

# Existence Of Food Self-Sufficiency Performance In West Java Province, Indonesia

Fitrah Gunadi, Rizal Sjarief Sjaiful Nazli, Eka Intan Kumala Putri, Bambang Pramudya Noorachmat

**Abstract :** The food self-sufficiency performance in West Java Province faces a very complex challenge in line with the decline in agricultural land area and population growth. This study aims to evaluate the performance of food self-sufficiency in West Java Province during the period of 2007 - 2015 using the indicator of the ratio of food self-sufficiency. The focus of this research is directed to rice commodities. The analysis in this study used a descriptive analysis of food self-sufficiency performance and the factors that influence it. The analysis shows that although the area of agricultural land was declining, rice production tends to increase. This was driven by rising rice cropping index and increasing productivity. On the other hand, rapid population growth in West Java Province encourages increased consumption of rice. The growth rate of rice consumption was greater than the amount of rice production, especially since the period 2011 - 2015 leads to a decrease in food self-sufficiency in West Java Province which was illustrated by the trend of decreasing the ratio of food self-sufficiency.

**Index Term:** food self-sufficiency performance, food self-sufficiency ratio, rice production, rice consumption

## 1. INTRODUCTION

Food is one of the basic rights that must be fulfilled in sufficient quantities to be able to support all human activities. Fulfillment of food needs is a challenge that must be faced in a global environment as global population growth. The policy of each country in developing its food security considers two key elements, namely: (1) the ability of a country to produce its food, and (2) how the carrying capacity of a country in the supply of food [1]. The two key elements will determine how a country is taking policy on its efforts to develop food security, either through food import policy or strengthening food security through food self-sufficiency. The policy of developing food self-sufficiency is an effort to increase the fulfillment of food needs through the development of domestic production by utilizing various resources owned. Indonesia is one of the countries developing its food security policy based on domestic production to fulfill food requirement as mandated by 2012 Food Act. The food self-sufficiency program is aimed at developing domestic production capacity and reducing dependence on imports mainly on strategic and political commodities. One of the commodities directed in food self-sufficiency program is rice commodity. Rice is a staple food for most Indonesians. Since the colonial era until post-independence, various policies related to increasing domestic rice production have been done in order to meet the needs of the population. The government on its effort to develop food self-sufficiency has encouraged the growth of rice production centers [2] [3]. West Java Province is one of the provinces that become the center of national rice production. In 2015, West Java Province contributed 11,373,144 tons of rice production from 75,397,841 tons of national production or about 15.08% [4].

Because of that the role of West Java is very important as a provider of national food. However, the role of West Java as a staple food producer in the future begin to get a big challenge. Rapid economic development and rapid population growth are driving increasing demand for food along with growing demand for land for industrial, commercial, residential and infrastructure sectors that lead to competition in land use between agricultural use and non-agricultural use. As a result of the land competition is the conversion of agricultural land, especially agricultural land for food crops for non-agricultural use. These conditions affect the performance of agricultural production, especially in food production and food self-sufficiency. Food self-sufficiency in West Java and its dynamics need to be a concern. The changes occurring in the food self-sufficiency performance in West Java will affect the performance of national food security. Since the development of food self-sufficiency in the areas of basic food production centers such as West Java has become a priority in national development and national security. This study tries to do descriptive approach to evaluate how food self-sufficiency performance in West Java Province in 2007-2015 period. This study aims to evaluate the performance of food self-sufficiency in the Province of West Java period 2007-2015 by using the indicator of the ratio of food self-sufficiency with the focus on rice commodities.

## 2. METHODS

### 2.1 Data Research

In this study, the data used are secondary data, obtained from various sources of government agencies. These data include: population, rice consumption per capita, rice field area, rice crop index, condition of irrigation network, rice production and productivity.

### 2.2 Technical Data Analysis

Based on the problems mentioned earlier, the study tries to analyze the performance of food self-sufficiency by focusing on rice commodities as West Java and national staple food. The method used is descriptive analysis method for food self-sufficiency performance in West Java Province. Several indicators which are the material for evaluation of food self-sufficiency, especially rice commodity are the development of

