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SINTA 2

Efficiency Comparison of the Cacao Intercropping Farming in Kolaka Regency

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ABSTRACT

The intercropping system is well-known for its extremely low risk of crop failure, its potential to overcome the risk of fluctuating product prices, and this system can save the production inputs. The study aims to compare the level of technical, allocative, and economic efficiency using the stochastic frontier production function model in the intercropping of cacao with annual crops with the pattern: cacao+coconut+patchouli; cacao+coconut+cashew; and cacao+coconut+banana. This research was conducted from March 2018 until April 2018 by determining the samples in the Kolaka Regency, which covered 17 sub-districts, taken from 3 sub-districts with purposive sampling. Each district was represented by 3 villages with purposive sampling. Each sub-district was represented by9 villages with total random samples of 270 respondents. The analysis used wasa technical, allocative, and economical efficiency analysis based on frontier analysis, with 270 respondents from 9 villages representing 3 sub-districts, using the random sampling method. The results discovered that the cacao intercropping farming system of cacao+coconut+patchouli had better technical, allocative, and economic efficiency values and was more feasible to cultivate compared to other patterns. The research results can be beneficial in developing cacao farmers' performance relating to the annual intercropping crops. For academics, this research is expected to support the frontier production theory with the stochastic frontier efficiency model in cacao intercropping with annual crops.

Keywords: Cacao, Efficiency, Frontier, Intercropping.

INTRODUCTION

Intercropping is an agricultural effortaiming to obtain more than one crop yield from one type or several crop types on the same plot of land in one year (Haque, 1984; Gebru, 2015; Guayet al., 2018). In this case, the crops will interact with each other. There are two kinds of intercropping interactions. First, the competitive interaction, in which one crop can inhibit the growth of or compete with other crops in the context of nutrients, water, oxygen, and sunlight consumptions. Second, the complementary interactions, in which each crop will grow and produce better than the monoculture crops (Allen, 1976; Arsyad et al., 2020). Through the intercropping arrangement pattern, the production achieved will be higher than the monoculture crop production. According to Effendi (1976) and Norman (1979), farmers employing intercropping systems receive an income 62% higher than those employing the monoculture system. Other advantages obtained from intercropping are a more efficient use of resources, fewer pests or weeds disturbance, and increased nitrogen and nutrients. According to Haque (1984), Wahyuni et al. (2018), and Herliani et al. (2019), a multiple-cropping system is an effort to escalate total production in

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one scope and time and increase higher income. In addition, a multiple-cropping system can also increase the effectiveness of nutrients in the soil, efficiency in scope, time, sunlight, reducing pests, disease-causing pathogens, weeds, and preventing erosion (Himmelstein et al., 2017; Yang et al., 2018). In developing an intercropping agricultural system using low input, the interdisciplinary (holistic) approach is required to generate recommendations for solving complex problems on ecological variables and the socio-economic conditions of an area. Based on the technical factors above, farmers must be capable ofproperly managing the production factors employed. The combination of production factors is a production function that explains the physical correlation between the amount of input invested and the amount of output produced (Aigner et al., 1977; Iqbal et al., 2019).

Identifying the efficiency of resource use is a crucial issue that determines various opportunities in the agricultural sector regarding their potential contribution to the income and welfare of farmer households (Widodo, 1989; Kiwia et al., 2019). Production technology is expressed as a transformation/production function that defines maximum output from various input contributions (Tan et al., 2019). Thus, the transformation function represents a production boundary or frontier (Wijayanti, 2020). If the production frontier is identifiable, the efficiency of input use can be estimated by comparing the positions of intercropping farming from those various patterns. The application of the production frontier function is to measure the efficiency level. Kolaka Regency is the center of cacao production for Southeast Sulawesi Province. The risk of cacao crop failure remains to be the major obstacle in farming due to pest attacks, climate, and agricultural systems that are more inclined towards monoculture farming (Besseah et al., 2014; Cerda et al., 2014; Attipoe et al., 2020). The efficient use of production factors, optimal production, sufficient income for the farmers' primary needs, and manifesting independent agriculture are the targetted goals in farming. Based on the background of the study, the researchers formulate the following research question: How do the technical, allocative, and economic efficiency comparisons of cocoa intercropping farming in the Kolaka Regency?.

