The Influences of Internal and External Environment on The Performance and Sustainability of Cardamom Farming

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Abstract. Cardamom farming in Banyumas Regency is mostly cultivated on *Perhutani* land. Land conservation management is an important part so that business sustainability can be maintained. Sustainable land conservation management combines technology, policies, and activities by integrating socio-economic principles that pay attention to the environment by (a) maintaining or increasing production (maintain or enhance productivity / services); (b) reduce the level of production risk; (c) protect the potential of natural resources and prevent the degradation of soil and water quality; (d) be economically viable; (e) be socially acceptable. The purpose of this study was to analyze the influence of individual characteristics and external environmental factors on the performance and sustainability of cardamom farming in *Perhutani* land, Banyumas Regency. The analytical method used is descriptive quantitative. Data analysis using Structural Equation Model Partial Least Square. The results of the analysis show that the factors that affect the performance and sustainability of cardamom farming are government policies and regulations; socio-cultural environment; and individual characteristics. While the economic environment has no significant effect on the 95% confidence level.

1 Introduction

Cardamom is a type of nutritious spice and is also used as a food ingredient, cardamom productivity is still very rare so the price of cardamom itself is quite expensive. Although the productivity of cardamom in Indonesia is still low, Indonesia has exported cardamom to several countries such as India, Singapore, and other middle eastern countries. Indonesia exports cardamom in the form of dried fruit and essential oils. Cardamom is commonly used as a flavoring agent in the food, drug, and cosmetic industries.

Banyumas Regency has a cardamom land area of 42.8 Ha and cardamom production of 949.8 tons. Cardamom production in Banyumas Regency is the 6th largest in Central Java Province after Tegal Regency with a total cardamom production of 435.6 tons.

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Tabel 1. Crop Harvest Area and Cardamom Production in Banyumas Regency in 2019

No.	District Area	Harvest Area (ha)	Production (Ton)
1.	Gumelar	255.02	2931.00
2.	Kedungbanteng	3.70	184.50
3.	Lumbir	9.50	59.90
4.	Pekuncen	10.60	57.09
5.	Somagede	1.40	27.90

Based on data from the Central Statistics Agency, there are 5 sub-districts which are cardamom production centers in Banyumas Regency, namely Gumelar, Kedungbanteng, Lumbir, Pekuncen and Somagede Districts. Most of cardamom is grown in the highlands, community forest areas and forestry areas.

The potential of cardamom in Banyumas Regency is very large and profitable, the selling price of cardamom at the farm level can reach US$ 13.5 However, the sustainability of cardamom farming is strongly influenced by external and internal factors. Changes in the internal environment such as capital, the development of technological facilities such as communication tools, production tools, management, and the external environment such as the physical limitations of the environment in the *Perhutani* area, government policies, social and cultural conditions. Cardamom farming in Banyumas Regency is mostly cultivated on *Perhutani* land. Land conservation management is an important part so that business sustainability can be maintained.

Sustainable land conservation management combines technology, policies, and activities by integrating socio-economic principles that pay attention to the environment by (a) maintaining or increasing production (maintain or enhance productivity / services); (b) reduce the level of production risk; (c) protect the potential of natural resources and prevent the degradation of soil and water quality; (d) be economically viable; (e) be socially acceptable [1,2].

The purpose of this study was to analyze the influence of individual characteristics and external environmental factors on the performance and sustainability of cardamom farming in *Perhutani* land, Banyumas Regency.

2 Material and methods

2.1 Basic methods

The basic method used in this research is descriptive analysis [3], which is a research method to examine a group of people, an object, a set of conditions, a thought or a class of events in the present or at least a period of time that is still affordable in the respondent's memory [4]. The sampling technique used was simple random sampling[3,5] with 97 respondent farmers. Sampling was carried out in Kedung Banteng District, Pekuncen District and Gumelar District as cardamom centers in Banyumas Regency.