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population, the condition of agricultural infrastructure such as the availability of wet land and the condition of irrigation infrastructure, the dynamics of rice consumption, the dynamics of rice production and the capacity of food self-sufficiency. The time period of analysis in the study was 2007 - 2015. The performance of food self-sufficiency is assessed based on the capacity to meet the needs of rice based on domestic production capability. The value of food self-sufficiency is determined based on the value of Food Self-sufficiency Ratio. Food Self-sufficiency Ratio (FSR) is the percentage comparison between domestic rice production to rice consumption in West Java Province. The Value of FSR adapts the O'Hagan equation [5] as follows::

$$FSR = \frac{\text{Rice Production}}{\text{Rice Consumption}} \times 100\%$$

### 3. RESULT AND DISCUSSION

#### 3.1 Infrastructure Condition

There are two important infrastructures in rice production in West Java Province, namely land for rice cultivation and irrigation networks. Conditions against these two infrastructures reflect the amount of rice production that can be generated. Changes to the state of these infrastructures affect the performance of food production. Land is a food agriculture resource and an asset for the fulfillment of food needs and is the main thing in supporting self-sufficiency and food security. The extent of food availability reflects the extent to which food production potentials can be met. As the population grows, the need of land for food and for other socio-economic activities increases and encourages higher land use competition amid limited availability of land. Several studies have shown that agricultural land is often the subject of land use change in line with the need for land for the non-agricultural sector [6] [7] [8]. The result of analysis shows that agricultural land area during the period of 2007 - 2015 in West Java Province shows a decreasing trend in both wet land and dry land (Table 1). In 2007, the total area of agricultural land in West Java was 1,868,289 ha, of which 939,228 ha were wet land fields and 929,061 ha were dry land fields. By 2015, the area of wet land and dryland fields decreased to 936,529 ha for wet land fields and 798,713 ha for dry land fields, so the total area of total agricultural land in 2015 was 1,735 242 ha. The decline in agricultural land area as seen in Table 1. is a logical consequence of the development and growth of rural-urban areas in the area of West Java Province in tandem with economic development in an area that will directly or indirectly encourage land competition and land conversion, especially on agricultural lands [9]. The phenomenon of land conversion occurring mainly in developing countries is unavoidable during economic development and population growth [10] [11]. The large number of social and economic interests affecting land use change decisions and land cover and this will continue in the future [7]. One important component in rice production in West Java Province is irrigated rice field. The majority of wet land field in West Java Province is irrigated rice fields. Its presence is essential for food production more than once a year. Irrigated rice fields as one of the resources and food production assets also showed a decreasing trend (Figure 1).

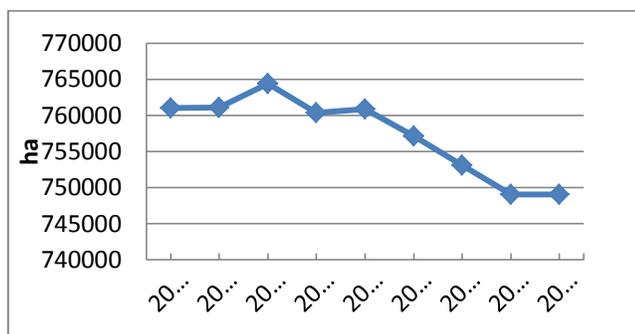
If in 2007, the area of irrigated wet land in West Java Province was 761,024 ha, then in the period of 2015 there was a decrease of irrigated area to 749.033 ha. In addition to the dynamics of very high population growth, structural changes to the economic sector in the form of development of manufacturing and service sectors and the development of new urban areas encourage land conversion, especially in the northern province of West Java [10]. As an influence there are consequences of loss of productive agricultural land and loss of employment for landowners and agricultural laborers as well as the loss or lack of optimum investment in irrigation infrastructure [12].

**Table 1.** Area of Agricultural Land in West Java Province Year 2007 – 2015

No	Year	Type of Agricultural Field (ha)		
		Wet Land	Dry Land	Total Agricultural Field
1	2007	939,228	929,061	1,868,289
2	2008	944,888	810,801	1,755,689
3	2009	949,914	810,044	1,759,958
4	2010	942,411	796,883	1,739,294
5	2011	942,974	784,217	1,727,191
6	2012	937,203	776,494	1,713,697
7	2013	939,353	783,337	1,722,690
8	2014	936,529	798,713	1,735,242
9	2015	936,529	798,713	1,735,242

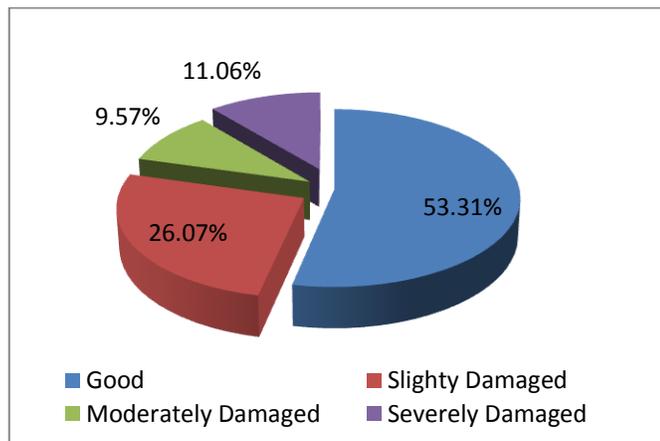
**Source :** BPS, West Java Province in Figures (2008-2016)

