



DETERMINANTS OF PADDY FIELD CONVERSION IN JAVA 1995-2013

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Abstract

Java is the biggest rice supplier with the largest paddy field compared to other islands in Indonesia. On the other side, economic growth needs more and more land for infrastructure growth. It was suggested that the growth would convert paddy field in Java to non-agriculture use. This paper reports the growth of land conversion, especially from paddy field to other utilization, in Java Island using panel data (provincial data 1995-2013). The data then treated as the dependent variable in the regression analysis for determining the factors that are significantly influential. The relative strengths of the influential factors are then compared using the concept of elasticity. It is found that farmers term of trade and GDP of manufacturing industries sectors significantly influence the land conversion. Meanwhile, the size of the population and the size of medium and large companies of manufacturing industries do not significantly influence the land conversion.

Keywords: Paddy Field Conversion, Determinant Factors

I. INTRODUCTION

A land is a resource that physically cannot be produced so that the supply of land is limited. On the other side, the high demand for land for a variety of activities tend to exceed the supply of available land. This condition leads to scarcity of land. Furthermore, the scarcity of land leads to the competition of land use and it can cause land conversion. This is consistent with Barlowe's description in Butar-Butar (2012) that there is competition in term of land use, because of the imbalance between limited supply and unlimited demand.

In these conditions, the increase in land use requirements for an activity will reduce the availability of land for other activities that can cause land conversion. Land conversion can be defined as a change of land use for an activity into other land use that is different from previous activities. Land conversion is a phenomenon that cannot be avoided either in underdeveloped, developing, or developed countries, in line with economic growth and population growth (Azadi, Ho, & Hasfiati,

2010). A land is a natural resource that is strategic for development. Almost all sectors of the physical development need land, such as agriculture, forestry, housing, industry, etc.

For agriculture, a land is a resource that is very important, both for farmers and for agricultural development. It is based on the fact that Indonesia still relies on farming land (land-based agriculture activities) (TB, Purwanto, F, & Ani, 2010). Although the quality of land resources can be improved, but the quantity of land resource available in each region practically remained the same. On the condition of these limitations, the increasing need for land for housing, industry, infrastructure development, social services, and others will reduce the availability of land for agriculture. As a result, a lot of agricultural lands, especially paddy field, is converted to non-agricultural use (Hidayat, 2008).

Viewed from the economic side, the paddy field conversion can be influenced by several factors such as the farmer's term of trade. The low term of trade based on his paddy production, causing no incentive

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for farmers to continue to live off their paddy fields, so they tend to convert their farm. Besides farmers' term of trade, paddy field conversion is also thought to be influenced by the growing number of industries, particularly large industry, in which the development of an industry depends on the availability of land. Moreover, in the creation of value added, the industrial sector also holds a dominant position. This can be illustrated through the increased role of the industrial sector in the GDP (Suriyanto, 2012).

The rise of land conversion that occurs on agricultural land cannot be separated from the Government's attention. Various efforts made by the Government to ensure food security include the protection of agricultural land. One of the Efforts made by the government to protect agricultural land is through a juridical approach by issuing policies. However, a research conducted by Irawan, et. al. (2000) found that the regulations to protect agricultural land are still ineffective enough to control the conversion of agricultural land into other uses. There is also an indication that paddy fields conversion, particularly in irrigated land, is precisely triggered by the mechanism of the Provincial/District Spatial Plan/RTRW (Isa, 2006).

The occurrence of paddy field conversion is not beneficial for the agricultural sector as one of them can lower rice production capacity, while about 95% of national rice production results from Paddy field (Irawan, Purwoto, Dabukke, & Trijono, 2012). Problems associated with the paddy fields conversion in Indonesia, of course, are inseparable from the role of Java as a center of rice production. Java's role in national rice production is quite large although the extent is only 7% of the total land area of Indonesia. Based on the distribution, Java has the largest paddy field, which is approximately 3,231 thousand hectares or 43% of the total area of paddy

fields in Indonesia (Isa, 2014). Considering Java is Indonesia's largest rice producer, so if the paddy field conversion is not anticipated, it is expected to have an impact on the food situation in the future. Based on the exposure above, the study about the determinant of paddy field conversion in Java becomes important and relevant.

Economic growth is characterized by the development of industry, economic infrastructure, public facilities, and settlements in which all require land and increased demand for land to meet the needs of the non-agricultural. However, there is no doubt that economic growth is also improving the socio-economic condition in a non-agricultural land. These conditions are caused by the conversion of agricultural land that continues to increase along with the growth and economic development, that could not be avoided (Sudaryanto, 2004).

