Advances in Economics, Business and Management Research, volume 101

1st International Conference on Islamic Economics and Business (ICONIES 2018)

Distribution Analysis and Agricultural Productivity Determinants in Indonesia

1st Rizky Oktabriani Putri
Department of Economic Development, Faculty of Economics and Business
University of Trunojoyo
Madura, Indonesia
rizkyoktabriani_putri@yahoo.co.id

2nd Selamet Joko Utomo
Department of Economic Development, Faculty of Economics and Business
University of Trunojoyo
Madura, Indonesia

3rd Henny Oktavianti
Department of Economic Development, Faculty of Economics and Business
University of Trunojoyo
Madura, Indonesia

***Abstract*—Agricultural productivity is a major issue in agricultural development in Indonesia. Therefore research on agricultural productivity is still very much needed. Accordingly, the objective of this study is to evaluate agricultural productivity and its distribution in Indonesia. The method used to clicking distribution of agricultural productivity is the Stochastic Frontier Analysis (SFA) and the ratio of output/input (agricultural production / agricultural production factor) using data from the 32 provinces of 2007-2015. The results of the analysis on Stochastic Frontier Analysis (SFA) indicates that Lampung Province, Jawa Timur Province, Central Java Province and West Java Province recorded as provinces with the most efficient level of agricultural productivity. Output / Input Ratio shows the Province of Nusa Tenggara Barat, Lampung Province and Jawa Timur Province as a highly efficient province. So that development efforts need to be carried out efficiently in provinces with high agricultural productivity to reduce overall economic disparities.**

Keywords—Spreading, Productivity, Agriculture.

I. INTRODUCTION

The importance of agricultural development when it becomes a significant issue in the economic development of a country. In line with this, the policy established by the government becomes a strong foundation. This is evidenced by the formation of Revitalization of Agriculture, Fisheries and Forestry (RPPK) in 2005-2025 and the issuance of Law No. 16 of 2016 on an extension of agricultural systems, fisheries, and forestry. The regulation on agricultural development becomes an objective in national development in agriculture. Developing an uneven national economy resulted in poverty in some areas. This happened because of the government's development is less than optimal and the construction is only done in certain sectors that are considered to reduce the level of poverty [1].

In connection with the alleviation of economic disparities in Indonesia, various efforts are made to improve agricultural productivity in Indonesia. Nowadays agricultural productivity improvements serve as one of the efforts to overcome the economic disparity. However, agricultural development takes place in areas that contribute in a complicated way. This is considered not able to be a solution to overcome the economic disparities. What province-related invention has the highest agricultural productivity can be obtained from analysis of the distribution of agricultural productivity. In line with that by efficient agricultural productivity, the need for studies into what factors are still relevant in the improvement. According [2], factors of agricultural production can be reviewed from four things namely labor, land area, management as well capital. Meanwhile, according to [3], the area of land, labor, fertilizer or seed, and irrigation into factors that affect the agricultural productivity of a region.

Of the above problems, the authors are interested in examining what factors are still relevant to increasing agricultural productivity as well as how the distribution of agricultural productivity in Indonesia in order to overcome economic inequality in Indonesia effectively and efficiently.

II. METHOD

The type of data used in this study is secondary data with range 2007-2015. Secondary data consists of data on production agriculture, labor in agriculture, rainfall and agricultural land in every province in Indonesia derived from the publication of the Badan Pusat Statistik (BPS) in Indonesia. Determination of what factors are still relevant in improving agricultural productivity using Stochastic Frontier Analysis (SFA) method with two models. The first model is linear logarithm or cells form and the second model is transcendental logarithm expressed operatively within the following form [4].

$$Ln(Y_{it}) = \beta_0+\beta_1 Ln(X_{1it})+\beta_2 Ln(X_{2it})+\beta_3 Ln(X_{3it})+V_{it}-SU_{it} \quad (1)$$

$$Log(Y_{it}) = \beta_0+\beta_1(\mathrm{X}_{1it})+\beta_2(X_{2it})+\beta_3(\mathrm{X}_{3it})+\beta_4(X_{1it})^2 +\beta_5(\mathrm{X}_{2it})^2+\beta_6(X_{3it})^2+\beta_7(\mathrm{X1.X2}_{it}) + \beta_8(X1.X3_{it})+\beta_9(X2.X3_{it}) + V_{it}-SU_{it}$$

Where **Y** is an agricultural production, $\boldsymbol{\beta_0}$ is a constant, $\boldsymbol{\beta_1,\beta_2,\beta_3}$ is the regression coefficient, $\mathbf{X_1}$ is rainfall, $\mathbf{X_2}$ is labor, $\mathbf{X_3}$ is an agricultural area, ***V*** is a *random error term*,***U*** is *an error term* of time-varying and ***S*** for the production function.