Another infrastructure that plays an important role in rice production in West Java Province is the irrigation network. The availability of irrigation facilities and infrastructure is an adaptation effort in order to maintain the availability of water for the sustainability of food production. Its existence can guarantee the distribution of water for agricultural land for production. Irrigation farming has provided evidence of its role in meeting and sustaining the supply of food because it is an important source of agricultural production. The existence of irrigation facilities allows food crops to be produced at any time as long as water resources are available. The ability of irrigation networks as a system in crop farming is an important factor in providing inputs highly dependent on how the conditions of irrigation network systems are available. The better the irrigation network system the more optimal the performance of irrigation in helping the production of food crops.



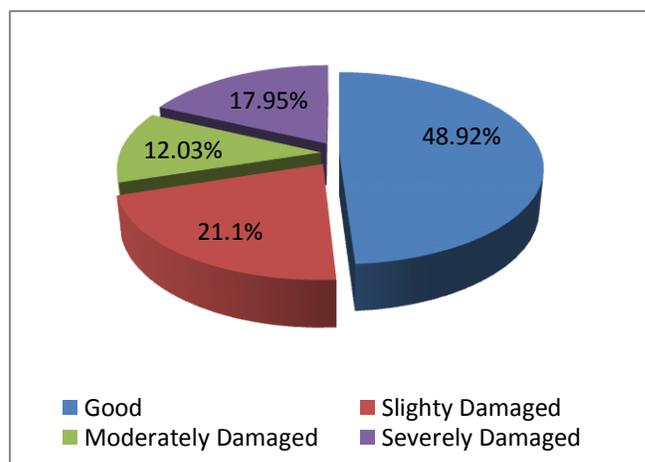
**Figure 1.** The Irrigated wet land area in West Java Province period 2007 – 2015

The majority of irrigation network system in West Java Province is a technical irrigation network. The existence of a technical irrigation network system contributes greatly to food production in West Java Province. The technical irrigation network system is divided into three authority groups, namely: Irrigation Network of Central Government Authority, Irrigation Network of Provincial Government Authority, and Irrigation Network Authority of Regency/City Government. The result of the analysis shows that the condition of irrigation network in West Java Province, whether under the authority of central government, provincial government and regency/city government is still far from optimal condition in its utilization. Irrigation networks under the authority of the central government only 53.31% are in good condition in terms of irrigation buildings and distribution channels. While the remaining 26.07% are in a slightly damaged condition, 9.57% are moderately damaged and 11.06% are heavily damaged. Specified based on irrigation networks of river areas under the authority of the central gitarum River Irrigation Area Network, the Citanduy River Irrigation Area Network and the Cimanuk River Irrigation Area Network which are under the authority of the central government each have good conditions of only 50.20%, 51.62% and 59.36% [13]. Details of the condition of irrigation network in the authority of central government in West Java Province are presented in Figure 2.



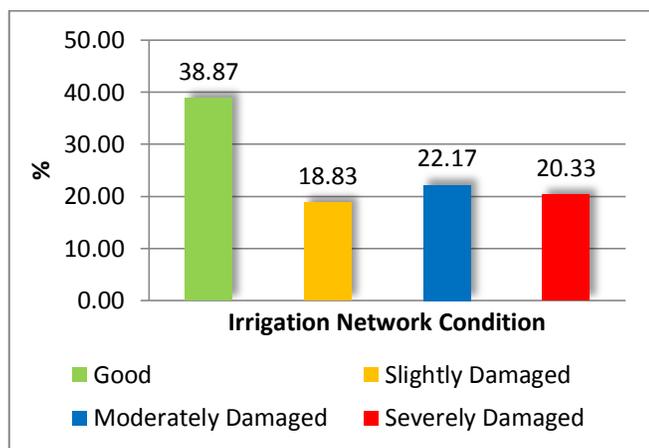
**Figure 2.** The condition of Irrigation network in the authority of central government in West Java Province (by December 2015)