Based on a research conducted by Pakpahan (1993), at the regional level, the conversion of paddy fields has been indirectly affected by Changes in the structure of the economy, population growth, urbanization Flow, and consistency on the implementation of the spatial plan. Paddy fields conversion is also directly influenced by Growth in the construction of transportation facilities, land for industrial growth, growth in residential facilities, and distribution of paddy fields. According to the research conducted by Ilham, Syaikat, & Friyatno (2005), it shows that land conversion factors are grouped into three items, namely: economic factors, social factors, and existing land regulations. In terms of the economy in Indonesia, In the micro level, the development of settlements affects paddy fields conversion, but at the macro level, the development of settlements, proxied by an increasing number of people, does not show a positive relationship. Meanwhile, based on the macro level, paddy field conversion is positively correlated with GDP growth

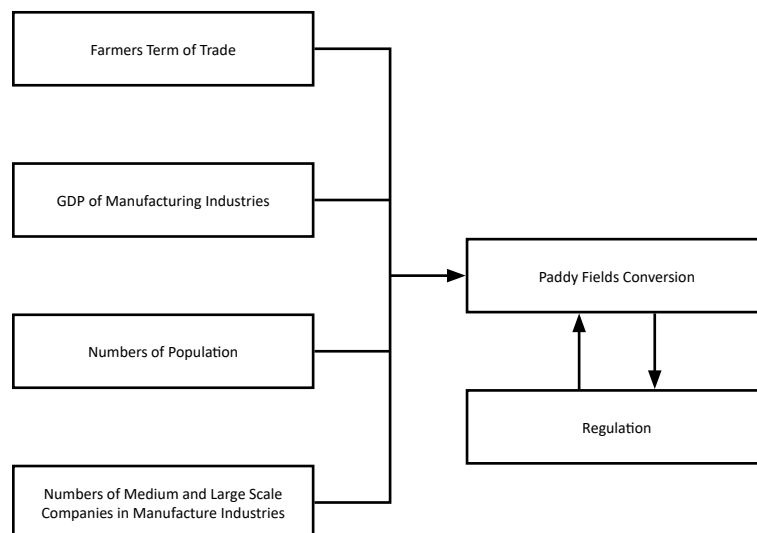


Figure 1. Mapping Framework of the Research

and paddy field conversion is negatively correlated with the farmers' term of trade. Therefore, this study tries to determine the factors that influence the occurrence of paddy fields conversion based on the farmers' term of trade variable, an industrial development seen from the GDP of the industrial sector and the number of medium and large companies in the manufacturing industry and also the population variable.

To review it, this research is proposing three main questions. First, how is the growth of paddy field conversion in Java? Second, what is the determinant factors influencing paddy fields conversion in Java? And third, how far is the regulations applied in order to control paddy fields conversion.

Summarizing the above review, the framework of this study can be illustrated as in Figure 1.

Research hypothesis can be described as follows: first, presumed that paddy fields conversion in Java is increasing. Second, the farmers' term of trade, the GDP of manufacturing industries, numbers of the population, and numbers of medium and large scale companies in manufacturing industries with significant influence towards paddy fields conversion in Java.

This is based on previous research about the factors that affect paddy field conversion, one of which is the research conducted by Kustiawan (1997) which stated that the external factors that influence the occurrence of paddy fields conversion are the regional development, population growth and GDP growth. The greater the rate regional development, the higher the rate of population growth and the greater the rate of GDP growth resulted in extensive increases of paddy field conversion.

II. METHOD

The data used in this study is secondary data. The data consists of data on the size of paddy fields, Gross Domestic Product (GDP) in manufacture industries, farmers term of trade (NTP), numbers of population, and numbers of medium and large scale companies in manufacturing industries in 5 provincial regions in Java, namely west Java, central Java, Yogyakarta, East Java, and Banten with time period 1995-2013. The data is collected by learning, studying, and analyzing the source of literature in the form of statistical data from the published data, books, and scientific journals that are relevant to the research.

The collected data then processed and analyzed in order to answer the problems in research. The analytical method used is quantitative descriptive analysis and statistical analysis using multiple linear regression methods to test the significance of the variables through F test and partial correlation.

A. Quantitative Descriptive Analysis

The quantitative descriptive analysis is a method to describe paddy fields conversion that occurred on the island of Java. The analysis is performed using a mathematical formula as follows:

$$(C_t - A_t) = L_t - L_{t-1}$$

Paddy fields conversion is defined as net paddy fields conversion. This means that paddy fields area in year t (L_t) is the paddy fields area of the previous year (L_{t-1}) plus the new paddy fields (C_t) and the reduced paddy fields (A_t). Thus, if the paddy fields conversion is positive, it means a new paddy field occurs more comprehensive, respectively in year t . Conversely, if the paddy fields conversion is negative, meaning that paddy fields reduced wider than new paddy fields, respectively in year t (Ilham et al., 2005).

