., 2015). The results of the partial analysis of the education level of cocoa farmers (X_4) showed the value of $\text{Exp}(\beta) = 0.814$. These results indicate that the factor of education level or length of education has a very small chance to influence the attitude of farmers to sell to certified traders by 0.814 times compared to sales to non-certified traders. Comparison with other factors shows that education level ranks seventh as a factor that has the opportunity to influence farmers' attitudes to sell their cocoa products to certified traders. The low number of respondents with an education above elementary school is generally caused by the family's economic limitations and the long distance to school that must be reached on foot. Situations like this reinforce the opinion that non-formal education through training is the best alternative in an effort to open up farmers' insight and increase farmers' knowledge, especially in agribusiness so that in the end they can make the right decisions in an effort to get maximum results from their farming. This condition is in line with the results of research related to non-formal education which states that non-formal education which includes material on plant cultivation, pest and disease control and empowerment of farmer groups has a positive influence on cocoa production

(Effendy and Antara, 2015; Effendy, 2018; Fauzi et al., 2019).

The income of respondent farmers obtained from cocoa farming within a year ranged from Rp. 2,730,000 – Rp. 35,761,914 based on the results of the interview. There are 93.75% of farmers whose income is < Rp. 27,649,999 or equivalent to Rp.2,304,167 per month, while based on the results of previous research, the average income from cocoa farming was only Rp. 15,976,150.79 /ha/year (Gugere et al., 2016). The value of the income obtained in the current study is still lower than the value of the Central Sulawesi UMP, which has been determined based on the Circular (SE) of the Minister of Manpower Number 11/HK04/X/2020 concerning Minimum Wage Determination in 2021 during the Covid-19 Pandemic, which is IDR 2 .303,711 Per Month. The low value of farmers' income from the cocoa sector has encouraged some farmers to carry out other activities to meet the needs of their families, such as being construction workers, odd jobs, collecting candlenuts, and cultivating other commodities such as corn, coffee, bananas, and vegetables. The results of the partial analysis of the household income level (X_5) show the value of $\text{Exp}(\beta) = 47.735$. These results indicate that the income factor of cocoa farmers in each year (X_5) has a very large opportunity to influence farmers' decisions to sell to certified traders by 47.735 times compared to selling to non-certified traders. Comparison with other factors shows that the income factor ranks second as a factor that has a very large opportunity to influence farmers in making decisions to sell their cocoa products to certified traders. The results of the partial analysis above are in line with the results of research related to farmer decision-making, where the higher the income of farmers from a farm, the greater the opportunity for the farmer to make a decision to choose something that can increase their income (Theresia et al., 2016; Effendy et al., 2021; Effendy et al., 2022). Giving a premium to farmers with Rp. 1,200/kg for each sale to certified traders, which will be given after the sales results recapitulation is carried out within a 1-year deadline, will be a great motivation for most farmers to make a decision to sell their cocoa products to the certified traders.

There are as many as 37.5% of respondent farmers who owe to traders and 62.5% of farmers who are no longer in debt to traders. Information obtained during interviews shows that the purpose of using the debt is widely varied including meeting household needs, children's education costs, purchasing production input costs, paying labor wages, and also for social purposes such as wedding parties or funeral events. The amount of debt owed to traders varies widely and is adjusted to the cocoa production capacity of the farmer, the value is between Rp.200,000 – 25,000,000. Loans are given

Table 4. Model Summary Results.

Step	-2 log likelihood	$\chi^2_{(8, 0.05)}$	Cox & Snell R Square	Nagelkerke R Square
1	29.277 ^a	14,067	0.640	0.853

Source: Own calculations.

Table 5. Results of Partial Independent Variable Analysis ($\alpha = 0.05$).

