Land conversion and economic development in Jawa Barat Province: *Trade off or Synergy?*

N Nuryartono¹,²*, A Tongato¹, S Yusdiyanto¹, S H Pasaribu¹,², T Anggraenie¹
¹International Center for Applied Finance and Economics (InterCAFE), Bogor, Indonesia
²Departments of Economics, Faculty of Economics and Management, Bogor Agricultural University, Bogor, Indonesia.

E-mail: nuryartono@yahoo.com

**Abstract.** Jawa Barat province contributed 22 percent to the national rice production. Since land availability is one of important factors for food production, this must be addressed seriously. During the period of 2008-2013, there had been a shrinking of wetland area of 20,502 hectares (nearly 2.2 percent out of total wetland area in Jawa Barat). This condition may have implications on local and national food production and food security. This study analyzes influencing factors for land use changes of wetland in West Java using a panel of 5200 villages’ level data in 2011-2014 by panel method. Important influencing factors that contribute to the land conversions mostly related to the development such as increasing number of new settlements and regional economic development. Spatially, using GIS map shows some areas have high rate of land conversion compared to other areas. The highest land conversion was in Kabupaten Bogor followed by Kabupaten Bekasi, while lowest was Bogor city. As there are tradeoff between economic development and land use, government policy should be addressed for economic development while it should be simultaneously preventing wetland conversion.

1. **Introduction**

The increasing in food security has always been the top priority of national food development scheme. It is logically understood that when there is a lack in food it could result in some great consequences economically, politically and socially. Land is one of the factors that plays an important role in agriculture production. Noting the importance of land in contributing the agriculture production and also the potential revenue of villages (PAD), increasing the potential revenue through agriculture production is becoming an important effort in achieving national food needs. Based on Agricultural Census (SUSENAS) in 2013, it is shown that Indonesian farming households in food crops dominated by the households that involved directly in revenue management of the villages. The number of Indonesian farming households in food crops dominated by plants that contributed to villages’ income is 14 million households, with a percentage of 79.80 percent, or decreased by 58 thousand households (-0.41 percent) compared to achieved revenue in 2003. Villages’ food crops had planting area of 94,478,528,364 m² and the average acreage of 6678 m² [1]. Jawa Barat is the third-largest province contributor to meet the food security needs of Indonesia. As for the year 2013, the agricultural area of paddy fields in Jawa Barat amounted to 925 thousand hectares.
Based on the results of Agricultural Census in 2013, it is found that the number of farming household in food crops in Jawa Barat province amounted to 2 million households. Compared to 2003, the number decreased by 121 thousand households. Meanwhile, the households number of business plantation contributing to villages’ revenue in Jawa Barat province in 2013 was 2 million households, or increased by 6 percent compared to 2003, based on BPS data [3]. However, the efforts of Jawa Barat province in contributing to the national granary to meet national food needs recently have some difficulties. This is reflected in the growth rate of rice production in Jawa Barat province which had been steadily declining from the year 2013 as many as 12 million tonnes to 11 million tonnes of villages’ revenue in 2015.

According to [1] showed that in 2013 the conversion of agricultural land into nonagricultural paddy fields in Jawa Barat province amounted to 12 331 hectares made it as the highest number compared to Jawa Tengah province that was equal to 8243 hectares. In contrast with Jawa Barat province which Jawa Timur province experienced an increase in the number of rice area as much as 2346 hectares. The impact of agricultural land conversion into non-agricultural land involves a very large dimensions like decreasing in food production as it is related to aspects that changes the orientation in economy, social-cultural and political community. The change direction, be it directly or indirectly, will affect the shift in economic conditions, spatial agriculture and agricultural development both at regional and national levels. Besides the economic aspect which significantly arising from conversion of agricultural land, the loss of long-term social aspect will also take place such as: (1) decreasing in food production; (2) degradation in agro-ecosystems; (3) degradation in farming tradition and culture; (4) limited arable farming; and (5) declining in farmers welfare, resulted by [4].
The increasing land conversion into non-agricultural land such as the expansion of housing, shops, industrial estates, and roads have led to reducing paddy field area and will ultimately reduce the production of rice from Jawa Barat province. According to [2], the level of agricultural land conversion had resulted in reducing paddy fields area in Jawa Barat province to 20 thousand hectares from 2008 which originally accounted to 945 thousand hectares and significantly decreased to 925 thousand hectares in 2013.