B. Statistical Analysis

In accordance with the objectives and hypothesis of the research, the relationship between variables can be described specifically in multiple linear regression models (Juanda & Junaidi, 2012). This analysis can be used to describe the extent of reliance is the dependent variable by one or more independent variables. Based on the variables that described the multiple linear regression models, it was formulated as follows:

$$Y = a + b_1 X_{1it} + b_2 X_{2it} + b_3 X_{3it} + b_4 X_{4it} + e_t$$

Information:

- Y = The rate of paddy fields conversion growth to provincial -i, the time period -t (%)
- X_1 = The rate of farmers term of trade growth to provincial -i, the time period -t (%)
- X_2 = The rate of GDP manufacturing industries growth to provincial -i, the time period -t (%)
- X_3 = The rate of population growth provincial -i, the time period -t (%)
- X_4 = The rate of medium and large number of companies in the manufacturing industry growth provincial -i, the time period -t (%)
- a = Constanta
- b_1, b_2, b_3 = regression coefficient
- e_{it} = error factors

The data used in the analysis is panel data with the time period of 1995-2013. Based on the variations in the formed assumptions, there are three approaches to the calculation of panel

Table 1.
Growth of Paddy Fields Conversion by Province in Java of 1995-2013 (Ha)

Year	West Java	Central Java	Yogyakarta	East Java	Banten	Java
1995-1997						
Total	-23.055	4.625	-1.080	-7.260	0	-26.770
conversion	-7.685	1.542	-360	-2.420	0	-8.923
Average						
1998-2000						
Total	-195.526	-1.249	-1.184	-5.388	-385	-203.732
conversion	-65.175	-416	-395	-1.796	-128	-67.911
Average						
2001-2003						
Total	-1.156	-2.939	-1.626	-49.763	-13.173	-68.657
conversion	-385	-980	-542	-16.588	-4.391	-22.886
Average						
2004-2006						
Total	2.508	-33.255	-1.442	-11.756	-219	-44.164
conversion	836	-11.085	-481	-3.919	-73	-14.721
Average						
2007-2009						
Total	-4.577	-471	-17	10.671	374	5.980
conversion	-1.526	-157	-6	3.557	125	1.993
Average						
2010-2013						
Total	-5.987	-14.671	127	-13.870	1.932	-32.469
conversion	-1.497	-3.668	32	-3.468	483	-8.117
Average						
1995-2013						
Total	-227.793	-47.960	-5.222	-77.366	-11.471	-369.812
conversion	-11.989	-2.524	-275	-4.072	-604	-19.464
Average						

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

data regression model (Firdaus, 2011), namely: (1) Common-Constant Method (The Pooled OLS Method or PLS), (2) Fixed Effect Method (FEM), and (3) Random Effect method (REM). Furthermore, this equation models are analyzed using the program Eviews 7.0 for estimating the determinant factors of paddy fields conversion on Java in 1995-2013.

III. RESULTS AND DISCUSSION

A. The Growth of Paddy Fields Conversion in Java

The growth of paddy fields conversion in this study is analyzed by looking at the changes in paddy fields area in each Java province. The growth of paddy fields conversion in Java in 1995-2013 can be seen in Table 1. Based on Table 1, it can be seen that during the year 1995-2013, paddy fields conversion

occurs in all provinces in Java with a total conversion of about 370 thousand hectares, or approximately 19 thousand hectares annually. This trend indicates that paddy fields conversion is greater than the new paddy fields. This conversion includes conversion of paddy field into non-agricultural activities such as industrial or service industries and conversion to agricultural activities other than paddy fields such as farm or plantation and horticulture.

Based on Table 1, the highest paddy fields conversion occurred during the year 1998-2000 with total paddy fields converted about 204 thousand hectares or approximately 68 thousand hectares annually. This shows that in the period of economic crisis, paddy fields conversion increased sharply compared to the previous period in which the paddy fields conversion in 1995-1997, during this period paddy field converted about 27 thousand hectares. Compared to the previous period, the

paddy field conversion is increased about 7.6%. The economic crisis led to unemployment rising and the subsequent cause a decrease in public revenue. This situation triggered the paddy fields conversion. Most people who only have assets in the form of paddy fields will sell the land to maintain living to those who earn high incomes.

Along with the increasing of economic level post economic crisis, the paddy field conversion is reduced, it can be seen throughout the year 2001-2003 which the amount of paddy field conversion is 69 thousand hectares reduced about 44 thousand hectares from the year 2004-2006. In the period 2007-2009 the overall paddy fields conversion even be positive, meaning that the number of new paddy fields is higher than the reduced paddy fields. The new paddy field occurs about 6 thousand hectares. However, unfortunately, this condition does not last long, the paddy fields conversion in Java occurs again in 2010-2013 and reduced about 32 thousand hectares paddy field or about 8 thousand hectares annually. It indicates that the paddy field conversion still cannot be controlled.

Based on paddy field conversion that occurs in all province in Java, paddy field conversion in West Java province is higher compared to other provinces. Throughout the Years 1995-2013 West Java Province experienced paddy field Conversion about 228 thousand hectares or about 12 thousand hectares per year. West Java province is also the province which experienced the sharpest increase of paddy field conversion on economic crisis period that is about 195 thousand hectares or increased about 8.5% from the size of paddy field conversion in the previous years. East Java is in the second position which experienced higher paddy fields conversion. During 1995-2013, paddy field conversion at central Java is about 77 hectares. That was followed by Central Java at 48 thousand hectares. Paddy field conversion in Banten Province is in the fourth position that the paddy field reduces about 11,5 thousand hectares, and followed by DIY of about 5 thousand hectares.