METHODOLOGY

Place and Time of the Study

The study was conducted in three sub-districts of Kolaka Regency, Southeast Sulawesi Province. The study involved 270 farmers as respondents, which were determined through purposive sampling. The primary data were obtained from interviews and questionnaires. The secondary data were obtained from the literature studies of Statistics of Kolaka Regency and Southeast Sulawesi Province, journal articles, books, and other secondary data. The analysis technique employed was Frontier Production Function and Efficiency. Efficiency is divided into economic, technical, and price efficiencies.

Frontier Production Function and Efficiency

The frontier production function is a production function employed to measure the actual production function concerning its frontier position. Some frontiers are located in the isoquant line since the production function is the physical correlation between the factors of production and the production itself. The isoquant line is the location of points indicating the optimal combination of production inputs (Widodo, 1989; Soekartawi, 1990).

The frontier production function, which is also the value of the X variable and possibly the value of the Y variable, fluctuates due to other factors. Mathematically, it could be expressedas follows:

$Y= f(x)exp=(v-\mu)$

In the formula, **f(X)exp(v)** is the stochastic production frontier and v should spread by a symmetrical distribution to identify errors and other variables that influence the values of Y and X. On the other hand, the value of exp μ indicates the technical inefficiency, where $> 0^2$.

Based on the graph, UU' curved line or isoquant line indicates the coordinating points for the use of inputs X_1 and X_2 on Y production. Point C and other points located outside the UU' line signify the technological level of each individual observation.

Figure 1 explains that: (1) The UU' line is an isoquant line from various combinations of input X1 and X2 to obtain a certain optimal Y value. This line also indicates the frontier line of the Cobb-Douglass production function; (2) The PP' line is the cost line indicating cost combination points allocated to gain the amount of input X1 and X2 and optimal cost; (3) the OC line indicates the "range" to what extent technology is applied in both agricultural and non-agricultural businesses.

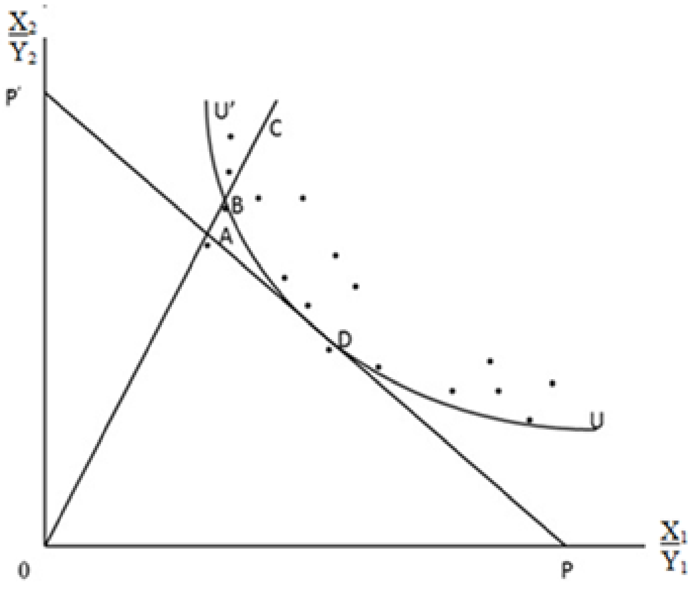
Based on Figure 1, the values of TE, PE, and EE can be measured using the following formulae:

a. Technical Efficiency (TE)
   ET= OB/OA ≤ 1
b. Price Efficiency (PE) *AE=OD/OB ≤ 1*
c. Economic efficiency= OD/OB OD/OA ≤1 or TE. PE (Soekartawi,1990).