Step 1 ^a	Var	β	SE	Wald	df	Sig	Exp (β)	Exp (β) Lower	Upper
	X ₁	-2.225	1.477	2.271	1	0.132	0.108	0.006	1.952
	X ₂	3.140	1.259	6.221	1	0.013	23.114	1.959	272.663
	X ₃	-0.086	0.060	2.054	1	0.152	0.918	0.816	1.032
	X ₄	-0.206	0.214	0.927	1	0.336	0.814	0.535	1.238
	X ₅	3.866	1.578	5.999	1	0.014	47.735	2.165	1052.584
	X ₆	2.275	1.113	4.178	1	0.041	9.732	1.098	86.257
	X ₇	3.444	1.409	5.977	1	0.014	31.320	1.980	495.498
	X ₈	5.083	1.829	7.723	1	0.005	161.18	4.472	5,809.160
							5		
	Const	-11.478	5.587	4.221	1	0.040	0.000		

Source: Own calculations.

without collateral but are only based on mutual trust between the two parties and are given without interest. The returns are made in installments when the farmers sell their cocoa products to the traders. The loan provided indirectly becomes a binder for both parties to be able to carry out buying and selling transactions on an ongoing basis. The results of the partial analysis of the debt relationship with traders (X_6) variables show a value of $\text{Exp}(\beta) = 9,732$. These results indicate that the debt factor to traders (X_6) has a large enough opportunity to influence farmers' decisions in selling their cocoa products to traders to whom they owe 9.732 times compared to selling to traders who do not provide debt. Comparison with other factors shows that the debt factor to traders (X_6) ranks fifth in terms of the magnitude of the opportunity value to influence the decision of farmers to sell to traders who provide debt. The relationship between farmers' debts and traders is a symbiotic relationship of mutualism that can lead to dependence with several consequences, including long and lasting relationships of farmers that have a dependent attitude and tend to find it difficult to get out of the zone, farmers tend to surrender and accept low prices, farmers tend to be exploited by farmers (Megasari, 2017).

The domicile factor of the trader is one of the important factors that determine the occurrence of buying and selling transactions of cocoa farmers. There is a tendency for farmers to sell their cocoa products to traders who live in the village more than those outside the village. The ratio is 42: 38. The results of the partial analysis of the trader's domicile (X_7) show the value of $\text{Exp}(\beta) = 31.320$. These results indicate that the domicile

factor of traders has a very large opportunity to influence farmers' decisions to sell their cocoa products to traders who are domiciled in the village by 31,320 times compared to selling to traders outside the village. Comparison with other factors shows that the domicile factor of traders ranks third which has a greater opportunity to influence farmers' decisions in selling their cocoa products to traders. The domicile factor of traders is closely related to the problem of transportation costs and the marketing chain where if the traders are domiciled in the village, the number of transportation costs that must be incurred by farmers selling their cocoa products becomes smaller even at no cost, especially if the traders are near the farmer's house. On the other hand, if the traders are outside the village, the farmers will incur relatively large costs to get to the traders in question, which means that from the aspect of marketing efficiency, it is not optimal. Marketing efficiency can be seen from the aspect of margins, costs, and profits where the greater the value of marketing efficiency, the marketing system is less efficient or less good (Nurjannah et al., 2015).

Of the number of respondent farmers who stated that they were satisfied with the pattern of merchant services, 67.5% of farmers and 32.5% of farmers were not satisfied. The satisfied category indicates that there are 5-7 indicators that are met from the 10 indicators assessed, while the less satisfied category indicates that there are only 3-4 indicators that are met. The types of service patterns that are often carried out by cocoa traders in Palolo District to maintain social relations with farmers are giving bonuses during holidays in the form of soft drinks. The number of pieces of weighing is not

too much; the waiters are very friendly, willing to give loan funds when needed with no collateral/collateral. This is a premium if selling to certified traders and also implementing a pick-up system if the farmers' cocoa production is large enough. The results of the partial analysis of the trader's service pattern variable (X_8) show the value of $\text{Exp}(\beta) = 161.185$. These results indicate that the service pattern factor has a very large opportunity to influence farmers in making decisions to sell to certified traders by 161.185 times compared to selling to non-certified traders. Comparison with other factors shows that the service pattern factor of traders ranks first which has a very large opportunity to influence farmers' decisions in selling their cocoa products to certified traders. This is in line with the results of research related to the level of customer satisfaction which states that service quality includes physical evidence, reliability, responsiveness, assurance, and empathy have a significant effect on customer satisfaction (Panjaitan and Yuliati, 2016; Apriyani and Sunarti, 2017).