The same condition also occurred in the irrigation network in the authority of the Provincial Government of West Java Province, where seen still high irrigation networks that are not in good condition. According to Water Resource Agency of West Java Province (DSDA) [13], 48.92% of the irrigation networks under management are still in good condition, while 21.10% of the conditions are slightly damaged, 12.03% are moderately damaged and 17.95% are heavily damaged (Figure 3). Irrigation network in the authority of West Java Provincial Government which has the highest level of damage is the irrigation network of Citarum River Region whose damage rate reaches 60.83% when compared to Ciliwung River - Cisadane River Irrigation Area (45.41% damage level), Cisadea - Cibareno River Region (50.98% damage rate), Ciwulan - Cilaki River Region (damage rate 53.81%), Citanduy River Area (47.62 damage level), and Cimananggar - Cisanggarung River Area damage (47.81% damage).

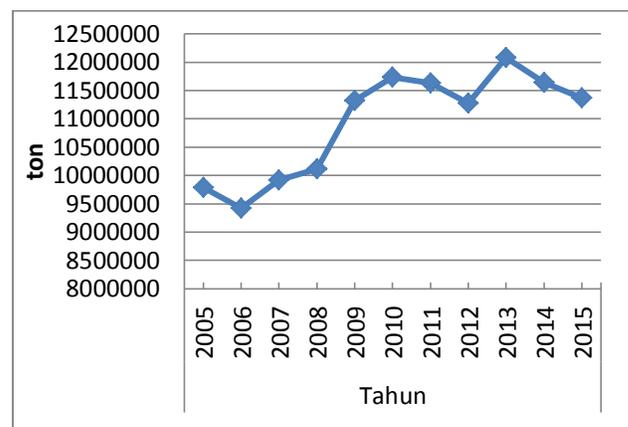


**Figure 3.** The condition of the irrigation network in the authority of the provincial government of West Java Province (by December 2015)

For Irrigation network which is the authority of regency/city government in West Java Province, conditions that are not much different also occur. In general, only 38.87% of irrigation network conditions that become in the management of district/city government that has good condition, while 18.83% with a slightly damage condition, 22.17% have moderate damage conditions, while 20.33% irrigation networks that have severe damaged conditions (Figure 4) [13].



**Figure 4.** The condition of irrigation network in the authority of regency/city government in West Java Province (by Desember 2015)



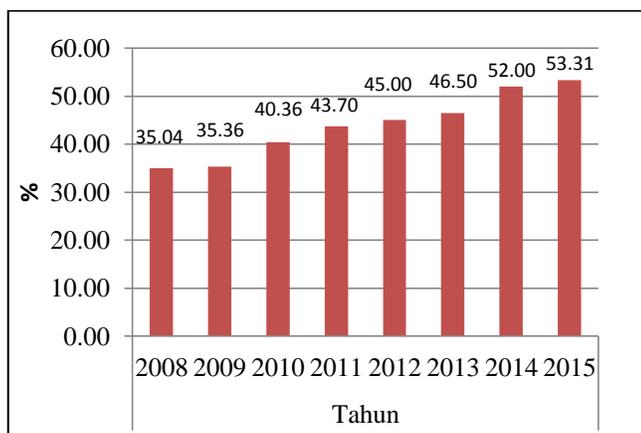
**Figure 5.** Rice production in West Java Province Period 2007 – 2015

In addition to irrigation network conditions in West Java that tend to be less good. The availability of water resources for agricultural production, especially food production is also a scarcity problem. Water utilization competitions between the agricultural sector and other sectors make water resources a scarce item as the number of usage of each sector increases. As a limited resource, water will become scarce as populations meet population growth needs, increase in urban activity and industrial development, as well as decreased availability due to population and climate change [14] [15] [16] [17]. Therefore, in the future, the availability of water and the management pattern of its utilization for agricultural irrigation becomes very important in the future.