The growth of paddy field conversion is also seen by a paddy field conversion rate. Paddy field conversion rate indicates the percentage of paddy field conversion speed that occurs in each province in Java. The rate of paddy field conversion by provinces in Java in 1995-2013 can be seen in Table 2.

Based on Table 2, it can be seen that the net rate of paddy fields conversion in Java over the period 1995 to 2013 is about 0.57% per year. West Java Province experienced the highest rate of paddy field conversion compared to other provinces in Java, in which the value is about 1.07% per year. The second position is experienced by Yogyakarta province with a paddy field conversion rate of about

Table 2.

Paddy Field Conversion Rate by Province in Java, the year of 1995-2013

Province	Paddy Field Conversion Rate at the average net per year (%)
West Java	1.07
Central Java	0.26
Yogyakarta	0.47
East Java	0.36
Banten	0.29
Java	0.57

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

0.47% per year. Third and fourth highest paddy field conversion rate in Java is occupied by East Java province with net paddy fields conversion rate of about 0.36% per year and Banten with paddy fields conversion rate of about 0.29% per year, while the last position with lowest paddy field conversion

Table 3.

Paddy Field Conversion Rate by Regency/City in Java, Year 2009-2013

Regency/City	Paddy Field Conversion Rate at the Average Net/Year
Depok City	-17.66
Bandung City	-11.76
Cirebon City	-8.76
Ciamis City	-6.17
Tegal City	-5.88
Kudus City	-5.86
Cirebon City	-5.53
Bogor City	-4.68
Surabaya City	-4.31
Yogyakarta City	-3.24
Cilegon City	-2.15

Source: Statistics Indonesia (BPS), 2009-2013 (processed)

Table 4.
The Estimation Results Using Pool Ordinary Least Square (PLS) Method

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.144938	0.118115	1.227089	0.2230
X1	-0.052569	0.009699	-5.419808	0.0000
X2	0.012045	0.001854	6.497371	0.0000
X3	0.140073	0.087902	1.593506	0.1146
X4	0.007954	0.006096	1.304716	0.1953
R-squared	0.441905	F-statistic	17.81571	
Adjusted R-squared	0.417101	Prob(F-statistic)	0.000000	

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

rate throughout the years 1995-2013 is occupied by Central Java province at 0.26% per year.

Based on the growth of paddy field conversion in all cities/regencies in Java in the last 5 years (2009-2013), it shows that in general, Paddy field conversion rate is the highest in urban areas, as shown in Table 3.

Based on Table 3, in the period of 2009-2013, the highest paddy field conversion rate is dominated by Urban area. Depok city experienced the highest paddy field conversion rate at 17.66%, followed by Bandung city on the second position with 11.76%. third, fourth and fifth position, respectively occupied by Cirebon regency (8.76%), Ciamis regency (6.17%) and Tegal city (5.88%). Table 3 also shows that the region with the highest paddy field conversion is dominated by areas in West Java province, such as Depok city, Bandung city, Cirebon regency, Ciamis regency, Cirebon city and Bogor city (4.68%). The region that experienced highest paddy field conversion rate in Central Java province is Tegal city and Kudus regency (5.86%). The region experienced highest paddy field conversion rate in East Java province is Surabaya city with paddy field conversion rate in 4.31%. Yogyakarta is a region which suffered the highest paddy field conversion Rate in Yogyakarta province is at 3.24%, While the highest paddy field conversion rate in Banten province is occupied by the city of Cilegon by 2.15%.

B. Determinant Factors of Paddy Fields Conversion in Jawa

The determinant factors that influence paddy fields conversion in Jawa in this study were analyzed based on the effect of the farmers' term of trade, GDP of manufacturing industries sector, numbers of population and number of medium and large

companies in the manufacturing industries.

Determination of the independent variables is based on previous research, especially research conducted by Ilham et al (2005) about the development and the factors that affect paddy fields conversion in Indonesia, where the independent variable used in this study is also one of the variables used in the study. Farmers' term of trade as a proxy for the competitiveness of agricultural products, especially rice; GDP of the industrial sector and the number of medium and large companies in the manufacturing industry as a proxy for industrial development, as well as a population as a proxy for residential needs.

These factors are calculated based on data from BPS between 1995 and 2013 from 5 Provinces in Jawa by using Eviews 7.0.

3) Regression Analysis

The model equations are obtained based on the results of the estimation Pool Ordinary Least Square (PLS) method, Fixed Effects Model (FEM) Method and Random Effects Model (REM) Method respectively as follows:

a) Pool Ordinary Least Square (PLS) Method

The model equations are obtained based on the results of the estimation Pool Ordinary Least Square method (PLS) is as follows:

$$Y=0.145-0.0526X_1+0.012X_2+0.140X_3+0.008X_4$$

The estimation results using Pool Ordinary Least Square (PLS) Method in the form of value coefficients, standard errors, t-statistics and analysis results are