This research also uses the calculation of *output / input* ratio (agricultural production / agricultural production factors). The use of this formula in accordance with the measurements applied by the Central Bureau of Statistics (BPS), here is the formula *output* ratio */ input:*

$$Agriculture\ Productivity = \frac{Agricultural\ Production}{Agricultural\ Production\ Factor}$$

Indecisive factors are still relevant in improving agriculture is Stochastic Frontier Analysis. Where in this method there are two estimation models, namely linear logarithms and transcendental logarithms. Here are the results best of measurements taken.

III. RESULT AND DISCUSSION

Factors Affecting Agricultural Productivity

Table 1. Determinants of Agricultural Productivity

Model	Variables	*Fixed Effect Model*(FEM)		*Frontier / Coelli*	
		Coef	*Std.Err*	*Coef*	*Std.Err*
***Linear Log*Model**	L Curah Hujan	-		-0.0425803	0.0347
	L Tenaga Kerja			0.0061776	0.0071
	L Luas Lahan			0.4900443*	0.0723
	Konstanta			10,42705*	0.9983
***Translog*model**	LCurahHujan	-0.3037269	0.4425		
	LTenagaKerja	-0.103784	0.1376		
	LLuasLahan	-0,4889684	0.3376		
	LCurah Hujan^2	-0.0069173	0.0331		
	LTenaga Kerja^2	0.0019588	0.0026		
	LLuas Lahan^2	0.0418039**	0.0131		
	LCurahTenaga	0.0175964	0.0166		
	LTenagaLahan	-0.0057613	0.0043		
	LLuasCurah	0.0160815	0.0242		
	Konstanta	15,45712*	2.6509		

Source: *print-out* Stata rearranged, 2018

*) Significant Level 1% **) Significant Level 5% ***) Significant level 10

From the results shown above table, the conclusions can be drawnis as follows:

$$Ln(\text{Produksi}) = 10{,}42705 - 0{,}0425803(\text{Curah Hujan}) + 0{,}0061776(\text{Tenaga Kerja}) + 0{,}4900443(\text{Luas Lahan}) + V_{it} - SU_{it}$$

$$Log(\text{Produksi}) = 15{,}45712 - 0{,}3037269(\text{Curah Hujan}) - 0{,}103784(\text{Tenaga Kerja}) - 0{,}4889684(\text{Luas Lahan}) - 0{,}0069173(\text{Curah Hujan})^2 + 0{,}0019588(\text{Tenaga Kerja})^2 + 0{,}0418039(\text{Luas Lahan})^2 + 0{,}0175964(\text{Curah Tenaga}) - 0{,}0057613(\text{Tenaga Lahan}) + 0{,}0160815(\text{Luas Curah}) + V_{it} - SU_{it}$$

Variable land area and labor have a positive and significant influence on increased agricultural productivity in a region. In this case, efforts in improving agricultural productivity can be focused on the development of the two variables mentioned. The second development can be done by educating the community to improve the results agricultural productivity.

Distribution of Agricultural Productivity Each Province in Indonesia

The determination of agricultural productivity distribution refers to the category of efficiency scale. This enelitian P melakukkan grouping of categories is not efficient, less efficient, efficient, and highly efficient. The results of grouping on the best form of *Stochastic Frontier Analysis* (SFA) results are as follows:

Table 2. Grouping of 32 Province Efficiency Categories in Indonesia(Rural Agricultural Productivity)

Category	*Linear Logarithm (Frontier)*	*Transcedental Logarithm Fixed Effect*
	Provincial ID	
Not efficient	5, 10, 31	5
Quite Efficient	29, 30, 20, 4, 6, 28, 8, 26, 32, 22,19, 24, 21, 1, 16, 23, 15, 27, 7, 17, 18, 3	10, 31
Efficient	13, 2, 25, 11, 12, 14, 9	24, 4, 6, 29, 30, 28, 22, 8, 19, 26, 21, 32, 24, 1, 7, 16, 15, 23, 17, 27
Very Efficient	-	18, 3, 18, 3, 25, 2, 13, 11, 12, 14, 9

Frontier and *transcendental logarithm fixed effect* models show the results if the Kepulauan Riau province has a low level of productivity. , and the value of agricultural production is relatively low. This is in accordance with what is proposed [2], if the low land area will cause the value of agricultural productivity is low. Nevertheless the model *frontier, transcendental logarithmsfixed effect* shows the same result on distribution with the next lowest agricultural productivity. Consistency of results in these two estimates

indicates that the Kepulauan Bangka Belitung Province is the province with the second lowest agricultural productivity after the Kepulauan Riau Province. In addition to being influenced by low land area, other production factors used in this calculation also affect the highest and lowest productivity spreads in Indonesia.