![Source: [2] Figure 3. Paddy Field Area in Jawa Barat province (ha) in 2004–2013](image)

The increasing agricultural land conversion (paddy field area) into non-agricultural land has caused the reducing in rice production ultimately. This means a threat to national food security. Therefore, control of wetland conversion is an important effort that must be taken in order to support national food security. Based on the facts mentioned above, this study aims to answer the critical questions related to:

1. What is the pattern and development of agricultural land conversion into non-agricultural land in Jawa Barat province?
2. What are factors that affect the conversion of agricultural land into nonagricultural land in Jawa Barat province?

2. Methods
The observation of this study includes all districts in Jawa Barat province which consists of 20 districts namely: Bandung district, Bandung Barat district, Banjar district, Bekasi district, Bogor district, Ciamis district, Cianjur district, Cimahi district, Cirebon district, Depok district, Garut district, Indramayu district, Karawang district, Kuningan district, Majalengka district, Purwakarta district, Subang district, Sukabumi district, Sumedang district, and Tasikmalaya district. The data used in this study were obtained from the Central Bureau of Statistics (BPS). All type of the data used which is the combination of individuals (cross section) data and time series data used survey data from Potential Village Survey conducted by BPS in 2011 and 2014 in Jawa Barat province. The variable type used to answer the factors that affect the conversion of land at the village level is described in Table 1 below.

| Table 1. Variables Type |
|--------------------------|
| **Data**                 | **Unit**                        |
| Micro, Small, and Medium Enterprises (MSME) | Unit |
| Convenient Stores       | Unit |
| Hotels and Lodgings     | Unit |
| DummyTransportation      | Transportation development 1=Exist; 0=Non |
| DummyResidence          | Residence development 1=Exist; 0=None |
| DummyEconomy            | Economy development 1=Exist; 0=None |
| Villages’ Revenue (PAD) | Millions of Rupiah |
| Agricultural land conversion_non-agricultural land | Percentage |
The analysis methods of this study used descriptive statistics method and quantitative method. The using of descriptive statistics method is to draw the characteristics, pattern and the development of agricultural land conversion into non-agricultural land in Jawa Barat province. Meanwhile, the quantitative analysis method is panel data method. The process in selecting data observations into a dataset is used by eliminating a few data observations that not exist in village potentials data in 2011 but then exist in 2014, which accounted to 149 villages. Therefore, total observations in this study amount to 11,626 observations.

The purpose of using panel data method in this study is to analyze factors that affect agricultural land conversion into non-agricultural land. Panel data method is analysis method that uses time series data in 2011 and 2014. In stylized form, the estimated model of determinant factors of agricultural land conversion is written as follow:

\[
Lc_{it} = \beta_0 + \beta_1 (\text{MSME}_{it}) + \beta_2 (\text{Convenient Stores}_{it}) + \beta_3 (\text{Hotels Lodgings}_{it}) + \beta_4 (\text{DumTransportation}_{it}) + \beta_5 (\text{DumResidence}) + \beta_6 (\text{DumEconomy}_{it}) + \beta_7 (\text{Villages's Revenue}_{it}) + \mu_{it}
\]

Where:
\[
\beta_0 = \text{intercept},
\]
MSME = Total Micro, Small and Medium Enterprises (MSME) (unit),
Convenient Store = Total Convenient Store (unit),
Hotels_Lodgings = Total Hotels and Lodgings (unit),
DumTransportation = Infrastructure Development in Transportation (dummy variable)
DumResidence = Infrastructure Development in Residence, (dummy variable)
DumEconomy = Development of Economy, (dummy variable)
Villages’ Revenue (PAD) = Total Villages’ Revenue or PAD (Millions of Rupiah),
Land Conversion (Lc) = Agricultural land conversion into non-agricultural land (percent),
\[
\beta_n = \text{slope } (n= 1, 2, ...),
\]
\[
\mu = \text{error}
\]

The independent variables apply in the model has been modified to answer research questions follows some authors [5-8].