The stochastic frontier model is also known as a composed error since the error term consists of two components as follows:

$\epsilon_i = v_i - u_i i = 1 \ldots\ldots n$

Component $\mathbf{v_i}$ is an external error factor (e.g., climate) assumed to follow a symmetrical normal distribution $v_i \approx N$ $(0, \sigma v\ ^2)$, while u_i is an internal error factor that can be controlled by the producers, thus, reflecting their managerial capability. $v_i \approx N$ $(0, \sigma v\ ^2/)$ This component has an asymmetric distribution ($u_i > 0$) or half of the normal distribution. If the production process is fully efficient, the production achieved is equal to its potentials or $u_i = 0$. Conversely, if the production achieved is below its potentials, then $u_i > 0$.



Source: Soekartawi, 1990

Figure 1
Farrel's Efficiency Measurement

Note:
OB/OC = Technically efficient isoquant
OA/OC = Technically efficient cost
OA/OB = Economically efficient cost

Aigner (1977) and Jondrow et al. (1982) defined and λ as follows:

$\sigma^2 = \sigma^2_v + \sigma^2_u$

$\lambda = \sigma_u / \sigma_v$

According to Widodo (1989; 1999), Technical Efficiency Rating (TER) index is one of the means to measure technical efficiency level or management variables with the frontier production function approach. The potentials of productivity achieved by farming are estimated using the frontier production function. The frontier production function states the maximum possibility of production achieved or the maximum feasibility of productivity in a farming condition. This function is used to measure the actual production function to its frontier position. According to Soekartawi (1990), Technical Efficiency Rate is measured with the following formula:

$ET = Y_i / y_i$

TE is the level of technical efficiency, amd ***Yi*** is the amount of production (output) in the i-th observation. y_i is the amount of estimated production in the i-th observation obtained through the Cobb-Douglas frontier production function (Soekartawi, 1990).

Price efficiency is related to the farmers' success in gaining maximum profits in a short period, i.e., the efficiency achieved by preparing the value of the marginal product is equal to the input price (NPMx = Px or price efficiency index = ki = 1).
Mathematical formulation:

$\pi = TR - TV$

$\pi = Pq.Q - \Sigma Px_i.X_i$

$\pi = Pq.Af\,(X_i, Z_i)\Sigma Px_i.X_i$

maximum π if δπ/δxi = 0, so:

$\delta Af\,(X_i, Z_i))/(P_q.\ \delta x_i) = Px_i.X_i$

$Pq\,.MPx_i = Px_i$

$VMP = Px_i = MFC \text{ atau } VMPx_i/Px_i = 1 = k_i$

π is profit = gross margin, **Pq** are output price, **Px** are factors of production (input) price, **Xi** are factors of production (input) on i-th variable, **Zi** are fixed factors of production (input), **MVP** is marginal value product, **MFC** is marginal factor cost, **Q** is total production (Soekartawi, 1990).

If ki >1, the farming has not achieved the allocative efficiency; thus, the use production factor should be extended to achieve optimal conditions. Meanwhile, if ki <1, the use of production factors is too excessive and needs to be reduced to achieve optimal conditions. This principle is a conventional concept based on the assumption that farmers use the same technology and deal with the same price (Soekartawi, 1990).

Nicholson (1999), stated that price efficiency is achieved when the comparison between the marginal product value (NPMxi) with the input price (vi) or ki = I. This condition requires NPMx to be equal to the price of X production factor, or it can be written as follows:

$\beta i.Y.Py/Xi = Pxi$

In many cases, NPMx is not always equal to Px since most cases happen in; (a) (NPMx/Px)> 1, which means using X input is not efficient yet. To achieve an efficient condition, it requires X input addition (b) (NPMx/Px) <1, which means using X input is inefficient. To achieve an efficient condition, it requires reducing X input (Soekartawi, 1990).

Economic efficiency is the product of technical efficiency with price/allocative efficiency and all input factors. Therefore, the economic efficiency can be stated as follows:

$EE = TER.AER$

EE is Economic Efficiency, **TER** is Technical Efficiency Rate, and **AER** is Allocative Efficiency Rate.