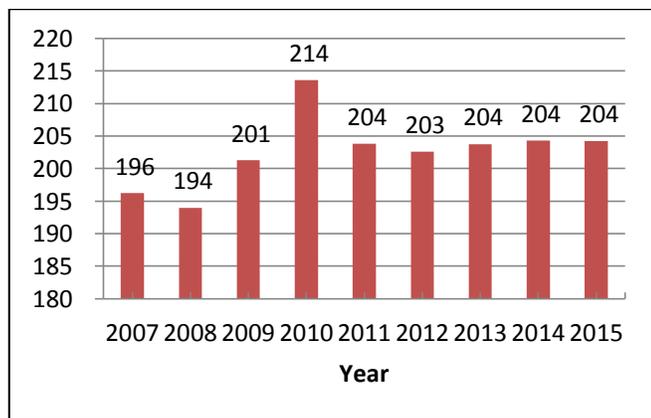
### 3.2 Rice Production Dynamics

Despite the decline in the area of rice fields, both wet lands and dry land fields, rice production in West Java Province in the period 2007 - 2015 was very fluktuatif, but showed an increasing trend. If in 2007 - 2010 showed an increasing movement, from 9,891,020 tonnes of dry unhusked rice (DUR) or about 6,220,056 tons of rice (based on the average rendement of DUR to rice by 62.74%) to 11,737,070 tons of DUR (7,363,837 tons of rice), rice production showed a decline during the 2011 to 2012 period to 11,633,836 tons of DUR equivalent to 7,299,068 tons of rice and 11,271,861 tons of DUR (7,071,965 tons of rice). In 2013, rice and rice production again increased to 12,083,162 tons of DUR (7,580,975 tons of rice), then decreased by 2015 to 11,373,144 tons of DUR or equivalent to 7,135,510 tons of rice.

Increased rice production that occurred in West Java Province caused by several factors. The results of this study found that the factors that influence the increase of rice production performance in West Java are rice field cropping index, harvested area and productivity. During the period of 2007 - 2015 the rice cultivation index, especially in paddy fields in West Java showed an increase graph. Despite the decrease in wet land area during the period, but with the improvement of irrigation network condition especially in the authority of central government, planting area and paddy cultivation area can be maintained stability. In 2008, the percentage of irrigation networks under the authority of the central government with good condition was 35.04%. Government efforts to improve the performance of irrigation networks for the utilization of the agricultural sector continue to be done by improving the conditions of irrigation networks. Budget constraints caused irrigation network repair done gradually. The government's efforts to improve the condition of irrigation networks have succeeded in improving the condition of the good irrigation network to 53.31% by 2015. Improved conditions of irrigation networks that became the authority of the central government succeeded in increasing the index of rice crop in West Java Province. If in 2007, the index of rice crop on paddy fields was 196, then in line with increasing conditions of irrigation networks, the index of rice crop increased to 204 in 2015. The dynamics of good irrigation network conditions and rice crop index on paddy fields is presented in Figure 6.



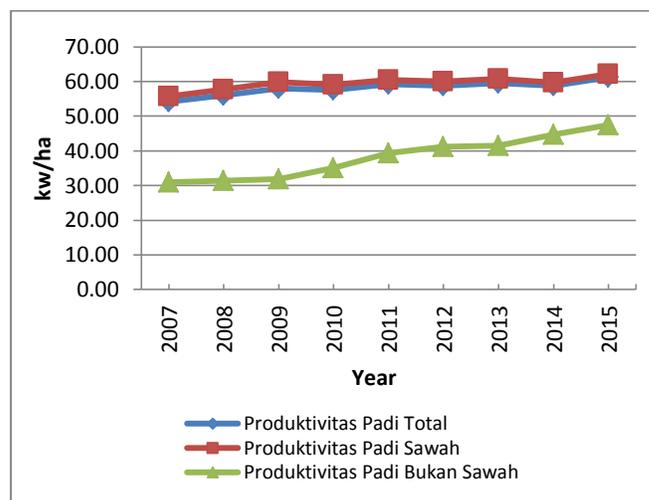
(a) The good condition situation of irrigation networks in the authority of central government in West Java Province (DSDA 2017)



(b) Rice crop index

**Figure 6.** Dynamics of good condition of irrigation network in the of central government and rice crop Index in West Java Province Period 2007 – 2015

In addition to the cropping index factor, productivity increase also gives effect to the improvement of rice production performance in West Java Province. Rice productivity in West Java Province during the period of 2007 - 2015 showed an increase. In 2007, the productivity of paddy in West Java was 54.20 kw/ha, and in 2015 rice productivity increased up to 61.22 kw/ha (Figure 7). In general, the highest rice productivity was in wet land compared to dry land fields. However, the largest increase in productivity during the period of 2007-2015 occurred in dry land.