The operational definition of each variable in this study is described below:

a. Micro, Small and Medium Enterprise (MSME)
Total number of micro, small, and medium enterprises (workforce less than 20 workers) in the village according to main raw material which consist of leather industry (bags, shoes, slippers, etc.), wood industry (furniture and etc.), metal and metal materials industry (furniture and jewelry from metal, etc.), fabric and weaving industry (woven handicrafts, convection, etc.), food and beverage industry (processing and preservation of meat, fish, fruits, vegetables, oils and fats, milk and dairy foods, other food and beverage industry, and etc.), and other related industries.

b. Convenient Stores
The total number of convenient store (projected by self-service system, ability in selling various kinds of retail goods with given price tags, and floor area < 400 m²).

c. Hotels and Lodgings
Hotels are interpreted as the total number of hotels which providing accommodation including a restaurant, and lodging certified license as a hotel while lodgings are interpreted as the total number of lodging area including hostel / motel / inn / guesthouse which providing accommodation and lodging with a business license.

d. DumTransportation
DumTransportation means all the programs and community development activities in the villages during the last 3 years including construction and the improvement of facilities and infrastructure in transportation (roads, bridges, etc.) in each village in Jawa Barat province.
e. DumResidence
DumResidence means all the programs and community development activities in the villages during the last 3 years including construction and the improvement of facilities and infrastructure in residence area, namely housing and health (sanitation, clean water, lighting, and posyandu) in each village in Jawa Barat province.

f. DumEconomy
DumEconomy means all the programs and community development activities in the villages during the last 3 years including construction and the improvement of facilities and infrastructure in terms of economy aspect (irrigation, markets, fish auction place (TPI), fish hauling harbor (PPI), trade facilities, and other facilities to support economy) in each village in Jawa Barat province.

g. Villages’ Revenue (PAD)
Villages’ revenue (PAD) means all the sources, forms and its value during 2010 and 2013: the revenue is measured in millions of Rupiah in each village in Jawa Barat province. The villages’ revenue comes from village enterprises, wealth of the village (coming from village treasury, village markets and village buildings), the result of self-help and peoples’ participation and also the result of mutual cooperation.

h. Conversion of agricultural land into nonagricultural land (Land Conversion)
The change in agricultural land (conversion) during the last year into non-agricultural land is in the form of percentage.

3. Results

3.1. Characteristics of Economic Development in Jawa Barat Province
Economic Characteristics of Jawa Barat province describes the development and economic growth in Jawa Barat province. The more rapid economic development of a region the more it indicates that the economic growth moves forward.

Table 2. Descriptive Statistics Variables Affecting the Conversion of Agricultural Land into Nonagricultural land in Jawa Barat province

| Variable                  | Indicated Conversion | Standard Error |
|---------------------------|----------------------|----------------|
| MSME (Unit)               | 37.331               | 92.406         |
| Convenient Stores (Unit)  | 1.542                | 17.761         |
| Hotels_Lodgings (Unit)    | 0.481                | 4.124          |
| DumTransportation (1)     | 0.931                | 0.252          |
| DumResidence (1)          | 0.686                | 0.463          |
| DumEconomy (1)            | 0.430                | 0.495          |
| Villages’ Revenue (Millions Rupiah) | 114.863              | 298.177        |

The highest number of MSME in 2011 was achieved by Gunungsari village in Cikatomas, Tasikmalaya which amounted up to 1,292 units. Fabric and weaving manufacturing (woven handicrafts, convection, etc.) was the most dominating industry in the area which amounted to 998 units. Meanwhile, the highest number of MSME in 2014 was achieved by Tanjungsari village in Rajadesa, Ciamis which amounted to 1,041 units. However, th woven industry (cane/bamboo equipment, grasses, rushes, papyrus, mats, bags, wall hangings, etc.) is the most dominating industry in the area which amounted to 998 units.