RESULTS AND DISCUSSION

The estimation results of the stochastic frontier production function model in the cacao intercropping with annual crops using KKN, KKJ, and KKP patterns are presented in Appendix 1. The table indicates each pattern's parameters, including arable land area, labor, manure, urea, SP36, KCl, insecticide, herbicide, number of tree stands, and staple plant age. In the KKN pattern, the insecticide production factors and staple plant stand number were negative. The production factors in the KKJ pattern consist of manure, urea fertilizer, and staple plant stand number was negative. Meanwhile, the KKP pattern production factors consist of labor, manure, insecticides, and plant age was also negative. This phenomenon indicates that, if extended, the input use would reduce the production level due to input use inefficiency.

The production factors in the KKN pattern, including; land area, labor, manure, urea, SP36, KCl, herbicide, and staple plants age, were positive. The KKJ pattern production factors, including land area, labor, manure, KCl, insecticide, and staple plant age, were positive. Meanwhile, the KKP pattern production factors, including land area, SP36, KCl, herbicide, and staple plant age, were positive. The positive coefficient means that the more the production factors are added, the more production will be obtained. Using the maximum likelihood estimation (MLE), the function estimation results with Cobb-Douglas functional form are presented, which are estimated using the frontier method as follows.

Appendix 1 indicates that the γ and σ values = 0.9599 (0.0133) (KKN), 0.9958 (0.0568) (KKJ), and 0.1226 (0.0210) (KKP) are relativelyhigh and greater than zero. Such values indicate that the half-normal distribution assumption is accepted. The cacao intercropping with annual crops using the KKN pattern hypothesis was proven more efficient when it was technically tested. It means all farmers practicing the KKT pattern using the production factors had been more efficient than the KKJ and KKP patterns. This hypothesis test was executed using the LikelihoodRatiotest as follows;

LR (KKN)= -2 (105.2117 – (- 193.9059) = 169.181 > X_1^2 = 8.223
LR (KKJ)= -2 (43.3669 – (- 13.292) = 87.8858 > X_1^2 = 4.1444
LR (KKP)= -2 (31.6417 – 39.1994) = 22.4872 > X_1^2 = 2.507

Based on the LR calculation of the three patterns, KKN, KKJ, and KKP, the results indicate that none of the LR value is = 0. Therefore, the assumption of the KKN pattern is more efficient than the KKJ, and the KKP patterns were not proven since the LR value is not equal to zero. Thus, the H_0 was rejected, and H_1 was accepted, in which the technical efficiency of each farming pattern had been achieved.

Table 1 indicates that the estimated technical efficiency with the frontier production function in the cacao intercropping farming with annual crops obtains

Table 1
Estimation Results of Technique Efficiency of Each Cacao Intercropping Farming with Annual Crops in Kolaka Regency

No.	Statistic	Intercropping Farming		
		KKN Pattern	KKJ Pattern	KKP Pattern
1	Total Samples	142	65	62
2	Average	0.8175	0.7111	0.6969
3	Stdev	0.0949	0.3134	0.1149
4	Minimum	0.4606	0.5694	0.4032
5	Maximum	0.9994	0.9927	0.9980

Source: Processed Primary Data, 2020

an average technical efficiency value of 0.8175 or 81.75% for the KKN pattern, 0.7111 or 71% for the KKJ pattern, and 0.6969 or 69.69% for the KKP pattern. It means that the average farmer in cacao intercropping farming with annual crops in the KKN, KKJ, and KKP patterns utilized a combination of production factors, efficiency, and farming management factors. It also means a chance to increase production yields in cacao intercropping farming with annual crops in the research area. These results are in line with the conclusions that Franzen et al. (2007), Usman (2010), and Wijayanti et al. (2020) regarding the estimated technique efficiency from various journals.