2.2 Data analysis

Data analysis using Structural Equation model based on variance, namely partial least square. The analysis using PLS-SEM consists of two sub-models[6]. The first sub-model is the measurement model or often referred to as the outer model which shows how the manifest variable represents the variable to be measured. The second sub-model is the structural model or often called the inner model which shows the power of estimation between latent variables or constructs

Inner Model. The inner model describes the relationship between latent variables based on substantive theory. The equation model can be written as follows [7]:

$$\eta=\beta_0+\beta_\eta+\Gamma\xi+\zeta \quad (1)$$

Where:
η=vector of endogenous latent variable (dependent variable)
ξ= vector of exogenous latent variable (independent variable)
ζ=vector residual (unexplained variance)

PLS-SEM is designed for recursive models, each dependent latent variable , or often called the clause chain system can be formulated as follows[8]:

$$\eta_j=\sum_i \beta_{ji}\eta_i+\sum_i \gamma_{jb}\xi_b+\zeta_j \quad (2)$$

Where:
Bji = path coefficient connecting endogenous predictors
γ_{jb} = path coefficient connecting exogenous predictors
i...b = index range along i and b
j = number of endogenous latent variables
ζ_j = *inner residual variable*

Outer Model. The outer model is often called the outer relation or measurement model which explains how each indicator relates to its latent variables. Blocks with reflective indicators, the equation is as follows:

$$X=\Lambda_x\xi+\varepsilon_x$$
$$y=\Lambda_y\eta+\varepsilon_y \quad (3)$$

Where, *x* and *y* are indicators or manifest variables for exogenous latent variables (ξ) and endogenous latent variables (*η*), while *x* and *y* are loading matrices that describe simple regression coefficients connecting latent variables and indicators. Residuals measured by _x and _y can be interpreted as measurement error or noise [9].

The formative model is the opposite of the reflective model where the formative model assumes that the manifest variable affects the latent variable. The direction of the causality relationship flows from the manifest variable to the latent variable. The equation with formative indicators can be written as follows:

$$\xi=\Pi\xi X_i+\delta_\xi$$
$$\eta=\Pi\eta Y_i+\varepsilon_\eta \quad 4)$$

Where, *ξ,η, XX* and *Y* are the same as those used in the equation, Πx and Πy are the multiple regression coefficients of the latent variable on the indicator block, while ξ and η are the residuals of the regression

This study contains 6 variables consisting of 5 exogenous variables, namely Government Policies and Regulations; Economic environment, social and cultural environment; Individual Characteristics and Management Capacity and 1 endogenous variable, namely Farming Performance and Sustainability [10]. In the SEM model, the exogenous latent variable is indicated by the presence of arrows coming from the variable to the endogenous variable. Meanwhile, the endogenous variable is indicated by the arrow leading to the variable. The variables and indicators in this study can be seen in Table 1.

Table 1. Variables and Indicators in Research

No.	***Unobserved* Variable**	***Observed* Variable**	**Symbol**
1.	Government Policies and Regulations (X1)	1. Protected forest area policy 2. Perhutani land use policy 3. Subsidized fertilizer policy 4. Sustainability policy	X1.1 X1.2. X1.3 X1.4
2.	Economic Environment (X2)	1. Availability of shops that provide farming inputs 2. Availability of markets that accommodate farming results 3. Farmers' freedom to sell their products 4. Easy access to market input and output	X2.1 X2.2 X2.3 X2.4
3.	Socio-Cultural Environment (X3)	1. Family support 2. Support from fellow group members 3. Local community support 4. Emotional connection	X3.1 X3.2 X3.3. X3.4
4.	Individual Characteristics (X4)	1. Formal education 2. Age 3. Experience 4. Technology 5. Operating Capital	X4.1 X4.2 X4.3 X4.4 X4.5
5.	Management Capacity (X5)	1. Planning 2. Organizing 3. Management 4. Evaluation	X5.1 X5.2 X5.3 X5.4
6.	Farming Performance and Sustainability (Y)	1. Production 2. Income 3. Capital Increase 4. Compliance with Regulations 5. Environmental sustainability	Y1 Y2 Y3 Y4 Y5