The highest number of convenient stores in 2011 was achieved by Cinunuk village in Wanaraja, Garut district; Singsasari village in Singaparna, Tasikmalaya district; Sinagar village in Sukaratu, Tasikmalaya district; Sirnajaya village in Gununghalu, Bandung Barat district; and Pondok Petir village in Bojongsari, Depok district which contributed to 98 units. Meanwhile, in 2014, in Samudrajaya village, Tarumajaya, Bekasi district, total number of convenient stores amounted to 1,427 units. The high number of convenient stores in Bekasi happens not only because of the existing industrial area in this
location but also this location is a part of the mega Jabodetabek area. The urban development in Bekasi also gives an impact on the development of other facilities especially convenient stores in Bekasi.

The highest number of hotels and lodgings in 2011 and 2014 was achieved by Cisarua village, Bogor district with the total number of 109 units and 113 units respectively. Cisarua village which located in the peak tourist area has its own charming characteristics. Tourism development was also playing an important role in encouraging the growth of hotels and lodgings while at the same time can also have implications in the conversion of agricultural land into non-agricultural land.

Programs and community development activities basically can be grouped into: the development of transportation infrastructure, housing and health infrastructure, and economic infrastructure. Over the last 3 years, there were 10 831 villages that owned empowerment program for transportation infrastructure, 7981 villages owning housing and health infrastructure program and 5000 villages that received economic infrastructure program. Thus, within a period of 3 years, the majority of villages in Jawa Barat province had enjoyed government programs related to road and transportation infrastructure. With the opening of road accessibility will also affect the conversion of agricultural land as physical development of road infrastructure requires more land area.

The highest amount of villages’ revenue (PAD) in 2011 was achieved by Cikalong village, Cimaung, district of Bandung. Meanwhile, in 2014, the Jelegong village in Cidolog, Ciamis district contributed to 9812 (in millions of Rupiah). The revenue comes from village enterprises, wealth of the village (coming from village treasury, village markets and village buildings), the result of self-help and peoples’ participation and also the result of mutual cooperation. The average amount of PAD accounted to 115 thousand millions rupiah.

3.2. Pattern and Development of Agricultural Land Conversion into Non-Agricultural Land in Jawa Barat Province

Increasing land conversion is a serious threat to national food security. The increasing in agricultural land conversion has led in the decreasing of paddy field area every year. In the village potentials data, there were some indicated conversion of agricultural land into non-agricultural land in Jawa Barat province in 2011 and 2014.

| Conversion to Non-Agricultural Land | 2011 (villages) | 2014 (villages) |
|------------------------------------|----------------|----------------|
| Conversion Indicated               | 1.886 (32.44%) | 1.769 (30.43%) |
| Conversion Unindicated             | 3.927 (67.56%) | 4.044 (69.57%) |
| Total                              | 5.813 (100%)   | 5.813 (100%)   |

Based on Table 3, the phenomenon of villages that suffered the conversion of agricultural land depicts a slight decreasing. As shown in 2011, 32 percent of villages in Jawa Barat province had been converted to non-agricultural land, while in 2014 it is shown that the percentage decreased to 30 percent. However, it is very mandatory be wary of this situation.