Table 2, defines the distribution of the technical efficiency level of cacao intercropping farming with annual crops from various patterns. The distribution of technical efficiency in the KKN, KKJ, and KKP patterns reached the category of 0.60 to 1.00, with almost 90% of the farmers reached an efficiency category close to 1. This situation informs that farmers in the KKN, KKJ, and KKP patterns utilized the right production factors and in accordance with the recommendations for the production process.

The farmers are classified in the efficient category if their technical, allocative, and economic efficiencies reach 100% efficiency. In the KKN pattern of 142 respondent farmers, 90 or 63.38% of farmers have an efficiency level of 61% to 90%. On the other hand, there are 44 respondents or 30.98% with an efficiency level ranging from 91% to 99.99% or 100%. It means that the input utilization for cacao intercropping with annual crops using the KKN pattern reached 94.4% in an efficient position. The highest level of allocative efficiency amounted to 44.41%, meaning that farmers' cacao intercropping with annual crops in the KKN pattern reached an allocative inefficiency of 55.59%. The economic efficiency was calculated by multiplying technical and allocative efficiency. Therefore, the highest level of economic efficiency obtained by the respondent farmers reached32.60%, whilethe lowest levelamounted to6.78%.

In the KKJ pattern of the 65 respondent farmers, 29 respondent farmers or 44.62% have an efficiency level ranging from 61% to 90%, and 35 respondent farmers or 53.85% have an efficiency level ranging from 91% to 99.99% or 100%. This means that the input utilization for cacao intercropping farming with annual crops using the KKN pattern reached 98.47% in an efficient position. On the other hand, the highest level of allocative efficiency reached 97.1%, meaning that farmers intercropping cacao with annual crops using the KKJ pattern reached an allocative inefficiency of 2.9%. The economic efficiency was calculated by multiplying technical and allocative efficiency, referring to attachments 22, 23, 24. Therefore, the highest level of economic efficiency obtained by the respondent farmers reached 72.27%, whilethe lowest level amounted to10.87%.

Table 2
The Distribution of Efficiency Levels of Cacao Intercropping Farming Techniques with Annual Crops in Kolaka Regency

No.	Category	KKN Pattern		KKJ Pattern		KKP Pattern	
		Total	Percentage	Total	Percentage	Total	Percentage
1	0.40 – 0.60	8	5.6	1	1.53	25	40.32
2	0.61 – 0.70	15	10.56	7	10.77	10	16.12
3	0.71 – 0.80	36	25.35	13	20	7	11.29
4	0.81 – 0.90	39	27.46	9	13.85	7	11.29
5	0.91 - 1	44	30.98	35	53.85	13	20.98
Total		142	100	65	100	62	100

Source: Processed Primary Data, 2020

Table 3
Estimated Results for the Determining Factor of Technical Efficiency Levelwith the Frontier Production Function Per Cacao Intercropping Farmingwith Annual Crops in Kolaka Regency

Variable	Intercropping Farming					
	KKN		KKJ		KKP	
	MLE	t-count	MLE	t-count	MLE	t-count
Constant	6.2956***	8.9576	4.2186***	4.5020	6.0987***	7.1452
Ages (yr)	0.2138*	1.3604	0.9530***	3.0412	0.5021*	1.2025
Education (yr)	-0.0108	-0.0984	-0.0664	-0.4411	0.1102*	1.3668
Experience(yrs)	0.3794***	3.7605	0.4069***	3.0404	-0.0479	-0.2657
Dummy KPL	0.0372	0.2874	0.0436	0.2989	0.1680	1.1892
Dummy AS	-0.0590	-0.4638	-0.1324	-0.7395	-0.1745	-0.2631
Dummy AJ	0.0191	0.1554	0.0179	0.0976	-0.0603	-0.3276
Dummy AB	-.2254***	-2.4608	-0.3412*	-1.2675	0.5412***	2.5725
Sigma-squared	0.4660		0.4480		0.6038	
Gamma	0.8805		0.8910		0.9999	
Log-likelihood	-84.4371		-36.52		-35.1580	
t-table	1.645		1.671		1.671	