F*rontier* and *transcendental*models*logarithmfixed effect* shows consistent results are four provinces that have the highest agricultural productivity value is Lampung Province, Jawa Timur Province, Central Java Province and West Java Province. The results show *frontier* models and *transcendental* models tend to be in accordance with the theory because some of the production factors used in the calculations in accordance with the characteristics of provinces that have low or high productivity distribution.

While the *Output / Input* ratio method shows fairly consistent results with the method of *Stochastic Frontier Analysis* (SFA). The calculation on the *output/input* ratio is divided into three forms. The first form is the productivity of land area, labor productivity, and rainfall productivity. *Output/input* ratio calculation results these three forms will be shown in the three graphs below.

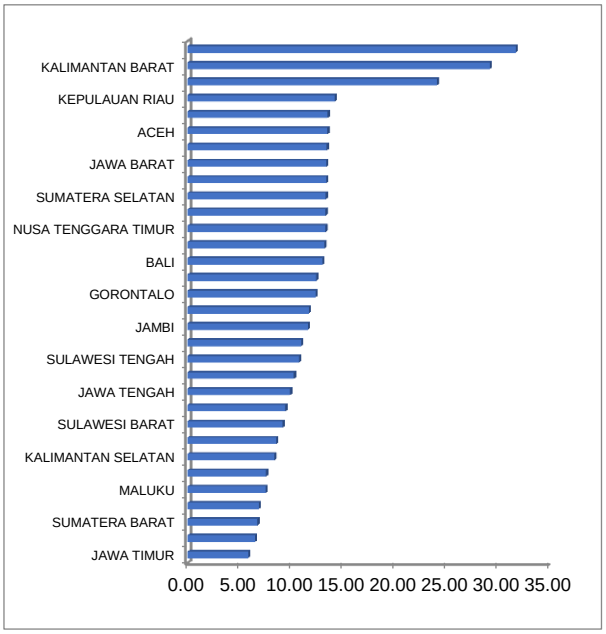

Figure 1 Productivity of Farmland Area in Indonesia
Source: BPS data is processed in 2018

The picture above shows if the Province of Nusa Tenggara Barat has a higher land productivity value compared with Jawa Timur Province. This is because the amount of land in Jawa Timur is not proportional to the amount of agricultural production produced . Nusa Tenggara Barat Province is able to produce 31 , 61 ton / ha while Jawa Timur Province only able to produce 5.85 ton/ha. The calculation of labor productivity shows different results, the use of different factors of production is the reason why the resulting agricultural productivity is also different. The results can be seen in the graph bang below:

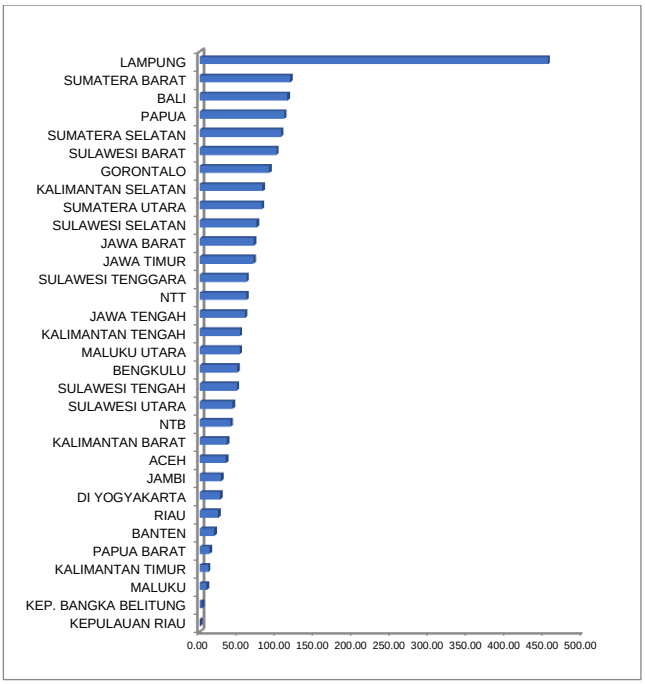

Figure 2 Agricultural Sector Productivity in Indonesia
Source: BPS data is processed in 2018