The general picture of land conversion in Jawa Barat province can be seen in figure 4. Some districts that had quite high increasing in land conversion from 2011 to 2014 were Kabupaten Bogor, Kabupaten Bekasi, Kabupaten Bandung, Kabupaten Cianjur, Kabupaten Garut and Kabupaten Cirebon. Particularly, the one that gaining serious concern is the district of Bekasi. In 2011, there were land conversion around 7 percent and rising to 11.2 percent in 2014. Within 3 years, the number increased and doubled. It certainly could not be separated from the fact that Bekasi district located in hinterland of the capital area of Jakarta as well as developing and expansion area of many industries. Not to mention, this situation also had further implications especially the decreasing of existing paddy field area.
3.3. Dynamic Changes in Agricultural Land Conversion into Non-Agricultural Land in Jawa Barat Province

The conversion of agricultural land into non-agricultural land in Jawa Barat province had changed in terms of conversion patterns in several villages in 2011 and 2014. A total of 1886 villages recorded to have converted their agricultural land into non-agricultural land in 2011. From those 1886 villages, it is then found that in 2014, around 893 villages (47%) happened to have converted agricultural land into non-agricultural land while the rest 993 villages had done no land conversion.

In 2011, 3927 villages did not experience any conversion of agricultural land into non-agricultural land. From those 3927 villages, a total number of 876 villages (22%) experienced the agricultural land conversion into non-agricultural land, while the other 3051 villages did not experience any of land conversion in 2014.

3.4. Analysis of Factors Affecting Land Conversion of Agricultural Land into Non-Agricultural Land

According to BPS (2015), the level of agricultural land conversion has caused reducing in paddy fields area in Jawa Barat province to 20 thousand hectares. The total area in 2008 was 945 thousand hectares, and later in 2013 it decreased to 925 thousand hectares. This also means a threat to national food security. Therefore, the analysis of the factors that affect the conversion of agricultural land into non-agricultural land is required in order to control the conversion of agricultural land.
The existence and development of convenient stores positively affect the conversion rate of agricultural land into non-agricultural land in Jawa Barat province and statistically significant at the 5 percent significance level. This indicates that an increasing of one unit convenient stores establishment resulting in an increasing of the level of agricultural land conversion into non-agricultural land in Jawa Barat province by 0.002 percent. This result is also in line with the study by Jinyan et al (2010), which explains that the dominant factor affecting the conversion of agricultural land into non-agricultural land is the increasing of economic activities on non-farming industries. The increasing activity on retail trade is also portrayed by the more development and establishment of convenient stores in rural areas which implies the needs for land for convenient store construction. Later, this would put more pressure on the need for land.

Table 4. Analysis of factors affecting the conversion of agricultural land into non-agricultural land

| Variable               | Koef    | Standard Error | t value | Prob       |
|------------------------|---------|----------------|---------|------------|
| MSME                   | -7.16E-06| 7.47E-06       | 0.957796| 0.3382     |
| Convenient Stores      | 0.000257***| 9.10E-05     | 2.823262| 0.0048     |
| Hotels_Lodgings        | 0.000143* | 8.51E-05     | 1.679298| 0.0931     |
| DumTransportation      | -0.005604***| 0.001355     | -4.135869| 0.0000     |
| DumResidence           | 0.005929***| 0.000661     | 8.975779 | 0.0000     |
| DumEconomy             | 0.002653***| 0.000295     | 8.979503 | 0.0000     |
| Villages’ Revenue (PAD)| -0.00000285***| 6.05E-07     | 4.717230 | 0.0000     |
| C                      | 1.742871 | 0.000752      | 2318.479 | 0.0000     |

R-Square : 0.9869  
Adj R-Square : 0.9826  
Note: *** Significant level at 1%; **) Significant level at 5%; *) Significant level at 10%

Hotels and lodgings positively effect the conversion rate of agricultural land into non-agricultural land in the in Jawa Barat province. With the significant level of 10 percent, it indicates that an increasing in the construction for 1 unit of hotels and lodging resulting in an increasing of the level of agricultural land conversion into non-agricultural land in Jawa Barat province by 0.0001 percent.