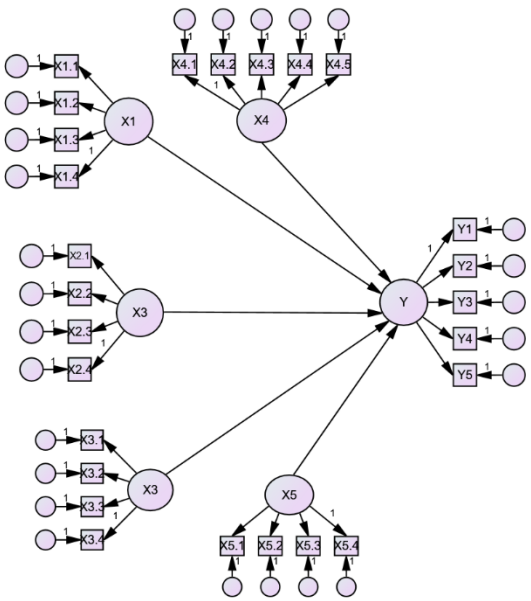

Fig. 1. Structural Modelling.

Measurement of these variables using a Likert scale. Respondents were asked to respond agree or disagree, important or unimportant, good or bad to the questions posed, which were stated in a score of 1 to 5, among others: strongly disagree (5); disagree (4); disagree (3); agree (2) and strongly agree (1); very unimportant (5); unimportant (4); less important (3); important (2) and very important (1); very bad (5); not good (4); not good (3); good (2) and very good (1)[9]; etc.

3 Result and Discussion

3.1 Government Policies and Regulations (X1)

Variables of government policies and regulations include the policy of protected forest areas; *Perhutani's* land use policy; Subsidized fertilizer policy and sustainability policy. The results of the descriptive analysis show that the indicator X1.1 or the protected forest area policy has a very high score because it is >4.2. Meanwhile, the indicators of *Perhutani's* land use policies, subsidized fertilizers, and sustainability policies received high score.

Table 2. Results of Descriptive Analysis of Government Policy and Regulation Variables.

	X1_1	**X1_2**	**X1_3**	**X1_4**
Mean	4.42	4.13	4.14	3.77
Median	4.00	4.00	4.00	4.00
Maximum	5.00	5.00	5.00	5.00
Minimum	3.00	3.00	1.00	2.00
Std. Dev.	0.57	0.87	0.78	1.12

3.2 Economic Environment (X2)

The economic environment variable has 4 indicators consisting of Availability of shops that provide farming inputs; the availability of a market that accommodates the results of farming; the freedom of farmers to sell their products; and easy access to input and output markets. The indicator of the availability of shops providing production facilities is in the very high category. This is because production facilities are easily obtained and subsidized by the government and distributed through local farmer groups. Cardamom harvests have always been taken by traders so that the indicator of market availability that accommodates business results is included in the very high category. The indicator X2_3 or the freedom of farmers to sell their products is in the low category, this is because farmers are already bound by contracts with middlemen who provide business capital [1]. Meanwhile, the ease of access to input and output markets is in the high category. The results of the descriptive analysis of the economic environment variables can be seen in Table 3.

Table 3. Results of Descriptive Analysis of Economic Environment Variables

	X2_1	**X2_2**	**X2_3**	**X2_4**
Mean	4.36	4.25	2.39	3.94
Median	5.00	4.00	2.00	4.00
Maximum	5.00	5.00	5.00	5.00
Minimum	2.00	2.00	1.00	2.00
Std. Dev.	0.79	0.63	1.20	0.88

3.3 Socio-Cultural Environment (X3)

The socio-cultural environment variable has 4 indicators consisting of family support; support among group members; local community support; and emotional connection. The results of the descriptive analysis showed that family support and farmer group members scored very high in cardamom farming, indicating that the internal environment strongly supports the success of farming. Indicators of local community support and emotional connection have a high category, which can be seen in Table 4.