Table 5.
The Estimation Results Using Fixed Effect Models (FEM) Method

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.218752	0.141169	1.549577	0.1249
X1	-0.053836	0.009472	-5.683664	0.0000
X2	0.011915	0.001801	6.615373	0.0000
X3	0.119965	0.089746	1.336719	0.1848
X4	0.007233	0.006050	1.195664	0.2351
Cross-section fixed (dummy variables)				
R-squared	0.458628	F-statistic		9.106971
Adjusted R-squared	0.408268	Prob(F-statistic)		0.000000

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

presented in Table 4.

b) Fixed Effect Model (FEM) Method

The model equations are obtained based on the results of the estimation using Fixed Effect Model (FEM) is as follows:

$$Y=0219+D-0.0543X_1+0.0119X_2+0.120X_3+0.007X_4$$

In equations using FEM method, the slope for farmers term of trade, the GDP of manufacturing industries sector, numbers of population and the number of medium and large companies in the processing industries applicable to all regions *i*, but

the intercept every region is different, depending on the value of the dummy (Di). The coefficient of basic, standard errors, *t*-statistics and analysis results are presented in Table 5.

c) Random Effect Model (REM) Method

The model equations are obtained based on the results of the estimation using Random Effect Model (REM) is as follows:

$$Y=0219-0.065X_1+0.0117X_2+0.135X_3+0.002X_4$$

In the equation using the method of this method, error component of each

Table 6.
The Estimation Results Using Random Effect Models (REM) Method

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.219056	0.316720	0.691640	0.4909
X1	-0.064911	0.028506	-2.277106	0.0251
X2	0.011670	0.005088	2.293663	0.0241
X3	0.134603	0.180525	0.745623	0.4578
X4	0.001712	0.017463	0.098011	0.9221
R-squared	0.099697	F-statistic		2.491596
Adjusted R-squared	0.059684	Prob(F-statistic)		0.048615

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

Table 7.

The Estimation Result of Likelihood Test Ratio Between FEM and PLS Method

Effects Test	Statistic	d.f.	Prob.
Cross-section F	0.229591	(4.86)	0.9211

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

region is different. The coefficient of basic, standard errors and *t*-statistics and analysis results are presented in Table 6.

Based on several methods above, then some tests are used to choose which method is the most appropriate. Chow Test or Likelihood Ratio Test is used to choose which one is more appropriate for PLS and FEM methods. The estimation results of Chow Test or Likelihood Ratio Test using Eviews 7.0 can be seen in Table 7. The test results showed that the probability for the Cross-section F is 0,9211, which is over 0.05 (Decision: accept H_0), H_0 in this case, indicates that the PLS method is better than FEM method, so it can be concluded that in 95% confidence level, PLS method is better than the FEM method.

Hausman test is used to find the appropriate method between FEM and REM method. Based on the result of Hausman test in Table 8, it shows that the probability value for the Cross-section F is over 0.05, which indicates the condition accepts H_0 .

In this case, H_0 is indicating the REM is better than FEM method. So that as the value of probability for the Cross-section F is 0,7055, it can be concluded that in 95% confidence level, REM method is better than FEM method.

Based on the result of a series of estimates above, it can be seen that the model equations generated by the PLS method is better in explaining the influence of variable farmers' term of trade, number of population and the number of medium and large companies in the manufacturing industries of the vast paddy fields research areas. Based on estimates by PLS method, obtained the following equation:

$$Y=0.145-0.053X_1+0.012X_2+0.140X_3+0.008X_4$$

The equation shows that:

1. C constant value of 0.145 means that if the farmers' term of trade, the number of population, and the number of medium and large companies in the manufacturing industries is 0, then the paddy fields conversion will grow to 0.145%.
2. $b(X_1) = -0.053$ means that if the farmers' term of trade is increased by 1%, while other variables remained, then the paddy fields conversion (Y) will be decreased by 0.053%. Sign (-) indicates a negative correlation between the inverse or opposite of the farmers' term of trade and paddy fields conversion, that is, if the farmers' term of trade is high, then the paddy field conversion will be low.
3. $b(X_2) = 0.012$ means that if the variable GDP of manufacturing industries sector increased by 1%, while other variables remained, the paddy fields conversion (Y) will be increased by 0.012%. Sign (+) positive indicates the same direction of the relationship between the GDP of manufacturing industries sector and conversion of paddy fields, that is, if the GDP of manufacturing industries sector is high then the paddy field conversion will also be high.
4. $b(X_3) = 0.140$ means that if a variable number of population increased by 1%, while other variables remained, the paddy fields conversion (Y) will increase by 0.140%. Sign (+) positive indicates the same direction relationship between the number of population and the paddy fields conversion that is, if the number of population is high, the paddy fields conversion will also be high.

Table 8.

The Estimation Result of Hausman Test Between FEM and REM Method

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.164429	4	0.7055

Source: Statistics Indonesia (BPS), 1995-2013 (processed)

5. $b(X_4) = 0.008$ means that if a variable number of medium and large companies in the manufacturing industry is increased by 1%, while other variables remained, the paddy fields conversion (Y) will be increased by 0.008%. sign (+) positive indicates the same direction relationship between the number of medium and large companies in the manufacturing industries and paddy fields conversion, that is, if the number of medium and large companies in the manufacturing industries is high then paddy fields conversion is also high.