Source: Processed Primary Data, 2020

Note:
t-table (α = 1% =*** (KKN= 2.326)(KKJ = 2.390) (KKP =2.390)
t-table (α = 5% =** (KKN = 1.645) (KKJ = 1.671) (KKP = 1.671)
t-table (α = 10% =* (KKN = 1.282) (KKJ = 1.296) (KKP = 1.296)

In the KKP pattern of 62 respondent farmers, 24 respondent farmers or 38.7% have an efficiency level ranging from 61% to 90%, and 13 respondent farmers or 20.98% have an efficiency level ranging from 91% to 99.99% or 100%. This means that the input utilization for cacao intercropping farming with annual crops using the KKP pattern reached 59.68% in an efficient position. Meanwhile, the highest level of allocative efficiency reached 34.12%, meaning that the farmers' cacao intercropping with annual crops using the KKJ pattern reached an allocative inefficiency of 65.88%. The economic efficiency was calculated by multiplying technical and allocative efficiency, referring to attachments 22, 23, 24. Therefore, the highest level of economic efficiency obtained by the respondent farmers reached 13.08%, whereasthe lowest level amounted to 8.17%.

The main factors included in the technical inefficiency model of the frontier production function in cacao farming using annual crops constitutethe farmer respondents' attributes, including; the farmers' ages, education, farming experience, and dummy variables, consisting of; the success of other farmers (motivation), farmers from Java, Bali, and Sulawesi. The estimated results for the attribute variables and dummy variables employing the frontier production function are presented in Table 3.

The farmers' ages for the KKN pattern indicate a positive impact, meaning that the older the farmers are, the more efficient they manage their farms. The farmers' ages have a $t_{\text{-ratio}}$ value smaller than the $t_{\text{-table}}$. It implies an insignificant effect, meaning that the older the farmersgetthe lower the production of each pattern. This study is in line with a study by Sukiyono (2004). The KKJ and KKP patterns have a positive sign, meaning that the older farmers are capable ofcombining production factors efficiently. The age attribute in both patterns has a $t_{\text{-ratio}}$ value greater than the $t_{\text{-table}}$. It indicates a significant effect, meaning that the older the farmers get the more the production increase in the patterns. The farmers' ages for the positive-signed KKP pattern are insignificant, meaning that the older the farmers get, the less influential they are in managing inputs efficiently. The farmers' ages with smaller $t_{\text{-ratio}}$ value than$t_{\text{-table}}$ indicate an insignificant effect, meaning that there is no effect on the production decrease or increase in this pattern related to the farmers' age.

The estimated results reveal that the farmers' education in the research area for the three patterns is marked negative. It assumes that the lower the education of the farmers, the less efficient they are in managing their business efficiently and unable to increase production. This attribute has an a$t_{\text{-ratio}}$ value greater than the $t_{\text{-table}}$. It indicates a significant effect, meaning that the lower farmers' education can reduce the production level since they cannot manage production inputs efficiently in the KKN and KKJ patterns. The KKP pattern is marked positive, meaning that the farmers' higher education level could affect the input allocation efficiently to increase production.

The farming experience of the three patterns is positive for the KKN and KKJ patterns, meaning that the longer the farmers' experiences, the more efficient they are in managing the cacao intercropping farming with annual crops. These patterns have a $t_{\text{-ratio}}$ value greater than the $t_{\text{-table}}$. It indicates a significant effect, meaning that the longer the farmer's experiences affect the input allocation to increase production. The KKP pattern has a negative and insignificant sign, meaning that the farmers' experiences in managing their farms are inefficient. This pattern with a smaller $t_{\text{-ratio}}$ value than $t_{\text{-table}}$ indicates an insignificant effect, meaning that the longer the farmers' experiences do not affect the input allocation to increase production.