Table 4. Results of Descriptive Analysis of Socio-Cultural Environment Variables

	X3_1	X3_2	X3_3	X3_4
Mean	4.24	3.91	3.32	3.27
Median	5.00	4.00	3.00	3.00
Maximum	5.00	5.00	5.00	5.00
Minimum	1.00	1.00	1.00	1.00
Std. Dev.	1.07	0.80	0.99	0.93

3.4 Individual Characteristics (X4)

Individual characteristics have 4 indicators, namely formal education, age, mastery of technology, and operating capital [1]. The age indicator is in the high category with the average age of farmers above 51 years, while the other indicators are in the low category with a score of < 2.6. This is because the level of formal education, mastery of technology and operating capital is still relatively low (Table 5). Formal Education is one of the internal factors that affect performance and income. High education will have an impact on improving performance and high income [1].

Table 5. Results of Descriptive Analysis of Individual Characteristic Variables

	X4_1	X4_2	X4_3	X4_4
Mean	2.40	3.51	2.46	2.54
Median	2.00	4.00	2.00	2.00
Maximum	5.00	5.00	5.00	4.00
Minimum	1.00	1.00	1.00	1.00
Std. Dev.	1.17	1.04	1.03	0.75

3.5 Farming Performance and Sustainability (Y)

Variable Performance and Sustainability Farming has 5 indicators consisting of production, income, additional capital, compliance with regulations and environmental sustainability [1]. The production indicators are in the medium category, while the income indicators, additional capital, compliance with regulations and environmental sustainability are in the high category. Environmental sustainability indicators are very high/good, this is because cardamom farming does not damage the environment around *Perhutani* land.

Table 6. Results of Descriptive Analysis of Farming Performance and Sustainability Variables

	Y1	Y2	Y3	Y4	Y5
Mean	3.37	3.83	4.00	4.08	4.29
Median	4.00	4.00	4.00	4.00	4.00
Maximum	5.00	5.00	5.00	5.00	5.00
Minimum	2.00	2.00	2.00	2.00	3.00
Std. Dev.	1.13	0.76	0.71	0.55	0.50

The influence of individual characteristics, motivation, external environment, and management capacity on the performance and sustainability of cardamom farming. [10]Data analysis used structural equation modeling partial least square (SEM-PLS). In the PLS analysis, there is one assumption that must be met before the analysis is carried out, namely the assumption of linearity, which requires that there is a linear relationship between variables. The assumption of linearity using the Curve Fit method is that the relationship between variables is declared linear if it meets one of the following two possibilities: (1) significant linear model (sig linear model < 0.05), (2) non-significant linear model and all possible non-significant models (sig linear model > 0.05, and sig model other than linear > 0.05). The test results show some linear model values < 0.05 and some p. values of all models > 0.005 so that the model is said to be linear and fulfills the assumptions set.

3.5.1 Model Fit

The results of the analysis indicate that the model is very good and ideal for research (Table 7). The measurement model in PLS is assessed in terms of inter-construct correlations, item-to-construct correlations, Cronbach's alpha, composite reliabilities, and the AVE for each construct; while in the case of formative measures, instead of examining the factor loadings, one examines the factor weights [11,12].

Table 7. The Result of Model Fit SEM-PLS

Model Fit	Result	
Average Path Coefficient (APC)	0.263	P value > 0.05
Average R-Squared (ARS)	0.555	P value < 0.001
Average adjusted R-squared (AARS)	0.535	P value < 0.001
Average block VIF (AVIF)	1.361	Ideally
Average full collinearity VIF (AFVIF)	1.419	Ideally
Tenenhaus GoF (GoF)	0.501	Large
Sympson's paradox ratio (SPR)	1.000	acceptable
R-squared contribution ratio (RSCR)	1.000	acceptable
Statistical suppression ratio (SSR)	1.000	acceptable
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	acceptable
Nonlinear bivariate causality direction ratio (NLBCDR)=1.000	1.000	acceptable