4) *Classical Assumption Test*

To be accepted as a multiple linear regression model assumption, it must meet the Classic assumption test, which includes:

a) *Normality Test*

Based on the test results of normality treated with 7.0 eviews program, it can be obtained that the shape of the histogram is distributed asymmetrically so that we expected residuals to be normally distributed. Based on statistical test Jarque bera statistical value of 1.528706 with 46.56% probability, it can be concluded that the residuals were normally distributed and pass the test for normality so that testing data is appropriate to proceed in the study.

b) *Multicollinearity Test*

From the data processing through the eviews 7.0 program, it can be concluded:

- The correlation coefficient for the variable farmer term of trade and the GDP of manufacturing industries sector amounted to -0.210224. This means that Multicollinearity does not happen between variable rate and the GDP manufacturing industries because of the correlation coefficient is less than 0.8. Then we can say "pass the Multicollinearity test".
- The correlation coefficient for the variable of farmers' term of trade and the number of population at 0.121284. This means Multicollinearity does not happen between the term of trade variable and a population of farmers because the magnitude of the correlation coefficient is 0.121284 less than 0.8, it can be said to "pass the Multicollinearity test".
- The correlation coefficient for the

variable farmer's term of trade and the number of medium and large companies in the manufacturing industries of -0.016026. this means not happen Multicollinearity between the farmer's term of trade variable and number of medium and large companies in the manufacturing industries because the magnitude of the correlation coefficient is -0.016026 less than 0.8 then we can say "pass the Multicollinearity test".

- The correlation coefficients for variables GDP of manufacturing industries sector and a number of the population are -0.548850. this means not happen Multicollinearity between GDP of manufacturing industries sector variables and a number of population. because the magnitude of the correlation coefficient is -0.548850 less than 0.8, then we can say "pass the Multicollinearity test".
- The correlation coefficients for GDP of manufacturing industries sector variables and the number of medium and large companies in the manufacturing industries are -0.005481. this means Multicollinearity does not happen between GDP of manufacturing industries sector variable and a number of medium and large companies in the manufacturing industries because of the magnitude of the correlation coefficient is -0.005481 less than 0.8 then we can say "pass the Multicollinearity test".
- The correlation coefficients for the number of population variables and the number of medium and large companies in the manufacturing industries are -0.045813. this means not happen Multicollinearity between a number of population variables and the number of medium and large companies in the manufacturing industries because the magnitude of the correlation coefficient is 1-0.045813 less than 0.8 then we can say "pass the Multicollinearity test".

c) *Heteroskedasticity Test*

Based on heteroscedasticity test through eviews 7.0 program, we can find

that the probability value Obs * R-squared are 0.2769. Because the probability value Obs * R-squared are $0.2769 > 0.05$, there is no heteroscedasticity.

d) *Test Autocorrelation*

Based on Autocorrelation test through eviews 7.0 program, we can find that the probability value Obs * R-squared are 0.5006. Because the probability value Obs * R-squared are $0.5006 > 0.05$ can be concluded that in this research model passes autocorrelation test.

e) *Test of linearity*

Based on the linearity test through eviews 7.0 program, we know the value of the F probability of 0.6352. Thus, the probability of $0.6352 > 0.05$ so that we can conclude this research model linearity test passes.

5) *Hypothesis Testing*

a) *t-Test*

- Farmers' term of trade variable
Based on the estimation by eviews 7.0 program for farmers' term of trade variable, the result obtained probability value (significance) = 0.0000. Thus because of the probability value less than $\alpha 0.05$ ($0.0000 < 0.05$). It can be concluded that the farmers' term of trade variable significantly influences the paddy fields conversion in Java.
- The GDP of manufacturing industries sector Variable
Based on the estimation by eviews 7.0 program for The GDP of manufacturing industries sector Variable, the result obtained probability value (significance) = 0.0000. Thus because of the probability value is less than $\alpha 0.05$ ($0.0000 < 0.05$), it can be concluded that the GDP manufacturing industries variables significantly influence the paddy fields conversion in Java.
- The numbers of population Variable
Based on the estimation by eviews 7.0 program for the number of population variable, the result obtained probability value (significance) = 0.1146. Thus because of the probability value less than 0.05α ($0.1146 < 0.05$), it can be

concluded that a variable number of the population did not significantly influence paddy fields conversion in Java.

- The number of medium and large companies in the manufacturing industries Variable

Based on the estimation by eviews 7.0 program for a number of medium and large companies in the manufacturing industries Variable, the result obtained the probability value (significance) = 0.1953. Thus because of the probability value is less than 0.05α ($0.1953 < 0.05$), it can be concluded that the number of medium and large companies in the manufacturing industries Variable did not significantly influence paddy fields conversion in Java.

b) *F Test*

Based on the estimation by eviews 7.0 program, probability value obtained for the F-statistic is equal to 0.000000. Thus because of the probability value (significance) is greater than $\alpha 0.05$ ($0.000000 > 0.05$). It can be concluded that simultaneously, the farmers' term of trade, the GDP of manufacturing industries sector, the number of population, and the number of medium and large companies in the manufacturing industries variables significantly influence the paddy fields conversion in Java.