**Figure 7.** Rice productivity dynamics period 2007 – 2015

### 3.3 Rice Consumption Dynamics

The large amount of rice consumption in West Java Province is very dependent on the population. The growing number of people encourages more and more rice consumption needs to be met. Population dynamics in West Java Province shows an increasing trend in line with economic development. Firman et al. [18] states along with the saturation of economic activity in the Province of Jakarta Capital Special Region, encouraging the need for economic activity expansion into the surrounding area. West Java Province as a border area directly and also as a buffer zone of Jakarta participated experiencing the dynamics of the growth of economic activity. As a result, there is rapidly growing population growth. If in 2007, the population in West Java was 41,483,729 people, then by 2015 the number of residents in West Java increased to 46,709,569 people as illustrated in Table 2. During the period 2007 – 2015, the population in West Java increased with an average growth rate of 1.495% per year. In addition to the natural process factors of birth and death, the development of population in West Java is also strongly influenced by the migration of the population as a result of increased social and economic activity in West Java. As a buffer zone of the nation's capital, Jakarta, West Java Province also participates in a rapid economic development characterized by increasing economic activity and the establishment of economic growth areas. [19] [18] According to Firman et al. [18], economic development is strongly associated with population growth. The shifting of economic activity from the growth center of the city of Jakarta to the surrounding areas encourages the formation of new growth centers that present economic activities such as industrial areas. These new growth centers are an attraction for some residents, both from West Java itself and from other regions to come and participate in economic activities in the region. According to Firman [20] The growth of economic activity in West Java is characterized by the physical growth of industrial and commercial centers and the emergence of new urban areas that are rapidly expanding in all directions through the main growth areas of Jakarta and Bandung. The regencies and cities in the northern part of West Java are located in Jakarta and Bandung corridors such as Bekasi

City, Bekasi Regency, Karawang Regency, Purwakarta Regency, Depok City, Bogor City and Bogor Regency. These cities are developed and transformed into urban areas in several areas and provide locations for urban activity. The spatial pattern of population growth in the northern region of West Java is preceded by the districts/municipalities that are close to the main growth centers experiencing a proportionate and absolute increase in the population, followed by districts and municipalities where there are centers of economic activity also participate in a proportionate increase in the population and in the end the growth of the urban population is created along the corridor of the northern part of West Java due to infrastructure growth [19]. Furthermore, this study explains that along with the growth of economic areas, districts and cities in the northern part of West Java continue to grow with various infrastructure built such as roads and transportation facilities and infrastructure that facilitate accessibility and inter-regional relationships within the corridor so that encouraging the development of residential areas and new cities that present the growth of commuter communities and foster rapid population growth [19] [21]. This increase in population has an impact on the increase of space requirement and food consumption requirement especially rice commodity and the losses of some agricultural land.

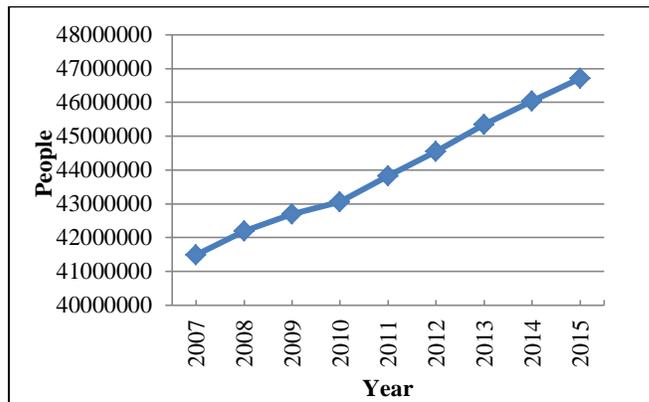
**Table 2 .The Dynamics of Population Growth in West Java Province Period 2007-2015**

Year	Number of Population (People)		
	Northern Part of West Java	Southern Part of West Java	Total West Java
2007	22,748,544	18,735,185	41,483,729
2008	23,123,999	19,070,870	42,194,869
2009	23,432,901	19,261,050	42,693,951
2010	24,194,563	18,859,169	43,053,732
2011	24,628,982	19,197,793	43,826,775
2012	25,107,436	19,440,995	44,548,431
2013	25,775,982	19,564,817	45,340,799
2014	26,286,910	19,742,758	46,029,668
2015	26,798,953	19,910,616	46,709,569

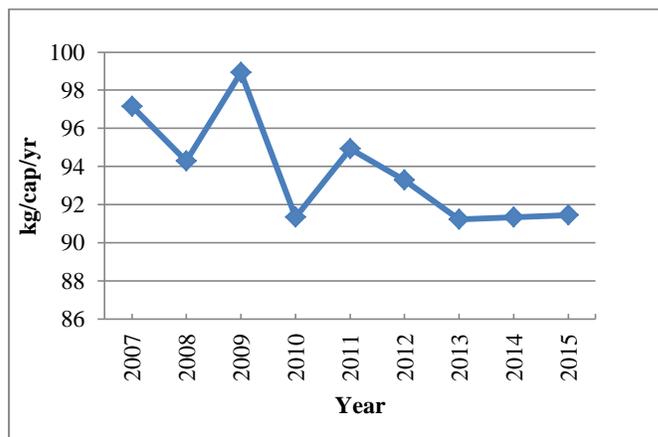
**Source :** BPS, West Java Province in Figures (2008-2016)