Materials and methods

Study area and sampling techniques

The research was carried out in Palolo District, Sigi Regency, Central Sulawesi, covering 7 (seven) villages which were the target areas of the UTZ certification program carried out by JB Cocoa and CAP as certificate holders. The research was carried out from May – July 2021. Research activities were carried out to answer specific objectives, starting with data collection using the survey method. The data used in this study are cross-sectional and time series data. The cross-sectional data used include data on cocoa land area, total cocoa production, age of cocoa farmers, education of cocoa farmers, the income of cocoa farmers, farmer's debt, domicile of certified collectors, service patterns of collectors, and the success of the cocoa certification program in Central Sulawesi. Cross-section data were obtained using a questionnaire. The number of samples used was 80 families. Time series data were obtained from several agencies, including the Plantation Service of Central Sulawesi Province and the Central Statistics Agency of Central Sulawesi Province.

Analytical framework and empirical model

To answer the research objectives 1 – 8 binary logistic regression models ($Y=0$ and $Y=1$), so that the equation follows the Bernoulli distribution as follows:

$$(y_i) = (x_i)(1-\pi(x_i))^{1-y_i} \quad (1)$$

where: $\pi_i = i^{\text{th}}$ occurrence probability

$y_i = i^{\text{th}}$ random variable consisting of 0 and 1

So that for $y_i = 0$, so $(0) = (x_i)0(1-\pi(x_i))^{1-0} = 1-\pi(x_i)$ (2)

And for $y_i = 1$, so $f(1) = \pi(x_i)1(1-\pi(x_i))^{1-1} = \pi(x_i)$ (3)

Suppose the probability of the response variable Y for the value of x which is given, denoted as $\pi(x)$. Common models (x) denoted as follows:

$$(x) = \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_p x_p) / (1 + \exp(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_p x_p)) \quad (4)$$

Equation (4) is called a logistic regression function which shows the relationship between predictor variables and probability that is not linear, so to get a linear relationship a transformation is often called a logit transformation. The logit form of (x) expressed as (x), that is:

$$\text{logit}[\pi(x)] = g(x) = \ln(\pi(x) / (1-\pi(x))) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_p x_p \quad (5)$$

Equation (5) is a form of logistic regression model relationship called the multiple logistic regression model (Harlan, 2018; Santoso, 2008; Tampil et al., 2017).

The logit equation that will be used in this research is:

$$\text{logit}[\pi(X)] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 \quad (6)$$

where:

X_1 = Land area of cocoa

X_2 = Cocoa production

X_3 = Cocoa farmer age

X_4 = Education level of cocoa farmers

X_5 = Household income level

X_6 = Debt relationship with trader's (Non debt=1; Debt=0)

X_7 = Trader's domicile (Inside village=1; Outside village=0)

X_8 = Trader's service pattern

$\beta_0, \beta_1, \beta_2, \dots, \beta_8$ = Regression coefficient

Conclusion

The land area has very little effect on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is only 0.108 times compared to sales to non-certified traders. Cocoa production has a significant influence on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is 23.114 times compared to sales to non-certified traders. Farmer's age has very little effect on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is only 0.918 times compared to sales to non-certified traders. The farmer's level/length of education has very little effect on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is 0.814 times compared to sales to non-certified traders. The income factor has a very large influence on the success of the certification program in Central Sulawesi.

The value of sales opportunities to certified traders is 47.735 times compared to sales to non-certified traders. The linkage of debt with traders has a significant influence on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is 9.732 times compared to sales to non-certified traders. The trader's domicile has a very big influence on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is 31,320 times compared to sales to non-certified traders. The Merchant Service Pattern has a very large influence on the success of the certification program in Central Sulawesi. The value of sales opportunities to certified traders is 161.185 times compared to sales to non-certified traders.

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