6) *Coefficient of Determination*

Based on the estimation through the program eviews 7.0, the coefficient of determination can be seen from the adjusted R-Squared value. The result for adjusted R-Squared value is 0.417101. This means that 41.71% of paddy fields conversion in Java is influenced by farmers' term of trade, the number of population and the number of medium and large companies in the manufacturing industries variables, while the remaining 58.29% is influenced by other variables which are not examined in this study.

Based on the results of the analysis determined by using the PLS (Pool Ordinary Least Square) method, it can be seen that together (simultaneously) the farmers' term of trade, the GDP of manufacturing industries sector, the number of population, and the number of medium and large companies in the manufacturing industries variables significantly influence paddy fields conversion in Java. From the F test results, it can be seen that the probability value for the adjusted R-squared value

of 0.417101 indicates that 41.41% of paddy fields conversion in Java is influenced by farmers' term of trade, the number of population, and the number of medium and large companies in the manufacturing industries variables, while the remaining 58.29% is influenced by other variables not examined in this study.

Based on the research, we find that the farmers' term of trade significantly influence the paddy field conversion in Java is in accordance with the initial hypothesis of the study. The low term of trade caused no incentive for farmers to continue to live in their paddy field production, so they tend to convert their paddy fields (Ashari, 2003). Similarly, the GDP of manufacturing industries sector variable significantly influenced paddy fields conversion, it indicates that industrial activities and the size of the role of the industrial sector in the GDP stimulated government priorities to shift from agriculture to the industrial sector. For farmers, the increase in industrial sector becomes one of the factors to switch professions to become workers in the industrial sector and convert their land into other uses rather than the paddy field.

Based on the estimation by eviews 7.0 program for the number of population variable, the result obtained probability value (significance) = 0.1146. Thus because of the probability value is less than 0.05α ($0.1146 < 0.05$), the number of population variable did not significantly influence paddy field conversion. Based on the estimation by eviews 7.0 program for the medium and large companies in the manufacturing industry variable, the result obtained probability value (significance) = 0.1953. Thus, because the probability value is less than 0.05α ($0.1953 < 0.05$), It can be concluded that the number of medium and large companies in the manufacturing industries variable did not significantly influence paddy fields conversion in Java. This result shows that both variables did not correspond to the initial hypothesis of the studies.

The negative slope of the variables equation such as on farmers' term of trade variable pointed out that the increase of farmers' term of trade will cause the decrease of the paddy field conversion. In contrast, the positive slope such as on the GDP of manufacturing industries sector pointed out that the increase in GDP of manufacturing industries sector caused the increase in paddy field conversions.

One of the interesting properties in empirical research model is that the slope coefficient (β) measure the elasticity of Y with respect to X, or in other words, the percentage change in Y for a given percentage change in X (Gujarati, 2007). In symbolic, if ΔY indicated the changes of paddy field conversion (Y) and ΔX indicated the changes in a variable that influence paddy field conversion (X), then it can be defined as a coefficient of elasticity

(E). Elasticity criteria are as follows:

- $E > 1$ = elastic
- $E < 1$ = inelastic
- $E = 1$ = uniter
- $E = 0$ = perfectly inelastic
- $E = \infty$ = perfectly elastic

As for the influence of these variables, it can be seen in the estimated equation below:

$$Y = 0.145 - 0.053X_1 + 0.012X_2 + 0.140X_3 + 0.008X_4$$

From the equation, we can conclude the elasticity of each variable. Based on a slope, the value of Farmers' term of trade variable amounted to -0.053, it can be seen that the elasticity value of Farmers' term of trade variable towards paddy fields conversion is -0.053. Based on a slope, the value of GDP of manufacturing industries sector variable amounts to 0.012, it can be seen that the elasticity value of GDP of manufacturing industries sector variable towards paddy fields conversion is 0.012.

Based on elasticity value of the farmers' term of trade variable and the GDP of manufacturing industries sector variable which is smaller than 1, it is indicated that the farmer's term of trade variable and the GDP of manufacturing industries sector variable are inelastic towards paddy fields conversion. It showed that every 1% increase in the farmers' term of trade will decrease paddy fields conversion amounted to 0.053%. Instead, each 1% increase in the GDP of manufacturing industries sector will improve paddy fields conversion amounted to 0.012%.

C. Government Regulations to Control Paddy Fields Conversion

Paddy field is a private good that is legal to be transacted. Therefore, the efforts to limit the occurrence of paddy field conversion can be done is merely control. The control should be the start from the factors that cause the occurrence of paddy fields conversion, there are economic, social, and legal instruments (Ilham et al., 2005). One of the efforts made by the government to control the conversion of paddy fields is through a juridical approach by issuing various regulations such as Law of the Republic of Indonesia Number 5 of 1960 on the Basic Regulation of Agrarian Principles, Law of the Republic of Indonesia Number 12 of 1992 concerning Plant Cultivation System, Law of the Republic of Indonesia Number 26 of 2007 on Spatial Planning, Law of the Republic of Indonesia Number 41 of 2009 on Sustainable Land Farming Protection, as well as the Presidential Regulation and other

government regulation.

