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ANALYSIS OF EFFICIENCY AND INCOME OF ROBUSTA COFFEE FARMING IN BATANG DISTRICT, INDONESIA

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ABSTRACT
Robusta coffee productivity in the Batang District Still low compared to with Coffee productivity in Kendal district is 1.5 tons per year. One the cause not yet efficient production input allocation, management farming not enough maximum so that influential to farmer's coffee production. Research objective was to analyze influence factors production farming to quantity coffee production, analyzing level of technical, allocative and economic efficiency. Study use survey methods, interviews farmer respondents in 10 sub-districts as many as 390 respondents of 9,460 coffee farmers with method two stage cluster random sampling.

KEY WORDS
Productivity, technical efficiency, efficiency, economics, production, coffee.

Coffee is one of them commodity owned plantations mark economy important for Indonesia. Coffee plantations in Indonesia are sufficient wide namely 1,279,560 ha with production 786,200 tons of rice coffee on in 2021 (Indonesian Coffee Statistics, 2021). There are many types of coffee plants attempted is Robusta coffee, i.e. around 83%, and remain 17% of Arabica coffee (Directorate General of Plantations, 2021). Robusta coffee plants are spread across various regions parts of Indonesia, especially in Central Java Province amounted to 21,610 tons or 45% of Robusta coffee production in Indonesia (Directorate General of Plantations, 2021). Increasing trend consumption and development the coffee business in Indonesia is influenced by various factors, mainly that is development science and technology in the field processing and serving of coffee that can be done increase Power pull consumer to product that. However, coffee productivity is also still experienced constraint important besides change climate, that is among them related with minimal interest generation young for farming / coffee cultivation and the lack thereof knowledge agronomy for example method Budi the right power for increase amount harvest and coffee quality (Fibrianto, *et al*, 2019). According to Sunarharum *et al* (2017), field production and handling post-harvest at the farmer level Still experience a number of problem so that quality Indonesian coffee commodities from several areas are assessed not enough consistent. Because there are so many plantations managed by the people, then readiness farmers and existence means infrastructure supporter for enhancement productivity as well as the quality of the coffee becomes very important. One district Robusta coffee producers in Central Java are Batang District, almost part large sub-district areas in the Batang District own good robusta coffee plants. Based on data from district BPS Batang In 2021, the area of Robusta coffee plantations in the Batang District in 2022, the area of robusta coffee plantations in the Batang District reached 1.02 0 ha, with Robusta coffee production reaches 624,339 tones. Robusta coffee productivity in the Batang District Still low compared to with Coffee productivity in Kendal district is 1.5 tons per year. One the cause not yet efficient production input allocation, management farming not enough maximum so that influential to farmer's coffee production.

Decline estimated robusta coffee productivity caused by yet efficient farmer in allocate the production inputs used in farming business, as well management modern farming and technology simple so that produce less production maximum. The descent productivity farming or not efficient use of production inputs will be influential to farmer income. That thing in accordance with opinion Saptana (2011) stated that level allocation used factor production

by farmers influential to amount resulting production, level productivity and level efficiency farming by farmers. Based on background and problems that occurred in the field, we formulated a number of problems: how influence production factors (extensive land, amount tree, dose fertilizer cage, dose NPK fertilizer, dosage Urea fertilizer, dosage of organic fertilizer, quantity power work, technology reproduction and participation in counseling to quantity production Robusta coffee farming in the Batang district, how level efficiency technical, allocative and economical efficiency use factors coffee production carried out by farmers in the Batang District and how level income earned farmer from Robusta coffee farming in the Batang District.

The method used in this research is the survey method. The survey method is a research method carried out using a questionnaire (Sugiyono, 2015). Study held from June to by August 2023 in the Batang District, Central Java. Determination location done in a way *purposive* in 10 sub-districts in the Batang District has Robusta coffee production.