From the estimation of factors that affect the conversion of agricultural land into non-agricultural land in in Jawa Barat province, the coefficient of Dummy Transportation is -0.0056. Dummy Transportis worth 1 if there is a program or community development activity in the village during the last 3 years which includes construction or improvement of facilities and infrastructure such as roads, bridges, etc. in each village of the Jawa Barat province and worth 0, otherwise. This result implies that the difference in conversion of agricultural land into non-agricultural land between developed transportation and non-developed transportation is 0.0056 percent. When there is a construction for infrastructure, the conversion of agricultural land into non-agricultural land in in Jawa Barat province will decrease. This is in line with [8] which explains that access to market does negatively affect the agricultural land conversion. Better infrastructure access will increase the manpower and capital investment as it can increase the amount of output since input costs are relatively cheaper, results by [9]. Access to better infrastructure can also increase the high-value of agricultural production and the using of inputs to the fullest. Conversely, if there is an increase in production costs, it will affect the amount of production output, due to factors of production that will do better in better infrastructure, results by [10]. The better infrastructure transportation will reduce the conversion rate of agricultural land. This is as explained before that in terms of infrastructure development, the local government considers sustainable aspects of Nationals’ Land Management Program (SLMP) which includes environmental aspects of sustainable development improvement on agricultural productivity through soil and water conservation in developing community infrastructure.

In addition, based on the estimation results of factors that affect the conversion of agricultural land into non-agricultural land in Jawa Barat province, the coefficient of Dummy Residence obtained is 0.0059. The Dummy Residence is worth 1 if there is a program or community development activity in the village during the last 3 years, which includes construction or improvement of facilities, and
infrastructure in housing and health (such as sanitation, clean water, lighting, and posyandu) in each village of the Jawa Barat province and worth 0, otherwise. This result implies that the difference in conversion of agricultural land into non-agricultural land between developed residence infrastructure and non-developed residence infrastructure is 0.0059 percent. When there is a construction for residence area, the conversion of agricultural land into non-agricultural land in Jawa Barat province will increase. This is in line with [11], which explains that the dominant factor affecting land conversion when viewed from the landscape aspect is on the accessibility to the location area.

The estimation coefficient result of Dummy Economy is 0.0026. Dummy Economy is worth 1 if there is a program or community development activity in the village during the last 3 years which includes construction or improvement of facilities and infrastructure that generally supports the economy (such irrigation, markets, TPI / PPI, trade facilities, and other supporting economic tools) in each village in Jawa Barat province and is worth 0 otherwise. This result implies that the difference in conversion of agricultural land into non-agricultural land between the region that has active economic development and the one that does not have it is 0.0026 percent. When there is economic development, the conversion of agricultural land into non-agricultural land in Jawa Barat province will increase.

Villages’ Revenue or PAD negatively affects the conversion rate of agricultural land into non-agricultural land in Jawa Barat province. The revenue itself comes from village enterprises, wealth of the village (coming from village treasury, village markets and village buildings), the result of self-help and peoples’ participation and also the result of mutual cooperation. The result shows that any increase in PAD amount to 1 million rupiah, the rate of agriculture land conversion to non-agricultural land in Jawa Barat province decreases by 0.00000285 percent. This result is in line study by [7], which explains that the external factors that affect the conversion of agricultural land is that GDP negatively affects agricultural land conversion. In other words, if there is an increase in GDP in the agricultural sector, it will lead to a decrease in conversion of agricultural land. The high villages’ revenue the more it will reduce the rate of agricultural land conversion.

4. Conclusion
The conclusions of this study are explained as written below:

1. The analysis results above of the increasing in agricultural land conversion into non-agricultural land in Jawa Barat province from 2011 to 2014 occurred in some districts such as: 2.62 percent in Bandung Barat district, 0.99 percent in Banjar district, 6.34 percent in Bekasi district, 1.25 percent in Cianjur district, 3.88 percent in Cirebon district, 0.93 percent in Garut district, 0.58 percent in Indramayu district, 0.39 percent in Majalengka, 1.16 percent in Purwakarta district and 0.57 percent in Sumedang district. The highest rate of agricultural land conversion into non-agricultural land in Jawa Barat province is reported in Bekasi district from 7.92 percent in the year 2011 and doubled to Rp 14.26 percent in 2014.