Rice consumption of West Java community shows an increasing trend during 2007 - 2015. In 2007, rice consumption in West Java Province was 4,074,698 tons and in 2015 increased to 4,258,643 tons. Although the level of rice consumption per capita in West Java Province shows a decrease, but along with the increase in population in West Java encourage the consumption of rice society increases. In 2007, the per capita rice consumption rate was 97.15 kg/capita /year. Along with the pattern of changes in income levels, food consumption preferences and lifestyle changes as well as government programs to diversify consumption patterns as described by Pandya-Lorch and Rosegrant [22], Kako [23], and Felloni et al. [24], rice consumption per capita tends to decrease to 91.43 kg/capita/year in 2015. However,

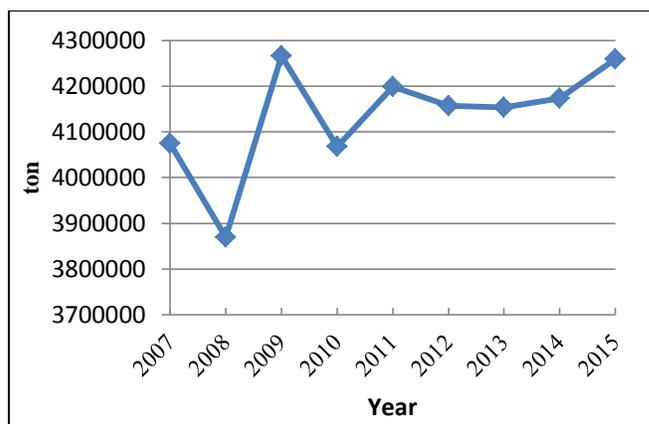
the increase of the population from 41,483,729 in 2007 to become 46,709,569 in 2015 caused a decrease in per capita consumption less successful in decreasing total rice consumption of the community .



(a) Population



(b) Rice consumption per capita



(c) Total of Rice Consumption

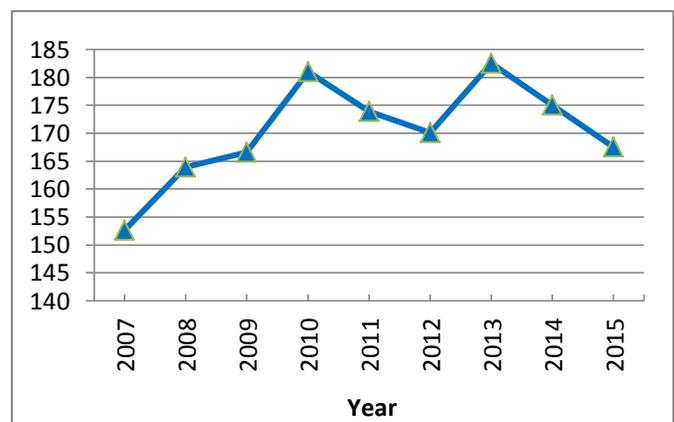
**Figure 8.** Population dynamics, rice consumption per capita and total of rice consumption in West Java Province period 2007 – 2015

From these phenomena, further analysis indicates that the increase in total rice consumption in West Java Province is driven by a combination of population growth and several other factors such as income growth and changes in food preference patterns that are thought to affect the strength of rice commodity demand [26] [27] [28] [29].