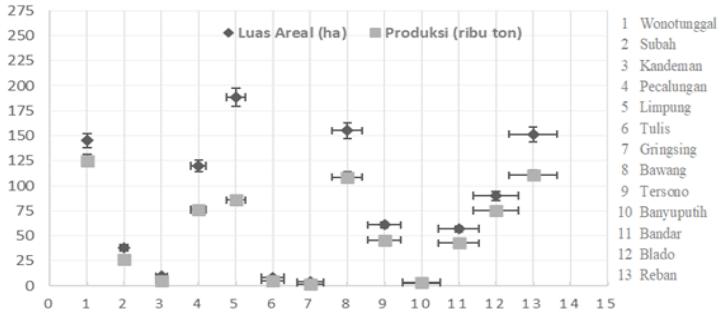

Figure 1 – Land area and productivity various Robusta coffees farming in Batang district

Retrieval method sample use *two stage cluster random sampling* (taking sample two-stage cluster randomization Where stage First is amount sub-district and stage second is amount coffee respondents). The size of sample calculated using *Slovin* formula (Setiawan, 2007):

$$n = \frac{N}{1 + (e^2)}$$

Where: n = number sample (farmer); N = number population (farmers); e = tolerance inaccuracy. Population in study is Robusta coffee farmers from 10 (ten) sub-districts; 9,460 farmers in total with sample amount based on *Slovin* formula – 390 farmers.

Sources and techniques collection used in study are primary data and secondary data. Data from the Directorate of Plantation, Food and Agriculture Service, BPS is in the form of quantity data production of Robusta coffee beans for period of 2017-2021, district data, and other data. According to Sugiyono (2017), engineering collection surveys are data that can be done with interviews (interviews), questionnaires (questionnaires), observations (observations) and combinations all three. So apart from the primary data above other data originate from observation, questionnaire and direct interviews with farmers, as well from literature review.

Draft measurement variable study covers respondent's age, length of farming, level education, dependents family, and type of livelihood. In research this variable input production used is wide land, amount trees, fertilizer cages, NPK fertilizer, organic fertilizer, urea fertilizer and energy work.

Data processing and analysis includes quantitative descriptive analysis. Quantitative methods have the aim of testing established hypotheses (Sugiyono, 2015). The data collected was analyzed using *Stochastic Frontier Analysis* or SFA version 4.1. The *Stochastic Frontier* method is one of the methods used to estimate production limits (*frontier)* and also measure the level of production efficiency. Estimates were made from sample data using the Cobb Douglass equation function which is considered capable of measuring unexpected influences within the production limits of Robusta coffee farming in Batang

District. Analysis of research objectives includes processing and analysis of efficiency data using the SFA approach. Data analysis procedures through identify independent and dependent variables. According to Yoga (2021) that factors alleged production influential to Robusta coffee farming is wide land, amount trees that produce, Urea Fertilizer, Fertilizer Cage, and quantity power work. Suspected influential factor called the free variable (*independent variable*), and the estimated factor influenced or the dependent variable is Robusta coffee production (Umi, 2016).

Table 1 – *Cobb-Douglas* Function Production Using the *Ordinary Least Squares* (OLS) Method

Variable	Coefficient	Standard error	t-ratio
constant	-2.021735500	0.41	-4.86*
Land area (ha)	-0.000008894	0.00	-6.40*
Number of Trees	0.817386250	0.07	10.67*
Manure Fertilizer	0.000007458	0.00	4.37*
Organic fertilizer	0.519637280	0.06	8.20*
NPK Fertilizer	0.000008528	0.00	4.99*
Urea Fertilizer	0.064946379	0.03	2.06*
Labor	-0.000006504	0.00	-4.09*
sigma-squared	0.717		
statistical F value	97,090		

*Symbol type: * = influential (t table 5% = 1.97); ns = not influential.*
Source: Analysis of data primary, 2022.

Table 2 – Parameters Conjecture Effect Inefficiency Technical Function Production *Stochastic Frontier*

Variable	Coefficient	Standard error	t-ratio
Constant	-1,315	1,014	-1,297*
Education	-0.721	0.211	-3,422*
Age	0,000	0,000	2,237*
Number of Family Dependents	-0.063	0.113	-0.558 ns
Farming business experience	-0.000	0,000	-2,819*
Propagation Technology	0,000	0,000	0.292 ns
Dummy Follows Counseling	-0.111	0.125	-0.888 ns

*Symbol type: * = influential (t- table 5% = 1.97); ns = not influential.*
Source: Analysis of data primary, 2022.