2. The analysis results using the panel data showing the variables that positively affect the rate of agricultural land conversion into non-agricultural land in Jawa Barat province are convenient stores, hotels and lodgings, Dummy Residence, and Dummy Economy. Meanwhile, variable Dummy Transportation and Villages’ Revenue (PAD) showing negative effects. DummyRecidence is the variable that mostly affects the rate of agricultural land conversion into non-agricultural land in Jawa Barat province.

5. Suggestion
1. Economic factors that becoming proxy in agricultural land conversion explain the fact that economic development has some certain implications related to the conversion problem. In other hand, the government still should spur economic growth and develop the economic activities. The other related things which also should be concern is that economic development, the need for housing, industrial areas and trade will reduce the agricultural area. It is therefore necessary to establish a consistent policy areas in accordance with existing spatial allocation. The determination of perennial land in effort to ensure the agricultural production process should also
get more attention in its implementation. Industrial zones, residence area and trade are set and should be seen in the context of inter-regional connections.

2. Residence area is the variable that mostly affects the rate of agricultural land conversion into non-agricultural land in Jawa Barat province. Thus, when it comes to residence construction, it is suggested to use the concept of vertical building than landed building. It is suggested because the concept of vertical building will reduce the land use area.

3. The development of the region will affect the development of other areas. The phenomenon that occurred in Bekasi district is an important lesson noting that Bekasi district is also the hinterland of Jakarta. The land conversion Bekasi district is relatively high compared to other areas. Therefore, the government needs to pay attention to hinterland areas of Jakarta in order to prevent massive conversion of agricultural land to non-agricultural. However, coordination between regions becomes absolutely necessary for the survival of the agricultural land area.

Acknowledgement
The authors are sincerely grateful to the Ministry for Research Technology and Higher Education, Government of Indonesia for financial support this research under research grand for International Collaboration and Publication.

6. References
[1] BPS 2016 Agricultural Census 2013 (Jakarta: Central Bureau of Statistics)
[2] BPS 2015 The total area of Paddy Field Area by Province (Hectares) tahun 2003 dan 2013 (Jakarta: Central Bureau of Statistics)
[3] BPS 2016 Production in Villages’ Revenue (PAD) in Jawa Barat Province (Tonnes) (Jakarta: Central Bureau of Statistics)
[4] Harini R, Nurdin M H and Aprilia L 2014 The Overview of Spatial Economic Analysis for Villages’ Revenue (PAD) on Agriculture: The Case of Converted Agricultural Land in District of Sleman Indonesian Journal of Geography 44 120 - 133
[5] Jinyan Z, Nana S, Shujin H E and Yingzhi L 2010 Factors and mechanism driving the land-use conversion in Jiangxi province Journal of Geographical Sciences 20 525-539
[6] Quasem M D A 2011 Conversion of agricultural land to nonagricultural uses in Bangladesh:extent and determinants (Bangladesh Development Studies) 34
[7] Harini R, Yunus H S, Kasto and Hartono S 2012 Agricultural land conversion: determinants and impact for food sufficiency in Sleman Regency Indonesian Journal of Geography 44 120 – 133
[8] Girma H M and Hassan R M 2015 Drivers of land-use change in the Southern Nations, Nationalities and People’s Region of Ethiopia African Journal of Agriculture and Resource Economics 9 148-164
[9] Binswanger H and J McIntire 1997 Behavioral and Material Determinants of Production relation in Land Abundant Tropical Agriculture Economic Development and Cultural Change 36 73-99
[10] Pender J N, Ephraim J, Pamela,S, Dick S and Henry 2004 Strategies to increase agricultural productivity and reduce land degradation: evidence from Uganda Agricultural Economics, Blackwell 31 181-195
[11] Benu N M, Maryunani, Sugiyanto and Kindangen P 2013 Analysis of land conversion and its impacts and strategies in managing them in City of Tomohon, Indonesia Asian Transactions on Basic and Applied Sciences 03 65-72