However, the actual fact showed that the control of paddy fields conversion through juridical approach is not maximized in overcoming problems of paddy fields conversion. Lichtenberg & Ding (2008) states that the biggest obstacle in the protection of agricultural land is institutional aspect rather than on the physical aspects. Failure to set the institutional aspects affect the demand and supply of land to be converted. A juridical instrument that has been developed by the government have not applied clear sanctions, overlapping and not supported by economic and social instruments (Irawan, 2008). This causes the paddy fields conversion rate is still quite large even venturing into paddy fields with technical irrigation potential for rice production.

For example, the implementation of Law of the Republic of Indonesia Number 41 of 2009 is plagued with the overlapping rules of other laws, such as Law of the Republic of Indonesia Number 23 of 2014 on Regional Government, where the Regional Government has authority to assign a function area. Agriculture is only a matter of choice for Regency/City Government in the Law of the Republic of Indonesia Number 23 of 2014. These conditions increase the chances of ignoring local agricultural sector. Irawan (2008) states that regional Government focus on the progress of their region that viewed from the economic growth and revenue (PAD), The Regional Government are trying to increase investment in the non-agricultural sector as it can generate greater revenue and promote faster economic growth. Consequently, if the case demands conversion of agricultural land to be used for other nonagricultural uses, the local government is less likely to consider a ban on land conversion applicable.

Furthermore, inconsistency between paddy fields conversion control objectives and determining the extent of paddy fields in the spatial instrument can also trigger the occurrence of paddy fields conversion. This can be seen in the research conducted by Dewi (2010) which showed that the Spatial Plan/RTRW as an instrument layout is precisely triggered by the occurrence of paddy fields conversion. This occurs due to the incompatibility of determining the extent of paddy fields contained in the RTRW with the actual area where it turns paddy fields area listed in the RTRW are smaller than the actual paddy fields. For example, The Study which comparing two RTRW in Bekasi Regency year 1999 and 2007 showed that in the RTRW 1999, vast areas allocated for paddy fields is 66.937 hectares, while in RTRW 2007, the area designed for paddy fields decreased into 51.093 Ha. This means that there has been a decline in the paddy fields area. In addition, through spatial analysis, it is known that based on the facts, the actual paddy fields area is larger than

stated in RTRW 2007, which is consist of the area for technical irrigated paddy fields amounted to 58.680 Ha and rainfed paddy fields area amounted to 2.486 Ha. This means that there is an actual technical irrigated paddy field amounted to 18.400 Ha that is not included in the allocation of paddy fields designation on RTRW 2007 so that it can stimulate the occurrence of paddy fields conversion in those areas. Thus, based on the case above, it turns the spatial instrument that expected to provide protection for paddy fields precisely triggering the occurrence of greater paddy fields conversion.

IV. CONCLUSION

Based on the estimation result it can be seen that during the year 1995-2013 paddy field conversion occurs at all provinces in Java with total conversion about 370.000 Ha, or about 19.000 Ha/year, with conversion rate are about 0.57% annually. West Java Province experienced the largest paddy field conversion in Java throughout the years 1995-2013 with total conversion about 228.000 Ha, or about 12.000 Ha/year.

Based on the resulting equation models, can be seen that the farmers' term of trade variable and GDP of manufacturing industries sector significantly influences the paddy fields conversion in Java. Based on the slope and the elasticity, in partial, it is known that each 1% increase in the farmers' term of trade will be lowered paddy fields conversion amounted to 0.069%. Instead, each 1% increase in the GDP of the manufacturing industries will improve paddy field conversion amounted to 0.287%, where the slope value of less than 1 indicates that the farmers' term of trade variable and GDP of manufacturing industries sector are inelastic towards paddy fields conversion.

Moreover, paddy fields conversion in Java needs to be controlled considering the vast reduction of paddy fields area in Java. Efforts to control paddy fields conversion in Java can be done by reducing the factors that affect paddy fields conversion. The effort required in order to reduce the paddy fields conversion in Java is to fix the farmers term of trade, especially paddy fields farmers and do monitoring in industries developments in order not to convert a paddy fields for the industrial expansion, that is the policy of increasing the purchasing power of farmers so that farmers term of trade increased. Besides that, it also needs policies in land conversion control due to the development of industrial activities such as monitoring the granting of land use, especially paddy fields for other uses.

However, currently, the regulations to protect agricultural land still have not effective enough to overcome problems of paddy fields conversion into another use. Overlapping rules, rules that have not supported by economic and social instruments,

and have not applied clear sanctions, and also inconsistency between paddy fields conversion control objectives and determining the extent of paddy fields in the spatial instrument still being obstacle in order to control paddy fields conversion in Java and in fact, precisely trigger the occurrence of greater paddy fields conversion.

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