Table 3 – Index Efficiency Allocative Factors of Production

variable	Regression coefficients	Value of Production Factors	Price	EA	information
Land area (ha)	-0.00	578.70	265,260,076.90	-0.00	Not efficient
Number of Trees	0.76	874.79	8,494.87	2.56	Not yet efficient
Manure Fertilizer	0.00	1.90	3,465.51	0.00	Not efficient
Organic fertilizer	0.58	0.47	5,538.46	3.00	Not yet efficient
NPK Fertilizer	0.00	0.28	2,426.41	0.00	Not efficient
Urea Fertilizer	0.05	0.49	2,746.15	0.53	Not efficient
Labor	-0.00	41.87	72,000.00	-0.00	Not efficient

Source: Analysis of primary data, 2022.

Table 4 – Income Robusta Coffee Farming in the Batang District

Subdistrict	Total Cost (TC) (Rp/Year)	Average Total Cost (TC) (Rp/Year)	Revenue (TR) (Rp/Year)	Average Revenue (TR) (Rp/Year)	Income (π) (Rp/Year)	Average Income (π) (Rp/Year)	Average Income (π) (Rp/ Month)
Bandar	109963194	2,557,284	465,505,400	10,825,707	355542206	8,268,423	689,035
Blado	33,297,167	774,353	416,547,200	9,687,144	383,250,033	8,912,791	742,733
Tersono	87,231,889	2,907,730	466,534,750	15,551,158	379,302,861	12,643,429	1,053,619
Limpung	318,608,297	7,770,934	872,975,000	21,292,073	554,366,703	13,521,139	1,126,762
Bawang	170,429,347	4,057,842	863,837,000	20,567,548	693,407,653	16,509,706	1,375,809
Subah	423,193,433	12,446,866	1,035,740,800	30,462,965	612,547,367	18,016,099	1,501,342
Reban	75,501,000	1,510,020	1,117,335,430	22,346,709	1,041,834,430	20,836,689	1,736,391
Tulis	123,934,500	3,177,808	1,043,090,000	26,745,897	919,155,500	23,568,090	1,964,007
Pecalungan	104,987,074	5,832,615	554,140,000	30,785,556	449,152,926	24,952,940	2,079,412
Wonotunggal	239,401,802	4,788,036	1,939,365,000	38,787,300	1,699,963,198	33,999,264	2,833,272
Amount	1,686,547,703	45,823,486	8,775,070,580	227,052,057	7,088,522,877	181,228,570	15,102,381
Min	33,297,167	774,353	416,547,200	9,687,144	355542206	8,268,423	689,035
Max	423,193,433	12,446,866	1,939,365,000	38,787,300	1,699,963,198	33,999,264	2,833,272
Average	168,654,770	4,582,349	877,507,058	22,705,206	708,852,288	18,122,857	1,510,238

Source: Secondary data analysis, 2022.

This study estimating the regression model of coffee production with 7 independent variables, namely land area, number of trees, manure, organic fertilizer, NPK, urea fertilizer and labor.

Analysis of data from research on the efficiency and income of robusta coffee farming in Batang District, specifically the size of the plantation and the number of workers have a negative effect, while the number of trees, dose of manure, dose of organic fertilizer, dose of NPK fertilizer, and dose of urea fertilizer have a positive effect on production. Technical efficiency (ET), allocative efficiency (EA) and economic efficiency (EE) of robusta coffee farming in Batang District are not significant. The average distribution of the technical efficiency index is <0.7 (0.521) and the distribution of the allocative efficiency index (EA) is > 1 (1.654) means that the use of production inputs is not yet efficient so it must be increased, while the average distribution of the economic efficiency index (EE) is <1 (0.492), which means the use of production factors must be reduced. The results of the analysis of coffee farmer respondents show that, for example, the average income of farmers in Wonotunggal Sub-district who have 1.0 hectares of land earns a net income of Rp. 17,305,694, - per year, where the feasibility value of the R/C ratio and Profitability is > 1, meaning that Robusta Coffee farming is feasible to carry out and expand.

This research puts forward the following policy suggestions and implications; (a) the need for an extension program that integrates aspects of resource allocation and business financial management, which aims to enable farmers to increase economic efficiency through continuous improvement of allocative competence, so that the competitiveness of coffee commodities becomes stronger; (b) the government can issue policies that benefit farmers regarding production factors, including land area, harvest area, and labor, especially being able to buy coffee directly from farmers without middlemen; (c) for farmers to increase their production through land expansion, standardization of basic quantities, processing technology for semi-finished materials through the coffee roasting process to increase added value so that prices are more competitive; (d) The local agricultural service can help carry out outreach, outreach and training related to robusta coffee cultivation and farming, especially at the Batang District Food and Agriculture Service.

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