The results shown in Figure 2 are provinces that have the highest labor productivity, Lampung Province and Kepulauan Riau Province are low productivity. The graph shows if the province of Lampung is able to produce 453.45 tons with a workforce of 100 people, while Kepulauan Riau Province is only able to produce an *output* of 0.59 tons per 100 inhabitants labor. The third productivity calculated using the *output/input* ratio is rainfall productivity. The results of this calculation can be seen in the picture below:

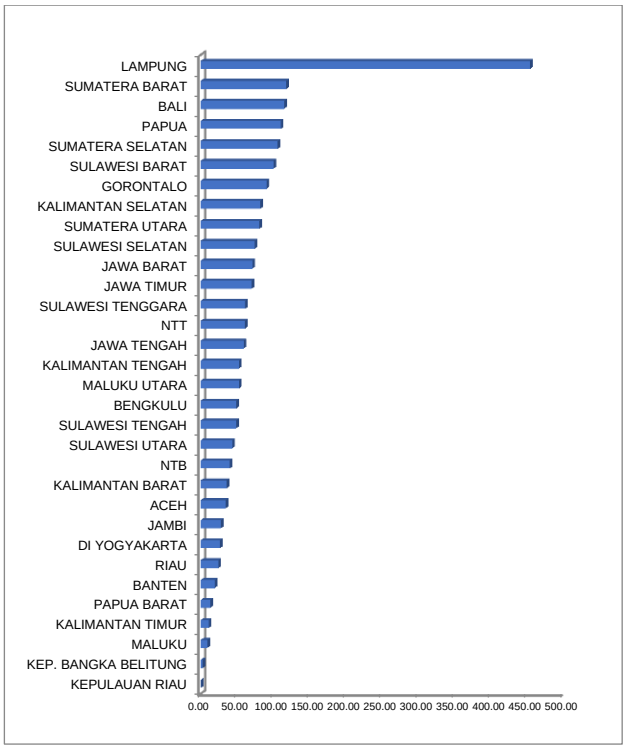

Figure 3 Rainfall Productivity in Indonesia
Source: BPS data is processed in 2018

The results shown in Figure 3 are the highest productivity of rainfall owned by Lampung Province while the Kepulauan Riau province has a low productivity level. Nevertheless, rainfall variables do not significantly influence the increase of agricultural productivity as a whole. This is because agricultural land in Indonesia is no longer a rainfed area. Agricultural land in Indonesia is dependent on irrigation.

From the five forms above, consistency of high and efficient agricultural productivity results are in Lampung Province and Jawa Timur Province. While provinces with low or inefficient agricultural productivity are Kepulauan Riau province. Based on these results, development in the agricultural sector needs to be re-upgraded to centers with high and efficient productivity levels.

IV. CONCLUSION

The result of research using SFA method shows if the production factor is land and labor area it is still relevant to have a significant effect on improving agricultural productivity in Indonesia. While the distribution of agricultural productivity with SFA method and output/input ratios indicate coefficiency if Lampung and Jawa Timur provinces are the provinces with the highest and most efficient agricultural productivity, while the Kepulauan Riau province is the province with the lowest and inefficient productivity.

REFERENCES

[1] Halim, J. H. Analisis Produktivitas Sektoral Terhadap Tingkat Kemiskinan dan Ketimpangan Pendapatan di Jawa Tengah. *Skripsi*. Fakultas Ekonomika Dan Bisnis Universitas Diponegoro. Semarang. 2014.

[2] Soekarwati. *Prinsip Ekonomi Pertanian.* Jakarta: Raja Grafindo Persada. 2003.

[3] Adhitya, Fazriyan Wardani, etc. DeterminanProduktivitas Lahan Pertanian Subsektor Tanaman Pangan Di Indonesia. *Jurnal Ekonomi Pembangunan.* 110-125. 14(1), 2013.

[4] Hartono, E. AnalisisEfisiensiBiayaIndustriPerbankan yang Tedaftar di Bursa Efek Indonesia (Studi Pada Perbankan yang Terdaftar di Bursa Efek Indonesia. *Skripsi.* Program Studi Magister ManajemenUniversitasDiponegoro. Semarang. 2009