The dummy variables of the other farmers' motivation for success in the study area for the three patterns are marked positive, meaning that the motivation for other farmers' success could increase production. This attribute with a $t_{\text{-ratio}}$value smaller than $t_{\text{-table}}$ indicates an insignificant effect, meaning that the motivation for other farmers' success has very little effect on the patterns' production increase.

The dummy variables from the Javanese farmers in the three patterns are marked negative, meaning that the Javanese farmers' variables are not efficient in allocating these production inputs to increase production. In these patterns, the variables with a $t_{\text{-ratio}}$ smaller value than $t_{\text{-table}}$ indicate an insignificant effect, meaning that Javanese farmers have not been efficient in allocating production inputs. The dummy variables of Sulawesi farmers are marked positive and insignificant for the KKN and KKJ patterns, meaning that the variables of these farmers in allocating production inputs are not efficient. The variables with a $t_{\text{-ratio}}$ value smaller than the $t_{\text{-table}}$ indicate that farmers' dummy variables have no significant effect, meaning that they do not affect the production increase in these patterns.

The dummy variables of Balinese farmers in the three patterns are marked negative for the KKN and KKJ patterns, meaning that the variables of Balinese farmers are not efficient in allocating these production inputs to increase production. In these patterns, these variables with a $t_{\text{-ratio}}$ value smaller than $t_{\text{-table}}$ indicate an insignificant effect, meaning that Balinese farmers are not efficient in allocating production inputs.

CONCLUSION

The cocoa intercropping farming with annual crops indicates that the cacao+ coconut+patchouli pattern has higher technical efficiency, allocative, and economic values and is more feasible to cultivate compared to the other patterns.The implications of this research can be useful in developing the performance of cocoa farmers in relation to annual intercropping. In addition, this research is expected to support the theory of frontier production with a frontier stochastic efficiency model in intercropping cocoa with annual crops.

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Appendix 1. Estimation Results of Frontier Production Function Parameters of Cacao Intercropping Farming with Annual Crops in Kolaka Regency

Variable	Intercropping Farming Concept					
	KKN (Cacao+Coconut+Patchouli)		KKJ (Cacao+Coconut+Cashew)		KKP (Cacao+Coconut+Banana)	
	MLE	t-count	MLE	t-count	MLE	t-count
Constant	3.7813***	6.9236	7.6592***	2.5948	5.9194***	3.1682
Arable Land Area (ha)	0.5366***	7.0429	0.8582***	3.8798	1.3225***	4.9950
Labor (working days)	0.1336***	2.7060	0.1014	0.5396	-0,1209*	-1.3346
Manure (kg)	0.0764**	1.7736	-0.1615	-0.9945	-0.0632	-0.6339
Urea (kg)	0.1794**	1.9762	-0.3802	-1.1367	0.1007	0.6703
SP36 (kg)	0.1282**	1.8999	0.1871	0.8296	0.0327	0.2153
KCl (kg)	0.0657	0.8899	0.2142	1.0406	0.0564	0.3638
Insecticide (liter)	-0.0407	-0.8057	0.1452	0.9674	-0,2226*	-1.2189
Herbicide (liter)	0,0679**	1.6724	0.1370	0.5969	-0.0794	-0.5858
No.of tree stands (trees)	-0.0191	-0.6860	-0.0631	-0.8250	0.1545	0.9005
Staple plant age (years)	0.1357***	6.2496	0.0516*	1.5459	-0.0128	-0.2919
Dummy PosL	-0.0208	-0.7117	-0.01365	-0.2605	0.0461	0.7125
σ^2	0.0133		0.0568		0.0210	
γ	0.9599		0.9958		0.1226	
Log-likelihood	-105.2117		-43.3669		-31.6417	

Source: Processed Primary Data, 2020

Note: t-table (α = 1% =*** (KKN= 2.326)(KKJ = 2.390) (KKP =2.390)

t-table (α = 5% =** (KKN = 1.645) (KKJ = 1.671) (KKP = 1.671)

t-table (α = 10% =* (KKN = 1.282) (KKJ = 1.296) (KKP = 1.296)