3.5.2 Goodness of Fit

The feasibility of the research model can be proven by looking at the analysis of the multivariate coefficient of determination expressed by Q-Square (Q). Q-Square is a measure of how well the observations made give results to the research model. Q > 0 indicates the model has predictive relevance. The criteria for the strength of the model are measured based on the Q-square predictive relevance, which ranges from 0 (zero) to one. The closer to 0 the value of Q-Square predictive relevance gives an indication that the research model is getting weaker, on the contrary the farther away from 0 (zero) and closer to the value of 1 (one), it means that the research model is getting better [8].

The calculation results show the predictive-relevance value of 0.55 or 55%. The predictive relevance value of 55% also indicates that the diversity of the data that can be explained by the model is 55% or in other words the information contained in the 55% data can be explained by the model. While the remaining 45% is explained by other variables (which have not been contained in the model) and errors. Thus the structural model that has been formed is appropriate. According [1], R square 0.33-0.66 is in the moderate category.

3.5.3 PLS Results

Testing the inner model (structural model) is essentially testing the hypothesis in research. Hypothesis testing is done by t-test (T-statistics) on each path of direct influence partially. The results of the PLS analysis as well as the results of testing the direct influence hypothesis are summarized in the following Table 8 [8].

Table 8. Structural Model of PLS Results: Direct Effect.

Relationship Between Variables	Path Coefficient	P-value	Information
Government Policies and Regulations (X1) to Y	0.43	0.001	Significant
Economic Environment (X2) to Y	0.13	0.090	Not significant
Socio-Cultural Environment (X3) to Y	0.19	0.030	Significant
Individual Characteristics (X4) to Y	0.30	0.001	Significant

The results of the SEM-PLS analysis show that there is an influence between the variables of government policies and regulations, the social and cultural environment, and individual characteristics on the performance and sustainability of cardamom farming on forested land in Banyumas Regency. Meanwhile, the economic environment has no significant effect on the 95% confidence level but has a significant effect on the 90% confidence level. This is in line with research[13-15]that a good internal and external environment will improve business performance.

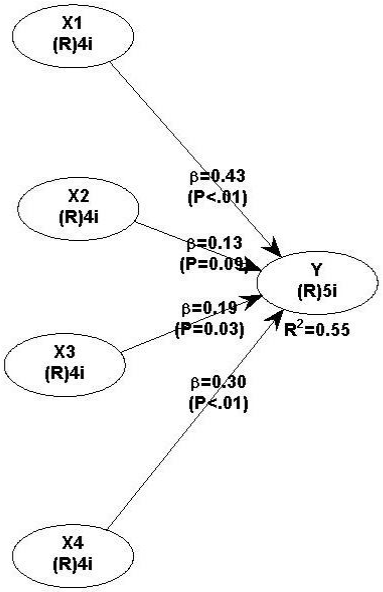

Fig. 2 SEM PLS Analysis Result

The economic environment does not have a significant effect because many indicators of the economic environment are of low value. This is because cardamom marketing has not been going well, farmers do not have market access and do not have a bargaining position in determining product prices. The government and related agencies need to make policies to encourage the economic improvement of cardamom farmers, increase marketing activities and product down streaming.

4 Conclusions

The variables of government policies and regulations are influenced by the policy of protect ed forest areas; *Perhutani's* land use policy; Subsidized fertilizer policy and sustainability p olicy. Social and cultural environment variables are influenced by family support; support a mong group members; and emotional connection. Individual characteristic variables are infl uenced by formal education, age, and mastery of technology. Meanwhile, performance and sustainability variables are influenced by production, income, additional capital, compliance with regulations and environmental sustainability. Factors that affect the performance and s ustainability of cardamom farming are government policies and regulations; socio-cultural e nvironment; and individual characteristics. While the economic environment has no signific ant effect on the 95% confidence level but has a significant effect on the 90% confidence le vel.

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