### 3.4 Food Self-sufficiency Performance in West Java Province

Considering the dynamics of food consumption and food production, especially rice commodities during the period of 2007 - 2015, the study shows that the value of food self-sufficiency ratio for rice commodities in West Java Province is divided into two stages. The first stage, during the years 2007 - 2010, the ratio of food self-sufficiency shows an increasing trend. In 2007, the value of food self-sufficiency ratio in West Java Province was 152,651. The food self-sufficiency ratio continued to increase to 181,040 in 2010. One of the factors driving this increase is in line with the increase in rice production in West Java. In the period of 2007 - 2010, the increase of rice production was higher than the increase of population in the same period. In that period, the increase of paddy/rice production reached 18.39% compared to 3.78% of the population growth. In addition, other factors affecting the food self-sufficiency ratio in that period were the decrease of rice consumption per capita in West Java from 97.15 kg/capita/year in 2007 to 91.34 kg/capita/year in 2010. The second stage is period 2011 - 2015 where there is a tendency to decrease the performance of food self-sufficiency in West Java Province. If in 2011, the ratio of food self-sufficiency in West Java is 173,857, then by the end of 2015 there is a decrease in food self-sufficiency to 157,554. This decline is influenced by population growth, also influenced by the tendency to decrease the performance of rice production. Although the per capita rice consumption level represents a decline in movement, the rapid growth of population causes the amount of rice consumption in the community to increase. In this period, rice production showed a slow decline from 11,633,836 tons of DUR (equivalent to 7,299,068 tons of rice) in 2007 and decreased to 11,373,144 tons of DUR (7,135,510 tons of rice). On the other hand, the number of residents has decreased the increase of 436,662 775 people in 2007 to 46,709,569 people in 2015. This condition of population growth increased the demand pressure on food demand amidst the decline of domestic rice supply in West Java Province. The dynamics of food self-sufficiency performance in West Java Province can be seen in Figure 9. From the results of the study also found the development of population and slowing of productivity growth amid the growth of land conversion has had an effect on the phenomenon of decreasing food self-sufficiency in West Java Province. Considering the pattern of food self-sufficiency performance on rice commodities during the period of 2007 - 2015, in the future efforts to maintain sustainable food self-sufficiency especially in rice commodities in West Java Province will be a real challenge. Changes that occur in the system of food self-sufficiency in West Java will affect the national food security system due to the position of West Java as a major production center of rice production. To maintain the capacity of West Java self-sufficiency in the future, many challenges must be faced. The first challenge is the rapid growth of

population that encourages increased demand for food in the future. Population growth and economic development in one area on the other will increase demand for land. And generally agricultural land is the easiest land to be converted to be used for infrastructure development, industrial estate and services as well as settlement. Efforts to maintain the availability of agricultural land from the conversion of agricultural land, especially in productive rice fields became the next challenge of concern especially in the northern part of West Java. Massive conversion of land on irrigated land can cause damage which leads to reduced functioning of irrigation networks and even the loss of irrigation and irrigation networks in the region. The irrigation network has a strong and significant correlation with harvested area and production [12]. Therefore the next challenge is to encourage the optimization of the irrigation network system in an effort to increase food production in the future.



**Figure 9.** Dynamics of food self-sufficiency ratio in West Java Province Period 2007 – 2015

From the description of the results of the study, the policy of sustainable development of food self-sufficiency in West Java Province in the future should be able to consider two aspects, namely aspects of consumption demand and production supply aspects as described by Keating et al. [27]. From the aspect of consumption demand is to reduce the demand for food. Meanwhile, from the aspect of the supply of production can be done by encouraging increased food production or by maintaining food production capacity.

## 4. CONCLUSION

Food self-sufficiency performance is assessed based on the magnitude of food self-sufficiency ratio that describes how much domestic food production capacity can meet the needs of food consumption in a region. The results of the analysis found that West Java Province still has a good performance of food self-sufficiency. From the general observation during the period of 2007 – 2015, it was found that there are two stages of food self-sufficiency performance existence in this case rice commodity as staple food in West Java Province. The first stage occurred during the period of 2007 - 2010 describes the increase in food self-sufficiency ratio in West Java Province. The increase in food self-sufficiency ratio is influenced by the increase of rice production which is much higher than the development of population and the decrease

of average rice consumption per capita of society. The second phase is a period of declining trend of food self-sufficiency in West Java Province which took place in 2010 - 2015. As time progress, the value of food self-sufficiency ratio both in the West Java region continues to show a tendency of slowing growth and even tends to decline at the end of 2015 period. Factors that affect the decline in food self-sufficiency, especially rice commodities in West Java province is very diverse. First are the factors that determine the demand for rice as the staple food, such as the number of people and the average per capita consumption of rice that determines how much the need for food must be met. Second is the factors that support the availability of food supply, such as availability and condition of food production infrastructure that is land and irrigation network. The condition of irrigation networks and the availability of agricultural land is a unity that determines the index of cropping. In addition, the optimization of irrigation networks will affect the success rate of harvest and land productivity. The results of the study's analysis found that during the period of 2007 - 2015 it was found that although average per capita consumption continued to show a decline, the increasing population and the decreasing trend of rice production in West Java resulted in the decreasing performance of food self-sufficiency. The results of this study explain that in the future, the policy in managing the supply aspects and aspects of rice staple food consumption should be the main concern to maintain the sustainability of food self-sufficiency in West Java starting from the provision of production facilities and infrastructure, the development of production capacity and the management of consumption.

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